The Impact of E-Readiness on E-Learning Success in Saudi Arabian Higher Education Institutions

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By

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بسم الله الرحمن الرحيم

In The Name of Allah, the Most Beneficent, the Most Merciful

To the memory of my Father " Farhan ", To my beloved Mother " Ruqayah ",

your belief in me has made this journey possible. You are the main reason behind

my success.

Abstract

This research investigates how e-readiness impacts the success of e-learning initiatives in Saudi Arabia's higher education institutions. The research model assesses this relationship taking into account the unique attributes of teachers, students and administrator in higher education institutions. Seven dimensions constituting the component factors of e-readiness were identified including policy and institutional business strategy, pedagogy, technology, interface design, management, administrative and resource support as well as evaluation and continual improvement. Also six dimensions which constitute the component factors of e-learning success including system, information and service qualities, use and user satisfaction as well as net benefits were also identified. The research hypothesizes, construct and test structural equation models (SEM) on the current levels of e-readiness of Saudi Arabian higher education institutions to successfully implement e-learning initiatives. Research instrument was developed using a pool of items generated from literature. The instruments used were verified and confirmed using exploratory factor analysis (EFA) and Confirmatory Factor Analysis (CFA). Results of EFA, CFA indicated the measurement scale can serve as reliable and valid tool to assess the relationship between e-readiness and e-learning success in Saudi Arabian higher education institutions. Structural equation modelling was used to test this relationship and to assess the applicability of the study's theoretical framework to different and multiple groups. The unique attributes of teachers, students and administrator to achieve meaningful comparisons across groups were considered and the results exhibit adequate cross-group equivalence which was achieved at different levels. Finding confirmed the universality

of the five dimensions of e-readiness to have significant effects on the six dimensions of e-learning success. Additionally, the findings indicated stability of the relationships among the variables within the structural equation model and it isn't influenced by differences of teachers, students, and administrators either conceptually or psychometrically. The current work contributes to our knowledge of e-learning through the lens of theoretical insights and empirical findings. The implications of the research in the context of Saudi Arabia are discussed and it is intended that the findings from this research can be used to inform strategic decision making towards harnessing the power of e-learning in the country's higher institutions of learning.

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Table of Contents

Abbreviations

KSA	Kingdom of Saudi Arabia
EFA	Exploratory Factor Analysis
CFA	Confirmatory Factor Analysis
SEM	Structural Equation Modelling
ICT	Information and Communication Technology
MOOC	Massive Open Online Courses
ILS	Index of Learning Styles
HE	Higher Education
MoHE	Ministry Of Higher Education
LMS	Learning Management System
OER	Open Educational Resources
DETC	Distance Education and Training Council
ALO	Advanced Learning Organization
AMOS	Analysis of a Moment Structures
$\chi 2$	Chi-Sqaure
KMO	Kaiser-Meyer-Olkin measure of sampling adequacy
AVE	Average Variance Extracted
GFI	Goodness of Fit index
CFI	Comparative Fit Index
NFI	Normed Fit Index
TLI	Tucker Lewis Index
RMSEA	Root Mean Square Error of Approximation
X2))/DF	Chi-Sqaure/ Degree of Freedom
SD	Standard Deviations
M.I	Modification Indices
CR	Composite Reliability
α	Cronbach's Alpha
p- value	Probabilty Value
SMART	Specific, Measurable, Achievable, Realistic and Timely

List of Tables

List of Figures

Chapter 1: Introduction

In this chapter, an overview of overall scope of this research as well as a summary of the content of thesis is provided. Section 1.1 presents the background which puts the current work into context and identifies the statement of the problem of research. Key research questions developed as a result of the problem statement is provided in Section 1.2 leading to the formulation of research aim and specific objectives as stated in Section 1.3. A brief summary of the contribution to knowledge and practice is highlighted in Section 1.4. Finally, the structure and organisation of the entire thesis is outlined in Section 1.5.

1.1 Background

Despite the huge efforts both in terms of financial investments and reforms in the Kingdom of Saudi Arabia (KSA), access to quality education to all citizens has been hampered significantly due to increase in population and the geographically dispersed nature of the country. Currently, it is estimated that over 60,000 students are unable to gain access to university education due to their geographical location within the country (Alharbi, 2016). In an attempt to address this growing concern, efforts towards adopting digital solutions and approaches to education was reinvigorated by the government. It is believed that by leveraging the power of digital solutions, access to quality education can be improved throughout the country. Accordingly, the government has put in a great deal of efforts to leverage the concept of electronic learning (e-learning) to address these issues. E-learning denotes a scenario whereby "instructional content or learning experience is delivered or enabled by electronic technologies (Ong et al., 2004). It can also be described as a set of synchronous and asynchronous instruction delivered to learners by leveraging information and communications technology (ICT) platforms

(Colvin and Mayer, 2008). Expressions including virtual learning, online learning, distance learning, technology-delivered instructions and web-based learning have all been used to describe e-learning (Chanchary & Islam, 2011).

The KSA in 2008 put forward a national plan towards the adoption of ICT across the country. One of the recommendations of the plans is the implementation of e-learning and distance learning and their subsequent applications in tertiary institutions. The government has mandated all institutions to follow suit and the Saudi Ministry of Higher Education (SMoHE) has established a new centre known as National Centre of E-learning and Distance Learning (ELC) to ensure the smooth adoption of e-learning (Chanchary & Islam, 2011). A number of universities have taken the initiatives on board and the SMoHE has established a repository for e-learning resources to aid the transition from the traditional approach to distance learning. For instance, electronic books (e-books) for a wide array of discipline such as medicine, engineering, humanities and computer science has been made available by the government in order to facilitate such transitions (Chanchary & Islam, 2011). More importantly, training and support is provided by government to academics who have embraced the use of e-learning as a teaching mechanism. The government is committed to e-learning and this is evident given that e-learning industry was projected to attain $125M in 2008 and it was planned to grow at an annual compound rate of 33% across five years, a growth that was driven by the country's Ministry of Education due to its initiatives and investments in ICT infrastructure (Chanchary & Islam, 2011). Significant increase in budgetary allocation towards education and manpower development also contributed to the encouragement to leverage the power of e-learning.

The adoption of e-learning can help overcome different forms of traditional barriers such as time and place. For example, e-learning can facilitate remote access to education by allowing students to study independently, either online or register for online class led by an instructor thereby integrating the advantages of self-study with current style based on the traditional classroom approach to learning. In an era where working class adults constitute a huge percentage of university population and where access to computers and internet facilities has become easier, the use of e-learning approaches can be leveraged to improve student experience and access to quality education (Cooper, 2001). E-learning also encourages self-paced learning which allow student to explore study materials at their own convenience (Lewis, 2007). It provides educational content in a consistent manner with the view to aid student learning by overcoming issues pertaining to instructors with different teaching philosophy and styles.

As highlighted above, e-learning brings about several advantages based on how it can be used to improve access to quality education, however, the adoption of e-learning as a means to deliver access to quality education is a difficult proposition. In fact, the challenge with e-learning is that having a measure of its success is a huge problem. Sun et al. (2008) reported that in some instances many users opted out of e-learning after their initial experience. There are a number of research exploring this research field. The success of e-learning has been predicated upon the level of readiness (i.e. the extent to which a country is ready to adopt e-learning as an ideal vehicle to convey education is a function of whether the e-learning approaches will succeed or not). Essentially, electronic readiness (e-readiness) is a measure of the extent to which any given country or economy is ready, willing or prepared to explore the benefits of

ICT to access education, towards the benefits of its citizenry. Put in another way, it is a measure of the quality of a country's ICT infrastructure and the ability of its government, businesses, and organisations as well as consumers to leverage ICT to their benefit (Chanchary & Islam, 2011). A number of authors including Jukic et al. (2009), Seliger (2010), Oreku and Mtenzi (2012), Bagui and Bytheway (2012), Ramaswamy (2009) and many more have defined e-readiness in various ways. A comprehensive review of the level of readiness of Saudi Arabia towards the adoption of e-learning is provided by Chanchary and Islam (2011).

In light of the above, a number of research has been carried on the relationship between e-readiness and e-learning in the context of Saudi Arabia. For instance, Alkhalaf et al. (2012) investigated the impact of e-learning system on higher education institutions in Saudi Arabia based on attitude and perception of members of the faculty in a university and concluded that the attitude was positive. Al-Harbi (2011) also conducted on the potential and challenges of e-learning in tertiary education in Saudi Arabia. Similarly, Al-Fahad (2009) carried out a study on the attitudes and perceptions of students towards the effectiveness of e-learning in King Saud University, in Saudi Arabia. Additionally, Alenezi and Karim (2010) completed research on a number of factors such as enjoyment, computer self-efficacy and anxiety as well as internet experience on e-learning. A detailed summary of more works on this topic is provided in Chapter 2. However, to date there exist difficulty in reaching a consensus regarding the optimal pathway with which to evaluate the success of e-learning in Saudi HE institutions. As highlighted above, most research has focused on analysis of various behavioural factors on e-learning but research is currently lacking on the use of tested and proven theoretical constructs to map the relationship between e-readiness and e-

learning. The use of sound theoretical constructs to ascertain this issue is therefore pertinent. Accordingly, the current research seeks to address this gap through the use of well-established theoretical framework such as Structural Equation Modelling (SEM) to investigate the impact of e-readiness on e-learning success in Saudi Arabia's higher education institutions. Based on this research aim,, the key research questions which the current work seeks to answer is provided in the section that follows.

1.2   Key research questions

Based on the gaps identified in the review of literature, the establishment of a problem statement in the context of e-readiness and e-learning success in the Kingdom of Saudi Arabia, the research questions that this work seeks to address emerged and are stated as follows:

1.   What is the relationship between e-readiness and e-learning success in the context of Saudi Arabian higher education institutions?

2.   What are the main factors that best explain e-readiness and e-learning success in Saudi Arabian higher education institutions?

3.   How does the relationship between e-readiness and e-learning success differ based on the group respondents which includes teachers, students, and administrators?

1.3   Research aim and specific objectives

The aim of this research is to hypothesize, construct and examine the relationship between e-readiness and e-learning success initiatives in Saudi Arabia's higher education institutions, using Structural Equation Modelling (SEM), taking into account the unique attributes of key actors including teachers, students and administrators.

Associated with this aim are the following research objectives:

1.   Develop and validate e-readiness and e-learning success measurement scale in Saudi Arabian higher education institutions

2.   Identify core values that best explain e-readiness and e-learning success in the context of Saudi Arabia's higher education institutions.

3.   Develop a comprehensive model of e-readiness and e-learning success based on SEM, taking into consideration the unique attributes of teachers, students, and administrators in Saudi Arabia's higher education institutions

4.   Test and validate the Structural Equation Model of e-readiness and e-learning success in Saudi Arabia's higher education institutions

1.4   Summary of original contribution to knowledge

The summary of the contribution of the research conducted by the research is provided as follows. The study contributes to our knowledge of the relationship between e-learning and e-readiness by providing theoretical insights and empirical findings using reliable and valid instruments to empirically establish the relationships between them. Many studies have pointed out that the significance of the relationships between e-readiness and e-learning success, but only a few of such studies have studied the effect of different demographic variables on this relationship. Furthermore, none of the studies in this field have examined the differences between the key stakeholders namely teachers, students and administrators in Saudi Arabia specifically and in the Arab region generally. The current work indicated that the stability of the relationships between the variables tested using SEM was not influenced by differences in attributes of teachers,

students and administrators, either conceptually or psychometrically. Further expansion of the contributions to knowledge are provided in Chapter 7.

1.5   Organisation of thesis

The rest of the thesis is organised into 6 chapters as follows. Chapter 2 provides a detailed review of the extant literature, setting the focus of the research with the view to establish the gap in knowledge that the current work seeks to fill. In Chapter 3, an overview of e-learning in Saudi Higher Education Institutions, detailing its history and barriers to adoption is presented. Chapter 4 provides the research methodological framework, including research instruments, sampling and data collection strategies, data screening and data analysis for which the research was carried out. Empirical results and analysis of the work carried out are presented in Chapter 5, leading to an overall discussion of findings detailed in Chapter 6. A summary of the overall conclusions and findings from the work carried out on the research, expansion on the original contribution to knowledge and the possible direction for future work is provided in Chapter 7.

Chapter 2: Literature Review

2.1 Introduction

In this chapter, a review of extant literatures detailing the relevant and important issues for the current research is provided. Conducting a literature review is one of the most challenging aspect of any given research given that it constitutes a paradox. This is because one cannot carry out such reviews without the formulation of a research problem and yet reviewing the existing literature plays a key role in establishing the research problem. In this work, the approach taken to overcome this paradox entails the searching, review and analysis of relevant theoretical concepts relevant to information technology development within the scope of E-Readiness and E-Learning successes in Saudi higher education institutions. This was then used to develop a conceptual framework which then constitute the lens through which the current work is viewed. Examples of key words used in the quest towards developing the conceptual framework include E-Readiness, E-Learning success, Saudi higher education institutions, Impact of E-Readiness on E-Learning success initiatives etc. and were derived using relevant journal articles and other useful online resources. Essentially, the chapter identifies the relationship between what has already been researched and studied in this field and what the issues the current research seeks to investigate so as to fill a gap in knowledge.

The primary aim of any educational system is to access a rich and quality education. This implies that the expectations of individuals in a given society should be met through such exposure to quality education. Results obtained from studies conducted in the same field have shown that e-learning is an appropriate strategy adopted in order to improve the quality of teaching and learning. This particular type of education makes use of a number of facilities and technologies including internet-

enabled technologies, satellite communications, computer networks and digital sciences (Golzari et al., 2010).

The focus of this research is on the current levels of e-readiness within the Saudi Arabian Higher Education (HE) institutions towards the successful implementation of alternative e-learning platforms such as Massive Open Online Course (MOOCS). As such, the current work assess the relationship between e-readiness and e-learning success by taking into account the unique attributes of teacher, student, and administrator in higher education institutions. Dimensions which constitutes the component factors of e-readiness has been identified, however, this chapter will also focus on dimensions forming the component factors of e-learning success. Additionally, the chapter explores the education system in Saudi Arabia, and the level of developments and achievements that has been recorded regarding e-learning in Saudi HE institutions. In the section that follows, a detailed review of the concept of e-readiness is provided.

2.2   E-Readiness

Achieving high levels of electronic readiness in most developing countries (e-readiness) has become a top priority and an incredibly huge amount of resources in terms of time, money and efforts has been invested to realise this goal. Electronic readiness is an indicator for measuring the degree to which any given country or economy is ready, willing or prepared to explore the benefits of ICT for the overall betterment of its citizenry. A number of other definitions of e-readiness has been put forward. For instance, Jukic et al. (2009) defined e-readiness as a measure of the maturity of the inhabitants of a country, businesses, government and non-governmental organisations (NGOs) to engage in electronic activities such as e-government, e-

commerce, e-learning etc. Similarly, Seliger (2010) described e-readiness as the level of preparedness of a region, country or entity (e.g. NGOs and large corporations) to adopt ICT-based technologies towards sustaining welfare and growth. Also Oreku and Mtenzi (2012) defined e-readiness as the capability of any country or organisation or corporation to adopt ICT facilities with the view to develop its economy, foster its welfare whilst enhancing better and improved participation in the socio-economic value chain of the globe.

An interesting definition put forward by Bagui and Bytheway (2012) is that e-readiness pertains to a network readiness index which has the capacity to estimate the extent of the progress a given country or nation or corporation has attained towards developing significantly the quality and the overall extent of its entire ICT infrastructure including e-commerce, e-government and the associated relevant regulations. Ramaswamy (2009) also define e-readiness as the extent of the preparedness of a country or a nation towards the implementation of e-governance. Averweg (2009) defined e-readiness based on the availability of ICT infrastructure, its accessibility to the general citizens and corporations as well as NGOs and the overall effect of the regulatory and legal frameworks on ICT use in e-government strategy, for example. Hellsten (2010) puts succinctly the definition of e-readiness by describing it as the capacity and ability of a country to provide services to its citizens, for example, through the Internet superhighway.

Khan (2005) described e-readiness as the capability of any corporation as well as the ability of key stakeholders in education sector (e.g. management members, tutors and students) to engage in learning through an electronic environment. In order to ascertain the level of e-readiness, important aspects such as the readiness of the human

resources must be put into consideration. The essential components of any viable human resources include the students, tutors, network administrators (Darab and Montazer, 2010). A number of studies pertaining to e-readiness by students has been reported by authors including Tubaishat and Lansari, (2011) and Akaslan and Law, (2011). In the same vein, researchers such as Seraji and Yar Mohammadi (2010); Santy and Smith, (2007) Dabbagh, (2007); Yukselturk and Bulut, (2007); Tronsen, (2006); Palloff, and Pratt, (2005), Rhode, (2004); Watkins (2004) and Piskurich (2003) have all investigated and identified the attributes of successful e-readiness strategies.

Zeithaml and Parasuraman, (2002) described e-readiness as the level of preparedness of people to adopt technologies for achieving goals. Readiness include awareness level of instructors, knowledge of users and their attitudes towards adopting the use of educational technology (Msila, 2015). Technical and pedagogical readiness are the two components of technological readiness as classified by researchers. These two components are an integral element for any technological innovation in teaching and learning to be adjudged successful. In their work across 22 countries, based on pedagogy and the use of ICT-enabled facilities, Law and Chow (2008) reported that the technical and pedagogical competence of tutors are essential predictors regarding the adoption of technology in teaching practice. Player-Koro (2012) identified a number of factors affecting the readiness of teachers to adopt technology including the attributes and characteristics of teachers, technological considerations, content knowledge and organisational capability.

E-readiness as an indicator is often used to measure the extent of the readiness to engage in electronic-based activities including e-learning, e-commerce, e-government, etc. The absolute data for e-readiness is represented by indices, where individual nations

are rated based on a number of factors such as the number of telephone line per 100 people, or the amount of money invested on ICT infrastructure (APEC 2000). E-readiness assessment can employed by communities for the evaluation of distinctive opportunities and challenges. It is a useful tool for ascertaining the starting point of a country's plan towards embracing the use of ICT facilities and can be considered as the first most important step towards national strategy building for internet-enabled activities. In developing countries, for example, e-readiness assessment can assist with the establishment of fundamental benchmarks for regional comparison by market verticals and for the overall purpose of national planning. Peter (2005) reported that e-readiness assessment is based on a number of factors including the rate of adoption of ICT, physical infrastructure, policy environment human capacity, and ICT economy (i.e. the size of ICT sector). The assessment of e-readiness is an important exercise because it serves as a basis for determining the starting point of a country and can be seen as the first step towards the precondition for the implementation of strategies for the successful embrace of ICT infrastructures.

E-learning implementation in educational institutions brings strong benefits. It provides educational content in a consistent manner with the view to aid student learning by overcoming issues pertaining to instructors with different teaching philosophy and styles. The use of ICT infrastructure offers tremendous advantages if it is adopted within the higher education sector, thereby enhancing the rate of development in terms of supporting great learning experience for the students. Flowers (2001) suggested that for e-learning to be enhanced a number of factors including ICT infrastructure informed by strong budgeting and financial controls alongside psychological balance must be put into consideration. Understanding the readiness of

users is a precedent to the successful implementation of any e-learning initiative. Educational institutions adopting e-learning platform can use it to achieve strong benefits. For example, e-learning ensures the provision of consistent content which allows the students to get over issues associated with instructors or tutors with different teaching styles (Austin and Mahlman, 2000).

The embrace of e-learning can overcome a number of traditional barriers including time and place. For instance, electronic platforms allow a student to embark upon an independent study online or register for online class led by an instructor thereby integrating the advantages of self-study with current style based on the traditional classroom approach to learning. Cooper, (2001) reported that in an era where working class adults constitute a huge percentage of university population and where access to computers and internet facilities has become easier, the use of e-learning approaches can be leveraged to improve student experience and access to quality education. Borotisand and Poulymenakou (2004) submitted that e-learning can be employed as a timely accessible, universal approach for the provision of learning at a reduced cost. This is because the Internet has rendered learning easier without any restrictions imposed by geographical boundaries or difference in time or weather (Williams, 2008). E-learning also encourages self-paced learning which allow student to explore study materials at their own pace and convenience (Lewis, 2007). With e-learning, instructors and technical support team can upload course materials to the server whilst providing avenue for students to get access (Lewis, 2007). This allows students to learn at their own place at anytime and anywhere across the globe. A large number of studies on e-learning readiness have been explored and are broadly categorized into three categories. For instance, Mosadegh et al. (2011) focused on

developing models for e-learning readiness assessment. Other authors including Ouma et al. (2013); Rahimidoost and Razavi, (2012) and Aydin and Tasci, (2005) concentrated on examining the level of readiness of universities or corporations towards implementing e-learning.

A number of other researchers such as Nasiri et al. (2014); Mahdiuon et al. (2011); Jariangprasert, (2007); Sadik, (2007) and Okhovati et al. (2005) have focused on other aspects of e-readiness. The concept of e-readiness has also been explored by a number of researchers including Molla and Licker (2005) on the perceived e-readiness factors for the adoption of e-commerce based on an empirical study of a developing country; Mutula and van Brakel (2006) on the e-readiness of small and medium enterprises (SMEs) with the Botswana's ICT sector as it pertains to access to information; Fathian, Akhavan, and Hoorali (2008) on e-readiness assessment of non-profit ICT SMEs using Iran as a case study; Dada (2006) on e-readiness for developing countries with the view to shift the focus from the environment to the end users. Khoja, et al. (2007) also developed e-health readiness assessment tool targeting healthcare institutions in developing countries.

The integration of e-learning technologies and facilities in education coupled with the availability of skilled faculties and students constitute an integral element of education system and curriculum development within IT and knowledge-based societies. Most of the aforementioned studies focused on how to facilitate decision-making processes regarding the planning and implementation of e-learning platforms in higher education institutions but neglect other aspects of e-readiness and e-learning which takes into account other important factors such as the perspectives and

experiences of the teachers, students and administrators. Exploring this gap is one of the hallmarks of the current work.

The assessment of e-readiness is a useful starting point for the developing countries such as the Kingdom of Saudi Arabia because it lays the foundation for the implementation of electronic learning strategies. The assessment provides a fundamental basis for planning and building policies and decisions on e-learning (CID, 2006). Through extensive literature review, seven dimensions which constitutes the component factors of e-readiness has been identified, including policy and institutional business strategy, pedagogy, technology, interface design, management, administrative and resource support, as well as evaluation and continual improvement. Against this backdrop, the current research seeks to develop a theoretical framework that hypothesize the impact of e-readiness on e-learning success. Findings from previous studies support the importance of the aforementioned factors in achieving successful e-learning initiatives (Pittinsky and Chase, 2000; Darab and Montazer, 2011; Watkins, 2014). With reference to the literature, there are 14 main factors that are measured in relation to e-readiness factors. These are: (i) policies, (ii) business strategy; (iii) leadership, (iv) management, (v) finance, (vi) technology, (vii) administrative commitment, (viii) human resources, (ix) culture, (x) standards, (xi) regulations, (xii) content, (xiii) ethics and (xiv) organisational barriers.

There is a growing body of literature regarding e-learning readiness that has produced a range of e-learning readiness models and they have focused mainly on three primary groups of stakeholders. These include (i) learners (cf. Demir and Yurdugül, 2015; Horzum et al., 2015; Dray et al., 2011; Tubaishat and Lansari, 2011; Hung et al., 2010; Valtonen et al., 2012; Asaari et al., 2005; Smith, 2005; Bernard et al., 2004;

Watkins et al., 2004, Oliver, 2001); (ii) educators (cf. Demir and Yurdugül, 2015; Al-Furaydi, 2013; Eslaminejad et al., 2010; Yun and Murad, 2006; Guglielmino and Guglielmino, 2003); and (iii) institutions/organisations (cf. Demir and Yurdugül, 2015; Watkins, 2014; Azimi, 2013; Schreurs and Al-Huneidi, 2012; Darab and Montazer, 2011; Omoda-Onyait and Lubega, 2011; Schreurs et al., 2008; Lopes, 2007; So and Swatman, 2006; Aydın and Taşçı, 2005; Psycharis, 2005; Borotis and Poulymenakou, 2004; Chapnick, 2000; Rosenberg, 2000).

A number of models developed in this field are integrative in nature and take a multi-layered approach to addressing the e-learning readiness of multiple stakeholders (cf. Moftakhari, 2013; Akaslan and Law, 2010a, 2010b; Mercado, 2008; Kaur and Abas, 2004). Darab and Montazer (2011) developed a model with three primary components each containing several sub components or factors: (i) hard infrastructure comprising technology hardware, software and network connectivity enabling and facilitating e-learning; (ii) soft infrastructure comprising organizational policy, management, finance, culture, content, human resources, regulations, resources, security and standards of e-learning; and (iii) coordination, supervision and support infrastructure comprising alignment, support and evaluation of e-learning. Elsewhere, Omoda-Onyait and Lubega's (2011) presented a case study of the e-learning readiness of Ugandan higher education institutions and proposed a model comprising awareness, technology, pedagogy, cultural ambience, and content.

This differs from Akaslan and Law (2010) who represent content as pedagogy including both theory and practice. Watkins (2014) advocates an approach with seven main components: (i) organization including commitment to stakeholders, integration of e-learning with organizational strategy; (ii) pedagogy including linking content to

desired outputs and outcomes; (iii) technology including the accessibility and interactivity of diverse media technologies such as audio, video and synchronous and asynchronous communication, and maintenance of the e-learning technology infrastructure; (iv) interface design including the e-learning network enabling learners to see their progress and access opportunities to develop their own long-term plans for learning; (v) management including the competencies of those delivering the e-learning, the extent of training and development available to e-learning educators, the amount of time e-educators have to provide e-learners with one-to-one feedback, the competencies of the e-learners; (vi) resource support including the extent of access learners have from specialist technology support staff (in addition to access to educators); and (vii) and evaluation and continual improvement including sufficient time being allowed for the formative evaluation of e-learning courses before they are rolled out, the extent of the contribution and alignment of e-learning to/with organizational strategies and stakeholder interests. Two interesting and relevant features of Watkin's (2014) approach to assessing the extent of organizational e-learning readiness are the separation of technology into ICT infrastructure, interface design and learners' technology competencies.

2.2.1 Models of e-readiness

Pittinsky and Chase (2000) presented a case study to establish the extent to which e-learning is integrated into the policies, procedures and practices of leading colleges and universities in the field of distance learning in the United States. They measured e-readiness through several indicators to ascertain the overall quality of e-learning implementation. The work presented was to determine the suitability of the aforementioned criteria with respect to faculty members, supervisors and students. The

study explored institutional support, course development, education learning, course structure, student support, faculty support, as well as assessment and evaluation. Institutional support focuses on the activities of the institution to ensure an appropriate environment and readiness to maintain the quality of distance education, so that educational institutions can focus on policies that promote the development of teaching and learning via the Internet. These standards focus on technological infrastructure issues, technology plan, and professional incentives for faculty members.

Educational programs are developed largely by either individual faculty members or groups on campus and subject matter experts within the organization. The teaching and learning process focuses on the range of activities related to pedagogy and teaching art including interaction, collaboration and normative learning. The structure of the session includes standards, policies, and procedures that support the learning and learning process. Course objectives include availability of resources for learning, types of materials provided to students, student response time, and student expectations. Student support focuses on the student services that are usually located on campus, including admission, financial assistance, etc.

The model presented by Hung et al (2010) focuses on students' readiness towards online education. The five main components considered within the model include: computer/internet intrinsic capacities, incentives, self-efficacy for online communication, learner control and self-learning guidance. Tubaishat and Lansari (2011) presented a model that helps to determine whether students in the Gulf region were prepared to adopt e-learning. The model takes into account six dimensions: infrastructure, the use of the Internet, computer skills for students, the development of

confidence, the preferred method of communication, and students' perception of e-learning.

Oliver (2001) stressed that the ability of the student to learn via the Internet is an important consideration before embarking on e-learning and considered four dimensions of assessment of e-readiness, namely teaching skills, access to technology (i.e. ability to own or access appropriate technology when it is required), technology literacy (which entails integration of social, cultural and technical skills) and self-learning. Post-technical skills considered include basic computer skills and experiences. Among the studies that focused on e-readiness for teachers include study by Faridi (2013) who developed a measure to determine the readiness of middle school teachers for e-learning. This measurement tool he developed consists of two components: the attitude toward e-learning and computer literacy. The attitude towards e-learning includes the components of the attitude towards use, intent of use, perceived ease of use and perceived benefits of computers. Computer literacy includes components of office and computer communications, the Internet and computer expertise.

With regard to e-readiness for educational institutions, Omoda-Onyait and Lubega (2011) attempted to determine the readiness of e-learning for higher education institutions. Their study indicated that most developed models can be found in developed countries; their study provided a model that could be applied in emerging countries. The model is designed on a hierarchical basis and consists of five components: awareness, culture, technology, education and content. The components vary in their degree of importance where the most important components are placed towards the bottom of the pyramid.

Darab and Montazer (2011) proposed a model that was applied to Iranian universities to determine the readiness of e-learning in higher education institutions. The model consists of three basic components: the solid infrastructure (equipment and networks); soft infrastructure and coordination infrastructure which consist of administration, regulations, standards, finance, security, culture, content, human resources and policy aspects; and the infrastructure for coordination, supervision and support, consisting of the dimensions of supervision, support and evaluation. In their study, they argue that the institutional e-readiness for e-learning is the readiness of the educational product and the readiness of the educational process. The educational product's readiness consists of standards, management, policy, networks and equipment. The educational process consists of content, regulation, finance, human resources, culture and society.

Lopez (2007) noted that the institutions' readiness model consists of business, technology, content, culture, human resources and financial components. The business aspect focuses on alignment with the higher education strategy, the external environment and the commitment of the educational institution. While the technology component focuses on the degree of access to technology and infrastructure, the content includes content availability, reuse, and standards. The element of culture focuses on the behaviour, perception and degree of use of e-learning. For human resources, it focuses on support for both teachers and students. Finally, financial components relate to the allocation of resources needed for e-learning.

