
# Towards improving teaching and learning in colleges of education using mobile learning – The Nigerian perspective

**By**

**John Gyang Chaka**
**213573272**

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**School of Management, IT and Governance**
**College of Law and Management Studies**

**Supervisor: Professor Irene Govender**

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# Declaration

I, John Gyang Chaka declare that

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# Dedication

This research work is dedicated first to God almighty who is the source of my inspiration, strength and wisdom.

I also dedicate this study to my mother Patricia Maria Gyang Chaka who has committed all her life to seeing that I succeed in all endeavours.

This research is also dedicated to the memory of my father, the late Gyang Davou Chaka. May God continue to grant his soul eternal rest.

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To God I give honour and glory.

# Abstract

The teaching and learning conditions, for example classrooms, learning materials, and manpower in colleges of education in Nigeria, which were established with a mandate to train foundation-level (primary school) teachers, are grossly inadequate. Compounding the situation is the high population growth and the high level of insurgency in Nigeria. The result is poor access to education, inadequate training of teachers and an overall negative effect on nation building. This study considers m-learning (mobile learning), as one viable way of addressing some of the challenges. To explore this possibility, the study is conducted in two stages. A mixed methods approach is employed across the entire study. The main research strategies used are surveys and interviews while observations are used in some cases. The preliminary stage investigates the perceptions of stakeholders or possible factors that may influence their intention to use m-learning. Study samples of 375 and 30 were used for the quantitative and qualitative components respectively. First, the preliminary study explored the experiences and usage of mobile devices by stakeholders, thereafter, their perceptions or factors that may have some influence on their intention to use mobile learning and social networking sites were ascertained. The second stage tests the implementation of the m-learning approach in four courses in colleges of education using study samples of 330 and 15 for the different components. While the preliminary study is guided by UTAUT (a subset of the conceptual framework), the second stage is underpinned by the entire conceptual framework derived from UTAUT, information systems success model and educational use of the *Facebook* model. Descriptive statistics and structural equation modelling (SEM) are applied to analyse the quantitative data while the qualitative data is analysed using content analysis aided by Nvivo. Findings from the preliminary stage reveal that stakeholders are positive about mobile learning, signalling their readiness to accept the technology. In the final stage, the study reveals that m-learning significantly improves the teaching and learning conditions in colleges of education, specifically by reducing the inadequacies of physical facilities, and by improving the reading culture and performance of students. The results further indicate that most of the stakeholders are satisfied with the benefits of m-learning and wish to continue using the technology. The research also contributes to theory and practice, extending m-learning implementation literature, through the development of an m-learning implementation model, which will be of value to colleges of education in Nigeria and beyond.



**Keywords:** Colleges of education; Mobile learning; Mobile learning acceptance; Mobile learning implementation; Mobile learning model; Technology enhanced learning

# Derived publications and presentations

## Publications

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## Presentations

Chaka, J.G. & Govender, I. The prevalence of social networking sites in Nigerian higher education institutions: The case of Colleges of Education. Presented at the 4th Business Management Conference (BMC) held on 24th – 26th August, 2016 at Riverside hotel, Durban, South Africa.

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# CHAPTER ONE
# INTRODUCTION

## 1.1 Introduction

This study examined the use of mobile learning to improve the teaching and learning conditions in Colleges of Education with specific reference to the Nigerian perspective. The role of Colleges of Education in the education sector of Nigeria is crucial in that these institutions are responsible for developing and educating the primary and junior secondary school teachers, who in turn are educators of the country. However, like other tertiary institutions in the country, colleges are unable to attain the objectives for which they were established in view of challenges that are associated with traditional teaching and learning practices (Obomanu, 2011; Tella, 2011). This study extends research in the discipline of information systems through the integration of mobile learning into the current teaching and learning practices.

## 1.2 Background of the study

Three key words can be taken from the definition of education. These are: moulding, sustenance, and impact. The implication is that education can only make a positive impact on society if the moulding process is sustained. The condition under which this objective can be achieved is that there must be a balance among three components – students, lecturers and the teaching and learning environment (Adegbesan, 2010). Students need to be educated and teachers need to teach, but the ratio of students to teachers must be in line with the prescribed standards. Similarly, the teaching and learning environment, be it teacher-centred, learner-centred or hybrid, it must be adequate (Moore, Dickson-Deane, & Galyen, 2011; Watson & Watson, 2007) for effective teaching and learning to take place.

Nigeria is one of the largest and most populous countries in Africa (Ifenkwe, 2013). As at 2016, Nigeria's population was estimated to be about 186 million people. This ranks the country in the seventh position in the world in terms of population numbers (Worldometers, 2016). In recent years, parts of the country have been witenessing a series of ethno-religious crises as well as various acts of religious violence. A typical

example is the activities of the *boko haram*, a Nigerian-based Islamic group. The group's initial goal was said to be the propagation of the true teachings and Jihad of the Prophet Mohammed, but later it extended its scope towards replacing the current governance of Nigeria with an Islamic administration (Falode, 2016; Walker, 2012). Literaly, *boko haram*, which is in the Hausa language, means 'western education is sin or prohibited'. Otoo (2015) states that most of the victims of the *boko haram* sect are schools. Many schools including primary, secodary, and tertiary educational institutions have been destroyed. Perhaps, one of the most devastating acts of the sect was the kidnapping of about 276 secodary school girls in April, 2014. More recently, precisely on November 29, 2016, a College of Education in Kaduna State (North-Western Nigeria) was reported to have annouced an indefinite suspension of academic activities due to the level of insecurity around the institution (*DailyTrust, 2016)*. These challenges have made education difficult to access for most Nigerians.

Ya'ardua_Foundations (2013) reports that a substantial number of Nigerian youth (aproximately 26 million) have no access to education. Similarly, the united nations education, and scientific corporation – UNESCO (as cited in Otoo (2015)) states that Nigeria now leads the world in terms of the number of people that have difficulty in accessing education. This is largely due to terrorist activities.

The inadequacy of the teaching and learning enviroments in most educational institutions especially at the tertiary level may have aggrevated the situation. Most higher education institutions in the country lack the needed facilities, for example classrooms, books and other relevant instructional materials (Asiyai, 2013; Ilogho, 2015; Jaja, 2013; Okojie, 2013). In addition, most Nigerian higher education institutions still depend on traditional teaching and learning methods, which are largely constrained to the use of physical structures such as classrooms, libraries, and workshops, having face-to-face contact with students. This makes it difficult for the Nigerian education institutions to handle the increasing number of candidates who seek education. Serbessa (2006, p. 129) describes the traditional teaching method as the "chalk and talk" lecture approach where the students are passive recipients of knowledge. The teacher is at the centre of the teaching process using a rigid curriculum structure to teach all students in the same manner (Ahmed, 2013; Bishara, 2015).The problem with the traditional teaching and learning practices is that access to education, depends on availability of physical infrastructure such as classrooms while learning depends on the teachers' competence. Thus, Clark

and Ausukuya (2013) observe that the insufficient number of teachers in most higher education institutions has resulted in teacher-student ratios as high as 1:356 in some cases, as against the recommended ratio of 1:25. This has affected not just the quality of training and performance of existing students, but also the enrolment of new students thereby increasing the access gap to education in the country. These problems affect all categories of higher education institutions including universities, polytechnics and colleges of education (Adu, Eze, Salako, & Nyangechi, 2013).

On closer examination of the situation, the challenges seem to emanate from poor funding which in turn results in inadequate physical facilities (classrooms, laboratories, workshops); poor staff welfare, the 'brain drain' of educated professionals; and poor library facilities – limited books, journals and other learning materials. Other aspects are either inappropriate or poor implementation of educational policies, increasing population growth rate with the consequent shortage and overstretching of already lean resources, and high dependence on traditional teaching and learning practices – exacerbating the challenges of the institutions.

Unfortunately, the economy of the country which depends mainly on oil is currently on the decline due to the falling prices of oil in the international market. This means that building of more classrooms, acquiring books and hiring enough lecturers to cater for the growing population is a dream that is farfetched. Even so, the level of insecurity remains a serious threat to the traditional teaching and learning environment. One option which is believed to be viable is minimizing the dependence on traditional teaching and learning practices. Some scholars have suggested the introduction of information and communication technologies (ICTs) as a way of narrowing the boundaries of time and location which are associated with the traditional teaching and learning method (Adewole & Fakorede, 2013; Ayodele & Oyewole, 2012). The inadequacy of power supply is another challenge. In this regard, mobile learning is seen as a viable option in view of the fact that mobile devices do not require as much constant power supply as computers (Adedoja, Botha, & Ogunleye, 2012; Madu & Pam, 2011). M-learning is seen as a form of e-learning which can occur anywhere and relies on mobile devices, such as mobile phones, PDAs, smart phones, and other portable electronic devices. (El-Hussein & Cronje, 2010; Oller, 2012). Several studies across the world (for example, Aker, Ksoll, & Lybbert, 2010; Valk, Rashid, & Elder, 2010) have indicated positive results in the application of mobile learning. Studies have suggested that the rapid growth of mobile

phone networks, the multimedia facilities built into phones as well as the Web 2.0 Internet technology are poised for the use of mobile devices as effective learning devices (Goundar, 2009; Trayek & Hassan, 2013; Warschauer, 2011). In line with these developments some models for the implementation of mobile learning have been proposed (Ako-Nai & Tan, 2013; Mogire & Oboko, 2013; Tan, Zhang, Kinshuk, & Mc-Greal, 2011; Toktarova, Blagova, & Filatova, 2015).

Similarly, some studies from the Nigerian perspective, which have been conducted mostly in universities have also indicated positive results in terms of mobile learning (Adedoja, Adelore, Egbokhare, & Oluleye, 2013; Adedoja *et al.*, 2012; Ogbuju, Mbanusi, Chukwu, & Onyesolu, 2012; Taiwo & Downe, 2013; Utulu & Alonge, 2012). Reports from the different studies seem to suggest that mobile learning may be an option to explore in tackling the problems of teaching and learning in Nigerian higher education institutions.

## 1.3. Statement of the problem

The previous section has established that mobile learning is an option that can be explored in order to limit the challenges that confront higher education institutions across the world. However, Traxler (2007) states that mobile learning adoption depends to a large extent on such factors as the environment, the culture and the infrastructure of the study context. From the Nigerian perspective, most of the studies with regards to mobile learning have been conducted in universities, which of course have different infrastructure and different philosophies from other higher educational institutions, specifically Colleges of Education.

Colleges of Education in Nigeria have the mandate to produce quality teachers to meet the shortage of teachers at the primary and secondary levels of education – placing them strategically in the education structure as they produce the foundation level teachers (FGN, 2014). However, as prevalent in other higher education institutions, while the number of in-service teachers in Nigerian schools is grossly inadequate, and the number of students seeking admission into higher institutions is escalating, the structures and learning conditions in the Colleges of Education are not coping with these challenges (Asiyai, 2013; Bamiro, 2012; Ogunyinka, Okeke, & Adedoyi, 2015; Tella, 2011). As has been alluded to in the previous section, the needed manpower, classroom facilities and

learning materials are inadequate, while the institutions continue to depend mainly on the traditional teaching and learning practices. Simply put, two out of the three vital components in the educational system (teachers and learning environment) are in poor condition. This has put teacher education in the forefront – the foundation of education being primary and junior secondary is in danger, and since every professional is a product of a teacher, it means that the entire nation is at risk.

More importantly, as earlier pointed out by Traxler (2007), existing mobile learning implementation models have not incorporated the peculiarities of formal education and environmental issues such as policies, training and confidence-building in view of inadequate skills and inertia, as well as low technological affordability. Therefore, this study asked the question:

*How do stakeholders in colleges of education perceive mobile learning and to what extent can it be used to improve the teaching and learning in colleges of education in Nigeria?*

## 1.4 Research questions

To understand clearly and to address the problem in focus, the main question/problem has been broken into two sub-questions as stated below:

1. What are the perceptions or possible factors that can affect the intention to use mobile learning in colleges of education in Nigeria?
    a. How are stakeholders using mobile devices?
    b. To what extent do the perceptions of stakeholders and associated factors affect their acceptance or intention to use mobile learning?

2. How can the acceptance factors and success factors work together towards the effective implementation of mobile learning in colleges of education?
    a. To what extent do the acceptance factors (performance expectancy, effort expectancy, social influence, mobile learning conditions, anxiety & personal innovativeness) jointly with user satisfaction influence the behavioural intention of participants?
    b. To what extent do mobile learning conditions, behavioural intention, and user satisfaction influence the actual use of mobile learning?

c. How does the actual use of mobile learning and user satisfaction result in an improved educational system?

## 1.5 Objectives of the study

The research questions were aimed at achieving the following objectives:

1. To understand the readiness of stakeholders by ascertaining the manner in which they use their mobile devices and how their perceptions or possible factors can influence their willingness or intention to use mobile learning.
2. To ascertain the extent to which the various acceptance factors (performance expectancy, effort expectancy, social influence, mobile learning conditions, anxiety & personal innovativeness) and success factors (actual use of mobile learning, user satisfaction & improved educational system) work towards the effective implementation of mobile learning in Colleges of Education.
3. To propose a framework for the implementation of mobile learning in Colleges of Education.

## 1.6 Significance, justification and contribution to knowledge

Babatunde and Ogedebe (2012) state that one of the key parameters for attaining the vision 20:2020 (that is, a vision to be among the world's top 20 economies by the year 2020) is a modern and vibrant education system that will provide the opportunity and facilities to enable all Nigerian citizens achieve maximum potential to support the country's human resources capacity. Thus, if education is the bedrock of development in any nation (FGN, 2014) then the teacher is the nation builder. Therefore, the need to reposition Colleges of Education in order to ensure quality and sustainable teacher education is inevitable. In line with the suggestions of Liverpool, Marut, Ndam, and Oti (2010) and Traxler (2011), exploring the possibility of adapting emerging learning technologies towards supporting and sustaining education, based on the peculiarities of the local environments, makes more sense in this context. As mentioned earlier, a major part of the problem is the high dependence on traditional teaching and learning practices. For this reason, this study is significant as it will assist in improving the teaching and learning conditions in colleges of education. Specifically, the study seeks to improve access to education by shifting from the traditional teaching and learning practices which

are limited by the boundaries of time and location. Secondly, the reading and research skills of students may improve as a result of frequent written communication and interaction with teachers and other colleagues. Overall, access to education, the quality of training and teachers produced will improve. By extension, the nation and perhaps other parts of the world will be affected positively.

In addition, the study makes a contribution to knowledge in terms of the implementation of mobile learning. Consequently, the study proposes a model that will guide the implementation of mobile learning, which takes into consideration salient components such as policy integration, capacity and confidence building, and freeware applications such as social networking sites in view of affordability. This model is considered unique because it takes into account the peculiarity of the context through integrated policies and provides room for the realignment of stakeholders with the new technology through training and orientation. In addition, the model provides specific indicators for measuring the success of mobile learning, which other models in the literature did not clearly highlight. This aligns with the suggestions of Ogboru (2008) and Ogundipe (2012). Hsu, Ching, and Snelson (as cited in Hsu and Ching (2015) that more research or ideas are required in terms of conceptual and theoretical guidance to support the design and implementation of mobile learning. Therefore, the ideas that are brought into this model will not only facilitate the use of mobile learning in Colleges of Education but will also contribute to knowledge and further research in the domain of information systems and technology.

## 1.7 Scope and limitations of the study

The study was conducted in Colleges of Education in Nigeria. Specifically, the North-central geopolitical zone of the country was used. The zone was selected by virtue of its central location in addition to the fact that the federal capital city of the country – Abuja is located in the zone. Therefore, the zone incorporates the diverse cultures of the country, which gives it the status of being a miniature Nigeria.

The major limitation is the large size of the country and the scattered distribution of Colleges of Education across it, which posed a financial challenge. This motivated the limiting of the study to the selected zone.

## 1.8 Overview of methodology

In line with the research questions and objectives earmarked, the study had two main sections, with each section addressing one of the two research questions. The first section is a preliminary investigation which addressed the first research question. Two main issues are addressed in the preliminary study:

i. the experiences of stakeholders in using mobile devices and the manner in which they use the mobile devices; and
ii. the perceptions or views of stakeholders towards mobile learning which suggest the factors that affect their acceptance to use the technology.

The preliminary investigation followed a mixed research approach. A quantitative method was used to ascertain the experiences of stakeholders in using mobile devices and the manner in which they use the devices while a qualitative approach was used to assess the perceptions of stakeholders and the factors or reasons behind the perceptions. The quantitative strand in the preliminary investigation followed the survey research strategy while the qualitative strand followed the grounded theory research strategy. Questionnaires were used to collect quantitative data while interviews and observations were used to collect the qualitative data.

The second aspect of the study addressed the second research question. This aspect also followed a mixed research design approach. Again, the questionnaire was used to collect quantitative data while mainly interviews were used to collect qualitative data. The researcher also made some observations, which were used to support the qualitative data.

Partly based on the outcome of the preliminary investigation, the study was guided by a conceptual framework developed from a combination of the unified theory of acceptance and use of technology (UTAUT), Information Success (IS) theory, and the educational use of *Facebook* model. A detailed explanation of the research methodology is presented in chapter five.

## 1.9 Structure of the thesis

The thesis consists of nine chapters as described below.

***Chapter one: Introduction***

The chapter gives a general overview and background of the research. It presents the statement of the problem, the research questions to be addressed and the objectives that the study aims to achieve. In addition, the chapter highlights the significance, justification of the study and its contribution to the domain of knowledge. The chapter also presents the scope and limitations of the study, and lastly the abridged version of the research methodology.

***Chapter two: Literature review – Overview of Nigerian education system***

Chapter two reviews the educational policies in Nigeria with a view to unravelling the challenges that have hindered the attainment of its objectives, especially at the tertiary level of education. The chapter also reviews attempts that have been made to limit the challenges and further suggestions that have been made on the way forward.

***Chapter three: Literature review – Technology enhanced learning***

Chapter three reviews the concept of technology enhanced learning, specifically mobile learning and the extent to which it has been used to support teaching and learning globally and in the Nigerian context in particular. The chapter also reviews the application of social networking sites in facilitating teaching and learning also from the global to the Nigerian perspective. Mobile learning implementation models that have been proposed are also reviewed in the chapter with the aim of ascertaining their suitability.

***Chapter four: Theoretical framework***

This chapter presents the conceptual framework that is used to guide the study. The chapter first reviewed three theoretical frameworks – UTAUT, IS success model and educational use of *Facebook* models from which the conceptual framework of the study emerged. Thereafter, the conceptual framework that has been developed for use in the research is presented and explained.

***Chapter five: Research methodology***

The fifth chapter presents a full description of all the processes that are followed in carrying out the research. The chapter discusses the various research approaches, designs and methods that are adopted in the entire study.

***Chapter six: Data analysis and results for preliminary investigation***

Chapter six deals with the analysis and interpretation of results from the preliminary investigation. Specifically, the chapter presents the analysis of the perceptions of stakeholders on mobile learning and the reasons that they based their views or opinions on. In addition, the chapter analyses the factors that may influence the educational use of social networking sites by stakeholders.

***Chapter seven: Data analysis and results for the implementation stage of m-learning***

Chapter seven presents the results of analysis, their interpretations and discussion for the second and main aspect of the study, which tests the implementation of mobile learning using *Facebook* as the learning platform. The results of the quantitative component are first presented and interpreted after which the qualitative component follows. The two data components are then discussed together. The chapter ends with a proposal of a model for the implementation of mobile learning.

***Chapter eight: Discussion of findings***

Chapter eight presents a discussion of the major findings from the study. The discussion is presented in line with the various sub-questions that are addressed in the study.

***Chapter nine: Summary recommendations and conclusions***

Chapter nine is the last chapter in the study. The chapter first presents a summary of findings from the literature. Thereafter, the summary of findings from the two stages of the study is presented with a conclusion drawn for each stage. The limitations of the study and contribution of the study to knowledge and research are also presented in the chapter. Finally, the chapter presents a general conclusion of the entire study, which is followed by some recommendations.

# CHAPTER TWO
# THE NIGERIAN TERTIARY EDUCATION SYSTEM AND CHALLENGES

This chapter looks at the Nigerian educational system, in particular at the tertiary level, pedagogical methods, the roles and objectives of Colleges of Education, and the challenges that have hampered the attainment of objectives of these institutions. It also reviews some attempts that have been made to address these challenges. To begin with, a brief background is given on the country – Nigeria.

## 2.1 Brief background on Nigeria

Nigeria became an independent country on October 1st, 1960. The country is regarded as the giant of Africa in view of its land mass and population (Ifenkwe, 2013). Based on the 2006 census, Nigeria's population was estimated to be slightly above 140 million and projected to about 164 million by 2011 (Kale, 2012). However, UN_Embassy (2012) estimated the country's population at about 168 million, implying that it accounts for about half of West Africa's population. As at 2016, the country's population is estimated to have risen above 186 million people, which places Nigeria in the seventh position in the world in terms of population numbers, (Worldometers, 2016).

Nigeria is divided into six (6) geopolitical zones. The zones include North-East, North-West, North-Central, South-East, South-West and South-South geopolitical zones. It is further subdivided into 36 States excluding the federal capital territory (FCT) – Abuja. The country has a number of natural resources with oil serving as the main source of income for the country. Other resources include natural gas, tin, limestone, iron ore, coal, and arable land for farming.

It has well over 250 ethnic groups with Hausa and Fulani accounting for 29%, Yoruba (21%) and Igbo (18%) among the three main languages. The country also has over 500 languages, with English as the official language (UN_Embassy, 2012).

The country recognizes three forms of education: informal, non-formal and formal (Ifenkwe, 2013). Ifenkwe explains that informal education is a type of education that is obtained informally under the supervision of adults. It involves activities such as

listening, watching and imitating demonstrations. Informal education is found in mostly home settings. Non-formal education refers to literacy, post-literacy and vocational training programmes. Formal education on the other hand is an organized curriculum-based training which is obtainable in institutional settings.

The country's education system is guided by an education policy known as the National Policy on Education (NPE).

## 2.2 The Nigerian formal education system

Education is the act of conveying knowledge to learners with the aim of building their minds and characters. Fafunwa (1982) sees education as the accumulation of all processes required to develop the qualities, abilities or other characteristics of learners to enable them to contribute positively to the society in which they live. Similarly, Obomanu (2011) states that education is a sustained process of building an individual's mind, of developing their potential and their behaviour through a continuous teaching and learning process within an appropriate environment. These two definitions of education have been carefully selected because they fall in line with the philosophy of the Nigerian education as specified in national education policy (FGN, 2014). The definitions clearly highlight three important points that align with the Nigerian education policy, which are:

i. education is a moulding process;
ii. the moulding process must be sustainable; and
iii. education should have a positive impact on the individuals involved and on the society. Society in this context could be local or global.

The above points seem to follow one another chronologically. The foregoing suggests that if education is adequately sustained, the entire society improves. Hence education is seen as a vital tool for national development (FGN, 2014), which raises the question – what does sustainability imply? Literally, sustainability implies maintainability. Adegbesan (2010) states that for an educational system to achieve its purpose, that is to be sustainable, there should be a balance between students, teachers and the environment. This implies that a sustainable education depends on the learner, teacher and environment. These three components work in a mutually inclusive manner (Peters, 2010). An inadequacy in any of the components will impact negatively on the process and by implication the society. The learner is one who is being moulded while the teacher is the

moulder. Traditionally, the teacher is one who coordinates the process of teaching and learning. He or she is the hub in any educational process while the learner remains a passive listener. However, Peters (2010) regards education as a reform which has no particular process. He argues that education can be attained by reading books, exploring the environment, travel and conversation or through physical interaction in a classroom. The implication of this according to Peters is that teaching requires a learner but that learning can still take place without teaching. This is not to say that the teachers are not crucial in learning, but rather that their role can be flexible. The teachers can serve as a moderator and/or a content provider. To assume these roles, the teacher must be well-prepared, which may have implications for the teacher training process.

The third component, which is the environment, serves as an interface between the teacher and the learner. The environment consists of infrastructure that can facilitate teaching and learning, and is highly dependent on the teaching and learning methodology (Moore *et al.*, 2011). Without a good learning environment, no meaningful educational process can take place.

It can be deduced from the above discussion that education is the bedrock of human and national development and that it is a continuous process, which requires an appropriate environment for it to be efficient. Emphasizing the importance of education, Jaja (2013) states that education is the best legacy that nations can provide for their youth. Okojie (2013), for his part, states that education and training are two different forms of developing human resources, which a wise nation must lay emphasis on in order to achieve rapid growth and development. Similarly, Crescente and Lee (2011) state that education has a direct link to development, hence most countries in the world are showing a lot of commitment to their educational policies. In other words, good educational policies presuppose a good educational system. This implies that its operations must be guided by rules and policies. In a like manner, Ogboru (2008) states that educational policies provide guidelines or a direction in which the educational sector of a country should move so that efficiency and productivity are enhanced to enable the country to attain the needed development. The Nigerian *National Policy on Education (NPE)* serves this purpose. A walkthrough of the NPE may shed more light on this endeavour.

### 2.2.1 Nigerian education policy

As mentioned earlier, the Nigerian education system is guided by the *National Policy on Education (NPE)*. According to Imam (2012), this Policy on Education (NPE) was officially flagged off in 1977 under the military government. In 1981, the policy was revised, giving rise to the second edition, which made education compulsory through the introduction of *Universal Primary Education* (UPE). Nwagwu (2007) states that the third edition of the policy, which was introduced in 1988 recognized the role of technology in national development. Further revisions of the policy emerged in the fourth edition (2004), fifth edition (2007), sixth edition (2013) and in the latest seventh edition (2014).

Some of the cardinal goals of education as stated in the Nigerian education policy document is the equipping of citizens with appropriate skills; developing their mental, physical and social capabilities and competencies that will enable them to be resourceful to contribute positively to societal development (FGN, 2014). This document also acknowledged the vital role of ICT in modern society and approved its integration into the education curriculum beginning from the primary school level. The current policy on education recognizes four (4) levels of formal education, which are early childhood education, the basic education, senior secondary education, and tertiary education.

The early childhood, also known as the pre-primary level of education takes care of education that occurs prior to primary education. The school-going age at the early childhood education is between the ages of 3 – 5 years. Education at this level is provided by government, private individuals, corporate organizations, communities as well as religious bodies.

The basic education level comprises the primary and junior secondary schools education, which spans a period of nine (9) years of learning. Under the *Universal Basic Education (UBE)* law, basic education is compulsory, universal and free.

Senior secondary education is designed for those who have successfully completed the junior secondary level. It is meant for ages 15 to 18 years. This level of education is more comprehensive with a 3 year core-curriculum, which is aimed at broadening the knowledge and outlook of pupils preparing them for future academic pursuit.

The fourth and last level of education in Nigeria is tertiary education. This level of education follows secondary education. It includes Universities, Colleges of Education,

Polytechnics, and Monotechnics. It is meant for people who are 18 years and above. Figure 2.1 shows the structure and hierarchy of the Nigerian formal education system.

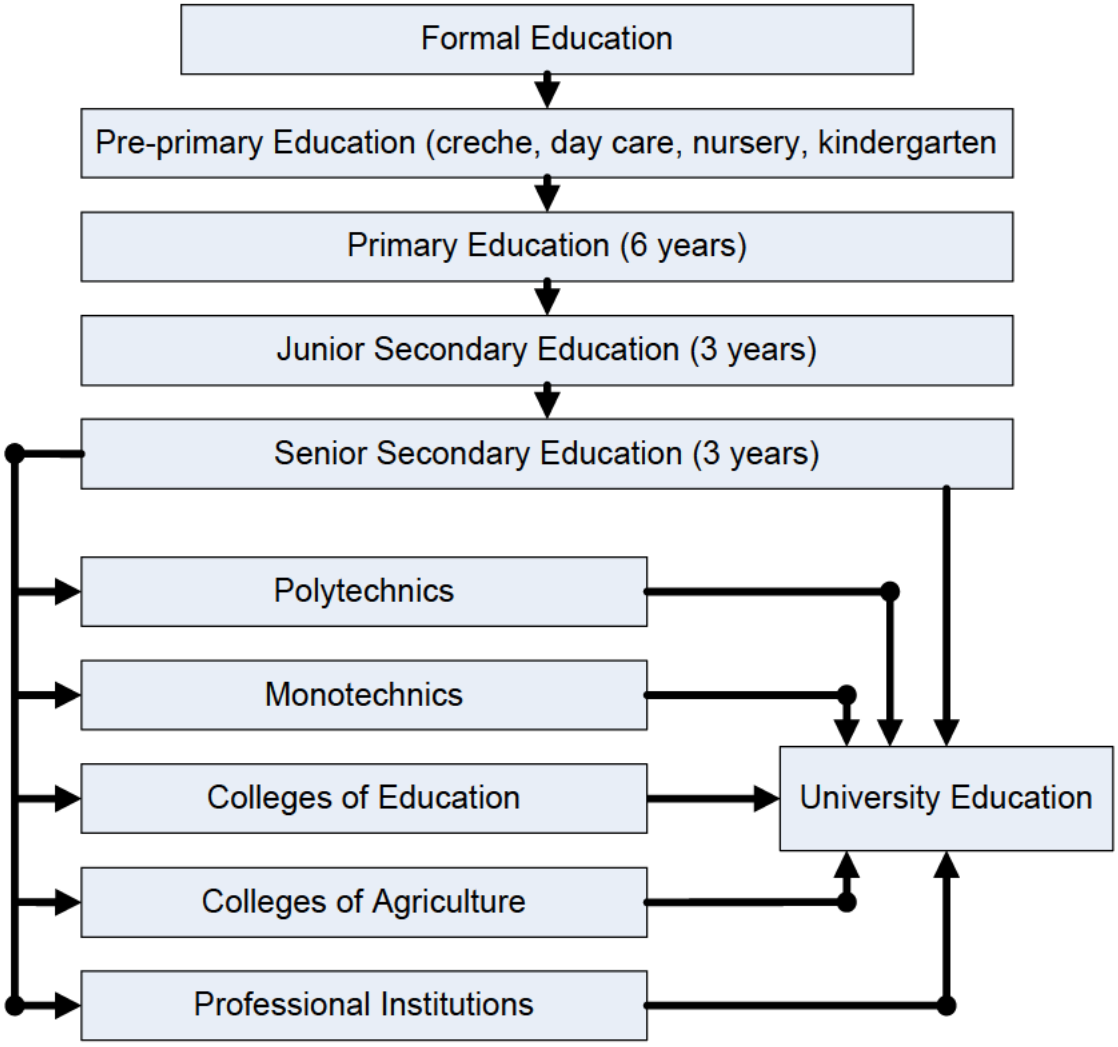


**Figure 2.1: Nigerian formal education structure (Ifenkwe, 2013, p.11)**

The national policy on education recognizes tertiary education as the level of education that enables an individual to realize his/her full capacity. For this reason, the study discusses the goals of this level of education in more detail, specifically the three most popular institutions (Universities, Polytechnics, and Colleges of Education).

### 2.2.2 Goals of tertiary education

The general goal of tertiary education as stipulated in the *National Policy on Education* (FGN, 2014) includes the provision of high level man power training that enables the individual to become self-reliant, appreciate the local and external environment, and contribute meaningfully to national development.

Specifically, Universities have the mandate to develop high-level manpower for the developmental needs of the nation. In addition, Universities are expected to engage in relevant research that will be meaningful to government and industries. Polytechnics have the responsibility of training middle level engineers and technologists for industries, while Colleges of Education are vested with the responsibility of teacher education. The main function of Colleges of Education is the training of quality and efficient teachers; and the inculcating of good skills and a sense of commitment in them so that they can feel enthusiastic about being in the teaching profession. The products of Colleges of Education are primary and secondary school teachers. In view of the importance of this profession, the *National Policy on Education* (FGN, 2014, p. 30) states that teacher education should be strategically positioned in the educational plan "since no education system may rise above the level of her (sic) teachers". By implication, the entire education system and nation by extension depend on teacher education.

Unfortunately, the journey towards attaining the objectives of education across all levels has been without the much-needed results. Despite the central role that education plays in national development, the Nigerian education system has not moved forward as expected. Nwagwu (2007) states that the needed development in Nigeria has not been attained, because the education system has not yielded the desired results. Ayodele and Oyewole (2012) concur that most of the problems that are hampering development in Nigeria, such as growing urbanization and rural neglect, youth unemployment, high levels of poverty, a high rate of crime and other societal vices as well as terrorism and insecurity are as a result of the lack of a vibrant educational system. They maintain that a solid educational system is the solution to these challenges. Corroborating this position, Obomanu (2011) suggests that urgent steps are required to remedy the country's education system, which is in a near state of collapse.

Therefore, some of the major challenges that are confronting the Nigerian education system, more especially tertiary education, are discussed in the following section.

### 2.2.3 Challenges confronting tertiary education institutions in Nigeria

***Poor funding and inadequate infrastructure and learning materials***

Most of the challenges that are confronting education, specifically at the higher education institutions are rooted in inadequate funding. Jaja (2013) asserts that the budgetary allocation to education in Nigeria falls far below expectations. He adds that the sector has

witnessed a serious decline in funding in recent years resulting in the decay of infrastructure and lowering the morale of stakeholders. Odia and Omofonmwan (2007) observed that the inadequacy of learning materials in Nigerian tertiary institutions has given rise to various kinds of extortion from students in the name of handouts and other learning materials, which they said could further lower the academic ability of students. Almost a decade has passed since their study, and the situation appears to be worsening. It is observed that the effect of poor funding has manifested itself in other areas such as inadequacy of classrooms and lecture halls, laboratories, workshops, erratic electricity supply, and fewer library holdings such as the latest books and journals (Ilogho, 2015). This position affirms the earlier findings of the committees on needs assessment for Nigerian public Universities (CNANPU, 2012) and those of other tertiary education institutions.

While commenting on the situation, Okojie (2013, p. 16) states that the needs assessment committee report of 2012 reveals that:

> *The Nigerian university system continues to lag terribly behind the competitive standards in the contemporary world. Engineering workshops which are meant to train 21st century engineers are provided with equipment and gadgets that were introduced in the 1960s. Library books and journals date not later than 1980s. Hostel rooms meant for four students in the 1970s are, in 2012 being occupied by 12 students each having a "Cooker corner" and using kerosene stove. With abysmally low level of research facilities in the universities, the future is bleak for Nigerian education*

The same category and chain of problems manifested itself in the report of the needs assessment committees of other tertiary institutions such as Colleges of Education and polytechnic, which the federal government of Nigeria also setup in 2013. On this basis, inadequate funding is regarded as the most critical of all the challenges that confront Nigerian higher education institutions (Asiyai, 2013).

***Poor commitment of leaders/poor implementation of policies***

Another challenge that is confronting Nigerian higher education institutions is the lack of commitment of leaders to education. Asiyai (2013) asserts that since the 1990s, no leader has shown any serious commitment to higher education in the country. As a matter of fact, the real problems of Nigerian education actually started in the 1970s due to a failure to support education mostly from the political leaders (Obomanu, 2011). He adds that

lack of sincerity, self-centredness and greed from the leaders resulted in the lack of or poor budgetary implementations.

This problem manifested itself in the improper execution of the educational policies (Imam, 2012). In line with this, Okah (2013) ponders how Nigeria will attain greatness since policy makers over the years have failed to address the fallen standards of education. Similarly, Asiyai (2013) states that poor policy implementation is a contributory factor to the poor performance of graduates of Nigerian higher institutions in their various fields of endeavour. The crisis in education is so bad that successive governments have continued to introduce new reforms in education which they have always failed to implement (Ilogho, 2015).

***Inadequate manpower and brain drain***

Poor human resources and brain drain constitute another big challenge to higher education in Nigeria. According to Asiyai (2013), quality education depends on availability of human and material resources. Towing the same line, Adegbesan (2010) states that quality education can only be achieved in a nation if there is a balance in the principal actors of the process, the teachers, learners, and the environment. He maintains that the number of teachers must be adequate and of high quality, and that the students too must be well trained while facilities must be adequately provided. Despite the role of teachers towards ensuring the delivery of quality education, most of the tertiary institutions in Nigeria are short of lecturers who will adequately handle teaching and learning activities. The inadequacy of teachers has given rise to excess workload on the few available teachers as well as the non-accreditation of programmes by accreditation agencies. In addition, CNANPU (2012) reveals that high teacher-student ratios such as 1:363 in some institutions as against the normal 1:25 is a serious challenge.

Another dimension to this problem is brain drain. Jaja (2013) attributes this to inadequate funding and poor conditions of service for lecturers. This has led to the exodus of lecturers in search of greener pastures. This is a big challenge because the institutions continue to lose the talented and brilliant teachers to other sectors or even countries, which is resulting in diminishing returns (Asiyai, 2013).

***Uneven distribution of facilities***

The concentration of facilities in urban areas while neglecting rural areas constitutes another challenge, which the federal government of Nigeria in collaboration with the

international labour organization (FGN_ILO, 2005) identified as detrimental to the attainment of education objectives in Nigeria. Aside from their inadequacy, teaching and learning resources such as libraries, laboratories are rarely found in most rural schools. This is coupled with the challenge of the inaccessibility of some rural areas. The implication is that most of the rural populace might not have access to good education.

***Lack of ICT facilities***

According to Asiyai (2013), the lack of adequate information communication technology facilities constitutes another challenge towards the attainment of quality higher education in Nigerian institutions of higher learning. He further states that although the Nigerian government had adopted information communication technologies across all levels of education as part of an effort to improve teaching and learning, most higher education institutions still do not possess an adequate number of computers and other desired devices that support technology-enhanced learning. He maintains that most of the higher institutions lack functional internet connectivity. Colleges of Education are trailing behind other institutions in this regard (Tella, 2011).

On this note, Ayodele and Oyewole (2012) state that if Nigeria must catch up with rest of the world, its teachers who are the nation builders must keep abreast with new teaching methods such as e-teaching. This, they believe will go a long way in boosting productivity. They maintain that more than 80% of graduates of higher education especially those in education-related programmes are unable to use computers adequately, which explains why less than 10% of primary and secondary school teachers who are mostly products of Colleges of Education are not computer literate. This is mostly due to the non-availability of the computers in the institutions.

***Poor reading habit/culture***

The term ‘reading’ is described as the ability to recognize, interpret and make meaning from printed or written symbols, letters or words through a cognitive progression (Aina, Ogungbeni, Adigun, & Ogundipe, 2011; Ilogho, 2015). Reading culture on the other hand refers to the act of engaging regularly in reading (Gbadamosi, 2007; Nssien, 2007). Adding to this, Olaofe (2003) sees reading culture as the act of instilling a reading habit and interest in students by means of favourable environments and assorted reading activities.

While the acquisition of reading skills has benefits on the entire life of an individual (Igwe, 2011), research has however shown that an average Nigerian reads less than a single book per year (Aina *et al.*, 2011). Igwe and Uzuegbu (2013) assert that poor reading culture has remained an issue that has been ravaging the educational system in Nigeria over the years. Likewise, Ogwu (2010) states that the general feelings among Nigerians is that poor reading culture partly accounts for the educational decline in the country. He maintains that this educational decline is a source of concern for government, school administrators, teachers, parents and all well-meaning Nigerians. Ogwu (2010) adds that a close observation of students especially in Colleges of Education reveals that most students only read during examination periods and that the few who read regularly do that for knowledge and pleasure. Ilogho (2015, p. 66) states that "teachers, school librarians and parents face an enormous task of trying to confront the poor reading culture environment in Nigeria".

According to Aina *et al.* (2011), a poor reading skill makes an individual develop a negative attitude towards school, which can have very negative consequences at a later stage. Supporting this position, Ogwu (2010) states that if a poor reading habit is not checked, the country will continue to witness high rates of failure in internal as well as external examinations, thereby increasing the drop-out rate of students with consequences such as poverty, increased illiteracy, loss of self-esteem and frustration among others. In addition to these, people with poor reading skills tend to dislike school and often do not develop their full potentials (Aina *et al.*, 2011). Furthermore, Fabunmi and Folorunso (2010) state that the effect of poor reading culture is ill-equipped and half-baked graduates.

The poor reading skills of students have been attributed to factors including inadequacy of learning materials such as books, absence of libraries in rural areas, poor attention of government to the issue and the effect of environmental factors such as home, parental guidance, socioeconomic status, among others (Aina *et al.*, 2011; Fatimayin, 2012; Igwe & Uzuegbu, 2013)

Ilogho (2015) recalls that people relied on books in the early days as their main source of information, but that with the advent of the internet, people today spend more time chatting. Ogwu (2010) corroborates this position by lamenting that most students are now using their reading time to watch videos and interact socially with friends via the internet.

By implication, Ilogho attributes poor reading culture of students to the increased use of technology.

***High population growth***

As stated earlier, Nigeria happens to be one of the countries with the largest population in Africa. This makes the delivery and management of education by the available institutions using the available resources a herculean task (Ogundipe, 2012). Nwagwu (2007) believes that the birth rate of about 3.3% per annum is a contributory factor to the crisis in education. The effect is more pronounced at the tertiary level of education as the institutions are not able to absorb a greater number of candidates that seek admission annually. Affirming the situation, Clark and Ausukuya (2013) report that only 33.3% and 31.1% of candidates who sought admission into various higher education institutions in Nigeria in 2012 and 2013 respectively were admitted. Thus, Nwagwu (2007) maintains that the crisis is as a result of the inadequate physical facilities to cope with the population growth.

***Dependence on traditional teaching methods***

The high dependence on the traditional teaching practices by most higher education institutions in Nigeria especially Colleges of Education compounds the situation. This method emphasizes teacher-centeredness, reliance on physical facilities such as four-walled classrooms, printed books and materials among others (Ahmed, 2013). This practice overstretches the physical facilities and further exposes their inadequacies. In view of the limitations of this practice, Ahmad, Chinade, Gambaki, Ibrahim, and Ala (2012) suggest the use of Moodle learning application to improve the situation.

***Inadequate power supply***

Power is another critical factor that affects every sphere of human endeavour. In Nigeria, inadequate power supply has affected virtually every human activity especially education. According to Madu and Pam (2011), power ranks first among the inhibitors of effective teaching and learning.

The foregoing reveal that the Nigerian higher education system is deficient in the kind of teaching and learning that is desired to change the fortunes of a nation. Simply put, physical facilities, teachers, and teaching and learning methods are inadequate, resulting in, ineffectual educational products – the learners. Another dimension is the threat to education as a result of insurgency. For example the *boko haram* group, which has

destroyed many schools and rendered many without access to education (Otoo, 2015). More worrisome is inadequate access to education, which amounts to a violation of the rights of the citizens to equal access to education as enshrined in the *National Policy on Education* (FGN, 2014).

A critical examination of the challenges further reveals that the root cause of the problems can be classified into four categories as shown in Figure 2.2.

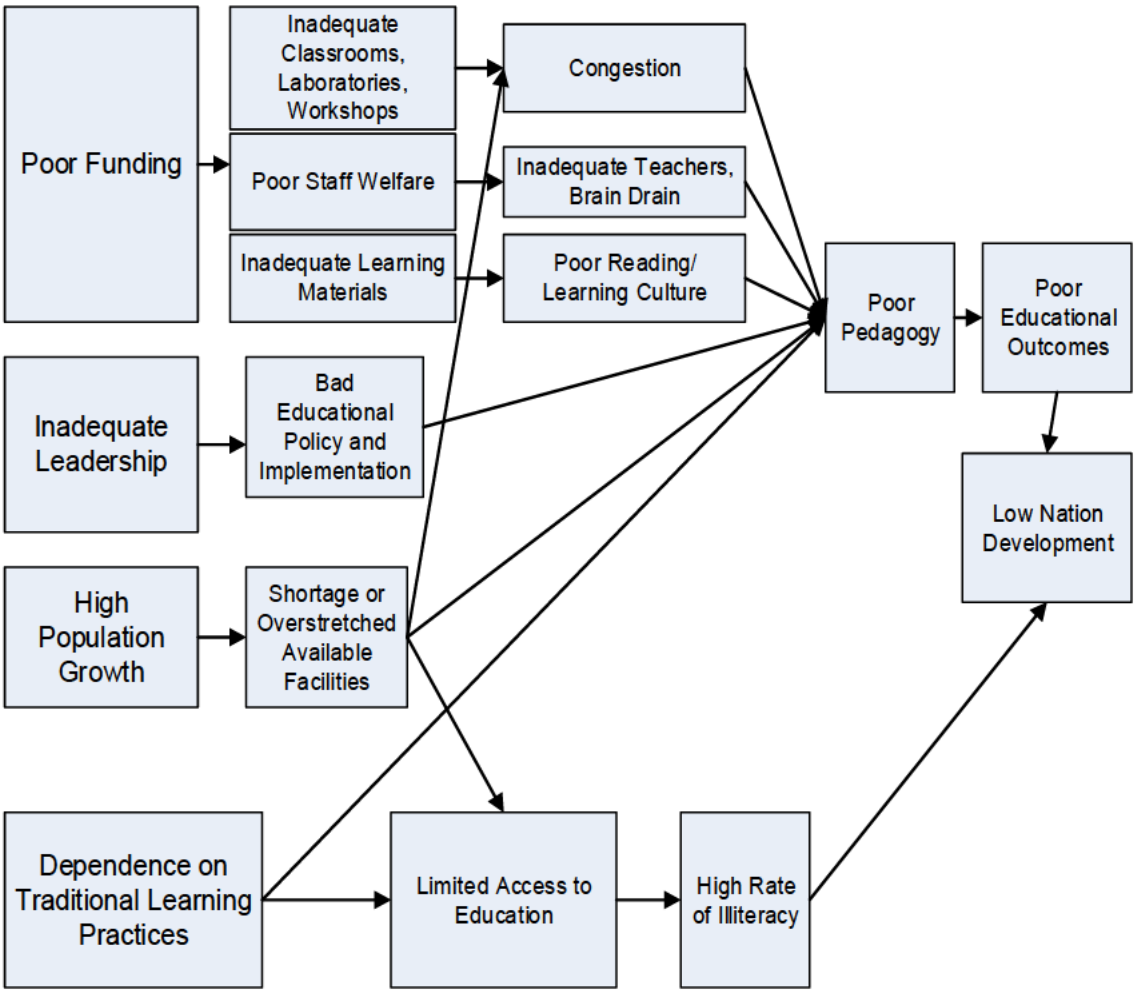


**Figure 2.2: Summary of challenges and their impact on educational outcomes**

Figure 2.2, summarizes the challenges that are confronting higher education institutions into four primary problems – poor funding, poor leadership, high population growth and dependence on traditional learning practices. These primary problems have a ripple effect, which finally result in poor educational products with a resultant negative effect on the nation's development.

i. Poor funding results in inadequate physical facilities (classrooms, laboratories, libraries), which in turn result in limited access to physical infrastructure and hence congestion. Furthermore, limited access to learning materials, such as books and journals among others from the library, have an adverse effect on the learning/reading culture of students. Additionally, the welfare of staff are compromised which can lead to the "brain-drain" syndrome resulting in poor quality of teachers remaining. These factors contribute to poor pedagogy, poor educational outcomes and therefore inadequate nation development.
ii. Poor leadership leads to inadequate policy formulation and or poor implementation thereof. Pedagogy will be affected negatively since quality control may be deficient. No doubt, this will impact negatively on educational outcomes and in turn nation development.
iii. High population growth leads to the shortage or overstretching of existing facilities, which in turn results in limited access to education, congestion, poor pedagogy, poor educational outcomes, and low nation development.
iv. High dependence on traditional teaching and learning practices leads to limited or poor access to education, higher rate of illiteracy, and then low nation development.

On this note, Jaja (2013) states that since the challenges are multidimensional in nature, ranging from human to infrastructural, multidimensional approaches are also required to alleviate these challenges. Government, institutional management, teachers, nongovernmental organizations as well as individuals must come together in order to address the situation (Ayodele & Oyewole, 2012). In line with this, several suggestions and recommendations have been made towards tackling the problems. Some of these are discussed in the next section.

### 2.2.4 Suggested remedies to the challenges confronting tertiary education institutions in Nigeria

***Introduction of technology***

One of the remedies that has been suggested towards tackling the prevailing problems in higher education institutions is the introduction of electronic teaching (e-teaching) to be accompanied by intensive training on the use of technology for teaching. This will keep teachers abreast of the current trends in their profession (Asiyai, 2013; Ayodele & Oyewole, 2012). In the same vein, Adewole and Fakorede (2013) posit that technology can be used to address most of the challenges of higher education in Nigeria, particularly when dealing with the question of time and location. In other words, students can choose to learn from any location and at any time. Adewole and Fakorede (2013) maintain that the application of ICTs in addressing the problems will include their use as teaching tools to improve teaching methods while at the same time increasing access to learning where the traditional approach is limited. The researchers add that the introduction of technology will shift the emphasis of the curriculum from the traditional teacher-centred or content-based to student-centred or inquiry-based. They further state that this will promote learner's independence and provide support for collaborative learning. Adewole and Fakorede (2013) believe that ICTs will also increase the availability of teachers by minimising the time that teachers spend on non-teaching activities such as planning.

***Improving teachers' quality***

The professionalization of teaching in order to ensure that only qualified teachers are allowed to teach in tertiary institutions has been seen as one way of addressing the challenge of poor quality lecturers. Another measure is the setting up of internal monitoring mechanisms to enhance the quality of lecture delivery (Asiyai, 2013; Ayodele & Oyewole, 2012).

***Improving teaching and learning strategies***

Government as well as education planners in Nigeria must continue to keep abreast of the field with evolving strategies for teaching and learning. This suggests the use of modern education techniques as practiced in other parts of the world. In addition, encouragement of team teaching in order to facilitate partnerships collaboration, cross fertilization of ideas and teaching and learning approaches as well as professional growth among teachers has been suggested as one way of dealing with the dominance of the traditional teaching method in higher education institutions in Nigeria. It is similarly suggested that

allowing collaboration among students results in some pleasure or fun which encourages their study abilities (Aina et al., 2011; Ayodele & Oyewole, 2012).

***Staff retention and hiring***

To address the challenge of brain drain and shortage of lecturers, improvement in the welfare conditions of lecturers has been viewed as one way of reducing the problem. In addition, employing more lecturers has been suggested as a way of reducing excess workloads of the existing lecturers (Asiyai, 2013).

***Moral reorientation***

Parents should play a role in ensuring that their children or dependants desist from acts that are educationally counterproductive, for example, corruption and examination malpractices. In addition, government and educational administrators must also continue to educate students on the consequences of bad moral conduct (Obomanu, 2011).

***Funding***

Most of the challenges of higher education have been linked to inadequate funding. Many have suggested that improved funding of education will provide the rapid development of infrastructure such as libraries, classrooms, laboratories, workshops, learning and other instructional materials as well as the hiring of adequate and competent teachers. It is envisaged that if the education budget is raised to the minimum of 26% of the country's annual budget as recommended by UNESCO, a great difference will be made in the education sector (Aina *et al.*, 2011; Asiyai, 2013).

In addition, some kind of partnership between government, the private sector as well as other philanthropists towards the development of education has been advocated (Igwe, 2011).

***Policy implementations***

Poor implementation has been attributed to inadequate or the absence of legislation that backs the policies. It has therefore been suggested that educational policies should be accompanied by proper legislations that will enforce their implementation (Aina *et al.*, 2011). Nwagwu (2007) frowns at a situation where policies are implemented haphazardly and suggests that government must continue to ensure that good policies are properly implemented even beyond the administration that created them.

***Mobile library services***

This involves the extension of learning beyond the physical classrooms or libraries. Aina *et al.*, (2011) indicate that one such practice is the extension of library services to people in their homes. Famers, nomads and others who are unable to access formal learning environments will also benefit.

***Digitization of learning materials***

In view of the dearth of learning materials, the digitization of learning materials has been seen as one way of increasing access to these materials in higher institutions of Education in Nigeria (Asiyai, 2013; Gani & Magoi, 2014). This will address the limitations of non-availability and inadequacy (due to quantity), theft and mutilation, which are commonly associated with print materials. Ogunsola (2015) envisages that the establishment of digital or virtual libraries in Nigerian higher institutions will remedy the inadequacy of learning materials by interconnecting with other libraries in the world and thereby speeding and widening the scope of access to resources.