Several studies have proposed multi-layered models for e-learning readiness. For instance, Mercado (2008) developed measurement tools on a one by one basis for students, teachers, and institutions. Access to technology is essential for both students

and teachers. According to the institutions, readiness consists of administrative support and resource support (commitment, policies and sub-component components), while financial, human and technical components constitute the resource support component. This model differs from the model proposed in this study in that there are many components that have been proposed and have not been applied to students and teachers. Based on the previous discussion of theoretical literatures, it was established that many models have been developed to measure the e-readiness of students, teachers, educational institutions or administrative staff independently. A summary of literature on e-readiness including the factors they considered is provided in Table 2.1 below.

Table 2.1: Summary of theoretical literature in electronic readiness and field of focus

SOURCE	Main Issues in E-Readiness	Focus
Peter (2005)	Physical infrastructure, ICT use, human capacity, policy environment, ICT economy (the size of ICT sector)	Administrative (Institution)
Flowers (2001)	ICT infrastructure, human resources, budget and finance, psychological and content with reference to the different types of colleges of education.	Administrative (Institution)
Darab and Montazer (2011)	Hard infrastructure comprising technology hardware, software and network connectivity enabling and facilitating e-learning. Soft infrastructure comprising organizational policy, management, finance, culture, content, human resources, regulations, resources, security and standards of e-learning. Coordination, supervision and support infrastructure comprising alignment, support and evaluation of e-learning.	Administrative (Institution)
Omoda-Onyait and Lubega's (2011)	Awareness, culture, technology, pedagogy and content.	Administrative (Institution)

Akaslan and Law (2010)	Pedagogy	Students
Watkins et al. (2004)	Access to technology, skills and relationships, educational use of tools online, online learning environments, dimensional relationships such as support, participation and experience with success.	Students
Watkins (2014)	organization, pedagogy, technology, interface design, management, resource support, evaluation and continual improvement	Students
Pittinsky and Chase (2000)	Policies, procedures and practices, institutional support, course development, education / learning, course structure, student support, faculty support, and finally assessment and evaluation, pedagogy.	Faculty, Supervisors and Students
Hung et al (2010)	Computer, internet intrinsic capacities, incentives, self-efficacy for online communication, learner control, and self-learning guidance.	Students
Tubaishat and Lansari (2011)	Infrastructure, the use of the Internet, computer skills for students, the development of confidence, the preferred method of communication, and students' perception of e-learning.	Students
Oliver (2001)	Teaching skills, access to technology, literacy technology (social, cultural and technical skills). and self-learning	Students
al-Faridi (2013)	Attitude toward e-learning (components of the attitude towards use, intent of use, perceived ease of use and perceived benefits of computers) and computer literacy (office and computer communications, the Internet and computer expertise).	Teachers
Lopez (2007)	Business, technology, content, culture, human resources and financial components	Administrative (Institution)

	Access to technology. Institutions readiness (administrative support and resource support (commitment, policies and sub-component components). Financial, human and technical components constitute the resource support component.	Students, Teachers, and Institutions
Mercado (2008)		

With reference to the literature, the main factors that are measured in relation to e-readiness revolves around these factor which are: (1) policies, (2) business strategy; (3) leadership, (4) management, (5) finance, (6) technology, (7) administrative commitment, (8) human resources, (9) culture, (10) standards, (11) regulations, (12) content, (13) ethics and (14) organizational barriers.

The e-readiness for e-learning dimensions of students focused on e-learning beliefs, confidence in basic and self-skills, self-efficacy of online communication, self-learning and access to technology, technology efficiency, acceptance, culture, commitment to e-learning. While the e-readiness models for teachers focused on the efficiency of technology use, pedagogical efficiency, emotional readiness, the trend towards e-learning, access to technology, motivation, time management, training, acceptance, content, organization and politics. Electronic readiness at the institutions and administrative level, include dimensions such as content, pedagogy, culture, psychology, content management system, human resources, finance, ICT infrastructure, technology efficiency, innovation and entrepreneurship, management and leadership, policy, regulations and standards, motivation, service training, and commitment to e-learning. All the dimensions included in the most proposed models for e-readiness in the literature have been studied. These dimensions can be combined or summarized into seven dimensions namely: organization, pedagogy, technology, interface design,

management, resource support, evaluation and continual improvement. These seven dimensions are described briefly in the subsections that follows:

(1) Institutional Policies and Business Strategies relates to organization and including commitment to stakeholders, integration of e-learning with organizational strategy. The evaluation of the institutional organizational strategies and policies is crucial as they demarcate and characterize the environment within which e-learning occurs. The task of the institution is to support e-learning via the provision of necessary pedagogy, resources, infrastructure, technologies, etc. In this regards, factor such as policies, leadership, finance, strategic integration, ethics and, organizational culture are variables used to evaluate the organization and institutional policies and business strategies.

(2) Pedagogy including linking content to desired outputs and outcomes. E-learning in general encourage collaborative, self-directed learning and learner centricity. Therefore, choice of pedagogical approaches is particularly relevant in e-learning. The pedagogical approach focus on underpinning philosophies, content analysis, alignment to other courses and institutional strategies, organization of e-learning environment.

(3) Technology including the accessibility and interactivity of diverse media technologies such as audio, video and synchronous and asynchronous communication, and maintenance of the e-learning technology infrastructure. Technology component is focusing on variables such as infrastructure planning and access to technology, hardware and software, communication media and networks.

(4) Interface design including the e-learning network enabling learners to see their progress and access opportunities to develop their own long-term plans for

learning. It includes variables such as website/page design, content design, usability/navigation, and user-centricity.

 (5) **Management** including the competencies of those delivering the e-learning, the extent of training and development available to e-learning educators, the amount of time e-educators have to provide e-learners with one-to-one feedback, the competencies of the e-learners. Management component seeking for maintaining e-learning environment, information distribution, educators' readiness for implementing and managing e-learning, provision of learning and development to educators, provision of learning and development to learners, sufficient time for educators to provide e-learners with one-to-one feedback, learners' competencies.

(6) **Resource support** including the extent of access learners have from specialist technology support staff (in addition to access to educators). It relates to administrative affairs issues, academic affairs issues, student services, online support and resource support.

(7) **Evaluation and continual improvement** including sufficient time being allowed for the formative evaluation of e-learning courses before they are rolled out, the extent of the contribution and alignment of e-learning to/with organizational strategies and stakeholder interests. Evaluation and continual improvement component include assessment of learners, evaluation of the e-learning environment, evaluation of e-leaning at programme and institutional levels.

Many studies agreed that these dimensions can be applied to students, teachers, and administrative staff in higher educational institutions (Pittinsky and Chase, 2000; Watkin's, 2014; Omoda-Onyait and Lubega's 2011; Akaslan and Law, 2010a, 2010b; Mercado, 2008). The current research considered many dimensions mentioned in

previous studies. The availability of these dimensions can be considered essential in determining whether the institution is ready for e-learning or not. Assessing the readiness of the educational institution from these perspectives is a step forward for the success of e-learning. These dimensions were based on other studies to develop an e-readiness measurement scale. These dimensions need to be empirically tested to determine the variables in each of them and to determine the level of importance for each variable in proportion to the Saudi environment. The variables that get the utmost importance and high correlation with each dimension will indicate the important aspects to focus on and to make decision with respect to educational institutions. Table 2.2 shows the initial items generated from literature for e-readiness instrument.

Table 2.2 Initial Items Generated for E-Readiness instrument

#	Item
	Institutional Policies and Business Strategies
IPBS1	Our institution has an E- Learning Policies
IPBS2	Top management's activities support e-learning development within the institution.
IPBS3	The university receives financial resources from government sources and other sectors (grants, loans, donations, etc.).
IPBS4	E-learning is an integral component of the university's pedagogical strategy.
IPBS5	The university has Code of Conduct regulating e-learning procedures that is publicized and freely available to both educators, learners, and administrators.
IPBS6	The university has common goals throughout the institution that are directed towards achieving organizational goals.
	Pedagogy
PED1	The university supports learner success through the organization of the working environment.
PED2	E-learning courses contain objectives that are specific, measurable, achievable/agreed, realistic/relevant and timed/timely (SMART).
PED3	E-learning courses aligned to institutional strategies
PED4	Learners have access to relevant media for e-learning.
	Technology
TEC1	The university has a comprehensive technology plan.
TEC2	The university has the computer and related hardware, software necessary to facilitate e-learning.

TEC3	The university has its own personalized and interactive Communication Media and Networks allowing learners to have their own secure, personal accounts.
Interface Design	
ID1	The university has a website where existing and prospective learners can view available courses.
ID2	The university website's interface provides learners with opportunities to create long-term learning plans.
ID3	The university's website contains e-learning use interface features.
ID4	The university's website navigation is simple and user-centric.
Management	
MGT1	The university positions and promotes the virtual learning environment VLE so that it becomes habitual for learners to use it outside of the classroom.
MGT2	The informative site provides information about the university, including its programmes and courses.
MGT3	Educators have adequate information and communications technology (ICT) knowledge.
MGT4	Educators are provides with support resources on using learning objectives to guide e-learning design and development.
MGT5	The university ensures that learners acquire and continuously develop their use of e-learning education.
MGT6	Educators have a Sufficient Time to Provide E-Learners with One-to-One Feedback
MGT7	The university has the research/test to indicate learners' personal characteristics influencing their competencies and attitudes toward e-learning.
Administrative and Resource Support	
ARS1	The university provides administrative support to facilitate E- Learning Process.
ARS2	The university developed its own policies and guidelines; they are communicated to all stakeholders groups including learners, educators, and support staff.
ARS3	The university has advise and support centre (the office or department providing student academic services related to course selection, finding a major, study skills, and referrals to tutoring and academic success skills).
ARS4	The university has the Instructional Support Centre that is staffed by professional consultants who provide free one-on-one consulting services to educators and learners on the use of instructional technology tools to complement teaching and learning.
Evaluation and Continual Improvement	
ECI1	The institution has policies and guidelines regarding the assessment of students that the course instructor must follow
ECI2	The institution has rated overall performance of the individuals, support staff, and administrative support services involved in the delivery and maintenance stages of e-learning according to the scheme offered.
ECI3	The institution has Evaluation of E-Leaning at Programme and Institutional Levels

2.3   E-Learning Success

In modern day form of education, Electronic learning or e-learning has emerged as the new paradigm with a record growth rate of 35.6% (Sun et al. 2008). It has been defined in a numerous manner across the extant literature. For instance, Ong et al. (2004) described e-learning as an expression used to denote "instructional content or learning experience delivered or enabled by electronic technologies". Colvin and Mayer (2008) described e-learning as a "set of synchronous and asynchronous instruction delivered to learners over technology". Panda and Mishra (2007) submitted that expressions such as virtual learning, online learning, distance learning, web-based learning are all related to e-learning. Cidral et al. (2018) described e-learning as a "web-based learning ecosystem for the dissemination of information, communication, and knowledge for education and training".

Across the years, the challenge with e-learning is that measuring its success has constitute huge problems. In some instances where e-learning has been previously adopted, it has been reported that many users opted out of e-learning after their initial experience (Sun et al., 2008). A number of research has however been conducted to identify various factors affecting user satisfaction with regards to e-learning. For instance, Sun et al., (2008) developed an integrated model based on six dimensions including learners, tutors, subject areas, technology, design and environment. They concluded that a number of factors such as anxiety of learners towards computers, the attitude of the tutors towards learning, flexibility and quality of e-learning courses, perceived ease of use and usefulness as well as diversity in assessments affects the perceived satisfaction of learners. The authors concluded their studies by recommending how learner satisfaction can be improved whilst further strengthening the

implementation of e-learning. Seraji and Yar Mohammadi (2010) identified five metacognitive skills for learner in e-learning courses, namely self-navigation, cognitive, communication and collaborative skills as well as access to the Internet. The most popular features of successful virtual learning include problem-solving and critical thinking skills, requisite understanding of how computers and the Internet works, time management skills self-learning skills, leadership skills, interest in learning spontaneity amongst others.

In their work, Cidral et al. (2018) concluded that the drivers of perceived satisfaction (i.e. success of e-learning) is attributed to a number of factors including quality of information, service and system, attitude of instructor towards learning, assessment diversity and learner's perceived interactions with others. Watkins (2014) reported eight main components that affects e-learning success including organisation, pedagogy, technology, interface, management, resource support, ethics and evaluation and continual improvement. Similarly, DeLone and McLean (2003) reported six dimensions of success regrading e-learning success, namely, information quality, system quality, service quality, use, user satisfaction, and overall net benefit. A number of studies have also assessed the success of e-learning initiatives on various measures such as learning environment (Jung et al., 2002); cost-benefits (Smith, 2001; Lawhead et al., 1997); learning styles (Byrne, 2002), teaching practices (Savenye et al., 2001; Owston and Wideman, 1998); learning outcomes (McClelland, 2001; Motiwallo and Tello, 2000; Teh, 1999); and learning benchmarks (Pittinsky and Chase, 2000). Pittinsky and Chase (2000) also provide comprehensive guidelines for e-readiness that influence success in e-learning based seven areas namely: course development, course

structure, teaching/learning, institutional support, faculty support, student support as well as evaluation and assessment.

2.4   Implementing E-Learning

According to Golzari et al (2010), e-learning can be considered as a suitable strategy to improve the teaching-learning process quality. Due to increased competition triggered by the global market and the need for changes in the structural pattern of institutions delivering e-learning, its implementation has become very significant and as such it must be given high level of attention. Dublin (2004) submitted that possessing a great e-learning strategy coupled with e-learning programs is not sufficient to guarantee success because without a well-thought-out and clear strategy focused towards implementation, all efforts towards e-learning might become counterproductive. Thune (2005) in his report on the standards and guidelines for quality assurance in higher education recommended six steps to towards the successful implementation of e-learning including: (i) careful and thorough analysis and planning with respect to business drivers, content, learners, didactics, technology, tracking, etc.; (ii) addressing the source of funding for e-learning strategies by securing financial funding and sponsorship from management or administrators; (iii) selection of the appropriate technology and content. This must be planned carefully e-learning management systems requires investment cost that is huge and long-term impact; (iv) gaining of overall acceptance from the employees and their respective managers; (v) ensuring enterprise-wide e-learning strategies based on system-wide implementation controls targeted towards making huge impact; (vi) evaluation and measuring of key benefits emanating from the implementation of e-learning.

Dušan Kocur and Kosc (2009) conducted a SWOT analysis with the view to ascertain the strength, weakness, opportunities and threats of implementing e-learning strategies. This was based on their initial work (D Kocur and Kosc, 2007) where it was established that the application of e-learning in everyday university learning can form a sound basis for SWOT analysis. They submitted that the strength of e-learning systems lies on the databases of e-learning course resources and study results and the availability of ICT tools which allows for the possibility of establishing new educational models which combines the traditional face to face teaching style with on-line study tailored for each individual. The main weaknesses identified pertains to the fact that e-learning relies heavily on technology and it is time consuming and capital intensive to maintain its continuous existence. Overall the benefits of successful implementation of e-learning are huge and all stakeholders involved such as students, teachers, management and associated third party can reap from such benefits.

Increase in efficiency of study and improvement of transparency at the institutional level are the two main opportunities identified by the authors. E-learning strategies can improve transparency for teachers, students, and university management staff through the adoption of user-friendly educational web-portals (e.g. Learning Content Management System (LCMS) loaded with consistent educational contents and modules where study results are transferrable). The threats identified pertains to unilateral development of students which inhibits them from interacting with other students face to face thereby preventing them from learning important concepts such as culture and ethics leading to a diminishing competency in terms of social interaction; and the perceived notion that teachers are being replaced by intelligent machines. This

eliminates interaction between teachers and students whilst diminishing the overall significance of impact of quality education.

Achieving a successful e-learning implementation including the adoption of a number of best practices such as the identification of the e-learning requirements, availability of formal process for the collection and documentation of e-learning requirements, selection of high level training programs that will ensure the smooth delivery of e-learning, a rigorous assessment of the level of e-learning readiness within the organization. This readiness could be either of social readiness, environmental readiness, psychological readiness, technological readiness, human resource readiness, content readiness and ultimately financial readiness (Arce and Hopmann, 2002; D Kocur and Kosc, 2007; Sharpe et al., 2006). Furthermore, the identification of barriers to e-learning such as personal barriers, learning style barriers, organizational barriers, instructional barriers, content barriers, situational barriers and technological barriers must be carried out to ensure a successful e-learning implementation. The adoption of the correct e-learning vendors also constitutes an integral step towards e-learning implementation.

One of the most important steps to take before implementing online programs is to assess the key stakeholders' attitudes towards online education (Nasser and Abouchedid, 2000). Administrators must oversee the quality of the online instruction and work to continuously improve it with the help of other stakeholders towards successful implementation of e-learning. Full support and future developmental needs for learners, instructors and technical personnel must be provided by administrators to ensure good quality online education, given that they constitute critical importance to the success of online education (Youngblood et al., 2001; Suanpang and Petocz, 2006;

Whitmore, 2005; Billings, 1999). Organizations that are new to online education should utilize the experiences and recommendations of those who are experienced in this area of education. Administration can help keep instructors motivated by appreciating the workload of online education and perhaps the need for external motivation such as providing financial incentives or reducing their workload encountered by other responsibilities (Youngblood et al., 2001; Hawkes, 1996; Steinbrown and Merideth, 2003).

Support provided by administrators is crucial for the successful implementation of e-learning. With a positive attitude displayed by administrators, the learning experience can serve as a motivator and springboard for both the learners and instructors. (Whitmore, 2005; Billings, 1999; Lee, 2002). Iwasiw, et. al. (2000) reported that setting of strategic goals, developing robust conceptual framework, designing work flow processes whilst making effective decisions on evaluation methods can pave the way for the successful implementation of e-learning platforms. Furthermore, in order to ensure a successful implementation of e-learning, faculty members must be empowered. There must be robust collaborative ventures in place and mechanism which ensures continuous support of the program must be put in place (Yoon, 2003). Before implementing e-learning in universities, the required skills of students should be assessed a alongside with learner, because these skills are crucial in success or failure of e-learning related courses. Ineffective administrative structure, organizational change, quality, legal issues and evaluation effectiveness are considered barriers to success of e-learning (Muilenburg and Berge, 2005). Attitudes and beliefs of the administrators are critical to the success of online programs because they are actually running the programs (Nasser and Abouchedid, 2000).

Additionally, administrators can provide instructors with access to instructional designers to prepare and design courses and materials that match the learners needs (Aragon and Johnson, 2008). In addition, all instructors should be provided with workshops on best practices in the design of instruction. Administration can help in frequent evaluation and improvement of the quality through regular staff development and in-service programs when an online program is established (Tham and Werner, 2005; Roffe, 2002). The overall focus should be on the competency of instructors, technical support and information availability (Maor and Volet, 2007; Fisher and Baird, 2005; Hawkes, 1996). To institutionalize online education, administrators should develop and update policies and procedures to accommodate e-learners and instructors (Appana, 2008). Due to distance learning, managers must have a large pool of instructors to recruit given that the availability of educational resources on the web is tremendous and their transfer is very efficient (Appana, 2008). Finally, in an e-learning environment, administrators are expected to be able to work with learners and teachers from different countries, so managers must have sufficient knowledge and experience in different cultures and international regulations. By ensuring all these on the part of the administrators, the pathway towards a successful implementation of e-learning can be established.

2.5 Structural Equation Modelling and the rationale for its adoption

Structural Equation Modelling (SEM) is a form of technique for conducting statistical modelling and is commonly adopted within the behavioural science community (Hox and Bechger, 1998). The technique encompasses a wide range of statistical methods, computer algorithms and mathematical models for the purpose of

analysing data (Fan, 2007; Kenny and McCoach, 2003; Santoso, 2007). SEM can be regarded as a technique that integrates regression or path analysis, confirmatory factor analysis (CFA) and latent growth modelling data (Fan, 2007; Kenny and McCoach, 2003; Santoso, 2007). SEM is often employed to establish constructs informed by theories that are represented by the latent factors and the relationship between these theoretical constructs are represented by path coefficients between the factors (Hox and Bechger, 1998). In other words, SEM entails a model for measurement which defines latent variables employing one or more observed variables and a structural model that establishes relationships between latent variables. In social science and behavioural science, the use of SEM is embraced due to its endowed capability to dissect relationships between latent variables (i.e. unobserved constructs) from variables that are observable (Hox and Bechger, 1998).

SEM offers a very broad and suitable methodological framework for statistical analysis that entails many traditional procedures that are multivariate in nature such as regression, factor and discriminant analysis and in some instances, canonical correlation (Hox and Bechger, 1998). The technique is usually visualized by a graphical path diagram and the model within it are represented by a set of matrix equations. In doing so, the researcher will decompose the representation of matrix from the path diagram whilst supplying the software with a collection of matrices for various forms of parameters including regression coefficients and factor loadings. In present day, there are software upon which the SEM could be used through the specification of the model directly in the form of a path diagram. Although this approach works fine for simple problems, it may become difficult when the models are complicated. A detailed

description of the underlying mechanism of SEM is provided by Hox and Bechger, (1998).

Modelling of structural equations is a practical statistical technique, which is a powerful tool for estimating measurement models and path models within the framework of analysis of variance (Brown, 2006). Exploratory and confirmatory analysis is used as intermediate stages prior to the design of the structural model. SEM has been very popular in the past decades in the fields of social sciences, psychological measurement, economics, operations research, management, as well as in natural sciences, engineering, marketing research, educational research and tourism. This technique provides an overview of the evaluation and modification of theoretical models (Byrne, 2002). SEM focuses on combining confirmatory factor analysis and regression analysis (models of simultaneous equations) in the overall model. The CFA is used as a means to construct the measurement model, through which the relationships between the observed variables (measured or observed) and the unobservable factors (latent) can be studied. The use of SEM is then used to measure and estimate the structural model, where relations between all variables can be estimated simultaneously (Byrne, 2002).

Analysis of exploratory factors is often used as an initial step to analyze the nature of underlying structures, providing an initial view of the relationships between measured variables and underlying factors. Exploratory analysis is useful to provide some guidance for further research using CFA (Brown, 2006). It is important to know that exploratory analysis does not test a particular theory, whereas CFA can examine the quality of indicator variables that represent underlying factors. Therefore, the difference between the exploratory and the confirmatory is that the exploratory focuses on the

derivation of factors from the data, while the focus of the confirmatory analysis on the assumption of factors in advance and experimental verification. SEM is an extension of general linear modelling procedures (ANOVA and linear regression) and can be applied to various data types such as continuous and hierarchical data (Byrne, 2001). SEM applies the theory of assertion to multivariate analysis of structural theory, which includes causal relationships between multiple variables (Hair, 2005). The objectives of SEM is to check whether the assumptions based on the theoretical model consistently reflect the observed data, and this examination is done by matching indicators to fit the data with the structural model. These indicators shows the level of reasonableness of assumed relationships. SEM is sometimes called analysis of covariance structures, where it can be seen as a generalization of paths (causal) models (Hair, 2010). Path analysis and corresponding path modelling are an extension of multiple regression modelling, providing an effective framework for modelling complex structural relationships and causal relationships between multiple variables. The analysis of these mutually reinforcing relationships also involves investigating patterns of variation and a different relationship between the variables treated (Hox & Bechger, 1998).

Designing the structural model and SEM modelling consists of three steps. EFA and CFA are often used as intermediate stages of model design. In the first step towards designing SEM models, EFA is usually applied as a preliminary step required to analyze the nature of the underlying structures and to provide an initial overview at the relationships between the measured variables and the corresponding underlying factors. Next, a CFA is performed, where the confirmation of the factor structures is verified on the basis of EFA achievement and in compliance with some theoretical knowledge (Hair, 2010). The CFA result is related to the measurement part of the SEM model,

which describes the loadings of indicator variables on the corresponding latent factors. In the next step, the measurement portion and the structural part of the SEM model are obtained, which gives us all the estimated correlations and causal relationships between the treated variables. Finally, the quality of the appropriate model for real data is verified by means of calculating appropriate indicators for the model. If the latter indicates poor model fit, some additional modifications to the model should be made (Hair, 2010).

2.5.1 Application of Structural Equation Modelling in the current work

In this work, the relationship between e-readiness and e-learning success was constructed and Structural Equation Modelling (SEM) was used to analyse the relationships among variables that are related. Detailed data samples were collected from teachers, students, and administrators within the Saudi Arabian higher education institutions. The instrument of this research was developed to conform to the hypothesized model with the view to validate the instrument/measurement scale using confirmatory factor analysis (CFA).

The development of measurement scale involves three steps namely (i) item generation based on literature review to put the initial scale of the questionnaire into context; (ii) interviewing the practitioners from the higher education institutions for the initial evaluation whilst ensuring readability and credibility. The measurement scale was reviewed by experienced academics to ascertain content validity; (iii) survey of selected sample to validate the measurement scale. Exploratory Factor Analyses (EFA) of all items related to e-readiness were used. A principal CFA with the Varimax Method were employed to assess the latent dimensionality of the instrument. Finally, CFA of the both instruments of e-readiness and e-learning success was conducted. Factors identified by

40

each instrument was used to test a hypothetical structural model of e-readiness and e-learning success. The use of CFA allows for assessment of both the discriminatory and convergent validity of the instrument (Kim and Bentler, 2002).

2.6   Chapter Summary

In this chapter, key theories and concepts which the current research explores is reviewed with the view to identify gaps in knowledge (see table 2.1), which the current work seeks to fill. Concepts including e-readiness, e-learning success and implementation were reviewed. Barriers to successful implementation of e-learning strategies were highlighted and discussed. Quality of online education can be improved if learners and instructors as well as administrators are committed to this complex system of e-learning. It is important for key stakeholders to understand the notion that online learning commands the same level workload and attention as that of traditional face to face learning. Learners, instructors, and administrator's attitudes, perceptions and beliefs about online learning are also important to evaluate because they constitute important determinant of the success of the online education. In a relatively short period of time, it is expected that online education in KSA will be integrated into universities' daily activities, as such the current research is timely as it lays the foundation for their applications in the context of Saudi Arabia higher institutions of learning. In the chapter that follows, an overview of Saudi Higher Education Institutions and the current state of affairs regarding e-learning adoption and implementation is presented.

Chapter 3: E-Learning in Saudi Higher Education Institutions

This chapter provides an overview of the Saudi Higher Education Institutions, detailing e-learning infrastructures and its adoption in its educational system. The chapter also provide a brief history of e-learning and the barriers/bottlenecks inhibiting its adoption within the Saudi Higher Education Institutions. This chapter therefore lays the foundation upon which the current research is constructed.

3.1   Saudi Higher Education Institutions

Across the Arabian Peninsula which consists of countries including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Yemen and some parts of Iraq and Jordan, the Kingdom of Saudi Arabia (KSA) is the largest. As of 2016, the official figure of the country is estimated to be >32 million comprising 55.2% and 44.8% of men and women respectively and the largest percentage of the entire population are those whose age range between 15 and 64 (Alharbi, 2016). Against this backdrop, the government of Saudi Arabia is putting in concerted efforts towards providing quality education to its citizen with the view to prepare them for future global challenges that can be met through exposure to university education in its highest level of quality. In order to realise this, the Crown Prince of KSA, Mohammed bin Salman, has come up with new vision and strategies such that by 2030, the country would be ranked among one of the most advanced countries across the globe in terms of economic growth and more importantly, education. Indeed, the revitalisation of higher education tops the agenda of the new visions and strategies. The Kingdom is developing new strategies to ensure that attention is shifted from the heavy reliance of its citizens on oil revenues to a diverse economy that places importance and priorities on high quality education and development of new knowledge and transferable skills to meet the

growing demand of skilled workers across the industry in KSA (Alamri, 2011; Jamjoom & Kelly, 2013; Smith & Abouammoh, 2013).

The KSA is endowed with eight (8) private universities and twenty five (25) public ones and are dispersed in different locations due to the geography and terrain of the country (Hamdan, 2013). All activities of the universities are governed by the Ministry of Education. Due to the increasing realisation of the importance of education coupled with the rising economic wealth, the country is at the forefront of transforming all aspects of living with a special focus on the improving the quality of education of its citizens. This is evident as the Ministry of Higher Education reported in 2009 that the country is making radical investment towards the fundamental pillar of an economy that is driven by knowledge, including education and learning, innovation and information technology (ICT) (Sawahel, 2010). Furthermore, the Saudi government has realised that the university is the greatest representation of national education where ideas are developed and where real worlds' problems are solved and where new policy directions are inspired in governmental parlance.

Accordingly, a huge portion of the country's budget has been focused on education and the government has further encouraged the expansion of private enterprise towards new institutions of higher learning. The government has put in a great deal of efforts towards the reform of the country's education system and has invested significantly into the development of schools and universities (Onsman, 2010; Siddiqi, 2013). It is believed that reforms in education will assist in transforming universities within Saudi into "functional developmental institutes" through optimal balance of academic standards, national requirements, cultural ambience and identity and careful management of the production, dissemination, management, access and

control of knowledge (Profanter, 2014). Universities and the government continue to work together towards the realisation of the vision to put Saudi Arabia at the forefront of the provision of education to its citizen in a manner that is globally recognised and acceptable.

The Kingdom of Saudi Arabia (KSA) has undertaken considerable reform strategies of its educational system and has invested enormously into the development of schools and universities to improve the quality of education of its citizens so that they can compete globally whilst correcting the notion that education is less important because the country is rich due to its abundant crude oil resources. (Onsman, 2010; Siddiqi, 2013). As such, the country has recognised quality educational system as a cornerstone of economic development. This has indeed manifested based on different initiatives targeted at raising the standards of both quality and quantity of education. Indeed, the country has put in significant effort towards developing and implementing detailed education reform activities that is intended to result in a highly skilled and knowledge-driven workforce in accordance with socio-economic objectives (Maroun, et al., 2008).