***Improving reading culture***

Aina et al. (2011) suggest that one way of addressing the issue of poor reading habits or culture is to integrate book reading with technology such as multimedia. This will provide some pleasure which stimulates and motivates learners to continue to read until they attain a permanent literacy (Aina *et al.*, 2011; Mitchell, 2003).

In line with the suggestions that have been discussed, one pertinent question that needs to be answered is – what effort have the relevant agencies made to implement some of the suggestions? Certainly, some efforts have been made towards tackling the problems from different perspectives. Some of these efforts are discussed next.

***Funding***

Since most of the challenges that are confronting education especially at the tertiary level have funding as their root cause, the government has made some effort towards addressing this challenge, even though the problem of funding cannot be completely overcome. Jaja (2013) states that one step that the Nigerian government has taken in order to combat this problem was the establishment of the Education Tax Fund (ETF), which mandated all registered companies and organizations operating in Nigeria to commit a certain percentage, specifically 2% of their annual income to the funding of education. The Fund which has been amended several times was renamed the *Tertiary*

*Education Trust Fund (TETFund*) in 2011. With the name change, the Fund was restricted to servicing only higher education institutions in areas such as funding of capital projects, library facilities, staff training as well as providing assistance to staff to attend conferences and workshops both within the country and overseas. Another body established by government which also assists institutions, minimally, is the *Petroleum Technology Development Fund (PDTF*). Its assistance has been in the area of training mostly.

Although the contributions of these bodies were meant to supplement the Federal and State governments' allocations to education, they (especially the TET Fund) has virtually become the mainstream financier of the education sector in recent times, due to the inadequacy of the main budget. Thus, the problem still lingers on (Jaja, 2013).

***Policies and implementation***

In the area of policies, successive governments have tried to initiate policies that were aimed at improving the standards of education as evident in the Nigerian education policy document. In addition to the main policy documents, persuasion from various unions in the education industry has forced government over the years to come up with certain immediate policies that have tend to reduce the challenges. Some of these policies are defined as agreements between governments and the unions. For example, the needs assessment committees which the federal government of Nigeria set up in 2012 and 2013 to determine the state of facilities and the challenges that are confronting Nigerian public Universities and other tertiary education institutions was part of the government's attempt towards the revitalization of education. The committee made very far-reaching recommendations which could no doubt bring back the lost glory of Nigerian tertiary education. However, the problems still persist as government has not been able to source the funds that are required to make the needed change. While government was only able to release some funds to some of the institutions specifically Universities in line with the recommendations of the committees, Polytechnics and colleges of education are yet to get a response in this regard.

***Use of ICT in facilitating access to learning materials***

A major breakthrough that was perceived to be the solution to the dearth of learning materials such as books, journals, periodicals and so on in Nigerian institution of higher learning was the digitization of libraries (Gani & Magoi, 2014). Elias (2011) asserts that the inability of institutional libraries to meet up with the needs of users in the provision

of learning materials led to the initiation of the virtual library project by government in the year 2000 through an initiative of UNESCO. Digitization is the process of converting physical materials into electronic forms. The digitization of library materials results in what is referred to as a digital library or an electronic library (Gani & Magoi, 2014; Ibinaiye, 2012). A digital or virtual library lays more emphasis on access to resources rather than on their ownership. In other words, it promotes the sharing of resources across borders by all, as long as the necessary infrastructure is put in place (Ibinaiye, 2012). With digital or virtual libraries in place, the quality of collections in academic libraries will increase while staff and students will have an unlimited access to resources for facilitating teaching and learning.

However, despite the promises of digital libraries, Nigerian higher institutions could not tap into their full benefits due to other problems which include poor funding, high cost of computers and maintenance, high cost of bandwidth, lack of a standardized operational framework and poor power supply in the country (Gani & Magoi, 2014; Ibinaiye, 2012). According to Fabunmi (2009), the servers that host the digitized materials needed to be running 24 hours a week, which could not be sustained in Nigeria in view of the erratic power supply.

***Bring back the book initiative***

In an effort to confront the problem of poor reading culture, the Nigerian government in 2010 initiated a policy project tagged 'bring back the book'. According to Igwe and Uzuegbu (2013), the main aim of the project was to revitalize the spirit of reading culture among the youth. This was to be actualized through a series of activities such as organizing book reading competitions in institutions, establishing clubs that promote book reading so as to develop the capacity of the youth intellectually; creating avenues for the youth to discuss nationally ways to improve reading and the educational system in general; conducting and supporting organizational research in this area; encouraging the local production of books through high patronage, and reviving and restocking of libraries with books.

Igwe and Uzuegbu (2013) add that at the launch of the project which took place on December 10$^{th}$, the Nigerian president also unveiled his own book titled *My friends and I*, which reflects his conversations with friends via *Facebook* on issues of governance. According to the president, the revitalization of the reading culture of the youth is as good as the revitalization of the education system and securing the future of the country.

However, they observed that one of the major shortcomings of the initiative is the fact that it had no legal backing and an established source of funding from the government. They suggest among other things that the project will be viable if it is legally backed by government with government funding the project. This was because some activities of the project such as procurement of books, reading competitions, and engaging the youth in meaningful discussions were both capital intensive. In other words, the sustainability of the project could not be guaranteed.

Undertaking a critical analysis of the primary problems and the various recommendations or suggestions that were made towards addressing the problems on the one hand, and also looking at some of the efforts that have been made towards implementing some of the suggestions on the other; poor funding has again remained the core impediment. On this basis, and in view of the poor economic situation of the country due to the decline in oil prices, the following rhetorical questions become imperative:

- Can the institutions, and by extension the government, ever have substantial funds to put in place enough classrooms, laboratories and workshops to cater for the growing population of students?
- Can the institutions, and by extension the government, ever have substantial funds to put in place libraries stocked with up-to-date books and journals that can adequately accommodate the growing population of users?
- Can the institutions, and by extension the government, ever have substantial funds to employ an adequate number of qualified lecturers to handle the growing population of students?
- Can lecturers ever cope with the growth in students' population using the traditional teacher-centred teaching and learning approach solely?

The answers to these questions cannot be an unqualified 'yes'. The big question therefore is: What then should be done to improve the teaching and learning conditions especially in Colleges of Education in Nigeria? Perhaps combining the ideas of Odia and Omofonmwan (2007), Ogboru (2008), and Ogundipe (2012) will provide an attempt to answer this question. Odia and Omofonmwan (2007) suggested the need for research and development to be encouraged in order to find an appropriate and lasting solution. Ogboru (2008), on the other hand, suggests the application of global knowledge in addressing local challenges through an investment in human capital and technological integration. Similarly, Ogundipe (2012) points out the need to explore a multi-channelled learning

opportunity which offers or provides a mechanism for a variety of flexible teaching and learning processes. The three suggestions also fall in line with Asiyai (2013), and Adewole and Fakorede (2013).

A synthesis of these ideas suggests that the solution may involve components such as research, human capital development and integration of technology all targeted at teaching and learning (pedagogy). In other words, the solution may involve some research into using technology to enhance teaching and learning, which must be supported by human capital reorientation. Figure 2.3 captures this solution's concept.

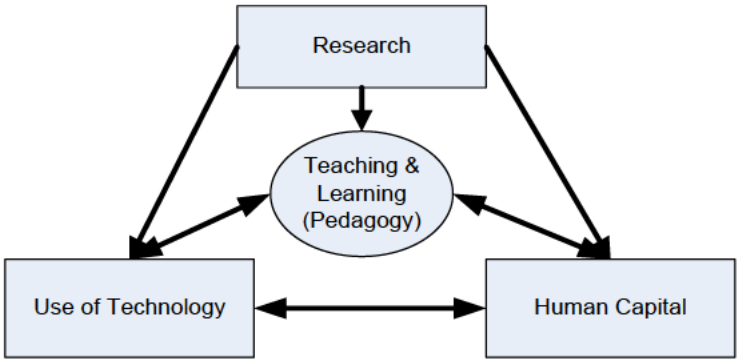


**Figure 2.3: Conceptual plan of this solution**

Figure 2.3 can be interpreted as follows:

i. Research into teaching and learning;
ii. Research into using technology for teaching and learning;
iii. Research on human capital for teaching and learning.
iv. Research on teaching and learning by human capital using technology

The implication of the solution's concept is a shift from a teacher-centred learning to a blended learning system (Adewole & Fakorede, 2013). McFadzean (2001) asserts that this implies a shift from the behavioural and cognitive paradigm where learning is controlled by the teacher to a humanist paradigm where learners control the learning process by themselves. In the teacher-centred paradigm, the teacher is the sole provider and evaluator of knowledge. Ahmed (2013) states that the traditional teaching style otherwise called the teacher-centred instruction is a teaching style whereby the students are passive learners or mere recipients of teachers' knowledge and wisdom with no control over their own learning. Duckworth (2009) is of the view that the teacher-centred

learning actually hampers students' educational growth. The reverse is the case in the student-centred approach. In the learner-centred paradigm, students acquire and contribute to knowledge through self-research abilities. According to Ahmed (2013), students are active players and make great contributions to the teaching and learning process in a learner-centred teaching approach. This is predicated on the fact that the students have the choices to make on the type of learning, the way they learn and the location to learn. He maintains that in recent years, the learner-centred approach has overshadowed the teacher-centred paradigm. The blended system on the other hand combines the two that is; it is a combination of teacher-centred and learner-centred approaches. Based on the foregoing, Figure 2.4 represents the researcher's view of the solution's plan.

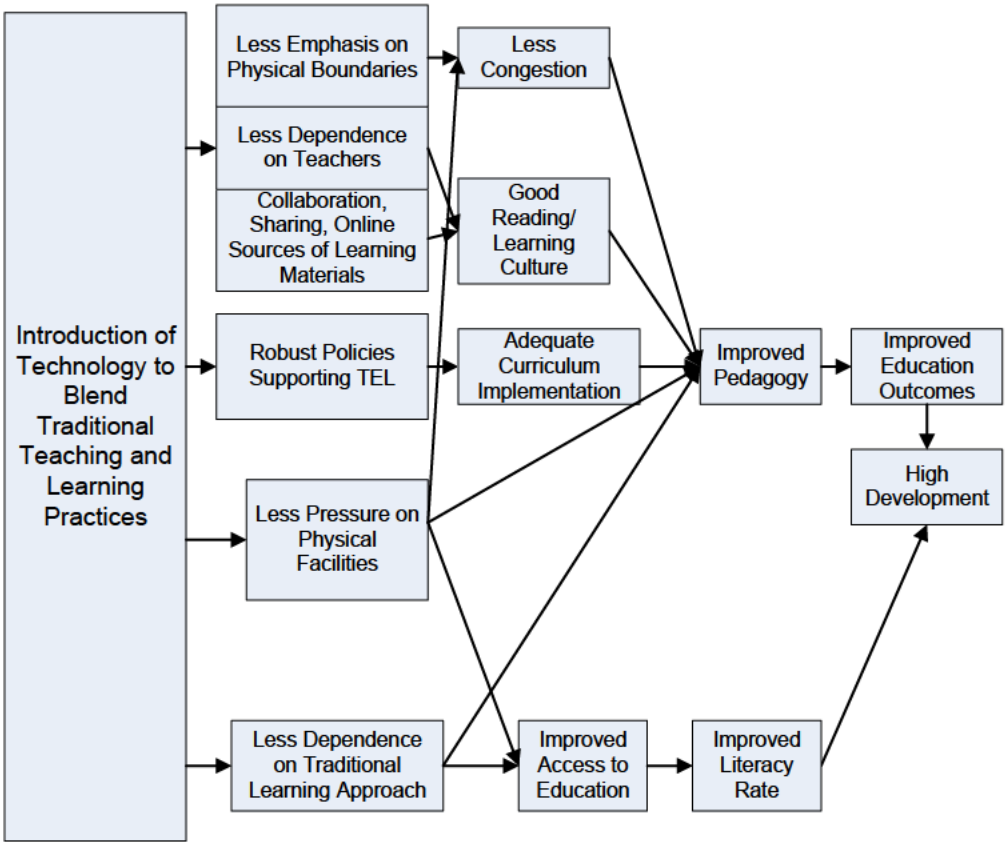


**Figure 2.4: Researcher's solution plan**

The researchers' solution plan indicates that blending the traditional teaching and learning practices with technology is likely to result in the following improvements:

i. Less dependence on physical boundaries or facilities will reduce congestions leading to improved learning and improved educational outcomes. This in turn impacts positively on the nation's development.

ii. Less dependence on teachers through collaboration, and sharing online resources of learning materials. This is likely to lead to improved pedagogy and improved educational outcomes. –

iii. Robust policies that support technology enhanced learning, which is likely to lead to improvements in pedagogy and educational outcomes.

iv. Less dependence on a traditional learning approach thereby increasing access to education, which leads to an improved literacy rate. This in turn impacts positively on the nation's development.

Figure 2.4 provides a pictorial view of the aim and overall objective of the study.

## 2.3 Summary

While recommendations towards the expansion of physical facilities, hiring of more personnel as a way of addressing the critical challenges that are confronting institutions of higher learning in Nigeria are laudable, limitations of funding and space may still prevail. Moulton (2008) argues that cardinal to the present day's society is the increasing volume of available information and knowledge which is due to the influence of technology such as the internet and that this has changed the culture in which knowledge is monopolized by experts. He advocates for new strategies that will enable society to cope with this new trend, which directly or indirectly presents a challenge to the providers of education. In line with this, Wagner, Hassanein, and Head (2008) point out that in a response to the rising cost, shrinking budgets and the increasing demand for education, most higher education institutions are re-examining the manner in which to deliver education, compelling most of the institutions to fall back on e-learning. This suggests that the application of technology to deliver education is capable of addressing the effects of the root problems of education.

Information and Communication technology provides an opportunity for learners to learn anywhere and at any time. This reduces the demand on physical facilities as well as teachers. It also removes the barrier of physical boundaries placed by traditional approach of delivering education, leading to an expansion in the level of access to education (Adewole & Fakorede, 2013). It also offers support for collaborative learning and sharing

of resources, in addition to digitization which improves access to learning materials (Gani & Magoi, 2014).

Therefore, in order to explore these opportunities and to be able to apply them appropriately, it is important, first of all, to understand what efforts have been made in the direction of using technology to address the problems of teaching and learning across the globe. The study will now, in chapter three, review the application of technology to support teaching and learning.

# CHAPTER THREE
# USE OF TECHNOLOGY-ENHANCED LEARNING

The previous chapter revealed that Nigerian higher education institutions, especially Colleges of Education are confronted with numerous challenges of teaching and learning such as inadequate classrooms, lack of lecturers, learning resources and dependence on traditional teaching and learning practices and environment. A number of suggestions were made on how to address the challenges. Among the recommendations, the application of technology stood out as it appears to have the potential of tackling all the main challenges put together. In the light of the forgoing remarks, this chapter reviews technology-enhanced learning, which is the application of technology to learning. In addition, a review of mobile learning across the globe and in Nigeria in particular, is presented.

## 3.1 Concept of technology-enhanced learning (TEL)

Technology enhanced learning is used generally to describe any learning process that is facilitated by Information and Communication Technology devices, for example, computers, mobile phones, and other telecommunication devices. Specht (2009) states that technology enhanced learning can be viewed as the facilitation of learning through the use of information and communication technology. He adds that enhancing the capability of human to work with information is not entirely new as can be seen in the use of tools such as paper and pen in order to illustrate, distribute as well as to record information. He maintains that even the blackboard which the teacher uses to illustrate concepts taught in a lecture has over the years been further developed into interactive boards which today can work with all kinds of digital media in a bid to facilitate teaching and learning.

Similarly, Walker *et al.,* (2014) define TEL as a technology which directly supports teaching and learning. For example, formal virtual learning environments, institutional intranets with learning and teaching components and customized or in-house systems among others. In line with this, Katz (2010) states that technology-enhanced learning has freed both the learners and teachers from the boundaries and restrictions of traditional teaching and learning. DkIT (2013) referred to technology-enhanced learning as a form

of instruction which utilizes technologies to facilitate and enhance learning. The institute presents technology-enhanced learning in a continuum of three levels. The first level consist of predominantly face-to-face approach with some use of technology. The second level is more flexible – a sort of blended approach which combines technology and face-to-face contacts in fairly equal proportions; the last level is a complete online solution, which depends fully on technology. Figure 3.1 shows the three levels of technology-enhanced learning from the institute's perspective.

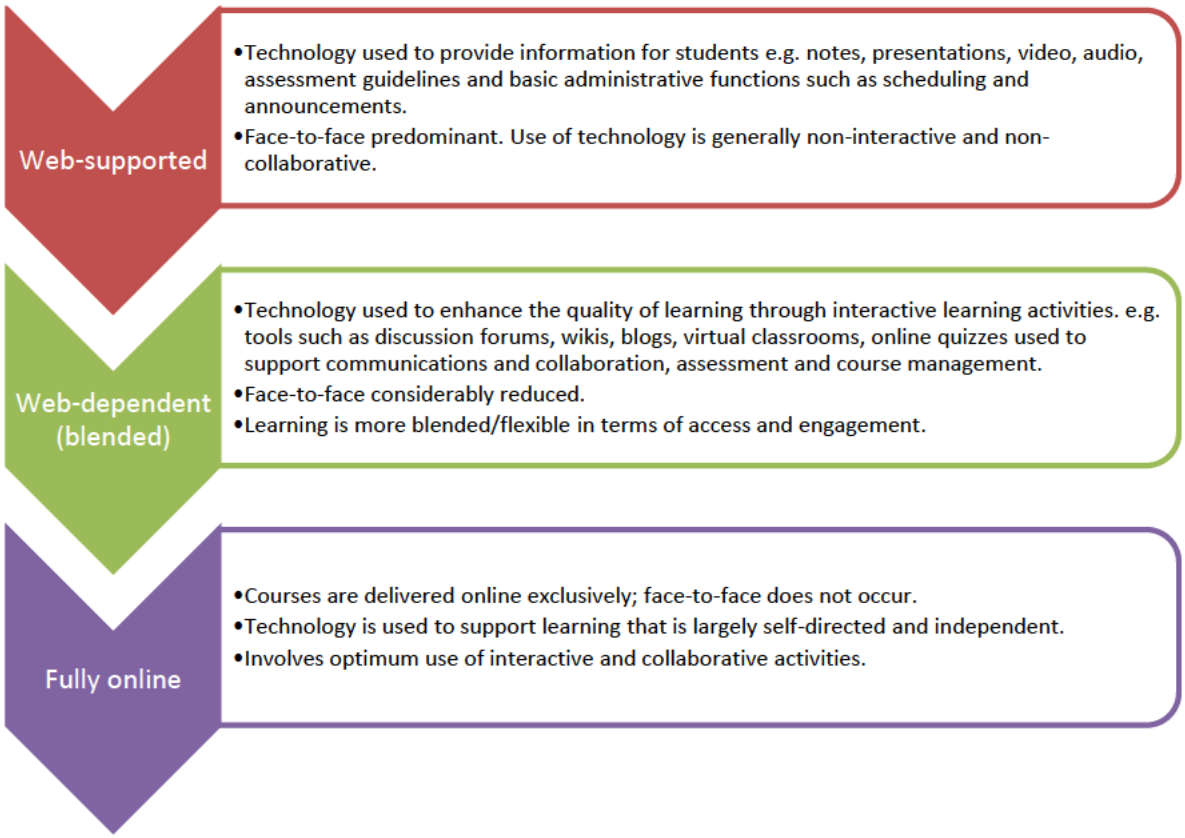


**Figure 3.1: Continuum of technology-enhanced learning (DkIT, 2013, p.1)**

While it has been a common practice by authors to use different terminologies that are associated with TEL interchangeably (Moore *et al.*, 2011), Phipps and Merisotis (1999) warn that the lack of clear understanding of terminologies may either result in some difficulties in their application or even wrongful application. Thus in view of the salience and frequency of using the terms TEL, e-learning and mobile learning in this study, the terms are more closely re-examined so as to draw a clear demarcation between them and to avoid any ambiguity in their application in the study.

According to Price and Kirkwood (2010), the word 'enhanced' in TEL implies a value judgment, which means improved learning or betterment in some way, whereas e-

learning does not necessarily result in an improved learning. They add that the application of technology in education offer educators the opportunity to select the best form of technology that will result in the much-needed pedagogical advantage. This results in different learning technologies including e-learning and m-learning among others. Scott and Vanoirbeek (2007) see technology-enhanced learning as encompassing computer-assisted and electronic learning systems whose objective is to facilitate and make learning experiences more effective and easier. They add that with emerging technologies, research on technology-enhanced learning is now tilting towards mobile and ubiquitous learning using a range of mobile applications, hybrid networks and environments. In other words, Scott and Vanoirbeek (2007) see both e-learning and m-learning as forms of TEL or ways in which technology-enhanced learning can be performed or actualized. Similarly, Kirkwood and Price (2014) state that technology-enhanced learning subsumes e-learning which has been used with a multiplicity of meanings. Based on the same reasoning, Specht (2009) identifies six main technological trends that have impacted on teaching, learning and research. They include mobile devices such as mobile phones, cloud-computing technologies which host large amounts of data, and geo–everything, which determines the location of all objects, and the personal web used to provide a variety of information on the internet. Other technologies are the semantic-aware-applications which use meaning to provide information to users, and lastly smart objects which provide contextual information. He further states that as new technologies continue to emerge, the future of technology- enhanced learning can be better imagined. Thus while the foregoing establishes that TEL encompasses e-learning, m-learning and other learning technologies, the distinction between e-learning and m-learning is still blurred.

In an attempt to bridge this gap, Sung (2009) argues that m-learning is a sub-component of e-learning and not a form of it, just like ubiquitous learning is a component of m-learning. He maintains that m-learning can simply be viewed as a new dimension to e-learning, noting that one thing that makes mobile learning unique is it's anytime/anywhere characteristic which has no permanent connection to physical networks. Similarly, Traxler (2009) states that mobile learning does not merely refer to the conjunction between the terms 'mobile' and 'learning' but that it has always referred to 'mobile e-learning' with its history as a continuation of the conventional' e-learning. He argues that the emergence of mobile learning was as a result of reactions to the perceived inadequacies or limitations of the 'conventional' e-learning.

Anohina (2005) argues that the terminologies that are associated with learning technologies consist of two components. The first component represents a word that characterizes learning or describes the type of learning e.g. 'distance' and the second component, which is almost common in all terminologies represents a pedagogical concept such as education, learning, teaching, instruction and tutoring among others. He gave the generic form of it (2005 p.92) as "a word characterizing learning + an educational concept". He further states that the first component (a word characterizing learning) also consists of a technology-describing word plus a connector (e.g. computer-based). This result in the extended generic form: "a technology describing word + a connector + an educational concept". He maintains that the difference in the terminologies emanates from the first component – a principle which he states has been behind the formation of eight groups of the most widely used terms. These groups of terms include the group of 'C' which is 'computer'; the group of 'D' which is 'distance'; the group of 'E' which is 'electronic'; and the group of 'I' which is 'internet'. Others are the group of 'O' which is 'online'; the group of 'T' which is 'technology'; the group of 'R' which is 'resource' and lastly the group of 'W' which is 'web'. As at today, these groups can be enlarged to include the group of 'M' which means 'mobile' and probably the group of 'U' (ubiquitous).

Korucu and Alkan (2011) differentiate e-learning and m-learning by the devices that are used in the learning process. They assert that e-learning is a new form of distance learning that relies on the computer and that it is closely linked to traditional learning, and that it is characterized by terminologies such as "multimedia, interactive, hyperlinked, media-rich environment" (2011 p.1927) among others. Korucu and Alkan (2011, p. 1927) further state that mobile learning on the other hand relies on devices such as PDAs, pocket PCs and mobile phones, and can be characterized by terminologies such as "spontaneous, intimate, situated, connected, informal, lightweight". Although some other researchers regard e-learning generally as the use of technology to supporting teaching and learning, they also agree with the reasoning that it is more related to the use of computers in terms of functionality (Behera, 2013). JISC (2004, p. 10) simply considers e-learning to be synonymous with enhanced learning. It maintains that e-learning, which is a form of learning that is facilitated by information and communication technologies, may involve some or all technologies that include "desktop and laptop computers, software, interactive boards, digital cameras, mobile devices, electronic communication tools such as e-mail,

chat facilities, and video conferencing". Others are "Virtual Learning Environments (VLEs) and learning activity management systems".

Traxler (2007) provides two sets of terminologies which can be used to distinguish between e-learning and m-learning. He states (2007 p.4) that while conventional e-learning is associated with such terminologies as "structured, media-rich, broadband, interactive, intelligent, and useable", m-learning is associated with terminologies such as "personal, spontaneous, opportunistic, informal, pervasive, situated, private, context-aware, bite-sized, and portable". In this case, unlike m-learning, e-learning is not necessarily mobile.

Therefore, synthesizing the arguments presented above, the study concludes that TEL is the integration of technologies to facilitate teaching and learning in order to enhance student achievement (Scott & Vanoirbeek, 2007; Specht, 2009). It is an umbrella term for the use of technology to facilitate teaching and learning (Goodyear and Retalis (2010). TEL depends on i) the learning device such as computers, mobile devices and associated network infrastructure, which define the type of learning, for example e-learning and m-learning (Behera, 2013; Korucu & Alkan, 2011); and ii) the learning environment or platform such as CMS, LMS and VLE among others, which manage the learning content (Epignosis_LLC, 2014; Walker et al., 2014). For this reason, the study discusses the major types of TEL (e-learning & m-learning) and learning environment in more detail in the sections that follow.

### 3.1.1 Electronic learning (e-learning)

A universally accepted definition of the term 'e-learning' has been difficult to obtain. It is one term that has been given different meanings by different people (Gyambrah, 2007). Moore et al. (2011) assert that although the origin of electronic learning is not clear, it might have originated at the same time with online learning in the 1980s. Scott and Vanoirbeek (2007) on the other hand state that electronic learning (e-learning) has its origin from Computer-assisted learning, which uses technology especially computer to improve learning processes. Computer-based learning is seen as any form of learning which takes advantage of the interactive nature of computer applications to impact positively on the acquisition of knowledge resulting in a high quality impact on learners (Queen, 2013). This perception of e-learning is in alignment with that of Epignosis_LLC (2014). According to Epignosis_LLC (2014), e-learning is associated with learning

systems called ‘learning-management systems’, which are used for the delivery of courses. Similarly, Traxler (2009, p. 2) states that “…this ‘conventional’ e-learning has been exemplified technologically by the rise in virtual learning environments and the demise of computer-assisted learning ‘packages’, …and by expectations in functionality and bandwidth in networked PC platforms”. He adds that the characteristics mentioned represent the distinction between the terms ‘e-learning’ and ‘m-learning’.

Although there is no agreement on the actual terminology for the use of computers in education, terminologies which have been used interchangeably include computer-assisted instruction, computer-aided learning, computer-aided instruction, computer-augmented instruction, computer-based learning and computer-managed learning among others (Kuklik, Kuklik, & Banghert-Drowns, 1985), all of which are forms of e-learning (Goodyear & Retalis, 2010). Furthermore, e-learning is seen as an improved kind of distance learning which relies on the computer as the learning device (Gutierrez, 2015; Korucu & Alkan, 2011). This makes it more static (Webanywhere, 2016).

On the other hand, Gordon (2014) simply sees e-learning as being synonymous with TEL. Gyambrah (2007) expresses fear that the assorted definitions of e-learning globally may create confusion. However, Moore et al., (2011) state that no matter the discrepancies or disagreements on the exact definition of e-learning, one thing that is clear is the fact that e-learning provides learning chances for individuals.

Synthesizing the views that have been presented in this section, it can be deduced that the traditional computer aided or assisted learning is related mostly to the use of computers within confined areas (standalone) while e-learning adds ‘distance’ (learning via networks) to it. Therefore, e-learning can be regarded as the application of computers, associated networks, and learning management applications to facilitate learning. It can be attained locally via intranets and widely over long distances via the Internet. E-learning has a formal structure, thus it extends the traditional computer-based or computer-aided learning beyond its local environment (Mehdipour & Zerehkafi, 2013; Webanywhere, 2016).

#### 3.1.1.1 E-learning benefits

Electronic learning can be beneficial in many ways. One of the major benefits is increased access to information and resources and by extension more access to education. It also provides room for the creation of learning communities as people can easily form or

identify with interest groups hitherto constrained by distance and time. Since e-learning makes use mostly of digitized materials it provides room for a faster or shorter content update cycle which is a constraint in the traditional learning system. In addition, e-learning encourages self-paced learning (Epignosis_LLC, 2014). This makes the management of learning easier as content can simply be linked to other learning resources such as distributed libraries (Behera, 2013).

#### 3.1.1.2 Shortcomings to e-learning

One major drawback of e-learning is that in addition to the lack of actual practical application of skills, learners are isolated. Thus, e-learning lacks an adequate student-teacher relationship that is required for quality learning. In addition, constant use of computers which is associated with e-learning may result in health problems such as eyestrain, and bad posture among concerns (Epignosis_LLC, 2014; O'Neill, Singh, & O'Donoghue, 2004). Perhaps the development of communities of practice in distance education which e-learning represents is one remedy for this situation. It is believed that communities of practice are critical in an online environment in order to bridge the gap that may exist due to the limited face-to-face meetings among students on one hand and between them and their teachers on the other hand (Brady, Holcomb, & Smith, 2010).

Another opinion that could be viewed as a shortcoming of e-learning is the fact that much effort may be required to achieve the desired results in view of the fact that it defines new roles for both students and teachers (Wagner et al., 2008). This may explain why O'Neill et al. (2004)suggest that e-learning implementation should be accompanied by intensive training. Furthermore, depending on the current institutional infrastructure, the implementation of e-learning has been viewed as capital intensive. This results from the cost of bandwidth, computers and software such as *Learning Management System* (Wagner et al., 2008). This also includes personal investments made by instructors and learners in using the technology (Kirkwood & Price, 2014). Power is another challenge of e-learning. It has also been argued that the computers which e-learning relies on require a constant supply of electricity, which serves as a limitation especially when it comes to developing countries like Nigeria where the supply is very erratic (Madu & Pam, 2011).

Based on the foregoing, Korucu and Alkan (2011, p. 1926) observe that "although e-learning has much (sic) more advantages than traditional education methods, some deficiencies of its own (sic) have lead (sic) science (sic) world to new pursuits" such as

mobile learning technologies, which has the additional advantage of enabling students to have access to learning irrespective of time and the environment. The next section focuses on mobile learning.

### 3.1.2 Mobile learning (m-learning)

As stated earlier, there is a strong belief that mobile learning has a relationship with 'traditional' e-learning (Lin, Wang, & Li, 2016). A number of studies (for example (Behera, 2013; Epignosis_LLC, 2014; Mehdipour & Zerehkafi, 2013) regard m-learning as form of e-learning with the difference that it utilizes mobile devices as its medium. As a result, early definitions of m-learning were based on the technological devices that are used to deliver the learning, for example mobile phones and other similar devices (Mehdipour & Zerehkafi, 2013; Traxler, 2007). Some authors based their definition of m-learning on mobility and portability (Behera, 2013; Park, 2011). Park (2011) regards m-learning as the application of mobile or wireless technologies to learn without being confined to any specific location. Park attributes the boost in mobile learning to innovations in social software programs such as *Facebook*, *Twitter MySpace* and other social networking applications. It is also argued that the increase in the availability or prevalence of mobile phones and the multimedia capabilities that have been embedded in them, in addition to the Web 2.0 Internet technology, have cleared the grounds for the application of mobile devices for learning (Behera, 2013).

However, not only are the new innovations mentioned by Park (2011) boosting mobile learning, they in fact perform a major role in the current definitions of mobile learning (Traxler, 2009). In keeping with this view, Walker (2006) mentions that m-learning does not only refer to the use of mobile devices to learn but also to learning in different contexts. In a similar manner, Yahya, Ahmed, and Jalil (2010) state that the emergence of new technologies has changed learning modalities from mobile learning to ubiquitous learning, with advantages (Korucu & Alkan, 2011, p. 1926) such as "life-long learning, learning inadvertently, learning in the time of need, learning independent of time and location, and learning adjusted according to location & circumstances". According to Traxler (2007), mobile devices which are themselves the products of social and economic demands of the society are in turn changing the manner in which knowledge is acquired in the same society such that both the formal and informal learning that were usually delivered "just-in-case" are now delivered "just-in-time, just-enough, and just-for-me"

(Traxler, 2007 p.5). He further points out that mobile devices also generate some new forms of knowledge and the manner in which they can be accessed. In other words mobile devices are in a position to facilitate the diffusion and dissemination of rich multi-media content, either through discussion in real-time, synchronously and asynchronously or using voice, text, and multimedia.

Elaborating on the various learning approaches that are provided by mobile learning, Traxler (2007) lists the following:

i. Personalized – learning that gives recognition to the individual difference or learning style;
ii. Situated – learning that takes place while performing an action in the right and meaningful context. For example learning in the workshop by an apprentice;
iii. Authentic – learning involving real-world problems which are of interest to the learner; and
iv. Spontaneous – learning that supports instant self-evaluations.

Adding to these, Winter (2006) states that mobile learning is techno-centric, extends from e-learning, augments formal education, and that it is learner-centred. Similarly, Jones, Issroff, Scanlon, Clough, and McAndrew (2006) perceive m-learning in terms of its motivational and affective perspectives, specifying qualities such as allowing users to have control and ownership of the learning process; providing easy communication among learners and giving them some sort of excitement or fun while they use the devices. Jones *et al.*, (2006) further state that mobile devices provide the opportunity for learners to locate resources easily within the context of learners and some other qualities of learning using mobiles.

The most distinctive attribute of mobile learning is its portability or mobility (Park, 2011). This has made individuality and interactivity possible (Traxler, 2008). It also reduces reliance on fixed locations for teaching and learning thereby introducing a change on the teaching and learning method (Peters, 2007). In line with this, (Park, 2011) presents a 'mobility hierarchy' as shown in Figure 3.2.

According to Park (2011), the figure categorizes the motivation for the use of mobile learning in higher education institutions into four levels alongside the different attributes of mobile devices supporting them. Level one refers to 'productivity' which focuses on the content, while level four refers to 'collaboration and communication' which focuses

on communication. He adds that level one aims at promoting individual learning and has components such as scheduling, calendar and grading applications all supporting the individual's organizational skills as well as self-directed learning. Level four on the other hand promotes collaborative learning and has components such as real-time chat, annotation, short messaging systems and wireless e-mail for the exchange and sharing of information among individuals in order to aid knowledge construction. Park (2011) further states that levels two (flexible physical access) and three (capturing and integrating data) fell in the 'middle-range' applications which include computer-aided instructions (CAI), database activities and mobile libraries among others.

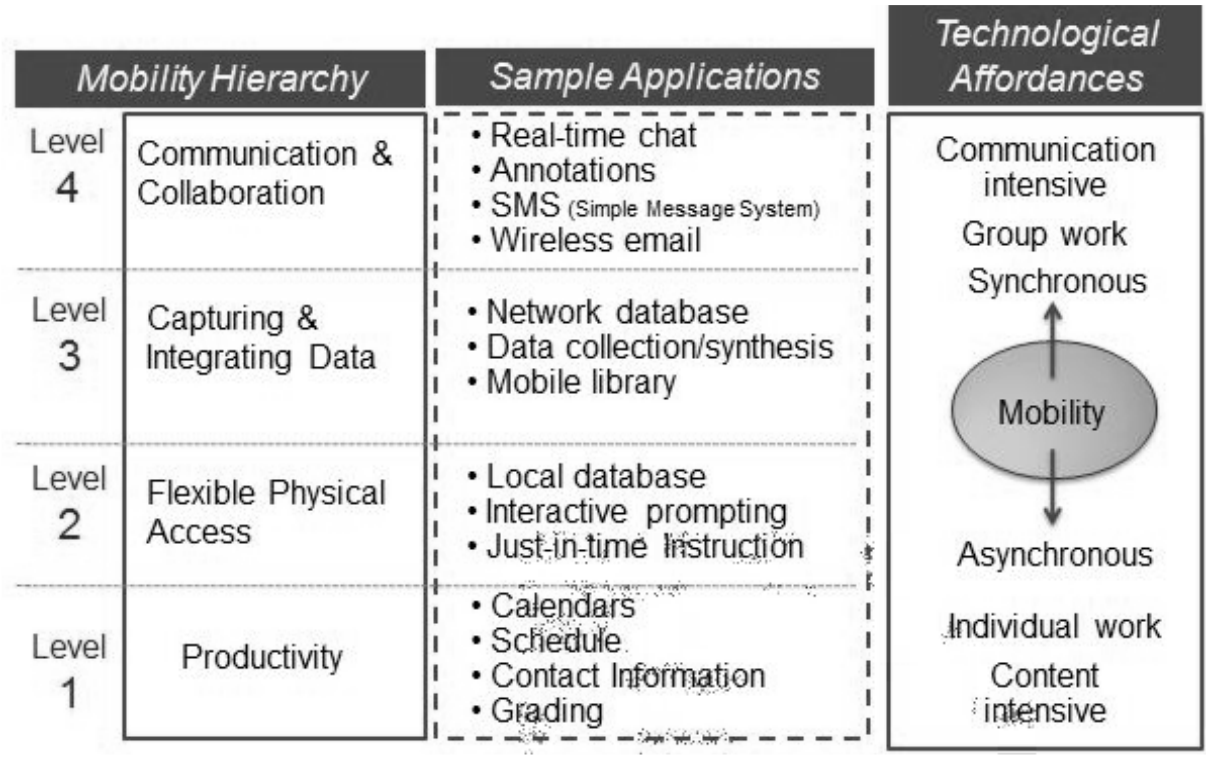


**Figure 3.2: Mobility hierarchy (Parks, 2011, p.82)**

### 3.1.2.1 Advantages of m-learning

Much has already been said about the benefits of using mobile devices to learn. Some of the advantages include easy reading; fast switching ability among applications; touch screen interface which provides friendlier user interactivity; easier mobility and affordable application development (Behera, 2013; Warschauer, 2011). This makes mobile learning more personalized, faster and interactive to the learners as compared to traditional e-learning approach. The implication is that it further reduces the workload of the teachers as the teacher here acts more like a facilitator in the learning process. In

addition, m-learning is relatively cheap since most mobile devices cost far less than PCs (Crescente & Lee, 2011; Elias, 2011).

#### 3.1.2.2 Limitations of m-learning

Everything in life has two opposing sides. This can be drawn from the third law of motion provided by Isaac Newton. In another context, everything in life has a positive and negative side. Similarly, as much as there are positives of mobile learning, equally there are shortcomings. Park (2011) enumerates some shortcomings of mobile devices which may have implications for their use in learning including:

i. Physical attributes: these include smaller screen size, lower memory capacity and shorter battery life span;
ii. Software limitations: these include limitations to the type and number of application to be installed; inadequate help facilities on how to run applications;
iii. Low speed and reliability, as well as poor coverage of mobile networks; and
iv. Excessive brightness poses a challenge in using the device outdoors. Also, excessive exposure to radiation poses health challenges.

The disadvantages enumerated by Park seem to be directly contradicting the advantages given by Warschauer (2011). However, despite the shortcomings, Park (2011) is optimistic that the increasing levels of innovations in the mobile technology industry are promising and that the challenges are therefore only temporary and diminishing.

Therefore, in view of the promises and increasing popularity of mobile learning, the study reviews applications of mobile learning across the globe and developing countries, especially Nigeria.

#### 3.1.2.3 General application of mobile learning

A number of studies have investigated the application of technology-enhanced learning particularly mobile learning across the globe. Attewell and Savill-Smith (2004) conducted a research in three countries in Europe, which included Italy, Sweden and the United Kingdom to investigate the manner in which young adults were utilizing their mobile phones. This was to assist in predicting the future usage of mobile devices and to determine the willingness of the target population to use mobile devices for learning purposes. Their results reveal among other things that 49% of the sample showed interest in using phone-based games to improve spelling and reading while 44% indicated the same for mathematics.

In another study, Kumar et al., (2010) investigated the extent to which children were willing to use mobile phones to access learning content. Their results revealed a positive response. Donner (2009) reviewed the impact of mobile devices on education in some developing countries, specifically Tanzania and Thailand. His results reveal that the majority of the population studied had positive feelings towards the use of mobile devices for learning.

In another development, Aker et al. (2010) performed a randomized evaluation of mobile phone usage in a literacy and numeracy program (Project ABC) in Niger, where students learned using mobile phones in a literacy and numeracy class. Their results reveal some positive impacts with evidence of long-term retention of gained knowledge.

In a similar manner, Valk et al. (2010) examined the extent to which the use of mobile phones could help to improve educational resources and in promoting acquisition of knew knowledge. This they achieved by reviewing the results of some pilot projects from Asia, Philippines, Mongolia, Thailand, India, and Bangladesh. They report that mobile phones had high impact on facilitating access to education but that there was little evidence that they promote new learning.

In 2011, Warschauer investigated the use of iPads in K-12 schools in the United States of America. His research showed that in California, iPads were preferred to laptops in view of their light weight, portability, touch screen capability, and user friendly applications. A similar investigation was carried out by Lee, Lee, and Kweon (2013) to ascertain the requirement for using mobile devices as ubiquitous learning tools in higher education in Korea through the use of a conjoint method. The attributes used were screen size of mobile devices, platform type, office productivity of the mobile device and lastly the mobile device's wireless technology. The authors reported that most respondents had preference for window-based larger screen devices for learning and mobile devices that have both Wi-Fi and cellular accesses. Their study further revealed that the respondents had moderate preference for office productivity. The findings of Lee et al. (2013) seem to suggest that tablet PCs might not be suitable due to their screen size and platform.

In general, the foregoing confirms that mobile devices have become viable tools for teaching and learning. This development has led to various forms of investigation to ascertain the acceptability of mobile learning at different levels of education. The next section reviews some studies that have used relevant theories specifically the Unified

Theory of Acceptance and Use of Technology (UTAUT), and Information System (IS) Success Model to test the acceptance or intention of users to use mobile learning more especially in higher institutions of learning.

#### 3.1.2.4 Application of relevant theories in testing the acceptance of mobile learning

In order to have a complete understanding with regards to the acceptance or intention to use mobile learning across the globe, the review of this section is carried out in three perspectives or contexts – the developed world, the developing world, and Nigeria.

***The developed world' perspective or context***

In an attempt to explain the acceptance of technology and specifically mobile internet in a consumer context particularly in Hong Kong, Venkatesh, Thong, and Xu (2012) used a variation of UTAUT which they described as UTAUT2. Justifying the use of UTAUT2, they explain that new contexts can result in significant changes in theories or models such that relationships are either altered or even rendered completely insignificant (Alvesson & Kärreman, 2007; Johns, 2006). They further explained that while facilitating conditions focus on the organizational environment in UTAUT, justifying their role as the entrance to actual behavioural control, the case is different in a consumer environment where the facilitating conditions can differ due to different application vendors, technology generations and devices. For this and other reasons, Venkatesh *et al*. (2012) introduced a new relationship to link 'facilitating conditions' and 'use behaviour'. Furthermore, in order to ascertain the unaccounted variance in UTAUT, Venkatesh *et al*. (2012) introduced three additional independent variables (Hedonic motivation, price value & habit). All the three variables had direct relationships with 'behavioural intention' (BI) as moderated by gender, age and experience while 'habit' had an addition relationship with 'use behaviour'. They did, however, drop voluntariness of use.

The authors applied partial least square (PLS) to test their model and found that the study explained 74% and 52% of the variances in BI and use behaviour respectively, which they state signified an improvement over the original UTAUT. However, their use of Hong Kong where the penetration rate of mobile devices is very high may have contributed to the level of success they recorded. The situation may be different in countries that have low technological affordances.

In a similar research Alwahaishi and Snáše (2013) integrated UTAUT and Flow theory to form a hybrid theoretical framework, which they used to investigate the acceptance

and use of mobile internet in a consumer setting, specifically Saudi Arabia. Their framework had eight constructs – the original four constructs of UTAUT (performance expectancy, effort expectancy, social influence, and facilitating conditions), while the other four include "Perceived Value, Perceived Playfulness, Attention Focus, and Behavioural Intention" (Alwahaishi and Snáše, 2013 p.61).

Alwahaishi and Snáše (2013) adopted an online survey approach to collect their data. They reported that that four of the variables (performance expectancy, perceived playfulness, social influence and facilitating conditions) significantly affected behavioural intention, which in-turn affected ICT use significantly. Again, similar to the previous study, this study was conducted in Saudi Arabia which has witnessed a rapid development of mobile internet.

The third study assessed the likelihood of accepting the use of m-learning by students in higher institutions (public and private) in Thailand. In this study, Jairak, Praneetpolgrang, and Mekhabunchakij (2009) adopt the UTAUT model as a theoretical framework to underpin their study. They explored the effects of the four independent variables of UTAUT on behavioural intention from two perspectives: i) based on the original UTAUT relationships as proposed by Venkatesh, Morris, Davis, and Davis (2003), and ii) introducing 'attitude' as a mediating variable between the four constructs and 'behavioural intention'. They however dropped all the moderating variables specified in UTAUT.

Jairak et al. (2009) found that effort expectancy, social influence, facilitating conditions, and attitude had a significant positive relationship to behavioural intention while performance expectancy did not. Additionally, they found performance expectancy, effort expectancy, and social influence to have a significant positive relationship to attitude while facilitating conditions had not. Their results further showed that while performance expectancy was the greatest predictor of attitude, social influence was the greatest predictor of behavioural intention. They further revealed that their study found a significant difference between the m-learning acceptance levels of students in public and private Universities in Thailand.

Jairak et al. (2009) concluded that positive attitudes led to the intention of students in Thailand to accept mobile learning.

In 2013, Abu-Al-Aish and Love also made an attempt to explore the application of UTAUT to ascertain the salient factors in the acceptance of mobile learning in higher education. Part of their objective was also to investigate whether or not prior experience accounted for any effect on behavioural intention, specifically in Brunel University in the United Kingdom. They adopted three constructs of the original UTAUT (performance expectancy, effort expectancy, and social influence (lecturers) in addition to three new ones (personal innovativeness and service quality. Mobile device experience being the third one was used as the moderating variable).

Abu-Al-Aish and Love (2013) analysed their data using structural equation modelling and found that all of the five constructs in the model significantly predicted behavioural intention and accounted for 55.0% of the variance, with effort expectancy being the strongest predictor. They further stated that the effects of effort expectancy, personal innovativeness and social influence (lecturers) on behavioural intention were stronger for students with three or fewer years of experience in using mobile devices, while the effect of service quality was stronger for students with more than three years' experience on mobile device usage.

Alharbi and Drew (2014) used an integration of UTAUT and the IS success model to explain the acceptance and success of m-learning in higher institutions, specifically Griffith University, Australia. The integrated model which they used consisted of three acceptance constructs from UTAUT (performance expectancy, effort expectancy, and social influence), three success constructs from the IS success model (information quality, system quality & user satisfaction) and a new construct lecturer's attitude. Alharbi and Drew (2014) reported that their study found performance expectancy, effort expectancy, and social influence to have positive relationships with behavioural intention. They further state that consistent with the IS success model, information quality and system quality were found to positively affect student's satisfaction of mobile learning. Student's satisfaction in turn positively affected student's intention to use mobile learning. In addition, Alharbi and Drew (2014) stated that system quality positively affected system satisfaction just as information quality affected information satisfaction. Lastly, they reported that the lecturer's attitude to the use of mobile devices positively affected students' behavioural intention towards the system. It was noted that the study completely relied on the use of correlational analysis to explore the influence of factors.

Motivated by the inadequacy of research that addresses the lack of conceptualization and measurement of the success of m-learning especially in the context of higher institutions of learning, Lin et al. (2016) utilized the updated IS success model (Delone & McLean, 2003) with six (6) constructs (information quality, service quality, user satisfaction, net benefit, and criterion) to address this concern. Lin et al. (2016) reported that the study was able to conceptualize and design the mobile learning system success item list.

***Other developing world perspectives or contexts***

As earlier pointed out, the application of mobile learning depends on the peculiarity of the situation or affordances. In view of this, Traxler (2007) stated that the experiences or picture of mobile learning in the developed world would be different from that in developing countries due to different affordances. Traxler maintains that essential infrastructure such as electricity, internet connectivity, and inadequacy of computers as well as other salient environmental or cultural factors can result in some differences in terms of the adoption of m-learning. Thus, this study finds it imperative to review the status of mobile learning in other developing countries and in Africa.

In a study which seemed like a replication of an earlier study conducted by Jairak et al. (2009), Thomas, Singh, and Gaffar (2013) compared the application of variations of the UTAUT model to explain the adoption of m-learning in higher institutions in developing countries, specifically at the University of Guyana, South America. In contrast to the original UTAUT, they introduced a new construct 'attitude' to mediate between the UTAUT constructs (performance expectancy, effort expectancy, social, and influence and facilitating conditions) and behavioural intention such that the four independent variables were related to 'behavioural intention' through 'attitude'. The authors employed the use of an online survey research strategy to elicit data from respondents who were mainly students. They used a questionnaire with 21 items on a 5-point Likert-scale to measure the UTAUT constructs including the additional construct (attitude). The scale ranged from 'strongly disagree' to 'strongly agree'. Thomas et al. (2013) used structural equation modelling to measure the fitness of their model with the data. Based on the variations that they introduced, three structural equation models were measured – the first consisted of the original UTAUT model, the second consisted of facilitating conditions predicting behavioural intention and the third had the construct 'attitude' introduced.

Thomas et al. (2013) reported that although their first model (relating performance expectancy, effort expectancy, and social influence to behavioural intention) fits the data,

the variance in behavioural intention explained 40.3% which fell short of the original UTAUT 70%. The second model (relating all four constructs to behavioural intention) had a better result – it explained 49.8% of the variance in the intention of users even though the value was still below that of the original UTAUT. They also noted that the second model rendered the regression effect of effort expectancy on behavioural intention non-significant. Their third model (relating all four constructs to attitude and relating attitude to behavioural intention) explained 58.3% and 59.3% of the variances in attitude and intention of users respectively. According to Thomas et al. (2013), although the third model appeared to be better than the first two, the variance in behavioural intention explained was still lower than that of the original UTAUT. In addition, they reported that their third model indicated that social influence had an insignificant effect on attitude while contrary to the original UTAUT, facilitating conditions affected the intention of users significantly. A further revelation that emanated from their study was that attitude affected behavioural intention significantly even with the presence of performance expectancy and effort expectancy.

Thomas et al. (2013) concluded that cultural and country differences may have significant effects on the UTAUT relationships, thus they encouraged more research across different cultures and countries to further verify this.

In an attempt to look at the behavioural intention and use of mobile learning from the African perspective, Mtebe and Raisamo (2014) investigated the factors that influence the adoption and use of m-learning by students in higher institutions in East Africa, using the UTAUT model as the theoretical framework. In view of the fact that the students use a mobile learning system to supplement other forms of learning, Mtebe and Raisamo (2014) regarded mobile learning as voluntary, thus they dropped the moderating variable 'voluntariness of use' from the UTAUT model. They also excluded gender, age and experience from their study for reason that their respondents were virtually of the same age group with little or no variation in technological experiences. They also cited alignment with other studies (Jairak *et al.*, 2009; Thomas et al., 2013) as reason for dropping the moderating variables in their study.

Mtebe and Raisamo (2014) found that the linear regression model (consisting of four independent constructs – performance expectancy, effort expectancy, social influence, facilitating conditions; and one dependent construct – behavioural intention) explained 27.7% of the variance in the behavioural intention of students in East Africa to adopt m-

learning. Mtebe and Raisamo (2014) further reported that all the four constructs predicted behavioural intention significantly with performance expectancy being the strongest predictor. However, the generalization of this study to the entire student population of East Africa may be problematic as four out of the five institutions came from one country (Tanzania).

In another attempt to ascertain the factors influencing the use of m-learning from the African perspective, Bere (2014) employed the use of WhatsApp mobile instant messaging platform to achieve his objectives. Using UTAUT as the underpinning theoretical framework, he added two other independent constructs – student-centric learning and hedonic motivation to three original UTAUT constructs – performance expectancy, effort expectancy, and social influence. Furthermore, Bere (2014) used marital status as the only moderating variable in place of the original four moderating variables of UTAUT. Also, he adopted the quantitative research approach using a survey for the study.

The research population consisted of students at a university of technology in South Africa. Bere (2014) found effort expectancy, social influence, and student-centric learning to have positive effects on the intention of users to use m-learning. He further reported that his study explained 67% and 72% of the variances in behavioural intention and m-learning usage respectively.

Bere (2014) concluded that all the five constructs (performance expectancy, effort expectancy, social influence, student-centric learning, and hedonic motivation were determinants of the intention of students and m-learning usage with WhatsApp.

***Nigerian perspective or context***

As this study is looking at mobile learning from the perspective of Nigeria, which is a developing country, a good starting point in ascertaining the status of mobile learning in Nigeria may be first to take a look at the level of penetration and usage of mobile devices more especially mobile phones.

In a study conducted on behalf of Pyramid Research to determine the effect of mobile services in Nigeria, Baez and Kechiche (2010) revealed in part that mobile services were already prevalent. They estimated that about 49% of the population were already using mobile devices. In another development, the National Bureau of Statistics (as cited in (Osang & Ngole, 2014) estimated that 58.5% and 84.0% of Nigerians in the rural and

urban areas respectively had access to mobile phones, while 63.9% of the entire population possessed mobile phones. Furthermore, Baez and Kechiche (2010) revealed that with the rapid growth and improvements in the telecommunications industry, more people were expected to see value and be in a position to use mobile services in the near future. However, Baez and Kechiche (2010) observed that mobile learning was still very low, with only about 3% of the interviewees claiming to use mobile Internet, and a very small percentage (0.5%) use their phones to access a dictionary. Baez and Kechiche (2010) reported that the use of mobile devices for the purpose of learning was much higher in urban areas than in the rural areas. This situation is however improving as the years are passing (Osang & Ngole, 2014).

In an earlier study , Isiaka, Adewole, and Olayemi (2011) carried out a feasibility study of m-learning in Nigerian higher institutions using two Universities – the University of Ilorin (a Federal University) and the Kwara State University (a State University) all in Kwara State. Isiaka et al. (2011) found that students were using mobile phones to carry out more functions than they use computers, and that a significant difference exists between mobile device usage and computer usage patterns. Based on their discussions on the results, the researchers concluded that the results were clear indications that mobile learning was feasible in Nigeria and that the availability, affordability and popularity of mobile devices serve as boosters.

In a similar study, Utulu and Alonge (2012) investigated the use of mobile phones for Project-Based Learning (PBL) among privately owned Universities in the South West Zone of Nigeria using a sample of three (3) out of the eighteen (18) private Universities in that zone. Utulu and Alonge (2012) found, among other things, that 95.9% of the respondents had mobile phones, which they use for communication, interactions, obtaining information, browsing the Internet, and sharing knowledge anytime they were involved in PBL. They further established that 2.3% of the students had no mobile phones at all, while 0.8% had lost their phones. Based on these findings, Utulu and Alonge (2012) concluded that mobile phones are viable tools for strengthening PBL as well as implementing information services in the institutions of higher learning in Nigeria.

In another study, Adedoja et al. (2012) investigated the extent to which students in developing countries such as Nigeria utilized their mobile phones for educational purposes. Their main objective was to ascertain the feasibility of mobile learning in both in-school and out-of- school settings. Thus, they investigated two initiatives, which

include the Jambmobile – an initiative of the Joint Admissions and Matriculation Board (JAMB) which is empowered by law to conduct entrance examinations (Unified Tertiary Matriculation Examinations (UTME)) for entry into Nigerian higher education institutions; and the University of Ibadan (UI) initiative – another mobile learning project. The UI mobile learning platform offered learning activities such as lessons, quizzes, chats, a news forum, wikis as well as smart exercises, and was designed for use on any kind of mobile device (Adedoja et al., 2012).

Based on their findings, the researchers concluded that mobile learning remains the most appropriate solution in tackling the problem of poor access to education in Nigeria and should be explored by tailoring it to the needs of the local environment.

Similarly, in view of the level of penetration and growing popularity of mobile phones in Nigeria, Ogbuju et al. (2012) developed a mobile learning application that enabled students to access learning facilities using their mobile phones taking a case of Nnamdi Azikiwe University, Awka, in Nigeria. The authors reported that the results they got from the use of the technology were very encouraging, as students were happy to access library holdings and collaborate with colleagues at any time.

As already mentioned, Osang and Ngole (2014) investigated the readiness of Nigeria to implement mobile learning with specific reference to the National Open University of Nigeria (NOUN) – a University that was primarily established to run open and distance learning programmes. With the aim of establishing the benefits and barriers to mobile learning, specific issues that they investigated include the availability of infrastructure (mobile devices), mobile phone's capability, and the readiness of stakeholders (educators and students) to adopt mobile learning. Their findings showed that about 97.5% of educators and 91.8% of the students had one form of mobile device or the other and that with the exception of laptops and smart phones, students use more varieties of mobile devices than educators. On the types of mobile learning activities used by stakeholders, Osang and Ngole (2014) found that students were more engaged in different activities (such as use of camera, video and audio recordings, browsing social networking sites, file transfers using Bluetooth, exchange of SMS) than educators except in the aspect of downloading e-books and sending emails. According to Osang and Ngole (2014), while the majority (above 50%) of the stakeholders perceived that mobile learning was beneficial to them, almost the same percentage also agreed that the poor power situation, security issues, low computer literacy, poor motivation of educators, and poor learning

environment were barriers towards the implementation of mobile learning. The researchers concluded that the possession of mobile devices with different capabilities by stakeholders and their familiarity with mobile learning applications were positive indicators of their readiness to use mobile learning.

In an attempt to explore the application of a technology acceptance theory, Adedoja et al. (2013) investigated the acceptance of students in using mobile phones particularly for distance learning tutorials. Using the University of Ibadan, Nigeria, as their case study, they utilized the Technology Acceptance Model (TAM) to underpin their study. The researchers analysed their data descriptively as well as inferentially. They established from the study that all the factors had positive effects on behavioural intention, explaining about 67.5% of the variance in intention of students to use mobile phones for distance learning tutorials. Adedoja *et al.*, (2013) concluded that the results were indications of the acceptability of mobile phones for the delivery of distance learning tutorials.

Concerned by the security implications in using mobile devices to learn, for example the integrity, confidentiality as well as the privacy of users and data among other factors, Shaibu and Mike (2014) investigated the perceptions of Nigerian students on these security issues. The research was aimed at ascertaining i) how students value the security of their mobile devices, ii) the risks and security issues that may be associated with using mobile devices for learning by students and iii) the damaging effects of the security risks of mobile learning to students. They used a study sample of 125 consisting of computer science students drawn from three Nigerian Universities.

Based on the result that they obtained, Shaibu and Mike (2014) concluded that despite the advantages of m-learning, students were aware and concerned about the confidentiality of their personal information while using mobile learning. They therefore advised institutions to put security measures such as authentication and authorization in place in order to protect and safeguard users' information.

From the literature, it can be established that not much research has been carried out in terms of using technology especially mobile devices to facilitate teaching and learning at the level of Colleges of Education. In a study which ascertained the state and use of technology in Colleges of Education in the South-west region of Nigeria, Tella (2011) established that only 12.5% of the institutions studied had internet connectivity while just 25% of them use the available ICT facilities for research and learning. The foregoing

confirmed the backwardness of colleges of education in terms of the application of technology for facilitating teaching and learning.

## 3.2 The learning environment

A learning environment consists of a place and tools that are used to support a learning process, which of course influences or determines the learning system or method. According to Rieber (2001), a learning environment is a place that has resources, time, and reasons to enable people to nurture and value their learning experiences and ideas. He further states that the type of resources that are found in the environment gives a clearer description of it, and that the ability to access such learning resources is even more vital. Similarly, Warger, Serve, and Dobbing (2009) assert that a learning environment includes learning resources, technology, and the ways in which teaching and learning takes place in relation to societal and global perspectives.

It is common knowledge that a large proportion of what we know today has been gained from our surroundings and experiences. Therefore, a learning environment contributes either positively or negatively to learning in the same way that our environment does in our lives. As mentioned earlier, in as much as the availability of learning resources in a learning environment is crucial, the ability to access the resources is even more crucial. For this reason, technology (Warger, Serve & Dobbing, 2009) has become an essential constituent of the learning environment, which seems to address the concern of access to resources highlighted by Rieber (2001). Hence, a learning environment may be categorized into two types of environment. One is the traditional learning environment which consists of the teachers interacting face-to-face with their students in a restricted classroom using the chalk or white board for any illustrations. In this case, teacher-learner interactions as well as access to learning materials are mostly limited and restricted. The second, which is vital to this study is the technology- enhanced learning environment where learning is either partially aided or facilitated by technology (blended) or where it is completely provided or delivered using technology (JISC, 2004)

### 3.2.1 The technology-enhanced learning environment

Based on an understanding of a learning environment as established in the previous section, a technology-enhanced learning environment will consist of all technologies that

facilitate the delivery of learning. These include learning management applications supported by relevant hardware such as computers and network infrastructure.

Al-Khalifa (2010) perceives a learning environment simply as a learning management system or as a platform for helping students to complete their activities such as uploading various documents and having access to information anytime and anywhere as quickly as possible. This makes access to learning content much easier as communication among students and teachers is also facilitated (Al-Khalifa, 2010; Gudanescu, 2012; Oye, Mazleena, & Lahad, 2011). Some technology-enhanced learning environments as mentioned by Moore *et al.* (2011, p. 130) include "a Learning Management System (LMS), a Course Management Systems (CMS), a Virtual Learning Environment (VLE), or even a Knowledge Management System (KMS)". In summary, a LMS typically refers to any infrastructure that supports the building, delivering and tracking of learning with the aid of technology (Phillipo & Krongard, 2012).

The characteristics of a learning environment include (i) the learning objects or contents which are tools such as digital resources that are available in the environment (Watson & Watson, 2007) and (ii) design methodology which refers to the manner in which the objects are delivered to the learner, for example self-paced or instructor-led (Moore et al., 2011). Kamel (2008) however observes that although learning management systems are essential in the delivery and management of structured content, their role can be limited in a situation where learning is not centred on self-discovery, exploration and thinking. He further states that having a clear picture of a virtual learning environment, which spells out the nature of learning to be adopted, how learning should be administered, and the appropriate learning strategy fall among the initial things to consider in the selection of an LMS. Furthermore, Ellis (2009) lists some pertinent questions that could serve as a guide the selection of appropriate LMS. These include the following:

- Is there room or needs for content development?
- Is there need for links to external information sources?
- Is there need for online assessment capabilities?

For the purposes of this study, CMS is used synonymously to VLE, which provide the environment for the development of course and management of their content. It also views CMS and VLE as subsets of LMS which is in agreement with Gagné, Wager, Golas, and Keller (2005), and Watson & Watson (2007). In other words, LMS is viewed

as a higher level solution involving the planning, delivery, and management of all learning events in an institution, covering both virtual classrooms as well as instructor-led courses (Greenberg, 2002).

In a recent survey, Walker *et al.* (2014) revealed institutional usage of some virtual learning environments, which include Moodle (62%), Blackboard Learn (49%); SharePoint (12%); Other VLEs developed in house (12%); FutureLearn (5%); Other intranet-based developed in house (3%); Blackboard WebCT (3%); Desire2Learn (2%); Instructure Canvas (2%); Sakai (2%); Other commercial VLE (2%); Coursera (1%); Pearson eCollege (1%); and Other open source VLE (1%).

The values in parenthesis represent the institutional usage in percentages. Blackboard Learn with 49% was found to be the most used as the main VLE followed by Moodle which is 39%. Additional findings from the survey further reveal in part that:

i. The primary reason for the use of TEL by the institutions is to enhance learning and teaching;
ii. Optimization of services for mobile devices is on the increase;
iii. Mobile technologies top the list of items that demand or make use of TEL;
iv. The use of social networking media, blogs and document sharing tools by staff and students is top among software that is non-centrally supported; and
v. Lack of time tops the list of barriers to the development of TEL. Other factors include lack of skills and lack of money.

The study of Walker *et al.*, (2014) confirms the viability of mobile learning as pointed out earlier (Korucu & Alkan, 2011), and the emerging role of social networking sites (SNS) in education. By implication, the study suggests that the time to develop learning application, skills of users and the cost implication play a major role in the application of TEL. While Walker *et al.* (2014) revealed mobile technologies are leading in terms of devices that make use of TEL, Toktarova *et al.* (2015) state that the development of learning applications especially for mobile devices is a very complex task. Perhaps this explains why the use of social media and related applications by lecturers and students tops the list of non-centrally supported applications in the institutions surveyed by Walker *et al.*, (2014). It is not surprising then that Itmazi and Megias (n.d.) and Kamel (2008) had suggested an integrated learning environment that places the learner at its centre with

tools like blogs, social networking, and collaborative tools, which enable him to explore various areas of personal interest.

Therefore, in what may seems like the welcoming of SNS in education, Klopfer, Osterweil, Groff, and Haas (2009, p. 1) state that:

> *Every day, many students are spending countless hours immersed in popular technologies—such as Facebook or MySpace, World of Warcraft, or Sim City—which at first glance may seem like a waste of time, and brain cells. But these genres of technologies—Social Networking, Digital Gaming, and Simulations—deserve a second, deeper, look at what's actually going on.*

Klopfer *et al.* (2009) further stated that using social networks has no age boundaries or limits as they argue that a closer interaction with them reveals that they are not only tools for entertainment, but also have some great impact on reasoning, learning and interaction with others. They maintain that good learning implies students collaborating and discussing ideas, learning that is designed around real world contexts, sharing ideas with colleagues across the globe, immersing learners in a situation that allows them to self - discover and gain a high level of thinking in an attempt to solve a problem. They further argue that social networks have all the characteristics and potential of achieving good learning, as users are now creating, learning, and communicating in new ways. Thus, since time, lack of skills and lack of money constitute the major barriers to the use of conventional VLEs (Walker *et al.*, 2014), the application of social networking sites in education seems to address these challenges. This is because social networking applications are freeware and most lecturers and students already have skills in using them (Klopfer *et al.*, 2009). Corroborating this position, Selwyn (2012) states that, perhaps the driving force behind the educational use of social networking sites is the nature of students that are enrolling in the institutions. This is more so because the current generation of students are not willing to be passive consumers, as such, they are increasingly eager to satisfy their choice, convenience and control through the design, production and distribution of products by themselves (Selwyn, 2012). Selwyn (2012, p. 2) further described the incoming students as those "who know nothing other than a life with the internet."

In the light of the above, Alsereihy and Al Youbi (2014) assert that with the exponential increase in the popularity of social networking media, higher education institutions are beginning to embrace their applications for various educational purposes. They maintain

that a number of Universities in the Western world today have included social networking in their curriculum in order to facilitate communication, research and collaboration among stakeholders. These arguments, beg the question – what is a social networking site?

### 3.2.2 Social networking site (SNS)

According to Mazman and Usluel (2009), social networking sites, also referred to as collaboration software are tools that support shared interests including collaboration, sharing of knowledge, interaction and communication, in which process they support both virtual and real world social activities. In like manner, Selwyn (2012) sees social networking sites as Web applications, which are based on shared content which are created, criticized and reproduced by the general public or users. Smith (2014) defines a social networking application as software that brings people together around an idea. Similarly, Buzzetto-More (2012, p. 64) sees social networking sites as applications which provide support for the storage and presentation of information to the "complex arrangement of connected nodes (people)" for the purpose of communicating and interacting with others. In general, social networking sites are web-based technologies that facilitate interaction, communication and collaboration among individuals or organizations. In addition, social networking sites are applications that are produced and maintained through the general contributions of various individuals and groups for the purpose of connecting people together through the sharing of information, ideas as well as collaborating with one another.

The list of social networking sites is growing on a daily basis. According to Buzzetto-More (2012), among the top ten social networking sites as at 2012 were *Facebook, YouTube*, *Twitter* and the remaining seven which include *Yahoo! Answers, Pinterest.com, LinkedIn, Tagged, Google+*, *MySapce* and *Yelp* in that order had below 1% of market share. In terms of popularity, *Facebook* was rated as the most popular social networking site with over 845 million users in over seventy (70) languages (Buzzetto-More, 2012). Thus, with the social interactive, communication and collaborative features of SNS which are lacking in most conventional learning management systems (LMSs), social networking sites are believed to be well-positioned to support teaching and learning (Buzzetto-More, 2012; Mazman & Usluel, 2010). They further argue that social networking sites, specifically *Facebook*, have the capacity to facilitate online discussions

and collaboration among students, and between students and teachers, in addition to providing opportunities for the sharing of ideas, educational content as well as enhancement of communication among stakeholders. This is very important more so when one considers the fact that the current generation of students consists of digital natives. This compels learning to be socially and digitally driven by ubiquitous technologies (Buzzetto-More, 2012). In line with this, Mazman and Usluel (2009) state that social networking sites are opening the door towards informal learning which is considered important and necessary as it gives room for spontaneous learning with learners having direct control of the learning process. They maintain that since social networking sites are being used extensively by many people, their application to education is long overdue in view of the numerous advantages including learner-centred, collaboration, and active participation among others. They further state that most people now have a preference for communication using an online environment instead of the traditional face-to-face situation, while virtual friendship is gradually replacing the traditional friendship. Yapici and Havedanli (2014) maintain that since most teachers and students are users of social networks, and that with *Facebook* having the largest population (e.g. 34% of *Facebook* users in Turkey are higher education students), the application of social networks especially *Facebook* in facilitating teaching and learning will certainly be rewarding. Earlier, studies such as Ajan and Hartshorne (2008) and Mason (2006) have pointed out that social networks have features that provide room for interaction, active participation, collaboration among members in groups, critical thinking as well as sharing information and sources, which are all important to education. In another dimension, Ahn (2011) states that the benefit of using social media in education can better be viewed from a literacy perspective, which is based on learning practices like creating media rather than the traditionally based practices (formal learning setting) which deal with grades or standardized assessments. In this sense, Ahn (2011) argues that the youth of today communicate and learn more from outside the school premises. Thus, engaging in interactions using social networking sites is viewed as a form of literacy practice which contributes to learning. According to Adewole and Fakorede (2013), appropriation is a skill which enables the communication of ideas by remixing content from different sources. They posit that social networking sites provide the tools to enable students to gather, synthesize and remix content, thereby acquiring skills and knowledge. Similarly, Clark and Ausukuya (2013) state that networking is the capacity to search, integrate, and disseminate information, which social networking sites provide.

In view of this, the next section examines the extent to which social networking sites have been useful in teaching and learning.

#### 3.2.2.1 Application of social networking in teaching and learning

In what appears like the first stage of studies to establishing a link between the use of SNS and educational performance, Karpinski and Duberstein (2009) conducted a survey using 219 undergraduate and postgraduate students of Ohio Dominican University to ascertain if there was a link between the use of *Facebook* and educational performance. Although part of the findings of Karpinski and Duberstein (2009) indicated that *Facebook* users had lower performance than non-*Facebook* users, their study did not suggest that *Facebook* use led to lower performance, as there could be other factors such as personality traits. Building on this, Pasek, More, and Hargittai (2009) examined the relationship between social networking use and learning outcomes among undergraduate students, and they found that *Facebook* usage had no relationship with GPA. They therefore suggested further research to investigate the relationship between *Facebook* and academic performance of students.

Laying a theoretical foundation on the application of SNS in education, Mazman and Usluel (2009) proposed a model for the educational use of social networking sites. Their model was from previous innovation and technology acceptance models (such as diffusion of innovation theory (DIT), technology acceptance models (TAM1, TAM2), and UTAUT. Following this initial conception, Mazman and Usluel (2010) came up with a structural model to explain how users can use social networking sites specifically *Facebook* for educational purposes. This model is discussed in more detail in chapter four. The researchers tested out their model and found that user-purposes and adoption processes accounted for 50% of the variance in educational use of *Facebook* while *Facebook* adoption processes explained 86% of user purposes. In other words, while *Facebook* adoption processes alone accounted for 45% of variance in educational use of *Facebook*, the joined effects of *Facebook* adoption processes and user purposes accounted for 50% of the variance in education use of *Facebook*.

Also, in a bid to understand the efficacy of social networking sites as instructional tools, Buzzetto-More (2012) examined the perceptions of students of the United States Mid-Atlantic minority-serving University, specifically management students who have already completed courses. As part of his methodology, the researcher integrated *Facebook* use into some courses that were taken by management students for at least one

academic session. According to Buzzetto-More (2012), while *Balckboard* management system was used in all the courses to handle activities such as distribution of PowerPoint slides, handouts, submission of assignments as well as grading, and access to grade books among others; *Facebook* was used to create course groups for the courses involved and all students who had registered for the various courses were made to join. Among the activities handled by *Facebook* were announcements, different forms of discussion, question and answer sessions, sharing of material and resources such as links, videos, news articles, and images among others. According to the researcher, participation in the *Facebook* activities was mandatory with marks assigned for involvement, and that no specific guidelines were given to students, rather, they were only advised to make contributions that were meaningful, thoughtful and relevant to the course as well as the topic being discussed. The instructor of the course remained active from the beginning to the end, acting as an engager on one hand and a facilitator on the other hand.

According to Buzzetto-More (2012), the findings from their study revealed that 33% of the participants indicated that they stay online for 3-8 hours per week engaged in social networking sites, and that 47% of them agree that *Facebook* develops interpersonal relationships. In addition, Buzzetto-More (2012) found that social networking sites especially *Facebook* can strengthen relationships within learning communities as 47 per cent of the students agreed that *Facebook* can enhance their learning process. The report further reveals that 50% of the students see *Facebook* as a good tool for engaging in learning while 35% prefer a social networking site such as *Facebook* for learning engagement as compared to a traditional LMS such as Blackboard.

To further verify the use of SNS, Shembilu (2013) investigated the benefits of social networking in education in Tanzania by sampling the opinions of students of the University of Dar’es Salaam. His data was collected using a questionnaire consisting of 19 items. The study found that the majority of the students (96%) use social networking sites to socialize with peers while a reasonable number (63%) use social networking sites for sharing academic-related information. Shembilu (2013) also found out that *Facebook* was the most preferred social networking site while blogs ranked second. The study further revealed that 65% of the respondents feel that social networking sites can serve both social and academic needs of students while 32% feel otherwise. Regarding measures that needed to be put in place to facilitate the educational use of SNS, sensitization of students and educators was ranked first (87%) followed by provision of

Internet access (68%), and distribution of Internet and ICT facilities nationwide (42%). Forcing government to provide free Internet centres was ranked last (12%).

Shembilu (2013) concluded that although participants see the educational use of social networking sites as promising, and that there was some evidence of the educational use of SNS in Tanzania, not much sensitization had been done to widen the scope of usage. In addition, challenges of ICT infrastructure and cost of Internet bandwidth served as obstacles.

Similarly, in order to assess the viability of SNS sites in facilitating teaching and learning, Dunn (2013) focused on the application of mobile and portable devices and an online survey strategy to elicit information from a sample of 231 students. In specific terms, his study aimed at ascertaining i) how students use SNS ii) whether students were willing to use SNS to support learning and iii) whether students viewed SNS as tools that enhanced their learning experiences.

Dunn (2013) found that the majority of students (92%) use one form of social networking medium or the other, with *Facebook* (86%) being the most popularly used. The study further indicated that 87% of subscribers use SNS for personal use, 33% for networking with other professionals while 24% use it for research-related activities. Regarding the belief of students in the helpfulness of social networking sites for learning, his study reveals that 75% of the students found social networking sites very helpful in learning.

Gülbahar (2014) investigated the current state of the use of social media in education, with specific reference to selected Universities in Turkey. With the aim of ascertaining the patterns and implications of using social networking media in both face-to-face and

online environments, he adopted a qualitative research approach using interviews to collect his data from students and instructors. His findings reveal that participants have positive perceptions on the use of social media in education but are, however not aware of the various facilitating tools that these technologies offer.

On the other hand, Alsereihy and Al Youbi (2014) argued that the positive reports that are emanating from the western world on the usage and application of social networking sites in education should not be generalized. In the light of this, they examined the usage of social networking sites by higher education institutions in Saudi Arabia. Adopting a quantitative research approach, Alsereihy and Al Youbi (2014) found among other things that the use of social networking applications was prevalent in major Universities in Saudi Arabia. Their study further found that *Facebook* was leading in terms of usage and awareness, but that the use of social networking sites as collaborating and educational tools was underutilized amidst privacy and security concerns.

In other words, while social networking sites have been found to be beneficial, research has also shown that they could be harmful especially to the youth. Based on this feedback, the next section reviews the situation from the Nigerian perspective.

#### 3.2.2.2 The use of social networking sites in higher education institutions in Nigeria

As learner-centred learning, otherwise referred to as flexible learning (Serbessa, 2006), gains popularity and support, pressure is mounting on every educational system including Nigeria's, to adopt it. This has become very necessary because as Buzzetto-More (2012) states, the current generation of students that are enrolling in tertiary education institutions are digital natives of a techno-centric world who only understand the language of omnipresent technologies. While positive reports have emanated from different parts of the world in support of the use of social networking sites, Alsereihy and Al Youbi (2014) state that the success stories that have been reported so far may not be generalized across countries as the situation may vary from country to country or region to region.

In Nigeria, the use of social networking sites is said to be prevalent among University students (Ezeah, Asogwa, & Edogor, 2013). For this reason, Ezeah *et al*. (2013) investigate some of the reasons for the use of social networking sites by University students in the South-Eastern part of Nigeria. They use a sample size of 300, which was drawn using a multistage sampling technique. After eliciting their data from the respondents using a questionnaire, they analysed the data using tables, charts and

descriptive statistics. Ezeah *et al*., (2013) found that while some students use social networking sites for positive engagements such as entertainment, education and discussion of some national issues, others use them for negative engagements such as cybercrimes or pornographic related activities. They in addition found out that the use of social networking sites reduces the study time of students. On this basis, Ezeah *et al*., (2013) recommend the provision of acts that control the use of social networking sites by both students and other users in Nigeria.

In a more recent study, Eke, Omekwu and Odoh (2014) found that most students at the undergraduate level use *Facebook, 2go, WhatsApp, Twitter, YouTube, Google+ and Yahoo*, with *Facebook* topping the list. They add that most students use social networking sites to interact with friends, share education-related information with classmates, as well as discuss national issues. They further found that social networking sites were beneficial to the students but there were some dangers which include cybercrimes, privacy issues, cross-site request forgeries, addiction and time wastage among many others. They therefore recommend controlled measures for the use of social networking sites in Universities.

Shifting attention from academic performance to research, Kanelechi, Nwangwa, Yonlonfoun, and Omotere (2014) investigated the influence of the use of social networking sites to promote the research skills of undergraduate students in selected Nigerian Universities. Their aim was to ascertain the extent to which social networking sites influence the ability of students to source quality research materials, develop good ideas on areas of research interest, as well as cultivate creative writing skills. Using a sample consisting of 600 students, drawn from six Universities across Nigeria, Kanelechi *et al.*, (2014) produced results that show that undergraduate students in Nigerian Universities utilize social networking sites especially *Facebook* to seek ideas from friends on areas of their research interests, while they make use of other tools such as word press to enhance their creative writing skills. Kanelechi *et al*., (2014) further note that students' dependence solely on social networking tools has resulted in a decline in their ability to produce quality research work.

In another contribution, Okoh and Lucky (2014), while investigating the use of social networking sites among students in one of the Federal Universities in Nigeria, found out that the students prefer using social networking sites for social interaction and sharing of pictures with friends, to using it for academic purposes. According to Okoh and Lucky

(2014), the findings negate the intention of using social networking sites for academic purposes such as support for library services.

Also, in a bid to understand the effects of social networking sites on the academic pursuits of students in tertiary institutions in Adamawa State, Nigeria, Onyeka, Sajoh and Bulus (2013) surveyed a sample of 600 students from a Polytechnic, a State-owned University and a College of Health Technology. Analysing their data using frequencies, percentages, graphs and chi-square, the researchers found that most of the students use social networking sites in their academic pursuits, and that the use of social networking sites had no negative effects on the academic pursuits of students as they recommended the use of social networking sites to facilitate teaching and learning.

#### 3.2.2.3 Weaknesses and strengths of social networking sites

It is common knowledge that there are always two sides to a story. In other words, while there are good stories on the use of social networking sites, there are also some criticisms regarding their use. In line with this, Ahn (2011) observes that the connectivity of youth to global online communities is both a prospect that is frightening to parents and educators as it is also intriguing for social science research. Ahn (2011) further states that while some educators feel that the use of social networking sites should be encouraged as they contribute positively towards the learning habits of students, others have blocked their students' access to social networking sites as parents are concerned about the effects of social networking sites on their children.

One of the major criticisms of social networking sites is what Turkle (2008) describes as 'tethering' – a situation where users become too dependent, addicted or preoccupied with social networking sites such that other aspects of their life suffer. Others include virtual harassment, identity theft, cyber-bullying among others (Buzzetto-More, 2012). Hargadon (2009) states that many educators and parents are worried about social networking sites because some of the outcomes are not positive, for example, gossip, waste of time, hurt feelings, and many other dangerous activities. He maintains that, for many people, social networking sites reflect so many negative tendencies that this could impede their meaningful use in education. Hargadon (2009) further states that it would surprise many if nothing inherently negative is attributed to social networking sites, adding that one of the reasons behind the 'time wasting' and 'unsafe' feelings about social networking sites may not be unconnected to the fact that the first SNS developed were 'casino like' in nature. Some commentators have also attributed other negative tendencies

such as intellectual ‘damping-down’ and ‘de-skilling’ to the constant use of social networking sites for access to information (Selwyn, 2012). The situation from Nigeria indicates mixed feelings. While some students use SNS for positive pursuits such as education and fun, others use it for negative activities such as cybercrimes, forgeries and pornographic activities (Ezeah *et al.*, 2013; Onyeka *et al.*, 2013; *Eke at al.*, 2014).

However, despite the fears and concerns that have emerged regarding the use of social networking sites, Selwyn (2012) states that the future looks bright for social networking sites as most of the negative aspects will diminish as society’s understanding of social networking sites becomes deeper and clearer. Regarding the lack of privacy and safety while using social networking sites by youth, Subrahmanyam and Greenfield (as cited in Ahn (2011)) state that most of the social networking sites have some privacy control measures which enable users to have control over the people that can view their profiles, the content they upload, and the people they interact with. Hinduja and Patchin (2008) state that although most youth disclose some of their personal information on their profiles, most of them are proactive in using privacy control measures to control the people that view this information. In addition, about 91% of youth who use social networking sites interact with friends that they already know (Lenhart & Madden, 2007). This agrees with Agosto and Abbas (2010) who state that youth in the United States use social networking sites to interact with friends and not strangers. Studies have also shown that youth are less likely to experience sexual harassments on social networking sites as compared to instant messaging systems (Ybarra & Mitchell, 2008).

Ahn (2011) states that even though the foregoing suggests that some of the criticisms regarding social networking sites may have been exaggerated, these privacy issues and other negative behaviour such as cyber bullying remain issues of concern to both parents and educators and should not be waved aside.

On the contrary, different benefits have emerged in the use of social networking sites. Wellman, Salaff, Dimitrova, Garton, and Gulia (as cited in Ahn (2011)) point to the fact that social networks provide positive benefits to users in the form of social capital. In addition, Putnam (as cited in Ahn (2011)) states that different social groups serve as bridges to information and ideas in much the same way that homogenous groups provide bonding relationships in terms of social support. Thus, using a sample of college students, Ellison, Steinfield, and Lampe (2007) found a positive correlation between higher *Facebook* use, and bridging and bonding social capital. The researchers also found

interactions, some measures of self-esteem and life satisfaction as other benefits. Examining a sample of college students in Texas, Valenzuela, Valenzuela, Park, and Kee (2009) found a positive correlation between *Facebook* usage and civic engagement, social trust and life satisfaction.

In the same vein, Valkenburg *et al.*, (2006) found that a relationship exists between the use of social networking sites, self-esteem and psychological well- being such that those who use social networking sites the most had more friends and more reactions on the site. They add that a correlation exists between having more positive reactions on one's social networking profile and higher self-esteem, as higher self-esteem has a strong relationship with life satisfaction. Valkenburg *et al.*, (2006) maintain that the positive reactions that users experience are elements of their social development, which has implications for their wellbeing. According to Ahn (2011), earlier studies on the use of the Internet indicated negative reports of psychological well- being while the more recent studies, for example, (Agosto & Abbas, 2010; Buzzetto-More, 2012; Selwyn, 2012) have shown the reverse due to innovations on the Internet especially the online features such as social networking sites which accompanied Web 2.0 applications. They add that most youth today join *Facebook* not to meet strangers but because their friends are already using it and have probably invited them. Thus, the Internet no longer isolates but rather connects people. Research further shows that self-disclosure is a vital component of social networking sites that affects wellbeing. Valkenburg and Peter, (as cited in Ahn (2011)), state that the quality of the relationship between people improves when they disclose more information about themselves, resulting in improved self-esteem and psychological wellbeing.

Better still, Selwyn (2012, p.2) argues that social networks "constitute an increasingly important context wherein individuals live their everyday lives". This falls in line with the study of Hargadon (2009) which established that the same Web 2.0 blocks which were used to build 'casino-like' sites can still be used to build schools, libraries, meeting halls and even teachers' lounges among others. He maintains that the Web 2.0 tools may be more effective in serving as educational tools than social tools. This is because Web 2.0 enables users to contribute to knowledge instead of remaining passive users as the case was with Web 1.0. Selwyn (2012) states that the Web today has become a many-to-many rather than a one-to-many connectivity channel. In other words, the three 'Rs' (reading, receiving, researching) of Web 1.0 have now become the three 'Cs' (contributing,

collaborating, creating) in Web 2.0 (Hargadon, 2009; Selwyn, 2012). For this reason, Hargadon (2009) suggests the use of the phrase 'educational networking' in place of 'social networking' to further emphasize or buttress the educational value of Web 2.0 technologies. He further states that the rapid movement of forward thinking academics and institutions towards the use of Web 2.0 tools to facilitate teaching and learning practices confirms his belief that Web 2.0 tools are a perfect fit for education. Hargadon (2009) observes that some educators, on grounds of privacy, professional and/or boundary concerns are still sceptical about the educational benefits of social networking sites, which are fostered by Web 2.0 tools. He notes however that these concerns have gradually been overshadowed by the success stories of social networking sites in education.

### 3.2.3 Mobile learning environment

The foregoing suggests that two forms of technology are associated with mobile learning – hardware and software platforms. The physical components of the mobile device itself such as screen, keypad, memory, and battery (with characteristics such as portability, screen size, processor speed, memory size, and battery power) define the hardware. On the other hand, the programs that run on it, such as the operating system and various applications that users interact with (characteristics such as user friendliness, flexibility, response time, latency, and memory requirement among others) define the software. Traxler (2007) states that both components alongside their characteristics result in different interpretations or implications for mobile learning. He compares for example, two scenarios that explain the implications of the hardware and software components of mobile devices. The Palm™ brand of handheld computers with zero-latency, task-oriented interfaces and moderate functionality on the one hand, which result in a maximum performance of the processor, memory and battery; and the Microsoft-based mobile devices that have PC-based interfaces and considerable latency thereby placing very high demands on the memory, processor and battery. He maintains (Traxler, 20 p.5) that while the former describes the "bit-sized, just-in-time" form of learning mechanism, the latter describes a portable learning mechanism that is close to the traditional e-learning. The software components can also include the learning environment such as learning management system, content management systems, and virtual learning environment among others (Watson & Watson, 2007).

### 3.2.3.1 Devices for m-learning

Regarding the devices and technologies that are associated with mobile learning, a number of studies (Hemabala & Suresh, 2012; Mehdipour & Zerehkafi, 2013; Yahya et al., 2010) highlight that some of the devices include mobile phones, smart phones, contactless smart cards, handheld terminals, and handheld gaming consoles among many other devices. Others are Radio Frequency Identifications (RFIDs), sensor network nodes, Personal Digital Assistants (PDAs), notebooks and Tablets. Hwang, Wu, Tseng and Huang (2010) provide a comparison of the technologies used by six well known mobile and ubiquitous learning systems, which are Tag Added learNinG Objects (TANGO), Musex, PERsonalised Knowledge Awareness Map (PERKAM), PPM, Mobile and Ubiquitous Learning (MoULe), and Picture Mail Database System (PMDS) as shown in Table 3.3.

**Table 3.1:** ***Comparison of the technologies used in various context-aware u-learning interventions***

| | **TANGO** | **Musex** | **PERKAM** | **PPM** | **MoULe** | **PMDS** |
|---|---|---|---|---|---|---|
| Learning Device | PDA | PDA | PDA | PDA | Smart phone | Mobile phone |
| LAT | RFID | RFID | RFID | RFID &GPS | GPS | QR-Code |
| Availability | Low | Low | Low | Low | Medium | High |
| Cost | High | High | High | High | Medium | Low |
| Communication Device | PDA | Transceiver | PDA | PDA | Smart phone | No |
| Instant help | Yes | Yes | No | Yes | Yes | No |

**Key:** RFID (Radio Frequency IDentification), GPS (Global Positioning System), QR (Quick Response)
**Source:** Hwang *et al.*, (2010, p.994)

From Table 3.1, it is apparent that the most available and affordable device for mobile learning is the mobile phone followed by the smart phone. However, Adedoja, Botha and Ogunleye (2012) state that the most common device for mobile learning in most developing countries remains the mobile phone with six learning channels which includes Short Message Service (SMS)/Multimedia Message Service (MMS), voice service, document sharing, video and audio services as well as interactivity.

### 3.2.3.2 Mobile learning implementation architectures

A number of implementation architectures, frameworks or models have been proposed, in view of the growing needs and application of mobile learning across the globe. Riad and El-Ghareeb (2008) proposed a Service Oriented Architecture (SOA), which

integrated mobile assessment into Learning Management Systems. The architecture facilitates the exchange of SMS between LMS, learners and teachers and thereby automates the entire learning process for appreciable performance. Figure 3.3 shows the architecture, which has three layers: interface, service and agent layers.

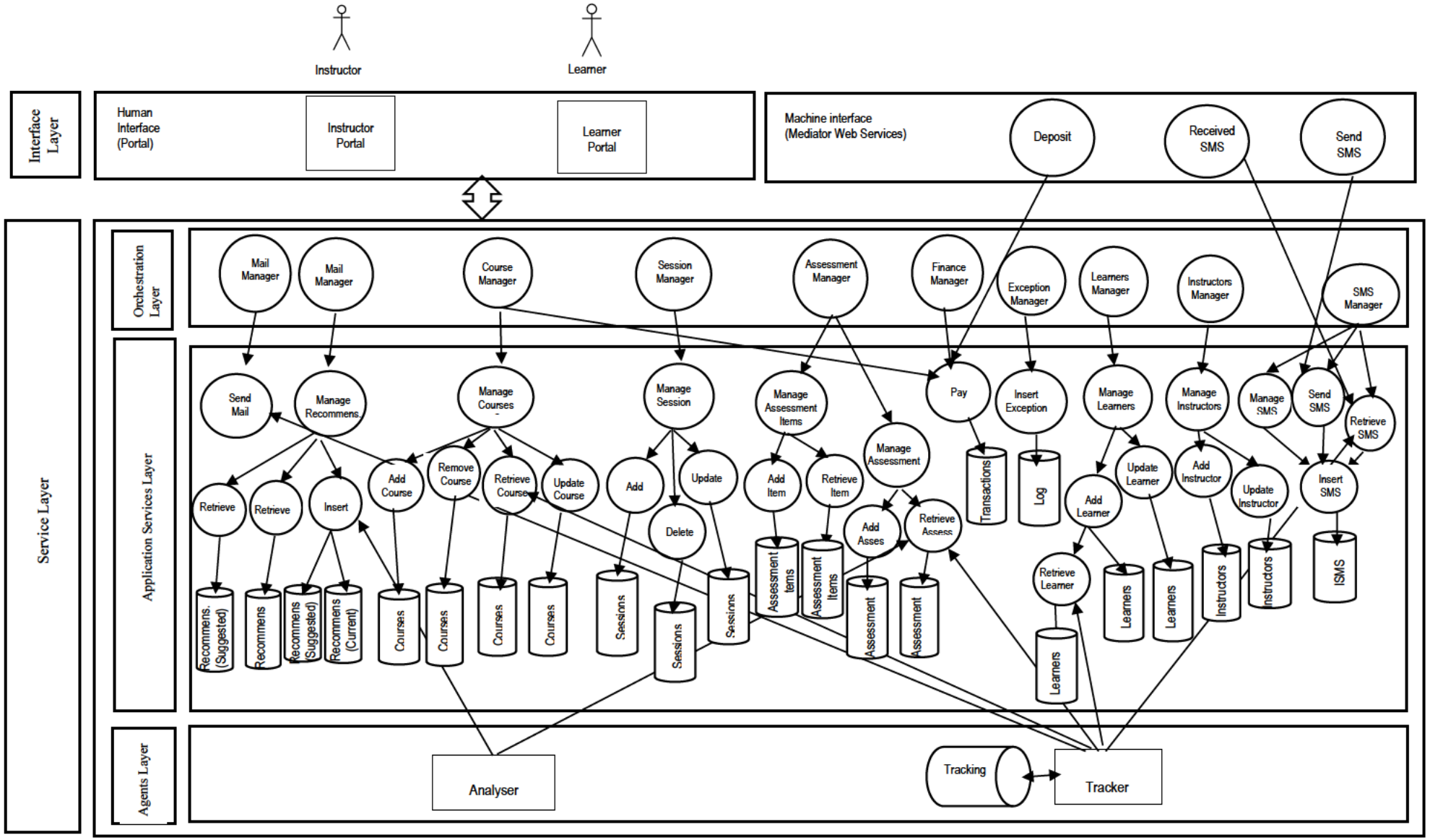


**Figure 3.3: LMS architecture (Riad & El-ghareeb, 2008, p.207)**

Tan et al. (2011) proposed a framework for adaptive location-based mobile learning using the semantic technology and ontology-based methods. Their framework principally aims at providing the right content to the right learner at the right time, and right location using the right device. As shown in Figure 3.4, time, location, learner and device are determinants of the right content, which ultimately is the objective of the system.

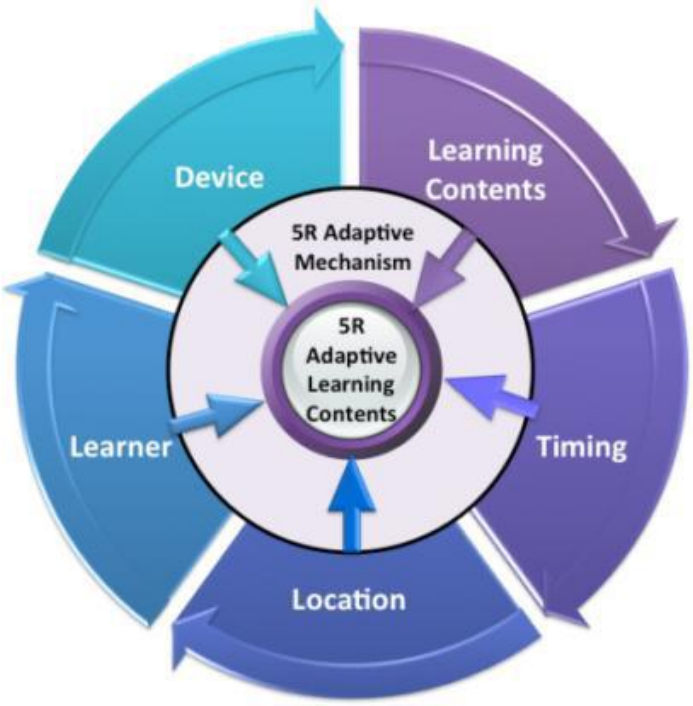


**Figure 3.4: 5R adaptation framework (Tan *et al.*, 2011, p.3)**

According to the researchers, the framework consists of five components – right time which deals with the date-time of the availability of the resources; right location, which refers to the current geographical location of the learner; and right device deals with the capability of the learner's device to adapt to his location and time in order to determine the right content. Other components of their architecture include the right content which refers to the right learning objects, activities and instructions for the learner; and right learner who is the person who uses a mobile device to gain knowledge in his mobile learning environment.

Ako-Nai and Tan (2013) implemented the framework that was proposed by Tan *et al.*, (2011) as they developed a Learning Management System (LMS) for Adaptive Mobile Learning. The architecture consists of five components: location sensing, content generation, grouping, learning, and messaging engines while the location based LMS has three modules: administration, instructor and learner modules. As compared to the

traditional learning system, their study reveals, among other things, that students are more engaged when using mobile devices and game-based learning approaches for studying. They also found that the system promoted ownership and collaboration among students. They further state that the collaboration among students enhanced the building of Figure 3.5 which shows the architectural diagram of the LMS that was implemented by Ako-Nai and Tan (2013).

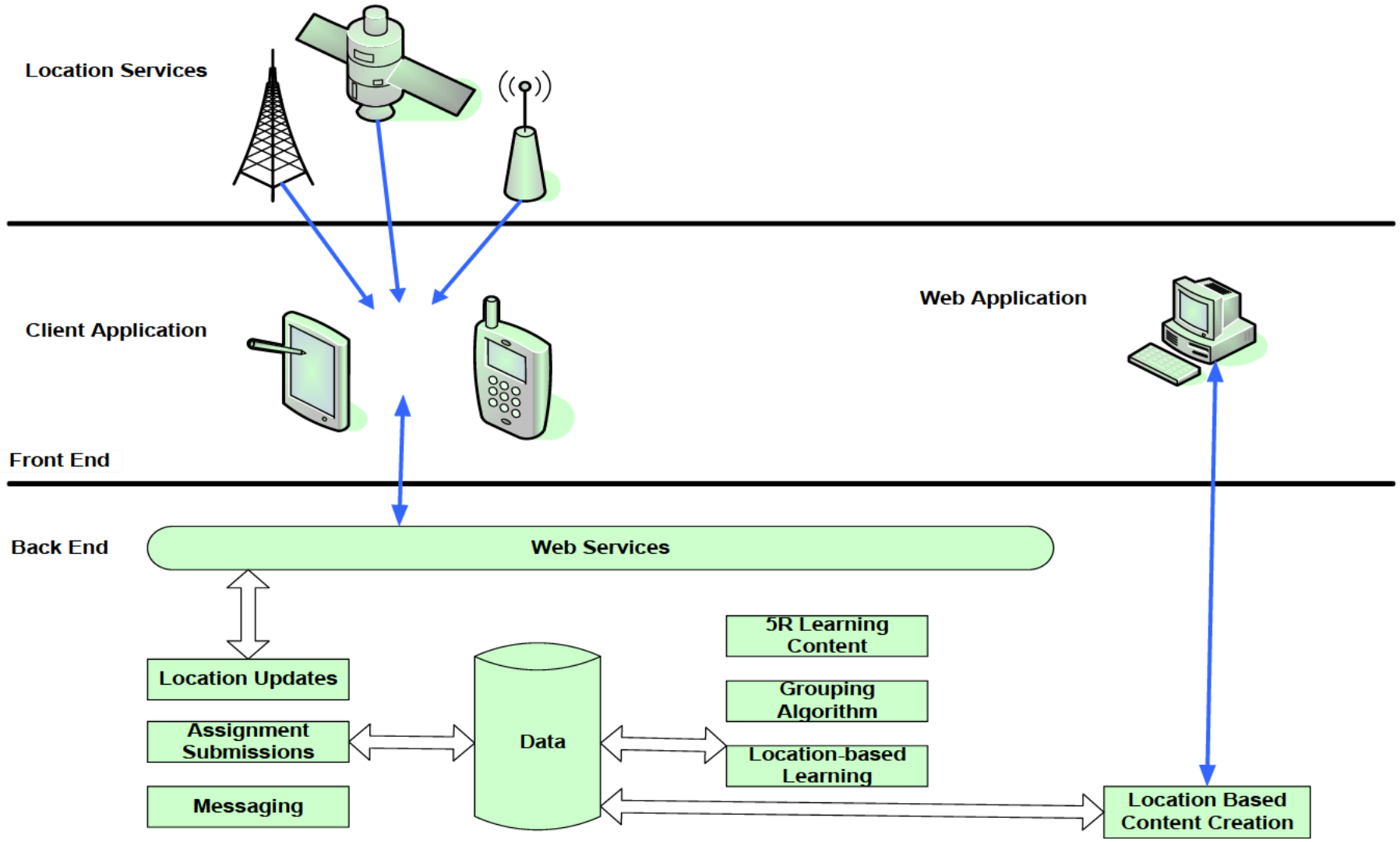


**Figure 3.5: System architecture diagram of location-based LMS (Ako-Nai &Tan, 2013: p.532)**

A key advantage of this architecture is the fact that it may be implemented in a web version as well, which will allow learning resources to be accessed from conventional laptops and desktops. However, its shortcoming is that it does not target the formal learning setting.

In another attempt, Mogire and Oboko (2013) proposed a framework to support ubiquitous formal learning using Mashups (interactive web applications which combine learning content from various sources). This effort was motivated by the challenges that learners face on the web before obtaining the right content at the right time and location, and the lack of desired collaboration by students. The framework which, takes into account context awareness and collaboration, consists of components that query websites to put together content from diverse sources that best fit users' devices, no matter their locations. A diagrammatic representation of the framework is shown in Figure 3.6.

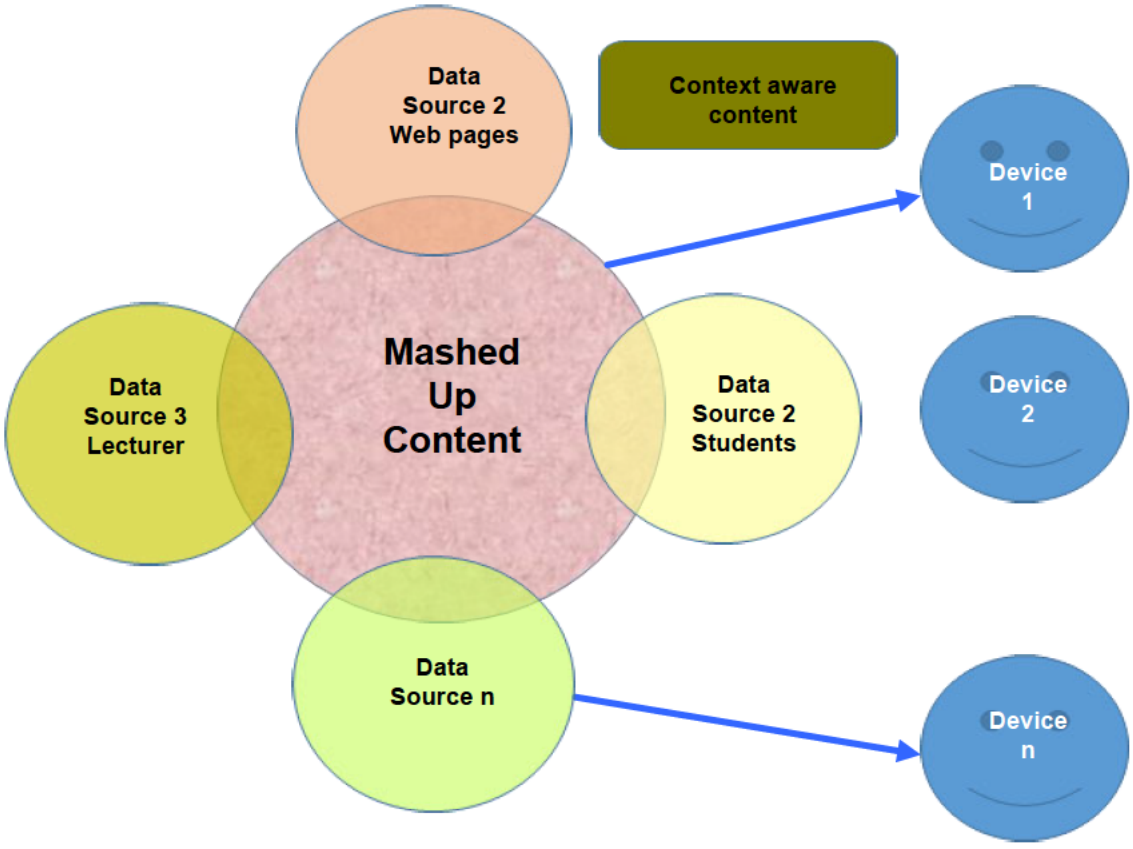


**Figure 3.6: Context-aware framework using mashups (Mogire & Oboko, 2013, p.249)**

One advantage of this framework is that its design takes into account the formal learning environment.