Onsman (2011) submitted that the KSA is positioning itself to playing a leading role towards becoming a global leader in improving access to quality education. This is evident based on the manner in which the Kingdom is balancing its ambitions to raise its standards of higher education, whilst maintaining its distinct cultural heritage. Cordesman (2003), reported that higher education requires rapid progression and adaptations because of the increasing demand for quality education from students. This increase in demand is due to the increasing competitiveness in the employment market

and because higher education is seen as critical towards improving the prospects of young people.

In light of the above demand, Saudi Arabia government is responding to this by encouraging the use of Information and Communication Technology in institutions for higher education. Accordingly, a number of strategies and initiatives has been put in place to encourage the development and implementation of e-learning in Higher Education Institutions. For instance, the establishment of the National Centre for E-learning and Distance Learning (NCeL) with the sole aim of carrying out research on e-learning and the implementation of distance learning in universities, signal the strong intention of the government in leveraging ICT infrastructure to improve and encourage access to quality education (Alebaikan, 2010).

There is no doubt that Saudi education is taking steady steps towards progress, making full use of ICT infrastructures as echoed by the Ministry of Education regarding the integration of technology as an ideal vehicle for delivering quality education. Indeed, the Ministry of Education is playing a leading role to support the educational system by providing a number of incentives including modern ICT systems and software to manage the educational process in schools and universities. The initiative to adopt digital solutions towards improving the overall education systems within the Kingdom is one of the most important steps that has been taken by the government to keep abreast of current developments in efforts towards quality education. Education enabled by digital solutions is one of the fastest way to achieve educational goals and deliver learning outcomes to learners (Maroun, et al., 2008), as it encourages learners to learn at their own pace and comfort. Saudi Arabia has invested heavily towards the development of its education system with the hope of achieving the goals set towards its

2030 Vision. In recent time, it has been reported that Saudi Arabia top the list of countries whose budgetary allocation to education is substantial (Maroun, et al., 2008).

Pearson, the world's largest provider of education services, reported that, Saudi Arabia's investment towards improving quality of education by leveraging digital solutions is among the highest in the world. Saudi Arabia adopts the digital education initiative based on several electronic systems and specialized software in the management of the educational process and the correction of exams and evaluation. An example of such system is termed, NOOR System, which is a comprehensive and integrated educational learning program that is based on high level and sophisticated technology within the realm of educational administration, covering all schools belonging to the ministry, educational directorates and public departments of the ministry. The system provides a wide range of e-services to students, tutors, parents and school administrators, whilst contributing to the preparation of the required reports and the provision of information regarding the educational process, through a central database linked with other existing and future systems.

Another example of robust systems for delivering education through digital means is called REMARK and is the leading US program in the field of automatic correction of tests since 1991. It has been in operational use for years and it is updated on a periodic basis. REMARK is used by many Saudi schools and universities to manage the automatic correction of tests, in order to comply with the standards and conditions of automatic correction in Saudi Arabia. It is also considered to be the first economic alternative to expensive conventional automatic correction devices. All these and other systems contribute to making the educational process more efficient and easy for the student or teacher to promote the Saudi education system, whilst improving its

overall standards globally (Onsman, 2011). In the section that follows, an overview of e-learning in Saudi Higher Education Institutions is presented.

3.2   E-Learning in Saudi Higher Education Institutions

Saudi educators and learners operate in a very different environment and it is important to have an understanding of the settings within which it operates. Accordingly, extant literatures on online learning and technology-based education in the Kingdom and other countries in the region is considered in this section. Denman and Hilal (2011) reported that there has been a shift in the Saudi HE sector towards a more accepting attitude for embracing the principles of globalisation and the advantages it offers. Denman and Hilal submitted that "*the country is beginning to view itself as 'global' and more at one with the world. In essence, the country is increasing its student mobility in an attempt to broaden its 'global' worldview and, due to economic rationalisation, tackle the issues of skilled migration by educating its best and brightest abroad*" (2011, p. 302). Whilst strides towards e-learning form part of this fundamental development policy, a number of issues including maintaining the quality of Saudi's rapidly expanding Higher Education sector, the use of English as the language of academic in its universities, gender-based segregation and its regional leadership, still exists (Onsman, 2011, p. 520).

The Saudi government attaches considerable importance to the development and integration of e-learning in Saudi HE institutions and is projected to reach $250 million in 2015 whilst growing at a compound annual rate of 33% across the next five years (Alenzi and Rashad, 2013, p. 22). Despite this projected growth, Alenzi et al. (2013) argues that many Saudi learners are reluctant to engage with technology and e-learning. Although, further research is necessary to determine the actual reasons for this

reluctance, Alenzi and Rashad (2013) submitted that feelings of enjoyment, computer self-efficacy and anxiety, influences Saudi learners' attitudes towards e-learning. This is contrary to Al-Fahad (2010) who finds that most Saudi students adopting e-learning facilities for their education expressed high levels of satisfaction and good learning outcomes from online modules. Similar attitudes were observed by Isman et al. (2012), who reported that Saudi secondary pupils displayed positive response and improved learning outcomes from effective use of interactive whiteboards, but that Saudi teachers requires professional development opportunities to successfully adopt this technology in their teaching duties.

Altameem (2013) evaluates the effectiveness of e-learning in Saudi universities and concluded that with the right infrastructure, support and access, Saudi students have a positive attitude towards technology and online learning and that the disparage views reported by some researchers might relate to the fact that students have individual and differing learning styles and preferences. Aljojo and Adams (2009) submitted that technology-enhanced learning solutions provides the opportunity to tailor teaching and learning to the individual. It does not only allow learners to learn at a given time, pace and place convenient for them, it also allows educators to present materials in formats suitable for a variety of learning styles. Numerous psychometric instruments measuring learning styles exist, however, most of them have been developed for an English speaking sample and applying them to other populations presents issues of translation and culture. Aljojo et al. (2009) report on the development of an Arabic equivalent of the Felder-Soloman Index of Learning Styles (ILS) instrument as part of an overall project focusing on an adaptive learning environment for students in a particular Saudi University. Based on the pilot study it was applied to, it was observed that it resulted in

lower internal validity in the instrument compared to those versions based on English language. This has implication for both measuring learning styles and adapting learning material for Saudi students.

Al-Qahtani and Higgins (2013) evaluated the effectiveness of learning outcomes for Saudi students using e-learning, traditional classroom based learning and blended learning incorporating both methods. They do not observe a difference between learners using either e-learning or classroom based learning, but concluded that blended instruction yields superior results. This is also observed by Cooper et al. (2000) as well as Bonvillian and Singer (2013), who submitted that e-learning has positive impact on HE education, with blended teaching likely being the instruction format of the future.

In an attempt to unravel issues pertaining to higher education in Saudi Arabia despite the revolution in the educational system, Al-Harbi (2011) conducted research on the potential and challenges of e-learning in the Saudi tertiary education. He argued that the issue of access still remains a top challenge and that the need for additional modes of delivery of education to learners regardless of where they are is pertinent and that e-learning implementations can play a vital role. To ascertain the level of successful implementation of e-learning, an understanding of the issues that promotes the efficient use of digital solutions is required. Accordingly, Al-Harbi (2011) investigated the factors that influences e-learning in Saudi tertiary institutions by analysing factors such as attitudes and perception of the students. He concluded that attitudes towards e-learning, perceived behavioural control, subjective norms as well as the features of e-learning systems were the key determinants of whether the implementation of e-learning strategies will be successful or not. Accordingly, the study provided unique insight into the optimal approach to promote the acceptance of e-learning among Saudi students.

By using modified acceptance framework that was informed by the Unified Theory of Acceptance and Use of Technology (UTAUT) model, Nassuora (2012) examined the possibility of the acceptance of e-learning in Saudi tertiary institutions and the factors determining such acceptance. Based on statistical analysis of quantitative survey of eighty (80) students, he concluded that the level of acceptance of e-learning is high. Alkhalaf et al. (2012) conducted a research on the measurement of the impact of e-learning on academic staff and faculty member of tertiary institutions in Saudi Arabia. By using a framework based on IS success/impact measurement principles within two top universities in Saudi, they concluded that academics exhibited positive and forward-looking attitude towards e-learning systems, thereby improving their performance in their jobs, whilst enabling the Universities to provide better and improved educational services to students.

By adopting an extended Technology Acceptance Model (TAM), Alenezi and Karim (2010) investigated the role of satisfaction, computer self-efficacy, anxiety towards computer, and Internet experience in influencing the intention of students to adopt e-learning in tertiary institutions within Saudi Arabia. Using data from 402 participants from across the universities, the results of stepwise regression showed that all the aforementioned factors significantly influenced the decision of students to embrace e-learning, except Internet experience which was less significant. Overall, the study highlighted the importance of attitude as a mediating factor in the relationship between a number of factors including perceived ease of use, perceived usefulness, and the behavioural intention of the students.

Saudi Arabia is a large country, the universities are widely dispersed geographically and distances between universities are very long and not easily

accessible. The e-learning in Saudi Arabia emerged and progressed due to these challenges (CDSI, 2011). Wong (2007) indicated that e-learning should be approached with caution, at the same time Cengiz and Deniz (2005) submitted that e-learning systems may provide an excellent solution for a country facing a lot of pressure and challenges due to increased demand but without the capacity to absorb all the students in its face-to-face educational institutions. Al-Khalifa (2009; 2010b) indicated that e-learning gathered widespread acceptance in Saudi Higher Education Institutions and has already been adopted as a means to expand access to quality educational opportunities. Many studies have demonstrated that Saudi Higher Education Institutions will be deemed ready for e-learning provided issues regarding the quality of learning material, acceptability, relevance of content and connectivity are addressed (Cengiz and Deniz, 2005).

The number of people completing secondary school education has increased in the last decade and the completion rate is expected to increase in next 10 years, with a corresponding 400% increase in the demand for higher education within the same time frame (MoHE, 2013a). This increase has caused increased pressure on resources in Saudi Higher Educational Institutions, as such, the Ministry of Higher Education is encouraging the use of ICT and e-learning to meet the surge in demand (Alebaikan, 2010).

E-learning industry in Saudi Arabia is estimated to be about US$125 billion and is set to increase by 33 % over the next five years (Krieger, 2007). Bates (2009) indicated that Saudi government is committed to investment in e-learning facilities for years to come with the view to increase access to quality education among its citizens. Although e-learning enjoys high level governmental support, educators and students in

some instances have a negative perspective toward the technology. This is as a result of social, cultural structures, norms, expectations and values of the population in Saudi Arabia which influences the adoption of technology. Generally, technology brings about critical changes in societies and organizations that would yield considerable impact. Given the conservative nature of the Saudi people as influenced by sociocultural factors, the full embrace of e-learning will pose significant challenge (Baker et al, 2010). However, current developments has shown that considerable level of progress has been made regarding the adoption of e-learning in Saudi Arabia despite the cultural ambience and heritage of the citizens.

3.3   History of E-Learning in Saudi Arabia

Saudi Arabia established a national plan for Information Technology through the MoHE in 2007 with the view to encourage the adoption of digital solutions in accessing quality education (Alebaikan, 2010). It also established the National Centre for E-learning and Distance Learning (NCeL) (Almegren et al., 2007) with the view to further expand on the development of e-learning. In 2007, a Learning Management System (LMS) known as 'JUSUR' was established to manage the course materials, store and share learning materials among universities. Afterwards, Saudi Centre for support and counselling (SANEED) was established to provide support and guidance towards improving the abilities of all e-learning users. Many Saudi universities has followed this initiative by establishing specialized departments for e-learning and distance learning to improve the quality of its delivery (Almohaisen, 2007). These initiatives have resulted in a rapid progress in e-learning but the higher education institutions in KSA are still in the early stage of e-learning development and adoption and a number of challenges still exists (Al-Shehri, 2010).

In a study of the reality of e-learning activities among some Arab countries, Saudi Arabia was described as the Center for Arab Unity Studies given its clear vision and strategy for deploying ICT infrastructures to improve access to quality education throughout the country. However, the reality on ground is not in commensurate with the principles of e-learning. Current application of digital solutions towards educational functions are limited to the principle of disseminating knowledge using the computer and its applications within the traditional educational process (Razzo, 2012, p. 371). Nevertheless, there are important e-learning experiences in the Kingdom of Saudi Arabia, for example, effective electronic teaching methods are currently being adopted at the King Abdul Aziz University. The university boasts of the largest electronic library across the Kingdom with over 16,000 e-books in stock.

In late 2006, the Ministry of Higher Education collaborated with Malaysia's Meteor Corporation with the view to establish the initial phase of the National Center for e-learning and distance education, which aims to create a core knowledge for a central center for e-learning and distance education for the institutions of higher education and unifying the efforts of institutions seeking to leverage the benefits of e-learning. The contract covers the initial phase of the National Center for e-learning and distance education for the university education institutions in the Kingdom. It is implemented in three main stages: (i) e-learning management system design; (ii) training around 1,500 employees and academics on the education management system; (iii) training around 1000 trainees regarding the requisite skills to adopt and benefit from e-learning and distance learning, and building the electronic curriculum.

Today, the Ministry of Education of the Kingdom of Saudi Arabia is moving towards the adoption of e-learning management systems and distance learning in all its educational establishments and institutions. The Ministry invited all universities at the 4th International Conference on E-Learning and Distance Learning held on 1 March 2015 by participating in Open Educational Resources (OER), an opportunity to integrate and reduce costs among them.

3.3.1 Existing efforts towards implementing e-learning in Saudi universities

Some universities have relied on certain systems according to the vision of the university and its future aspirations, and the mission that seeks to deliver, for example. The Deanship of e-learning and distance learning at the King Saud University has conducted extensive research on the learning management systems available and used in the major universities in the world. The Deanship selected the Black Board system as a learning management system. The system has been installed and ready for use at the beginning of the first semester 1430-1431 H. The system is characterized by ease of use, which helps improves it adoption among the faculty and students, and contain many of the tools that help the faculty to manage its courses and help the student to participate effectively in the decision, as well as the presence of a large company supporting the entire process especially as it pertains to the development and customization of the system to suit the needs of current and future university , whilst providing full support and training for the University. It was revealed that during the period of experimental implementation in the academic year 1430-1429, the system suffers from some difficulties such as: - (i) lack of hosting on the servers of the university; (ii) failure to integrate with the systems adopted at the university. King Saud

University has been working on the development of faculty members through the establishment of workshops and courses on the use of the Blackboard management system and management of the educational process (Salloum, 2011).

King Khalid University currently has an integrated electronic environment similar to that found in international universities, and is the first of its kind at the level of Saudi universities, which relies on the Blackboard system. It is regarded as one of the most powerful systems of global e-learning management and distance learning and is endowed with electronic testing systems, systems for recording and transmitting electronic lectures and conferences on the Internet, content-creation systems and an electronic repository for educational units. These systems are integrated with each other and with other systems. The University entered into a number of contracts with international companies to provide systems and services related to e-learning as part of the overall efforts to expand e-learning in order to meet the needs of the students.

KAUST is currently adopting the Blackboard system as a tool for managing the learning process for all students in all academic programs to replace the previous systems such as Centra and EMES (Deanship of e-learning, King Abdulaziz University, 2015). The Imam Mohammed Bin Saud University has adopted TADARUS System for almost seven years now and it is an e-learning management system that was designed by the Egyptian Hafar Foundation and its advantages in terms of performance and usability has been highlighted, which included the fact that it supports English and other languages.

King Faisal University has a strong technical infrastructure, making the servers of e-learning systems work at a high level and the number of students enrolled on this system is about 9000. E-learning management at King Faisal University systems is

currently based on a variety of different goals that the university is seeking to achieve: blackboard student's attendance, Blackboard 9.0, classrooms Virtual Interactive System (Virtual Class Room), recording lectures system (Class Recording / Capturing Tools), system Online Exams (Deanship of e-learning and distance learning, King Faisal University, 2015).

The University of Princess Nora which was recently established is still taking its first steps towards the adoption and implementation of e-learning facilities. Currently, the university uses the Blackboard system, similar to many universities in Saudi Arabia and the world, but on a small scale, through which only three subjects are taught in different disciplines. Leadership at the university is aware of this delay and has appointed a Dean for nearly a month to promote e-learning at the university. The university is represented by a director who is aware of the great role of e-learning systems and its impact on the progress of the educational process as well as the awareness that the adoption of e-learning is a global trend that can benefit the students. The aim of the university is to adopt e-learning tools to strengthen the current curricula and courses and attract new students in the Kingdom and the Gulf, thus providing an additional resource for the university to help increase the quality of educational outputs. At the Fourth International Conference on e-Learning and distance learning, Princess Noura University expressed its intention to employ these open source learning materials in a distinctive manner to launch e-learning at Princess Noura Bint Abdulrahman University.

3.4   National Centre for e-learning and distance learning

King Abdullah bin Abdul Aziz in his capacity as the custodian of the Two Holy Mosques in Saudi Arabia and the traditional leader of the country, established the National Plan for Information Technology which is saddled with the responsibility of ensuring the smooth adoption of e-learning and distance learning across the country. The plan also entails the establishment of a National Centre for e-learning which will be responsible for providing technical support and necessary tools and infrastructures for the development of digital solutions to improve access to quality education among the citizens of the country. The Centre must ensure the overall quality of the e-learning developmental approaches by coordinating approved programs, conducting training on e-learning and ensuring the production of study materials of the highest quality. An integral function of the National Centre is to ensure that knowledge based on Islamic principles and values are embedded within the e-learning facilities and should be accessible by every interested user.

Essentially, the overall aim of the Centre is to (i) ensure the effective dissemination of e-learning and distance learning applications to enhance quality education delivered with the highest quality of standards; (ii) contribute towards the expansion of the retentive capacity of university education by leveraging e-learning capabilities; (iii) disseminate awareness in terms of technical requirements of e-learning, e-learning practice and culture whilst building a society that is ICT-literate; (iv) evaluate the progress and success of programs and projects emanating from the adoption of e-learning; (v) provide relevant support in terms of research on current trends in e-learning and distance learning with the view to reap the fruits of their implementation; (vi) contribute to the development of quality standards towards the

design, production and dissemination digital study materials; (vii) provide adequate consultation services to relevant bodies within the field of e-learning; (viii) develop educational software and using it to enhance quality of education; (ix) encourage projects that are deemed outstanding towards the development of e-learning; (x) organize a number of activities including regular meetings, conferences, symposium and workshops towards the advancement of e-learning and distance learning.

The responsibility of the National Centre for e-learning is to employ ICT to improve the quality of education in Saudi by implementing quality control strategies to ensure its smooth operation during implementation. To be able to deliver on its mandate, the National Centre, enjoys high level of financial independence and administrative freedom and it is strategically linked to the Ministry of Education. The Centre therefore establish regulations and quality standards towards e-learning and distance learning; provide license and certifications to companies with the requisite expertise to provide e-learning infrastructure both in software and hardware forms.

The Council of Higher Education has approved the list of distance education in higher education institutions in Saudi Arabia to help Saudi universities improve the quality of this type of education by creating technical standards that drive their quality and improve their efficiency. Some quality organizations in distance learning have been helping and coordinating with each other to familiarize themselves with the working mechanism and standards used in distance learning programs such as the Distance Education and Training Council (DETC), the Advanced Learning Organization (ALO). Also, the Saudi Digital Library offers the National Centre for e-Learning and distance learning the electronic resources available to the higher education staff in universities, government colleges, colleges and other higher education institutions.

The library contains about 114,000 digital books and more than 300 international publishers. The library provides advanced information services and sources of digital information in various forms such as books, periodicals, university letters, conferences, seminars and other sources of information in order to improve the educational process through the support of the learning system in general and e-learning in particular, whilst meeting the requirements of scientific research and general knowledge by the citizens. The Council of Higher Education approved the controls of educational satellite broadcasting in the Kingdom of Saudi Arabia, which makes the academic institutions in the Kingdom have the right to use satellite broadcasting within the scope of its competence, and to achieve its objectives. Implementation of this resolution will achieve the spread of the values of higher education and support e-learning and distance education, and contribute significantly to the dissemination and promotion of the culture of the knowledge society among all segments of Saudi society.

Since the decision was issued, the National Centre has undertaken the task of transforming these controls into an operational plan, in coordination with interested universities, capable of benefiting from satellite broadcasting. There will be a satellite package, reserved for university channels, especially since the Saudi universities are enjoying many of these events, and will have the opportunity to see what is going on in these conferences, seminars and scientific forums as they are being broadcasted directly.

3.5 Barriers to adopting and implementing E-Learning in KSA

Many researchers have studied the barriers that may face the implementation of e-learning in Saudi Arabia. For instance, Aldraiby et al. (2010) identified a number of issues within the educational system in KSA including financial issues, technical issues, administrative issues and more importantly, the perception of the society. Technical

barriers may play a critical challenge for implementation of e-learning. Many challenges can be attributed to the perception of users regarding course content, delivery of the content and, testing systems (Aldraiby et al., 2010). Sait et al. (2003) pointed to problem regarding the information and telecommunications infrastructure adding to the internet connection and training in the e-learning environments.

Some barrier may arise based on the perception of students seeking education via e-learning. Many students still perceives e-learning negatively. Elango et al. (2008) evaluated the perception of students on various aspects of quality in e-learning. The results of this study showed that a high percentage of students were not happy with the course contents and the quality of the method used to deliver it. Many of students believed that the online courses are not delivered effectively. These results indicate that much improvements should be directed to the e-learning delivery method to ensure full confidence in e-learning. Hussein (2011) observes considerable barriers towards the successful implementation of e-learning at Saudi universities. There is difficulty in finding consensus on how to best evaluate e-learning success. Many studies attempted to explore a variety of factors and intervening variables that might have an impact on the success of e-learning in Saudi Higher education. Many researchers pointed to cultural issues, religious values, the adoption of modern technology and the preservation and social skills as barriers for implementing e-learning (Mohamed et al, 2008). Baker et al. (2010) focused on the social barriers and argued that Saudi Arabia has distinct cultural traditions and this can be a barrier from embracing change given that some people are rigid towards adopting a new technology.

Recognizing the above mentioned barriers has a major role in enhancing technology and e-learning acceptance. Initiatives should focus on overcoming the

barriers as indicated by many researchers including availability of computer equipment (Al-Wehaibi et al., 2008), basic computing knowledge (Al-Fahad, 2010), organizational skills and management strategies (Woodill, 2007), flexibility of e-learning programs (Mirza, 2007), social interaction between educators and students (Al-Fahad, 2010), Internet connection (Al-Wehaibi et al., 2008) and many others. Supporting the discussion of these barriers can enhance the development of technology such as e-learning and would facilitate the opportunity to meet the needs of students, whilst providing solutions to barriers of adopting e-learning.

Several studies have pointed out the existence of organizational and administrative obstacles to e-learning in the Kingdom of Saudi Arabia (Onsman, 2010; Siddiqi, 2013; Alebaikan, 2010; Onsman, 2011; Denman and Hilal, 2011; Alenzi et al, 2010). In general, it can be said that there are many obstacles that may contribute to reducing the spread of e-learning and its use in the field of education in general. Issues surrounding the adoption and implementation of e-learning can be identified based on four categories:

In terms of learners; it is difficult to change from a traditional teaching method to a modern learning method and students resist this new style of learning and not interact with it. Difficulty in obtaining computer hardware for some students, access to some prohibited sites that may call for renouncing of cultural values. Religion and ethics also constitute problems when it comes to the adoption of e-learning concepts. Many students cannot benefit from many sites except those who mastered the English language. Sitting the learners in front of the computer for a long time may affect them in a number of ways. The computer does not provide direct opportunities to learn manual

skills or social interaction between peers during learning. E-learning lacks realism, and requires human touches between students and teachers.

In terms of the teacher; this stems from the fact that the students seeking education via e-learning have not been trained towards self-directed learning and this creates problems for the e-learning instructor. Difficulty in making sure that students are able to use computer skills and the lack of teachers trained on the computer, coupled with the negative impression of some faculty regarding e-learning also constitute a major hindrance. The continuous need to train and support learners and teachers on how to learn using the Internet is therefore pertinent.

In terms of costs; this is linked to the cost of providing e-learning requirements. The continuous development of computer technologies and programs may be another burden in following up on these developments and taking advantage of all that is new. Lack of appropriate high-quality software for the great effort they need to design is a major issue.

Technical barriers may include: the extent of verification of the personality of the beneficiary student, especially when applying the various tests and evaluation methods. Privacy, confidentiality and protection against piracy on websites, which affects electronic courses, exams and their results. A sudden glitch in the internal or external network or the computers, which leads to the interruption of the service during the search and browsing or sending messages, which may have the teacher or learner or researcher lost a lot of data written or collected. The rapid development of global standards requires many modifications and updates in electronic courses. The need to deploy electronic courses at a high level of quality is high given that competition is high. Finally, in terms of society, the lack of awareness among members of society for

this type of education and negative attitudes towards e-learning is another factor. Lack of professionals specializing in the field of computer education in the education systems in many countries, especially developing countries also constitute hindrance.

Many studies have been conducted on the obstacles to the implementation of e-learning in the Ministry of Education in KSA, which showed that there are statistically significant differences in the obstacles of this type of education for females, the least experience, and academic qualification. Several studies have confirmed the importance of feasibility studies for e-learning and to motivate employees and train them to use modern technology. The main barberries focused on lack of mechanisms of e-learning, heavy burdens required, lack of incentives. Obstacles related to the curriculum such as density of courses, incompatibility of the curriculum with the rapid development of programs also constitute great barriers. Technical constraints such as lack of readiness of information infrastructure, lack of access to the high speed network are also a barrier. Administrative obstacles such as the number of students in one class, the lack of computers in the school constitute barriers. Regulatory constraints such as lack of suitable place, lack of human resources and the high cost of this type of education also constitute barriers towards the adoption of e-learning

A number of studies have pointed to the need to pay attention to the educational design in e-learning courses to achieve quality and excellence in this type of learning (Al-Saidi, 2011; Hassanzadeh, 2012). As a result of the importance of e-learning and the spread of its applications in many international and Arab universities, there has been a growing interest in improving quality and quality assurance. The issue of quality assurance and its emphasis on e-learning has become a new challenge to the e-learning system in Saudi universities. Ignoring this challenge means that programs and decisions

that lack quality will be created. E-learning is growing both locally and internationally; Saudi universities have introduced e-learning to realize the principles of learning for all and lifelong learning; diversifying opportunities for university education for all; keeping pace with development requirements; meeting the needs of the labour market.

Numerous studies indicated that there are several problems related to the quality of some e-learning courses. Most notably are the inadequacy of these systems for educational needs and characteristics of learners. Examples include: - lack of real interaction in e-learning courses (i.e. it does not employ synchronous and asynchronous communication tools in an interactive way); lack of support and immediate feedback for learners during the process of learning; navigational difficulties, and the poor design of the pages, leading to exhaustion;   narrow learner paths that limit the learner's freedom to navigate information correctly; mandatory inclusion of some GIF images and animations, which "developers" marvel at regardless of their relevance to the subject; display context and content in a partial manner;   grammatical and linguistic errors. Many e-learning sites do not take advantage of available technological possibilities and restrict learners to a narrow view limited to provide them with information and examples, and task them to write reports on what they have learned. This can be summarized by the lack of standards for the quality of educational design of e-courses in Saudi universities that govern the design and production of courses to ensure their quality (AL-TAbakh, Abdel Hadi, 2005).

Other studies have pointed out that there is a weakness in the programs of preparing the e-learning teacher and that there is an urgent need to present a proposed vision. Therefore, because the teacher is the focus of the educational process, this may put pressure on the educational institution on how to conceive the preparation of e-

learning teacher in Saudi Arabia. This means that the educational institutions being required to identify the requirements of the transition from traditional education to e-learning via the Internet, and to identify the roles of the teacher of e-learning, and then provide a proposed scenario for the preparation of e-learning teachers in Saudi Arabia (Al-Dosari, 2014).

3.6   Chapter summary

In this chapter, an overview of e-learning in terms of opportunities, challenges and barriers in the context of Saudi Arabia is presented, setting the scene for the current research.   E-learning is still in the early stage of its development in Saudi Arabia. The growing pace of e-learning in KSA have indicated many barriers that may face the adoption of E-Learning, such as technical, social, cultural, organizational and management barriers. The discussion in this chapter indicated that the adoption of e-learning in Saudi Arabia can provide opportunities for students who are seeking to access the educational resources. Also the discussion indicated the limits that may prevent student form achieving these benefits from the developments and advancements in IT, especially in the education sector. Lack of research that explore the factors influencing the success of e-learning and obtaining valuable educational achievements from e-learning was highlighted.

The overall aim of the current work is to investigate and evaluate the constructs of e-readiness in Saudi Arabian higher education institutions to successfully implement e-learning initiatives. The methodological framework to realize this objective is therefore presented in the chapter that follows.

Chapter 4: Methodology

4.1 Introduction

In chapters two and three, a review of extant literatures on e-learning and e-readiness and their implementation from a general perspective and with a focus on the Kingdom of Saudi Arabia (KSA) were presented. An overview of e-learning systems in terms of opportunities, challenges and barriers in the context of Saudi Arabia was highlighted, laying the foundation for the current research. Current efforts put in by the Saudi Government with the view to drive the move towards e-learning was also highlighted. To date, robust theoretical framework for e-readiness and how it effects e-learning success with respect to KSA is lacking. This work therefore seeks to address this gap by using Structural Equation Modelling (SEM) to test the levels of e-readiness in KSA. Against this backdrop, this chapter presents the methodological framework (i.e. research instrument, sampling techniques, data collection methods and data analysis) to deliver the objectives highlighted in chapter one.

This research evaluates, constructs and applies SEM on the current levels of e-readiness of Saudi Arabian higher education institutions to successfully implement alternative e-learning scenarios such as Massive Open Online Courses (MOOCS). As such, the research seeks to develop a comprehensive model of e-readiness and e-learning success factors taking into consideration the unique characteristics of teacher, student, and administrator in higher education institutions. Through extensive literature review, seven dimensions forming the component factors of e-readiness has been identified, including policy and institutional business strategy, pedagogy, technology, interface design, management, administrative and resource support, and evaluation and continual improvement.

Literature review has also indicated six dimensions forming the component factors of e-learning success including system, information and service qualities, use and user satisfaction as well as net benefits. For instance, Pittinsky and Chase (2000) also provided comprehensive guidelines for e–readiness that influence success in e-learning, benchmarking seven areas namely: support from the institution offering e-learning, the manner in which the course content is developed, nature of teaching and learning, the content and structure of courses, support from both students and faculty and the approach to evaluation and assessment. Development of theoretical framework for e-readiness and how it effects e-learning success is therefore the focus of the current research. To achieve this, the current work builds on the e-learning success model developed by DeLone and McLean (2003) which considered six dimensions of e-learning success, including three forms of quality (system, information and service), use and user satisfaction as well as net benefit.

4.2   Research Instrument

A total of 68 items were generated from the literature. Potential paragraphs on each factor of the scale was established and revised with practitioners from different institutions adopting e-learning with the view to assess the readability and credibility of the scale. Structured interviews with practitioners engaging in e-learning in some universities were conducted to ensure clarity and relevance of paragraphs for each factor. The practitioners were asked for ordering of paragraphs according to priority of measuring that factor, then classified by harmony of each paragraphs with factor. Based on their observations duplicated and unclear paragraphs were removed. In some instance, slight modifications were made and new paragraphs were added when necessary. This process was repeated three times to ensure its conformity to the

surrounding environment. Thereafter, the scale was sent to 7 academics at the University of AL-Qassim, King Saud University, where selected academics in the Department of Management Information Systems, Department of Business Administration reviewed each paragraph of the scale to ensure good formulation. Based on their recommendations paragraphs were removed, modified, or added for each factor where necessary.

The scale settled on 56 paragraph (see Appendix). The questionnaire was developed to measure the variables (e-readiness, e-learning success). 5-Likert scale measurement was adopted to assess the answers for both e-readiness, e-learning success variables. The answers are ranged as follows: (5= Strongly Agree: 1= Strongly Disagree). A scale of 56 items was distributed into 13 component factors. Seven factors were determined to measure e-readiness namely (institutional policies and business strategies = 6 items; pedagogy = 4 items, technology = 3 items, interface design = 4 items, management = 7 items, administrative and resource support = 4 items, and, evaluation and continual improvement= 3 items). The other six factors were to measure e-learning success including (system quality= 2 items, information quality= 3 items, service quality= 8 items, use= 6 items, user satisfaction= 2 items, and finally, net benefits= 4 items).

Data gathered were subjected to exploratory factor analysis (EFA) as a second step. EFA was used to assess the latent dimensionality of the construct related to e-readiness. Final step focused on Component Factor Analysis (CFA) of both constructs of e-readiness and e-learning success to validate the measurement scales.

4.3   Sampling, data collection and screening

Sampling was conducted two times. Two different samples were used to develop and validate the measurement scale. Sample 1 was used for pilot testing and exploratory factor analysis (for e-readiness measurement scale); Sample 2 was used for confirming factors that resulted from EFA. First sample consisted of three higher education institutions (Qassim University, King Saud University and King Fahad University), and 120 responses were obtained. The initial sample were used for EFA to validate e-readiness measurement scale. Final version of scale were used for the survey. The survey included all the higher institutions that use e-learning as a tool for delivering online courses during the period between 2016 and 2017.

Data were collected using the developed survey which has been tested by a group of academics and practitioners to verify the readability and clarity, then validated using CFA. All higher education institutions in the Kingdom of Saudi Arabia have been chosen. A Stratified sample was chosen from these institutions which experience e-learning. Given that the research focus the unique attributes of teacher, student, and administrator, Stratified sample can be used to assess the salient features of the population. In any estimation problem, the most pertinent objective is to obtain an estimator of a population parameter which has the capacity to take care of the salient features of such population. Collins et al. (2006) reported that for a homogeneous population based on the characteristic under consideration, the technique of simple random sampling always produce a homogeneous sample, indicating that the sample is a reflection of a good estimator of population mean. To improve an estimator's level of precision, sampling scheme which has the capability of reducing the population's heterogeneity was used.

Structured self-completion questionnaire was the approach taken to data collection. The distribution and collection of the questionnaires was carried out directly by the researcher. The participants were asked to complete the form. Suitable questionnaires were subjected to detailed analysis, and those deemed incomplete were excluded. Although almost all the precautionary measures used in this research have been used extensively in other studies, it was important to assess the developed questionnaire in this work as well.

The validated questionnaire was developed and written in both English and Arabic languages and sent to participants by e-mail. Some participants were interviewed directly given the strategic nature of the information required from them as informed by the questionnaire. The questionnaires were sent to top management academic in the higher education institutions because they are considered the best and most reliable source of information. A sample of (14) of higher education institutions were selected during varying periods from different regions in the KSA, including Qassim, Riyadh, Jeddah, Dammam, AlMadinah Almunwarah, and Hail. The number of questionnaires sent to the selected sample is 2000 with a corresponding response rate of 60.9% (i.e. 1218 responses out of 2000). This response rate is high, and it is a reflection of strong response from the total population targeted within the selected universities. A sample of higher education institutions was selected from five governorates region in Saudi Arabia (i.e. Central, Western, Eastern, Southern and Northern Regions) to ensure evenly distributed representation.

Data were entered into SPSS statistical tool and were thoroughly checked for detecting and correcting missing values. Accordingly, 21 responses were deleted due to the number of missing values of more than 20% of the total paragraphs in the

questionnaire. The remaining datasets were then analysed using AMOS.16. To identify outliers during data screening, 36 responses were removed because the Mahalanobis distance values is > the $\chi2$ value ($\chi2$=99.29; n=28, p<0.001), a final of (1161) response were devoted for the analysis. Further statistical analysis was then conducted with the view to test for reliability and validity using CFA, for discriminant and construct validity for a number of features including composite reliability, multicollinearity treatmentand average variance extracted as well as testing the fit for both the hypothesized and revised CFA models. The validated measurement models facilitate further implementation of SEM to examine the structural relationships between e-readiness and e-learning.

4.4   Data analysis

In this work, in order to analyse the study variable and the characteristics of the demography, the principles of descriptive statistics was employed. The assessment of skewness and kurtosis coefficients were used to test assumptions pertaining to the normality of the distribution of multivariate data. In general, all aspects of multivariate normality are not captured within a single statistical framework, however the technique is widely used (Mardia, 1995). A normalized multivariate kurtosis value is adjudged satisfactory is not greater than between 3 and 4 (Park and Schutz, 2005). In addition to this measure of satisfaction, for all variables if the absolute value of the skewness is <3 and those for kurtosis is <10, then the overall measure is also adjudged satisfactory. Overall, statistical analysis packages such as SPSS and AMOS was employed for the data analysis.

4.4.1 Exploratory factor analyses (EFA)

Exploratory factor analyses (EFA) was conducted for all items related to e-readiness. For the latent dimensionality of the instrument. Principal CFA with the principle component method was adopted to evaluate it. Items with factor loading with a minimum of 0.4 as well as those with an eigenvalue of 1 were retained. The overall evaluation included Kaiser-Meyer-Olkin (KMO) measure of Bartlett's test of sphericity and sampling adequacy. Kim and Bentler (2002) reported that factor analysis is adjudged adequate if the KMO has a value > 8 and the Bartlett's p is significant.

4.4.2 Confirmatory factor analyses (CFA)

CFA have been adapted to authenticate the theoretical constructs (Byrne, 2001). CFA has been identified by numerous researchers as a suitable statistical test especially when a number of factors is required to put into context the inter-correlations between the variables of measurement (Sureshchandar et al. 2002). CFA is considered to be the appropriate technique for the confirmation of the proposed factors of e-readiness and e-learning success. The level to which the model were reliable and valid were examined to meet certain empirical properties and standardization of the scale of measurement. Cronbach alpha coefficient, composite reliability and average variance extracted (AVE) were computed to evaluate of reliability of each factor within both models. If the correlation between items that falls under similar construct is relatively high, then a construct validity is said to be established based on the adoption of CFA. Furthermore, Hair et al. (2010) submitted that a construct validity is also said to be established when factors such as high regression weights, square multiplied and factor loading correlations of the items are significantly correlated. The extent to which items are able

to measure the underlying constructs is termed convergent validity. The extent to which variables are considered latent is reflected by discriminant validity (Zikmund, 2003).

4.4.3 Structural Equation Modelling (SEM)

Reliability and validity of results from the CFA models indicated that accepted measurement models will facilitate the adoption of SEM. The structural relationships between e-readiness and e-learning success was established using SEM. SEM approach based on maximum likelihood estimation was utilised to assess both the hypothetical and modified models with the view to appraise the level of significance of effects. To assess the level of fitness of the model, several indices were considered: the chi-square to degrees of freedom ratio $((X2))/DF$, the goodness of fit index (GFI), Tucker Lewis Index (TLI), comparative fit index (CFI), normal fit index (NFI), and root mean square error of approximation (RMSEA) (Kline, 2010). A multi-group SEM approach will be extended to compare the three groups of teachers, students, and administrators to investigate whether a specific model fits equally well in deferent groups or not (Hair et al, 2010).

4.5 Chapter Summary

This research aimed to investigate the readiness of higher education institutions in KSA to adopt e-learning programs. The researcher assessed the overall readiness of policy and institutional business strategy, pedagogy, technology, interface design, management, administrative and resource support, and evaluation and continual improvement. The three groups considered were teacher, student and administrator in higher education institutions. This research is considered a step towards assessing the practicality of using online education in higher education institutions in Saudi Arabia.

This research was conducted using validated instruments, developed and written in both English and Arabic languages, because some respondents may not be able to understand questions written in the English language. In addition, native speakers of the Arabic language may find it easier to respond to an Arabic survey, even when they understand English, and this will enhance the response rate. A survey was conducted with the help of many research assistants and they were responsible for distributing the questionnaires, reminding respondents and collecting the completed surveys. The involvement of the research assistants is mandated by their institutions to help maintain the confidentiality of respondents.

This research focused on the readiness of the higher education institutions to use e-learning programs. This chapter therefore presents the statistical modelling approaches taken to analyse the collected data. It is intended that the results which will be reported in Chapter five will provide decision makers in higher institutions with the requisite knowledge required to ensure the successful implementation of e-learning is achieved after a deep understanding of structural relationships between all variables examined in this research.

Chapter 5: Finding of the Study

5.1 Introduction

This chapter presents the results of the data analysis carried out in this research. The data were analysed using the SPSS statistical software version 22 and AMOS.16. Data analysis included distribution and return rate of surveys, description of the respondents' demographics in both sampling process and data analysis related to the research questions and hypothesis.

5.2 First sample and Exploratory Factor Analysis (EFA)

EFA was conducted for items of e-readiness to evaluate the latent dimensionality of the study instrument. A total of 31 items generated were subjected to pilot study and analysed using EFA. The first sample was used to develop and validate the measurement scale of e-readiness. As highlighted in Chapter four, the questionnaires were sent to a selected number of respondents by e-mail and most of them were interviewed directly. The first sampling process included respondents from three universities namely Qassim University, King Saud University, and King Fahad University. Stratified sample were selected and the total number of questionnaire distributed were 120 from which 105 were returned. Response rate differed between the teachers, students and, administrators staff. Table 5.1 shows the response rate from each of the three categories.

Table 5.1 Response Rate for Teachers, Students, and Administrators for E-Readiness Questionnaire

Respondent	Total Response	%
Teacher	31	30%
Students	48	47%
Administrators	24	23%
Total	103	100%

The main focus of this section is to determine the latent dimensionality of the e-readiness instrument. As such, a description of the respondents' demographics was conducted for the large scale surveying in order to confirm the two measurement scales. The response rate of the selected sample (88%) was very high, because most of the respondents were directly interviewed. The data were entered into SPSS.22 and checked for missing data. Two responses were excluded because they did not complete the questionnaires. Overall the valid questionnaires for analysis were one hundred and three (103) in total.

5.2.1 Evidence of validity of EFA

The use of EFA is to establish the level of appropriateness of the items under consideration and to also establish the internal structure of e-readiness scale so as to ascertain the overall reliability of the entire scale preference considered in this work. EFA increases the reliability by identifying inappropriate items which may then be removed from the dataset. Hair et al. (2009) reported that EFA can be used for the identification of a construct's dimensionality through the assessment of the relationship between items and associated factors. Against this backdrop, EFA was conducted in the early stages of developing the measurement scale of e-readiness. The appropriateness of 31 survey items were measured through the use of descriptive statistics where the mean and standard deviations (SD) of all responses were calculated.

Kim (2010) stated that for an item, if the mean is established to range between 1 and 5, then these items must be eliminated because of their tendencies to skew the correlation of results between items under consideration. Accordingly, the distribution normality through skewedness and kurtosis were tested before conducting EFA. After

the distribution's normality was confirmed, EFA was carried out using SPSS. The e-readiness measurement scale included seven factors namely institutional policies and business strategies, pedagogy, technology, interface design,management, administrative and resource support and, evaluation and continual improvement. Using these factors, the structural relationship of the initial questions were established. The number of factors were established based on the number of eigenvalues >1 (Kaiser, 1960). Hair et al. (2009) reported that within a sample of 100 respondents, a factor loading > 0.55 is adjudged significant.

Before starting the EFA, the researcher ensured that there are correlations between the items in the questionnaire (factorability of R). Tabachnick and Fidell (2007); Hair et al. (1995); Hair et al. (2007); and Hair et al. (2009) all reported that the significant correlations between the questionnaire items should not be < 0.30. The correlation between the measurement items was calculated and it was established that 82 of 186 (i.e. 44%) were significant at 0.01, and > 0.30, providing evidence of the possibility to initiate EFA. By calculating and testing the factorability of R, it was observed that the correlation coefficients was > 0.30.

EFA was conducted for the assessment of the eigenvalues for all factors within the dataset. This was then followed by the execution of Kaiser Meyer-Olkin (KMO) for the measurement of the level of adequacy of sampling. Additionally, a test known as Bartlett's Test of Sphericity (BTS) was carried out for the determination of the validity of the constructs with the view to ascertain that the data collected is appropriate and whether the correlations between items is sufficient for EFA. To ascertain this, the BTS should be to a value of ≤0.05. EFA was conducted to highlight items load of < 0.55, on wrong factors and cross-loading on multiple factors. Items with these attributes are

deleted accordingly and the EFA was performed repeatedly until the achievement of a simple model was attained.

5.2.2 Testing reliability

Cronbach's alpha for each factor were conducted to ensure consistency, stability, and dependability of item score. Blunch (2008) reported that the alpha value should be at least > 0.7 to judge the acceptability of internal consistency, which indicates the survey items are pulling together. An alpha value of > 0.70 implies that if a respondent provides accurate answer to a survey item, it is highly likely that other responses to other items on the survey or questionnaire will be answered positively.

5.2.3 Results of descriptive statistics

Statistical analysis detailing the mean (i.e. average), standard deviations, variance, minimums and maximums of the seven factors of e-readiness was conducted. Table 5.2 shows the descriptive statistics and it reveal that respondents had a high level of perception technology factors (M= 4.707), interface design (M= 4.314), management (M= 4.259) and pedagogy (M= 4.012) and relatively low perception for evaluation and continual improvement (M=3.897), administrative and resource support (M= 3.789) and institutional policies and business strategies (M= 3.270).

Table 5.2 *Descriptive statistics of each factor of E-Readiness instrument*

Factor	Mean(M)	Std. Deviation	Skewedness	Kurtosis	Min	Max	N
Institutional Policies and Business Strategies	3.270	0.846	-0.910	0.095	1	5	103
Pedagogy	4.012	0.709	-0.817	0.854	1	5	103
Technology	4.707	0.708	-0.864	0.878	1	5	103
Interface Design	4.314	0.805	-0.877	0.654	1	5	103
Management	4.259	0.912	-0.985	0.852	1	5	103
Administrative and Resource Support	3.789	0.841	-0.974	0.545	1	5	103
Evaluation and Continual Improvement	3.897	0.891	-0.854	0.855	1	5	103

The results also supported the normality for responses as the degrees of skewedness and kurtosis were < 1. Given this confirmation of the normality of the distribution, it then becomes possible to perform EFA.

5.2.4 Validating the measurement scale using EFA

The purpose of this section is to develop an instrument that is robust and effective enough to measure e-readiness regarding online learning or e-learning with predictors that are reliable. EFA was conducted for 31 items using varimax rotation using SPSS. The initial items generated from literature was listed in Table 2.2.

Before factor extraction and assessing the suitability of respondents' data for factor analysis, Kaiser-Meyer-Olken (KMO) was calculated to measure the efficiency of samples and BTS. Hair et al. (2009) submitted that the KMO should range between 0 and 1 and that a KMO value of 0.50 is considered appropriate for factor analysis. Bartlett's Sphericity test must also be significant (p <0.05) before factor analysis can be considered as an appropriate method for the analysis. The results in Table 5.3 indicated the adequacy of KMO (0.636), also the result of the Sphericity test is significant at (0.000). Chi Square test also pointed out that the correlations or relationship between variables are large enough for conducting EFA.

Table 5.3 *KMO of the adequacy of sampling and BTS*

KMO adequacy of sampling		0.636
BTS	~ Chi Square	1874.571
	Df	97
	Sig	0.000

The result of the extraction of component factors indicated that 5 factors were retained. Table 5.4 include the information regarding possible factors that could be

extracted from 31 items. As stated above, eigenvalue was employed to determine which factors to be considered for further analysis and interpretation (Hair et al 2009). Some factors were selected prior to the specification of the percentage of variance which was extracted. The results showed that five factors have an eigenvalue >1.0, while the eigenvalue of the sixth factor is <1.0 (0.39). The five factors with an eigenvalue >1 explain 92.8 of the variance of the seven factors. This means the higher explanatory power of the five factors. This value is highly satisfactory for the explanation of the total variance.

Table 5.4 *Extraction of component factors results*

	Initial Eigenvalues		
Component	**Total**	**Variance (%)**	**Cumulative (%)**
1	1.54	22	22
2	1.43	20.4	42.4
3	1.21	17.3	59.7
4	1.19	17	76.7
5	1.13	16.1	92.8
6	0.39	5.6	98.4
7	0.11	1.6	100.0

The EFA was performed several times in order to identify the variables (elements) attributed to each factor, where the loaded variable < 0.55 was the variables that loaded on two or more factors and that had the cross-loading were excluded. There are some variables that were transferred to another factor. Each time the necessary corrections are made by moving variables to their respective factors alternately, the rotated factor matrix for the variables pattern were studied. The cross-loading and the non-significant loading variables are excluded.

Analysis of VARIMAX-rotated were applied to obtain a complete and clean set of loading factors structure. Similar analysis was conducted in addition to obtaining a structure of factors in which there are no cross-loading variables on more than one

factor or other factors. The structure of the clean factors also helps increase the loading values of the variables on the associated factors. Factor loading is an indicator of the correlation or the relationship between one factor and another (Hair et al, 2009). Table 5.5 shows the analysis of the round component after making the appropriate corrections where the variables loaded with many factors have been deleted. The table also shows the results of five factors extracted (the loading factor for each variable). The sixth column indicates the quality of each variable in the component factor. Eigenvalue (sum of the square loading) at the bottom of the table indicates the importance of the factor in the calculation of the related variation. The sum of the five Eigenvalues are 2.521, 2.405, 2.246, 2.213 and 2.193 respectively. Total of five values of eigenvalues (11.578) indicate the overall amount of variance extracted by factors.

The last row in the table is the percentage of trace, which indicate all the variance explained by all five factors which compared to the total variation. As indicated by the component analysis, the number of variables is equal to the trace given that individual variable has eigenvalue of 1.0 (Hair et al, 2009). The percentage of trace extracted from each of five factors are (14.0, 13.4, 12.5, 12.3, and 12.2) respectively and the total of this index is 64.3% of the total variance (eigenvalues divided by number of variables). The index is high which means that the variables are highly related to factors. Table 5.5 show the reduced set of variable using VARIMAX- ROTATED loading for factors, noting that factor loading with < 0.55 was not included in matrix. And the variables were sorted by loading on each factor.

Through the above analysis, 13 items were deleted from the questionnaire, and the scale stabilized on 18 items loaded on 5 factors. Also 2 items loaded on other factors namely (IPBS2, IPBS5) which have been moved to factor (Management). The final

structure of variables are listed below, each variable (item) has significant loading above (0.55) and load on only one factor.

Table 5.5 *VARIMAX- ROTATED Component Analysis Factor Matrix*

#	Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
	Technology					
TEC1	The university has a comprehensive technology plan.	0.932				
TEC2	The university has the computer and related hardware, software necessary to facilitate e-learning.	0.913				
TEC3	The university has its own personalized and interactive Communication Media and Networks allowing learners to have their own secure, personal accounts.	0.905				
	Management					
MGT2	The informative site provides information about the university, including its programs and courses.		0.812			
IPBS2	Top management's activities support e-learning development within the institution.		0.781			
MGT5	The university ensures that learners acquire and continuously develop their use of e-learning education.		0.765			
IPBS5	The university has Code of Conduct regulating e-learning procedures that is publicized and freely available to both educators, learners, and administrators.		0.742			
	Pedagogy					
PED1	The university supports learner success through the organization of the working environment.			0.812		
PED2	E-learning courses contain objectives that are specific, measurable, achievable/agreed, realistic/relevant and timed/timely (SMART).			0.792		
PED3	E-learning courses aligned to institutional strategies			0.784		
PED4	Learners have access to relevant media for e-learning.			0.587		
	Interface Design					
ID1	The university has a website where existing and prospective learners can view available courses.				0.792	
ID2	The university website's interface provides learners with opportunities to create long-term learning plans.				0.711	
ID3	The university's website contains e-learning use interface features.				0.645	

ID4	The university's website navigation is simple and user-centric.				0.589		
	Administrative and Resource Support						
ARS1	The university provides Administrative support to facilitate E- Learning Process.				0.885		
ARS2	The university developed its own policies and guidelines; they are communicated to all stakeholders groups including learners, educators, and support staff.				0.846		
ARS3	The university has advise and support centre (the office or department providing student academic services related to course selection, finding a major, study skills, and referrals to tutoring and academic success skills)				0.811		
	Sum of Squares (Eigenvalue)	2.521	2.405	2.246	2.213	2.193	11.578
	Percentage of trace	14.000	13.400	12.500	12.300	12.200	64.320

The correlation matrix between factors in Table 5.6 indicates a high correlation between factors, and this is an indicator of internal consistency between factors.

Table 5.6 *Factor Correlation Matrix*

Factor	1	2	3	4	5
1	1				
2	0.512	1			
3	0.496	0.443	1		
4	0.342	0.456	0.369	1	
5	0.582	0.612	0.448	0.388	1

Alpha Cronbach's was calculated to assess reliability. It was calculated for all factors retained in the electronic readiness measurement scale through exploratory factor analysis. Blunch (2008) reported that the internal consistency values should be between 0.7 and 0.9. The factors shown in the table have both high reliability and internal consistency. With the highest rate of factors being pedagogy (0.851) and lowest is interface design (0.722).

Table 5.7 *Cronbach's Alpha for dimensions within the instrument for e-readiness*

Factor	Cronbach's Alpha	Cronbach's Alpha as informed by standardized items	No. of Items
Technology	0.781	0.799	3
Management	0.814	0.825	4
Pedagogy	0.851	0.882	4
Interface Design	0.722	0.71	4
Administrative and Resource Support	0.809	0.822	3

The result of EFA indicated that the scale of e-readiness in e-learning has five-factor structure, which explained 64.32% of variance among all items, with high reliability of all factors which are denoted by the fact that Cronbach's Alpha is > 0.722. In the final scale, the number of items retained after the deletion of thirteen (13) items, which was loaded on numerous factors because of a weak factor loading of < 0.55, is 18. Two factors were moved to another factor (IPBS2, IPBS5 which related to Institutional Policies and Business Strategies have moved and loaded in the factor of management). The final factor structure of the measurement scale is Technology and have 3 items (TEC1, TEC2, TEC3), then Management included four items (MGT2, IPBS2, MGT5, IPBS5), Pedagogy included four items (PED1, PED2, PED3, PED4), Interface Design also included (ID1, ID2, ID3, ID4), and finally Administrative and Resource Support included three items (ARS1, ARS2, ARS3).

Based on Hair, et al. (1995, 2009), the data used can be considered appropriate and works well for EFA in line with the results of descriptive statistical analysis and sample size. The resulting measurement scale of e-readiness was used to ensure alignment with the measurement scale of e-learning success for extensive and comprehensive surveying of teachers, students and administrators in Higher Education Institutions in Saudi Arabia. The e-learning success measurement scale were adopted from DeLone and McLean (2003). Exploratory analysis cannot be considered as a

technique or approach that is robust enough to put the theoretical underpinnings of the instrument to test. Accordingly, additional analysis based on confirmatory factor analysis (CFA) is required to assess the relationship between indicators (i.e. elements) and latent variables.

5.3   Confirmatory Factor Analysis and comprehensive survey

The design of the current work is largely dependent on the development and validation of the reliable and accurate construction of e-readiness and e-learning success measurement scale. The EFA measurement scale was used together with the measurement scale of success in e-learning. See Appendix for a comprehensive survey of a selected sample of higher education institutions in Saudi Arabia. 43 items of the full scale (i.e.18 for e-readiness and 25 for e-learning success) were used for data collection. A survey approach was employed to collect data from various universities from different geographical locations in Saudi Arabia. The online sample survey was conducted in addition to the direct interview method.

The dataset consists of three groups of respondents who practice online learning in higher education institutions in Saudi Arabia: teachers, students, and administrators. The collected data were used to examine and validate the measurement model. This was done by relying on respondents who are directly involved in this e-learning field. The researcher followed the stratified sampling strategy. Three groups were used to ensure the representation and distribution of the sample. To ensure accurate responses, the participants must satisfy a number of criteria. First, the participants must be currently enrolled in online learning and must have been involved over an extended period, whilst having access to online resources so that viable responses can be derived from them.

Second, the distribution of the higher institution was considered and many respondents could be obtained from the same institution.

In this study, the focus of was not on the gender variation. The aim of study was to assess the stability of three groups namely teachers, students, and administrators with respect to e-learning strategies in Saudi Arabia's higher institutions of learning. The third criterion is sample size that must be sufficient to achieve meaningful estimation of key parameters. A sample size of > 150 is generally regarded as the benchmark of sample size for which insightful parameter estimates can be adjudged satisfactory (Anderson & Gerbing, 1988; Bentler, 1983).

The number of questionnaires sent to the selected sample is 2000, with a corresponding response rate of 60.9% (i.e. 1218 responses out of 2000). This response rate is high, and it is a reflection of strong response from the total population targeted within the selected universities. A sample of higher education institutions was selected from five governorates region in Saudi Arabia (i.e. Central, Western, Eastern, Southern and Northern Regions) to ensure evenly distributed representation. The distribution of sample size in each university and respondent types are shown in Table 5.8. Years of engagement in online learning is depicted in Table 5.9.

Table 5.8 *Distribution of sample size and respondent type*

University	Province	S. Size	Teacher	Student	Administrator	% Teacher	% Student	% Administrator
King Saud University	Central Region	78	26	28	24	0.33	0.36	0.31
Saudi Electronic University	Central Region	98	32	39	27	0.33	0.40	0.28
Prince Sultan University	Central Region	74	24	31	19	0.32	0.42	0.26
University of Hail	Central Region	103	33	36	34	0.32	0.35	0.33
Qassim University	Central Region	97	32	33	32	0.33	0.34	0.33
King Abdulaziz University	Western	79	20	38	21	0.25	0.48	0.27
Umm Al-Qura University	Western	96	32	42	22	0.33	0.44	0.23
Taif University	Western	66	9	48	9	0.14	0.73	0.14
University of Dammam	Eastern	81	27	38	16	0.33	0.47	0.20
King Faisal University	Eastern	88	29	48	11	0.33	0.55	0.13
King Fahd University for Petroleum and Minerals	Eastern	84	22	44	18	0.26	0.52	0.21
King Khalid University	Southern	96	33	45	18	0.34	0.47	0.19

Jazan University	Southern	76	21	38	17	0.28	0.50	0.22
Tabuk University	Northern	102	24	56	22	0.24	0.55	0.22
Total		**1218**	364	564	290	0.30	0.46	0.24

Table 5.9 *Year of Engagement of the Sample in Online Learning*

Years of Engagement	Distribution	%
Less than 1 years	224	18.4%
1 to 5 Years	658	54.0%
Greater than Five Years	336	27.6%
Total	1218	100%

As discussed in previous chapter, the sample consisted of three different groups namely Teachers, Students, and Administrators. The survey method was based on the online survey. In addition to the direct distribution of questionnaires, the databases were used in universities to gain access to user data for online survey and e-mailing. Data collection consisted of three phases, the first phase focused on the students which constitute the highest percentage of respondent of 46% with a total students sample of 564 respondents. The second phase involved the collection of the data from teachers, which exceeded 30% of respondents, and the total number of teachers was 364. The final phase involved surveying administrators, most of whom were reached out to directly due to small numbers across universities in Saudi Arabia.

The total numbers of administrators was 290 and the approximate percentage were 24% of respondents. Table 5.9 reveals that a large number of sample size (54%) has participated in e-learning for more than one year, and 27.6% participated for more than 5 years, indicating that most of the selected respondents had knowledge and experience in e-learning as a platform for accessing education. It also confirms the fact that the opinion gathered through the surveys are reliable. This is because direct experience with e-learning can play a huge role in the quality of response derived from

90

the participants. This helps in ascertaining the true level of readiness of the institution towards the implementation and adoption of e-learning strategies.