In yet another attempt, Toktarova et al. (2015) proposed a model for teaching and learning using mobile devices. The objective of their model is to improve the efficiency of teaching using mobile devices through 'open access' to various courses and resources at any given time and place. The researchers also cite an increase in the IT skills of students as another objective of their model. The model is presented in Figure 3.7.

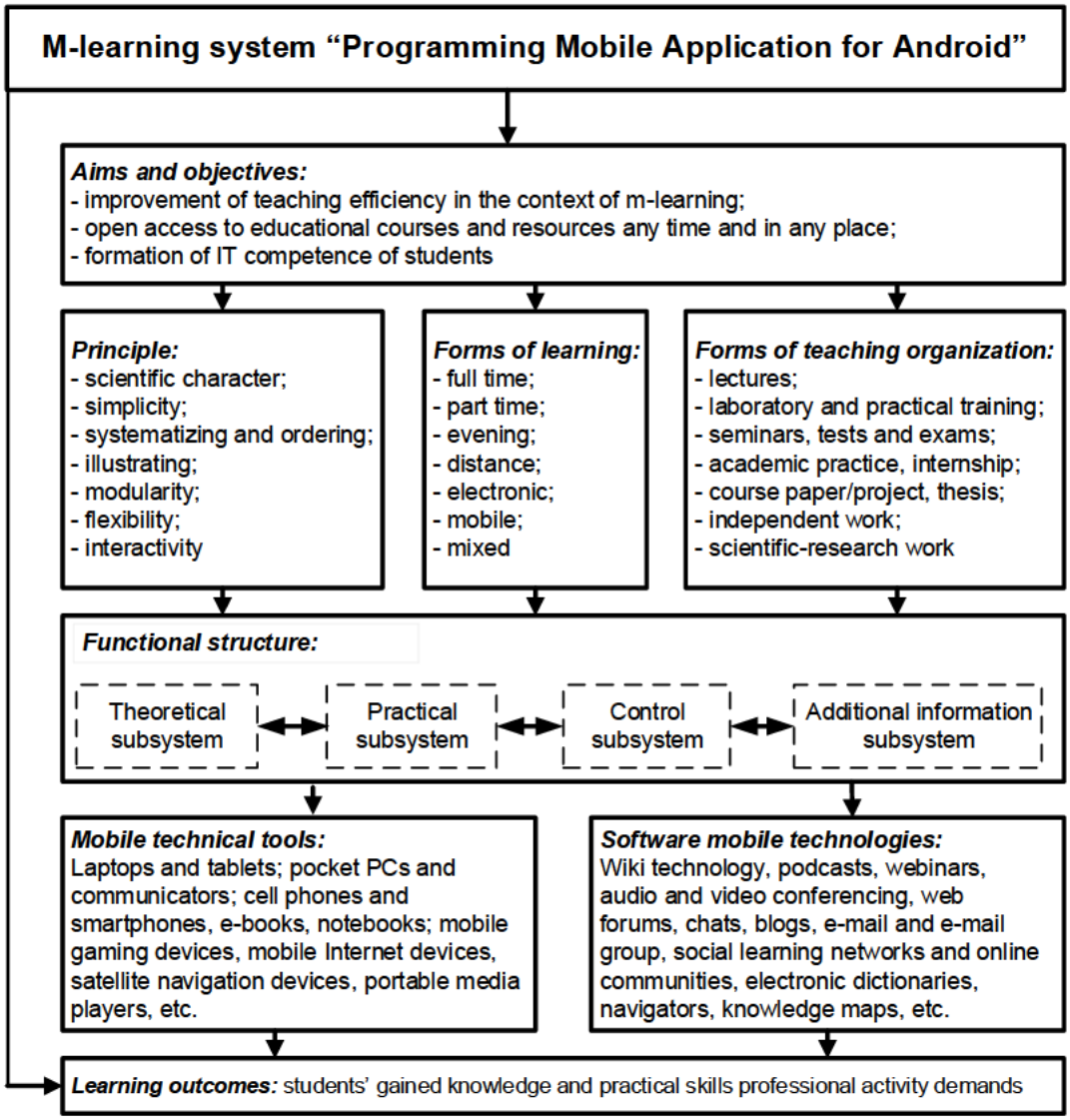


**Figure 3.7: Implementation of m-learning model (Toktarova *et al.*, 2015, p. 323)**

Again while the contribution of this model is acknowledged, the technological affordances and skills required to implement this model may be above the level of most beginner users, especially in developing countries.

In general, contextual peculiarities such as existing policy frameworks, skills of the stakeholders, availability and affordability of the associated technologies are salient features that have not been considered in most of these frameworks. These features are

very important to consider especially in formally defined educational settings, as well as in developing countries where technological development is still low.

Furthermore, there is no clear indication of the extent to which mobile learning improves the teaching and learning conditions in formal education settings. According to Traxler (2007)**,** the increasing rate in diversity in m-learning and the complexities of mobile technologies raises a question of adequacy of conventional evaluation techniques that are based largely on formal and traditional learning. He further states that the application of mobile learning is growing so rapidly in recent years such that a community of practice that is distinct from those of traditional e-learning has evolved. He adds that most of the applications of m-learning have been "short-term small-scale pilots and trials in the developed countries of Europe, North America, and the Pacific Rim, and there is a taxonomy emerging from these pilots and trials that suggests tacit and pragmatic conceptualisations of mobile learning" (Traxler, 2007, p.1). He maintains that the fact that mobile learning is personalized, contextual and situated makes its conceptualization and evaluation problematic and at odds with formal learning, which is based on "courses, semesters, assessments and campuses" coupled with strict monitoring mechanisms (Traxler, 2007, p. 1). Similarly, in their review and synthesis of mobile learning models/frameworks, Hsu and Ching (2015) acknowledge that not much research has been done in terms of the evaluation of mobile learning. As a guide, there is a need to categorize the emergence and application of mobile learning to include the following:

i. Technology-driven m-learning – deploys some specific innovations to demonstrate the feasibility and pedagogic possibilities of mobile learning in academic institutions.
ii. Miniature but portable electronic learning – uses mobile and wireless technologies on established e-learning approaches or solutions such as virtual learning environments (VLEs) or as replacements for static desktop systems.
iii. Connected classroom learning – uses technologies for example interactive white boards to support collaborative learning.
iv. Informal, personalized and situated m-learning – integration of technologies with enhanced functionalities such as location-aware and video-capture capabilities for learning especially in situations where learning seems to be impossible.

v. Mobile training or performance support – uses the technologies to enhance the delivery of information in time and in context to mobile workers in order to improve their productivity and efficiency.
vi. Remote or rural development mobile learning – uses mobile technologies to solve environmental as well as infrastructural problems by providing education to places where conventional e-learning is limited.

Therefore, an institution can adapt or adopt any of the categories depending on their peculiarity and affordances, which may depend on:

i. Infrastructure such as power and internet connectivity;
ii. Technical support and/or sparsity of equipment,
iii. Wider policy objective such as lifelong learning;
iv. The integration of mobile distance learning in the blended distance learning framework and the affordances of other learning and support systems.

## 3.3 Summary

This chapter has shown that technologies which can enhance teaching and learning as depicted in Figure 2.4, otherwise known as technology enhanced learning (TEL), include electronic learning (e-learning) and mobile learning (m-learning). Whereas e-learning is generally associated with the use of the computer as the learning device, m-learning is specifically associated with the use of mobile devices such as mobile phones and ipads as the learning devices (Behera, 2013; Korucu & Alkan, 2011). Each form of TEL (e-learning or m-learning) is inclusive of a learning platform which provides the learning content.

Considering the fact that computers are more expensive and depend on electricity which is a major problem in Nigeria, mobile learning becomes a more viable technology to consider adopting (Adedoja *et al.,* 2013; Madu & Pam, 2012). This is due to less dependence on electricity, portability and omnipresent nature of mobile devices, which promotes individualized learning. Although mobile learning appears to favour informal learning more than formal learning settings, researchers are optimistic that mobile learning will play a vital role in formal education when it is blended with the traditional teaching and learning practices (Traxler, 2007, 2009; Adewole & Fakorede, 2013). Hence, frameworks/models for the implementation of mobile learning have been

proposed (Ako-Nai & Tan, 2013; Mogire & Oboko, 2013; Toktarova *et al.*, 2015). However, while the contribution of these frameworks has been acknowledged, this fails to take into consideration certain contextual issues which are considered important in the successful implementation of mobile learning. The peculiarities of the environment which connotes issues such as existing policy frameworks, skills of the stakeholders, and availability and affordability of the associated technologies are salient features (Traxler, 2007) that have not been mapped into some of these frameworks. In their critical review of frameworks, Hsu and Ching (2015) found that not much has been done in conceptualizing the evaluation of mobile learning.

In terms of the learning platform or environment through which the learners will interact, the literature indicates that while a number of traditional learning management systems exist, for example Blackboard and Moodle among others (JISC, 2004), poor budgets, lack of adequate skills, as well as complexities in their development have been cited as some barriers to their application in the implementation of mobile learning (Toktarova *et al.*, 2015; Walker *et al.*, 2014). Fortunately, social networking sites are user friendly; very compatible with most mobile devices; and most stakeholders especially lecturers and students in higher education institutions are comfortable with them (Klopfer *et al.*, 2009; Mazman & Usluel, 2010). Social networking sites can facilitate collaboration, resource sharing, and the use of online sources to support learning materials. In view of this, several studies (for example, Selwyn, 2012; Alsereihy & Al Youbi, 2014; Yapici & Havedanli, 2014) have explored the use of social networking sites to facilitate teaching and learning with positive results emerging. Similar studies conducted in Nigeria yielded mixed results (Ezeah *et al.*, 2013; Eke *et al.*, 2014). Although critics have raised their voices against the use of social networking sites in education due to their perceived negative tendencies and usage in some quarters, Selwyn (2012) states that the benefits of using social networking sites in education have overshadowed the disadvantages of using them.

It is gathered from the literature that despite the promises of social networking sites and mobile learning in facilitating teaching and learning, no known study has integrated the use of mobile learning with social networking sites in Nigeria, especially in the context of Colleges of Education. Some studies (such as Isiaka *et al.*, 2011; Adedoja *et al.*, 2013; Osang & Ngole, 2014; Shaibu & Mike, 2014) have investigated mobile learning in Universities but not with social networking sites as the learning platform. The situation

in other higher education institutions remains unclear in view of different affordances, which are key determinants of any research output (Traxler, 2007; Thomas *et al.*, 2013). Colleges of Education are vital, based on their role as teacher training institutions, but are most affected in terms of the challenges that are confronting teaching and learning in Nigerian higher education institutions (Ogunyinka *et al.*, 2015; Tella, 2011). Therefore, exploring the use of mobile learning in improving the teaching and learning conditions in higher education institutions, specifically Colleges of Education has become imperative. In view of the affordability and commonality of SNS, their use as the learning platform may be more viable.

# CHAPTER FOUR
# THEORETICAL FRAMEWORK

As indicated in the concluding part of the previous chapter, this study explores the use of mobile learning to improve the teaching and learning conditions in Colleges of Education, specifically from the Nigerian perspective. The study achieves this in two stages. First, the acceptance of mobile learning by stakeholders is ascertained, and secondly, the implementation of the technology is tested. The study uses a social networking site to serve as the mobile learning platform.

In order to guide the study towards achieving its aim as reflected in Figure 2.4, an appropriate conceptual framework is required. Most of the studies reviewed in the literature made use of the unified theory of acceptance and use of technology (UTAUT) or variations of the theory to understand the acceptance or intention and usage of mobile learning in higher education. UTAUT was developed by Venkatesh *et al.* (2003) to measure the intention and usage of technology by users. This aligns with one of the objectives of this study. Hence, the study finds UTAUT relevant. However, one limitation of UTAUT in relation to this study is that UTAUT only measures the likelihood of users to accept a technology and the users' intended usage behaviour of the technology (Venkatesh *et al.*, 2003). In other words, UTAUT is mainly suitable for use prior to the application or implementation of a technology. By implication, UTAUT alone is unable to address the two main objectives of this study.

To be able to measure the acceptance and successful use of technology by individuals and organisations, a number of studies (Alharbi & Drew, 2014; El-Hussein & Cronje, 2010; Jones, 2007; Yapici & Havedanli, 2014) have integrated either the technology acceptance model (TAM) or the UTAUT model with the IS success model. Based on the foregoing, three models – the UTAUT model, the IS success model, and the educational use of *Facebook* model are considered critical in explaining the acceptance and use of mobile learning, as well as educational use of social networking sites. While the IS success model is considered suitable in view of its capacity to measure the success of the application of information systems in organisations, the educational use of *Facebook* model brings into the study constructs that are peculiar to the use of *Facebook*. Therefore, these models are briefly reviewed in this chapter with a view to

providing a background to the conceptual framework of the study. First, the meaning and use of theory in a research process is discussed.

## 4.1 Meaning and use of theory

A theory is an established scientific framework, which presents and explains the various constructs (variables) that surround a given phenomenon and the interrelationship between them. Kerlinger (1979, p. 64) defines a theory as "a set of interrelated constructs (variables), definitions and propositions that presents a systematic view of phenomena by specifying relations among variables with the purpose of explaining natural phenomena". Creswell (2014) explains that a theory may be presented in a research study in the form of an argument, a discussion, or rationale, which assists in explaining any phenomena that is occurring in any part of the world. By implication, a theory provides a sketch or skeleton of the research. In other words, the theory serves as the pillars upon which the research is based.

Creswell (2014) further states that a theory may be used in a mixed method research either deductively (quantitative theory testing and validity) or inductively (emerging qualitative theory or pattern).

## 4.2 Relevant theories or models

As has already been mentioned, this section reviews the UTAUT, IS success, and educational use of *Facebook* models in view of their relevance to the study. These are presented below.

### 4.2.1 Unified theory of acceptance and use of technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology was developed by Venkatesh *et al.*, (2003). The theory was used to study and explain the behaviour of people towards the acceptance and use of an Information System/technology. This theory indicates that three key constructs otherwise known as the independent variables (Performance Expectancy, Effort Expectancy, and Social Influence) directly influence the intention of individuals towards the acceptance and use of a new system/technology. The theory further holds that other factors such as gender, age, experience, and voluntariness of use control or moderate the impact of the four independent variables as shown in Figure 4.1.

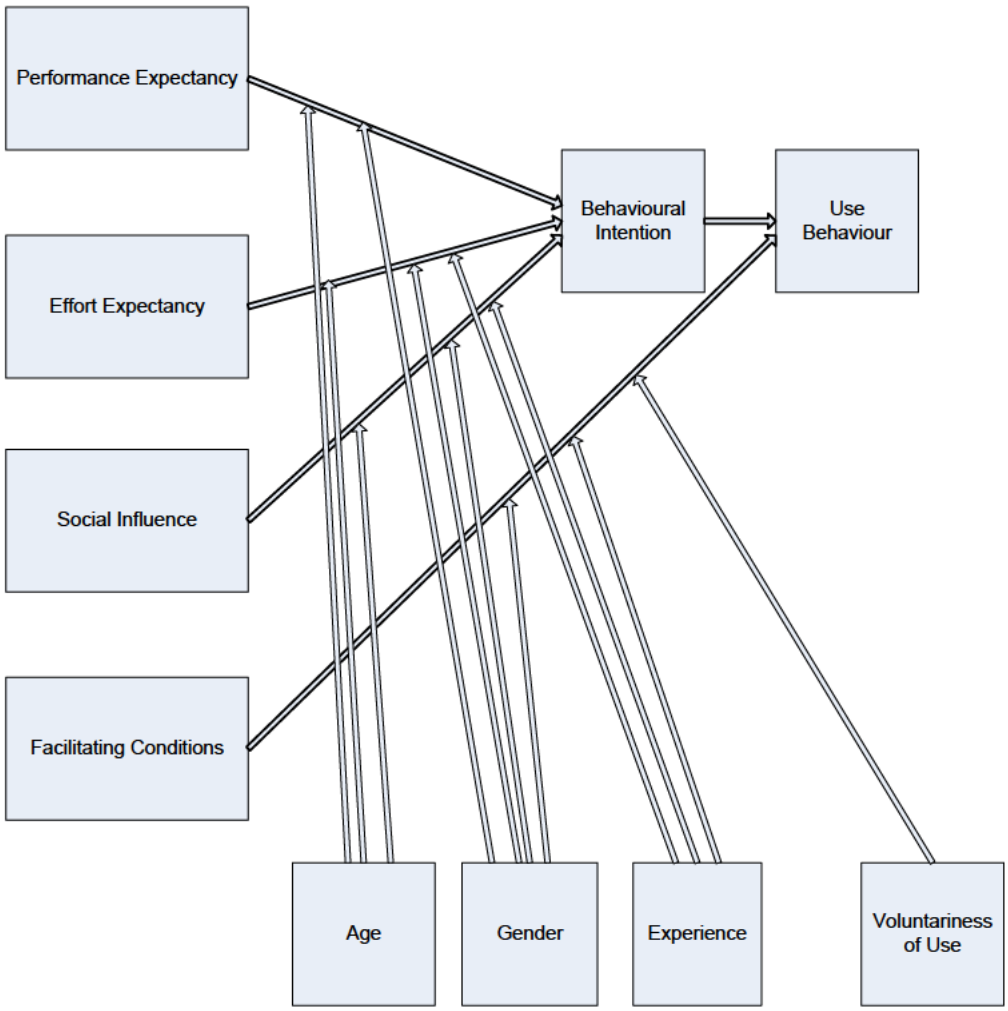


**Figure 4.1: Unified theory of acceptance and use of technology (Venkatesh *et al.*, 2003, p.447)**

As can be seen from the model, the theory further indicates that the usage behaviour depends on the intention of the user and the facilitating conditions. An explanation of the various constructs as given by the developers follow.

***Performance expectancy*** – measures the degree or level (assurance) to which users feel that a system will help them to improve their job performance. In other words, the construct measures relative advantage of the new system/technology to the users. Other terms which are used in place of Performance Expectancy in other models include Perceived Usefulness (technology acceptance model - TAM), Extrinsic Motivation (Motivation Model – MM), Job-fit (Model for PC utilization - MPCU), Relative Advantage (Innovation diffusion theory – IDT) and outcome expectations (Social cognitive theory – SCT). Venkatesh *et al*., (2003) theorized that performance expectancy, which was the strongest predictor of intention in their study is moderated by gender and age. Since men appear to be highly task-oriented (Minton & Schneider, 1980), Venkatesh

*et al*., (2003) argue that performance expectancy, which concerns task accomplishments is likely to be more salient in them. Similarly, age is theorized to play a moderating role as research has shown (Hall & Mansfield, 1995) that younger people value extrinsic rewards more than others. Thus the researchers hypothesized that performance expectancy has an influence on behavioural intention and that this is moderated by gender and age such that the effect is more discernible in younger men. The implication is that, as long as younger men believe that the system or technology will assist them to perform their job, the more positive their behaviour will be towards accepting and using the technology.

***Effort expectancy* –** measures the degree or the level of ease of using the system. In other words, the construct measures the effort needed to operate the system. Terminology used in other models in place of Effort Expectancy include Perceived Ease of Use (technology acceptance model – TAM), Complexity (model for PC utilization – MPCU) and Ease of Use (innovation diffusion theory – IDT). The implication of Effort Expectancy is that if the system or technology is easy to use, the more positive is the attitude of the users towards accepting and using the technology. Effort Expectancy is more significant in the early stages of usage (Agarwal & Prasad, 1997). Thus, Venkatesh *et al*., (2003) further theorized that Effort Expectancy is moderated by gender, age, and experience.

***Social influence* –** measures the degree to which important others influence an individual to use a system or technology. Other terms which are used to refer to this construct include Subjective Norm (technology acceptance model 2 – TAM2, theory of planned behaviour – TPB, combined technology acceptance model and theory of planned behaviour – C-TAM-TPB), Social Factors (MPCU), and Image (IDT). It is theorized in UTAUT that social influence is moderated by all four moderating variables of gender, age, experience, and voluntariness of use. Therefore the effect of Social Influence on behavioural intention is moderated by gender, age, experience and voluntariness of use.

***Facilitating conditions* –** refers to the degree to which users view their organizations and the state of facilities in their domain as supportive of the system. Other terms, which are used to refer to the construct include Perceived Behavioural Control (TPB, C-TAM-TBP), Compatibility (IDT). Venkatesh *et al*., (2003) theorized that facilitating conditions do not have a direct influence on intention but on usage and that facilitating conditions are moderated by age and experience. They further state that facilitating conditions do

not have much influence on behavioural intention but that they have a significant influence on usage behaviour moderated by age and experience.

#### 4.2.1.1 Non-direct determinant constructs of behavioural intention in UTAUT

i. Self-efficacy and Anxiety, which were direct determinants of intention in SCT are excluded as direct determinants of intention in UTAUT. It is theorized in UTAUT that the variables have no direct influence on intention beyond effort expectancy.
ii. Venkatesh *et al.*, (2003) also theorized that 'Motivation' as used in MM; 'Affect towards use as used in the MPCU; and 'Affect' as used in SCT; only taps into an individual's feelings such as liking, enjoyment and pleasure, that are associated with the use of technology. Thus, they do not have any direct effects on intention. Venkatesh *et al.*, (2003) further theorized that affective reactions such as intrinsic motivation and attitude may be operating through other constructs such as Effort Expectancy and/or Performance Expectancy.

#### 4.2.1.2 Strength(s) and weakness (es) of UTAUT

The strength of UTAUT lies in its broad based nature, and its wide use and application for explaining the factors that affect the behaviour or attitude of users towards accepting and using a technology. However, some of its weaknesses include its little or non-inclusion of factors that measure information system success (Alharbi & Drew, 2014).

UTAUT has been applied in many studies such as understanding: the perceptions of students in using course management software (Yapici & Havedanli, 2014), consumer acceptance and use of IT (Venkatesh *et al.*, 2012), consumers' acceptance and use of ICT (Alwahaishi & Snáše, 2013), a meta-analytic review of empirical findings of UTAUT (Taiwo & Downe, 2013), students' ICT adoption (Attuquayefio & Addo, 2014), students behavioural intention to adopt and use mobile learning in East Africa (Mtebe & Raisamo, 2014), the factors that are influencing students' acceptance of mobile learning (Abu-Al-Aish & Love, 2013), and the factors that affect the behavioural intention of college students to use mobile learning in Saudi Arabia (Omar Al-Hujran, Al-Lozi, & Al-Debei, 2014).

#### 4.2.1.3 Variant applications of UTAUT

Research has shown that new contexts can bring about significant changes in theories, such as alterations in relations or even render relationships completely insignificant (Jones et al., 2006) (Alvesson & Kärreman, 2007). For this reason, the adaption of UTAUT in different contexts has resulted in different variations or alterations to the original UTAUT. Venkatesh *et al.*, (2012) classify the various forms of applications, extensions or integrations into three major categories. These include the extension/integration of UTAUT in new contexts such as new technologies, new user populations or new cultural settings; the addition of new constructs so as to expand its endogenous theoretical mechanisms; and lastly the inclusion of exogenous variables.

A number of studies have been found to apply variations of the UTAUT model. One such is the consumer acceptance and use of information technology. In this study, Venkatesh *et al.*, (2012) investigate the salient factors that are associated with the use of technology in a consumer context. They extended the original UTAUT model by adding some factors which they considered salient in a consumer setting. These factors include hedonic motivation, price value and habit. This resulted in what the Venkatesh *et al.*, (2012) described as UTAUT 2.

One of the strengths of UTAUT 2 is that it opens the application of UTAUT to other contexts such as consumer behaviour and brings to bare the effect of intrinsic motivation on adoption or behavioural intention, which was excluded in the original UTAUT by Venkatesh *et al.*, (2003). On the other hand, UTAUT 2 is also silent on the success measurement, which Alharbi and Drew (2014) had pointed out as a short-coming of the original UTAUT.

Another study which used a modification of the UTAUT model is that of Mtebe and Raisamo (2014). In this study, the researchers investigated the behavioural intention of higher education students in East Africa towards adopting mobile learning. Unlike the original UTAUT which linked facilitating conditions directly to usage, Mbete and Raisamo (2014) linked all four independent variables of UTAUT (performance expectancy, effort expectancy, social influence and facilitating conditions) to behavioural intention and dropped all the UTAUT moderating variables.

In yet another study, Bere (2014) applied the UTAUT model to investigate the factors that have the potential of influencing mobile learning using the WhatsApp application (a

mobile instant messaging application). However, Bere dropped Facilitating Conditions while he introduced two other variables (student-centric learning and hedonic motivation) as additional independent variables. He also introduced marital status to moderate the five independent variables.

A key aspect of Bere's framework is that it provides an insight into the effect of learning method/style on behavioural intention.

### 4.2.2 Information system success model

The information success model was proposed by DeLone and McLean (1992) to provide a general and comprehensive understanding of Information System (IS) success measurement across different perspectives. Their first model consists of six (6) IS success measures (information quality, systems quality, user satisfaction, use, individual impact and organizational impact). Based on inputs and observations from other researchers, DeLone and McLean came up with an updated version of the model in 2003. Changes that were made in the updated model include the introduction of the constructs 'service quality' and 'intention to use' while 'individual impact' and 'organizational impact' were collapsed into a single construct called 'net benefits'. Figure 4.2 presents the updated model.

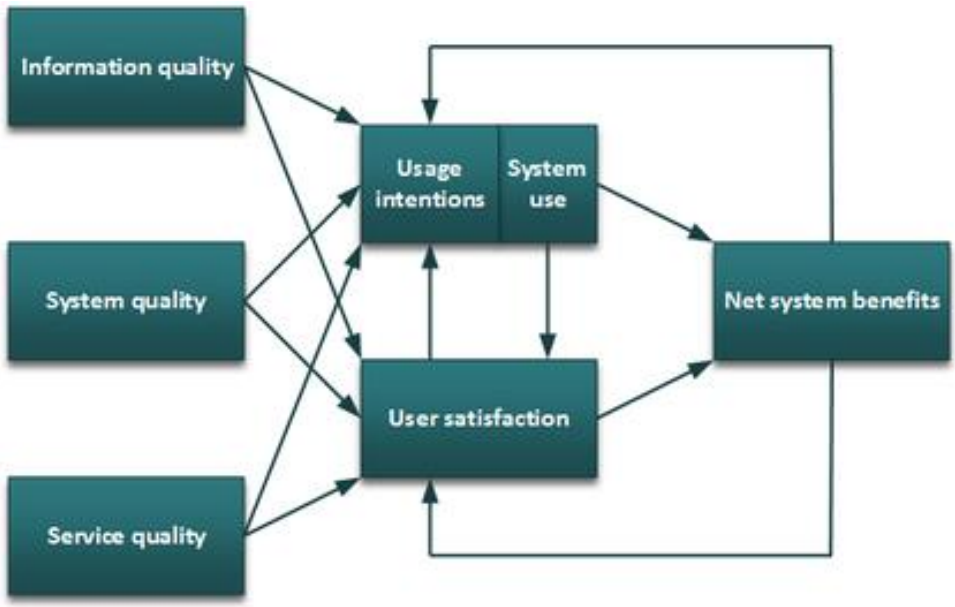


**Figure 4.2: Updated DeLone and McLean IS success model (DeLone & McLean, 2003, p.24)**

Delone and McLean (2003) explained the various constructs in the model as follows:

***Systems quality*** – measures the desirable characteristics such as usability and performance of the system under examination. Delone and McLean (2003) provide a list of some system quality measures, including adaptability, availability, reliability, response time and usability.

***Information quality*** – measures the desirable characteristics such as the quality and usefulness of information produced by the system. Seen as a key determinant of user satisfaction, Delone and McLean (2003) provide a list of information quality measures to include adequacy, completeness, format, relevance, ease of understanding and security.

***Service quality*** – represents the quality of technical support that is available to the user (For example, training or orientation and help-desk support). Delone and McLean (2003) provide a list of information quality measures to include assurance, empathy, and responsiveness.

***Intention to use/use*** – refers to the degree and manner in which an information system is used by its users. A list of some of the measurements will include frequency of use, nature of use, navigation patterns and daily use among others.

***User satisfaction*** – is viewed as one of the most valued information system success measures; user satisfaction represents the level of satisfaction (happiness) of the user when using an information system. According to Delone and McLean (2003) measurement of user satisfaction is more useful under mandatory use of information system. An example is a formal learning environment. They provide a list of user satisfaction measures to include effectiveness, efficiency, enjoyment, information and system satisfaction, and overall satisfaction.

***Net benefits*** – combine the individual and organizational impact of the original DeLone and McLean IS success model. It represents the extent to which the information system is contributing to the success of the different stakeholders and thereby resulting in the overall success of the organization (Pushpakumara, Wanniarachchige, Peiris, & Samantha, 2014). The choice of the impact that is measured also depends on the system that is being evaluated as well as the purpose of the study (Urbach & Müller, 2012). Depending on the system, the list of individual impact could include job effectiveness, job simplification, productivity, job performance, individual productivity and learning among others while organizational impact includes improved outcome/output, overall productivity, overall success and enhancement of communication and collaboration.

**Interrelationships among constructs**

***System use:*** DeLone and McLean (2003) reveal that relationships exist between system use and information quality, system quality, service quality, user satisfaction and net benefits. However, research (Urbach & Müller, 2012) shows that while the relationships between system use and user satisfaction as well as that between system use and net benefits are only moderated at the individual level, those between system quality, information quality and service quality are either mixed or lack sufficient data.

***User satisfaction*:** represents the relationships existing between user satisfaction and information quality, system quality, service quality, system use and net benefits (Delone & McLean, 2003). According to Urbach and Müller (2012), the relationship between user satisfaction and information quality as well as that between user satisfaction and system quality are very strong only at the individual level. On the other hand, the relationship between user satisfaction and service quality and that between user satisfaction and net benefits are only moderate at that level.

***Net benefits:*** refers to relationships that exist between net benefits and user satisfaction, information quality, system quality, service quality, as well as system use (Delone & McLean, 2003). Urbach and Müller (2012) on the other hand found that while the relationships between net benefits and information quality as well as service quality are moderate only at the individual level, those between net benefits and system quality as well as system use are moderate at both individual and organizational levels. On the other hand, the relationship between net benefits and user satisfaction is very strong only at the individual level.

A number of studies have adapted the information system success model to suit different contexts, with most of them combining technology acceptance with information system (IS) success measures. Alwahaishi and Snáše (2013) combined some constructs of the UTAUT and IS success models to understand the factors that are affecting the acceptance and use of ICT applications, specifically mobile internet in a consumer's context. The model introduced three new constructs (perceived value, perceived playfulness, and attention focus) in addition to the original four independent constructs of UTAUT.

While the integration of both acceptance (performance expectancy, effort expectancy, social influence and facilitating conditions) and success constructs (perceived value, perceived playfulness, which can be linked to satisfaction) are laudable, the framework

does not address constructs that specifically address environmental/cultural issues, which Alwahaishi and Snáše (2013) themselves had earlier identified as critical to behavioural intention.

Similarly, Alharbi and Drew (2014) combined UTAUT and IS success model to understand the acceptance and success of mobile learning systems. The framework consists of three constructs (performance expectancy, effort expectancy and social influence) drawn from UTAUT to measure the acceptance of mobile learning and three constructs (information quality, system quality and user satisfaction) drawn from the Information System (IS) Success model to measure the success of mobile learning system. They also introduced a new construct (lecturer's attitude) to measure the opinion of lecturers on students' behavioural intention.

Alharbi and Drew (2014) believed that facilitating conditions in the original UTAUT was theorized to measure usage behaviour and that since their research only aimed at measuring the intention of users to accept mobile learning, they decided to drop the construct. While the moderating variables of age and gender were dropped for the sake of simplicity, experience was dropped because it acts on use behaviour. Voluntariness is also omitted because their research was conducted in a voluntary environment.

One of the strengths of this framework is that it integrates both acceptance constructs and success constructs. However, since the model is only limited to behavioural intention and does not address system use, the overall net benefit of the system cannot be ascertained. Therefore, it does not provide a complete set of constructs for IS success model.

In yet another variation which combines the UTAUT and the IS success models, Abu-Al-Aish and Love (2013) introduced two new variables – quality of service and personal innovativeness to explain the acceptance and success of mobile learning. They also use lecturers' influence as an external variable that acts on behavioural intention, and mobile device experience as a moderating variable.

The strength of this model is its use of personal innovativeness which is particularly important more especially in developing countries such as Nigeria where there is a high level of uncertainty, for example anxiety and phobia probably due to the fact that the use of information technology is still new and its application thereof lags behind in most institutions, specifically Colleges of Education (Tella, 2011).

### 4.2.3 Educational use of the Facebook model and use of social networking media in education

In view of the increasing use of social networks among stakeholders in education, especially students, Mazman and Usluel, (2010) came up with a model to facilitate the application of SNS, especially in higher education. Their model leans on existing theories of acceptance and use of technology (such as TAM & TAM2, TPB, IDT, and UTAUT). The model consists of the following constructs:

***Usefulness:*** also referred to as relative advantage (Rogers, 2003) and performance expectancy (Venkatesh *et al.*, 2003). They defined usefulness as the perception that arises from the belief that the use of a certain system increases the performance of individuals as compared to the previous one.

***Ease of use*:** also referred to as effort expectancy (Venkatesh *et al.*, 2003), is defined as the ease of using *Facebook* features and the management of its overall content with less effort.

***Social influence*:** also referred to as social factors (Triandis, 1980). Mazman and Usluel (2010) defined social influence as an individual's perception of how others, who are important to him or her, will react to this individual joining *Facebook*.

***Facilitating conditions*** is defined as access to support and facilitating services to an individual's *Facebook* activities.

***Community identity*:** is seen as a major motivator to individual's participation in virtual communities. They defined community identity as the feel of belonging that individuals associate with the joining of groups to share and collaborate with others on *Facebook.*

***Social relations (purpose):*** this is seen as the making of new friends as well as the maintenance of existing ones with neighbours, family members as well as other people of common interests.

***Work related (purpose)*:** this can be viewed as the accessing or sharing of information such as projects, materials, resources and ideas by users either online or offline, in order to support their work progress.

***Daily activity (purpose)*:** this can be activities that are timewasting, that involve current affairs, playing games or having fun.

***Communication (educational use)*:** this consists of communication among students, and between students and their instructors on matters such as announcements about classes, communiqués, delivery and/or submission of assignments.

***Collaboration (educational use)*:** this refers to the opportunity provided for people to share ideas and work together as individuals or in groups with common interests.

***Resource/materials sharing (educational usage)*:** this refers to the sharing of resources or materials such as projects, documents, lecture notes and multimedia (audios and videos) by people on *Facebook*.

Based on these definitions, Mazman and Usluel (2010, pp.446-447) hypothesized as follows:

i. Usefulness, ease of use, social influence, facilitating conditions, and community identity will have a significant influence on *Facebook* adoption;
ii. Social relations, work-related purposes, and daily activities will have a significant influence on purposes of *Facebook* usage;
iii. Communications, collaboration, and resource and material sharing will have a significant influence on educational usage of *Facebook*;
iv. *Facebook* adoption will have a significant and positive relationship with purposes of *Facebook* usage;
v. *Facebook* adoption mediated by purposes of *Facebook* usage will have a significant and positive relationship with educational usage of *Facebook*.

Figure 4.3 shows Mazman and Usluel's model for educational use of *Facebook*.

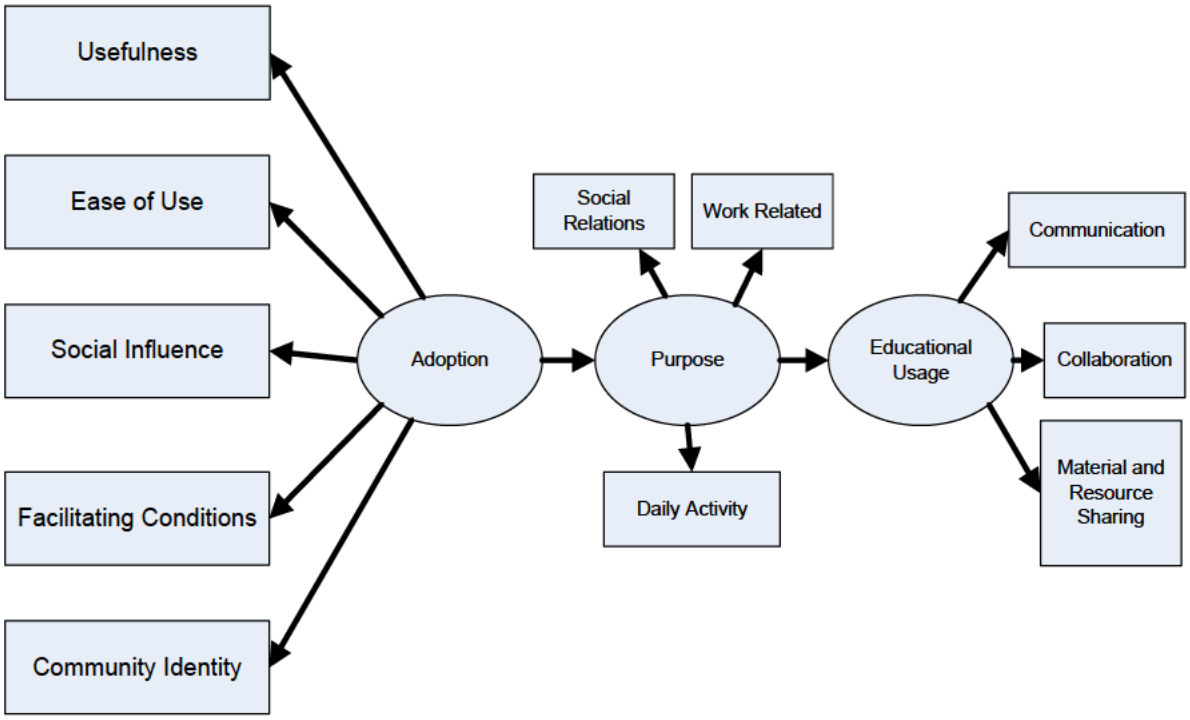


**Figure 4.3: Model for educational use of *Facebook* (Mazman & Usluel, 2010, p. 446)**

Sánchez, Cortijo, and Javed (2014) applied this model to investigate the perceptions of students on the use of *Facebook* for academic purposes using students of the University of Huelva, Spain. They found social influence to be the most influential factor as students adopt *Facebook* to maintain contact with interest groups.

The framework is comprehensive for explaining the educational use of *Facebook* as it looks at both technological and social views of social networking applications (Sánchez *et al.*, 2014).

## 4.3 Conceptual framework of this study

Alwahaishi and Snáše, (2013) state that most information systems failures have been due to the lack of their acceptance by users rather than their quality. In addition, Alharbi and Drew (2014) suggest that information systems can better be assessed from two perspectives – acceptance and successes. Since this study explores the use of mobile learning to address the challenges of teaching and learning in Colleges of Education using social networking site as the learning medium, it considered the views of Alwahaishi and Snáše, (2013), and Alharbi and Drew (2014) to be very important. Therefore, in view of the limitations and reasons that were highlighted in the introductory section to this

chapter, the conceptual framework for the study was underpinned by the concepts of UTAUT, IS success and the educational use of *Facebook* models. In order to keep the framework as simple as possible, more so that the study involves three groups of participants (students, lecturers, and management), emphasis is placed on the differences across the three groups in the acceptance of mobile learning rather than the impact of moderating variables. Thus the four moderating variables of UTAUT have been dropped.

The framework adopts the four independent variables of UTAUT (performance expectancy, effort expectancy, social factors and facilitating conditions) as the acceptance measures. The construct 'facilitating conditions' is renamed as 'mobile learning conditions'. The difference is that facilitating conditions deal more with organisational factors while mobile learning conditions are mostly personalized in view of the nature of the mobile learning technology. Additionally, the study introduced Personal Innovativeness and Anxiety as determinants of intention because the study is new in the context of Colleges of Education in Nigeria. As reviewed, these variables have been used in previous studies either in full (Alwahaishi & Snáše, 2013; Thomas *et al*., 2013; Mtebe & Raisamo, 2014), in part (Abu-Al-Aish & Love, 2013; Alharbi and Drew, 2014; Bere, 2014) or in addition to other constructs (Venkatesh *et al.*, 2012) to explain mobile learning. They have also been used to explain the educational use of *Facebook* (Mazman & Usluel, 2010; Sánchez *et al.*, 2014).

On the IS success constructs, the study agrees with Delone and McLean (2003) as well as Alharbi and Drew (2014) that user satisfaction mediates the influence of information quality, system quality and, service quality on 'use' and 'intention'. Furthermore, the study claims that personalization by way of student-centred learning drive the satisfaction of stakeholders in Colleges of Education (Bere, 2014). Hence 'student- centric learning' is theorized as another determinant of user satisfaction.

Actual use of mobile learning is represented in the study as a latent variable (AUML) with two observable variables (communication and interaction, collaboration and resource sharing). The second latent variable is Improved Educational System which also serves as the net benefit dependent variable in the overall study. The four observable variables (less demand on teachers, less demand on physical facilities, improved reading culture, and improved performance) are the result of an improved educational system. Figure 4.4 presents the conceptual framework of the study.

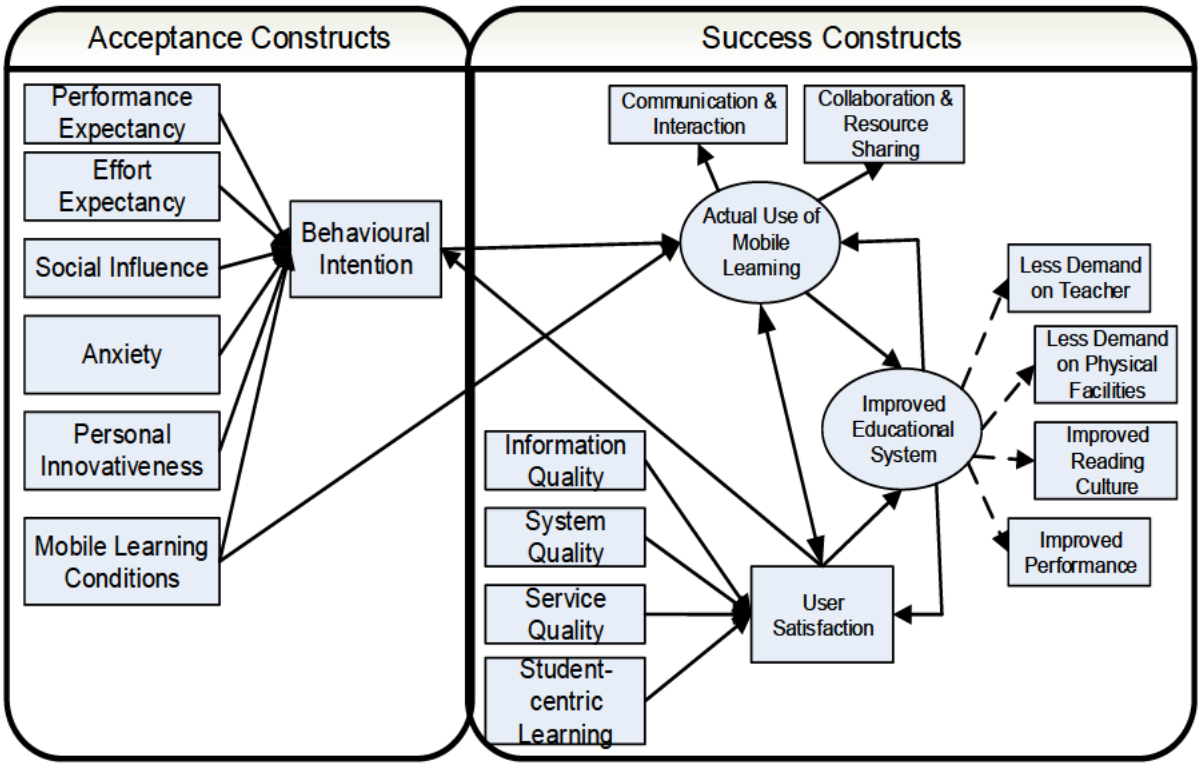


**Figure 4.4: Conceptual framework of the study**

The various constructs (variables) in the framework are explained as follows:

***Performance expectancy*** – the degree or level which stakeholders in Colleges of Education feel that mobile learning will help in supporting and improving current teaching and learning practices. Thus, the intention of stakeholders to use mobile learning will improve if they feel that the technology is useful.

***Effort expectancy*** – the degree which stakeholders feel that mobile learning will be easy to use to improve the learning conditions of students. Thus, the intention of stakeholders will increase if they feel that mobile learning is easy to use.

***Social influence*** – the degree to which other important people such as peers, friends, institutional policies, teachers and parents influence the intention of stakeholders in Colleges of Education to use mobile learning. For a country with a multicultural setting such as Nigeria where some cultures accord greater importance to authorities, people in high level positions and the elderly, this study proposes that in addition to the influence of peers and friends, the environment consisting of the institutional policies, teachers and parents may play a significant role in technology acceptance and adoption.

***Anxiety*** – the degree of uncertainty that stakeholders attach to the use of mobile learning in improving teaching and learning practices. With the low level of technological

development in Nigeria, it is natural that uncertainties such as phobia and anxiety may prevail among individuals' with regards to a new technology. This may have some implications for the intention of such individuals towards adopting mobile learning.

***Personal innovativeness*** – the degree of willingness of stakeholders to try to use mobile learning as it is a new technology. A point of interest here may be a comparison between the effects of anxiety and personal innovativeness on behavioural intention. This study purports that there will be differences in personal innovativeness across groups as students will be more willing to use mobile learning. This is in view of students' level of acquaintance with technology.

***Mobile learning conditions*** – the degree to which stakeholders in Colleges of Education feel that they have favourable conditions, such as access to supportive mobile devices, quality mobile network infrastructure as well as some technical skills and support for mobile learning.

While Venkatesh *et al.*, (2003) state that facilitating conditions only have a direct relationship with the usage behaviour of a technology, most studies on mobile learning (such as Alwahaishi & Snáše, 2013; Mtebe & Raisamo, 2014) suggest behavioural intention plays a significant role as a mediator between facilitating conditions and usage behaviour. In other words, facilitating conditions can either influence the intention of individuals to use technology or influence the way that they use it. Therefore, in addition to having a direct link or relationship with actual use of mobile learning, the framework also indicates that mobile learning conditions have a direct relationship with behavioural intention.

***Behavioural intention*** – This refers to the intention of stakeholders in Colleges of Education to use mobile learning. An intention must have a motivation. This implies that behavioural intention depends on certain factors. This study theorizes that behavioural intention will depend on performance expectancy, effort expectancy, social influence, mobile learning conditions, anxiety, personal innovativeness, and user satisfaction. Furthermore, if users intend to use a system then they may have a way or pattern of using it (Davis, 1989; Venkatesh *et al.*, 2003). In other words, a relationship exists between behavioural intention and actual usage of mobile learning such that as the intention of stakeholders increase, so will the actual use of mobile learning increase.

***User satisfaction –*** regarded as one of the most salient measures of Information System's success (Urbach & Müller, 2012)**.** It constitutes the level of satisfaction of a user when using an Information System. In relation to this study, user satisfaction measures the level in which stakeholders in Colleges of Education feel satisfied in using mobile learning. The study theorized that user satisfaction will depend on information quality, system quality, service quality and student-centric learning.

***Information quality*** – measures how stakeholders feel about the fact that mobile learning provides them with complete information that is, varied, sufficient, correct and current.

***System quality*** – measures how stakeholders feel that mobile learning is relevant, interactive, flexible and reliable.

***Service quality*** – measures how stakeholders feel about the fact that mobile learning assures them of improved, responsive, and ever-present learning.

***Student-centric learning*** – measures how stakeholders are satisfied with the student-centric learning style that mobile learning provides.

***Actual use of mobile learning*** – has relationships with behavioural intention, user satisfaction and an improved educational system. It is measured using two constructs (Communication and Interaction, Collaboration and Resource Sharing). These are discussed as follows:

***Communication and interaction*** – refers to activities including the exchange of vital information such as announcements among students, between students and their teachers; interacting with interest groups, and facilitating class discussions (Mazman & Usluel, 2010). This construct ascertains how communication and interaction using mobile devices among students, between them and lecturers, as well as interest groups, enhances teaching and learning.

***Collaboration and resource sharing*** – explores the degree to which collaboration and resource sharing using mobile devices facilitates teaching and learning.

***Improved educational system*** – is the overall dependent variable of this study. It is similar to the organization or institution's net benefit (Delone & McLean, 2003). The organization's net benefit is dependent on the individual's net benefit (DeLone & McLean, 1992). Some measurement of net benefit at individual level includes individual productivity (El-Hussein & Cronje, 2010; Oller, 2012), job performance (Bamiro, 2012; Gordon, 2014), and learning. Benefits at organizational level include improved

outcome/output, overall productivity (El-Hussein & Cronje, 2010), overall success (Almutairi & Subramanian, 2005) and quality improvement (Sabherwal, 1999). In this case, improved educational system (improved outcome/output or overall success) is measured using four constructs (improved reading culture, improved performance, less demand on teachers and less demand on physical facilities). The four constructs are discussed below.

***Improved reading culture*** – is similar to 'learning' which is an individual level net benefit (Oller, 2012). The construct therefore measures the degree to which mobile learning impacts on the reading/learning culture of the students.

***Improved performance*** – is similar to productivity which is also an individual level net benefit (Sedera & Gable, 2004). The study posits that if the reading culture of students improves, then students become more productive as their performance is also likely to improve. Hence the construct measures the degree to which mobile learning impacts on the performance of the students.

***Less demand on teachers*** – is similar to job performance which is an individual level net benefit (Davis, 1989). Difficulty in delivering education through the traditional means and inadequate staff numbers among others, were identified as some of the problems that confront teaching and learning in Nigerian higher education institutions especially Colleges of Education. Mobile learning promotes a student-centred learning paradigm, which tilts learning activities towards the student domain. The implication is that while the student is given a free hand to learn and gain skills, less demand or pressure is exerted on the teacher. This makes the teachers perform their jobs better and with less stress too.

***Less demand on physical facilities*** – is also similar to 'learning' which is an individual's level net benefit. Blending the traditional and mobile learning tackles the difficulty in delivering education through the traditional means. This implies that some learning activities are performed online, thus reducing the pressure on physical facilities such as print materials and even classrooms.

The next chapter discusses the procedure or methodology that is adopted in order to answer the research questions that guided the study.

# CHAPTER FIVE
# RESEARCH METHODOLOGY

This chapter presents the methodology or research process that was followed in order to bring about an increase in the understanding of the use of mobile learning to improve teaching and learning in Colleges of Education.

For emphasis, the study addressed two main research questions with specific objectives as restated in the section that follows.