5.3.1 Confirmatory Factor Analysis (CFA) for the Second Sample

The electronic readiness scale developed using exploratory factor analysis, as well as the adapted measurement scale of success of e-learning included a set of well-defined factors to measure e-readiness for the success of e-learning in higher education institutions in Saudi Arabia. When developing a comprehensive measurement model, we look at how to aggregate all the individual elements (factors) together. To ensure this, unidimensional measures which can explain variables (indicators / elements) through only one construct was employed (Hair et al., 2009). In contrast to EFA, it is assumed that the single variable is associated with only one structure, i.e. there is no cross loading as in CFA as it is assumed to be zero.

The proposed model was designed to produce confirmatory results and to test the measurement model. Standard rules and procedures have been followed to obtain a model that is adjudged valid. The same sample used in the validation model was adopted to ascertain the relationships between e-readiness and e-learning success using structural equation modelling (SEM). Before carrying out CFA, it is important to ensure that associated error in the data due to unforeseen circumstances during the data collection phase are identified through initial screening of the datasets. This is conducted by assessing the normalization of the dataset prior to the configuration and testing of the measurement model. Data normalization allows for easier interpretation of both response values and coefficients, hence the need for it to be carried out before the configuration of the measurement model. In CFA, several statistical validation and

analysis was used to carry out tests such as fitting the hypothesized and revised CFA model.

5.3.2 Data Screening

The final sample size that was entered in SPSS version 22 was 1218. Adequate response was not provided in some of the questionnaires distributed to participants. For instance, it was observed that >20% of some of the returned questionnaires contained responses that were blank and are therefore excluded from the analysis. Techniques such as obtaining the average value of responses from other participant with full responses as recommended by Rubin (1987) was adopted to correct anomaly posed by missing or incomplete data. Based on the above, 21 responses have been deleted due to the number of missing values of more than 20% of the total paragraphs in the each questionnaire

In order to ensure the enhancement of normalization of data, the Mahalanobis distance for the identification of possible outliers from the collected data sample was assessed. In conducting the assessment, the version 16 of AMOS, a tool that allows the easy application of SEM to test hypotheses on the relationships between variables with the view to derive new insights from data, was employed for the calculation of the distance for what was observed in the dataset and from the middle of the distribution of data. An outlier is said to occur when the specific observation's distance appears too far in comparison with the majority of other forms of observation within a dataset.

Accordingly, this prompted the deletion of some observations with the view to improve the multivariate normality in line with the observation number. From a data set containing 1197 entries which were screened and checked for outliers, 36 observations were marked for deletion from the dataset because the Mahalanobis distance values was

> $\chi 2$ value (i.e. $\chi 2$=99.29; n=28, p<0.001). As such, only the 1161 remaining part of the data was subjected to analysis. Because of the large size of the sample (1000+), the new sample distribution will be close to normal distribution.

5.3.3 Model Specification

The CFA for e-readiness and e-learning success model assumes that the responses to the questionnaire items can be explained based on 11 factors. Each item contains a non-zero load on its factor and a zero load on the rest of the other factors in the model. There is a correlation between all the 11 factors however in terms of the error terms related to the component measurements, no correlation exists. The use of CFA was to examine the convergent and discriminant validity of the instrument. Whenever it is intended to conduct appropriate test using statistical methods to ascertain the number of factors that is required to offer a deep explanation regarding the correlation and inter-correlation between measurement variables under consideration in order to ascertain which observable variables have the likelihood to constitute reliable indicators or measures of a given factor, CFA is the preferred technique to adopt (Sureshchander et al., 2002).

The correlation between factors and the extent of such correlations were ascertained in advance based on the methods described by Tacq (1997). In order to establish the relationship between e-readiness and e-learning success, CFA offers the capability to do so. A two-step approach as described by Anderson and Gerbing (1988) was used to determine whether elements should be excluded from the measurement model, taking into account some criteria including weak and cross loading, and residual errors. To construct the measurement model, the free estimate of the indicators for each construct were specified.

CFA was conducted for all eleven latent constructs. Unidimensionality were ensured before proceeding to assess validity and reliability. Low factor loading should be eliminated because it can affect model fitting. Hair et al (2005) suggest that factor loading for item < 0.60 should be removed. The deletion process in the measurement model was conducted repeatedly to achieve unidimensionality because it requires positive factor loading for all items. Assessment of fitness were ensured in each run to demonstrate model fitting to the sample data. Researchers such as Holmes-Smith (2006) and Hair et al., (2010) have expressed different views regarding fitness indexes to use for assessment of fitting, but they however indicated that at least from the three categories of fitness including absolute, incremental and parsimonious fits must be considered. Table 5.10 provides the model fit category indices and the acceptance level for each category.

Table 5.10 *Model Fit categories and the Acceptance levels*

Category	Index		Acceptance Level
Absolute fit	Discrepancy Chi Square	Chi-Square	P-value > 0.05
	Root Mean Square of Error Approximation	RMSEA	RMSEA < 0.08
	Goodness of Fit Index	GFI	GFI > 0.90
Incremental fit	Adjusted Goodness of Fit	AGFI	AGFI > 0.90
	Comparative Fit Index	CFI	CFI > 0.90
	Tucker-Lewis Index	TLI	TLI > 0.90
	Normed Fit Index	NFI	NFI > 0.90
Parsimonious fit	Chi Square/Degrees of Freedom	Chisq/df	Chi-Square/ df < 3.0

Those indexes (Chisq/df, CFI, RMSEA, and GFI,) were frequently reported in literature in terms of their usage but the overall level of their acceptance varies. For example, $\chi2$ (chi-square) is used to test the degree of mis-specification. A non-significant chi-square is an indication that the model is not fitted correctly with the data selected. P-value for $\chi2$ should be closer to non-significant. Chi-square is very

sensitive to increase in sample size, therefore, the P-value for $\chi 2$ tends to be significant (Joreskog and Sorbom, 1996). Additionally, $\chi 2$ value will increase when number of observed variables increases, little attention for P-value will be paid because of the complexity and large size of the sample given that many factors and items were taken into consideration within the model.

To overcome this problem, root mean square error of approximation (RMSEA) can be used when the sample sizes increases and when there are numerous variables. The relative amount of the observed variances and covariance presented by the model can be assessed through the use of Goodness of Fit Index (GFI). On the other hand, Comparative Fit Index (CFI) is used to indicate comparative lack of fit of the model against the baseline model. The normalized value for CFI varies between 0 and 1 and a higher value represents good fit. CFI is extensively used because its strengths, such as its relative insensitivity to increase in sample size and the complexity of the model under consideration. Hair et al (2009) suggest reporting 3 or 4 fit indices would be acceptable to provide an indication of model fit due to the fact that most of other goodness of fit indices are predominantly redundant. The specified measurement model of the study is shown in Figure 1.

Figure 1 The Measurement Model combining all constructs involved in the study
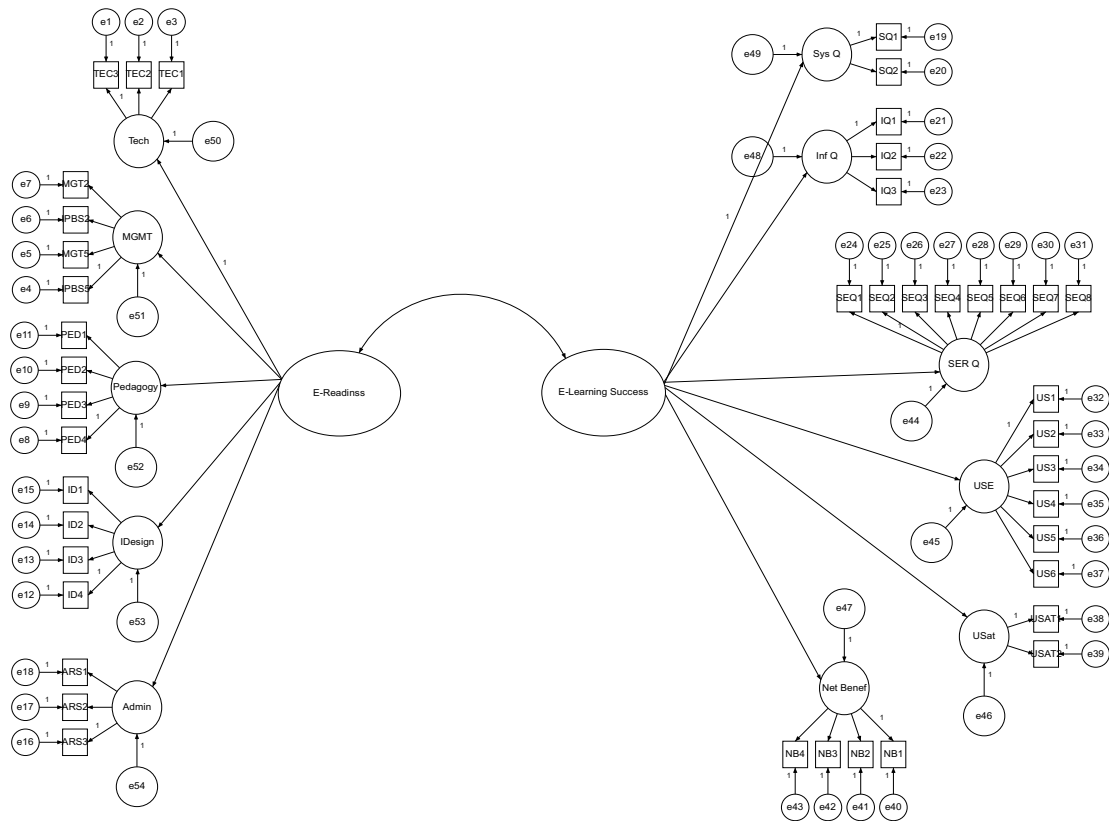
The model comprises eleven constructs including:

E-readiness scale measurement based on five sub-constructs:

1. Technology (measured using 3 items TEC1- TEC3)

2. Management (measured using 4 items MGT2, IPBS2, MGT5, IPBS5)

3. Pedagogy (measured using 4 items PED1-PED4)

4. Interface Design (measured using 4 items ID1-ID4)

5. Administrative and Resource Support (measured using 3 items ARS1-ARS3)

E-Learning Success scale measured using six sub-constructs

1. System Quality (measured using 2 items SQ1, SQ2)

2. Information Quality (measured using 3 items IQ1-IQ3)

3. Service Quality (measured using 8 items SEQ1-SEQ8)

4. Use (measured using 6 items US1-US6)

5. User Satisfaction (measured using 2 items USAT1, USAT2)

6. Net Benefits (measured using 4 items NB1-NB4)

The constructs in the measurement model were combined as can be indicated in Figure 1 and the CFA was conducted. The outputs are shown in Figure 2. Fitness indices which emanated from the measurement model are examined as depicted in Table 5.12.

Figure 2 Factor Loading for all items related to each Construct
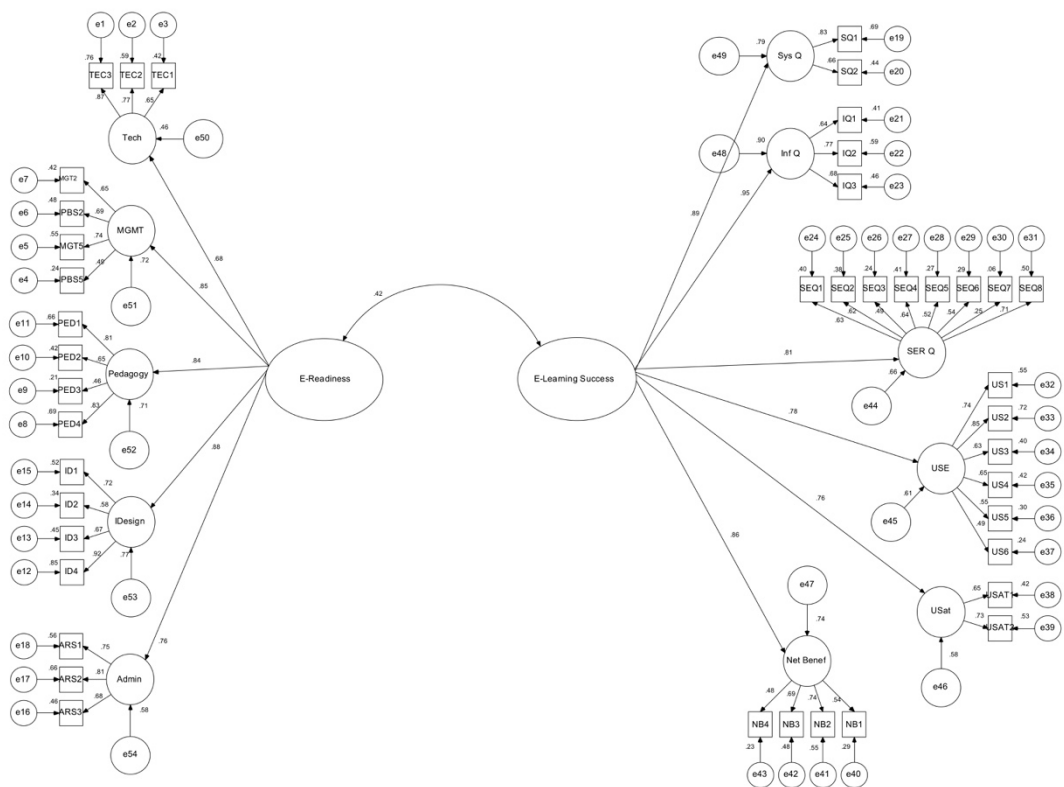
The results of CFA analysis in figure 2 represent the factor loading for each items as well as the factor loading for each component. Correlation between constructs has been calculated. The fitness indices (RMSEA, GFI, AGFI, and Chisq/df) didn't

achieve the satisfied accepted level due to low factor loading of < 0.60. Results of fitness indices for the initial CFA model is shown in Table 5.11.

Table 5.11 Measurement Model's fitness indices

Fitness Indexes	Index	Value of index	Level of acceptance
Absolute fit	RMSEA	0.087	Not Accepted
	GFI	0.712	Not Accepted
Incremental fit	CFI	0.768	Not Accepted
Parsimonious fit	Chisq/df	2.553	Not Accepted
P-Value= 0.000			

Items with a loading factor < 0.6 and R2 (R-Squared) < 0.4, are deleted from the measurement model. The reason for obtaining the low loading factor is due to several reasons, including: the factor may not be useful to measure this construct and the keeping of this item will reduce the fitness indicators of the total measurement model, or getting indicators unsatisfactory. Furthermore, biased statement, or a double meaning statement, in which there are ambiguities, a sensitive statement, or other reasons related to the data collection process can also be responsible. The 11 items that were deleted because of the low load factor are listed below:

1. IPBS5: The University has Code of Conduct regulating e-learning procedures that is publicized and freely available to both educators, learners, and administrators.

2. PED3: E-learning courses aligned to institutional strategies

3. ID2: The university website's interface provides learners with opportunities to create long-term learning plans.

4. SEQ3: Graded test and assignments, were returned punctually.

5. SEQ5: The instructor is available for consultation.

6. SEQ6: The instructor provides answer to questions in a satisfactory manner

7. SEQ7: Student participation in course activities was facilitated by the instructor

8. US5: Presentations that were videotaped aided my understanding and assimilation of the course content.

9. US6: Course assignments contributed to my understanding of the course content.

10. NB1: My ability to analyze and evaluate information was enhanced by the course

11. NB4: The course stimulated me to read further in the area.

Figure 3 Factor Loading for each items, the Factor loading for every component, and the correlation between the constructs.
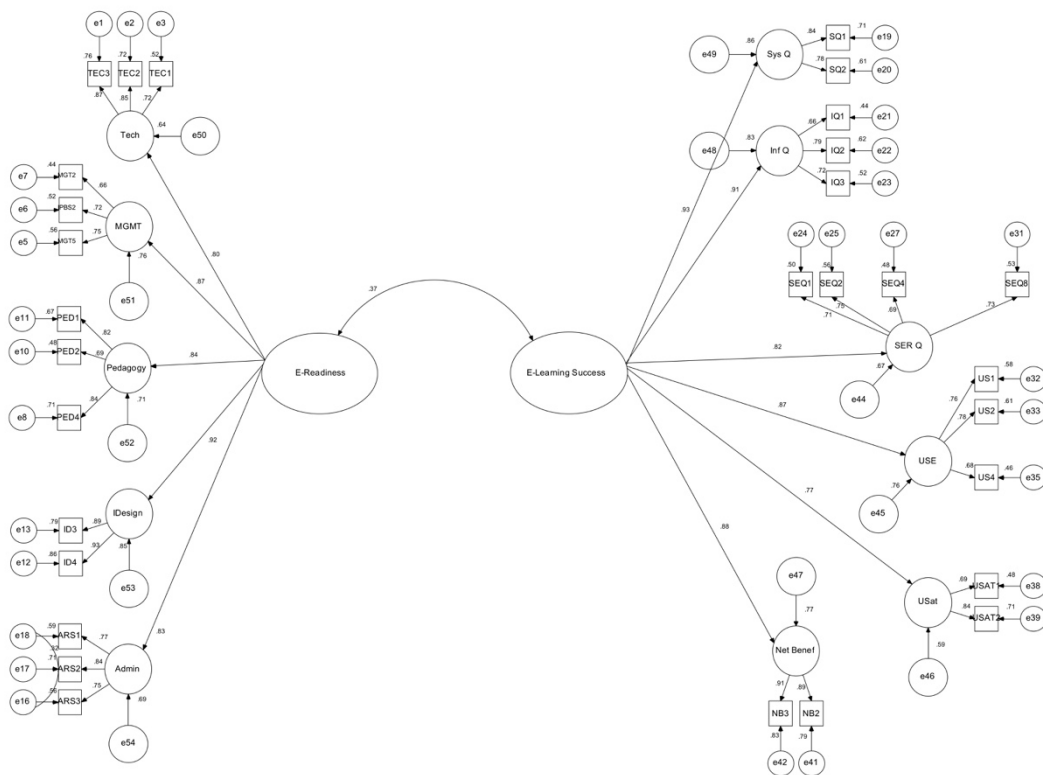
The new measurement model was conducted to examine the model fitness, once any factors loaded of <0.60 were removed; this did not result in fitness following the removal of low factor loadings, based on the criteria outlined in Table 5.11. Consequently, the Modification Indices (MI) was analysed, showing that a value of MI above 15 reveals a superfluous pair of items in the model. The poor fit of the model was caused by these redundancies which were overcome by removing the factors with lower loadings. By setting the identified redundant items as "free parameter estimate" by co-vary them (setting error covariance), the redundancy can also be removed. The MI which provide covariance between items that are adjudged redundant are shown in Table 5.12. The results show redundancy in ID1 (e12) with item ID4 (e15); while US1 (e32) is redundant with item US3 (e34). With this in mind, the lowest factor loading for deletion (ID1, US3) were chosen as they loaded 0.72, 0.63 respectively. Due to the fact that ARS1 and ARS3 (e16, e18) are both considered to be imperative to the hypothesized model and theory, they were paired together.

After the deletion of the factors loaded that are < 0.60, the CFA was performed again and the measurement model and the fitness model were also assessed. Although the low-loading factors were removed, the fitting was not achieved after this deletion. This was conducted on the basis of the criteria listed in Table 5.11. There was a need to examine the Modification Indices (MI) for adjustment, where a high value of MI 15 indicates the redundancy of certain items in the measurement model. Redundancies between items renders the measurement model weak thereby yielding poor fit. In order to solve the problem of redundancy, the less loaded factors for deletion were identified. Another procedure to solve the redundancy problem is to place a pair of redundant items as a "free parameter estimation" by pairing (i.e. specifying the error covariance).

The error variance that provide the variance between the redundant items appear in Table 5.12. Item ID1 (e12) is redundant with Item ID4 (e15) and US1 (e32) redundant with Item US3 (e34), the lowest loading factor was selected for deletion (ID1, US3) where 0.72, 0.63, respectively. Elements ARS1 and ARS3 (e16 and e18) were paired together as they are very important for the theory and hypothesized measurement model.

Table 5.12 Modification Indices (covariance) for redundant items

			M.I	Par Chang
e12	<-->	e15	24.789	0.143
e16	<-->	e18	17.186	0.132
e32	<-->	e34	16.144	0.113

After these previous procedures, the model was modified based on the indicators of Modification Indices shown in Table 5.12. The new model is shown after the modification in Figure 3. The new fitness indicators are shown in Table 5.13. Below, the deleted factors in the modified measurement estimate are:

1. ID1: The University has a website where existing and prospective learners can view available courses.

2. US3: The use of presentation slides through Microsoft PowerPoint enhanced my understanding and assimilation of the course content.

3. ARS1 and ARS3 are Paired

Table 5.13 Model's measurement fitness indices

Fitness Indexes	index	Index value	Acceptance
Absolute fit	**RMSEA**	0.062	Accepted
	GFI	0.914	Accepted
Incremental fit	**CFI**	0.903	Accepted
Parsimonious fit	**Chisq/df**	2.247	Accepted
P-Value= 0.000			

The results depicted in Table 5.13 indicates good fitness. It was also noted that fitness indicators have improved due to the deletion of low loading items and redundant item as indicated by the modified measurement model which appears in the figure after e16 and e18 have been set as free estimate. The second measurement model settled on thirty items. Unidimensionality was achieved and confirmed after deletion for low loading factors. The electronic readiness measurement model for the selected sample of the higher education institutions in Saudi Arabia consist of five components as the standard path coefficient of the five construct is greater than 0.80 and the significance level (P≤0.05). The same results also for e-learning success, which indicated that the standardized path coefficient for the six constructs of e-learning success measurement scale are greater than 0.77 (see figure 3). The items related to the six constructs of e-learning success measurement model are fit with the data selected which indicated e-learning success measurement along with e-readiness measurement can serve as a good measurement scale of e-readiness with respect to e-learning success in Higher Institutions in KSA.

After completion of CFA measurement model to highlight the influence of e-readiness on e-learning success, it was ensured that the modified model is characterized by the validity and reliability for the construct. Before proceeding with modelling the structural model assessment is required to ascertain unidimensionality, validity, and reliability. This entails ensuring the data are normalized to allow for the evaluation of each variable's distribution included in modified CFA mode. To ensure internal consistency between variables, Alpha Cronbach's was also calculated.

5.3.4 Normality of Measurement Model, Validity and Reliability

Validity is the ability of latent constructs in the instrument to measure the required items or indicator or parameter to be measured (Hair et al., 1995). In their work, Hair et al., (1995) identified two variants of validity namely convergent and discriminant validities. The former is valid when all of the items in the model are statistically significant; for each construct, the AVE can be calculated and if this value is above 0.5 the construct is convergent. In this case, retention of the low loading factor in the model does not improve the validity of the convergence. Conversely, if the fitness indicators are acceptable, validity can be obtained. The fitness indicators, shown in Table 5.12, reveal that the items measuring their corresponding loading factor, lead to good fitness of the model. Discriminant validity, the second type of validity identified by Hair et al (1995), indicates how diverse the variables are (i.e. a single latent construct is measure by each item only and therefore the model does not include redundancies). When the value of the correlation between two construct does not exceed 0.85, it can be said that there is a discrimination between them. If the value of the correlation is 0.85 or more, it means that the constructs are redundant or that they are experiencing a serious multicollinearity problem.

Another important measurement characteristic is reliability. To obtain the measurement model's reliability, the Cronbach alpha, coefficient, composite reliability the AVE were calculated. Internal reliability is an indicator of the consistency of measurement items together in measuring the constructs of the measurement model. If the value of Alpha-Cronbach is > 0.7, reliability of the measurement is verified. The internal consistency and reliability of the underlying structure (Hair et al., 2009) is shown by composite reliability. The result of the AVE is an indicator of the average

percentage of variation interpreted by the measurement items the underlying latent construct.

Fornell & Larcker (1981) indicated that composite reliability assesses the internal consistency of a measure and it is obtained by combining all of the true score variances and covariance in the composite of indicator variables related to the constructs, and by dividing this sum by the total variance in the composite.

Holmes-Smith (2001), Hair et al (1995) and Zikmund (2003) discuss the concept that composite reliability must exceed 0.7 and the AVE should be > 0.5. The composite reliability and AVE values, shown in Table 5.14, clearly exceed these acceptable thresholds and therefore show the reliability of the measures, leading to a consistent result with no errors. The normality of the model is shown in both the descriptive statistics and Cronbach's Alpha for the items remaining within the construct in the study. The equations below outline the requirements for the calculation of the AVE and composite reliability (Hair et al, 1995):

$$\mathbf{AVE} = \sum \frac{\mathbf{K^2}}{\mathbf{n}}$$

$$\mathbf{CR} = \frac{(\sum \mathbf{K})^2}{[\sum(\sum K^2) + (\sum \mathbf{1} \text{-} \mathbf{K^2})]}$$

In order to calculate the composite reliability (**CR**) and the Average Variance Extracted **(AVE),** the value of the loading coefficient for each item in the scale was taken into consideration. In the above equations, (**K**) represents the load coefficient. The (**K^2**) value is squared correlation/ factor loading which indicates the probability of variance for item, and is sometimes used as an estimate of the amount of variance of the item in common with other items. This equation was applied to the composite reliability

and average variance extracted for all the constructs in the measurement scale. We review how the results were derived for the first construct (i.e. technology).

Initially, the loading coefficients for the construct are (0.72, 0.85, 0.87) respectively, with corresponding squared factor loading (K^2) of those values (0.5184, 0.7225, 0.7569) respectively. Then the squared factor loading (K^2) was subtracted from 1.00 to calculate Error Variance of Estimates, the summation was displayed as shown in the calculation below:

K	K²	1-K²
0.72	0.5184	0.4816
0.85	0.7225	0.2775
0.87	0.7569	0.2431
Sum (K)= 2.44	Sum (K²)= 1.998	Sum(1-K²)=1.002

In order to calculate the Average Variance Extracted and according to the equation below:

$$AVE= \sum K^2 / n$$

Where $\sum K^2$ represents the loading coefficient squared and (n) is the number of items in construct which are 3 items, thus:

$$AVE= 1.998/3 =$$

$$AVE= 0.666$$

For calculation of Composite Reliability (CR):

$$CR = (\sum K)^2 / [(\sum K)^2 + (\sum 1 - K^2)]$$

Where $(\sum K)^2$ is squared sum of factor loading

$$(\sum K)^2 = (2.44) 2= 5.9536$$

And $(\sum 1 - K^2) = 1.002$

By applying these output to the equation

$CR = (\sum K)^2 / [(\sum K)^2 + (\sum 1 - K^2)]$

CR= 5.9536/(5.9536 + 1.002)

CR= 0.856

This calculation method was applied for all constructs in the measurement scale.

Several references indicated that a composite reliability value > 0.7 is required, with an AVE value > 0.50 (see for example Holmes-Smith, 2001; Zikmund, 2003). The results in Table 5.14 show that the composite reliability values and AVE results are greater than these suggested minimum values and therefore it can be said that the measurements are reliable with no errors, thereby yielding consistent results. Table 5.14 also presents the results of the descriptive statistics, the multivariate normality assessment of the remaining items in the measurement model, the alpha Cronbach, the composite reliability and the AVE results for each model construct. In order to obtain AVE values and composite reliability, the equation stated above was used (Hair et al., 2009).

The data's normality was assessed to determine the distribution of each variable in a dataset once it has been fitted to the measurement model. Normality was determined by assessing the skewness of each item; as all of the results show a skewness value less than 1.0, this shows a normal distribution of data. Furthermore, assessment of the multivariate kurtosis shows a critical ratio (c.r.) not in excess of 3.0 (Kline, 2011; Mardia, 1995).

Hair et al (2010) state that SEM within a Maximum Likelihood Estimator (MLE) is robust and sensitive to skewness which is > 1.0 and is also sensitive to kurtosis violations of multivariate normality when a large sample size is available and the kurtosis's Critical Ratio (CR) is < 3.0. If the sample is large enough and the skewness and kurtosis results lies between 1.0 and 3.0 respectively, it is possible to apply additional analysis to the SEM. The results of the assessment of normality for each item considered in measurement model are shown in Table 5.14.

After making sure that the measurement model is appropriate and that important statistical characteristics are present, it was necessary to ascertain the data's normality and to evaluate the normal distribution of each variable in a data set. The standard deviation for each item was calculated, as most of the resulting deviation is less than 1.0. To ensure the normal distribution of data, the absolute value of the skewness was calculated. The skewness value, which is less than 1.0 shows that the data is normally distributed. There is another measure through multivariate kurtosis, where it should not exceed the critical ratio (cr) for 3.0 as suggested by Mardia (1995) and Kline (2011).

SEM, which uses a Maximum Likelihood Estimator (MLE), is very robust and sensitive to a deviation > 1.0 and is robust for the multivariate normality violations provided the size of the sample is large and the kurtosis's CR is not > 3.0. Hair et al (2010) submitted that together with a sufficiently large sample and deviation and restrictions not exceeding 1.0 and 3.0 respectively, further analysis using SEM within MLE can be carried out. Outputs resulting from the standard evaluation of each item included in the measurement model are also shown in Table 5.14.

Table 5.14 *Results of multivariate normality and CFA Model*

#	Item	Loading	SMC	Error Variance	SE	CR	P	Composite Reliability	AVE	Cronbach Alpha	Skewness	c.r.	Kurtosis	c.r.
	Technology							0.856	0.666	0.892				
TEC1	The university has a comprehensive technology plan.	0.72	0.52	0.48	0.139	5.179856115	0.001				-0.561	-2.061	-0.228	-0.835
TEC2	The university has the computer and related hardware, software necessary to facilitate e-learning.	0.85	0.72	0.28	0.133	6.390977444	0.000				-0.456	-1.956	-0.123	-0.730
TEC3	The university has its own personalised and interactive Communication Media and Networks allowing learners to have their own secure, personal accounts.	0.87	0.76	0.24							-0.854	-2.354	-0.521	-1.128
	Management							0.754	0.506	0.743				
MGT2	The informative site provides information about the university, including its programmes and courses.	0.66	0.44	0.56	0.154	4.285714286	0.000				-0.843	-2.343	-0.510	-1.117
IPBS2	Top management's activities support e-learning development within the institution.	0.72	0.52	0.48	0.125	5.76	0.000				-0.548	-2.048	-0.215	-0.822
MGT5	The university ensures that learners acquire and continuously develop their use of e-learning education.	0.75	0.56	0.44							-0.961	-2.461	-0.628	-1.235

	Pedagogy							0.828	0.618	0.789				
PED1	The university supports learner success through the organisation of the working environment.	0.82	0.67	0.33	0.211	3.886255924	0.000				-0.852	-2.352	-0.519	-1.126
PED2	E-learning courses contain objectives that are specific, measurable, achievable/agreed, realistic/relevant and timed/timely (SMART).	0.69	0.48	0.52	0.149	4.630872483	0.000				-0.853	-2.353	-0.520	-1.127
PED4	Learners have access to relevant media for e-learning.	0.84	0.71	0.29							-0.746	-2.246	-0.413	-1.020
	Interface Design							0.906	0.829	0.833				
ID3	The university's website contains e-learning use interface features.	0.89	0.79	0.21							-0.831	-2.331	-0.498	-1.105
ID4	The university's website navigation is simple and user-centric.	0.93	0.86	0.14	0.233	3.991416309	0.001				-0.754	-2.254	-0.421	-1.028
	Administrative and Resource Support							0.830	0.620	0.842				
ARS1	The university provides Administrative support to facilitate E- Learning Process.	0.77	0.59	0.41	0.241	3.195020747	0.000				-0.743	-2.243	-0.410	-1.017
ARS2	The university developed its own policies and guidelines; they are communicated to all stakeholders groups including learners, educators, and support staff.	0.84	0.71	0.29	0.239	3.514644351	0.000				-0.872	-2.372	-0.539	-1.146

ARS3	The university has advise and support centre (the office or department providing student academic services related to course selection, finding a major, study skills, and referrals to tutoring and academic success skills)	0.75	0.56	0.44							-0.109	-1.609	0.224	-0.383
System Quality								0.793	0.657	0.785				
SQ1	I was able to navigate through the course website to find what I needed to complete the course.	0.84	0.71	0.29							-0.208	-1.708	0.125	-0.482
SQ2	I was able to access course materials.	0.78	0.61	0.39	0.220	3.545454545	0.000				-0.214	-1.714	0.119	-0.488
Information Quality			0.00	1.00				0.769	0.526	0.865				
IQ1	The instructor outlined in reasonable detail course requirements and grading procedures.	0.66	0.44	0.56							-0.621	-2.121	-0.288	-0.895
IQ2	The instructor organized the presentation of the course material in an effective manner.	0.79	0.62	0.38	0.148	5.337837838	0.000				-0.812	-2.312	-0.479	-1.086
IQ3	The instructor demonstrated good knowledge of the subject matter.	0.72	0.52	0.48	0.141	5.106382979	0.000				-0.325	-1.825	0.008	-0.599
Service Quality								0.812	0.519	0.746				
SEQ1	Grading in the course was fair and consistent.	0.71	0.50	0.50							-0.344	-1.844	-0.011	-0.618

Item	Description													
SEQ2	Assignments were distributed fairly throughout the semester.	0.75	0.56	0.44	0.112	6.696428571	0.000				-0.910	-2.410	-0.577	-1.184
SEQ4	Graded assignments included helpful comments from the instructor.	0.69	0.48	0.52	0.124	5.564516129	0.002				-0.691	-2.191	-0.358	-0.965
SEQ8	Email contributed to my understanding of the course content.	0.73	0.53	0.47	0.218	3.348623853	0.000							
Use			0.00	1.00				0.785	0.549	0.859				
US1	Printed materials contributed to my understanding of the course content.	0.76	0.58	0.42							-0.522	-2.022	-0.189	-0.796
US2	Posted discussions contributed to my understanding of the course content.	0.78	0.61	0.39	0.205	3.804878049	0.000				-0.496	-1.996	-0.163	-0.770
US4	Audio taped presentations contributed to my understanding of the course content.	0.68	0.46	0.54	0.210	3.238095238	0.003				-0.219	-1.719	0.114	-0.493
User Satisfaction			0.00	1.00				0.741	0.591	0.796				
USAT1	I am satisfied about the overall value of this course.	0.69	0.48	0.52							-0.654	-2.154	-0.321	-0.928
USAT2	I am satisfied about the overall quality of teaching by the primary instructor in this course.	0.84	0.71	0.29	0.144	5.833333333	0.001				-0.452	-1.952	-0.119	-0.726
Net Benefits			0.00	1.00				0.895	0.81	0.854				

NB2	The course helped me to develop the ability to solve problems.	0.89	0.79	0.21								-0.654	-2.154	-0.321	-0.928
NB3	I gained an understanding of concepts and principles in this field.	0.91	0.83	0.17	0.180	5.055555556	0.000					-0.446	-1.946	-0.113	-0.720

Note: SE= Standard Error, CR= Critical Ratio, SMC= Squared Multiple Correlation, AVE=Average Variance Extracted

SE and CR for some item in each factor in the model are not shown because the regression weight of the first variable of each factor is fixed at 1.

Critical Ratio is calculated by dividing an estimate (Factor Loading) by its Standard Error (SE)

For the discriminant validity, as Zikmund (2003) points out, it reflects the extent to which the variables are different from each other in the measurement model, so that each item separately measures one latent construct and does not measure the construct of a respectable latent at the same time. To achieve the validity of discrimination in the measurement model, all or duplicated recurring items have been deleted or paired. As shown in Table 5.15, the discrimination validity index was developed. The AVE's square root was calculated for individual construct, and the correlation between the constructs are also highlighted. The values of square root of AVE are > the values in their row and column, and a conclusion can be reached that all eleven combinations are discriminately validated.

Table 5.15 *Discriminant validity test outcomes*

Construct	TEC	MGT	PED	ID	ARS	SQ	IQ	SEQ	US	USAT	NB	AVE
Technology (TEC)	**0.82**											**0.666**
Management (MGT)	0.590	**0.71**										**0.506**
Pedagogy (PED)	0.650	0.450	**0.79**									**0.618**
Interface Design (ID)	0.660	0.430	0.450	**0.91**								**0.829**
Administrative and Resource Support (ARS)	0.490	0.240	0.580	0.490	**0.79**							**0.620**
System Quality (SQ)	0.590	0.560	0.690	0.280	0.220	**0.81**						**0.657**
Information Quality (IQ)	0.470	0.410	0.540	0.390	0.240	0.280	**0.73**					**0.526**
Service Quality (SEQ)	0.440	0.590	0.560	0.360	0.270	0.690	0.470	**0.72**				**0.519**
Use (US)	0.560	0.330	0.450	0.240	0.290	0.640	0.590	0.540	**0.74**			**0.549**
User Satisfaction (USAT)	0.540	0.250	0.230	0.380	0.390	0.290	0.360	0.560	0.270	**0.77**		**0.591**
Net Benefits (NB)	0.580	0.450	0.240	0.520	0.370	0.570	0.320	0.210	0.260	0.370	**0.90**	**0.81**

5.4 Structural Equation Modelling and Multi- Group Analysis

The resulted measurement model from CFA analysis was deployed to test the structural relationship between e-readiness and e-learning success across three groups. The CFA model showed compelling evidence of internal consistency, validity and reliability. Also, it indicates appropriate feature for testing invariances among three groups of teachers, students, and administrators. The hypothesis is that the construct of e-readiness (consisting of five factors) has significant effects on e-learning success (with six factors) is the same for teachers, students and administrators.

As stated in CFA analysis, the sample survey was conducted with valid responses of 329 teachers, 551 students and 281 for administrative staff. It must be ensured that the structural model is robust to conduct measurement of invariance for different groups and to ensure that different sample have similar relationship. Lu and Chiou (2010) reported that dissimilar variables of demography may cause differences in e-learning, however, Lai and Li (2005) argued that a model underpinned by theory is said to be ideal if it consists of relationship structures that are identical in the construct items among the various groups.

To investigate the predictive power of e-readiness to e-learning success, and to gain an understanding of different groups' influence on how stable the structural model is, empirical data was utilized to assess any form of invariance among groups, and tests were carried out to ascertain whether variations across groups influences e-learning success. The purposes of invariance analysis are: (i) testing whether there are a conceptual disagreement with the measurement items among groups, and whether the groups differ regarding their understanding of a specific construct. This may lead to factor weighting or loading that are inconsistent due to difference in results; (ii) psychometrical disagreement which occurs when different groups have similar view regarding the explanation of a construct generating differences among groups because of the methods used for the measurement (Lai & Li (2005). Invariance testing is very important because researchers will not be able to confirm that the instruments used can be generalized to other samples unless it exhibit cross-group invariance.

As mentioned in literature review, many authors studied e-readiness taking into consideration the unique attributes of teachers, students and administrators. In this study, we used the multi-groups SEM to demonstrate that the scale developed to

measure e-readiness for online learning success have a good fit for the sample data. The invariance between groups indicate persuasiveness of the results (Lai and Li ,2005). The model hypotheses of invariances between groups are listed:

1. Subjects of different (Teachers, Students, and Administrators) have the same configurable model for (E-Readiness – E-Learning Success).

2. Subjects of different (Teachers, Students, and Administrators) have equivalent factor loading in (E-Readiness – E-Learning Success).

3. Subjects of different (Teachers, Students, and Administrators) have equivalent structure weights in (E-Readiness – E-Learning Success).

4. Subjects of different (Teachers, Students, and Administrators) have equivalent structure residuals in (E-Readiness – E-Learning Success).

5. Subjects of different (Teachers, Students, and Administrators) have equivalent measurement residuals in (E-Readiness – E-Learning Success).

Brown (2006) reported that both CFA and SEM have the ability to test the equivalence of the measurement and structural models across multiple groups. The multiple-group SEM compares groups within the latent variable measurement model context, adjusting for measurement errors, correlated residuals etc. SEM is conducted simultaneously in two or more groups using separate variance–covariance matrices for each group. The equivalence or invariance of measurement can be tested through the placement of equality constraints on key parameters in the groups. In equality constraints, there is a requirement that parts of the model to be equivalent across groups. Brown (2006) also recommended running the multiple-group CFA several times with different marker indicators each time. Brown suggests not using Chisq (χ2) difference test because it is sensitive to large sample size, but it is used for testing invariance

across multiple groups. The structural model was tested separately in each group and the simultaneous test of equal form was conducted, after which the equality of factor loadings and indicator intercepts were tested. The equality of indicator residual variances and those for factor variances and latent means have all been tested. Based on the CFA 30-item model, it is anticipated that a model with the following features for all three groups would emerge: the model exhibited a two factor structure, e-readiness consisting of five dimensions and e-learning success consisting of six dimensions. The model is illustrated in Figure 4.

Figure 4. **Eleven dimensions and two components of the E-Readiness – E-Learning Success**
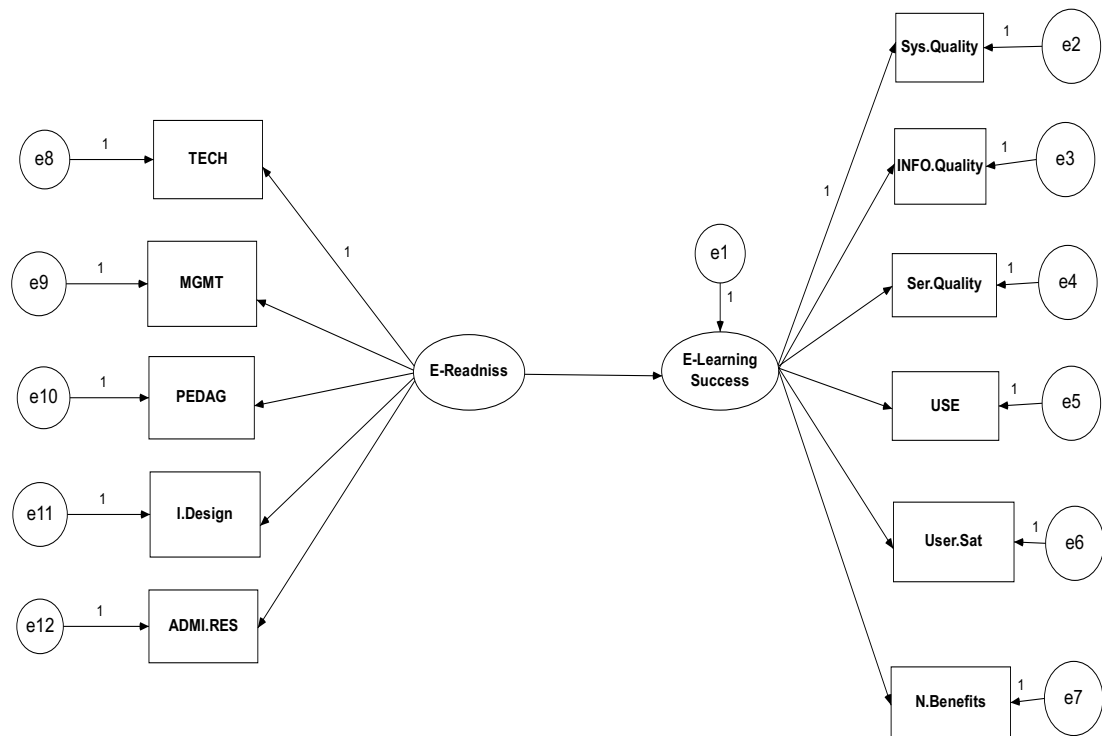
All of participants in this study meet the certain criteria including the fact that they all have a clear understanding of the requirement of online learning success and are engaged closely to online learning processes. As such, internal consistency was

calculated using Cronbach's α for each group (see table 5.16). Multi-group structural equation modelling was used for the testing of 30-item model's invariance using AMOS. SEM was performed on the 11 dimensions together with 2 components factors. Results in Table 5.16 indicated that all dimensions are reliable and have acceptable internal consistency as the value (α) exceeded 0.70 for each group.

Table 5.16 *Cronbach's α for the eleven dimensions, three groups*

Value	Res. Type	Technology (TEC)	Management (MGT)	Pedagogy (PED)	Interface Design (ID)	Administrative and Resource Support (ARS)	System Quality (SQ)	Information Quality (IQ)	Service Quality (SEQ)	Use (US)	User Satisfaction (USAT)	Net Benefits (NB)
	Teachers	0.77	0.75	0.89	0.72	0.85	0.84	0.76	0.88	0.83	0.71	0.85
Cronbach's α	Students	0.87	0.79	0.86	0.78	0.76	0.81	0.75	0.78	0.91	0.74	0.82
	Administrators	0.93	0.95	0.84	0.87	0.91	0.94	0.98	0.84	0.91	0.93	0.87

The model invariance was assessed by reporting fit criteria mentioned before namely: Chisq/df, CFI, RMSEA and GFI, for every category or group. Measurement equivalence and model invariance investigation were carried out based on the work of Byrne (2002) who used five models based on parameters with increasing constraints including regression intercepts, factor loadings, slopes, variances in error and covariance between latent variables. The model which is unconstrained was appraised so that all parameters within the model are evaluated such that there is no requirements for the parameters to be equal for the different groups, Figure 4. Thereafter, the weight of the model is estimated to ascertain if factor loadings are similar within the groups.

If invariance is adjudged satisfactory, the measurement of the latent variables will be in a similar manner across groups. This will lead us to test the model's intercept together with regression slopes for all groups. When invariance is not observed, comparisons of group regarding indicator variables may limit their validity. Brown (2006) reported that measuring covariance is optional for the structural model for multi-group analysis and therefore the covariance model between latent variables was not estimated.

The structural model was estimated and resulted in a poor fit regarding Chisq/df, CFI, GFI and, RMSEA. Some modification were therefore performed based on this results to improve model fit. The modifications included error covariance between (e5-e4 and e6-e7) due to high standard error between them. These modifications steps have led to an improved model fit (Chisq/df=2.49, CFI=.891, GFI=.905 and, RMSEA=.062). Accordingly, a good model fit for the structural model for all groups was achieved, and additional alterations may not guarantee absolute model fit. This model was employed as the configurable model and was used to compare the three groups. The three models modified together with their factor loadings are depicted in Figures 5 (a–c).

Figure 5 (a): Model for Teacher group after modification
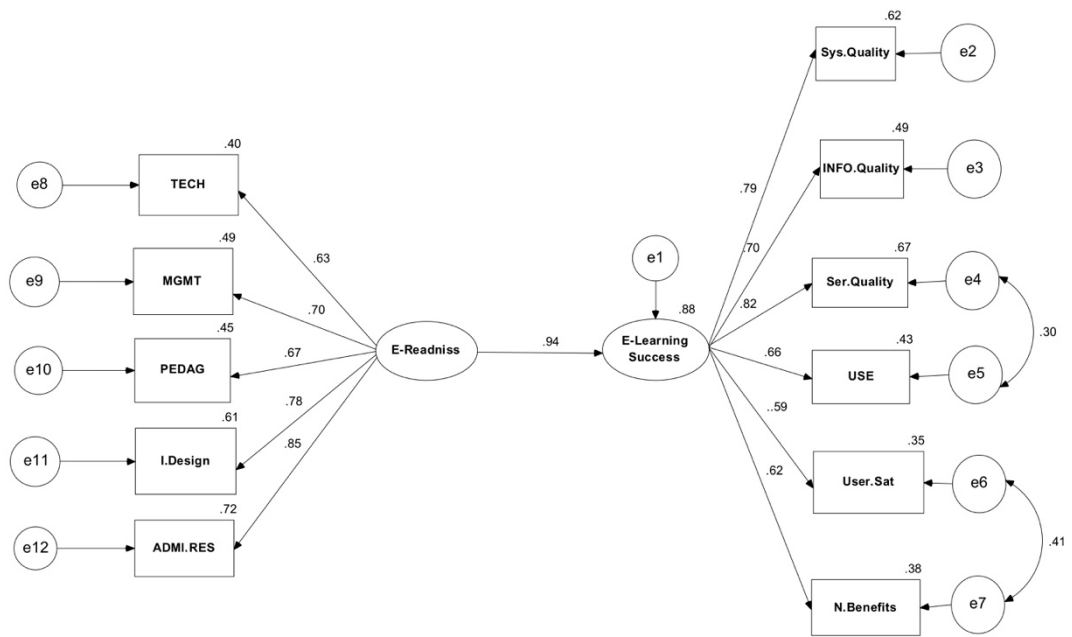
Figure 5 (b): Model for Students group after modification
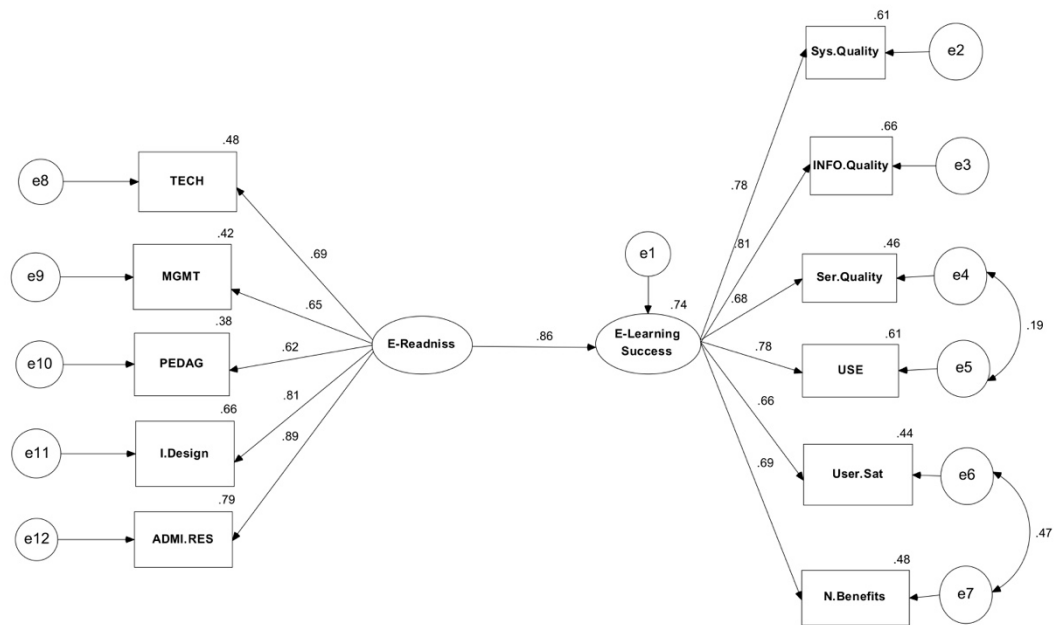
Figure 5 (c): Model for Administrators group after modification
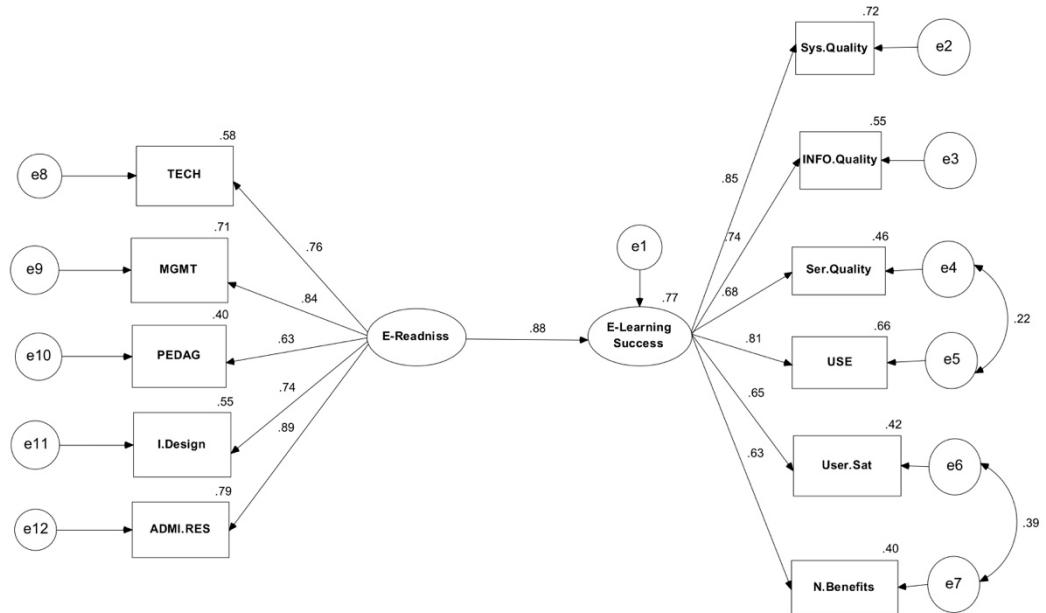
The results of Multi- Groups analysis including model fit criteria are shown in table 5.17.

Table 5.17 Results of invariance model (Multi- group analysis) and model fit for each group.

Invariance Model	Chisq/df	p-value	CFA	GFI	RMSEA
Unconstrained model	2.553	0.000	0.910	0.942	0.061
Weights model	2.49	0.001	0.892	0.961	0.0603
Intercepts model	2.413	0.000	0.902	0.912	0.071
Residuals model	2.332	0.000	0.904	0.934	0.081

In addition to good model for all three groups, results also indicates the fact that the instrument reflected an excellent coefficients of Cronbach ($\alpha \geq 0.7$) across the entire dimensions (Table 5.16). Accordingly, the results reveal a reliable structural model and a good invariance within the groups, and the ability of the model to show differences

between groups since that there are no significant differences regarding the assessment parameters. This also implies that individuals from different groups of the study may interpret the e-readiness and e-learning success in the same manner.

5.4.1 Assessment of the structural model

The causal effect of e-readiness on e-learning success in Saudi Higher Education Institutions are tested. The causal path identified was very strong as shown in figure 6 (Standardized Regression Coefficient = 0.94, P= 0.001), factor loading and squared multiple correlation exceeded (0.60, 0.40) respectively.

Figure 6 Structural Model (Causal Path E-Readiness – E-Learning) for all groups
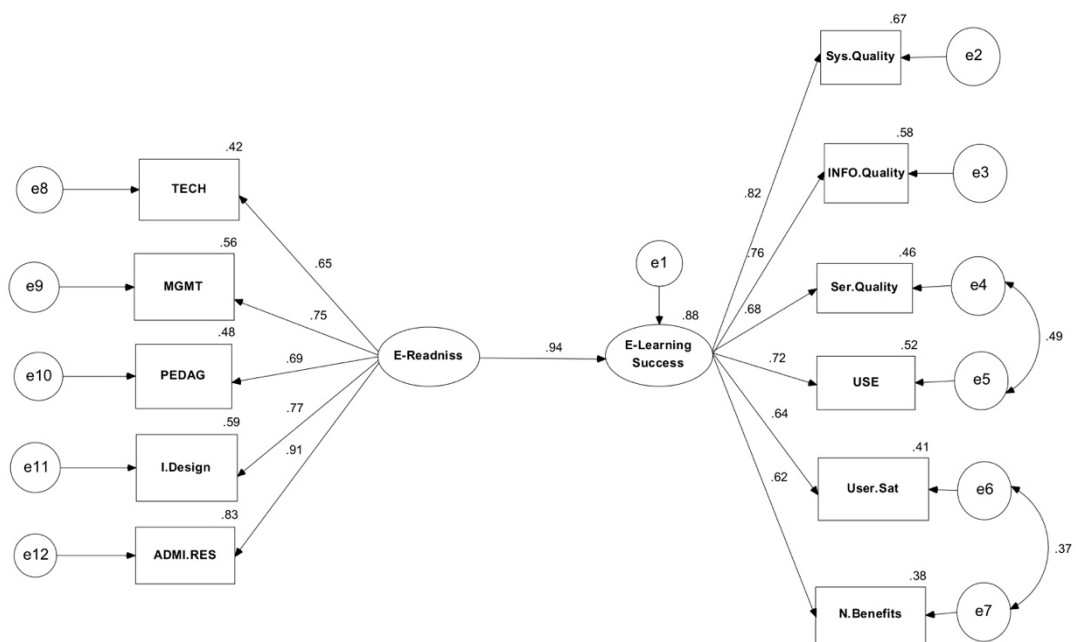
Testing the structural model indicated that e-readiness exhibit a strong effect on e-learning success. Overall goodness-of-fit indices showed that the structural model fit the data perfectly (Chisq/df=2.59, CFI=.917, GFI=.923 and, RMSEA=.073). The examination of causal path in three groups also showed that they are probably equal and

there are no significant differences. Therefore, the causal path for the final model was constrained to be equal. Also factor loadings, factor intercepts and factor error variances were equal across three groups. The final model achieved better fit and supported the hypothesis that the positive causal effect from construct e-readiness to construct e-learning success is same for the three groups.

5.5   Chapter Summary

In this chapter the results of the data analysis were presented. Research instrument was verified using EFA for pilot study of 103 respondents. The first sample was used to develop and validate the measurement scale of e-readiness. Cronbach's alpha for each factor were conducted to ensure consistency, stability, and dependability of item score. EFA was conducted for 31 items using varimax rotation through SPSS to validate the measurement scale. Results of the initial extraction indicated that 5 factors namely technology, management, pedagogy, interface design and, administrative and resource support were retained form overall measurement scale (the original scale contained 7 factors). Cronbach's Alpha was calculated for second time, and it was observed that the factors in the scale exhibited high rating of reliability and internal consistency.

Extensive survey and CFA was performed. The resulted measurement scale from EFA was used along with e-learning success measurement scale. 43 items of complete measurement scale were adopted (18 for e-readiness and 25 for e-learning success) to collect data. The data set consisted of three groups of respondents practicing online learning in Higher Education Institutions in the Kingdom of Saudi Arabia including teachers, students, and administrators to validate the measurement model based on information received from respondents who have relevant experience in the

field. Data were checked screened and analysed using appropriate means as highlighted in this chapter.

Results from CFA indicated good fit given that the indices for measuring fitness improved after items whose factor loading are low and items laced with redundant were deleted. Thirty items emanated from the estimation of the second measurement model. These items were confirmed and the condition for unidimensionality was achieved by deleting item process for loading items with low factor. The dataset consisted of three groups of respondents who practice online learning at Saudi higher education institutions: teachers, students, and administrators to validate the measurement model and its reliability for respondents with relevant e-learning experience. Data checked and validated, final data set that is valid for analysis were (1161). Through the CFA analysis, the researcher ensured a model fit for the measurement model, where indicators were better suited after excluding items with low factor loading and redundant items.

The measurement model stabilized on 30 items. These items have been confirmed and the unidimensional requirement has been achieved through the process of deleting and pairing the error variance. Results also showed that the measurement scale for e-readiness of the sample selected from higher institutions in KSA has five components, and a corresponding six components for e-learning success. The measurement model for both constructs indicated validity and reliability of the construct. Normality distribution for each variable that resulted was also examined by measuring skewness and kurtosis violations. Results indicated that the ability to proceed to further analysis to Structure Equation Analysis. The resulted measurement model

from CFA analysis was deployed to test the structural relationship between e-readiness and e-learning success across three groups.

The results reveal a reliable structural model and a good invariance between the groups, and the ability of the model to show differences between groups since that there are no significant differences regarding the assessment parameters. This mean also individuals from different groups of the study may interpret the e-readiness and e-learning success in the same manner. Finally, the causal effect between each factors were assessed and such effect indicated a very strong standardized regression coefficient of e-readiness on e-learning success and overall goodness-of-fit indices showed that the structural model perfectly fit the data. A detailed discussion of these results are provided in Chapter six.