## 5.1 Research questions and objectives

**RQ1** *What are the perceptions or possible factors that can affect the intention to use mobile learning in Colleges of Education in Nigeria?*

This question was broken down into two sub-questions:

a. *How are stakeholders using mobile devices?*
b. *To what extent do the perceptions of stakeholders and associated factors affect their acceptance or intention to use mobile learning?*

**RQ2** *How can the acceptance factors and success factors work together towards the effective implementation of mobile learning in Colleges of Education?*

The second research question was further broken down into three sub-questions:

a. *To what extent do the acceptance factors (performance expectancy, effort expectancy, social influence, mobile learning conditions, anxiety & personal innovativeness) jointly with user satisfaction influence the behavioural intention of participants?*
b. *To what extent do mobile learning conditions, behavioural intention, and user satisfaction influence the actual use of mobile learning?*
c. *How does the actual use of mobile learning and user satisfaction result in an improved educational system?*

The research questions were aimed at achieving the following objectives:

1. To understand the readiness of stakeholders by ascertaining the manner in which they use their mobile devices and how their perceptions or associated factors can influence their willingness or intention to use mobile learning;
2. To ascertain the extent to which the various acceptance factors (performance expectancy, effort expectancy, social influence, mobile learning conditions, anxiety & personal innovativeness) and success factors (actual use of mobile learning, user satisfaction & improved educational system) work towards the effective implementation of mobile learning in Colleges of Education; and
3. To propose a framework for the implementation of mobile learning in Colleges of Education.

To adequately address the research questions and attain the objectives of the study, the study was carried out in two stages – preliminary investigations and implementation. The preliminary stage ascertained the perceptions or possible factors that can affect the intention of stakeholders to use mobile learning while the implementation stage ascertained how the acceptance and success factors are synthesized towards the effective implementation of mobile learning.

The detailed process followed is presented in the subsequent sections.

## 5.2 Philosophical worldview or assumptions of the researcher

The problem that the study addresses is a real-world problem. Therefore, the study assumes the pragmatic worldview or philosophy. Pragmatism is more concerned with applications or practical solution to problems, in other words, it is concerned with what works (Creswell, 2014). Rather than focusing on one method, pragmatists combine all available approaches to tackle the problem. This worldview is considered suitable for mixed methods research especially in the social sciences (Goodyear & Retalis, 2010). Similarly, Venkatesh *et al.*, (2013) suggest that pragmatism is more applicable to research in information systems. They argue that while quantitative and qualitative studies are based on deductive and inductive reasoning respectively, pragmatism is based on abduction which falls between the two. They maintain that abduction moves forward and back between deduction and induction, making it suitable for addressing real-world problems through a mixed-methods approach as discussed below.

## 5.3 Research approach and design

Research can be categorized into three main approaches – qualitative, quantitative and mixed methods. These three research approaches are different, but may not be seen as rigid and distinct categories, rather they are at different ends on a single continuum (Creswell, 2014).

The qualitative approach is characterized by the use of words and open-ended questions or interviews as opposed to the use of numbers and closed-ended questions which the quantitative approach centres on (Creswell, 2014; Kumar, 2011).

A mixed methods approach on the other hand finds itself in the middle of the continuum incorporating elements of the two extreme approaches; involving the collection of both qualitative and quantitative data and integrating those using distinct designs which may involve the use of suitable philosophical worldviews and theoretical frameworks (Creswell, 2014; Epignosis_LLC, 2014).

This study adopted a mixed research methods approach in addressing the research questions in order to provide a richer and broader understanding of the perceptions of stakeholders and how best the acceptance and success factors can work together to achieve an effective implementation of mobile learning in Colleges of Education. Different respondents may have different opinions or views regarding mobile learning. Similarly, the participants may have different experiences in the use of the technology. In this case, while it is possible to use a quantitative approach to explore the perceptions of respondents and perhaps how they feel the technology can be best implemented in order to achieve the objectives earmarked, the quantitative approach employs closed-ended questions which tend to limit respondents to only specific options. This approach may not give enough room for respondents to express their divergent views regarding mobile learning. The qualitative approach which allows respondents to openly express their opinions was needed to fill this gap (Creswell, 2014; Johnson *et al.*, 2007). Therefore the mixed methods approach was considered more appropriate than either of qualitative or quantitative method alone as it also falls in line with the philosophical worldview of the study (Creswell, 2014; Epignosis_LLC, 2014; Venkatesh, Brown, & Bala, 2013).

For the preliminary stage of the study, the quantitative approach was first of all used to determine the usage of mobile devices by stakeholders, and their perceptions or

possible factors that could affect their intention to use mobile learning. This was followed by the qualitative approach to ascertain the perceptions of stakeholders on mobile learning. By implication, the preliminary stage followed the explanatory sequential mixed methods research design as summarized in Table 5.2 and also reflected in Figure 5.1. Explanatory sequential mixed methods is a form of mixed methods research where the researcher first investigates the problem using a quantitative approach and then applies a qualitative approach to provide a further explanation of the results. Creswell (2014) states that this method is called 'explanatory' because the qualitative approach is used to provide clarity of the initial quantitative result; and 'sequential' because the two approaches are in sequence. This method aligns with the 'complementarity' purpose of mixing methods (Venkatesh *et al.*, 2013).

In the second stage of the study which addressed the second research question, the qualitative component was used to support the quantitative component. The two sets of data were collected in parallel. This procedure also provided room for some form of data triangulation. Therefore, the second stage of the study followed the concurrent parallel mixed methods research design as indicated in Table 5.2 and Figure 5.1. The concurrent parallel mixed methods is a mixed methods strategy or design where the researcher combines both qualitative and quantitative data in order to give an inclusive or complete analysis of the problem situation through triangulation. In this case, the researcher collects the different forms of data at almost the same time and use the combined information obtained to understand or interpret the overall result. This method also aligns with the 'completeness', 'corroboration/confirmation' and 'diversity' purposes for mixing methods (Creswell, 2014, Venkatesh *et al.*, 2013).

The quantitave components followed the survey research strategy. This was to enable the possibility of generalizing the findings of the study to the entire population. The survey design is considered more feasible in this study in view of its advantages most especially cost saving (Kumar, 2011). In addition, it is easier and advatageous to measure the attributes of a population from a smaller group (Creswell, 2014; Leedy & Ormrod, 2010). This is imperative considering the fact that Nigeria is one of the largest countries in Africa (landmass of 923,768 km$^2$). The qualitative component of the study, on the other hand, followed the grounded theory research startegy. This is to enable the researcher to generate themes that could be used as points of camparason and support for the quantitative study (Creswell, 2014; Leedy & Ormrod, 2014).

## 5.4 Research methods

Research methods are concerned with the ways in which data is collected, analysed, and interpreted in a study. Kumar (2011) states that most data collection methods can be applied to both quantitative and qualitative research with the distinction being the restrictions that are imposed on the flexibility, structure, sequence, and depth of freedom which the researcher has in their application. He further states that while the quantitative methods favour restrictions, the qualitative methods seem to act against them. On the other hand, Creswell (2014) argues that each research approach has unique research methods. The implication of Creswell's argument is that a mixed methods research must follow the rigors of the two research approaches that have been mixed. This position is corroborated by Venkatesh *et al.*, (2013). This study adopts the position of Creswell (2014) and Venkatesh *et al.*, (2013) because the strengths of each method supplement the weaknesses of the other. This makes the results richer and more acceptable.

Therefore, various research methods were applied to each stage of the study as discsused below.

### 5.4.1 Study site

The study was conducted in Colleges of Education in Nigeria, specifically in the North-central geopolitical zone of the country. This zone was selected in view of its comopolitan nature. Apart from being the zone where the nation's capital (Abuja) is located, the zone is located in the centre of the country, and draws from the diverse cultures of almost all the ethnic groups in Nigeria, thus it can be regarded as a miniature Nigeria. The zone consists of six states (Plateau, Nassarawa, Benue, Kogi, Kwara and Niger). In addition to these six states there is the federal capital territory (FCT), Abuja.

There are three categories of Colleges of Education in Nigeria based on their ownership. These include federal government-owned colleges, State government owned colleges, and privately owned colleges. The first stage of the study as has already been explained was a preliminary investigation which determined the opinions of stakeholders in Colleges of Education regarding mobile learning. In this sense, it was considered important to ensure that as vast and divergent a range of views as possible were obtained. Therefore, the study involved all three major groups of participants (students, lecturers, & management) as well as the three categories of colleges (Federal, State, and private).

The colleges involved were simply idenfied throughout the study as Federal college, State college, and private college. This is in keeping with the principle of confidentiality which most of the institutions preferred.

The second stage leaned on the findings of the preliminary investigations to test the implementation of mobile learning. Lecturers from one of the Colleges of Education (Federal College) were used to test the use of mobile learning by using the technology to supplement the teaching of selected four courses (CS 412, DBE 221, GUC 205, SSE 313 ), one per lecturer. The four lecturers used were drawn from four of the five schools in the college. The schools include School of Arts and Social Sciences, School of Education, School of Sciences, and School of Vocational and Technical Education.

The researcher used his experience as an insider to select lecturers that were more knowledgeable in the use of computer and social networking applications. A social networking site (*Facebook*) was used as the learning platform. This is in view of the availability of the application, its user friendliness and compatibility with most mobile devices, and the fact that most members of the colleges were already using it.

***Preparation of lecturers for implementation***

As part of the implementation process, the following guidelines were specifically provided to lecturers to follow:

1. Create a group in *Facebook* and name the group after the course that you are teaching (e.g. call the group DBE 221) if DBE 221 is the course to be taught;
2. Enrol your students as members of the group. Also add me (researcher) as a member of the group;
3. Engage your students in various teaching and learning activities such as:
    a. ***Discussion forum:*** Post a question or topic that is relevant to the course and allow students to discuss it freely while the teacher facilitates.
    b. ***Sharing and collaboration:*** Encourage students to do more research into the topic and share relevant links with colleagues in the group. The teacher can also share relevant links, documents, files, videos, etc. in the groups.
    c. ***Assessment***: Teachers can post assignment as a document or file to the group and advise students to submit the same through a private message to them.

d. ***Motivation:*** Teachers should encourage participation of students by awarding marks to very active participants and to quality contributors in the group.
e. ***Ubiquitous:*** since the exercise is using mobile devices, participants should be engaged at anytime and anywhere in the exercises.

4. All activities should be performed using mobile devices (phones and possibly tablets) only.

### 5.4.2 Target population

The target populaion of a study can be described as that whole group from which the study sample is obtained or drawn (Saunders, Lewis, & Thornhill, 2009). Yount (2006) sees population as the total number of subjects that one wants to study. Perhaps a more comprehensive definition is that of Sekaran and Bougie (2009, p. 262) who see population as "the total group of people, things or events which a researcher intends to investigate". This definition implies that members of a population could be people, items or events.

As at 2013 when this study started, there were about 15 approved Colleges of Education located in the North-central geopolitical zone of Nigeria. This was based on information obtained from the official website of National Commission for Colleges of Education (http://www.ncceonline.edu.ng). Four of the colleges were Federal government owned, eight were State government owned, and three were privately owned.

As already highlighted in the previous section, the study had a kind of pyramidal structure. The beginning (preliminary stage) was broader in scope and it then narrowed towards the end (implementation stage). Four Colleges of Education were intially selected for the preliminary stage of the study. The four colleges included one federal college, two state colleges and one private college. The strategy was adopted to ensure that the three categories of colleges were represented fairly proportionately. However, the number of colleges selected later dropped by one due to the closure of some of the Colleges of Education due to a prolonged strike by lecturers. This afected one of the two State colleges where the research had already obtained a gate keeper 's letter. Eventually, only three Colleges of Education were used for the study.

Therefore, the target population in the preliminary stage of the study was three Colleges of Education with 15100 members, consisting of students, lecturers and core management staff. In the implementaion stage however, the target population was the

students of the Federal college who registered for the four courses or modules that were facilitated by using mobile learning and the four lecturers that facilitated the exercise.

### 5.4.3 Sampling design

Kumar (2011, p. 193) defined sampling as "the process of selecting a few (sample) from a bigger group (population) to become the basis for estimating or predicting the prevalence of an unknown piece of information, situation or outcome regarding the bigger group". In other words, a sample, which is the result of sampling is a reprentative of the target population. Since this study adopted a mixed methods research approach, different sampling designs were employed in two approaches (quantitative and qualitative) that were mixed (Creswell, 2014). The procedures involved in the quantitative and qualitative components are presented below.

#### 5.4.3.1 Quantitative sampling design

As already mentioned, the three Colleges of Education that were used in the preliminary stage of the study were selected in such a way that at least one college was included from each category or cluster. This reasoning was based on the assumption that each college possesses similar characteristics to other colleges in the same cluster (Kumar, 2011). By so doing, the study employed a sort of multistaged sampling technique which combined cluster sampling and stratefied proportionate sampling technique, while judgmental and convenience sampling was used at some levels (Bryman & Bell, 2011; Kumar, 2011; Sekaran & Bougie, 2009). This strategy ensured that the strengths of one design complemented the shortcomings of the others (Hedt & Pagano, 2011).

Cluster sampling is mostly used in studies with very large populations (Wilson, 2010) and relies on the researcher's ability to split the population into groups of easily visible or identifiable characteristics called 'clusters', from which elements are selected using simple random sampling (Kumar, 2011). The technique as used in this study involved the identification of groups or clusters, for example the three categories of Colleges of Education as well as the three groups of stakeholders (students, lecturers and management staff) from which the researcher drew samples (Creswell, 2014; Kumar *et al.,* 2010).

As stated earlier, only the Federal college was used to test the implementation of mobile learning. This was to ensure efficiency and to enable the researcher to manage and

monitor the exercise effectively. The Federal college was selected purposively for a number of reasons. First, the College is more populated than the State and private colleges. Secondly, Federal colleges in Nigeria serve as models for other colleges. This is because the formulation and implementation of most educational policies start from the Federal level before moving down to States and other sectors. Therefore, testing the implementation of mobile learning at the Federal college not only maintains the trend, but may also hasten the adoption and implementation of the technology. Lastly, the researcher is a member of staff of the institution. This made it easier for him to have access to the system as well as the much needed level of cooperation. Kumar (2011) posits that bias can be introduced by a researcher if it becomes difficult to penetrate the population.

In the selection of the actual study samples for the quantitative components of the study, the sample table composed by Krejcie and Morgan (1970), which is provided in appendix A was used to guide the process. Based on this Table and Kumar's (2011) suggestion, study samples of 375 and 330 were considered adequate for the preliminary and implementation stages of the study respectively.

The stratified proportionate sampling technique was then used mainly in the preliminary stage to ascertain the number of participants to include from each of the three colleges as well as the number of students and lecturers. The detailed procedure followed is shown in Table 5.1.

**Table 5.1:** ***Number of respondents to include in the sample from each stratum***

| **Cluster** | **Stratum** | **Estimation process** |
|---|---|---|
| Federal College | Whole institution | Population of college =6698<br>Proportion in target population =6698/15100 = 0.443<br>Number of respondents to include = 0.443x375 = 166 |
| | Students | Number of students and lecturers in college =6691<br>Proportion of students = 5782/6691 = 0.864<br>Number of students to include = 0.864x162 = 140 |
| | Lecturers | Number of students and lecturers in college =6691<br>Proportion of Lecturers = 909/6691 = 0.136<br>Number of Lecturers to include = 0.136x162 = 22 |
| State College | Whole institution | Population of college =4696<br>Proportion in target population =4696/15100 = 0.311<br>Number of respondents to include = 0.311x375 = 116 |
| | Students | Number of students and lecturers in college =4689<br>Proportion of students = 4103/4689 = 0.875<br>Number of students to include = 0.875x112 = 98 |
| | Lecturers | Number of students and lecturers in college =4689<br>Proportion of Lecturers = 586/4689 = 0.125<br>Number of Lecturers to include = 0.125x112 = 14 |
| Private College | Whole institution | Population of college =3716<br>Proportion in target population =3716/15100 = 0.246<br>Number of respondents to include = 0.246x375 = 93 |
| | Students | Number of students and lecturers in college =3709<br>Proportion of students = 3542/3709 = 0.955<br>Number of students to include = 0.955x89 = 85 |
| | Lecturers | Number of students and lecturers in college =3709<br>Proportion of Lecturers = 167/3709 = 0.045<br>Number of Lecturers to include = 0.045x89 = 4 |

It should be noted that the stratified sampling technique was only applied to the students' and lecturers' strata as the number of core management staff in each college was very small (7). Therefore judgmental sampling technique was used to sample management staff in order to ensure that only those who perform academic-related functions were included. Hence, four management staff – the Provost, deputy Provost, Registrar and Librarian were selected from each of the three colleges. A simple random sampling technique was then used to draw students and lectures. A serially numbered list of registered students containing their registration numbers (student numbers) and

departments was used in each of the colleges. The list of lecturers indicating their various departments were similarly obtained in each case. These lists served as the sample frame in each cluster and stratum.

Starting with students, a small bowl containing the registration numbers of all students written on pieces of papers was used to select students. After each selection, the student with such a registration number was ticked on the registration list. The process continued until the number of students in the sample was attained. The same process was applied in the selection of lecturers.

In the second stage of the study, four out of the 330 respondents were lecturers. As earlier highlighted, the lecturers were purposively selected to engage students in the practical application of mobile learning. Their selection was based on their knowledge of the use of computer and social networking applications. The students on the other hand were included in the sample using the same stratified disproportionate sampling technique.

The institutional structure was then used to facilitate the administration of the research instrument to the selected respondents. Details of distribution of the research instrument are discussed under data collection. The selected students and lecturers were then sorted according to their departments and the offices of the Dean, school of education in the respective institutions assisted in the distribution of questionnaires through the various heads of departments. In the event that selected respondents were not within reach, they were replaced through the same random process of selection. Although much success was recorded at the end of the day, the process was generally complex and time-consuming.

#### 5.4.3.2 Qualitative sampling designs

Unlike quantitative studies, virtually all the non-random sampling techniques (purposive, judgmental, and accidental) were applicable in this study. Similarly, the number of participants that were involved depended on saturation and the diversity of information provided by the participants rather than on a representative sample of the population (Creswell, 2014; Kumar, 2011).

Thus, in the preliminary stage of the study, about 30 participants were involved. This number consisted of 10 students, 10 lecturers and 10 management staff drawn from the three Colleges of Education. The 31$^{st}$ participant was the researcher who also served as an observer. While students and lecturers were sampled by convenience, management

staff were sampled purposively to ensure that only those that perform academic-related functions such as Provosts, Deputy-Provosts, Librarian and Registrars were included.
In the implementation stage however, 15 participants were involved. This number included the four lecturers who had earlier been selected, 10 students and the researcher who was an observer.

### 5.4.4 Data collection procedures

Data collection involves the elicitation of relevant information from respondents or participants that are involved in a study. This section describes the sources, methods and instrument used for gathering data in this study.

Two sources of data exist in a research – primary and secondary (Kumar, 2011). Primary data refers to first-hand information that is collected from respondents using questionnaires, interviews or observations. Leedy and Ormrod (2010, p.89) refer to primary data as "the closest to the Truth". The three main methods that can be used to collect primary data are briefly highlighted below.

***Questionnaire***

A questionnaire consists of a written number of questions in which the answers are recorded or written down by the respondents. According to Kumar (2011, p.145), 'in a questionnaire, respondents read the questions, interpret what is expected and then write down the answers'. In this case, the questionnaire is more suitable in situations where respondents can read and write.

***Interviews***

An interview is a method of data collection whereby a researcher collects data from respondents via face-to-face interactions. According to Kumar (2011), it is at the discretion of the interviewer or researcher to determine the format and content of questions including their wordings and the order in which they are asked. In addition, the interview process can range from being flexible where the researcher is not restricted to asking only specific predetermined questions, to being inflexible where the interviewer is restricted to asking only specific predetermined questions. In other words, the interview process is a continuum from one pole (unstructured) to another pole (structured) while other forms of interviews (semi structured interviews) fall between the poles (Newton, 2010).

*Structured interview* – A structured interview is a form of interview in which the research is restricted to a set of predetermined questions. The research uses the same wordings and order of questions specified in the interview schedule to elicit data from respondents (Kumar, 2011). According to Kumar, a structured interview has the advantage that it provides uniform data, which guarantees easy comparability.

*Unstructured interview* – An unstructured interview is a form of interview which has a flexible structure and content. It also allows the researcher to ask questions in no particular order or using no particular wordings. The structure, content, nature of questions and the order of questions asked is at the discretion of the researcher. Its strength lies in the almost complete freedom of the researcher. The researcher can reformulate, shed more light on questions or even raise new questions in the middle of a discussion (Kumar, 2011; Newton, 2010).

*Semi structured interview* – A Semi-structured interview is a form of interview which falls between the structured and unstructured interview and draws from the characteristics of the two extreme forms of interview. Cohen and Crabtree (2006) state that a semi-structured interview has a paper-based interview guide which the interviewer follows in order, like in the case of a structured interview, but that discussions can diverge at any point in time like in the case of an unstructured interview.

***Observation***

Observation is a purposeful way of listening to or watching an event or interaction as it occurs in a study. Kumar (2011) classified observations into two types – participant observation and non-participant observation. He states that participant observation refers to a situation where the researcher takes part in the activities of the group that is being observed. On the other hand, non-participant observation refers to a situation where the researcher does not take part in the activities of the group that is being observed but remains a passive observer.

Secondary data refers to data that is already available and only need to be extracted from sources such as government publications, earlier research, census reports, personal records, client histories and service records among others. According to Leedy and Ormrod (2010), secondary data is farther away from the Truth because it is derived from primary data.

In this study, the two sources of data were applicable. Primary data was collected directly from respondents using questionnaires, interviews and observations. Data for the quantitative component of the study was collected using the questionnaire. The questionnaire was considered appropriate in view of the fact that the research was conducted in higher education institutions of learning where all the participants could read, understand and interpret the content of the questionnaire by themselves (Kumar, 2011). Furthermore, the questionnaire was designed in such a way that it reflected three types of variables (attributes or demographic variables, opinion variables, and behavioural variables) as suggested by Saunders et al. (2009). The qualitative data was collected using semi-structured interviews while observations were used in some cases. Since the study was mixed, any gap that was left open due to lack of understanding of the content of the questionnaire was complemented by the qualitative components (Creswell, 2014). The primary data was supported by secondary data such as findings of other studies as uncovered from the literature. The procedures used in collecting data for the preliminary and second stages of the study are presented as follows:

#### 5.4.4.1 Data collection for first stage (preliminary investigation)

In line with the explanatory sequential research design adopted in the preliminary stage of the study, data for the quantitative component was collected first.

Since the first stage of the study was a preliminary one, the study was comfortable with surplus data rather than insufficient data. Therefore, the questionnaire that was used in the preliminary study was made up of four sections. Section 'A' consisted of items that dealt with demographic information. Section 'B' ascertained the manner in which participants use their mobile devices and their competency levels in certain computer applications. The third section (section 'C') considered the current state of teaching and learning in Colleges of Education in Nigeria, this was later discarded from the analysis as it was found not to be necessary. Lastly section 'D' dealt with the perceptions of participants regarding mobile learning. The perceptions were measured in alignment with the four independent variables or constructs of UTAUT (performance expectancy, effort expectancy, social influence, mobile learning conditions) and the dependent variable (Behavioural intention). All 47 items in section 'D' were measured based on a 5 point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

The qualitative data collection in the preliminary investigation was carried out after the quantitative component had been completed. In the qualitative component, the

interviewer had one main issue or question which he used to set the interview process rolling. The question only served as a guide and was not necessarily asked in the same way throughout the study. The question was simply based on the opinions of participants regarding the use of mobile devices to facilitate teaching and learning. Other questions emanated from the discussions where necessary. In this case, the study followed a semi structured form of interview. The interviews in the preliminary stage were recorded mostly through handwritten notes, since most of the participants declined to be recorded for personal reasons.

Furthermore, the researcher took some time to observe the learning environments in the various institutions visited during data collection. Some of the observations made were included in the qualitative data. Thus, a kind of non-participant observation was employed in the preliminary study.

#### 5.4.4.2 Data collection for second stage (implementation)

Based on the research design as summarized in Table 5.2 and Figure 5.1, data for the quantitative and qualitative components in the implementation stage of the study were collected virtually at the same time.

The questionnaire used in the second or implementation stage consisted of two sections – Section '1' obtained demographic information while Section '2' elicited information regarding the use of mobile learning in line with the constructs contained in the conceptual framework of the study. The items in the questionnaire were measured on a 5 point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Different components of the questionnaire items were adapted from various sources. The first set of 26 items which measured the acceptance of mobile learning using a social networking site (*Facebook*) were adopted from Venkatesh *et al.*, (2003) and Abu-Al-Aish and Love (2013). The second set of 48 items which measured the actual use and success of mobile learning were adopted from a number of sources (Alharbi & Drew, 2014; Delone & McLean, 2003; Lee-Post, 2009; Lin *et al.*, 2016; Mazman & Usluel, 2010; Wang, Wang, & Shee, 2007). All the scales used in the studies had very good internal consistency reliability ratings, with most of them above 0.9.

As was done in the preliminary stage, the qualitative component in the implementation stage of the study also followed a semi-structured form of interview. Participants were probed on issues regarding their impression of the technology after using it. In other

words, questions were asked pertaining to the efficacy and level of satisfaction of participants regarding mobile learning. In the second stage, participants more willingly agreed to be video-recorded. The reason for the higher level of cooperation in the implementation stage may be due to the level of familiarity of the researcher with the participants since the researcher was an insider in the institution that was used to test the application of mobile learning. Therefore, most of the interviews in the second stage of the study were video-recorded using a digital camera.

Additionally, the researcher participated in the teaching and learning exercise that was conducted using *Facebook*. This accorded the researcher the opportunity to perform a sort of participant observation in the exercise.

#### 5.4.4.3 Administration of the research instument

In all cases, printed copies of the questionnaires were administered physically to respondents in the various Colleges of Education by the researcher (Kumar, 2011). The researcher spent a minimum of one week in each of the colleges while administering the research instrument to respondents. As stated earlier, the process was facilitated by the office of the Dean, school of education in the public colleges (Federal and Sate colleges) while the Provost personally facilitated the process in the private college. This method contributed to the huge success recorded on the return rate of the research instrument.

## 5.5 Data analysis

Like in the data collection, different techniques and tools where employed in analysing the two components of data (quantitative & qualitative data).

In the quantitative data analysis, the nature or normality of the data to be processed determined the choice between two main types of statistical procedures – parametric data analysis procedures and non-parametric data analysis procedures.

Parametric data analysis procedures make certain assumptions about the study population, for example, they assume that the population has normally distributed scores and that the data has interval level scaling (Pallant, 2011). According to Pallant (2011), among measures that can be used to ascertain the normality of a distribution are skewness and kurtosis. He explains that positive skewness values indicate that scores are clustered on the low or left hand side while negative skewness values indicate that scores are

clustered at the high or right hand side of the distribution. On the other hand, positive kurtosis values indicate the peakness of the distribution at the centre as negative kurtosis values indicate a flat distribution. Tabachnick and Fidell (2007) state that with larger sample sizes of say above 200, the risk of skewness and kurtosis diminishes

Non-parametric data analysis procedures on the other hand do not make stringent assumptions on the study population and data collected. Pallant (2011) states that one shortcoming of non-parametric statistics is that they are less sensitivity as compared to parametric statistics. This makes them unable to detect differences that may exist between groups. Pallant (2011) maintains that non-parametric statistical procedures are more suitable for smaller samples or data that is measured only at ordinal level.

Another type of statistical procedure which is important to this study is structural equation modelling (SEM). Though relatively new and sophisticated, it is used to test models to ascertain interrelationships among a group of variables (Pallant, 2011). According to Hooper, Coughlan, and Mullen (2008), SEM is increasingly becoming one of the most important techniques of data analysis in social science research. Kumar (2011) states that it operates on the principles of multiple regression and factor analysis and provides mechanism for evaluating and testing the predicting ability of each independent variable in the model as well as testing the model's overall fitness for the data. SEM in addition allows for the comparison of alternative models to ascertain the one that best fits the data. Hence, Yaun (2005) states that assessing how a model fits the data is an important step in SEM.

The process of data analyses in qualitative studies can be carried out either by hand or by using computer software. Creswell (2014) states that although the researcher may still have to scan through the text line by line as in the case of hand or manual coding, coding using the computer software is much more efficient. It enables researchers to locate all passages that belong to same code very quickly and help to compare the pattern of responses by different participants with ease.

The various techniques that were used to analyse data in the two stages of the study are discussed below.

### 5.5.1 Data analysis procedures for first stage (preliminary investigation)

In the preliminary stage of this study, non-parametric statistics using SPSS version 21 were used to analyse the quantitative data since the normality of the data could not be assured. Consequently, descriptive statistics (mean, frequency tables and graphs), chi-square test of independence, and chi-square goodness-of-fit test were applied in the analysis of sections 'A' and section 'B' of the questionnaire. This section deals with the use of mobile devices, specifically the experience of stakeholders in using mobile devices and the manner in which they use the devices to access services. Specifically, the demographic variables were cross-tabulated in order to explore them from various perspectives. The chi-square test of independence was used on cross-tabulations to see whether or not a significant relationship exists between the two variables represented in the cross-tabulation. The variables in this case are experience in the use of mobile devices and the category or group of respondents. Fisher's exact test was used where the conditions were made. In addition, chi-square goodness-of-fit test was used on categorical variables to test whether or not any of the response options were selected significantly more/less often than the others.

As already stated, it was not found necessary to analyse the data from section 'C' of the questionnaire. This section ascertained the problems confronting Colleges of Education in Nigeria. The section was considered unnecessary because it did not add any value to the study as most of the challenges confronting Colleges of Education had already been identified from the literature. Section 'D' was analysed using regression analysis. Before then, the Wilcoxon signed rank test alongside mean scores of measurement items were used to ascertain the level of agreement or disagreement of participants on all items that were used to measure each construct.

For the qualitative data, a popular qualitative data analysis program, QRS Nvivo was used. Nvivo provides tools that can be used to code data easily, and to record and link ideas in different ways, which facilitates the searching and exploration of various patterns and relationships from the data.

Recall that the qualitative data for the study consisted primarily of interview transcripts while observations were used in some cases by the researcher to support the interview data. In analysing the qualitative data, the researcher was able to strike a balance between the steps provided by Kumar (2011) and those of Creswell (2014). A substantial aspect

of the qualitative data for the preliminary stage was recorded manually, therefore, not much transcription was required.

To ensure that the data was properly organized, each interview was transcribed and stored as a separate word document. For the purpose of confidentiality, the actual names of participants were not revealed. Coded names (such as Participant 1.x) were assigned to participants. The 'participant' portion represented the category of participant, '1' represented the first stage of the study while 'x' represented the serial number of the participant. For example, STUD 1.1 referred to a student participant in the first stage of the study, who has a serial number '1'. Similarly, STUD 2.1 referred to a student participant in the second stage, who has a serial number '1'.

The data was then cleaned up by removing typographical errors and areas that were vague or incomprehensible. Details of the analysis are specified in chapters six.

### 5.5.2 Data analysis procedures for the second stage (implementation)

In the second (implementation) stage of the study, categorical demographic variables were similarly analysed or explored from different perspectives using cross-tabulations, while continuous variables were analysed using descriptive statistics including mean and standard deviation. Structural equation modelling (SEM) was used to test the fitness of the model to the data and also to explore various relationships in the conceptual model in order to provide answers to the research questions earmarked. Furthermore, being one of the requirements for applying structural equation modelling, the normality of the distribution was assessed using skewness, kurtosis, 5% trimmed mean, and histogram plots. Specifically, IBM Amos version 23 was used to analyse the data. This was to enable the researcher to draw inferences about the population of the study. SEM was considered more suitable to use in the implementation stage to enable the researcher test the conceptual framework which was a kind of new conception (Kumar, 2011; Pallant, 2011).

For the qualitative data analysis, similar procedures adopted in the preliminary stage were used. Data was equally analysed using QRS Nvivo software. Although the interviews from the second stage of the study were recorded, the researcher chose to transcribe the data manually. This was to enable him get more familiar with the data. Transcribed data for each participant was stored as a separate word document as the actual names of participants were not revealed. Coded names (such as Participant 2.x) were assigned to

participants. While the description of other components of the coded names remained the same as used in the first stage, the '2' represented the second stage of the study. For example, STUD 2.1 referred to a student participant in the second stage of the study, who has a serial number '1'. Details of the analysis are presented in chapters seven.

A summary of the research methodology reflecting the research approaches, research designs, strategies, data collection, and data analysis procedures that are adopted in each stage of the study is presented in Table 5.2.

**Table 5.2:** ***Summary of overall research methodology adopted***

| Stage | Purpose | Main objective | Research approach | Research design | Research strategy | Data collection procedures | Data analysis techniques | Research objects |
|---|---|---|---|---|---|---|---|---|
| **1.** | Preliminary investigation | Ascertained the use of mobile devices by stakeholders and the perceptions or possible factors that can affect their intention to accept mobile learning. | Mixed methods | Sequential explanatory mixed methods. | Quantitative survey was carried out first, and grounded theory research strategy followed later. | Questionnaire was used first, then semi-structured interviews and non-participant observations followed later. | Quantitative data used descriptive statistics (mean, frequency tables, and graphs) and non-parametric statistics (chi-square test of independence, chi-square goodness-of-fit test).<br><br>Qualitative data used content analysis. | Students, Lecturers, and Management in three colleges (Federal, State, and Private). |
| **2.** | Implementation of mobile learning using *Facebook*. | Ascertained how the acceptance and success factors are synthesized towards the effective implementation of m-learning. | Mixed methods | Concurrent or convergent parallel mixed methods. | Quantitative survey and grounded theory research strategies were used concurrently. | Questionnaire was used to collect quantitative data, while semi-structured interviews and participant observation was used to obtain qualitative data. | Quantitative data used descriptive statistics (mean, cross-tabulations, and graphs) and structural equation modelling.<br><br>Qualitative data used content analysis. | Students, and Lecturers in one college (Federal) |

## 5.6 Validation of the study

Validation is a cornerstone in social science research and symbolizes the quality and rigor of the study (Venkatesh et al., 2013). Since the approach used in this study was mixed, the two individual approaches were validated separately (Creswell, 2014). Thus, the measures of validation as applied to the quantitative and qualitative components of the study are discussed below.

### 5.6.1 Validition of the quantitive study

Two measures– reliability and validity are used to validate quantitative studies (Venkatesh et al., 2013). The two measures as applied in this study are discussed below.

#### 5.6.1.1 Reliability

Reliability shows how a scale is free from random error. The most common method of ascertaining a scale's reliability is its internal consistency. Internal consistency indicates the extent to which items on a scale measure the same attribute (Pallant, 2011).

In this study, although the research instruments used, particularly in the implementation stage of the study was adapted to a large extent from previous studies, the instrument was revalidated since the items were modified. The internal consistency reliability of the instruments used was ascertained using Cronbach alpha coefficient (α). This was achieved by running a reliability test on the data using the IBM SPSS statistics software. This was based on the rule of thumb that a scale with a Cronbach alpha coefficient above 0.7 is considered reliable (Pallant, 2011).

#### 5.6.1.2 Validity

Validity refers to the ability of a scale to measure what the scale is designed to measure. It deals with the legitimacy of the findings (Venkatesh et al., 2013) . Validity can be ascertained through empirical evidence regarding its use (Pallant, 2011). Different types of validity include construct validity, content validity, convergent validity and discriminant validity.

The questionnaires used in the study were subjected to various measures of validity. Most constructs or variables used in designing the research instruments were adapted from previous studies which were based on sound and tested theoretical frameworks (for

example UTAUT, IS success model, and educational use of *Facebook* model). This guaranteed the validity of the constructs. Content validity was ensured by subjecting the research instrument to expert opinions. The instrument was sent to a statistician to ensure that it had the needed face validity and that it was also aligned to the various constructs in the conceptual framework of the study.

Convergent validity was assessed by observing composite reliability (CR) values, factor loadings, and average variance extracted (Field, 2009; Hair, Black, Babin, & Anderson, 2009). The indication is that factor loadings should be > 0.5, CR should be > 0.6, and average variance extracted (AVE) should be > 0.5. Discriminant validity was tested by comparing the values for average variance extracted to corresponding values for average squared variance (ASV). Furthermore, a check to ensure the non-violation of the assumptions of multicollinearity was carried out. Specifically, the tolerance and variance inflation factor (VIF) values in the coefficient table were inspected against the prescribed values (Pallant, 2011). Details on these measures are further explained in chapters six and seven.

### 5.6.2 Validation of the qualitative study

The issue of validation in qualitative research is rather ambiguous as there may be no clear or generally accepted principles for validation. Creswell (2014) sees qualitative validity simply as a way of employing certain procedures to ensure the accuracy of findings. He suggests a number of strategies that may be used to ensure qualitative validity. Some of these include triangulating different data sources, verifying reports or themes with participants, providing detailed descriptions of settings or different perspectives of a theme, and presenting negative information which may run counter to a team.

In this study, a number of measures were taken to validate the data. First and foremost, the multiple sources of data used in the study (quantitative survey, interviews, and observations) complemented the weaknesses of one another (Creswell, 2014). Secondly, transcripts were first of all checked to ensure that typographical and other obvious errors were eliminated. Further to the above, interview transcripts were presented to participants to authenticate before they were analysed.

## 5.7 Ethical considerations

Since a research process involves the collection of data from people and about people, it is important to anticipate and make provision for addressing ethical issues (Punch, 2005).

Based on Creswell's (2014, p.93) list of ethical issues and possible ways of addressing them, this study adhered to the following ethical procedure:

i. After the institutions to be used for data collection had been selected, the researcher wrote to the supervising body for Colleges of Education in Nigeria – the *National Commission for Colleges of Education (NCCE*) - to seek permission to undertake the study in Colleges of Education. This permission was granted and a letter of introduction to the various heads of colleges where the researcher had indicated to collect data was issued.

ii. In addition to the letters of introduction that had been provided by the NCCE, the researcher also requested for permission from the heads of various colleges in writing. A written approval was then granted by each of the three Colleges of Education that were used for the study.

iii. During data collection, the first point of call of the researcher in each institution was the office of the officer who signed the approval letter. In all cases, it was either the registrar or his deputy. Thereafter, the registrar linked the researcher to a designated officer (Dean of education in most cases) who then assisted in the data collection process.

iv. For all individuals that were involved in the study either by completing a questionnaire or taking part in an oral interview, their consent was obtained through a consent letter that was attached to the data collection instrument.

v. For the purpose of confidentiality, the real identities of the institutions used, and the respondents or participants involved in the study were not revealed. While generic names such as Federal College, State College and Private College were used to identify the different institutions, coded names (for example STUD 1.1, LECT 1.2 and so on) were used to identify participants for the qualitative study.

## 5.8 Limitations of the research methodology

Although the research methodology adopted in the study was carefully planned and executed, to the best of the researcher's ability, there were however some limitations encountered.

Probability sampling techniques could not be used to sample participants throughout the entire study. For example, while the stratified sampling technique was used to sample respondents for the study, the technique could not be applied to the management group in view of the size of the group in the population. In addition, not all members of management were in a position to provide useful information for the study. In this case, the researcher was left with no choice but to apply a non-probability sampling technique in selecting the management group, specifically judgmental or purposive sampling techniques.

In addition to the complexity and time consumption associated with the simple random sampling technique, another challenge that was encountered was that not all the registered students and lecturers that were presented in the nominal roll were available. In other words, there were cases where selected participants were not within reach.

Furthermore, only one of the three colleges used in the preliminary stage of the study was used to testing the implementation of mobile learning. The development seemed to tilt the study towards a case study approach.

These limitations may have affected the ability of the study to be generalized to the population (Kumar, 2011, Creswell, 2014). However, research has shown that the combination of sampling techniques can increase efficiency as the strengths of one strategy can augment the shortcomings of the other (Hedt & Pagano, 2011; Kumar, 2011).

## 5.9 Summary

The chapter has clearly discussed the research methodology that was followed in order to ascertain the viability and success of mobile learning in Colleges of Education, specifically in Nigeria. In line with the nature of the research problem, which manifested in the nature of research questions, a mixed methods research approach was considered more appropriate. This was informed by the philosophical assumption – pragmatism, which the study embraced. Accordingly, based on the objectives to be achieved in

response to each of the sub-questions formulated in the study, the explanatory sequential mixed methods design was considered appropriate for the preliminary stage while the convergent parallel mixed methods approach was adopted in the second or implementation stage of the study. As suggested by Creswell (2014), although a mixed research approach was adopted, the study adhered to the rigors of the methods of the individual (quantitative and qualitative) research approaches. Figure 5.1 presents a snapshot of the entire research methodology with time frames.

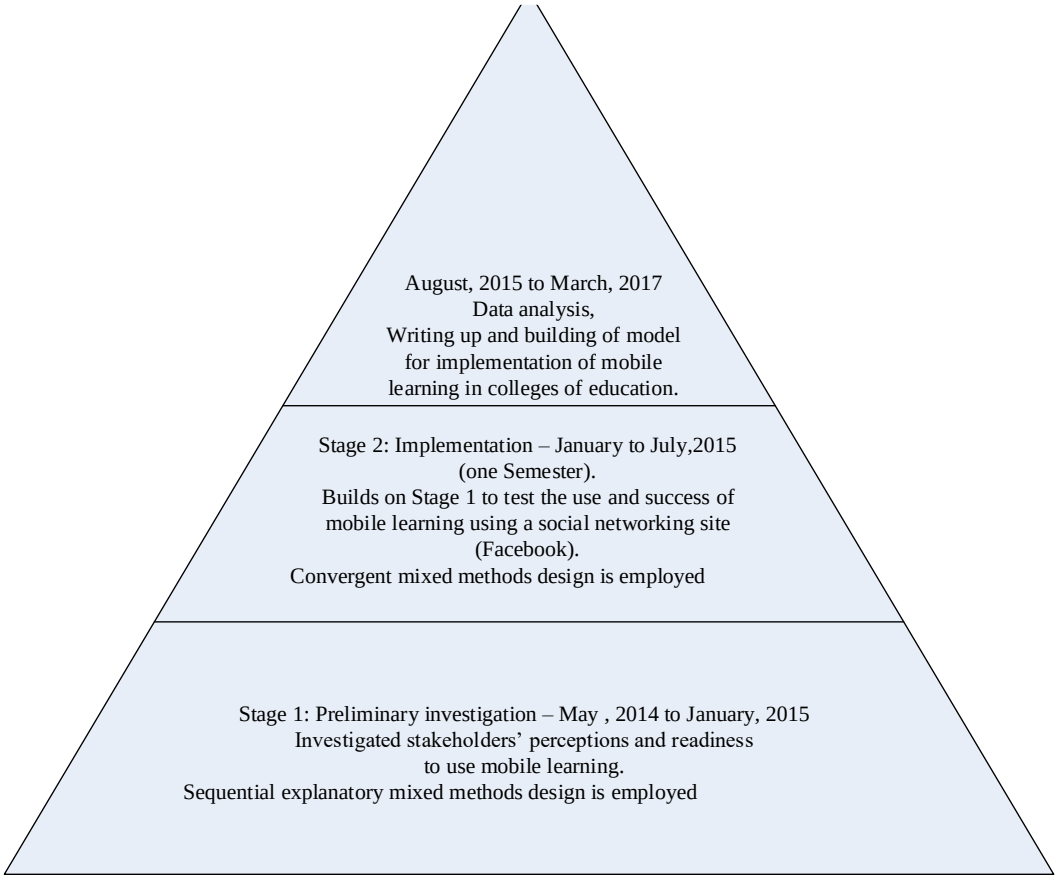


**Figure 5.1: Snapshot of research methodology of the study with time**

# CHAPTER SIX
# ANALYSIS: PERCEPTIONS/FACTORS AFFECTING THE INTENTION TO USE M-LEARNING

As indicated in the previous chapter, the study followed two stages – the preliminary investigations followed by a test implementation of the mobile learning technology. This chapter presents the analysis and results of the preliminary investigations. For emphasis, the preliminary investigation addressed the following research question and its sub-questions:

> *What are the perceptions or possible factors that can affect the intention to use mobile learning in Colleges of Education in Nigeria?*
>
> a. *How are stakeholders using mobile devices?*
> b. *To what extent do the perceptions of stakeholders or associated factors affect their intention to use mobile learning?*

Both quantitative and qualitative approaches were employed in addressing the sub-questions. The first sub-question was addressed by ascertaining the length of time that participants have used mobile devices and the services that they use their mobile devices to access mostly. This was explored using the quantitative research approach. In addressing the second sub-question, the perceptions of stakeholders on the use of mobile learning were explored in line with the constructs of the UTAUT model, which is a subset of the conceptual framework underpinning the study. This analysis provided an indication of the factors that may affect the intention of stakeholders in Colleges of Education to use mobile learning. The quantitative analysis of the perceptions of stakeholders or possible factors that may affect their acceptance of mobile learning have been published in two accredited journals, and are therefore not presented in this thesis. Hence, only the qualitative data analysis for the second sub-question is presented in this thesis. In view of the emergence of additional factors (personal innovativeness and anxiety) from the qualitative data analysis, a holistic assessment of the effects of acceptance factors is necessitated. The second stage of the study considers a second set of quantitative data which include all acceptance factors.

It emerged from the analysis of the data that participants use their mobile devices to access social networking sites, particularly *Facebook* in addition to other services. This finding served as a motivation towards considering the use of social networking sites as the platform for mobile learning. Therefore, the perceptions of participants on the use of social networking sites to support teaching and learning were also ascertained. However, since this was an addendum, the perceptions of participants were explored using the qualitative approach only. On this basis, this investigation and data analysis were carried out along with the qualitative study of the perceptions of participants on the use of mobile learning.

To collect data for the quantitative component of the study, 375 questionnaires were distributed, out of which 370 were retrieved. This figure represents a response rate of 98%. The success recorded could be because of the use of the institutional administrative structures to administer the research instrument on a face-to-face basis. The qualitative component involved about 30 participants.

The data were analysed in three perspectives – analysis of demographic information, quantitative data analysis and lastly the qualitative data analysis. The various aspects of the analysis are presented below.

## 6.1 Analysis of demographic information

The demographic information of respondents was explored in three dimensions using cross-tabulations. The first dimension is based on the institutional or college category, stakeholders' group and gender; the second is based on the institutional or college category, stakeholders' group and age bracket; and the last one is based on the institutional or college category, stakeholders' group and marital status. These three dimensions are presented in Tables 6.1 – 6.3.

**Table 6.1:** ***Cross-tabulation of respondents by college, group and gender***

| **College** | | | **Group** | | | **Total** |
|---|---|---|---|---|---|---|
| | | | Student | Lecturer | Management | |
| Federal college | Gender | Male | 106 | 19 | 2 | **127** |
| | | Female | 32 | 3 | 2 | **37** |
| | **Total** | | **138** | **22** | **4** | **164** |
| State college | Gender | Male | 52 | 11 | 1 | **64** |
| | | Female | 46 | 3 | 2 | **51** |
| | **Total** | | **98** | **14** | **3** | **115** |
| Private college | Gender | Male | 31 | 2 | 2 | **35** |
| | | Female | 53 | 2 | 1 | **56** |
| | **Total** | | **84** | **4** | **3** | **91** |
| Total | Gender | Male | 189 | 32 | 5 | **226** |
| | | Female | 131 | 8 | 5 | **144** |
| | **Total** | | **320** | **40** | **10** | **370** |

Table 6.1 reveals that a higher proportion (44.3%) of the sample came from the Federal College. The State College has (31.1%) while the least (24.6%) came from the Private College – in keeping with the stratified proportionate sampling technique that was adopted. By implication, the Federal College stratum has a greater number of members than the State and Private College strata. Similarly, the State College has more members than the Private College.

The target population comprised three groups of participants (students, lecturers, and management). These groups are considered important in the business of teaching and learning because their views can vary. As highlighted in the methodology chapter, students are the learners, lecturers refer to academic staff while management staff in this phase of the study refer to the staff who occupy core managerial positions in the colleges. These positions are more or less seven in number. Table 6.1 shows that a substantial proportion (86.5%) of the sample consists of students. Lecturers represent 10.8% while management represent 2.7%. This implies that students are the majority in the study population. Again, Table 6.1 shows that the Federal College has the highest proportion of members in each of the three groups.

In terms of gender, Table 6.1 reveals that the majority of the respondents (61.1%) are males. Since there was no conscious effort made to include more males or females in the study sample as the participants were randomly sampled, this may be indicating that the study population has more males than females. Except for the management group which

has a 50:50 ratio, the same trend is observed in the students' and lecturers' groups. The difference is more pronounced in the lecturers group where 80% of the group are males. This may imply that fewer females are engaged in the institutions as lecturers.

**Table 6.2:** ***Cross-tabulation of respondents by college, group and age***

| **College** | | | **Group** | | | **Total** |
|---|---|---|---|---|---|---|
| | | | Student | Lecturer | Management | |
| Federal college | Age | <18 yrs. | 11 | 0 | 0 | **11** |
| | | 18 - 29 yrs. | 123 | 1 | 0 | **124** |
| | | 30 - 39 yrs. | 4 | 3 | 0 | **7** |
| | | 40 - 49 yrs. | 0 | 7 | 1 | **8** |
| | | 50yrs + | 0 | 11 | 3 | **14** |
| | **Total** | | **138** | **22** | **4** | **164** |
| State college | Age | <18 yrs. | 27 | 0 | 0 | **27** |
| | | 18 - 29 yrs. | 66 | 2 | 0 | **68** |
| | | 30 - 39 yrs. | 4 | 3 | 0 | **7** |
| | | 40 - 49 yrs. | 0 | 5 | 2 | **7** |
| | | 50yrs + | 1 | 4 | 1 | **6** |
| | **Total** | | **98** | **14** | **3** | **115** |
| Private college | Age | <18 yrs. | 6 | 0 | 0 | **6** |
| | | 18 - 29 yrs. | 67 | 0 | 0 | **67** |
| | | 30 - 39 yrs. | 7 | 2 | 1 | **10** |
| | | 40 - 49 yrs. | 2 | 1 | 1 | **4** |
| | | 50yrs + | 1 | 1 | 1 | **3** |
| | **Total** | | **83** | **4** | **3** | **90** |
| Total | Age | <18 yrs. | 44 | 0 | 0 | **44** |
| | | 18 - 29 yrs. | 256 | 3 | 0 | **259** |
| | | 30 - 39 yrs. | 15 | 8 | 1 | **24** |
| | | 40 - 49 yrs. | 2 | 13 | 4 | **19** |
| | | 50yrs + | 2 | 16 | 5 | **23** |
| | **Total** | | **319** | **40** | **10** | **369** |

Table 6.2 indicates that the majority (80%) of the respondents, who are mostly students, fall within the age bracket of 18-29 years. The Table also reveals that most lecturers (40%) are above 50 years of age and most management staff members (50%) are also above 50 years of age. Only a few students fall in the same age group (> 40 years) as lecturers and management. As can be observed from the Table, the total number of students from the Private College is shown to be 83 instead of the 84 students who responded to the questionnaire. The reason is because one of the students did not indicate

his age group when completing the research instrument, thus, the student is omitted from the cross-tabulation of respondents by college, group, and age.

**Table 6.3:** ***Cross-tabulation of respondents by college, group and marital status***

| **College** | | | **Group** | | | **Total** |
|---|---|---|---|---|---|---|
| | | | Student | Lecturer | Management | |
| Federal college | Marital status | Single | 120 | 1 | 0 | **121** |
| | | Single parent | 3 | 1 | 0 | **4** |
| | | Married | 14 | 20 | 4 | **38** |
| | | Divorced | 1 | 0 | 0 | **1** |
| | **Total** | | **138** | **22** | **4** | **164** |
| State college | Marital status | Single | 86 | 1 | 0 | **87** |
| | | Single parent | 4 | 1 | 0 | **5** |
| | | Married | 8 | 12 | 3 | **23** |
| | **Total** | | **98** | **14** | **3** | **115** |
| Private college | Marital status | Single | 60 | 0 | 1 | **61** |
| | | Single parent | 3 | 0 | 0 | **3** |
| | | Married | 21 | 4 | 2 | **27** |
| | **Total** | | **84** | **4** | **3** | **91** |
| Total | Marital status | Single | 266 | 2 | 1 | **269** |
| | | Single parent | 10 | 2 | 0 | **12** |
| | | Married | 43 | 36 | 9 | **88** |
| | | Divorced | 1 | 0 | 0 | **1** |
| | **Total** | | **320** | **40** | **10** | **370** |

It is apparent from Table 6.3 that the majority of the respondents (72.7%) are single while 23.3% are married. This may be so because most of the respondents are students who are within the age bracket of 18-29 years. The table further indicates that 83.1% of the students are single, while 90% of the staff (lecturers as well as management) are married.