Chapter 6: Discussion of Findings

In this chapter a detailed discussion of the results obtained in Chapter 5 based on Structural Equation Modelling and how the results can be used to inform implementation strategies for e-learning within Higher Education Institutions in Saudi Arabia is presented.

6.1 Study Evaluation

Many procedures have been followed to ensure that the findings from this research have been achieved faithfully and appropriate procedures have been followed based on a determined level of accuracy. According to Strauss and Corbin (1990, p. 252; 1998, p. 268), there are different issues to be taken into consideration to ensure the validation of the grounded theory and procedures. These issues include (i) the applicability of the theory to a phenomenon; (ii) the credibility of the data; (iii) the sufficiency of the research process and (iv) the empirical grounding of the findings. These criteria have been adopted to evaluate the accuracy and reliability of this research. The evaluation processes adopted are described in the subsections that follows.

6.1.1 Applicability of the theory to a phenomenon

The researcher built theory to meet essential criteria to judge the applicability of the theory to a phenomenon. To achieve the applicability of the theory to a phenomenon and give the theory its explanatory powers, the processes followed included scanning the participants' opinions about e-readiness measurement items to ensure the data was closely related and corresponds to their daily realities and to make it understandable to the people who are engaged in e-learning process. This was shown and demonstrated in Chapters 4 and 5. The creation of concepts used in the study was based on data gathered

and are linked in a systematic fashion to shape the overall narratives of the research. The study used EFA and theoretical sampling technique to get sufficient control over the structures and the procedure of collecting and analysing data, with the view to modifying and ensuring that the models fits the data accurately in the context of Saudi Arabia's higher institution of learning.

6.1.2 Credibility of the data

The level of the accuracy and trustworthiness of the data indicates the credibility of any piece of research (Rinaldi, 1995). Accurate measures were put in place to ensure data were collected in the right manner. It must be stated that not all questions were answered from the questionnaires distributed. For instance, > 20% of questions within the questionnaires were left unanswered. Accordingly, techniques such as the use of average imputation of responses (Rubin, 1987) from other participants were adopted. All data were checked, processed, cleaned and screened for outliers. Where outliers were spotted, they were deleted from the data accordingly to ensure the sampling distribution was close to normal distribution as much as possible. The first data sample was used to develop and validate the measurement scale of e-readiness and the second surveying process was conducted to confirm the results of EFA. Most of the initial sample were interviewed directly to ensure the accuracy of data.

In the extensive survey, the data which was used to validate the measurement model were those from the respondents who have relevant experience in the field of e-learning. Participants in the study were ensured to meet several criteria. First, participants are those who are currently making use of distance learning as a means to access education and are therefore familiar with key concepts in that they have access and are able to use online resources to their advantage. Second, the way and manner in

which higher institution across the country is distributed was taken into consideration and a wide range of respondents were obtained from the same institution. This ensures that the dataset reflects the process of the current form of e-learning in an efficient manner. Third, sample size were ensured to be robust and adequate enough to achieve meaningful estimations of key parameters. As reported by Anderson and Gerbing (1988); Bentler, (1983); Joreskog and Sorbom (1993) a sample size of > 150 is typically necessary for obtaining insightful parameter estimates.

6.1.3 Sufficiency of the research process

This research clearly explained the procedure that was followed to select the original sample for this study (Chapter 4), which was from the society of Saudi Arabia using the purposive sampling technique (stratified sample) alongside the theoretical sampling technique of the grounded theory as shown in chapter 5. Chapter 4 presents how the sample was determined, based on theory and the method of building the study instruments, items which pooled from reference to previous literature determined dimensions based on the number of recurrence in previous studies. In addition, when using exploratory analysis, the most important dimensions that can form the theoretical framework and compare it with previous studies were adopted. These dimensions are consistent with previous studies and are used to conduct the confirmatory study where their validity for using them for this type of analysis were adjudged satisfactory. Although this work was based on using theoretical constructs to establish the relationship between e-readiness and e-learning success, the results obtained were in conformity to previous studies that were purely based on empirical analysis.

6.1.4 Empirical grounding of research findings

Strauss and Corbin (1990, pp. 245-256) suggest that generating theoretical and conceptual models and their grounding in the data is necessary to judge the quality of the findings from the grounded theory. Developing concepts that are linked to theory is very important, and linking the core concepts with other concepts and validating their relationships against the data are also needed to ensure quality of research findings. Here, the theory was constructed followed by the development of the conceptual model informed by past studies in this field. In order to ascertain the conformity of the concepts to the data, an exploratory study was carried out. As mentioned above, exploratory analysis helps to develop theory and then the confirmatory study through the empirical analysis was conducted which aims to verify the quality of conformity and verify the validity of those concepts. By measuring the association between each concept, the results indicated the possibility of generalizing these results and their conformity with the results of previous studies. A compliance with previous studies suggests that results can be used and empirically applied for other studies.

6.2 Discussion and theoretical explanation of the key findings

During the first phase of the instrument development process, the reliability and validity of the instrument was thoroughly examined. Result of Exploratory Factor Analyses (EFA) indicated that teachers, students, and administrators in Saudi Higher Education Institutions can leverage e-readiness to gain access to quality education and this is based on the measurement of five factors including technology, management, pedagogy, interface design and, administrative and resource support. Moreover, when teachers, students, and administrators need to understand their level of online readiness, the measurement scale which resulted from EFA can serve as a tool to enhance their

readiness prior to preparing and delivering their online courses. Hair et al (2009) submitted that Confirmatory Factor Analysis (CFA) differs from EFA, because CFA allows for testing and confirming whether a theoretical measurement model is valid or not, while EFA explores data to identify potential constructs. In this work, EFA was carried out on the sample data to identify factors and patterns among multiple data points, prior to the development and confirmation of the model. The results of EFA assisted towards the development of the theory of e-readiness which led to proposed measurement in which CFA was used to validate the measurement model of e-readiness.

The e-readiness measurement scale can provide student profiles for educationalists, administrators or institutions seeking the success of distance learning by taking into consideration a number of critical success factors including technology, management, pedagogy, interface design as well as administrative and resource support. These factors are in agreement with the studies by a number of authors including Akaslan and Law, (2011); Watkin et al. (2004); Omoda-Onyait and Lubega (2011). In addition to the aforementioned success factors, further attention should be given to institutional policies and business strategies as well as evaluation and continual improvement. Although these two factors were not been verified on the scale in this work but it is important that teachers, students and administrators be aware of these additional factors because of their unique importance towards realizing e-learning objectives. For e-learning implementation to be successful, the higher institution of interest must plan and design their strategies around the aforementioned critical success factors as recommended by Abdullah and Toycan (2018).

The evaluation process is very important in e-learning considerations (Al-Adwan and Smedley, 2013), given that it is a very important factor that can be used to assess progress and ascertain barriers and bottlenecks. A feedback mechanism based on a robust evaluation process is therefore important towards the successful delivery of online learning powered by digital solutions. Teachers, students, and administrators must have a profound understanding of the role of evaluation process and must ensure the process is in place before committing efforts and huge resources to e-learning approaches. Evaluation must be in place from initiation of e-learning to fruition, including curriculum development and other associated e-learning activities (Alharbi and Drew, 2014).

Understanding the readiness of users is precedent to the success of any e-learning initiative. Finding from previous studies (Pittinsky & Chase, 2000; Darab and Montazer, 2011; Watkins, 2014) highlighted the importance of policy and institutional business strategy and evaluation and continual improvement in delivering e-learning strategies and implementation. Hussain (2011) reported considerable barriers towards the successful implementation of e-learning in Saudi universities and concluded that there is difficulty in reaching a consensus on how to best evaluate the success of e-learning concepts.

In this work, Confirmatory Factor Analysis (CFA) was employed to confirm the results of EFA used in the first validation of e-readiness measurement scale, and to confirm that the e-readiness measurement scale can work along with the e-learning measurement scale adapted from DeLone and McLean (2003). The modified measurement model in Figure 3 showed the result of five factor CFA model of e-readiness and six factors of e-learning success. Fit indices (Table 5.14) indicate good fit

based on the sample data given that it produces a p-value of 0.000 and a normed chi-square of 2.247. Other indices include a Comparative Fit Index (CFI) of 0.903; Goodness Fit Index (GFI) of 0.914, and a RMSEA value of 0.062. The correlation of all the aforementioned indices indicates the level of correctness and validation of e-readiness and e-learning based on the CFA model. The loading range between 0.66 and 0.93 also indicates the level of accuracy of the model.

Validation of convergence of the model of measurement is also confirmed as indicated by 14 items which converged into e-readiness constructs based on the five component factors namely technology, management, pedagogy, interface design and, administrative and resource support. Results also indicate that 16 items converge into e-learning success constructs based on six component factors namely system, information and service qualities as well as use, user satisfaction and overall net benefit. The five components factors for e-readiness have standardized path coefficient (SPC) > 0.80 and the significance level of P≤0.05 Similarly, the six constructs of e-learning also have SPC >0.77 which indicated that e-readiness measurement scale along with e-learning success measurement can serve as a measure of good measurement scale of e-readiness and e-learning success in Higher Institutions in KSA. For the overall model, construct validity was achieved since the fitness indices for all constructs were all adjudged satisfactory and acceptable, indicating the attributes of a good model fit for the items towards the measurement of their respective latent constructs.

As indicated in Table 5.15, based on the measurement from the model, discriminant validity was achieved when all items that are considered redundant were either constrained or deleted. Furthermore, the values of AVE are greater than the values in the corresponding rows and columns, a situation that suggested that all

132

constructs are not the same. Additionally, factors including Cronbach Alpha, AVE and composite reliability values surpasses the minimum acceptable values, a scenario that highlights the fact that measures were reliable and demonstrated high level of consistent results. Against this backdrop, it can be concluded that if e-learning strategies within Higher Institutions in Saudi Arabia is to be successful in terms of deriving maximum benefits, a number of factors including technology, management, pedagogy, interface design and, administrative and resource support must be taken into consideration.

The purpose of both forms of factor analysis (i.e. EFA and CFA) was to be able to validate the values of e-readiness in relation to e-learning success as highlighted by a number of authors including Pittinsky and Chase (2000); Akaslan and Law, (2010); Darab and Montazer, (2011); Watkins (2014) who provided sufficient level of evidence regarding five dimensions of CFA model which can be adopted in Higher institutions and also suggested that these factors are important in facilitating readiness toward the enhancement of e-learning practices. The results obtained in the current work are in line with findings in extant literatures in this field, in terms of theory and best practices. This provided empirical evidence towards the validation of the instrument employed in this work for the evaluation of e-readiness and e-learning success. The implications of these results enable us to understand the measurement validity in e-learning research (Clark and Mayer, 2016).

Assessing the applicability of the study's theoretical framework to different scenarios is very crucial to ascertain the generalizability of the study. As suggested by related literature within the field of e-readiness taking into consideration the unique attributes of teacher, student, and administrator is crucial in order to reap the benefits of e-learning (Moftakhari, 2013; Akaslan and Law, 2011, 2011b; Mercado, 2008; Kaur

and Abas 2004). As such, in order to achieve meaningful comparisons across groups, the structural model developed to test the relationship between two constructs of the study exhibited adequate cross-group equivalence. The measurement invariance has a role in establishing comparative validity. In this work, a number of factors including configurable metrics, factor variance and invariance, latent means for measurement among three groups were tested. The invariance and variance were achieved at different levels. Thus, the finding in this work confirmed the universality of the five dimensions of e-readiness to have significant effects on six dimensions of e-learning success adopted based on the work of DeLone and McLean (2003).

The assessment of latent means indicated minor variance- covariance in the three groups regarding (service quality, use) and (user satisfaction, net benefits). This variance emanated from the respondents' understanding and interpretation of these constructs and it was under the influence of several factors such as the e-learning development process and functional values for each level. The invariance of the causal relationship between two constructs were tested and the model revealed sufficient evidence of validity and equivalence which is a further confirmation of the results reported in this work. Thus, it can be treated as an essential aspect to achieve progress and realization of objectives in e-learning initiatives as stated by Lašáková et al. (2017).

The study contributes to our knowledge of e-learning through the provision of theoretical insights gathered from the empirical findings reported in this work. An extensive group of factors with the view to extending the understanding of the attributes of e-readiness and e-learning success was highlighted. Through a large-scale web survey across Higher Education Institutions in Saudi Arabia, this research developed reliable and valid instruments and empirically tested the relationships among two

constructs. Additionally, the research tested the moderation effect of respondent categories who engaged in online learning on the relationships between e-readiness and e-learning success using multi-group analysis of structural invariance.

The implication of the results from EFA, CFA and Structural Equation Modelling (SEM) for multiple group is that it allows for the understanding of e-readiness for e-learning success validity in online learning research. Colleges and universities facing problems including designed online learning that cannot meet demands of the students will learn from the findings reported in this work. As the pressure continues to mount on colleges or universities to provide an effective education, educational institutions in KSA are scrambling for alternative and inclusive approach to provide an education that attracts students in a highly changing and competitive world. Universities in KSA are more interested in integrating Internet-based technologies in the classroom as part of learning which has the potential to change the nature of learning environments and the ways they learn. E-learning provide effective ways for student's performance and improve curricula and pedagogy through involving them in the assessment process. Colleges in KSA are paying increased attention to the establishment of e-learning and are integrating e-learning developments and concepts into their educational strategies and policies. Most of the theories have indicated the role of continuous use of technology, management, pedagogy, interface design and, administrative and resource support in ensuring the success of online learning. In addition to focusing on these factors, the current work measured the invariance of different groups in understanding these factors in influencing on e-learning success. All these points to the fact that for the higher institutions to reap the value of e-learning, all the aforementioned factors must be incorporated in their design thinking and strategy.

Studies such as Moftakhari (2013); Akaslan and Law, (2010a), (2010b); Mercado, (2008); Kaur and Abas, (2004) pointed out that the significance of the relationships between e-readiness and e-learning success might be affected due to differences in demographic variables. Additionally, Lu and Chiou (2010) indicated that different demographic variables caused differences in e-learning success. Currently, none of the studies in this field have examined the differences between the three groups of teachers, students and administrators within the Arab region or even in Saudi Arabia. The stability of the relationships among the variables in structural model was not influenced by differences of teachers, students, and administrators either conceptually or psychometrically. This results ascertain the level of correctness of applying the measurement and structural models and highlighted the fact that testing participants does not require separation. The implication of this is that it can serve as crucial tool for measuring the factors affecting the success of online learning.

Online learning is gaining tract and attention throughout the higher education institutions in KSA. As such, the current work shows that for online learning to continue to enjoy success, teachers and administrators alike must ensure that a sense of belonging is impressed on students studying via distance learning so that they will feel like natural member of the traditional academic community. As highlighted before, attention should be directed to institutional policies and business strategies and evaluation and continual improvement to reap the full potential and benefits of e-learning (Nyoro et al, 2015). Although these factors were not verified empirically in the current work, nevertheless, it is important that teachers, students, and administrators are

aware of the role of these factors in online learning before huge investments are put into the adoption of e-learning capabilities.

In this work, ideas on the psychometric properties that should be measured to better understand the concept of e-readiness is highlighted. Although, technological issues such as comprehensive technology plan, Internet connection, interactive communication media and networks etc., have significant impact on success of e-learning, technology alone will not guarantee this success. As such, other factors of e-readiness as highlighted above are still necessary for online learning to be successful. For example, it must be understood that e-learning environment is different from traditional learning or classroom learning environment and that extra efforts must be put into the process of e-learning with the view to recreate the experience of traditional classroom learning so that students can have a sense of belonging and attachment to the overall process of learning. This work provides suggestion regarding types of administrative and resource support for improving the learning process such as support centre like an office or a department responsible for providing student academic services related to course selection, study skills and referrals to tutoring and academic success skills must be established.

6.3   Factors affecting e-Readiness

Current instruments for e-readiness focus mainly on technology, management, pedagogy, interface design and, administrative and resource support with the view that teachers, students and administrators can use the instrument as a more contemporary instrument to measure the online learning readiness by combining these factors. However, the role of institutional policies and business strategies as well as evaluation and continual improvement must not be ignored due to their importance as highlighted

before. This work recommends focusing on raising awareness among concerned parties about the importance of planning for e-learning and setting clear and specific goals, in addition to focusing on integrating e-learning in institutional policies and strategies.

6.3.1 Technology

The adoption of e-learning in higher education institutions is a technology-enabled process which require institutions and educators to reorganize and restructure how courses are developed and structured. Results support the technology dimension as an enabler for e-learning readiness. Saudi Arabia has witnessed many developments in the use of technology in e-learning. It has also made great progress in utilizing technology to transform and improve learning experience in a variety of ways, most notably the transformation of modern technology into how to improve learning such that all students are guaranteed access to top quality learning experiences. Technology is increasingly adopted to customize learning and provide students with plenty choices regarding the nature of what they are learning and the level of pace and readiness at which the learning is taking place. Scientific research and experience with the aid of technology has served as a springboard towards the understanding of what distinguishes people who need the knowledge and the required skills and competencies that is required of them to succeed in life and get employed in a competitive market environment. By creating an enabling environment where teachers are equipped with the current state-of-the-art equipment and professional training with the view to improve outcomes, e-learning strategic objectives will be realized (Tarhini et al, 2015). Advancement in software technologies and their seamless integration with digital hardware platform have also contributed to the success of e-learning education by allowing correct mapping of teaching assessments with the individual abilities of

different learners. At the national level, significant progress has been made towards ensuring that each school has a high-speed communication as a basis for gaining access to quality education through e-learning. The cost of digital devices and solutions has dropped dramatically, while computing has increased, coupled with high quality interactive availability for educational tools and applications, thereby increasing the practicability of e-learning. The embrace of technology has enabled the rethinking of the design of physical learning spaces to accommodate new and expanded relationships between teachers, mentors, learners and peers.

Despite this notable progress, there are many gaps to focus on and can be seen as a step towards the future. From the results of the study, there exist a huge gap between e-learning users who employ the service of technology in a creative and positive manner and those who focus on the perceived negative traits of embracing technology towards the delivery of education. Accordingly, there is an urgent need to support and provide better tools at Saudi universities in order to facilitate timely access to information on how strategies work through rapid transformation by focusing on technology assessment and encourage positive attitude towards the adoption and embrace of e-learning. During the study, it was noted that many higher education institutions in Saudi Arabia do not yet have full access to technology effectively, and in instances where technologies exist, it has not been put into optimal use which supports education in an effective manner. This further confirms the need for research in this area to be accelerated and expanded with the view to adopt and exploit effective techniques in e-learning in institutions of higher education.

Many higher education institutions overlook how to integrate e-learning into traditional style of education. To overcome this, key stakeholders must be involved in

the formulation of e-learning strategies. This study revealed that there are few educational institutions that have adopted the use of technology for educational purposes because of the traditionally held believe that e-learning does not offer the same level of social interaction between the students and the learning ecosystem. In fact, many teachers and graduates are unwilling to adopt technology as a means to support student's learning as they move to teaching and use technology effectively in the classroom. Although technology assessment techniques have evolved, they still do not use technology that has full potential on a wider scale than desirable outcomes, particularly non-cognitive competencies.

However, as highlighted in this research, the use of e-learning as a vehicle for delivering quality education is important provided the key advantages of the concept are properly harnessed. Based on the results reported in this work, it was emphasized that the focus on remote technology, providing access to the Internet, and equipment for learners should not overwhelm the importance of preparing teachers for effective teaching. Focus on technology should be backed with attractive and relevant digital learning content to realize its full potential. In order to further encourage the use of e-learning, the issue of security which is of concern to some potential users of e-learning facilities must be addressed without compromising access to teaching materials and interactive learning.

6.3.2 Management

The results of this study indicated that universities must ensures that learners acquire adequate knowledge through the continuous development of their use of e-learning platform as an avenue to access quality education. Top management activities to support e-learning development within the institution must therefore be put in place

to ensure that the objectives of adopting e-learning are realized. Although technology is the vehicle or platform through which e-learning is administered, adequate strategy inspired by sound management structures is the key to the successful delivery of e-learning. As such, the management must put in place robust specifications and requirements detailing learning outcomes for students through effective delivery of teaching via e-learning. This can be achieved through effective communication of academic programs and course contents and through the provision of adequate support for e-learning development within the institution. To ensure the success of e-learning, management must put in place a robust conflict resolution mechanism between the students and the teachers delivering the online content.

Management practices are focusing on creating a culture and conditions for innovation and change (Abdullah and Toycan, 2018), which are essential attributes of strong leadership which can be harnessed to deliver smooth e-learning practices. In order to ensure that maximum benefit of technology to transform learning is derived, a very strong management leadership is required (Usagawa, 2018). With strong management leadership, a common vision can be established for all those involved in e-learning as a vehicle for accessing quality education. A strong vision and how to make the best use of technologies can help in harnessing digital solutions for e-learning purposes. With clear goals and objectives, technology can be used to transform learning whilst opening up new possibilities for realizing the vision of the educational institution.

The adoption of e-learning and its success relies on the skills and competencies of the management leadership. This is because e-learning requires an understanding of how to effectively deploy resources to realize the full potential of e-learning. Dexter (2005) submitted that in order to fully realize the benefits of e-learning, there must be a

balance between leadership, student learning and experience, adequate ICT infrastructure and teachers with skills and expertise to administer online teaching.

Based on the results from the current work, the role of management as a dimension of e-readiness was highlighted. Essentially, without a robust management practice in place, the full potential of e-learning cannot be realized. Both short term and long term plans towards the continuous improvement of e-learning and its derivatives must be put in place by the management. Investment in technology towards the actualization of quality education requires both short and long term plans because technology can serve as a catalyst for extending access to quality education especially in a country like Saudi Arabia where potential students seeking access to education are dispersed due to the geographical conditions imposed by nature.

6.3.3 Pedagogy

Pedagogy factor was concluded to have significant impact on e-readiness. Catchy statements such as university supports learner success through the organization of the working environment; e-learning courses contain objectives that are specific, measurable, achievable/agreed, realistic/relevant and timed/timely (SMART); and, learners have access to relevant media for e-learning" were considered to have the most influence on the embrace of e-readiness in higher education institutions in Saudi Arabia by students. A number of authors such as Khan (2011); AI-Wabil et al, (2010); and Russell (1980) have indicated that pedagogical dimension include content, audience, goal and media analysis as well as design approach, organisational structure and the procedural framework and strategies of e-learning environment.

The current work revealed that many teachers are trying to reconsider the nature of their work, to rethink their curricula and teaching methods so that they can transform

their practices in education using ICT-enabled teaching platform. However, it is clear that much of the education sector denies the role and implementation of ICTs within the educational context. This may be due to stakeholder-related reasons. However, e-learning is about rethinking curricula and methods of teaching and transforming education through the use of ICT. In the Kingdom of Saudi Arabia, the use of ICT has been incorporated to supplement teaching styles so that resources and educational discussions are easily integrated into pedagogy.

The printed text content has been transferred to the content or material provided by the web-based information and communication technology. The element of educational discussions remains important, as it has not occurred in the design of online learning modules. Many of them have been created by putting online learning materials on the Internet after they were paper-based. It was noted through this study that the transition to e-learning was neither accompanied by a reflection on teaching methods related to new contexts nor in the new ways that have changed in the context of the work of academics and their students.

Teachers' understanding of e-learning as a model or method of delivering educational programs students who have not been able to enrol in higher education institutions and who craves quality education, is required. Currently, academics are afraid of the complexities associated with e-learning because of their lack of ICT knowledge, as well as their lack of understanding of the educational use of e-learning to develop learning experiences for their students in the information age. Turkle (1998) noted that the introduction of educational programs over the Internet may have negative effects on changing the context and form of communication for learners. His study confirmed that this is important in rethinking the new pedagogy of learning. This raises

questions about whether academics are adequately prepared to run educational programs well to maintain the essential aspects of the process and take into account the educational importance.

A number of researchers including AI-Wabil et al, (2010) and Turkle, (1998) agreed that there are many ways to solve such problems. They have pointed out the importance of rethinking learning and pedagogical methods for improving learning. There is a great need for referential frameworks to reflect on the ways in which learning occurs and evaluating the outcomes of the learning process. The new vision of e-learning is that it contributes to the creation of communities that education will be lifelong and expand on larger scales and that there are new technologies constantly evolving which increases the effectiveness of the educational process. Finally it will change the view towards e-learning from being an expensive project but rather as an investment towards enhancing greater access to quality education.

The most important thing in the pedagogy dimension is the curriculum. Emphasis should be placed on curriculum development in a way that suits the e-learning environment. The development process requires collaboration and technical knowledge of educational content and support for the learning sector through strategies to enhance learning programs, technology inclusion and advisory support. Continuous coordination of persons, processes and infrastructure to provide access and deliver programs, develop effective policies and practices, develop and implement curricula and pilot courses for teacher guidance is paramount towards the success of e-learning. The proposed syllabus should meet certain criteria to be suitable for online delivery; syllabus depends on the transfer of knowledge and the development of cognitive and social skills. The content can include mechanisms for thinking about the necessary interaction between learners

and trainers. The content may be complex and requires time to absorb and rely heavily on the project's work to engage and interact with the learner.

6.3.4 Interface Design

Results of EFA in this work support the notion that a website through which e-learning is administered with interactive user interface with easy-to-navigate layout encourages students towards the acceptance of e-learning as an avenue to access quality education. User interface design is the interface between the user and computer programs. The success or failure of any software application system depends on the interface design. The use of software, ease of use and learning are all issues that are affected by the user interface. The user interface is important in designing e-learning programs. There are many principles and concepts that should be considered in e-learning and user interface is an integral aspect. Many studies have confirmed the logical relationship between teaching, learning, using multimedia and designing the user interface, the design of an effective user interface contributes to improving learning, stimulating learners and improving the time efficiency of e-learning (Akhavan and Masoodi, 2005; Khandaldel, et al, 2008; Mayer et al, 2001; Moreno and Mayer, 2000).

There are many software that has emerged to support e-learning over the last twenty years, and no doubt these software have brought about changes in the scope of e-learning. At this stage, the focus has been on the development of e-learning systems based on the psychology of learners. Several studies have been conducted which focused on the factors that affect the psychology of the learners and the nature of learning, most notably the design of the user interface (Akaslan and Law, 2011; Omoda-Onyait and Lubega, 2011). These studies supported the results of the current work in considering the design of the user interface as one of the most important factors that

determine the success of e-learning. It is important to take into account what was mentioned in previous studies and this research when designing the e-learning system in the Kingdom of Saudi Arabia in depth. E-learning is different from normal learning, and some adjustments must be made to e-learning in order to suit the nature of the use of technology, taking into account electronic issues and making some adjustments. Although these modifications may cause some new problems, such as conflict with the nature of distance learning, psychological issues should be considered by employing the effective design of the user interface in e-learning.

Because the user interface is the point of interaction between the user and the educational content, learning goals may not be achieved if they are not effectively and successfully linked between learning content and user effectively interface, so the results will not be realized. Even if the user readiness is available, the user interface needs to be effectively designed. The user interface is an interactive interface between software and user icons. When designing the user interface, items that are handled (text, labels, and other educational content) must be arranged in an easy way for the user and minimize errors.

Possibility of frequent errors, or if the user was unable to achieve his goals, he would not return to using the system regardless of the strength of the system and the possibilities it provides or functions that the system provide. Because the user interface is the one that makes the program aware. The process of designing the interface should begin with user-defined understanding including profiles, understanding their demographic nature (e.g. age, gender, physical abilities, education, cultural background, ethnicity, motivations and personal goals). The user interface may not be suitable for all users, but may be suitable for specific users, but there are three main rules for user

interface design: allowing the user to control, reduce reliance on user memory, and finally consistency in the interface design.

6.3.5 Administrative and Resource Support

Results also indicated that administrative and resource support has considerable influence on e-readiness. Such support facilitates e-learning process because it allows the institutions involved to have a clearer picture of how their own policies and guidelines will be developed and communicated to key stakeholders including learners, educators, and support staff within the overall e-learning ecosystem.

Higher education institutions in Saudi Arabia can support teachers by sharing the expected objectives of integrating e-learning with the traditional approach to education. Graham et al. (2013) reported that education policy must include the integration of e-learning so that teachers can then be encouraged to develop their skills on the use of technology until they gain mastery of it. Olapiriyakul and Scher (2006) suggests that higher education institutions can do this and should provide teachers with rules and guidelines on how to prepare for effective e-learning or coeducation, whilst assigning full responsibility for further development and training.

This will encourage teachers to develop their ICT abilities and expose them to current trends in e-learning approach to education. Wasilik and Bolliger (2009) submitted that there are many ways that can be used to increase the satisfaction of teachers in the e-learning environment and one of which is to provide teachers at a certain level ability to interact with students online or face to face. The study showed that teachers can bear additional burdens if work is of high value. It is essential that departments in higher education institutions seek ways to enable teachers to receive appropriate burdens and allow them to develop their abilities.

Based on results, the study found the sample of the study would agree about that e-learning is aligned with the institutions, and there is a commitment on the part of institutions to use technology to attain both strategic and academic objectives. The higher education institutions are willing to employ capable and experienced faculty to oversee the implementation of the e-learning environment. They are also willing to accept e-learning as a mode for teaching and learning and are providing teachers with professional development opportunities to assist them in improving their online teaching experience. They support teachers to have access to a network of other online practitioners to discuss pedagogical and curricular issues. Higher education institutions are also willing to put professional support system in place to ensure teacher's success in delivering the online course and to make provisions for collaborative teaching arrangement. Indeed, higher education institutions in KSA are committed to the adoption of e-learning and in the near future, its integration with traditional approach to education will be realized.

Administrative support initiatives require financial, human and technical resources to fully realize the successful implementation and adoption of e-learning. This is because of the interrelated activities involved in establishing a seamless and effective learning atmosphere via e-learning. As such, when planning and developing e-learning strategies, adequate resources must be put in place to facilitate the delivery and implementation of e-learning strategies.

6.4   E-learning Success

Results confirmed that the factors of e-learning success model based on the work of DeLone and McLean (2003) which broadened the approach towards gaining a better understanding of how to assess the success of e-learning in Saudi Higher

Education institutions. This model was presented to shed light on how to design, develop and deliver successful e-learning by taking into account the perception and views of all stakeholders.

The main reasons for using system design, delivery of system and system outcomes as indicators of the success of any e-learning initiatives is that many educational institutions offer Internet courses using asynchronous computer-based teaching, many higher education institutions use the Internet as a primary delivery method of education and distance learning courses. This model can be considered as best practice in e-learning development as informed by previous works summarized by DeLone and McLean (2003). Delone and McLean (2003) submitted that in instances where there is no consistency or where there is absence of consensus on what constitutes e-learning success, it will be difficult to recognize critical success factor. The model was built on the basis of the recent recognition of educational promises for Internet-based technologies. DeLone and McLean's six dimensions were identified and integrated into the success model of e-learning success factors derived from literature including quality of information, quality of system, quality of service, use and user satisfaction as well as net benefits.

These factors focused on the integrated vision of the success of information systems. For example, system quality includes easy-to-use, stability, speed, and responsive variables. On the other hand, quality of the information includes well structured, effectively presented information, appropriateness length of information, clearly written, useful, modernity of information. Quality of service related to speed, responsiveness, integrity, knowledge and availability. The usage factor includes variables related to the use of PowerPoint slides, sound, scenario, training problems,

discussion board, case studies and tutorials, assignments and practice exams. Net benefits include positive aspects including empowerment, enhanced learning, time and academic success. Negative impact includes lack of communication, isolation, quality concerns, and reliance on technology. Finally, user satisfaction factor that entails overall satisfaction and success, enjoyable experience and possibility to recommend to others.

Several studies prior to DeLone and McLean (2003) used the empirical and congruent analysis of this model, and most studies agreed on the explanatory power of these six factors in measuring the success of information systems. The credibility and validity of considering the success model of e-learning initiatives from the perspective of information systems is that each of these efforts seeks to employ modern technology to effectively meet the needs of users. The success of information systems in the development and evaluation of e-learning programs has been investigated in this study. The e-learning success model focuses on measuring and evaluating success. This model indicates that the overall success of e-learning initiatives is a function of success at individual stage of e-learning development including design, delivery, and final analysis and evaluation of results. The design phase includes three dimensions of success: system quality, quality of information, quality of service. As for the delivery phase, the success evaluation will be based on usage. The third stage is to evaluate the success of the results phase based on user satisfaction and net benefits. The successful design of the system is critical to the successful delivery of the system, which necessarily affects the success of the results of the system in general. The success of the results is important dimensions in evaluating the successful delivery of the system again.

All variables have been studied in many previous researches. In this study, the model was used, which was based on the study of DeLone and McLean, 2003. The

empirical analysis was used and the results indicate that this model is useful for measuring the success of e-learning initiatives in Saudi Arabia. Results indicated that the ability of students to easily browse through the course website with the view to locate the required resources to complete an assignment or coursework constitute the main attributes of System Quality. Results also indicated that the way and manner in which an e-learning instructor organizes content and resources, course requirements, announcements and grading procedures on the website constitute Information Quality.

Service Quality included items such as issues around whether the grading system used to assess a course is consistent and fair or whether assignments are structured in an easily accessible manner or whether well-composed emails detailing instructions about course materials. The Use factor confirmed that printed materials which contributed to student's understanding of the course content, posted discussions contributed to student's understanding of the course content, audio taped presentations contributed to student's understanding of the course content. User Satisfaction can be evaluated through satisfaction about the overall value of the course, and satisfaction about the overall quality of teaching by the primary instructor in the course. The last factor is the Net Benefits which can be evaluated through the ability of the course to develop the student's ability to solve problems and their ability to understand the concepts and principles in specific field.

The results of measuring invariance for the structural model indicated that teachers, students, and the administrator staff of institutions understand these success factors in same way. This means that institutional support such as technical infrastructure, high-speed Internet access are provided to support ongoing instructors' workshops, which focus on training and sharing of best practices pertaining to e-

learning, technical and pedagogical development facilitate instructors' e-learning adoption. Technical support helps in finding solution to any issues that emanate in e-learning delivery and access. The model provides a detailed view of the success of e-learning that students, teachers, and administrator all have roles to play. For example, successful development and delivery of e-learning depends on the understanding of students' learning requirements and recognizing their attitudes towards e-learning.

Essentially, information quality, system quality and service quality are essential for designing and developing online courses before the content is delivered by a tutor. This process is supported by teachers and administrators. Online readiness is very important for the students, teachers, and administrator and should be assessed based on a number of factors including technology, management, pedagogy, interface design and administrative and resource support as highlighted above. In each dimension of the success of e-learning, we find that the administrative staff of the educational institution involved, in addition, the teachers concerned with the dimensions that focus on the design of e-learning system as well as for the administrative staff. While the focus is on the measurement of the actual use of the system, the parties involved in this dimension are teachers and students, teachers are concerned with the educational material that contribute to a greater understanding of the educational content, in addition to discussions and presentations and other teaching aids such as the audio content. As with students, they understand little about the actual delivery and use of the system, as well as the development of educational content.

The benefits to students are focused on two factors: user satisfaction and net benefits. In these two factors, we find that the students are the most involved. The satisfaction factor measures the total value achieved for the student from the course, as

well as the student's satisfaction with the quality of delivery provided by the course teacher. The net benefits measure is focusing on the contribution of the course in increasing the student's ability to develop his ability to solve problems, as well as increasing the understanding of the principles and concepts in each course.

Finally, e-learning success model can help higher education institutions with the requisite guidance for the design, development and delivery of e-learning initiatives. It can help deepen the understanding of how to define, assess e-learning success. Success in e-learning can be assessed though six dimensions including three forms of quality-system, information and service; use and user satisfaction as well as net benefits. Each success dimension is evaluated and quantified based on a single numeric measure through the aggregation of ratings of its set of attributing items. And the overall success of e-learning can be calculated and the low degree of success indicates that there is a shortage in this area, and the institution is required to direct and devote efforts to address deficiencies.

6.5 Chapter Summary

This research investigated the factors of e-readiness that influence the e-learning success in Higher Education Institutions in Saudi Arabia. Data were gathered from Education Institutions using valid and reliable instrument. The e-readiness instrument was validated using exploratory factor Analysis (EFA), while e-learning success instrument was adopted based on the model put forward by DeLone and McLean (2003) with further verification to fit the data gathered. Both instruments were verified using Confirmatory factor analysis (CFA). Testing the effectiveness of e-readiness on e-learning success was performed using Structural Equation Modelling (SEM). To measure whether this relation differs regarding the respondents' type (e.g. teachers,

students, and administrators), multi-group SEM was adopted to measure invariance between the three groups.

Overall, in this chapter, detailed analysis and discussion of the results is presented. Additionally, the implication of the study's finding with respect to higher education in Saudi Arabia is presented. Finally, a number of recommendations for decision maker in higher education institutions towards the smooth delivery and implementation of e-learning is presented.

Chapter 7: Conclusion and Future Work

7.1   Introduction

Based on the gap identified from the review of extant literatures relevant to the current work presented in Chapters two and three; the answers to the research questions based on the methodology presented in Chapter four; the results presented in Chapter five and the discussion of results presented in Chapter six, the summary of conclusions and main findings from all the discussion and analysis carried out throughout this research is presented in this chapter. Additionally, the major contribution to knowledge, limitations of the work and an outline of possible future direction of the work is equally presented in this chapter.

The aim of this section is to describe how the research questions raised in Chapter one, section 1.2 are answered leading to the realisation of the aim and objectives listed in Chapter one (section 1.3). To reiterate, the aim of the current work is to hypothesize, construct and examine the relationship between e-readiness and e-learning success initiatives in Saudi Arabia's higher education institutions, using structural equation modelling (SEM), taking into account the unique attributes of key actors including teachers, students and administrators. The findings is to help Saudi Arabia to further harness its resources to realise the full potential of e-learning. Against this backdrop, the overall aim of the research could be said to have been actualised due to the answers provided to the research questions as highlighted in the sections that follows.

7.1.1 What is the relationship between e-readiness and e-learning success?

To answer this question, the relationship between the two main constructs namely e-readiness and e-learning success was evaluated and tested through the use of

Structure Equation Modelling (SEM). Through literature review, a number of factors that influences the relationship between e-readiness and e-learning success were identified. Some of the factors identified include organizational, strategic, technological and educational factors. Through the use of SEM, these factors were tested and were established to be in line with previous studies. Overall, this work confirmed the dimensions of e-readiness which have significant positive effects on e-learning success as detailed in the subsection that follows.

7.1.2 What are the main factors that best explain the relationship between e-readiness and e-learning success in Saudi Arabia's higher education institutions?

Seven (7) dimensions which are considered the main factors upon which e-readiness can be measured were identified based on extensive literature review and include policy and institutional business strategy, pedagogy, technology, interface design, management, administrative and resource support as well as evaluation and continual improvement. Similarly, by building on the work of DeLone and McLean (2003), a number of factors which affects e-learning success constructs were identified. These six factors include system, information and service qualities, use and user satisfaction as well as net benefits. A number of previous studies on e-readiness have empirically investigated these factors and were able to ascertain how the aforementioned factors highlight the relationship between e-readiness and e-learning success. However, none of these studies validated these factors based on robust theoretical constructs. In this work, in order to validate these factors, exploratory factor analysis (EFA) was deployed for the development of theoretical framework of e-readiness which led to proposed measurement scale.

EFA revealed that the use of e-readiness as a measure of the level of success of e-learning based on factors including technology, management, pedagogy, interface design and administrative and resource support, provided a better understanding of the relationship between e-learning success and e-readiness. The resulting instrument can serve as a tool to enhance the understanding of readiness prior to preparing and delivering online courses. By using confirmatory factor analysis (CFA), results indicated that the e-readiness measurement scale can work along with the e-learning success measurement scale adapted from the work of DeLone and McLean (2003). The overall results showed a very good fit for five factor of CFA model of e-readiness and six factors of e-learning success based on sample data drawn from Higher Educational Institutions in Saudi Arabia.

7.1.3 How does the relationship between e-readiness and e-learning success differ according to the group respondents which includes teachers, students, and administrators?

In this work, a comprehensive model of e-readiness and e-learning success which takes into consideration the unique attributes of teacher, student, and administrator in higher education institutions was developed. These three categories of attributes were considered as moderating factors. As highlighted earlier, the findings from this work did not differ from findings from previous studies, however the current work established the relationship between e-readiness and e-learning success using sound theoretical framework in which teachers, students and administrators were used as variables. This allows the generalisation of the applicability of theoretical framework to this type of problem to be ascertained. The results from this work supports the empirical validity of e-readiness as a measure for e-learning success based on the use of

SEM. The analysis of the structural model was extended to measure the differences between the three respondents group: teachers, students, and administrators.

Results of multi-group SEM analysis indicated that all of the three groups conceptualize the constructs of the measurement scale in a similar fashion. The unique attributes of teacher, student and administrator to achieve meaningful comparisons across groups was considered when using the structural model to test the relationship between e-readiness and e-learning success and were found to exhibit cross-group equivalence, with the invariance and variance achieved at different levels. The finding from this work further buttressed the universality of five dimensions of e-readiness to have significant effects on six dimensions of e-learning success as highlighted by DeLone and McLean (2003).

7.2 Study Contribution

The study have achieved its objective in providing several contributions to knowledge and practice, which can be summarized as follows:

•   Several studies on e-learning and distance education for higher education institutions in Saudi Arabia have been conducted by a number of authors including Alenzi et al. (2013); Hussain (2011); Onsman (2010); Siddiqi (2013). Most of these studies focused on barriers, benefits, implementation, attitudes and perceptions of the participants. The current work is the first of its kind to establish the relationship between e-readiness and e-learning success factors using tested and proven theoretical constructs based on structural equation modelling (SEM). This work explores seven dimensions that constitute component factors of e-readiness namely policy and institutional business strategy, pedagogy, technology, interface design, management,

administrative and resource support, and evaluation and continual improvement. It can be concluded that all higher education institutions in the world in general and in Saudi Arabia in particular need to focus on these dimensions when evaluating their level of e-readiness with the view to measure e-learning success. It can also be concluded that these seven dimensions correspond to the findings by Pittinsky & Chase (2000), who provided comprehensive guidelines for e-readiness factors that influence success in e-learning. The framework presented in this work analysed e-readiness from different perspectives such as organizational, strategic, technological and educational aspects.

- The study also proposed a framework for evaluating e-learning success based on DeLone and McLean (2003), who proposed a model for measuring e-learning success in higher education. The study relied on this model because a number of studies have adopted it to evaluate e-learning success factors. This model was based on previous studies in the same field and was based on well recognised factors and dimensions such as system, information and service qualities, use and user satisfaction as well as net benefits. Many empirical studies have approved the explanatory power of the model and the significance of adopting a multi-construct dependent measure of e-learning success within a CFA framework has been validated. Although this model has been confirmed in many studies, this current work aimed to confirm these results in the context of Saudi Arabia's educational higher institutions. One of the important contributions of this study is that it used the empirical analysis to confirm the results through the adoption of Confirmatory Factor Analysis.

• This study also contributed to knowledge by exploring the appropriate dimensions that constitute e-readiness through the use of exploratory factor analysis (EFA). The main objective of using EFA is to identify factors that fit the data obtained from higher education institutions in Saudi Arabia. To the best of the researcher's knowledge, there is no current work that has adopted the principles of EFA to highlight the relationship between e-readiness and e-learning success factors in the context of the higher education institutions in Saudi Arabia. Accordingly, the current work is the first to use EFA to establish the theory of how e-readiness can be used as a measure of e-learning success.

• Although this study did not sway from the narratives of previous studies in constructing the relationship between e-readiness and e-learning success, it differs from the previous studies in that it assesses the applicability of theoretical framework to different groups which is very crucial to judge generalizability of the results. Most of previous studies on e-readiness have empirically investigated these factors and established the influence of e-readiness factors in e-learning success, none of the previous literature indicated whether this relationship is appropriate for a group that depends on the invariance testing of the three groups engaged in e-learning: teachers, students, and administrators. This study constructed the relationship between e-readiness and e-learning success by using SEM to analyse this relationships based on a number of related variables. The study's main contribution lies in the fact it considers the unique attributes of teacher, student and administrator to provide meaningful comparisons across groups. The results indicated adequate cross-group equivalence, the

invariance and variance have achieved at different levels. The finding confirmed the universality of factors of e-readiness to have impact on e-learning success.

Overall, the current work introduced practical analytical approach by developing theoretical and conceptual models and testing these model using analytical approach to attain meaningful insights regarding the relationship between e-readiness and e-learning success in the context of higher education institutions across the Kingdom of Saudi Arabia. It is intended that the understanding derived from this work will deepen the knowledge of each of the dimensions identified. Indeed, for any e-learning initiatives to be successful, it is important that the level of e-readiness within the country of interest to be ascertained. Without that, opportunities to reap the full benefits of adopting e-learning may be missed. Although fragmented initiatives could emerge, a genuine systemic change towards attaining the full potential of e-learning will remain elusive. This work has shed more light on the relationship between e-readiness and e-learning success in the context of Saudi Arabia's higher institutions of learning and it is believed that it will help decision makers in such institutions to focus on the important aspects of e-readiness before embarking on future e-learning initiatives.

7.3   Limitations of the Study

Though the objectives of this study has been achieved, the present work suffers from a number of limitations as detailed below:

• Despite the care taken towards the design of the current work, it is still laced with certain limitations as with all forms of research. These limitations may inform future direction for further work on this topic. One of the limitations is that a single survey mechanism was used for the data collection used for measurement and

evaluation of key parameters and this has the ability to introduce elements of bias into the study. And although EFA was used to examine the models developed and the results were validated using CFA, additional work is needed to ensure that the level of bias in minimised to the barest levels. Secondly, the theoretical focus of this research didn't consider another constructs for e-readiness, thus, future studies must improve the imperfections underpinning the theoretical framework for analysing the impact of e-readiness on e-learning success in countries such as Saudi Arabia. Third, this study did not consider the gender differences in terms of disaggregating the data samples into male and female respondents. Gonzalez-Gomez et al. (2012) reported that male and female have different perspectives regarding their views and perception of using e-learning to access education. For instance, female students give more priorities to the overall planning towards delivering e-learning as compared to males. It is therefore important that the gender perspective is put into consideration when future research in this field are conducted. This is particularly important in a country like Saudi Arabia where males are segregated from females.

- This study is limited to Saudi Arabia, its findings may not be generalized to any other countries. Unless that there is a possibility to extend some of these results to other societies such as countries in the Arab Gulf because of their similar circumstances. There is a need to conduct such a study in other Arab countries as they share some of the ideas, traditions and ICT infrastructure similar to those adopted in Saudi Arabia.

• Although this study constructed a comprehensive theoretical model that included dimensions such as policy and institutional business strategy, pedagogy, technology, interface design, management, administrative and resource support, and evaluation and continual improvement considered in previous studies, and despite the efforts exerted by the researcher to confirm these dimensions in proportion to the data collected from the Saudi environment, there is a need to study each of these dimensions separately. Each dimension of this study can be considered as an independent variable which impact the success of e-learning and should be measured. This is important given that measuring each dimension at an individual level can increase efficiency and efficacy of managing these dimensions.

• Time is one of the most important determinants of this study. Although the size of the sample was considered appropriate and sufficient for the exploratory and confirmatory study, in addition to the analysis of constructional equations, the sample size may be considered as small compared to the number of students involved in e-learning. Because the researcher had little time to complete the study, the researcher sought to obtain a representative sample as much as possible. The researcher used the stratified method to represent the study population appropriately, taking into account the homogeneity of each class. However, the size of the selected sample is small for such studies. Accordingly, one of the recommendations for further research is to include a larger sample to be representative of the community and thereby yielding potentially more accurate results. One of the reasons for the small sample size was the lack of response from the respondents. Saudi Arabia is a large country, and it is difficult to reach distant universities. The researcher used the electronic survey method. Due to the

inability to conduct a direct survey, the responses collected were few. Nevertheless, the data sample used in this work was sufficient to establish the relationship between e-readiness and e-learning success in the context of Saudi Arabia's higher institutions of learning.

• Another limitation pertains to the level of awareness of participants i.e. the students and educators within the university regarding e-learning. This is because most of the students targeted were not fully enrolled on e-learning programs. Some are only enrolled on individual courses that are delivered online by the University. This suggest that most the responses recorded from this type of respondents may not be informed by their actual involvement and participation in e-learning but based on experiences drawn from elsewhere. It is therefore important that respondents are drawn from people who have a direct and first-hand experience in e-learning. As such, there may be some disparity in results when compared to research conducted based on people with direct experience in using e-learning as a means to access education.

7.4   Recommendations

The study aimed to evaluate the current state of e-readiness for e-learning success in higher education institutions in Saudi Arabia as perceived by its educators, students, and administrators. Accordingly, a number of recommendations which stems from the research carried out with the view to further enhance the success of e-learning in Saudi Arabia is provided in this section.

• At the initial stage of the development of the study instrument for this work, the validity and reliability of such instruments were examined and were adjudged

satisfactory after the analysis. Accordingly, decision makers can adopt this instrument as a basis to improve e-learning experience in their respective universities. This will allow them to have a deeper understanding of how factors including technology, management, pedagogy, and interface design as well as administrative and resource support can be harnessed to deliver quality e-learning experience. This will also allow newcomers into the world of e-learning to test the level of their readiness before embarking on e-learning strategies.

- Decision makers in higher education institutions in Saudi Arabia should focus on how they can make the best out of e-learning systems by ensuring that the right combinations of comprehensive technologies plan including hardware, software and other related aspects of an e-learning platform are put in place. This will encourage further interest in the adoption of e-learning by prospective students. For instance, the universities should have had its own personalized and interactive communication media and networks allowing learners to have their own secure, personal accounts. Furthermore, decision maker in higher education institution must ensure successful deployment and delivery of e-learning through gaining an understanding of the needs and requirements of students regarding their attitudes towards e-learning. Standard methods for delivering lectures via e-learning initiatives should be identified and implemented accordingly before actual delivery of e-learning courses.

- Universities should ensure that learners acquire and continuously develop their use of e-learning education. Top management members of the university community must support e-learning development within the institution. The websites

that support e-learning delivery should be informative by providing relevant materials about the university, including its programs and courses and how they will be administered during the program. A clear and informative e-learning plans will foster trust among potential students who wants to access education via e-learning.

• The higher education institutions in Saudi Arabia should supports learner's success through the organization of the working environment by getting learners to have access to relevant media for e-learning. E-learning courses should contain objectives that are specific, measurable, achievable/agreed, realistic/relevant and timed/timely (SMART). The user interface of the e-learning platform should be made easily accessible and user-friendly. Ease of learning, ease of use, understanding, trust and more importantly satisfaction are some of the key factors that can guarantee successful delivery of e-learning.

• Universities should developed their own policies and guidelines and ensure they are effectively communicated to all stakeholders including learners, educators and support staff, whilst providing adequate administrative support to facilitate the entire e-learning process. Additionally, support centres should be put in place so that students can easily lodge complain about any aspects of the e-learning they find difficult to access or understand. Several orientation programs and training workshops should be put in place with the view to train all members involved in e-learning.

•   It was established in this work that technology (i.e. faster internet connection, high-speed computers etc.) will play a vital role towards the smooth delivery of e-learning. However, technology alone cannot guarantee the success of e-learning. Robust management mechanism must be put in place to ensure that technologies are harnessed in manner that is accessible to students. Teachers and students must be given adequate training to access e-learning. Some of the important factors identified in this work including policy and institutional business strategy, pedagogy, interface design, management, administrative and resource support as well as evaluation and continual improvement must be integrated with technology to realise the full potential of e-learning.

•   The study revealed that policy and institutional business strategy, evaluation and continual improvement had less impact on the perception of participants. Many researchers have indicated that there is a lack of detailed institutional strategic plans for e-learning implementation in higher education institutions in Saudi Arabia. And although there are some individual initiatives building terms of strategic plans, however, such plans are not robust enough and do not provide enough details to drive an e-learning agenda. Against this backdrop, it is recommended that management put in place e-learning strategic plans detailing clear regulations, standards and procedures regarding the best way to derive benefits from e-learning and how student satisfaction can be improved. Currently there is a wide gap between the way e-learning strategies are implemented in other parts of the world and Saudi Arabia. Lesson must therefore be learnt from success stories around the world from which from the Kingdom of Saudi Arabia can imbibe towards advancing its own distance learning platforms.

• This study explores how the power of digital solutions can be explored to enhance e-learning. In doing so, it was revealed that e-learning success model based on the work of DeLone and McLean (2003) can provide guidance towards the design, deployment, development and delivery of e-learning. In order to ensure a very successful e-learning systems, decision maker in higher education institution can use this success model to improve their understanding regarding the definition, assessment and promotion of e-learning success. Decision makers can assess e-learning success based on the six dimensions identified in this work namely system, information and service qualities, use and user satisfaction as well as net benefits. Firstly, they should focus on the three quality dimensions to ensure success in system design. The use dimension is in the second stage to achieve success in system delivery. Finally, to assess system outcome success, they should focus on net benefits and user satisfaction dimensions. These dimensions can be assessed by using the items that were developed through the survey in this study. Based on this process, decision makers can explore the shortcomings and direct towards improvement these dimensions.

7.5   Further Research

Although the empirical study did not demonstrate the importance of institutional policies and business strategies, as well as evaluation and continual improvement. However, these two dimensions are considered to be the most important dimensions when assessing electronic readiness. The reason for the exclusion of these two dimensions is due to the empirical study using EFA, which revealed a weakness in the perception of the three sample categories of the importance of including e-learning in the policies of educational institutions and inclusion in their strategic plans. As for

continuous evaluation and improvement, many studies have pointed out that most e-learning initiatives fail because of lack of interest in continuous evaluation, which in turn leads to continuous improvements in the e-learning system in educational institutions.

Since continuous evaluation is one of the most important barriers, future research should address the impact of continuous assessment on the success of e-learning as well as policies and strategies. Furthermore, as highlighted earlier, it is important that this type of work is extended to other countries other than Saudi Arabia with the view to test the generalisability of the model in this research.

In addition, this study investigated a sample consisting of three categories. One of these classifications were students. The sample of students was chosen regardless of specialization, and the specialization was not considered when collecting the sample. It is therefore recommended that future researches should take specialty as a control variable in assessing the model given that views from people from different academic background and discipline might provide new insights not captured in this research.

There are a number of other factors that this research did not take into consideration. As such, it is recommended that future research work should explore the effects of factors such as technical competence, level of academic preparedness, learning preference, lifestyle to establish the relationship between e-readiness and e-learning success.

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Appendix

Part A: Demographic Variables

Please Check the appropriate answer

1	Gender	Male		Female
2	You are:	Student	Instructor	Administrator Staff

3	Educational Level	High School or Less	Diploma	University Degree	Post-Graduate
4	Have you previously participated in an e-learning program regardless of whether you are a student, a teacher, or an administrator?	Yes		No	
5	Are you currently enrolled in the e-learning program?	Yes		No	

Part B: E-Readiness

To what extent do you agree or disagree with the following statement?

#	Domian	Statement	Disagree Strongly	Disagree Somewhat	Don't Know	Agree Somewhat	Agree Strongly
	Institutional Policies and Business Strategies						
1		Our institution has an E- Learning Policies					
2		Top management's activities support e-learning development within the institution.					
3		The university receives financial resources from government sources and other sectors (grants, loans, donations, etc.).					
4		E-learning is an integral component of the university's pedagogical strategy.					
5		The university has Code of Conduct regulating e-learning procedures that is publicised and freely available to both educators, learners, and administrators.					
6		The university has common goals throughout the institution that are directed towards achieving organisational goals.					
	Pedagogy						
7		The university supports learner success through the organisation of the working environment.					
8		E-learning courses contain objectives that are specific, measurable, achievable/agreed, realistic/relevant and timed/timely (SMART).					
9		E-learning courses aligned to institutional strategies					
10		Learners have access to relevant media for e-learning.					
	Technology						
11		The university has a comprehensive technology plan.					
12		The university has the computer and related hardware, software necessary to facilitate e-learning.					
13		The university has its own personalised and interactive Communication Media and Networks allowing learners to have their own secure, personal accounts.					
	Interface Design						
14		The university has a website where existing and prospective learners can view available courses.					
15		The university website's interface provides learners with opportunities to create long-term learning plans.					
16		The university's website contains e-learning use interface features.					
17		The university's website navigation is simple and user-centric.					
	Management						

#		Statement					
18		The university positions and promotes the virtual learning environment VLE so that it becomes habitual for learners to use it outside of the classroom.					
19		The informative site provides information about the university, including its programmes and courses.					
20		Educators have adequate information and communications technology (ICT) knowledge.					
21		Educators are provides with support resources on using learning objectives to guide e-learning design and development.					
22		The university ensures that learners acquire and continuously develop their use of e-learning education.					
23		Educators have a Sufficient Time to Provide E-Learners with One-to-One Feedback					
24		The university has the research/test to indicate learners' personal characteristics influencing their competencies and attitudes toward e-learning.					
	Administrative and Resource Support						
25		The university provides Administrative support to facilitate E- Learning Process.					
26		The university developed its own policies and guidelines; they are communicated to all stakeholders groups including learners, educators, and support staff.					
27		The university has advise and support centre (the office or department providing student academic services related to course selection, finding a major, study skills, and referrals to tutoring and academic success skills)					
28		The university has the Instructional Support Centre that is staffed by professional consultants who provide free one-on-one consulting services to educators and learners on the use of instructional technology tools to complement teaching and learning.					
	Evaluation and Continual Improvement						
29		The institution has policies and guidelines regarding the assessment of students that the course instructor must follow					
30		The institution has rated overall performance of the individuals, support staff, and administrative support services involved in the delivery and maintenance stages of e-learning according to the scheme offered.					
31		The institution has Evaluation of E-Leaning at Programme and Institutional Levels					

Part C: E-Learning Success

To what extent do you agree or disagree with the following statement?

#	Domian	Statement	Disagree Strongly	Disagree Somewhat	Neutral	Agree Somewhat	Agree Strongly
	System Quality						
32		I was able to navigate through the course website to find what I needed to complete the course.					
33		I was able to access course materials.					
	Information Quality						
34		The instructor outlined in reasonable detail course requirements and grading procedures.					
35		The instructor organized the presentation of the course material in an effective manner.					
36		The instructor demonstrated good knowledge of the subject matter.					
	Service Quality						
37		Grading in the course was fair and consistent.					
38		Assignments were distributed fairly throughout the semester.					
39		Graded assignments, test, etc., were returned promptly.					
40		Graded assignments included helpful comments from the instructor.					
41		The instructor could be contacted for consultation.					
42		The instructor satisfactorily answered questions.					
43		The instructor facilitated student participation in course activities.					
44		Email contributed to my understanding of the course content.					
	Use						
45		Printed materials contributed to my understanding of the course content.					

46		Posted discussions contributed to my understanding of the course content.					
47		PowerPoint (R) slide presentations contributed to my understanding of the course content.					
48		Audio taped presentations contributed to my understanding of the course content.					
49		Video taped presentations contributed to my understanding of the course content.					
50		Course assignments contributed to my understanding of the course content.					
	User Satisfaction						
51		I am satisfied about the overall value of this course.					
52		I am satisfied about the overall quality of teaching by the primary instructor in this course.					
	Net Benefits						
53		The course strengthened my ability to analyze and evaluate information.					
54		The course helped me to develop the ability to solve problems.					
55		I gained an understanding of concepts and principles in this field.					
56		The course stimulated me to read further in the area.					