## 6.2 Usage of mobile devices by stakeholders

As earlier stated, this section of the chapter addresses the first sub-question, which ascertains the use of mobile devices by participants. To ascertain how participants are using their mobile devices, it is considered important to know their experiences (length of time) in using mobile devices. This is followed by ascertaining the services that they use the devices to access. To achieve this objective, descriptive statistics such as frequencies of the measured items were used. Additionally, Chi-square goodness-of-fit-

test was used on categorical variables to test whether any of the response options was selected significantly more/less often than the others. Chi-square test of independence was used on cross-tabulations to see whether or not a significant relationship exists between the two variables represented in the cross-tabulation. When the conditions for this test are not met, Fisher's exact test is used.

The analysis and results obtained are presented next.

### 6.2.1 Experience of using mobile devices

This section attempts to ascertain the experience that stakeholders have in using mobile devices. The experiences of stakeholders is signified by length of time which they have used a mobile device. The length of time is categorized into five levels as shown in Table 6.4.

**Table 6.4:** ***Experience of respondents on the use of mobile devices***

| Age range in years | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | <1 | 25 | 6.8 | 6.8 | 6.8 |
| | 1 - 5 | 122 | 33.0 | 33.0 | 39.7 |
| | 6 - 10 | 160 | 43.2 | 43.2 | 83.0 |
| | 11 - 15 | 44 | 11.9 | 11.9 | 94.9 |
| | >15 | 19 | 5.1 | 5.1 | 100.0 |
| | Total | 370 | 100.0 | 100.0 | |

It is clear from Table 6.4 that the majority of the respondents have used mobile devices for a period of between six to ten years. The Table further reveals that few respondents have over 15 years of experience on the use of mobile devices. Figure 6.1 shows the variation in experience across the three groups of respondents.

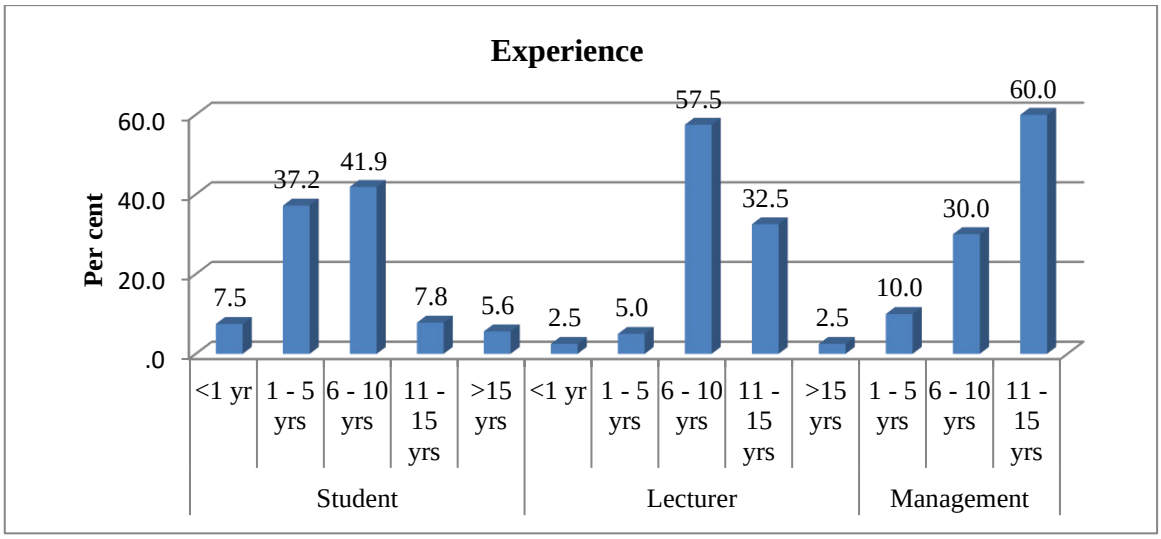


**Figure 6.1: Years of experience in using mobile devices by respondents across the three groups**

As can be seen from Figure 6.1, the majority of management staff have used mobile devices for a longer period than lecturers and students. Similarly, the majority of lecturers have used mobile devices for a longer period than students have. In general, this result seems to suggest that the more senior the participant, the more likely they are to have used the mobile phone for a longer period.

In order to see if there is a significant relationship between the different groups in terms of the length of time (experience) they have been using mobile devices, the results were cross-tabulated and tested using chi-square test of independence. This test is used to explore relationships between two categories of variables, each having two or more categories (Pallant, 2011). It compares frequencies of cases that occur in two or more categorical variables.

Results show that there is a significant relationship between experience and category of respondents (Fisher's (N=370) =46.061, p<.005). Interestingly, a significant number of students have used mobile devices for a period of 1 – 5 years; lecturers have used mobile devices for between 6 and 15 years; and management have used mobile devices for a period of 11 – 15 years. Although the results seem to show that as the age group increases the number of years of use of mobile devices increase, the result overall indicate that almost 92.5% of students have used a mobile device for at least one year. A similar situation can be observed in the lecturer's group. This finding is of interest to the study as it signifies that the key stakeholders (students & lecturers) have some basic experience that may position them to use mobile learning.

### 6.2.2 Services stakeholders use mobile devices to access

The services which stakeholders in Colleges of Education use their mobile devices to access were determined by the selected choices of respondents from a set of services. A 'Yes' or 'No' option was used to determine if a respondent uses a certain service or not. Mobile services used were categorized into two types – regular services, and social networking related applications. The regular services include voice calls, SMS/MMS, browsing, chatting, and electronic mail (email) services. The social networking and related applications include *Facebook, Twitter, Skype, LinkedIn*, and others.

***a. Regular services***

Figure 6.2 shows the analysis of various regular services which stakeholders in Colleges of Education in Nigeria use their mobile devices to access.

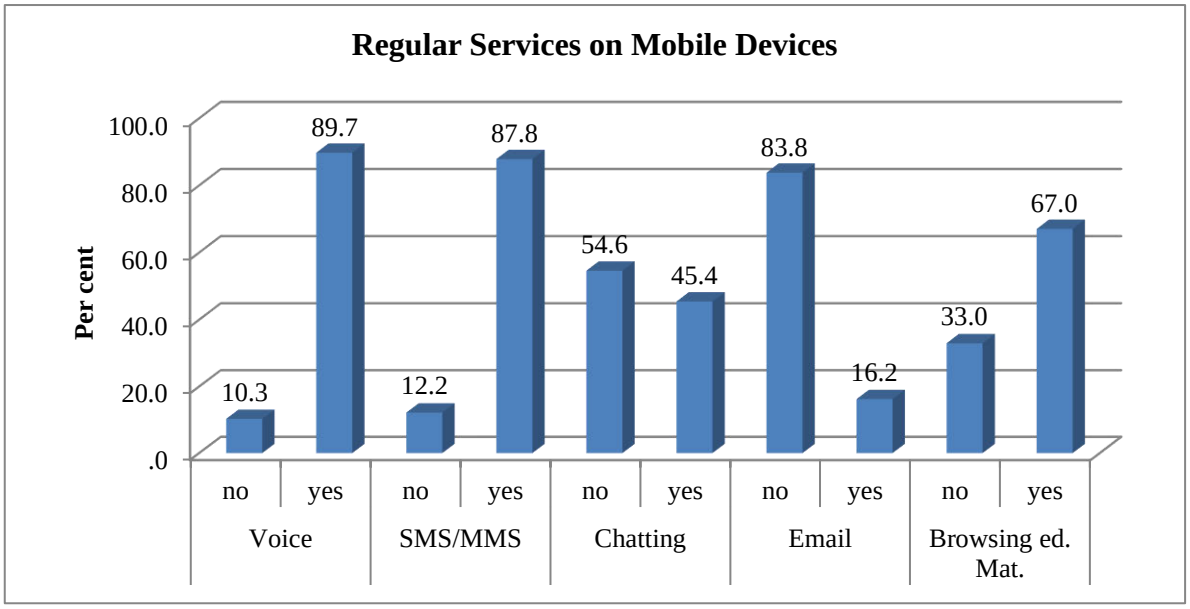


**Figure 6.2: Use of mobile device for regular services by stakeholders**

Figure 6.2 shows that majority of the stakeholders in Colleges of Education in Nigeria use their mobile devices for voice calls, SMS/MMS, and for browsing educational material. On the other hand, close to 50% of the respondents use their mobile devices for chatting while only a few of them access emails with their mobile devices.

To further corroborate this result, the chi-square goodness-of-fit test was applied to the data to see whether the 'Yes' or 'No' option was selected significantly more than the other. The results reveal that a significant number of the respondents responded 'Yes' to

the use of their mobile device for voice calls ($\chi 2(1,N=370) = 233.611, p<.005$); SMS/MMS ($\chi 2(1,N=370) = 211.892, p<.005$), and browsing educational materials ($\chi 2(1,N=370) = 42.908, p<.005$). The results on the other hand show that a significant number of stakeholders do not use their mobile devices for accessing emails ($\chi 2$ (1, N=370) =168.919, p<.005).

By implication, most of the stakeholders in Colleges of Education in Nigeria use mobile devices for voice calls, short message or multimedia message services as well as the browsing of educational materials. Only about 16.2% of the stakeholders in these institutions use mobile devices for accessing electronic mail.

Since the data was collected across, three groups (students, lecturers and management) it was important to see whether or not some differences exist in the manner in which the three groups use their mobile devices. Thus, the chi-square goodness-of-fit test was repeated for the three groups. The result indicated that a significant number of students use their mobiles for voice calls, short message or multimedia message services, and browsing educational materials.

All the lecturers (100%) indicated that they use their mobiles for voice calls and SMS/MMS, while a significant number use their mobile devices to browse educational materials. As was the case in the students' group, the number of lecturers that do not use mobile devices for emails is also significant.

Similarly, a significant number of management staff was found to be using their mobile devices for voice calls while 100% of them said that they use them for SMS/MMS.

In summary, the results reveal that most stakeholders use their mobile devices mostly for voice calls, SMS/MMS, and browsing of educational materials, but less frequently for accessing emails. The fact that a substantial number of the participants use their mobile devices for browsing educational related materials may be a positive indicator for the use of mobile learning to improve teaching and learning practices in Colleges of Education.

***b. Social networking and related applications***

The use of social networking and related applications by stakeholders in Colleges of Education in Nigeria is shown in Figure 6.3.

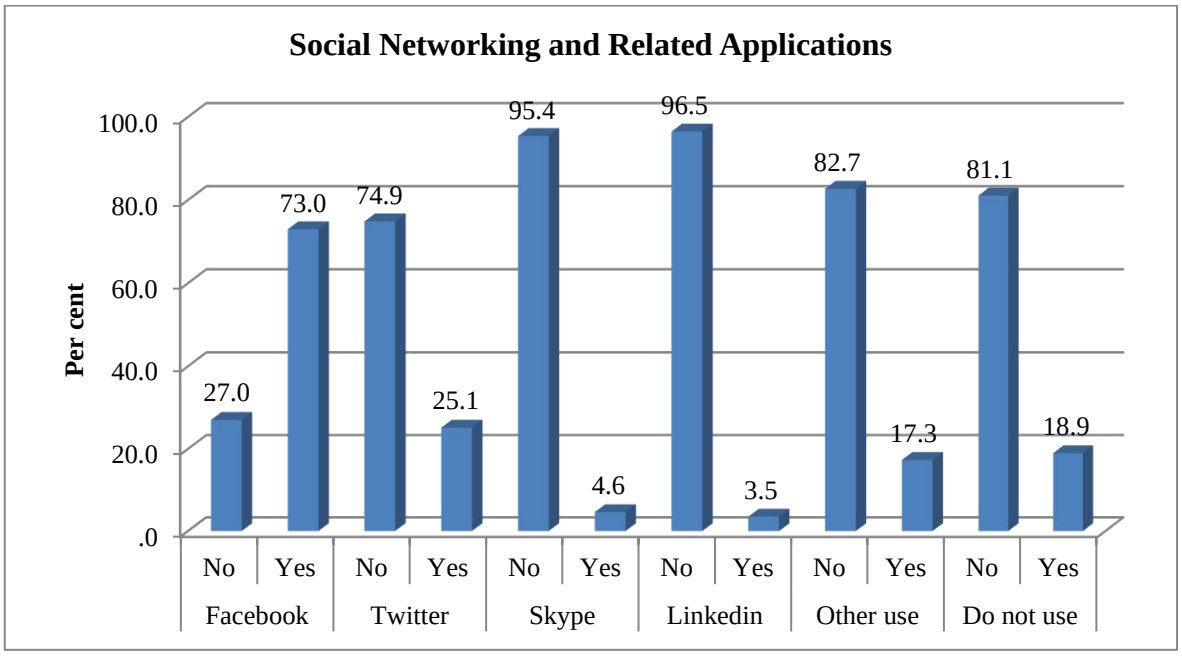


**Figure 6.3: Use of social networking and related applications by stakeholders**

From Figure 6.3, it is observed that most participants use at least one social networking or related application. The most commonly used social networking site is *Facebook.* A few (18.9%) of the stakeholders indicate that they do not use any social networking application at all.

Again, in order to ascertain whether 'Yes' or 'No' was selected significantly more than the other, the chi-square goodness-of-fit test was used. Results show that a significant number of the respondents responded 'Yes' to the use of *Facebook* with their mobile devices ($\chi 2$ (1, N=370) =78.108, p<.005). On the other hand, a significant number of respondents responded 'No', which is an indication that they do not use their mobiles to connect to *Twitter* ($\chi 2$(1,N=370) = 91.503,p<.005); *Skype* ($\chi 2$(1,N=370) = 305.124,p<.005); *LinkedIn* ($\chi 2$(1,N=370) = 319.827,p<.005), and other ($\chi 2$(1,N370) = 158.281,p<.005).

An analysis of the data by groups reveal that the majority of students and lecturers use their mobile devices to access the *Facebook* social networking site while a substantial number of management staff do not use any social networking or related application at all. These findings seem to concur with some previous studies (Alsereihy & Al Youbi, 2014; Buzzetto-More, 2012). This result may be suggesting the possibility of using a social networking site, specifically *Facebook* to facilitate teaching and learning in

Colleges of Education. No doubt, this conjecture requires further research. Therefore, the qualitative component of the study, which follows, presents the analysis and results of further investigations. These include the perceptions of stakeholders on the use of mobile learning and the use of social sites to support teaching and learning.

## 6.3 Perceptions that affect the intention of stakeholders to use mobile learning

This section presents the qualitative analysis of the perceptions of participants. The perceptions of participants provide some indication of the possible factors that may affect the intention of stakeholders to use mobile learning as well as social networking sites. Therefore, the perceptions are explored in line with the various constructs of the conceptual framework. Additional factors that emerged from the data were also reported.

The qualitative data had two sources – face-to-face interviews and observations made by the researcher during data collection. A software-aided content analysis using Nvivo 10 was applied in analysing the data. In order to trace each comment to a participant easily, the transcript of each participant was imported as a separate word document into Nvivo. As was explained in the methodology chapter, participants are identified in the qualitative strands of the study starting with the participant's group (such as STUD, LECT, & MGT for student, lecturer, & management respectively), followed by unique codes which represent the stage of the study and participant's serial number in that stage.

Content analysis was used to generate themes from the qualitative data through a process known as coding (Jones, 2007). The themes were named based on constructs of the conceptual framework of the study. Therefore, these themes represent the factors that may possibly affect the use of mobile learning in Colleges of Education. The analysis of excerpts based on each theme is presented as follows.

### 6.3.1 Performance expectancy

The theme 'Performance Expectancy' represents the views or opinions of participants who perceived that mobile learning as well as social networking sites such as *Facebook* will be beneficial to teaching and learning in Colleges of Education. One of the major benefits which may have informed the positive views of participants regarding mobile

learning is the improved access to teaching and learning, as well as learning materials. The following comments seem to depict this notion:

> *I can learn from anywhere not necessarily in a school environment or formal classroom (STUD 1.1).*
>
> *Students can learn from any location at any time using their mobile devices. This helps them to learn more to support what they have learnt in class (STUD 1.6).*
>
> *It facilitates education in its entirety, because one can simply be at home and still acquire knowledge and be able to teach too (LECT 1.12).*
>
> *With mobile learning, students can be engaged in meaningful discussions online. This provides room for more students to participate in learning compared to face-to-face contacts (LECT 1.16).*
>
> *In addition, it can provide a wide range of solutions to academic problems. Like in terms of easing congestions and promoting research (LECT 1.19).*

From these excerpts, it can be deduced that students as well as lecturers are positive that mobile learning provides room for them to access education and that the technology may be useful in reaching out to more students thereby narrowing the access gap that is associated with the traditional teaching and learning environment. This will make teaching and learning slightly informal, giving students more opportunity to learn on their own. The role of mobile learning in supplementing access to education is considered vital in Nigeria in view of the current level of personal safety in the country. As one interviewee said:

> *I see it as a welcome development because one challenge that is confronting education in Nigeria today is that of insecurity (LECT 1.17).*

This assertion is believed to be linked to recent reports of activities of the "book haram" group, ethno-religious crises and other cases such as kidnappings, which have constituted a serious threat to teaching and learning in Nigeria in recent years. This reasoning aligns with one of the major benefits of m-learning – it facilitates access to education in areas that are experiencing difficulties in accessing education or post-disaster environments (Mehdipour & Zerehkafi, 2013).

Participants also feel that mobile learning will open new doors to improved communication among learners, and their teachers. This can be inferred from the comments below:

> *Learning with mobile devices will compliment teaching and learning because students can interact with each other and even with lecturers so easily. For*

*example a lecturer can easily communicate with students or give them assignments using the mobile device. (STUD 1.4).*

*Yes, one benefit of mobile learning is that it makes access to students especially class representatives easier. This makes it easier to pass vital information to students. In addition, it can provide a wide range of solutions to academic problems (LECT 1.18).*

This development further extends the usefulness of mobile learning in two ways. First, it creates room for networking and cross-fertilization of ideas beyond the local environment by stakeholders. Secondly, it helps in developing the reading ability of students. This can be gathered from comments presented below.

*I am confident that mobile learning will help a great deal in developing students reading ability (LECT 1.15).*

*In other words, it attracts the attention of learners easily (MGT 1.23).*

It is believed that as students continue to exchange messages with colleagues and lecturers, their interest in terms of reading will increase, thus their learning skills and possibly performance will improve as well.

Participants also have strong feelings that mobile learning may be useful in terms of access to instructional and learning materials. This position can be noted from the following excerpts:

*Mobile devices can supplement access to learning materials in addition to notes (STUD 1.5).*

*It makes a lot of online learning materials available (STUD 1.9).*

*Learning materials are not adequate in our institutions, thus most teachers rely on the internet for support in terms of instructional materials (LECT 1.13).*

*Because of its mobile nature, mobile learning can curb the inadequacies of infrastructure and other learning materials (LECT 1.18).*

*In the absence of books students make use of their mobiles to find useful materials online (MGT 1.25).*

Furthermore, participants seem to be positive that mobile learning may assist in a more efficient management system of large classes by having lecturers engaging students in online discussions via discussion forums. This view is further supported by the interview excerpts below.

*With mobile learning, emphasis on physical classrooms is reduced. People can learn from their comfort zones – home, office or anywhere (STUD 1.10).*

*I teach in very large classes and to me, one great potential that I see in mobile learning is their ability in assisting to manage large classes. With mobile learning, students can be engaged in meaningful discussions online (LECT 1.16).*

*Mobile learning can take place anywhere not necessarily in the classroom. This addresses the problem of inadequate classrooms (MGT 1.25).*

Aligned with this view, a member of management suggests that lecturers could make video recordings of their lectures, which can be shared with students. This view is reflected in the following comment:

*Yes, lecturers can use mobile phones to record presentations by students and students can do likewise (MGT 1.30).*

The shared resource may make learning more convenient thereby encouraging more students to learn. This belief is in line with other participants as inferred in the excerpt below.

*Mobile learning will be useful as it will tend to shift teaching and learning to where the students are. This way, students may indirectly be encouraged to learn* (MGT 1.29).

Participants also feel that mobile learning may promote collaboration and team work among students. Some instances that support this view are listed below.

*For instance one can use it to assess team work among students by asking them to collaborate on certain assignments (LECT 1.14).*

*It provides room for people to share experiences, gain more understanding on a certain subject by synthesizing different views of people (MGT 1.21).*

In other words, mobile learning makes learning easy in the sense that access to information is readily available. More, specifically, collaboration seems to be more easily achieved. This enables the exchange of ideas which broadens the acquisition and construction of knowledge.

Another dimension to the benefits or usefulness of mobile learning that participants highlighted is what can be related to the educational use of social networking sites.

For instance:

*Mobile devices are useful especially with the current explosion of social networking media. Lecturers and students can use chat forums to discuss topics that are relevant to academic matters (LECT 1.14).*

*This will serve as a boost as learning is taken right to the door step of the learner (MGT 1.29).*

The comment from LECT 1.14 seems to link the use of mobile learning to the educational use of social networking sites. Participants perceived that social networking sites will also be useful to teach and to learn in different ways. A point of view is that SNS will be very useful in managing classes with large number of students. This position can be inferred from the comments below.

*It provides a faster means of reaching out to students. For instance a teacher must not wait to see students in class. He can just post a message via his mobile to them (MGT 1.22).*

*It allows for easy interaction between lecturer and students, not necessarily in the physical classroom (MGT 1.23).*

Participants feel that less physical interaction with the learner makes him work more, leading to faster skill acquisition. This inference can be drawn from the following statements:

*Facebook will provide less physical interaction with the learner. It will create room for more work by the learners/students (STUD 1.1).*

*It will aid the learning of new skills and knowledge through sharing of relevant educational materials with friends and lecturers (STUD 1.8).*

Other similar comments include:

*One motivating factor is the fact that social networking sites accommodate people from different parts of the world and therefore expands my learning horizon (STUD 1.3).*

*I think it will facilitate educational instruction and sharing of ideas with professionals across the world (MGT 1.23).*

Although comments like these can fit into the description of the construct 'community identity' as theorized by Mazman and Usruel (2010), the comments point to the usefulness of mobile learning on the larger picture. Another opinion which buttresses the same point is the comment of a student who said that:

*Teaching and learning is made easier by creating a group using Facebook where a teacher and his students meet to discuss and share knowledge (STUD 1.5).*

A common interest among teacher and the students is teaching, learning and research. Therefore, stakeholders across the three groups seem to be unanimous that social networking sites are capable of promoting this goal.

Aside from learning from lecturers, social networking sites may serve as good tools for collaboration and learning from other sources. As one student said:

*Social networking sites help you to learn from different people through sharing of ideas (STU 1.10).*

Another view is that the use of social networking sites may help to redirect the attention of learners to learning since most of them spend a substantial amount of time using SNS. This view is reflected in the excerpt:

*Well, students and staff are already using most of these technologies especially Facebook and WhatsApp. It will just be a matter of maximizing the gains (LECT 1.17).*

Overall, stakeholders in Colleges of Education may be willing to use mobile learning since they find it useful to teaching and learning. By implication, performance expectancy can influence the intention of stakeholders in Colleges of Education to use mobile learning and social networking sites to facilitate teaching and learning.

### 6.3.2 Effort expectancy

The theme 'Effort Expectancy' envelopes comments which imply that participants are optimistic that mobile learning or social networking sites (*Facebook*) will be easy to use. One instance is the excerpt below.

*Mobile devices especially the mobile phone is (are) very easy to operate (STUD 1.7).*

Another comment, which comes from a student further confirms the extent to which mobile learning makes learning easier:

*Mobile learning will be less stressful compared to the traditional (classroom approach) where students sometime stand while receiving lectures (STUD 1.10).*

Considering the comment above, there may be no doubt that certainly, less effort will be required to use the mobile phone to learn. Other participants are positive about mobile learning because it will be *enjoyable* and *fun*. Some comments in this respect are presented below.

> *Most importantly, a lot of students will enjoy it because they use it to also chat with friends on Facebook (STUD 1.8).*
>
> *I foresee that mobile learning will be fun most especially to students (MGT 1.21).*

Enjoyment and fun are indicators of intrinsic motivation, which has been associated with ease of use (Venkatesh et al., 2003). Most of the comments related to this theme have come from students because the students are more at the receiving end than lecturers. There can be no stress such as standing for hours to receive lectures.

On the aspect of social networking sites, participants across groups especially students and lecturers perceived that social networking sites may be easy to use to support teaching and learning. For example:

> *It facilitates getting in touch with people in other parts of the world, a kind of modern and current or latest means of learning easily and can be adapted fast (LECT 1.14).*

In other words, the lecturer sees the use of social networking sites as a current means of learning which is easy to accomplish and to adapt. His opinion may be based on the availability and simplicity of most social networking applications. Another participant captures it more clearly as reflected in the excerpt:

> *It will be fun. Teaching and learning will be made easier by creating a group using Facebook where a teacher and his students meet to discuss and share knowledge (STU 1.5).*

Furthermore, another lecturer states that:

> *It makes teaching and learning ubiquitous (LECT 1.16).*

By implication, teaching and learning can take place at home, school, cafeteria or any other place. This again is very important in the Nigerian context where the inadequacy

of teaching and learning infrastructure prevails. This belief is further supported by the comment below:

> *It will be exciting as lecturers and students will be able to discuss relevant educational topics without physical contacts (STUD 1.10).*

This means that the use of social networking will be intrinsically motivating. Another dimension that may be associated with the ease of using SNS is the cost-saving benefit. This view is illustrated in the comment of the student below:

> *It will make it easier for me to communicate or discuss with my colleagues and lecturers. This will save a lot of cost in terms of transportation (STUD 1.7).*

Based on these comments, there can be no doubt that stakeholders will support the use of social networking sites especially *Facebook* for teaching and learning. This is an indication that effort expectancy may be having some influence on the use of mobile learning as well as social networking sites. Viewed from another angle, the excerpts of STUD 1.7 may be indicating that mobile learning is cheaper in terms of cost. This suggests that cost may as well be an influential factor on the intention of stakeholders.

### 6.3.3 Social influence

This theme reflects how participants feel that important others influence them to use mobile learning or social networking sites. Some excerpts from the data in this regard are presented below.

> *Looking at the trend in technology especially with the advent of social networks, most of the students and even lecturers are always using their mobile devices to communicate with each other. This makes it easier for lecturers to share knowledge and experiences with students and colleagues (LECT 1.14).*
>
> *Most of our students use the technology every day, so it will be easier to get to them (MGT 1.23).*
>
> *Well, students and staff are already using most of these technologies especially Facebook and WhatsApp. It will just be a matter of maximizing the gains (LECT 1.17).*

It is observed that most of the comments under the theme "social influence" directly relate to social networking sites. This is because, aside voice calls and SMS/MMS, most participants simply associate the use of mobile devices to social networking sites. In other words a major attraction towards the use of mobile devices is social networking

applications. Therefore, the fact that most students and even lecturers use the technology seems to be the major influence on participants to use mobile learning and social networking sites to support the current teaching and learning practices. To further confirm this development, another management staff states:

> *That is what everyone seems to be talking about these days. It is also in vogue (MGT 1.22).*

It may be inferred from the comment that the use of social networking sites in education is a generational change or a revolution whose influence is already overwhelming.

### 6.3.4 Mobile learning conditions

Mobile learning conditions describe views of participants with regard to available conditions that support mobile learning. In this respect, some of the participants indicated that the affordability of mobile devices and the data bonuses provided by service providers are favourable conditions. Some instances include:

> *One factor is the availability of an enabling environment. Mobile phones are affordable. They are cheaper in terms of cost and easy to access (STUD 1.8).*
>
> *It has a wide coverage and is cheap in terms of operation (LECT 1.19).*
>
> *Mobile learning will be more affordable as students and even staff can take advantage of data bonuses that they get from service providers (MGT 1.27).*

The majority of the participants have mobile devices that could connect to the Internet. This was observed by the researcher during his fieldwork. This development may be as a result of the affordability of the devices as highlighted in comments of participants. All these seem to suggest positive conditions for mobile learning. Again, examined critically, the comments may be suggesting that cost could be another factor that may affect the intention of stakeholders to use mobile learning.

However, this is not to say that all conditions are favourable for mobile learning. Some of the comments of participants appear to point to some inadequacies in terms of facilities and other conditions. For instance:

> *I do not have a mobile device, so I don't know (STUD 1.2).*

This statement is important because it highlights the fact that not all the stakeholders especially students possess mobile devices. Other comments relate to poor or unstable

mobile network signal, cost of data, and the absence of policies that support mobile learning.

Some instances include:

> *I am sceptical really. One challenge to mobile learning will be the ineffectiveness of the mobile network (LECT 1.12).*
>
> *Policy issues may be the only challenge. Government must first of all come up with policies that support mobile learning MGT 1.23).*

The excerpts from MGT 1.23 suggest that the presence of policy regarding the use of mobile learning, may affect the intention to accept mobile learning. Furthermore, the researcher during data collection observed that all the colleges visited had inadequate computers, library materials, and manpower.

Although the mentioned inadequacies are capable of resulting in some pessimism regarding mobile learning, the motivation is that with the rate at which mobile technology is growing in Nigeria, these conditions will improve within a short time. The current effort that is being made by most of the providers to migrate to optical fibre may go a long way in stabilizing the networks. In addition, the researcher's observations regarding the inadequacy of computers, library materials, and manpower in most of the institutions may be viewed as an advantage in disguise, as these may serve to further boost the adoption of mobile learning in the institutions (Madu & Pam, 2011; Adedoja, Botha, & Ogunleye, 2012).

In terms of social networking sites, most of the participants seem to be emphasizing the same point – affordability, convenience, cheap and availability. This may be so because most social networking applications come preinstalled on mobile devices. Even when they are not preinstalled, they can be easily downloaded mostly at no cost. In line with this perception, an interviewee said:

> *Because social networking sites are always available and cheaper to use (STUD 1.8).*

Similarly, another participant commented:

> *Social networking sites are less expensive and provide room for freedom of expression (LECT 1.17).*

These comments are indicative of the participant's acceptance of available conditions for using social networking sites as many of them are already using the technology.

### 6.3.5 Personal innovativeness

'Personal innovativeness' is an envelope for comments which suggests some sort of self-encouragement or will power. The comments that constitute this theme suggests positive attitudes of participants toward mobile learning. Most of the comments affect students who incidentally are the key stakeholders in the study. Some examples include:

> *Students seem to be far ahead of lecturers (MGT 1.22).*
>
> *Most of them prefer to spend hours chatting (MGT 1.29).*

These comments describe attitudes that indicate the determination of students to use mobile devices, aligning with personal innovativeness (Abu-Al-Aish & Love, 2013).
It can be inferred from the comments above that students are far ahead because they are constantly online. Thus, the data seems to suggest that personal innovativeness can affect mobile learning in Colleges of Education in Nigeria positively. The issue of chatting is an echo of a similar idea mentioned earlier by one of the students, which is reflected below:

> *Most often, I love doing things with friends. I believe that mobiles devices will ease sharing of relevant class information with friends and classmates (STUD 1.6).*

This comment also highlights the role of personal innovativeness on the use of social networking sites.

### 6.3.6 Anxiety

The theme 'Anxiety' consists of comments that can be associated with nervousness. Most of the comments in this theme concern fears or apprehension of the unknown. For example, concerns were expressed about the use of mobile devices as indicated in the excerpts below.

> *Another problem is that students may abuse the use of mobile devices, resulting in disrespect to lecturers (STUD 1.10).*
>
> *The greatest challenge will however be the fear of the unknown. Most of us fear that technology will one day take over our jobs (LECT 1.15).*

> *The major problem will be that most staff are not computer literate, hence it becomes difficult for them to cope with current teaching practices. The best way is to organize intensive orientation to both staff and students (LECT 1.19).*
>
> *I am not completely sure of this because the low literacy level of staff is a challenge.*
> *Staff are over-dependent on the traditional method of doing things (MGT 1.22).*

The last comment may be connected to the inadequacy of computers in most higher education institutions in Nigeria as earlier highlighted in the literature and confirmed by the researcher during data collection. The dearth of computers impacts negatively on teaching, more especially discipline subjects which require computers as basic tools. As a result, most participants are only very knowledgeable in word processing, but lacked proficiency in other specialized software of their discipline specific subjects (Chaka & Govender, 2014). Virtually all the mobile networks in Nigeria rely on wireless technologies for transmission, thus the signal fluctuates occasionally. In addition, as promising as mobile learning may be, many people may not take it seriously unless they are compelled by the educational authority (policy implementation) to do so. This explains the apprehension behind the absence of a policy in support of mobile learning. However, while some of the concerns are already being tackled, others are such that will diminish with time (Selwyn, 2012).

Some of the participants attribute their apprehension on mobile learning to the attitudes of people who indulge in the sharing of pornographic related materials to friends. One such comment is:

> *My concern is that some students may use mobile phones negatively to share pornographic materials. This can also influence others negatively by discouraging them (LECT 1.20).*

Another concern raised is that mobile learning may reduce the kind of cohesive relationship that face-to-face teaching and learning provides. One notable comment in this direction came from a lecturer who states that:

> *What may seem a challenge or discouraging about mobile learning is the fact that it will not create a cohesive relationship between students and lecturers since it reduces face-to-face contacts (LECT 1.18).*

This position points the one of the shortcomings of e-learning as earlier indicated in the literature (Epignosis_LLC, 2014). It can also be linked to inertia or resistance to change, which should be expected in any new intervention. The attitude of some lecturers who may not be willing to interact with their students via mobiles is also a concern. Some lecturers in the Nigerian context may see it as disrespectful for a student to chat with them. The good news is that mobile learning is only supplementing the traditional teaching and learning practices and not replacing it.

In summary, the foregoing seems to suggest that anxiety is a factor that may affect the use of mobile learning in Colleges of Education. Contrary to this finding, Venkatesh *et al.*, (2003) theorized that self-efficacy and anxiety are non-direct determinants of behavioural intention. Although there seem to be no excerpt that directly links anxiety to the use of social networking sites, the statement of LECT 1.20 may be implied.

### 6.3.6 Behavioural intention

The theme 'Behavioural Intention' embraces comments which seem to suggest that participants may be willing or ready to accept mobile learning. While some of the participants state clearly that they may be willing to use mobile learning, others indicate their willingness indirectly using such statements as "*it is a good idea*" or "*it is a welcome development*". For example, the following comments seem to indicate clearly that participants are willing to use mobile learning:

> *If lecturers will allow students to freely communicate with them via the mobile phone, it will encourage mobile learning (STUD 1.4).*
>
> *The phone is very easy to operate. In addition, most of my friends have it. This will encourage mobile learning. Also, data services must be affordable (STUD 1.5).*

In some situations the willingness of participants is implied in their statements. For example:

> *It is good because it is faster to use the mobile device to do my assignment through browsing (STUD 1.8)*
>
> *It will be useful to me because at times, I use my phone to record lectures and play it later again and again (STUD 1.9).*

These statements imply that the participants may intend to use mobile learning in view of its usefulness. Similarly, the statement below may be indicating the willingness of participants to use social networking sites.

> *I am encouraged to accept the use of social networking sites for teaching and learning because it makes students (to) express their ideas freely without feeling shy or any fear (STUD 1.6)*
>
> *It will be fast and motivating (STUD 1.9)*
>
> *It is (quite) a very good idea because it will facilitate learning and drastically reduce the rate of computer illiteracy in our system (STUD 1.10).*
>
> *Use of social networking sites will facilitate effective teaching and learning (LECT 1.12).*
>
> *It will be a very good idea (LECT 1.13).*

The implication is that participants may be willing to use social networking sites due to their potential benefits.

## 6.4 Summary

The quantitative component revealed that about 92% of students and lecturers who constitute the key stakeholders in Colleges of Education have used mobile devices for at least one year. The majority of the participants have been using mobile devices for a period of 6-10 years. The study further revealed that in addition to using their mobile devices for voice calls and SMS/MMS, stakeholders also use them largely for browsing educational materials. Additionally, it was found that most of the stakeholders, specifically students and lecturers, use their mobile devices to access social networking sites especially *Facebook.* These findings suggested some positive indications towards the use of mobile learning and the possibility of using social networking sites to facilitate teaching and learning in Colleges of Education.

Further research conducted to ascertain the perceptions of participants to use mobile learning and social networking sites has yielded positive results, indicating that the grounds may be fertile for the application of the technology. The positive perceptions of most of the stakeholders across the three groups suggested their intention to embrace mobile learning. The quantitative findings that performance expectancy (PE), effort expectancy (EE), social influence (SI), and mobile learning conditions (MLC) are

positively associated with behavioural intention to use mobile learning affirm Chaka and Govender's (2017) report. However, in their study, Chaka and Govender (2017) found that specifically, PE, EE, and MLC significantly predict BI.

In the qualitative component, the various themes which emerged from the views of participants on the use of mobile learning were virtually the same as those that emerged from the educational use of social networking sites. These themes suggest the factors that may affect the acceptance of mobile learning as well as educational use of social networking sites in Colleges of Education. In addition to PE, EE, SI, and MLC, the qualitative study indicated that personal innovativeness and anxiety are other factors that may influence the intention of stakeholders to use mobile learning in Colleges of Education in Nigeria. Additional factors, cost and policy implementation, were highlighted in the analysis, suggesting that these factors could affect the intention of stakeholders in Colleges of Education to accept mobile learning. The cost factor align with the study of Venkatesh *et al.* (2012), which found that price value affects the intention of users to accept the use of mobile internet.

Although a few concerns such as the negative use of social networking sites by students were raised, stakeholders were positive that the prevalence of social networking sites especially *Facebook* among students and lecturers may add value to teaching and learning in Colleges of Education if explored.

The study concludes preliminarily that in view of the positive views expressed, stakeholders in Colleges of Education in Nigeria may be willing to use mobile learning using social networking sites, particularly *Facebook* as the mobile learning medium. The likely factors that may affect the acceptance of the technology include *performance expectancy, effort expectancy, social influence, mobile learning conditions, personal innovativeness and Anxiety.* These results are consistent with the constructs of most technology acceptance models such as TAM and UTAUT. As highlighted in the literature, some of the factors assume variant names in other studies. Some of the comments from the data on the use of social networking sites could be related to *Community identity* – a construct in the educational use of the *Facebook* model. However, this construct on a closer examination deals indirectly with the usefulness of using *Facebook* which is represented by performance expectancy. Thus this factor is well covered by the conceptual model of the study, which incorporated components of UTAUT, educational use of the *Facebook* model and Information Success models.

The next chapter of the study presents the implementation of mobile learning using *Facebook* which determines how the acceptance factors and success factors work together towards the effective implementation of mobile learning in Colleges of Education.

# CHAPTER SEVEN
# IMPLEMENTATION OF MOBILE LEARNING

Based on the positive results obtained from the preliminary stage of the study, it became necessary to test the implementation of mobile learning in order to see how the acceptance and success measures work together to achieve the overall objective of the study. Therefore, the second stage of the study ascertains the viability and success of mobile learning in improving the teaching and learning conditions in Colleges of Education. Specifically, the *Facebook* application is used as the mobile learning medium or platform. This follows from the fact that most stakeholders in Colleges of Education are already using this application as ascertained from the preliminary investigations.

For ease of reference, the second research question that is addressed in this stage of the study is restated below.

**RQ2** *How can the acceptance factors and success factors work together towards the effective implementation of mobile learning in Colleges of Education?*

*This question was broken down into three sub-questions as stated below:*

*a. To what extent do the acceptance factors (performance expectancy, effort expectancy, social influence, mobile learning conditions, anxiety & personal innovativeness) jointly with user satisfaction influence the behavioural intention of participants?*
*b. To what extent do mobile learning conditions, behavioural intention, and user satisfaction influence the actual use of mobile learning?*
*c. How does the actual use of mobile learning and user satisfaction result in an improved educational system?*

As was explained in the methodology chapter (5), only one of the institutions (Federal college) was used to test the implementation of mobile learning in Colleges of Education in Nigeria. Since the study follows the convergent mixed methods research design, the quantitative and qualitative data components are used in order to provide a complete understanding of the viability and success of mobile learning.

A new dataset from the same population was collected because there was a long gap in time between the preliminary and the implementation stages of the study. A total number

of 330 questionnaires were distributed to respondents using the physical (face-to-face) method out of which 324 of them were retrieved. This number represents a return or response rate of about 98%. As earlier stated, the success recorded in retrieving the questionnaires may be attributed to the physical method adopted. Three of the questionnaires were later discarded for inconsistency resulting in 321 useable questionnaires. 14 of the sampled members were also involved in the qualitative study. The data analysis is presented in two sections – descriptive analysis and inferential analysis.

## 7.1 Descriptive analysis

The descriptive analysis involves the analysis of demographic information. This is considered in two perspectives – categorical variables and continuous variables. These two categories are presented below:

### 7.1.1 Categorical variables

Table 7.1 shows a cross-tabulation of stakeholders' grouped by gender.

**Table 7.1:** ***Analysis of respondents in by gender***

| | | Gender | | Total |
|---|---|---|---|---|
| | | **Male** | **Female** | |
| Stakeholders' group | Student | 184 | 133 | **317** |
| | Lecturer | 4 | 0 | **4** |
| **Total** | | **188** | **133** | **321** |

Table 7.1 reveals that the study sample had more males than females. Since a random sampling design was adopted in the sampling of respondents, it can be inferred that the target population consisted of more males than females. This trend was also observed in the preliminary stage of the study.

As already mentioned in chapter five, the data involved only students and lecturers because management staff do not take part in the actual application of mobile learning.

### 7.1.2 Continuous variables

The analysis of continuous demographic variables is presented in Table 7.2.

**Table 7.2:** ***Analysis of demographic information for continuous variables***

| | N | Min. | Max. | Mean | Std. Deviation | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|---|---|
| | Stat. | Stat. | Stat. | Stat. | Stat. | Stat. | Std. Error | Stat. | Std. Error |
| Age | 321 | 19 | 52 | 26.98 | 5.156 | 1.561 | .136 | 3.575 | .271 |
| Use of mobile device experience | 321 | 1 | 12 | 4.12 | 2.355 | .797 | .136 | .208 | .271 |
| Valid N (listwise) | 321 | | | | | | | | |

Table 7.2 shows that the minimum age of respondents is 19 years while the maximum age is 52 years. The average age is 26.98. From the Table, it is gathered that the age of respondents is positively skewed; meaning that majority of the respondents lie below the average age of 26.98. Table 7.2 further reveals that respondents have used mobile devices for a minimum of one year and a maximum of 12 years.

## 7.2 Inferential analysis

In order to obtain a thorough understanding of the acceptance and success of mobile learning in Colleges of Education, so that a framework for mobile learning may be proposed, the data was first analysed quantitatively using SEM and then qualitatively using content analysis.

### 7.2.1 Quantitative data analysis using SEM

Structural equation modelling (SEM) using IBM Amos version 23 was used to analyse the data by exploring various relationships that exist in the proposed or conceptual framework. As earlier explained in chapter five, the primary goal of SEM is to determine and validate a proposed causal process or model. In other words the model used in the study was specified in chapter four as the conceptual framework, subject to confirmation. Therefore, SEM is a confirmatory technique. Like any other test or model, we have a sample and want to say something about the population that comprises the sample. We have a covariance matrix to serve as our dataset, which is based on the sample of collected measurements. The empirical question of SEM is therefore whether or not the proposed model produces a population covariance matrix that is consistent with the sample covariance matrix. Hence the model specified/proposed in chapter 4 needs to be validated/ tested.

SEM is suitable for testing complex models especially new ones to determine if the model is adequate or not. It handles this process by calculating Goodness-of-fit statistics that determine whether the model is appropriate or needs further revision.

Additionally, SEM can be used to explore relationships among variables to tell the amount of variance in the dependent variables (DVs) – both manifest (observable) and latent, that is accounted for by the independent variables (IVs). Observable variables are variables that are measured directly using items on the measurement instrument such as a questionnaire. Latent variables on the other hand are not measured directly. They are measured through observable or manifest variables.

Therefore using SEM is considered suitable to test the conceptual model, which is a new formulation. The interplay between different variables provides the answers to the second research question and its sub-questions. In order to apply SEM, the data has to satisfy a number of assumptions. Thus as part of the process of analysis, the data in this study was first cleaned up and tested for the non-violation of the assumptions of SEM.

#### 7.2.1.1 Testing for non-violation of assumptions

The measures taken to test the data against the non-violation of the assumptions of SEM are highlighted below.

***Completeness of data***

One main assumption of SEM is that the data to be analysed must be complete. In other words, there should be no missing data. Where missing data exist, any of the ad hoc solutions such as list-wise deletion of cases, pairwise data deletion, or mean substitution may be applied. The major problem with these methods is the assumption that the data is missing completely at random (Little & Rubin, 1987). According to Roth (1994), list-wise deletion is acceptable in a situation where the proportion of missing data cases is less than or equal to 5%, otherwise, maximum likelihood estimation is recommended. In this phase of the study, there was no need to adopt any ad hoc measure since no missing data was present.

***Normality***

Another assumption of SEM is that the dependents and mediating variables are continuous and normally distributed (Pallant, 2011). In this study, normality was checked by looking at skewness and kurtosis for all variables in the model. While Kline (2012) suggests that so long as skewness <=3 and Kurtosis <=10, normality is not a concern, Curran, West, and Finch (1996) state that skewness and kurtosis are concerns if skewness >2, and kurtosis >7. In addition, skewness and kurtosis are not a concern with large sample sizes, above 200 (Tabachnick & Fidell (as cited in (Pallant, 2011).

In this stage of the study, the normality of the data on the dependent and/or mediating variables in the model (behavioural intention, and user satisfaction) were found to appear normal. This was done by assessing the effect of 5% trimmed mean on actual values, and also looking at skewness, and kurtosis of each measured (observable) dependable variable as shown in Table 7.3. The 5% trimmed mean refers to the computed mean excluding 5% of the upper (largest) and lower (smallest) values of the distribution. It a robust statistics that helps to eliminate the effect of data values at the ends of a sample, which may negatively affect the actual mean.

**Table 7.3: Trimmed mean, skewness and kurtosis statistics for dependent variables**

| Descriptive | | | | |
|---|---|---|---|---|
| | | | **Statistic** | **Std. Error** |
| BI | Mean | | 7.07 | .101 |
| | 95% Confidence Interval for Mean | Lower Bound | 6.88 | |
| | | Upper Bound | 7.27 | |
| | 5% Trimmed Mean | | 7.15 | |
| | Median | | 7.00 | |
| | Variance | | 3.307 | |
| | Std. Deviation | | 1.818 | |
| | Minimum | | 2 | |
| | Maximum | | 10 | |
| | Range | | 8 | |
| | Interquartile Range | | 2 | |
| | Skewness | | -.654 | .136 |
| | Kurtosis | | .157 | .271 |
| US | Mean | | 10.35 | .144 |
| | 95% Confidence Interval for Mean | Lower Bound | 10.06 | |
| | | Upper Bound | 10.63 | |
| | 5% Trimmed Mean | | 10.42 | |
| | Median | | 11.00 | |
| | Variance | | 6.652 | |
| | Std. Deviation | | 2.579 | |
| | Minimum | | 3 | |
| | Maximum | | 15 | |
| | Range | | 12 | |
| | Interquartile Range | | 3 | |
| | Skewness | | -.509 | .136 |
| | Kurtosis | | -.042 | .271 |

Considering Table 7.3, the skewness and kurtosis values for the two variables are within the prescribed values. Similarly, the trimmed mean values for both dependent variables are not very different from their actual mean values; which implies that the extreme values of the distribution do not have much influence on the mean. These results indicate that the two variables are normal.

Normality was further observing by inspecting the histogram for each variable as shown in Figures 7.1 and 7.2. The histogram plots show normal curves, confirming that the two variables are normal.

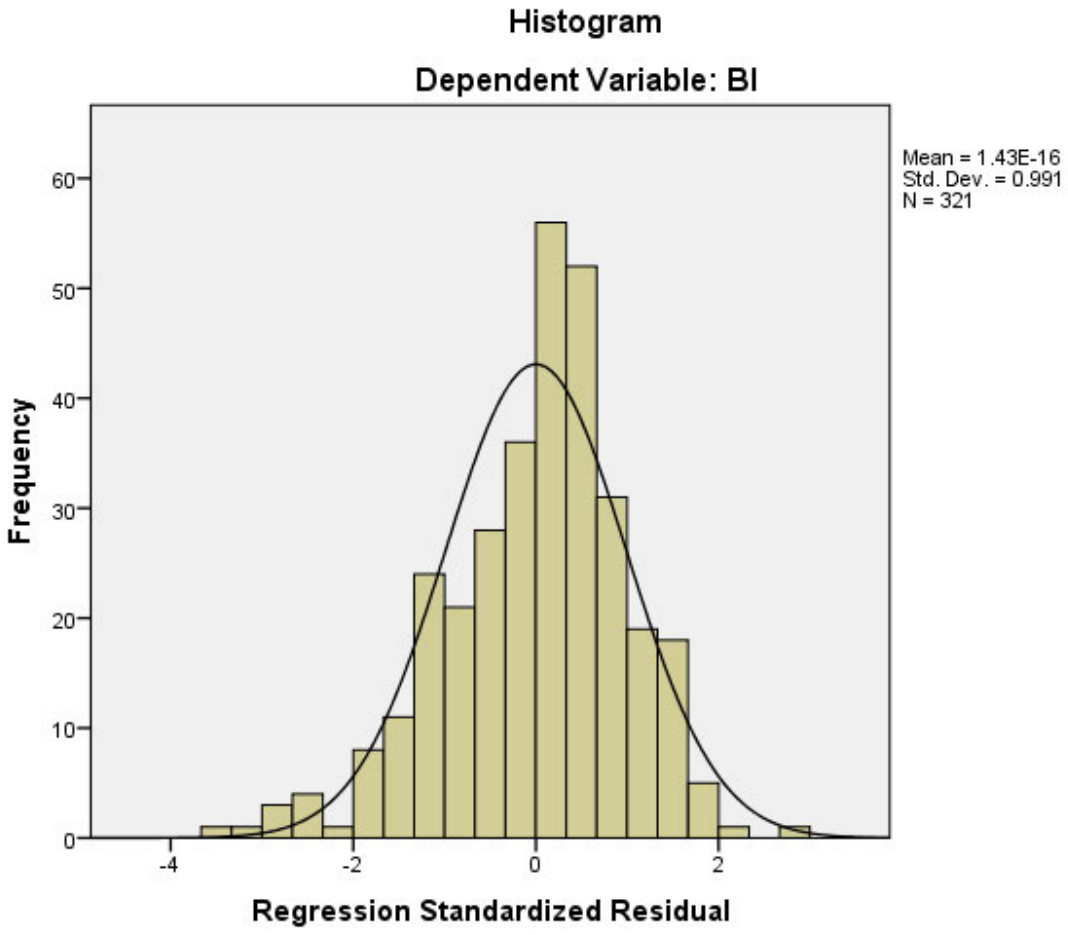


**Figure 7.1: Histogram plot for behavioural intention (BI)**

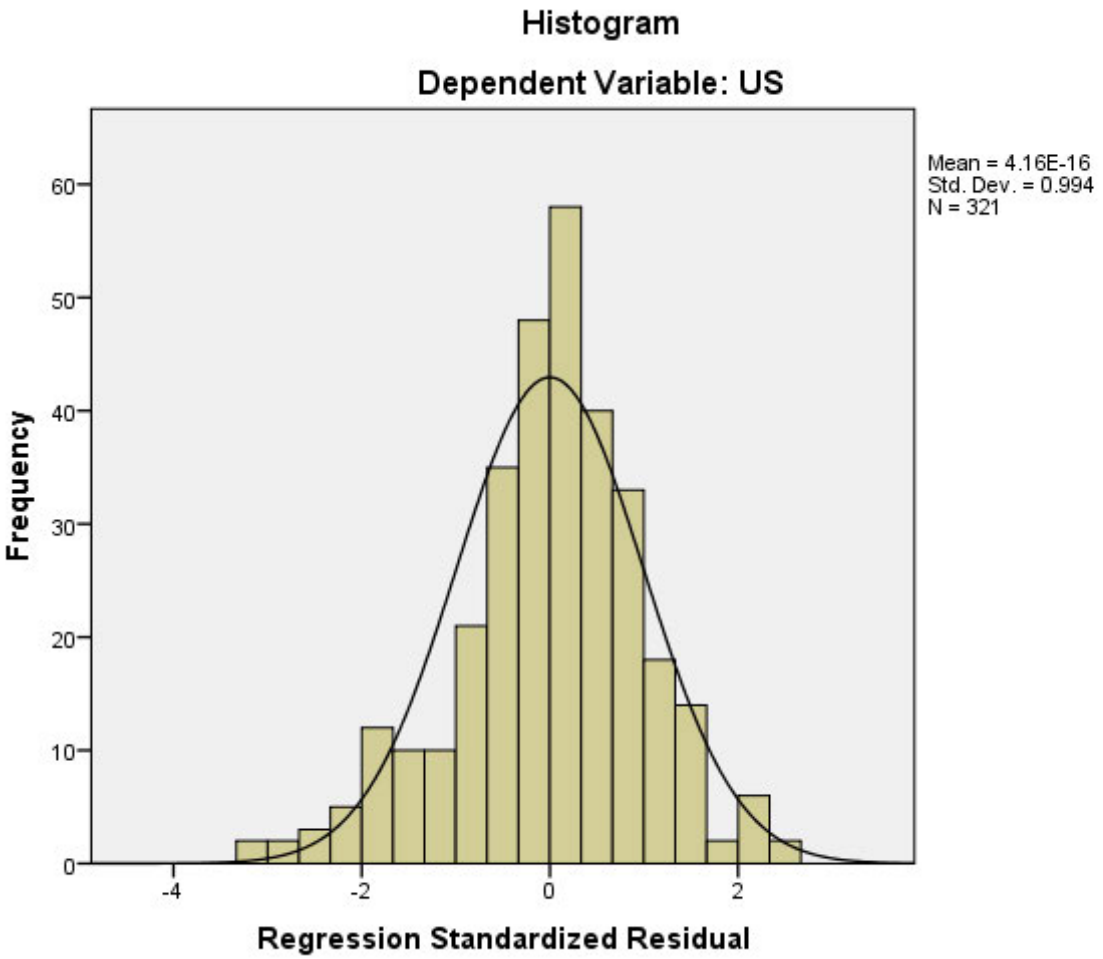


**Figure 7.2: Histogram plot for user satisfaction (US)**

### *Sample size*

Sample size is also an important factor in SEM. Although there may be no consensus regarding the sample size appropriate for SEM analysis (Sivo *et al.*, as cited in (Hoe, 2008)), it is suggested that large samples of say 200 and above may result in the needed level of statistical power with any given model (Schreiber, Nora, Stage, Barlow, & King, 2006). In addition, Loehlin (1992) suggests that a sample size of say 200 and an above number of cases may yield better results for models with two to four factors. He adds that smaller sample sizes may result in consequences such as more convergence failures, improper solutions, and inaccurate parameter estimates especially standardized errors. In line with the above suggestions, the sample size of 321 utilized in this phase of the study is considered appropriate for applying SEM.

### 7.2.1.2 Exploratory factor analysis and validation of measurement model

As part of the refinement process of the measurement model, exploratory factor analysis is used to assess the factor loadings of all items that estimate each construct. Due to the complexity of the conceptual model of the study, each of the 4 sub-models were taken individually and tested for 'uni-dimentionality' and cross-loading. Reliability and validity were calculated and based on these results, adjustments were made. These adjustments included adding in covariance indicators to error variances and removing any measured items with low loadings or indications of cross-loading.

After the sub-models were treated individually and the 'best' sub-models achieved, they were taken together in pairs and then three at a time and the same process was carried out.

Information regarding each construct in the measurement model with the number of factors entered and retained is presented in Table 7.4.

**Table 7.4:** ***Information on various constructs in the measurement model***

| **Construct** | **Initial number of items** | **Number of items retained** |
|---|---|---|
| ***Sub-model A*** | | |
| Performance expectancy | 4 | 2 |
| Effort expectancy | 4 | 3 |
| Social Influence | 4 | 2 |
| Anxiety | 3 | 3 |
| Personal innovativeness | 3 | 2 |
| Mobile learning conditions | 4 | 3 |
| Behavioural intention | 4 | 2 |
| ***Sub-model B*** | | |
| Communication & interaction | 5 | 3 |
| Collaboration & resource sharing | 4 | 2 |
| ***Sub-model C*** | | |
| Information quality | 7 | 5 |
| System quality | 5 | 4 |
| Service quality | 6 | 5 |
| Student-centric learning | 3 | 2 |
| User satisfaction | 3 | 3 |
| ***Sub-model D*** | | |
| Less demand on teacher | 3 | 2 |
| Less demand on physical facilities | 3 | 3 |
| Improved reading culture | 5 | 3 |
| Improved performance | 4 | 2 |

***Fitness of the model***

To assess the fitness of the model, fit indices are used. Some studies (for example, Reisinger & Mavondor; Tomarken & Waller (as cited in Hooper, Coughlan, & Mullen, (2008)) have argued that fit indices may not be completely relied upon as measures of model fit. Consistent with this argument, Barrett (2007) calls for the abandonment of the use of fit indices in ascertaining model fit. Similarly, Marsh *et al.*, (as cited in Hooper, Coughlan, & Mullen 2008, p.57) maintains that a strict compliance with the thresholds of fit indices may lead to "the incorrect rejection of an acceptable model". On the other hand, studies for example Bentler and Wu (2002) and Hoe (2008) state that model fit indices provide a good indication of model fit.

Furthermore, the number of fit indices that should be reported and what minimum values the various indices should have for the model to be regarded as having an acceptable fit is still under debate. Hooper *et al.*, (2008) state that there is no known agreement on the model fit indices that should be considered. For example, Garver and Mentzer (1999) recommend that the Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) be reported in addition to chi-square, and the chi-square value over degree of freedom (CMIN or $X^2$ / Df). They further recommend thresholds greater than 0.9 for NNFI and CFI, less than 0.08 for RMSEA, and a ratio of less or equal to 3 for the chi-square over degree of freedom (CMIN or $X^2$ / Df). Hu and Bentler (1999) on the other hand recommend a certain combination of fit indices.

Since it is not necessary or realistic to report all the fit indices produced by SEM application, Hooper *et al.*, (2008) recommend that, in addition to Chi-square value, its degree of freedom and the p-value, a variety of the indices which tests different aspects of the model fit should also be reported. In accordance with this discussion, this study reports at least one fit index from each test group. The chi-square value (CMIN or $X^2$), degree of freedom (Df), chi-square value over degree of freedom (CMIN or $X^2$ / Df), RMSEA, GFI, IFI, TLI, and CFI were reported for each model test.

For the integrated model proposed for this study, it was found that the best fit indices that could be obtained without dropping any of the constructs were not entirely within the prescribed values as can be seen in Table 7.5.

**Table 7.5*: Overall fit indices of the proposed measurement model***

| Fit Index | Observed Value |
|---|---|
| CMIN | 1543.415 |
| Df | 1040 |
| CMIN/Df | 1.484 |
| GFI | .847 |
| IFI | .909 |
| TLI | .890 |
| CFI | .906 |
| RMSEA | .039 |

As can be seen from Table 7.5, with the exception of GFI and TLI which are adequate or marginally acceptable, all the indices indicate a good fit (Barrett, 2007; Hoe, 2008). The model was then tested for reliability and validity, which are presented in Table 7.6.

**Table 7.6: *Reliability and validity measures of the proposed measurement model***

| Construct | Items | Loadings | Cronbach's alpha | CR | AVE | MSV | MIC |
|---|---|---|---|---|---|---|---|
| Performance expectancy | PE2 | 0.854 | 0.747 | 0.765 | 0.625 | 0.228 | 0.410 |
| | PE3 | 0.698 | | | | | |
| Effort expectancy | EE1 | 0.700 | 0.695 | 0.687 | 0.423 | 0.394 | 0.419 |
| | EE2 | 0.612 | | | | | |
| | EE3 | 0.653 | | | | | |
| Social Influence | SI2 | 0.656 | 0.684 | 0.690 | 0.530 | 0.228 | 0.381 |
| | SI3 | 0.792 | | | | | |
| Mobile learning conditions | MLC1 | 0.690 | 0.694 | 0.688 | 0.425 | 0.394 | 0.382 |
| | MLC2 | 0.670 | | | | | |
| | MLC3 | 0.613 | | | | | |
| Anxiety | AX1 | 0.589 | 0.718 | 0.723 | 0.469 | 0.032 | 0.458 |
| | AX2 | 0.788 | | | | | |
| | AX3 | 0.661 | | | | | |
| Personal innovativeness | PI1 | 0.819 | 0.757 | 0.761 | 0.615 | 0.119 | 0.484 |
| | PI2 | 0.746 | | | | | |
| Behavioural intention | BI1 | 0.798 | 0.657 | 0.661 | 0.497 | 0.262 | 0.369 |
| | BI2 | 0.616 | | | | | |
| Information quality | IQ1 | 0.538 | 0.803 | 0.795 | 0.441 | 0.408 | 0.387 |
| | IQ2 | 0.681 | | | | | |
| | IQ3 | 0.678 | | | | | |
| | IQ4 | 0.770 | | | | | |
| | IQ5 | 0.639 | | | | | |
| System quality | SQ1 | 0.452 | 0.648 | 0.664 | 0.402 | 0.209 | 0.339 |
| | SQ2 | 0.642 | | | | | |
| | SQ3 | 0.573 | | | | | |
| | SQ5 | 0.682 | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Service quality | SVQ2 | 0.647 | 0.745 | 0.765 | 0.395 | 0.375 | 0.357 |
| | SVQ3 | 0.640 | | | | | |
| | SVQ4 | 0.600 | | | | | |
| | SVQ5 | 0.637 | | | | | |
| | SVQ6 | 0.616 | | | | | |
| User satisfaction | US1 | 0.859 | 0.819 | 0.853 | 0.659 | 0.408 | 0.402 |
| | US2 | 0.776 | | | | | |
| | US3 | 0.804 | | | | | |
| Student-centric learning | SCL1 | 0.722 | 0.751 | 0.750 | 0.601 | 0.251 | 0.498 |
| | SCL2 | 0.836 | | | | | |
| Less demand on teacher | LDT2 | 0.712 | 0.71 | 0.712 | 0.553 | 0.458 | 0.452 |
| | LDT3 | 0.774 | | | | | |
| Less demand on physical facilities | LDF1 | 0.761 | 0.765 | 0.764 | 0.520 | 0.461 | 0.521 |
| | LDF2 | 0.720 | | | | | |
| | LDF3 | 0.683 | | | | | |
| Improved reading culture | IRC2 | 0.672 | 0.761 | 0.759 | 0.513 | 0.456 | 0.407 |
| | IRC3 | 0.785 | | | | | |
| | IRC4 | 0.700 | | | | | |
| Improved performance | IP1 | 0.743 | 0.659 | 0.665 | 0.499 | 0.358 | 0.377 |
| | IP2 | 0.667 | | | | | |
| Communication & interaction | CMI1 | 0.648 | 0.724 | 0.722 | 0.465 | 0.449 | 0.374 |
| | CMI2 | 0.694 | | | | | |
| | CMI3 | 0.716 | | | | | |
| Collaboration & resource sharing | CLR1 | 0.828 | 0.728 | 0.735 | 0.583 | 0.449 | 0.438 |
| | CLR2 | 0.694 | | | | | |

***Reliability***

The reliability or internal consistency of a scale ascertains how measures of the same constructs hang together (Pallant, 2011). Internal consistency is indicated if Cronbach's alpha values are greater than 0.7. From Table 7.6 above, it is observed that while some variables indicate acceptable and good reliability, others (effort expectancy, social influence, mobile learning conditions, behavioural intention, system quality and improved performance) have marginally acceptable Cronbach alpha coefficients (Chinomona & Cheng, 2013).

However, it has been observed that Cronbach's alpha coefficients are sensitive to the number of items in a scale (Gliem & Gliem, 2003), such that scales having fewer than ten items often result in Cronbach's alpha coefficients as low as 0.5 (Pallant, 2011). While some researchers (such as (Briggs & Cheek, 1986)) suggest that a scale with mean inter-

item correlations (MIC) coefficients in the range of 0.2 to 0.4 is reliable, others (for example (Clark & Watson, 1995)) recommend a range of 0.15 to 5.0 depending on the nature of construct being measured. Since the number of items used in the various subscales in this study is below ten, the mean inter-items correlations for each construct is also computed and considered. In this case, all constructs are considered reliable.

***Validity***

In this study, convergent or construct validity and discriminant validity were used to measure the validity of the scale. Convergent validity ascertains the level of agreement between items that measure the same construct (Guo, Aveyard, Fielding, & Sutton, 2008). Convergent validity is assessed by observing factor loadings, composite reliability (CR) values, and average variance extracted (Field, 2009; Hair et al., 2009). These measures determine if variables converge at some point. The rule of thumb is that CR values should be greater than 0.6, and average variance extracted or estimated (AVE) should be greater than 0.5 (Hair et al., 2009). Additionally, factor loadings should be greater than 0.5.

Table 7.6 shows that all factors have acceptable loadings, just as all constructs have acceptable CR. Similarly, most of the constructs indicate acceptable values for AVE (>0.5), while others (with AVE>0.4) are marginally acceptable (Chinomona & Cheng, 2013). Service quality (SQ) with AVE < 0.4 seems to be the only concern in this case.

***Discriminant validity***

Discriminant validity measures the distinctiveness of constructs in a given model (Guo et al., 2008). In this study, discriminant validity is assessed by ascertaining the maximum shared variance in each construct, which should be less than AVE. As can be clearly seen from Table 7.6, all constructs in the study passed the discriminant validity test.

***Multicollinearity***

A check to ensure the non-violation of the assumptions of multicollinearity was carried out. Multicollinearity ascertains the extent to which the various constructs are related to or measure the same concept/object. Specifically, the tolerance and variance inflation factor (VIF) values in the coefficient table were inspected against the prescribed values (tolerance value <0.10, or a VIF value >10 for the presence of multicollinearity) (Pallant, 2011). Results indicate a non-violation of multicollinearity assumption as the lowest tolerance value was 0.647 and the highest VIF value was 1.415.

**Improvement of the measurement model**

After exhausting all the possible avenues towards improving the model, the model still did not fit the data well. A further improvement on the model was not possible without dropping some variables. In an effort to improve the model in this regard while ensuring the retention of most vital components of the model, it became imperative to drop anxiety from the acceptance measures, and then system quality and students'-centric learning from the success measures. These changes yielded some more improvements on the model. The final measurement model and fit indices are presented in Figure 7.3 and Table 7.7 respectively.

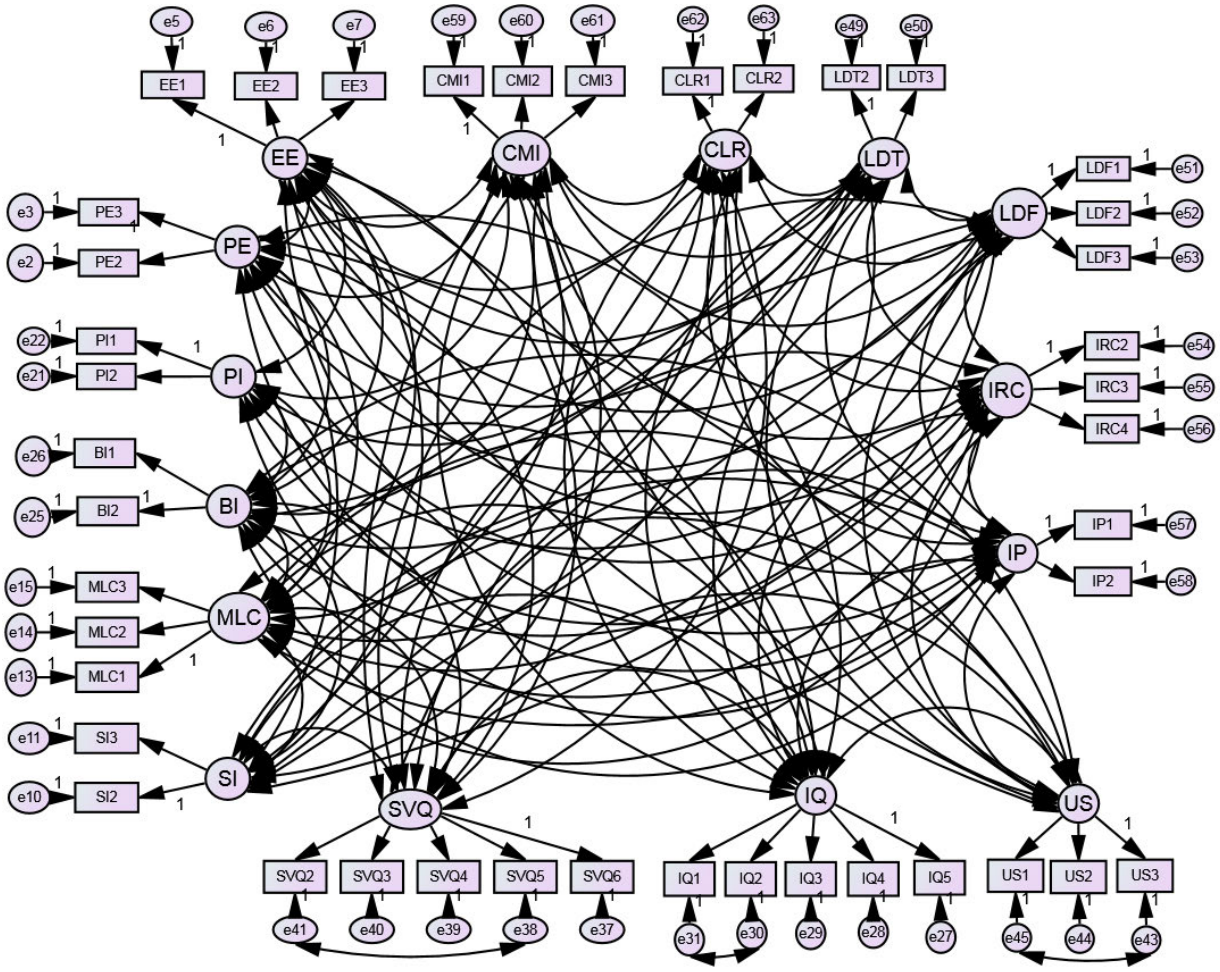


**Figure 7.3: Measurement model for the acceptance and success of m-learning in colleges of education**

The measurement model shown in figure 7.3 consists of different components including rectangular boxes, circle/ellipses, error terms, non-causal or non-directional relationships (correlations), causal relationships or directional relationships (single headed arrows). The rectangular boxes represent observed or measured variables. In this case, they

represent measured items (questions) that were specified in the measuring instrument. The components represented as circles/ellipses are latent or unobserved variables including exogenous or independent variables (IVs) and endogenous or dependent (DVs). These variables were measured through the variables in rectangular boxes as indicated by the path coefficients (single headed arrows that flow from the IVs/DVs to the measured variables). The circles/ellipses with numbers that are preceded by the letter 'e' are error terms or residuals. They represent omitted causes or errors on each measured variable. The double-headed arrows connecting two error terms represent the residuals' covariance. All unobserved variables are interrelated with each other using double-headed arrows called correlations.

**Table 7.7:** ***Final fit indices of the proposed measurement model***

| **Fit Index** | **Observed Value** |
|---|---|
| CMIN | 1094.109 |
| Df | 718 |
| CMIN/Df | 1.524 |
| GFI | .868 |
| IFI | .920 |
| TLI | .901 |
| CFI | .917 |
| RMSEA | .040 |

Table 7.7 indicates that with the exception of CFI which has a marginally acceptable index, all the other indices are within the prescribed thresholds (Hoe, 2008; Tabachnick & Fidell, 2007). On this basis, the measurement model is considered acceptable.

### 7.2.1.3 The structural model

Based on the acceptability of the measurement model, confirmatory factor analysis was applied to the structural model. Composite scores for each construct were calculated by averaging measured variables (questions) identified in the measurement model analysis. These were then used in the model to test with SEM. As can be seen in Figure 7.4, Mobile Learning Conditions (MLC) had two direct relationships – one relationship with Behavioural Intention (BI), and the second relationship with Actual Use of Mobile Learning (AUML).

An assessment of the structural model showed that the model has adequate or marginally acceptable fit. It was observed from the model that if the relationship between Personal Innovativeness (PI) and BI is removed, the relationships between MLC and BI as well as that between MLC and AUML become significant. Furthermore, if PI is completely

removed from the model, the model's fit improves negligibly. The action further lowers the variance in BI explained.

However, since dropping PI from the model did not result in any significant improvement, PI was retained in the model.

The structural model is presented in Figure 7.4.

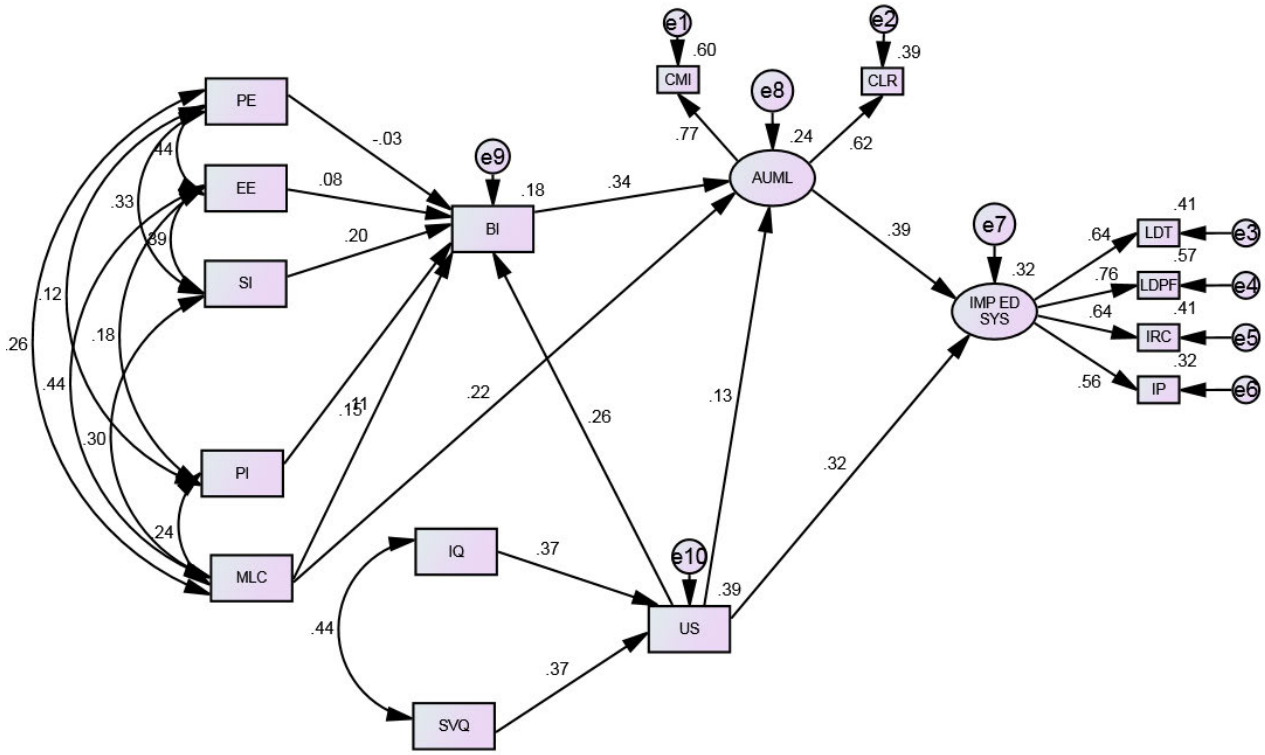


**Figure 7.4: Structural model for the acceptance and success of m-learning**

In the structural model, the rectangular boxes represent observable IVs and DVs, while the circles/ellipses represent latent variables.
Table 7.8 presents the overall fit indices of the model.

**Table 7.8:** ***Overall fit indices for the structural model***

| Fit Index | Observed Value |
|---|---|
| CMIN | 205.573 |
| Df | 66 |
| CMIN/Df | 3.115 |
| GFI | .922 |
| IFI | .884 |
| TLI | .836 |
| CFI | .881 |
| RMSEA | .081 |

Table 7.8 reveals that RMSEA has a mediocre or average fit (MacCallum, Widaman, Preacher, & Hong, 2001) while IFI, TLI, CFI have marginally acceptable or adequate fit indices. GFI on the one hand has an acceptable index. This suggests that the model is marginally acceptable or adequate.

In addition, although the indices shown in Table 7.8 may suggest that the model has marginal or mediocre fit, Schunn and Wallach (2005) caution that goodness-of-fit measures for a model should not be regarded as alpha-levels. They maintain (p.117) that "a model should not be thrown out simply because it does not exceed some arbitrarily defined threshold for goodness-of-fit". Rather, goodness-of-fit should be compared to previous ones in the domain. In other words, a relatively weak fit to the data can be acceptable in terms of newer models. Based on this argument, this structural model is considered acceptable since it is a new formulation, even though derived from three already validated theories. Further research should be carried out to improve the model.

The model indicates that behavioural intention (BI) is the main variable that is used to measure the acceptance of mobile learning. BI depends on five independent variables (PE, EE, SI, PI, and MLC). BI relates directly with two success measures – AUML and US, while MLC also relates directly to AUML. These relationships represent the operational interplay between the acceptance of mobile learning and its success. AUML is a latent variable, which is observed or manifests itself through two variables – Communication and Interaction (CMI), and Collaboration and Resource Sharing (CLR). The overall dependent variable that represents the net benefit of the study is Improved Educational System (IMP-ED_SYS). This variable is also a latent variable, which is observed or manifests itself through four other variables (LDT, LDF, IRC, and IP). The endogenous variable User Satisfaction (US) depends on two independent variables – Information Quality (IQ) and Service Quality (SVQ). US plays a mediating role between these two variables and the other three endogenous variables (BI, AUML, and IMP_ED_SYS). Table 7.9 presents the regression estimates from the model.

**Table 7.9:** ***Regression weights of the structural model***

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| US | <--- | IQ | .251 | .033 | 7.653 | *** | par_9 |
| US | <--- | SVQ | .250 | .033 | 7.563 | *** | par_10 |
| BI | <--- | EE | .060 | .046 | 1.293 | .196 | par_5 |
| BI | <--- | SI | .167 | .049 | 3.436 | *** | par_6 |
| BI | <--- | PI | .163 | .058 | 2.792 | .005 | par_7 |
| BI | <--- | MLC | .081 | .042 | 1.917 | .055 | par_23 |
| BI | <--- | US | .174 | .034 | 5.074 | *** | par_24 |
| BI | <--- | PE | -.026 | .054 | -.481 | .631 | par_26 |
| AUML | <--- | BI | .360 | .071 | 5.064 | *** | par_8 |
| AUML | <--- | MLC | .166 | .049 | 3.395 | *** | par_12 |
| AUML | <--- | US | .096 | .046 | 2.085 | .037 | par_27 |
| IMP_ED_SYS | <--- | AUML | .251 | .055 | 4.599 | *** | par_11 |
| IMP_ED_SYS | <--- | US | .148 | .029 | 5.017 | *** | par_25 |
| CMI | <--- | AUML | 1.000 | | | | |
| CLR | <--- | AUML | .564 | .083 | 6.793 | *** | par_1 |
| LDT | <--- | IMP_ED_SYS | 1.000 | | | | |
| LDF | <--- | IMP_ED_SYS | 1.461 | .154 | 9.497 | *** | par_2 |
| IRC | <--- | IMP_ED_SYS | 1.133 | .129 | 8.750 | *** | par_3 |
| IP | <--- | IMP_ED_SYS | .828 | .104 | 7.955 | *** | par_4 |

Figure 7.4 and Table 7.9 are used to address the various research questions as highlighted below.

### 7.2.1.4 Results and interpretation

This section presents the results of the analysis and interpretation of how the three sub-questions of the second research question of the study are addressed using output from the structural model.

***Joint influence of acceptance factors and user satisfaction on behavioural intention***

As can be seen from Table 7.9, MLC does not have a significant influence on behavioural intention to accept m-learning. The only acceptance measures or independent variables that significantly predict BI are SI (ESC = .167, p<.005) and PI (ESC=.163, p=.005). As already stated, the influence of MLC on BI becomes significant if the effect of PI is suppressed. The two independent variables have positive effects on the intention of stakeholders to accept mobile learning. This means that an increase in one standard deviation of SI will result in an increase of 16.7% in the value of the standard deviation of BI. Similarly, an increase of one standard deviation of PI will result in an increase of 16.3% in the value of the standard deviation of BI.

Furthermore, the study reveals that US has a significant influence on BI (ESC = .174, p<.005). This means that an increase in the value of the standard deviation of US will cause an increase of 17.4% in the value of standard deviation of BI. US has a stronger effect on BI as compared to the individual effects of SI and PI. This is an indication that

the user satisfaction is a driving force in the intention of stakeholders to accept mobile learning. The three predictors account for 18% of the variance in the intention of stakeholders in Colleges of Education in Nigeria to accept mobile learning using *Facebook.*

***Influences of mobile learning conditions, behavioural intention and user satisfaction on actual use of mobile learning***

Mobile learning conditions (MLC) significantly predict the actual use of mobile learning (AUML). This effect is positive (ESC =.166, p<.005). The implication of this result is that an increase in one standard deviation MLC will result in an increase of 16.6% in the value of the standard deviation of AUML. This result agrees with the results of Venkaesh *et al.* (2003) as well as Venkatesh *et al.* (2012). The results suggest that the actual use of mobile learning by stakeholders in Colleges of Education will depend on the mobile learning conditions.

Table 7.9 further shows that BI (ESC =.360, p<.005) significantly predicts AUML as did US (ESC = .096, p=.037). The effects of the two variables are positive, meaning that an increase in one standard deviation of BI will yield an increase in the actual use of mobile learning by 36.6% of the value of its standard deviation. Similarly, an increase in one standard deviation of US will result in an increase of 9.6% in the value of the standard deviation of AUML by stakeholders.

The implication is that BI has the greatest effect on the actual use of mobile learning. Thus, the more stakeholders develop an intention to use mobile learning, the more they actually use it. The two variables explain 24% of the variance in the actual use of mobile learning.

The conceptual model shows that user satisfaction is an endogenous or dependable variable, which has relationships with a number of factors including the actual use of mobile learning (AUML), information quality (IQ) and service quality (SVQ). To assess the influence of AUML on US, the relationship between the two variables was reversed. The results indicate that AUML does not significantly predict US. This is contrary to the finding of Delone and McLean (2003). In other words, the quantitative study indicates that the actual use of mobile learning was not a significant determinant of the satisfaction of stakeholders in Colleges of Education.

Rather, two exogenous (independent) variables – Information Quality (ESC = .251, p<.005) and Service Quality (ESC = .250, p<.005) significantly predict the satisfaction

of stakeholders in mobile learning. The two variables explained 39% of the variance in the satisfaction of stakeholders.

***Influences of actual use of mobile learning and user satisfaction in an improved educational system***

The study reveals that AUML (ECS = .251, p<.005) has a significant influence on IMP-ED_SYS, as did US (ESC =.148, p<.005). The influences of the two variables are positive. This means that an increase in one standard deviation of AUML results in an increase of 25.1% in the value of the standard deviation of IMP_ED_SYS. Similarly, an improvement of one standard deviation of US yields an improvement of 14.1% in the value of the standard deviation of IMP_ED_SYS. This shows that AUML has the strongest influence on IMP_ED_SYS. The two variables explain 32% of the variance in IMP_ED_SYS. This result may be suggesting that other factors exist that account for the remaining variance in IMP_ED_SYS.

***Feedback from the improved educational system on actual use of mobile learning and user satisfaction***

The feedback that results from the net benefits of mobile learning (IMP_ED_SYS) leading to satisfaction and actual use of mobile learning could not be ascertained with the quantitative data. However, it is expected that stakeholders in Colleges of Education will become satisfied due to the level of improvement that mobile learning brings to the current practices of teaching and learning in the institutions. In addition, improvement in the teaching and learning conditions in the colleges should result in the continuous use of mobile learning. This position is verified in the qualitative strand of the study.

### 7.2.2 Qualitative data analysis and results

As already stated, the aim of the qualitative component is to provide a richer and complete understanding of the extent to which mobile learning addresses the challenges of teaching and learning in Colleges of Education. In line with this aim, interview excerpts are explored to generate themes that align with measured constructs in the framework, and to ascertain the interplay among the various endogenous variables. This was used either to substantiate or to refute the findings of the quantitative analysis as the case may be.

First, the acceptance factors are considered, thereafter the success factors followed.

#### 7.2.2.1. Influences of acceptance factors and user satisfaction on behavioural intention

***Performance expectancy***

A few comments from the data seem to align with performance expectancy and the role that it plays on the intention of stakeholders to accept mobile learning. Some instances include the following:

> *It is a very useful discovery for research and administering of assignments to students (LECT 2.12).*
>
> *It is awesome to me because not only in this college but as [an] electronic music student, most times I interact with friends who study abroad, they usually send to me some interactive videos and tutorials which do help me (STUD 2.3).*
>
> *It is so interesting and useful particularly to my academic work because I learn so much from other people's weaknesses or mistakes and from the strengths of others (Student 2.4).*

It can be inferred that the participants see mobile learning as a way that assist them to perform their jobs more efficiently – in the case of students, they are able to learn more easily; in the case of lecturers, they are able to facilitate the course better. This implies that their intention to use it may be positive. Thus in contrast to the quantitative component, Performance Expectancy may be an influential factor in the acceptance of mobile learning by stake-holders in Colleges of Education in Nigeria.

***Effort expectancy***

A number of comments from participants were also found to portray 'effort expectancy' as having some influence on the intention to accept mobile learning in Colleges of Education. For example:

> *I will prefer to use my mobile phone because the mobile is [a bit] simple to operate and easy to carry (STUD 2.1).*
>
> *In fact, I enjoyed using it for learning (STUD 2.2).*
>
> *It was easy for most students and lecturers to [get along] (STUD 2.10).*

From the comments, it is apparent that participants especially students may prefer the use of mobile phones to learn from because they find them portable, easy to operate, and more enjoyable. Another student commented in support of the ease of use of mobile learning:

> *It was easy for most students and lecturers to get along with it (STUD 2.4).*

The foregoing again suggests, in contrast to the quantitative component, that effort expectancy has some influence on the acceptance of mobile learning in Colleges of Education.

***Mobile learning conditions***

There are some indications from the qualitative data that available conditions are supportive of mobile learning. This is inferred from the comments below.

> *The battery power of the mobile phone can last longer than the laptop (STUD 2.1).*
>
> *The good thing is that you don't need a very expensive phone to be able to access Facebook (STUD 2.10).*

The use of *Facebook* as the mobile learning platform seems to be a major attraction that promotes the use of mobile learning in Colleges of Education. This may be in view of its availability and simplicity as has already been highlighted in the literature. In addition, the battery power of mobile devices is an important consideration in Nigeria based on the power situation in the country. In support of this position, one of the lecturers stated:

> *At night, you cannot have the luxury of electricity at the time that you need it, but to some extent, your mobile phone will be active (LECT 2.11).*

It can be inferred from this statement that the poor power supply, which of course is a big challenge in Nigeria, will not be much of a limitation to mobile learning as compared to conventional e-learning that uses personal computers and requires a more stable power supply. Likewise, it can be inferred from the second comment that most of the available mobile devices are compatible with *Facebook*, the learning platform considered in this study. This manifestation suggests again in contrast to the quantitative component that mobile learning conditions influence the intention of stakeholders to accept mobile learning.

***User satisfaction***

User satisfaction is indicated by the use of words such as *enjoy, interesting, sweet, like*, and *good*. Other indicators that this study associates with user satisfaction are phrases such as *welcome development*, and *good idea*.

Therefore, judging from some of the comments that participants made, their level of satisfaction on mobile learning may be signifying their intention to accept its use. For example, one lecturer indicated that:

> *From the experience that I had with my students, it was very interesting. There was much enthusiasm. It was clear that they really liked it (LECT 2.11).*

In like manner, another lecturer stated:

> *The students were enthusiastic about the whole thing (LECT 2.13).*

Apparently, these two lecturers reveal that the students and lecturers are happy or satisfied with mobile learning; therefore, they may be interested in using it.

Another comment, which seems to indicate the satisfaction of participants, is reflected below:

> *I have come to understand that to a certain extent, it brought out some of my students from the dark (LECT 2.14).*

Indirectly, the lecturer is happy with mobile learning because it has exposed his students to something new – perhaps an improved form of learning or the feasibility of using social networking sites to support teaching and learning rather than mere socializing with friends.

Confirming the views of the lecturers, some of the students assert:

> *It was my first encounter really, because we have never used this technology, so it was fun (STUD 2.9).*
>
> *I like it and I love it (STUD 2.1).*

Some other students expressed their satisfaction with mobile learning using the following statements:

> *It is fun (STUD 2.5).*

*It is a good and welcome idea (STUD 2.7).*

From another perspective, participants were also happy and satisfied with the mobile learning platform. Some comments that convey this impression include the following:

> *In fact, using Facebook for learning keeps me alive, I learn with lots of excitement (STUD 2.4).*
>
> *The good thing is that you don't need a very expensive phone to be able to access Facebook. I think, Facebook is very appropriate, I am happy with that (STUD 2.10).*

The comments appear to indicate that stakeholders in Colleges of Education are happy with mobile learning, hence they may be interested in using it.

However, a few participants were not completely satisfied with mobile learning. They had mixed feelings. Some notable comments in this regard include the following:

> *Though it was tasking to some extent, it was equally sweet (LECT 2.12)*
>
> *My experience with mobile learning has been sometimes fun and sometimes hectic (STUD 2.1).*

While the lecturer cited the need to stay online more regularly as the reason for his reservation, the statement of the student may not be unconnected with the occasional instability of the mobile networks.

#### 7.2.2.2 Interplay between user satisfaction, exogenous variables and actual use of mobile learning

Based on the level of satisfaction expressed by participants, an attempt is made to see the interplay between this variable, its exogenous variables and the actual use of mobile learning. These relationships are explored by considering the reasons participants attribute to their satisfaction with mobile learning. The reasons are regarded as indications of the factors that influence the satisfaction of users. These reasons are presented and discussed under the relevant sub-themes, starting with the relationship between user satisfaction and its exogenous variables – service quality and information quality.

***Service quality***

Some participants attribute their happiness with mobile learning to the quality of service provided by the technology. The following comments seem to provide this impression:

> *It makes my learning mobile. With my phone in the pocket, I can use it anywhere and anytime that I have difficulty. For example, I need some information that I cannot find around here, must I go to the national library to find it? No, that will be too far. In addition, the cost of transportation will be much (STUD 2.4).*
>
> *It is fast, motivating, and very interesting (STUD 2.9).*
>
> *It is a very welcome technology because of the flexibility in dissemination of information and learning (LECT 2.13).*

It can be inferred from the comments above that participants are satisfied with mobile learning in view of the quality of service that it provides. This includes the speed with which mobile learning can provide access to information, its flexibility, portability and its ability to be used for learning at any location that has reception and at any time. These comments adequately support the quantitative component, which had revealed that the quality of service provided by mobile learning significantly influences the satisfaction of stakeholders in Colleges of Education.

***Information quality***

It would appear that the quality of information received is also significant in influencing user satisfaction. Some comments, which portray this position, are listed below:

> *The use of mobile learning helps to get everything we [at] need at our own disposal (STUD 2.4).*
>
> *I must say that I am quite impressed by mobile learning because it gives me a number of alternative [sources of] information to choose from (STUD 2.6).*
>
> *The lecturers also share valuable materials [to] (with) the group so easily (STUD 2.9).*

The foregoing suggests that the ability of mobile learning to make a variety of information available at any time may be responsible for the satisfaction of stakeholders using mobile learning. This may further explain why information quality significantly predicts user satisfaction as determined in the quantitative component of the study.

***Actual use of mobile learning***

The use of an information system is expected to result in some form of satisfaction (Delone & McLean, 2003). As depicted in the conceptual framework (Figure 4.4),

communication and interaction (CMI) as well as collaboration and resource sharing (CLR) are two important indicators of the use of mobile learning using *Facebook*. This section deals with comments, which directly or indirectly link the satisfaction of participants to the actual use of mobile learning. The following comments appear to positively link their satisfaction to their use of mobile learning:

> *It is fun because I share many things such [as] ideas with friends whenever I am using mobile learning. With it, I can collaborate with friends not only in this college but all over the world (STUD 2.1).*
>
> *It is awesome to me because not only in this college but as [an] electronic music student, most times I interact with friends who study abroad, they usually send to me some interactive videos and tutorials which do help me (STUD 2.3).*
>
> *Mobile learning has honestly helped greatly, for example, when I am given an assignment, I go to the internet and make some research (STUD 2.5).*
>
> *It is exciting to see lecturers and students discussing relevant educational topics without physical contacts. We could exchange ideas and information in a relaxed atmosphere and everything was ok (LECT 2.13).*
>
> *I find it very interesting because it gives the students a better room for participation in various discussions or learning exercises instead of the film watching, calls or chats that they usually do (LECT 2.14).*

It is clear from the comments listed above that participants are happy because they are able to use mobile devices for various learning activities such as interacting, collaborating, and sharing resources and knowledge with friends and lecturers. In this case, while lecturers are pleased that they used mobile devices to teach, students were excited that they could acquire knowledge from their teachers and other sources using mobile devices. In other words, their satisfaction (happiness, joy or excitement) is rooted in their achievement with mobile learning, as indicated particularly by their ability to communicate, interact, collaborate and share learning resources which was hitherto difficult. Although the quantitative data did not find a significant relationship in this direction, these comments clearly indicate that the actual use of mobile learning, to some extent may have influenced user satisfaction.

#### 7.2.2.3 Net benefits (Improved educational system) and determinants

The actual use of a system and its level of satisfaction to the users result in some overall benefits to the immediate user, organization or nation (Delone & McLean, 2003). In other words, the net benefits of a system depend on its use and the satisfaction of the users. A number of comments from the qualitative data seem to attest to this assertion. One

dimension of these benefits is less demand on physical facilities. The physical facilities include classrooms and other learning materials such as books. The following comments seem to support this:

> *Mobile learning with Facebook provides less physical interaction with the learner (STUD 2.1).*
>
> *I find teaching and learning so easy amidst the prevailing challenges of inadequate classrooms, materials and so on (LECT 2.13).*

The comments suggest that mobile learning reduces the level of physical interactions between students and lecturers, leading to a reduction in the dependence on physical facilities such as classrooms and other learning materials. This also places lesser pressure and demand on teachers as captured in the following comments.

> *Mobile learning provides an opportunity for learning not only from your teacher or local friends, but also provides assorted ideas and cross fertilization which results in a richer knowledge base (STUD 2.1).*
>
> *The use of mobile devices and Facebook helps teaching and learning to take place without necessarily presenting yourself in a classroom and that reduces stress on the part of teachers and the learners as well (LECT 2.14).*

The comments above may also imply that mobile learning widens the scope of teaching and learning thereby increasing access to learning and productivity. The technology also increases the participation of students in various learning activities. In further support of this view, another lecturer commented:

> *Even the ones that don't talk in class were responding seriously online. I could see that there was much affinity to it (LECT 2.11).*

Another dimension to the benefits of the actual use of mobile learning and satisfaction is the cultivation and promotion of good reading and research skills by students. Some comments that follow this line of reasoning include the following:

> *The use of social networking site such as Facebook is very useful because it made many people to learn by force as they will not want to be disgraced by friends for lack of knowledge (STUD 2.2).*
>
> *I get valuable information even before others get it (STUD 2.4).*
>
> *It encourages students to read, synthesize and develop good research skills (LECT 2.12).*

The overall implication is an improvement in the performance of students. This is clearly reflected in the following statements:

> *Sharing ideas with different people improved my knowledge a great deal (STUD 2.4).*
>
> *It has greatly improved my learning abilities. We were sharing ideas as if we were in a group discussion and on that particular course, the results were great (STUD 2.5).*

The improved educational experience is in line with the quantitative data analysis – that is, the use of mobile learning and the satisfaction of stakeholders may result in significant benefits – that of improving the teaching and learning conditions in Colleges of Education. These results corroborate the ideas of Ayodele and Oyewole (2012) who suggested that allowing students to collaborate, interact and network results in some kind of pleasure, which is capable of increasing their learning abilities. Therefore, it is likely that the full implementation of mobile learning in Colleges of Education in Nigeria will be a huge success.

#### 7.2.2.4 Feedback from benefits of implementing mobile learning

The feedback emanating from the benefits of implementing mobile learning in colleges had two dimensions – negative and positive. The negative views are mostly concerns and challenges that participants associate with the technology, while the positive ones represent some elements of satisfaction and counter reactions, which signal the likely continuous use of mobile learning in Colleges of Education.

***Concerns and challenges***

Although participants in Colleges of Education in Nigeria are happy and have significantly acknowledged the positive impact of mobile learning on the educational system, there are a number of issues, which they feel, may water down the success of mobile learning in Colleges of Education in Nigeria if they are not adequately addressed. Most of the comments concern the negative use of the technology. Some instances of these comments are presented.

> *Sometimes, in the process of chatting, it can influence people negatively (STUD 2.4).*
>
> *The use of mobile devices sometimes can be distractive (STUD 2.5).*

*The platform that would be used for studies should be separated from those that are meant for entertainment, otherwise, many people may be messing up or distracted (STUD 2.6).*

*Some of us instead of taking advantage of it to actually use it for learning, we go off track to maybe do some things that are not educationally related (STUD 2.7).*

Most of the concerns are associated with the use of social networking sites as the learning platform, some of which had been highlighted in the literature earlier. An observation that was made by the researcher may be in keeping with some of the comments listed above, specifically STUD 2.6 and STUD 2.7. The words of the researcher are:

*A number of the students normally deviate to non-relevant matters whenever they are left unengaged by the lecturer.*

Other comments, which may be regarded as challenges, have to do with the quality of the mobile network and the non-possession of mobile devices by some of the students. Some example of such comments include the following:

*It is not everyone that has a good phone even though we are supposed to have it (STUD 2.9).*

*Some of the challenges that I encountered were mostly internet or network related, which is generally a big challenge in this college. It can be frustrating really, because sometimes it takes very long to get a task done on the internet (LECT 2.11).*

*One of the challenges that I encountered is with some of the students. They have accounts on Facebook but they do not have the mobile device to access it (LECT 2.12).*

Some of the participants see these challenges as a threat to mobile learning while others feel that they are just temporary.

***Positive opinions***

Despite the concerns and challenges, most participants still indicated some faith in mobile learning using SNS. For example:

*It is wonderful (STUD 2.4).*

*Mobile learning should be encouraged because it aided the learning of new skills and knowledge through sharing of relevant educational materials with friends and lecturer (STUD 2.8).*

*When you chat with friends, you may get to have an idea of what is happening around them, in school or somewhere else, which to me are all part of learning (STUD 2.10).*

The foregoing suggests that participants may be anxiously waiting for the full implementation of mobile learning in Colleges of Education because they feel it is wonderful and encouraging. It just makes things work for them. Some of the participants also reacted to the concerns that have been raised by others about the negative use of mobile learning. Apparently referring to the fear on the negative tendencies of SNS, one interviewee said:

> *We must use it because that is where we can get everyone (STUD 2.6).*

Other similar comments are listed below:

> *No matter the situation, if you want to do bad things, you will do bad things and if you want to do good, you will do good. Therefore, if you want to use social networks for negative things, that you will do but if you want to use them for positive things such as learning; that is also possible (STUD 2.5).*
>
> *Though it may encourage some negative activities but to me, that should not be a disadvantage of the systems because whatsoever that you are putting yourself into will depend on your mind-set. If someone has made up his mind to do a negative thing, he will do it whether a social networking site is being used for learning or not. (STUD 2.9).*
>
> *I think it is a positive step because if we do not utilize it for positive things, then people will use them for negative things. If we use it, it will be good because it will therefore mean that those who would like to use it for negative things also have some positives things to use it for. Things that can guarantee their future (LECT 2.11).*

The argument of these participants is that negative use of mobile learning does not rest on the technology, but rather on the mind-set of the user. This implies that participants are happy and comfortable with mobile learning in view of the benefits that it offers, but not based on how others choose to use it. The participants insist that the only way to stop the negative use of something is to introduce the positive use of it. As such, participants are convinced that the educational use of SNS would rather help in redirecting the focus of students.

Regarding an alternative mobile learning platform, some of the participants had the following to say:

> *A social networking site such as Facebook is good because not only that many people are already using it, it also provides better facilities for collaboration with people across the world (STUD 2.1).*

*Skype would have been another, but it requires more bandwidth in addition to the fact that it requires real time connectivity. Therefore, the best bird for now is a social networking site (LECT 2.11).*

*I think this is appropriate because you have an opportunity to meet a group of people who are already using the technology, so you do not need much or any training for them. There are other social networking applications that could be used, but to me they are not as good as Facebook. Not only that Facebook is very common, it has features that enable you to create groups and discuss with your students as if you are in a traditional class (LECT 2.12).*

*It is very appropriate. There is nothing that human use that others cannot introduce a negative dimension to it. Therefore, the fact that students can use it negatively does not nullify or reduce the potentials of social networking. WhatsApp too can be an alternative, because to me, that one is more readily available than Facebook and many of the students are more at home with WhatsApp than Facebook (LECT 2.13).*

For most part, the argument in support of the use of a social networking site as the mobile learning platform has been overwhelming. The other side of the argument is the concern for the appropriate SNS to use. While a few of the participants suggest the use of Skype and perhaps WhatsApp, the majority go with *Facebook*. It is not surprising that *Facebook* is the most popular and the most used SNS (Buzzetto-More, 2012; Mazman & Usluel, 2010) as was determined in the preliminary stage of the study. The findings may also be consistent with the literature, which indicated that students are more comfortable with the use of social networking sites for learning as compared to conventional learning platforms (Buzzetto-More, 2012; Shembilu, 2013).

## 7.3 Summary

The study revealed that the use of mobile learning using a social networking application such as *Facebook* may have strong support in Colleges of Education in Nigeria in view of the derived benefits. The quantitative component of the study indicate that the intention of stakeholders will depend significantly on the influence of important others, personal innovativeness and level of satisfaction of users with the technology. In addition, the actual use of mobile learning largely depends on the mobile learning conditions, behavioural intention and user satisfaction. The study further indicated that the actual use of mobile learning and the level of satisfaction of the users results in an improved educational system. This is reflected in less demand on facilities such as classrooms and books, improved reading culture, and improved performance of students.

Some of these findings are fully supported by the qualitative study. Additionally, while there seems to be no comments from qualitative data that relate to personal innovativeness and social influence, other themes such as performance expectancy, effort expectancy, and mobile learning conditions emerged. This indicates that performance expectancy, effort expectancy and mobile learning conditions also account for the intention to use mobile learning in Colleges of Education.

The qualitative study also supports the findings of the quantitative study to the effect that user satisfaction may have some influence on behavioural intention. Furthermore, contrary to the finding from the quantitative component of the study, the qualitative data shows that the actual use of mobile learning may have some influence on user satisfaction. The forgoing confirms the acceptability and success of mobile learning in Colleges of Education. Discussion on the findings, which climaxed in the mobile learning implementation framework is presented in the next chapter.

# CHAPTER EIGHT
# DISCUSSION OF FINDINGS

This chapter discusses two sets of findings which emanated from the study. The first set of findings came from the preliminary investigation while the second set emanated from the second stage or implementation stage. The two sets of findings are incorporated such that the conceptual framework, together with the researcher's solution plan are adjusted to yield the mobile learning implementation model as presented in figure 8.1. These two sets of findings are discussed in the sections that follow.

## 8.1 Findings from the preliminary study

The preliminary stage of the study ascertained the perceptions or possible factors that can affect the intention to use mobile learning in Colleges of Education. Findings from this stage of the study were presented in two dimensions in line with the two sub-questions. The first dimension relates to the usage of mobile devices by stakeholders while the second concerns the perceptions or factors that could affect the use of mobile learning. The two dimensions of findings are presented below.

### 8.1.1 Usage of mobile learning

Two indicators determined the usage of mobile devices by stakeholders – the length of time stakeholders have used mobile devices (experience), and the services that stakeholders use mobile devices to access. Findings made are as follows:

***Length of time (experience) in use of mobile devices***

On the length of time, the result showed that the length of time that participants have used mobile devices increased with the age of the participants. In other words, the more senior people such as the management and lecturers have used mobile devices for longer than students. This was obvious since the more elderly people have lived longer. However, what appeared to be of more interest to the study in this case was the indication from the results that almost 92.5% of the students have used a mobile device for a period of at least one year. The same finding applied to the lecturers. This finding was considered crucial to the study because it indirectly showed that the majority of the key stakeholders who are the students and lecturers might have access to mobile devices and some experience

in using them. This may have led to the more positive perceptions of mobile learning by the stakeholders.

***Service used by stakeholders***

The study revealed that the services that participants used their mobile devices to access include regular services, and social networking and its related applications. Two of the regular services which participants indicated that they mostly use were obviously, voice and SMS/MMS services. The third regular service which was found to be mostly used by participants is the browsing of educational materials. Again, this finding further provided a positive indication towards the viability of mobile learning in Colleges of Education. Indirectly, the finding revealed that the use of mobile learning may not be entirely new to stakeholders. Therefore, they could be ready to expand the scope of usage to accommodate the formal teaching and learning process.

As already mention, the study revealed that majority of the stakeholders use at least one social networking and related applications such as *Facebook, Twitter, Skype, LinkedIn,* or any other. *Facebook* was found to be the most used social networking site. This result signified that *Facebook* was more popular. This finding is consistent with the literature (Alsereihy & Al Youbi, 2014; Buzzetto-More, 2012; Mazman & Usluel, 2010). The popularity of *Facebook* may be due to its compatibility with most mobile devices including the very simple mobile phones. Perhaps the interactive nature and other services that *Facebook* offers as compared to the other applications may as well be a contributory factor. As revealed in the literature (Okoh & Lucky, 2014; Sánchez *et al.*, 2014), the prevalence of the *Facebook* application in Colleges of Education suggested that social networking sites especially *Facebook* may as well be used to support or facilitate teaching and learning in the institutions. The findings made up to this point necessitated some further verification. This was achieved by addressing the second sub-question of the first research question. The findings made are discussed in the next section.

### 8.1.2 Perceptions or possible factors that may affect the intention to use mobile learning

Based on findings that emanated from the first sub-question as discussed previously, a further investigation was carried out in two directions – perceptions or possible factors that may affect the use of mobile learning on one hand and the use of social networking sites on the other hand. As explained in chapter six, the perceptions or possible factors

that may affect the intention to use mobile learning were ascertained using a mixed methods research approach, while the social networking aspect was investigated using only the qualitative approach. The reason for not using the two approaches on the social networking aspect is that the use of mobile learning constitutes the main study while the use of social networking sites is an addendum or supplement. For the reason that a holistic quantitative analysis of the acceptance factors is presented in the second stage of the study, only the findings from the qualitative components were reported on in this thesis. In addition, a major aspect of the findings from the quantitative component had already been published in a journal.

The analysis of extracts from the qualitative data revealed that stakeholders were positive to a large extent regarding the use of mobile learning as well as for social networking sites. This development signified their intention to use the technology. Themes which emerged from the data as shown in Table 8.1 represent the possible factors that were inferred to have some influence on the use of mobile learning and social networking sites as generated from Nvivo.

**Table 8.1:** ***Distribution of comments on each factor across the various groups of participants***

| Theme | A : Students | | B : Lecturers | | C : Management | | D : Researcher | E:Total | |
|---|---|---|---|---|---|---|---|---|---|
| | ML | SNS | ML | SNS | ML | SNS | ML | ML | SNS |
| 1 : Performance expectancy | 10 | 12 | 11 | 6 | 6 | 6 | 0 | 27 | 24 |
| 2 : Effort expectancy | 4 | 5 | 0 | 4 | 1 | 3 | 0 | 5 | 12 |
| 3 : Social influence | 4 | 0 | 2 | 1 | 4 | 3 | 0 | 10 | 4 |
| 4 : Mobile learning conditions | 10 | 2 | 3 | 3 | 6 | 3 | 4 | 23 | 8 |
| 5 : Personal innovativeness | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 2 | 1 |
| 6 : Anxiety | 3 | 0 | 5 | 0 | 6 | 0 | 0 | 14 | 0 |

**KEY:** ML= mobile learning, SNS = social networking sites

The table shows a summary of results from the qualitative data analysis across the different groups of participants based on the number of comments that align to each theme or factor as extracted from the data. Classical content analysis is used to interpret and discuss the results of qualitative analysis. Classical content analysis counts codes or comments so as to provide an understanding of concepts that are discussed predominantly by participants (Leech & Onwuegbuzie, 2011). Below is a further discussion on each theme.

***Performance expectancy***

The summary of results showed that a higher number of the comments that were extracted from the data regarding the use of mobile learning as well as social networking sites were related to performance expectancy or the usefulness of the technologies to the teaching and learning. The same scenario was found in the groups except the management's group. In other words, performance expectancy was not the leading factor in the management's group in terms of the number of comments, as it was in the students and lecturer's groups. The reason for the difference could be that management staff members are not directly involved in the teaching and learning process as are the students and lecturers. Therefore, it may not be out of place for students and lecturers to perceive more than management staff that mobile learning may be useful in teaching and learning.

As the literature had indicated, the inability of learning infrastructure such as classrooms, books, and other valuable instructional materials in coping with the growing needs of teaching and learning in Colleges of Education may account for the high performance expectancy. These inadequacies might have made the traditional teaching and learning environment very inconvenient and unattractive as they hamper effective teaching and learning. In addition, the majority of the students come from families with poor backgrounds and income. Thus, the high cost of print materials such as handouts, which lecturers impose on them is a challenge to them. Furthermore, most Colleges of Education are not able to buy computers and maintain an Internet subscription which would have provided alternative sources of learning materials. More worrisome, the level of insecurity in Nigeria might have rendered education more inaccessible to the citizenry via the traditional means as the literature has indicated.

Considering all the above, it is natural that stakeholders, especially students, should be more interested in how useful or helpful mobile learning can be in addressing the challenges that they are encountering. Therefore, this result is simply an indication that stakeholders in Colleges of Education in Nigeria, especially students and lecturers, may be willing to adopt mobile learning and social networking sites not just for fun but to a large extent in view of their optimism that the technologies will go a long way in minimizing the high dependence on traditional infrastructure. Students further believe that instead of having to travel physically to discuss issues with colleagues or lecturers, vital information can simply be passed on using a social networking site such as *Facebook.*

These particular findings support the findings of some quantitative studies in the literature (Adedoja *et al.*, 2013; Mtebe & Raisamo, 2014; Thomas *et al.*, 2013). The findings also support the already published quantitative component of the study (Chaka & Govender, 2017), only to the extent that performance expectancy is a predictor of behavioural intention, but not the leading predictor.

***Effort expectancy***

As can be seen in Table 8.1, the preliminary investigation indicated that effort expectancy may be a possible factor that can affect the use of mobile learning in Colleges of Education. Students were found to be talking more about the ease of using mobile learning as well as social networking sites than the other two groups. This finding suggested that students find the use of mobile learning and social networking sites easier than the other two groups. The reason behind this result may be that students spend more time online using their mobiles than lecturers and management (Buzzetto-More, 2012). This makes them more familiar with the use of the technology. In addition, students are more affected by the challenges of the traditional learning environment. They stand for long hours to receive lectures because classroom facilities are not able to accommodate the huge numbers of students (CNANPU, 2012; Jaja, 2013; Okojie, 2013). Therefore, they perceived that the use of mobile learning and social networking sites may really serve as a relief to most of them. Some of the learning activities can be communicated to them via mobile learning, which makes it more convenient. Furthermore, participants believe that instead of having to travel physically to discuss issues with colleagues or lecturers, vital information can simply be passed on using a social networking site such as *Facebook*. No doubt, this finding is a positive development because if the learners, who are key in the education enterprise, find the technology easy, it implies that they may enjoy it. Therefore they may be willing to use it because enjoyment is an intrinsic motivation (Venkatesh *et al.*, 2003). The finding is likewise supported by the same studies that have been listed under performance expectancy as well as the quantitative component of the study.

***Social influence***

Social influence is also highlighted as a possible factor that may account for the intention of stakeholders to use mobile learning and social networking sites. In terms of mobile learning, the study revealed that social influence may be experienced more in the students and management groups than the lecturer's group. This finding may be because the two groups are at two extremes – students are highly flexible while management is

conservative. Students are exposed to many different kinds of influence. For example, apart from the fact that they are easily influenced by their peers or friends, respect for elders and those in higher positions is a key component of the Nigerian culture. This means that students may base some of their decisions largely on their lecturer's attitudes and institutions' authority. Management on the other hand are highly conservative with a high level of anxiety when it comes to technology, thus they need to be thoroughly convinced about something before they can make a decision or venture into it. While this finding is supported by a number of studies in the literature as already listed, it is not supported by the findings of the quantitative component of the preliminary study. However, this reasoning appears to be contradicted by the absence of comments in the students' group regarding the use of social networking sites. A possible explanation is that most students might have already become familiar with the use of social networking sites, thus they require little or no influence to adopt them. The non-effect of social influence on the intention of use social networking sites might be setting the study apart from Sánchez *et al*. (2014).

***Mobile learning conditions***

It will be recalled that the theme or factor 'mobile learning conditions' indicated the extent to which stakeholders feel that conditions are available to support mobile learning in Colleges of Education. Table 8.1 shows that the theme 'mobile learning conditions' has the next highest number of comments after performance expectancy, which is an indication that mobile learning conditions is the second prevalent theme or factor that may affect the intention of stakeholders to use mobile learning. As indicated in the analysis, most of the comments on this theme relate to the availability and affordability of mobile devices. It is common knowledge that no matter the efficiency of a technology, affordability plays a vital role in its adoption to a large extent. This is more so because the Nigerian economy has not been doing well in recent years. The cost of living seems to have gone beyond the capacity of the average man to afford. Therefore, the affordability of mobile devices may have given mobile learning an upper hand over other technologies.

The factor may likewise have some influence on the intention to use social networking sites as can be seen from Table 8.1. Again, since students in higher education institutions are more familiar with the use of mobile devices (Isiaka *et al.*, 2011), it is obvious that they should understand more regarding the adequacy or otherwise of the mobile learning

conditions in the environment than the other group of participants. Therefore, they seem to talk more on the theme. The finding is in line with most of the studies that were reviewed in the literature as well as the quantitative component of the preliminary study.

Although, the theme 'mobile learning conditions' represents the feelings of participants regarding the availability of supporting conditions, not all the comments extracted were positive in terms of available conditions for mobile learning. One of the major concerns of participants is that the instability in the mobile network might hamper the smooth use of the technology. While this concern is genuine, this challenge may seem to be temporary in view of the effort that is being made by most of the mobile network service providers to connect major cities using fibre optic cables.

***Personal innovativeness***

As can be seen from Table 8.1, a few comments relating to personal innovativeness emerged from the qualitative data. Although the comments specifically came from the management's group, they were based on the attitude of students, who are ever willing to stay online for a long time using their mobile devices to chat. Nevertheless, the result provided an indication that personal innovativeness is a possible factor that can affect the intention of stakeholders in Colleges of Education to use mobile learning and social networking sites. The zeal of students to stay online is an important attribute because it might serve as the driving force behind their intention to use the technology. It should be noted that the factor 'personal innovativeness' was not included in the quantitative component of the preliminary study. This is because the preliminary investigation did not consider this factor from the outset. The investigation was based on the four constructs of UTAUT. The theme or factor only emerged from the qualitative data analysis. However, the emergence of this theme aligned the study with another important study in the literature (Abu-Al-Aish & Love, 2013).

***Anxiety***

Anxiety is another factor that was not included in the quantitative component of the preliminary study for the same reason that only the constructs theorized as direct determinants of intention in the UTAUT model were used. Like 'personal innovativeness', 'anxiety' emerged from the qualitative data. Table 8.1 revealed that this factor is more prevalent in the lecturers and management groups than in students. This suggests that lecturers and management seem to be more apprehensive about mobile learning than students. The fears of most of the lecturers and management are based on

issues such as low computer literacy, negative influence of the technologies on students, and perhaps the thinking that the technology might result in students' disrespect for constituted authority. Some of the fears particularly the negative influence of the technologies on students may not be out place as they have been expressed even in the literature (Ahn, 2011). In the Nigerian situation, an incident that occurred where a student of a particular higher education institution was lured away and later murdered by an unknown friend that she made on *Facebook* might still be fresh in the minds of stakeholders.

The implication is that lecturers and management may be more uncertain in terms of their intention to use mobile learning and social networking sites. However, Selwyn (2012) claims that the advantages of the technologies outweighs the disadvantages.

Overall, the preliminary study showed that the intention of stakeholders in Colleges of Education in Nigeria may be affected by factors such as performance expectancy, effort expectancy, social influence, mobile learning conditions, personal innovativeness, and anxiety. Students' intention may be influenced more by performance expectancy and mobile learning conditions; intention of lecturers may be influenced more by performance expectancy and anxiety; and management's intention may be influenced more by anxiety, performance expectancy and mobile learning conditions.

Although both anxiety and self-efficacy which is similar to personal innovativeness were theorized as non-direct determinants of intention in the UTAUT model, they may be effective in this study in view of the context of the study and in light of the issue of affordability (Thomas *et al.*, 2013; Traxler, 2007).

The preliminary study further revealed that the intention of stakeholders to use social networking sites may be influenced by factors such as performance expectancy, effort expectancy, social influence, mobile learning conditions, and personal innovativeness. As in the case of mobile learning, performance expectancy seemed to be the most influential theme in the use of social networking sites to facilitate teaching and learning in Colleges of Education. The results may be signifying that participants consider the usefulness of the technologies to their job as a top priority. In other words participants may be more willing to accept to use mobile learning as well as social networking sites in view of the perceived usefulness of the technology to their responsibilities, which is teaching and learning. However, since participants were yet to use the technology at this stage, the

success of the technologies could only be ascertained when participants had used them. Thus, the findings of the preliminary investigation served as impetus for the second stage of the study which tested the effectiveness of mobile learning using *Facebook* through the integration of acceptance and success factors. Findings from the second stage are discussed in the next section.

## 8.2 Findings from the implementation stage

The implementation stage is the main stage of the study. This stage investigated how the acceptance factors and success factors work together towards the effective implementation of mobile learning in Colleges of Education. The objective was achieved by following a convergent parallel mixed-methods research design. Findings that were made based on the three sub-questions that were addressed in this stage of the study are discussed below.

### 8.2.1 Joint influence of acceptance factors and user satisfaction of behavioural intention

In contrast with the conceptual framework of the study, the quantitative component of the study revealed that performance expectancy, effort expectancy, and mobile learning conditions do not have a significant effect on behavioural intention to use mobile learning using *Facebook*. Only social influence and personal innovativeness significantly affect the behavioural intention of stakeholders.

It may not be adequate to compare the result of this study with studies that were reviewed in the literature since the conceptual framework and the scale used in the study are variants of those used in the other studies. Therefore, the results are only discussed with reference to findings of the related literature. This result agrees with Venkatesh *et al.*, (2003) who hypothesized that facilitating conditions (MLC in this case) are non-direct determinants of behavioural intention. It is important to note that this result only agrees with Venkatesh *et al.*, (2003) in this respect, when 'personal innovativeness' is present in the model. Otherwise, the study aligns with the preliminary investigation and other studies (Jairak et al., 2009; Thomas *et al.*, 2013; Venkatesh *et al.*, 2012) to the extent that MLC is a significant predictor of BI. A possible explanation for this finding may be that PI has some relationship with MLC.

The study also agrees with Abu-Al-Aish and Love (2013) regarding the influence of personal innovativeness as well as social influence on the intention of stakeholders. The insignificant effects of performance expectancy and effort expectancy in the quantitative component seem to set the study apart from the preliminary investigation and most other previous studies. However, as explained at the outset, in the methodology chapter, the essence of adopting the convergent parallel mixed-methods research design is to provide a complete and more comprehensive picture of the viability and success of mobile learning in Colleges of Education (Creswell, 2014). Therefore, the study draws its strength from the qualitative component, which finds performance expectancy, effort expectancy, and mobile learning conditions to have some influence on behavioural intention. In aggregate, the study finds the five factors - Performance Expectancy, Effort Expectancy, Social Influence, Mobile Learning Conditions, and Personal Innovativeness Influential on the Behavioural Intention of stakeholders in Colleges of Education to use mobile learning using *Facebook*.

Furthermore, as indicated in the conceptual framework, the quantitative study finds that user satisfaction significantly affects the behavioural intention of stakeholders to accept mobile learning. User satisfaction has a stronger effect on behavioural intention as compared to the individual effects of social influence and personal innovativeness on behavioural intention. The qualitative component of the study also supports this finding. By implication, stakeholders in Colleges of Education seem to be saying that their desire to use mobile learning with *Facebook* as the learning platform increases more in view of their satisfaction with the technology. The result confirms the updated information systems success model (Delone & McLean, 2003) and the findings of Alharbi and Drew (2014).

### 8.2.2 Influence of mobile learning conditions, behavioural intention, and user satisfaction on actual use of mobile learning

In line with the conceptual framework of the study, the quantitative component of the study reveals that mobile learning conditions (MLC) has some significant influence on the actual use of mobile learning (AUML). This result again agrees with Venkatesh *et al.*, (2003) as well as Venkatesh *et al.*, (2012). This finding is supported by the qualitative component of the study. The implication of the result is that the actual use of mobile learning by stakeholders in Colleges of Education will depend on the mobile learning

conditions. As the qualitative data reveals, some of the mobile learning conditions include the battery power of the device as well as the compatibility of *Facebook* (the mobile learning platform) with most mobile devices. The battery sustains the device in the absence of electricity thereby making it less dependent on external power. This is considered very important in the Nigerian context where power supply remains a challenge (Adedoja et al., 2012; Madu & Pam, 2011).

In addition, the quantitative component of the study revealed that both behavioural intention of stakeholders and their level of satisfaction significantly influence the actual use of mobile learning. Behavioural intention has the greatest effect on the actual use of mobile learning. This finding is consistent with Delone and McLean (2003) to the extent that 'user satisfaction' leads to 'intention' and that 'intention' leads to 'use'. The addition, which this study is suggesting, is that the actual use of mobile learning does not only depend on the intention of stakeholders, but on the satisfaction of the use with the technology as well.

The three predictors contribute 24% of the variance in the actual use of mobile learning. This implies that there may be other variables in addition to these three, which affect the actual use of mobile learning in Colleges of Education. This position may be confirming the statement of Delone and McLean (2003, p.23) that "attitudes, and their links to behaviour, are notoriously difficult to measure". As stated earlier, AUML is a latent variable, which is observed through two other variables – communication and interaction, as well as collaboration and resource sharing. However, the study indicates that AUML only manifests itself significantly through collaboration and resource sharing. This may also be indicating that communication and interaction did not adequately measure AUML in Colleges of Education. Further research may need to be carried out to uncover other factors that may be used to measure the variable adequately.

In a reverse order, the quantitative study found AUML to have no significant influence on US. This finding is contrary to the claim of DeLone and MCLean (2003, p.23) which states that "'use' must precede 'satisfaction'". Perhaps, in addition to the likely inadequate measure of AUML, this finding may be due to the fact that stakeholders did not use the technology for long. The time might have been short for them to have gained "positive experiences" that may drive their satisfaction (Delone & McLean, 2003, p.23). Furthermore, participation of participants in the test-implementation of mobile learning

was more of a voluntary exercise. Therefore, their level of commitment may have affected their satisfaction. Nevertheless, the qualitative component of the study seems to have bridged this gap. A number of comments from the qualitative component reveal that actual use of mobile learning does have some influence on the satisfaction of stakeholders. A further revelation from the quantitative component of the study indicated that user satisfaction depends on information quality and service quality. These variables explained 39% of the variance in user satisfaction. This finding also had the backing of the qualitative component. The actual use of mobile learning using *Facebook*, and the satisfaction of users with the technologies resulted in some improvements in the educational system in Colleges of Education in Nigeria. The findings are discussed in the next section.

### 8.2.3 Influence of actual use of mobile learning and user satisfaction on an improved educational system.

As already mentioned, overall, the quantitative component of the study revealed that the actual use of mobile learning and the satisfaction of users significantly and positively resulted in some improvements in the educational system in Colleges of Education. The two variables explained 32% of the variance in an improved educational system. The improved educational system represents the net benefits of implementing mobile learning in Colleges of Education in Nigeria using *Facebook* as the learning platform (Delone & McLean, 2003). As already mentioned in some relevant sections of the study, the actual use of mobile learning in the context of this study signifies communication and interaction, as well as collaboration and resource-sharing among stakeholders, while satisfaction indicates the fulfilment of stakeholders with the technology. Similarly, the improved educational system means less demand on teachers; less demand or pressure on physical facilities such as physical classrooms and other learning materials such as books; improved reading culture by students, and lastly improved performance of students.

The implication of the findings of the study is that as stakeholders in Colleges of Education use mobile learning with *Facebook* to communicate and interact, as well as to collaborate and share resources with each other, the teaching and learning conditions in the institutions improved. Teachers and students were able to interact and share knowledge using mobile learning, without necessarily meeting face-to-face. Students could also consult with their lecturers using *Facebook* on their mobiles. No doubt,

handling some of the teaching and learning activities by virtual means reduced pressure on physical facilities such as classrooms, while at the same time it increased access to education. For example, all students have an equal level of interaction with the lecturers and their colleagues. Participation in various class activities got a boost as students who were hitherto shy in class had the opportunity to participate actively in the mobile learning exercises.

Another factor was the use of mobile learning to set the stage for students to compete in wanting to impress their lecturers as well as colleagues. Thus, each student struggled to see that he or she impresses the group by contributing to the discussions. As already pointed out by some of the participants, this situation encouraged most of the students to read harder in order to create a good impression in the eyes of the lecturer and colleagues. This way, the reading culture, critical thinking, communication skills, and research skills of students improved. An excerpt from the qualitative data in support of this view is stated below.

> *It encourages students to read, synthesize and develop good research skills (Participant 2.12).*

The corollary of improved access to teaching and learning, improved reading culture and research skills, is almost certainly, improved performance, which is one of the key benefits of the study. The comment below captures it all:

> *It has greatly improved my learning abilities. We were sharing ideas as if we were in a group discussion and on that particular course, the results were great (Students 2.5).*

As some form of feedback, certain reactions trailed the implementation of mobile learning in Colleges of Education. Some of the reactions are positive, while others are negative. Most of the negative concerns relate with the negative influence of mobile learning especially the learning platform, which is a social networking site. The negative concern may seem to be highlighting some elements of anxiety which is reflected in the conceptual framework but was dropped in the process of improving the measurement model for SEM. Interestingly, there were counter reactions from other participants. More of the participants seem to feel at home with mobile learning. The participants argue that the benefits of mobile learning are too much to be waved on the basis of what others use the technology for. Considering the two sides of the debate, it is evident that the opinion of

participants is more on the positive side. Participants are satisfied and willing to continue using the technology. These positivity can be further strengthened by tailoring mobile learning to the peculiarity of Colleges of Education. As stated in the introductory chapter of this study, the lack of a suitable framework in this direction as highlighted in the literature (Hsu & Ching, 2015; Ogundipe, 2012; Traxler, 2007) is a gap that this study fills. Thus, the study proposes a framework for the full implementation of mobile learning in Colleges of Education. This framework is provided in Figure 8.1. Discussion towards the emergence of the implementation framework is presented in the section that follows.

## 8.3 Mobile learning implementation framework

As a mark of their satisfaction and intention to continue to use mobile learning in Colleges of Education, participants put forward some suggestions to guide the implementation of the technology. These suggestions and the major findings from the study as discussed in sections 8.1 and 8.2 have been integrated with the conceptual framework of the study as well as the researcher's solution plan. This synthesis yielded the implementation framework for mobile learning which is presented in Figure 8.1. Some of the suggestions that were considered very useful are highlighted below.

> *There should be provision of necessary equipment for the successful running of the programme. For example mobile phones can be provided to students at subsidized rates (Student 2.1).*
>
> *If the college authority decides to implement mobile learning, that will be good, in doing that, they should liaise with the mobile network providers so that there should be a stable network (Student 2.7).*
>
> *Students must be monitored to ensure that they used it strictly for learning and not for any other things. If the authority can make it a policy thing and integrate it into our teaching and learning system, success will be recorded (Student 2.10).*
>
> *Most of the challenges that I have mentioned are such that could be solved or managed. With this in place, the college can subscribe to a large bandwidth and provide wireless access points all over the premises so that students are allowed to connect freely using their mobile devices (Lecturer 2.11).*
> *There would be need for enlightenment and orientation especially on the part of staff because many of the students seem to be fine with it (Lecturer 2.13).*
>
> *It must be made compulsory for all staff to use. This will go a long way in boosting the ICT skills of staff. The reason is that some staff have a phobia of technology (Lecturer 2.14).*

Most of these suggestions relate to mobile learning conditions. These comments further indicate that mobile learning conditions remain very influential in the context of this study. The participants suggest that increasing internet access by mounting more wireless access points (APs) and subsidizing the cost of mobile devices are key ingredients to the successful implementation of mobile learning in Colleges of Education. The mobile learning conditions form an integral part of the mobile learning environment. Other components that participants consider salient are supporting policies and adequate training. Policies are necessary ingredients in any system where different components operate. Policies specify the rules to be followed and provide support and a clear direction on the operation of the system. Similarly, training and orientation are important components in every new system because they prepare the users and build their confidence in the system. No wonder, Shembilu (2013) found sensitization of students and educators to be ranked first among measures that must be put in place to ensure the effective use of social networking sites for educational purposes. From the suggestions, three key components can be identified as inputs to the implementation framework or model. They include appropriate mobile learning environment, training and support, and supporting policies. These are reflected in Figure 8.1 which is the proposed implementation framework.

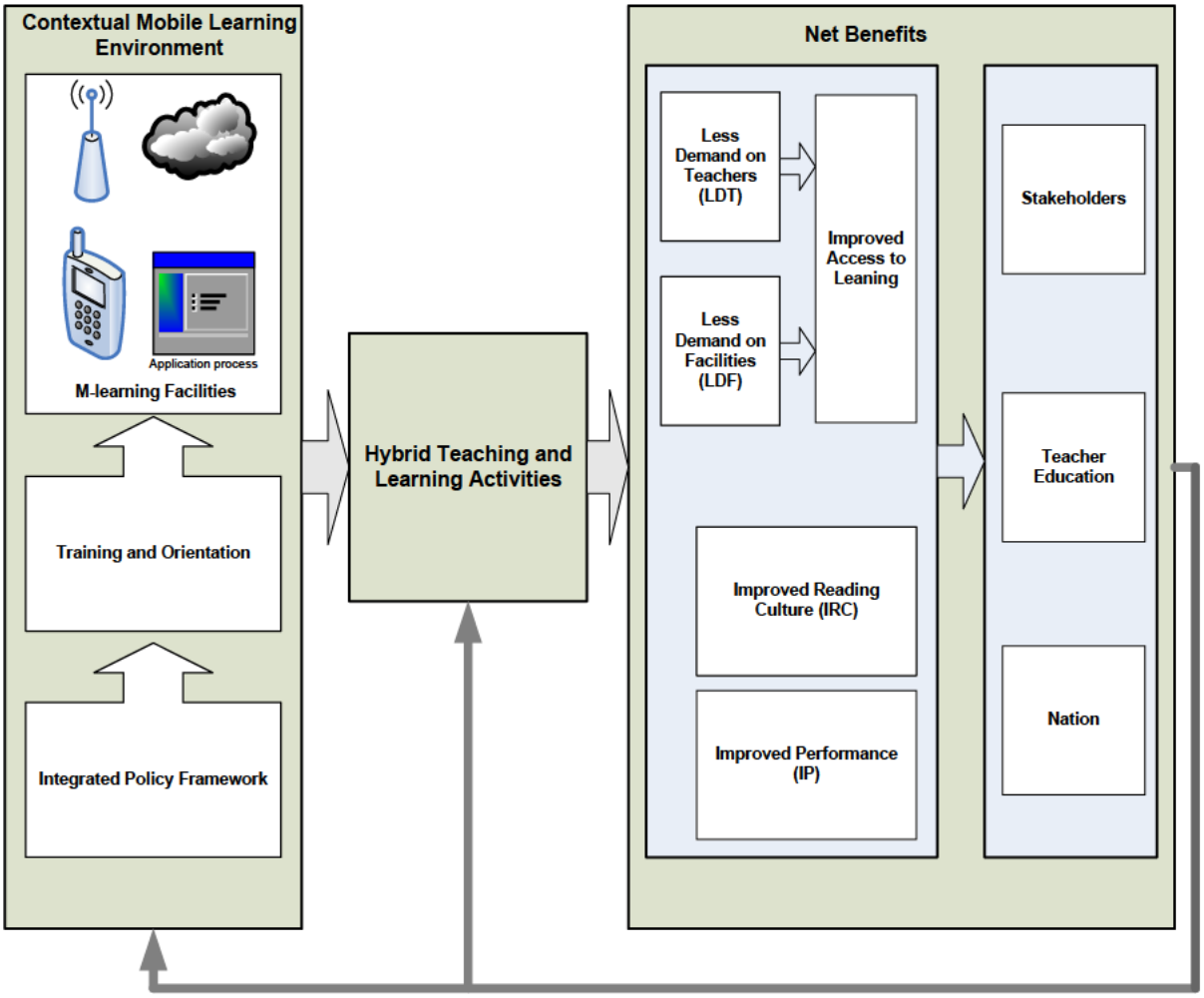


**Figure 8.1: Implementation framework for mobile learning in colleges of education**

The model in Figure 8.1 represents the proposed implementation framework for mobile learning in Colleges of Education. The model shows that the contextual mobile learning environment, which consists of three components – integrated policies, training and orientation, and mobile learning facilities would serve as a support to the various teaching and learning activities in Colleges of Education. The mobile learning environment is termed 'contextual' because it is based on the affordability and peculiarity of the study context. This provision integrates in the model vital components relating to contextual affordances and peculiarities which were pointed out in the problem statement as lacking in most models. This also falls in line with the suggestion of Traxler (2007). This model will be of broad use to the education communities, specifically the Colleges of Education, to bring about some benefits (improvements).

The interaction or relationship between the three components is in a certain (chronological) order. First, a policy framework which integrates existing policies must

be put in place to guide and support the operations of mobile learning. It may be recalled that the literature (as reflected in Figure 2.2) highlights the presence of flawed education policies or the poor implementation thereof as one of the challenges that confront Colleges of Education. In agreement with the literature, the absence of a policy that could guide the use of mobile learning in Colleges of Education is one of the fears that participants expressed in the preliminary stage of the study. Thus, the policy component serves as a foundation for the development of legal backing for the use of mobile learning and specifies other guidelines such as the operational boundaries in the use of the technology. The policies will take into account the peculiarities of the study context or environment. This development aligns with the researcher's solution plan indicated in Figure 2.4. Next to the policy framework is training and orientation of users. The purpose of this component is to boost the skills of users, to create the necessary awareness in stakeholders and to build their confidence in the use of the technology. The last vital component is mobile learning facilities. This component consists of available facilities that support mobile learning and the interaction between them. It includes the appropriate mobile devices, the learning application (a social networking site in this case), wireless access points (provided mostly by private mobile telecom services), and perhaps broadband internet connectivity. More importantly, the choice of the learning platform should be free of the burden of cost. It should ensure compatibility with available devices, and also provide some level of user friendliness. Fortunately, as the stakeholders have already testified, most social networking applications especially *Facebook* are user-friendly and compatible with most mobile devices. Thus, as indicated in the researcher's solution plan (Figure 2.4), mobile learning using *Facebook* represents the technology that is blended with the traditional teaching and learning practices to yield an improved education system.

The model further advocates that the interaction among the three components of mobile learning should affect teaching and learning positively to yield benefits such as less demand or dependence on teachers, less demand on physical facilities, improved reading culture and improved performance. It is believed, as indicated in the model, that less dependence on teachers and physical facilities will boost or increase access to teaching and learning. This is because the restrictions and inefficiencies of the traditional teaching and learning practices would be reduced. Therefore, the way is paved for as many learners as possible to have as much access as possible to teaching and learning.

At the end of the day (as evaluated using the conceptual framework), the various stakeholders benefit; the teacher education system benefits; the nation and possibly some other parts of the world will benefit. These benefits lead back to the sustained use of mobile learning. New users and even the regular users (in case changes have occurred in the system) will need first to study the policy, undergo some training and avail themselves with the necessary mobile learning facilities. The summary of the study, conclusion and appropriate recommendations are presented in the next chapter.

# CHAPTER NINE
# SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter presents a summary of the study and its major findings. The chapter then draws a conclusion based on the findings and highlights its contribution to the domain of knowledge in the discipline of information systems. The limitations of the study and some useful recommendations on the way forward also form part of the chapter.

The essence of the study was to address the challenges that are confronting the traditional teaching and learning practices in Colleges of Education, specifically from the Nigerian perspective. Some of the problems which prevent Colleges of Education in Nigeria from attaining their objectives include the inadequacy of physical facilities such as classrooms; learning and instructional materials such as books; and manpower such as lecturers. These challenges had impacted negatively on the institutions resulting in inadequate training of teachers, as well as poor access to quality education.

To explore ways of limiting the challenges so as to enable the institutions to improve their teaching and learning conditions, the study was conducted in two stages. These stages were preceded by a thorough review of the literature. Findings from the literature provided information regarding the main problems that are confronting teaching and learning in Nigerian tertiary institutions including Colleges of Education. In addition, suggestions on how to tackle the problems, particularly ways in which other researchers have tackled similar problems and the results that they obtained emerged from the literature. This enabled the study to come up with a proposed solution, the viability of which was investigated in the two stages mentioned. The stages followed each other in chronological order, with each having a specific research question and a unique objective to achieve. Major findings from the literature review as well as the subsequent stages in the study are presented below.

## 9.1 Major findings from the literature

It was revealed that the major challenges that are confronting tertiary or higher education institutions including Colleges of Education in Nigeria can be summarized into four broad categories. These are poor funding, inadequate leadership, high population growth and

dependence on the traditional learning practices. Poor funding results in lack of facilities such as classrooms, books and other learning materials as well as shortage of lecturers, which in turn gives rise to overcrowded classrooms (congestion) and poor learning, and of course ill-founded pedagogy. Inadequate leadership results in poor educational policies and implementation, which also results in inaccurate pedagogy. The resultant impact is a poor educational outcome which means a slow pace of development.

The literature revealed that a number of attempts have been made to address the challenges. Some of them include digitization of learning materials such as books and journals in order to increase access; and the 'bring back the book' initiative which was aimed at improving the reading culture and performance of students. It is found that these efforts were hampered mainly due to the lack of funds and an inadequate power supply to support the digitization process (Gani & Magoi, 2014; Ibinaiye, 2012; Igwe & Uzuegbu, 2013). The literature then suggested the integration of technology to reduce dependence on physical facilities and traditional teaching and learning practices, which could also widen access to learning (Adewole & Fakorede, 2013; Ogundipe, 2012).

Even in the application of technology to enhance teaching and learning, conventional e-learning is hampered in most institutions largely due to inadequate funding to buy computers and to sustain broadband internet subscriptions on the one hand and an erratic power supply on the other hand (Adedoja *et al.*, 2012; Madu & Pam, 2011). Thus, mobile learning became the next viable option. To ascertain the efficacy of mobile learning, some early applications of the technology were reviewed. Most of the studies indicated that mobile learning was viable in supporting teaching and learning (Akers *et al.*, 2010; Lee *et al.*, 2013; Kumar *et al.*, 2010). In addition, a review of the application of relevant theories (specifically UTAUT, IS success model and educational use of social networking sites) was carried in the study. There were agreements and disagreements in the findings of most of the studies.

For example, in the context of higher education, specifically public and private Universities in Thailand, Jairak, Praneetpolgrang, and Mekhabunchakij (2009) revealed that Effort Expectancy, Social Influence, Facilitating Conditions, and Attitude have significant positive relationships with behavioural intention while Performance Expectancy has not. Abu-Al-Aish and Love (2013) on the other hand found that Performance Expectancy, Effort Expectancy, Social Influence, Personal Innovativeness, and Service Quality have significant influences, explaining 55% of the variance in the

intention of higher education students in the United Kingdom to use mobile learning. Furthermore, Alharbi and Drew (2014) found Performance Expectancy, Effort Expectancy, and Social Influence to have positive relationships with behavioural intention while Information Quality and System Quality were found to positively affect student's satisfaction with regard to mobile learning. Student's satisfaction in turn positively affected Student's Intention to use mobile learning. They also state that System Quality positively affected System Satisfaction just as Information Quality affected Information Satisfaction. The authors, in addition, established that Lecturer's Attitude to the use of mobile devices positively affected students' behavioural intention towards the system.

In the context of developing countries, specifically University of Guyana, South America, Thomas et al. (2013) found that all four constructs of UTAUT had significant influences on behavioural intention of students, explaining 49.8% of the variance in behavioural intention of students to use mobile learning.

From the African perspective (East Africa to be specific), Mtebe and Raisamo (2014) found that all four independent constructs – performance expectancy, effort expectancy, social influence, and facilitating conditions significantly influence the intention of higher education students in East Africa to use mobile learning, and that the model explained 27.7% of the variance in behavioural intention.

Bere (2014) provided a situation report on the factors that affect the intention of students to use mobile learning from the South African perspective. He found Effort Expectancy, Social Influence, and Student-centric learning to have positive effects on behavioural intention to use mobile learning, explaining 67% of the variance in behavioural intention while behavioural intention in turn explained 72% of the total variance in m-learning usage.

From the Nigerian perspective, some studies that investigated the viability of mobile learning indicated that mobile learning was feasible (Adedoja *et al.*, 2012; Isiaka *et al*., 2011; Osang & Ngole, 2014; Utulu & Alonge, 2012). In line with this development, Adedoja *et al.* (2013) explored the acceptance of mobile learning using one of the first generation universities as case study. The researchers established that all the factors of the technology acceptance model (TAM) affected the intention of students to use mobile

phones for distance learning tutorials. Their model explained 67% of the variance in behavioural intention.

The study also uncovered from the literature some reports on the educational use of social networking sites (Alsereihy & Al Youbi, 2014; Buzzetto-More, 2012; Gülbahar, 2014; Shembilu, 2013). While the literature revealed many success stories and compliments regarding the promises of social networking sites in supporting teaching and learning, specifically in view of the availability, ease of use and prevalence, there were equally concerns regarding their negative tendencies. Most of the concerns were based on issues such as cybercrimes, cyberbullying, addiction, privacy issues, time waste, and sexual harassments among others (Hargadon, 2009; Turkle, 2008). The Nigerian situation also produced some mixed feelings. It was found that while most of the students use SNS especially *Facebook* for research and other academic-related activities, there were indications that some students may be using the technology negatively (Eke *et al.*, 2014; Ezeah *et al.*, 2013; Kanelechi, Nwangwa, & Omotere, 2014; Okoh & Lucky, 2014).

However, researchers argued that the advantages of social networking sites outweigh the shortcomings by far. It was further argued that the future remained bright for social networking sites as most of the negative usage was diminishing with society's clearer understanding of social networking (Selwyn, 2012).

One thing that was glaringly obvious from the literature is that not much research has been carried out to investigate the use of mobile learning in Colleges of Education that seemed to be more affected in terms of teaching and learning inadequacies because of their lagging behind in the application of technologies (Tella, 2011). Furthermore, a mobile learning implementation framework that takes into account the peculiarity of the study context and one that also highlights success indicators was lacking. As a result of these gaps, this study explored the use of mobile learning to improve the teaching and learning conditions in Colleges of Education, with a view to contributing to theory and practice. A summary of the findings that were made is presented below.

## 9.2 Findings from preliminary investigations

The preliminary stage of the study investigated the perceptions or possible factors that can affect the intention of stakeholders to use mobile learning and social networking sites. To achieve this objective, the explanatory sequential mixed-methods approach was followed. In this case, the quantitative approach was first used to ascertain the experiences of stakeholders in the use of mobile devices and the manner in which they use the devices. Thereafter, the perceptions or possible factors that can affect the use of the technologies were investigated. The qualitative technique was then used to elicit more information regarding the perceptions or the factors that affect the use of mobile learning and educational use of social networking sites. A sample of 375 was used for the quantitative component while 30 participants took part in the qualitative enquiry.

The major findings from the preliminary investigations are presented in three sections as follows:

### 9.2.1 Experiences of stakeholders

The length of time which respondents have used a mobile device signified the experience of the stakeholders. This experience was categorized into five levels (< 1year, 1-5 years, 6-10 years, 11-15 years, and above 15 years).

Although it was found that management had used mobile devices for a longer period than lecturers and students in view of their age, the study generally revealed that the majority of the participants have used mobile devices for at least 5 years. This finding was considered significant as it marked the first positive signal for mobile learning.

### 9.2.2 Services stakeholders use mobile devices to access

The services that stakeholders use their mobile devices to access were categorized into two – regular services and social networking and related applications. The regular services include voice calls, SMS/MMS, browsing, chatting, and electronic mail (email) services. The social networking applications and related applications include *Facebook*, *Twitter, Skype, LinkedIn*, and others. These were measured based on 'Yes' or 'No' answers.

For each of the regular services, chi-square goodness-of-fit was used to see the option that was selected more significantly. It was found that a significant number of the

stakeholders indicate that they use their mobile devices for voice calls, short message or multimedia message services (SMS/MMS), and for browsing educational materials, while a significant number do not use their mobiles to access emails.

Considering the results across the three groups of respondents, the results showed that a significant number of students use their mobile for voice calls, SMS/MMS, and browsing educational materials. The lecturers' group differs slightly. All the lecturers use their mobiles for voice calls and SMS/MMS while a significant number use of them for browsing educational materials. In the management's group on the other hand, a significant number use their mobiles for voice calls while 100% use them for SMS/MMS.

In summary, the results reveal that most stakeholders including students, lecturers and management use their mobile devices mostly for voice calls, SMS/MMS, and browsing of educational materials, but less use their mobiles for accessing of emails and chatting.

Regarding the use of social networking and other related applications, the study revealed that although almost all participants use at least one social networking and related application, a significant number use the *Facebook* social networking site. In other words, the most commonly used application is *Facebook*. Results across the three groups indicated that a significant number of students and lecturers use their mobile devices to access the *Facebook* application while a substantial number of management staff do not use any social networking or related applications. The long years of experience in using mobile devices and the fact that most of them use their mobile to browse educational materials and *Facebook* suggested the possibility of using social networking sites to facilitate mobile learning. This served as impetus towards ascertaining the perceptions of stakeholders on using mobile learning and educational use of social networking sites as presented in the next section.

### 9.2.3 Perceptions or factors that can affect the use of mobile learning and educational use of social networking sites

It can be recalled that only the qualitative component of the analysis on the perceptions or factors that can affect the use of mobile learning were presented in the thesis as earlier explained at various stages in the study. Furthermore, being an addendum, the views on social networking sites were explored using only the qualitative approach.

Excerpts from the qualitative data led to the emergence of themes which indicated factors that could possibly affect the use mobile learning and social networking sites. Six factors

emerged which could affect the use of mobile learning. The factors include performance expectancy (usefulness of m-learning to teaching and learning); effort expectancy (ease associated with use of m-learning); and social influence (influence of important others on participants intention to use m-learning). Other factors were mobile learning conditions (available conditions that support m-learning); personal innovativeness (self-confidence to use m-learning), and anxiety (fear or apprehension associated with use of m-learning). The same factors were perceived to affect the use of social networking sites.

The dominant factors in the students group were performance expectancy, effort expectancy and mobile learning conditions for m-learning, and performance expectancy and effort expectancy in the aspect of SNS. In the lecturers group, dominant factors were performance expectancy and anxiety in the aspect of m-learning while performance expectancy and effort expectancy dominated the aspect of SNS. The management group was dominated more by performance expectancy, mobile learning conditions and anxiety in terms of m-learning while performance expectancy dominated the use of SNS. In all the three groups, with the exception of students, performance expectancy was dominant. This indicated that the usefulness of m-learning and social networking sites was the top priority of stakeholders in Colleges of Education. The quantitative component differed slightly with these findings. Only performance expectancy, effort expectancy and mobile learning conditions were found to predict the intention of students, with mobile learning conditions taking the lead. In aggregate, the findings are consistent with some studies that were reviewed in the literature.

In summary, the preliminary investigations of the study revealed that:

i. The majority of the stakeholders in Colleges of Education have an acceptable level of experience (above five years) in using mobile devices.
ii. Stakeholders use their mobile devices to browse educational materials and also access some social networking and related applications, with *Facebook* being the most popular.
iii. Since the two components of the study support each other, all six factors (performance expectancy, effort expectancy, social influence, mobile learning conditions, personal innovativeness, and anxiety) may have some level of influence on the use of mobile learning and social networking sites.

It was therefore concluded that:

i. Stakeholders may readily accept to use mobile learning since they have positive perceptions towards it and the majority of them have over five years' experience in using mobile devices.

ii. A social networking site, specifically *Facebook* may serve as a good platform for mobile learning since the majority of stakeholders use it on their mobiles.

iii. The integration of the acceptance and success factors may provide a better understanding of the effectiveness of mobile learning in Colleges of Education.

These deductions led to the second stage of the study, the findings of which are summarized below.

## 9.3 Implementation of mobile learning

The implementation of mobile learning using *Facebook* was tested at this stage to see how the acceptance and success factors work together towards the effective implementation of mobile learning. The study followed the convergent mixed-methods approach underpinned by the integrated conceptual framework developed. A sample of 330 respondents was used in the quantitative strand while 15 participants including the researcher were involved in the qualitative component. The quantitative data were analysed using structural equation modelling while the qualitative data were analysed using content analysis. The following findings were made from the study:

### 9.3.1 Joint influence of acceptance factors and user satisfaction

It was found that social influence, personal innovativeness and user satisfaction affected behavioural intention significantly. Mobile learning conditions were only significant if personal innovativeness was removed from the model. The study attributed this behaviour to the possibility that a strong relationship exists between MLC and PI.

The qualitative component of the study, on the other hand, found comments that suggested the influence of performance expectancy, effort expectancy, and mobile learning conditions. The comments on mobile learning conditions related to both behavioural intention and the actual use of mobile learning. Cumulatively, all four factors were considered to have some influence on the intention of stakeholders to use mobile learning.

### 9.3.2 Influence of mobile learning conditions, behavioural intention and user satisfaction on actual use of m-learning

Consistent with the literature (Venkatesh *et al.*, 2003; Venkatesh *et al.*, 2012), it was found that mobile learning conditions had a significant influence on the actual use of mobile learning (AUML), as did behavioural intention and user satisfaction. Behavioural intention had the strongest effect among the three variables. This finding also had some support from the qualitative component of the study. Contrary to the findings of DeLone and McLean (2003), the actual use of mobile learning had no influence on user satisfaction. However, information quality (IQ) and service quality (SVQ) were found to significantly predict user satisfaction in consistence with DeLone and McLean (2003). The two variables explained 39% of the variance in US. The qualitative component on the other hand found that all the three variables – AUML, IQ, and SVQ had some influence on US. This reaffirmed the position of DeLone and McLean (2003). Further research may need to be carried out in order to clarify this impasse.

### 9.3.3 Influences of actual use of m-learning and user satisfaction on an improved educational system

The study revealed that actual use of mobile learning led to a significant improvement in the educational system as did user satisfaction. The model explained 32% of the variance in an improved educational system. The qualitative component supported the findings. The study revealed that benefits such as less dependence on teachers and physical facilities provide room for students to learn from any location at any time, which opens the door to improved access to teaching and learning. These findings are also consistent with the suggestion of Adewole and Fakorede (2013) from the literature. As mobile learning systems allow students to explore other sources of learning and collaborate with colleagues, students' reading skills are improved and by implication, their performance is also improved. Overall, the stakeholders benefit, the institutions benefit, and the nation benefits.

### 9.3.4 Feedback effect of improved educational system on actual use of m-learning and user satisfaction

The improvements recorded on the educational system had some feedback effects on the actual use of mobile learning as well as the satisfaction of users. These effects were established from the qualitative component of the study. Most of the comments that were

extracted from the data indicated that participants were satisfied and encouraged to use mobile learning as a result of the improvement in teaching and learning.

There were also negative reactions and counter-reactions specifically with regard to the use of social networking sites. While some of the participants expressed concern over the negative effects of using social networking sites on the part of students, the majority of the participants argued that the benefits of the technology should not be ignored on the grounds of misuse by others.

Therefore, the study concluded that the actual use of mobile learning in Colleges of Education gave stakeholders some joy and excitement and also yielded some benefits which include reduced pressure on lean resources such as manpower and physical facilities, improved access to learning, improved reading culture, as well as performance of students. With these benefits, stakeholders feel more satisfied and are happy to continue to using the technology.

## 9.4 Contribution to research and knowledge

This study contributes to research and knowledge in three ways.

Firstly, the thesis makes a contribution to literature on mobile learning with specific reference to Colleges of Education in a developing country. Although there is considerable research on mobile learning, to the researcher's knowledge there has been no study of mobile learning in the specific context of Colleges of Education – involving teacher education.

A second contribution relates to the theoretical and methodological approach used in the study. Two vital components that determine the contribution of a theory to research and knowledge are its ability to provide a revelation or new way of seeing as well as its utility (Oller, 2012). The combination and adaptation of the theories UTAUT, IS success model and educational use of *Facebook* model has been used uniquely in this study to obtain an in-depth understanding of the application of mobile learning in addressing challenges of teaching and learning in higher education institutions such as Colleges of Education. Specifically, the use of a more complex statistical technique such as SEM to test the model and to explore relationships among variables resulted in the addition of a valid path leading from 'User Satisfaction' to 'Actual Use of Mobile Learning'. In addition, the possibility of using a social networking site as the platform for mobile learning in the

context of Nigeria, a developing country with multicultural backgrounds, has been shown to be viable.

The third major contribution is the development of a mobile learning implementation model, which the study proposed as its outcome. The model defined specific indicators for measuring the success of mobile learning while taking into consideration the peculiarity of the study environment through an integrated policy framework that maintains a balance between the mobile and the traditional learning environments. These ingredients have been found to be lacking in most existing m-learning implementation models. The model can be used to implement mobile learning in Colleges of Education and other Higher Education Institutions (HEIs) across the globe.

## 9.5 Limitations of the study

Finally, a number of limitations need to be considered.

Firstly, the findings of the study are limited to Colleges of Education in Nigeria. Based on the size and the number of Colleges of Education in Nigeria, it was not possible to study the entire country. However, as justified in the methodology chapter, the North-Central geopolitical zone was selected in view of its cosmopolitan nature and the fact that the country's capital city – Abuja is located in this zone.

Furthermore, considering that the State owned Colleges of Education were more in number than the Federal and private colleges, the study was designed to use four colleges (one federal owned, two State owned, and one privately owned). This plan could not be achieved as members of one of the State owned colleges could not be accessed at the time of data collection. The institution was closed down for a long period of time due to some industrial disputes. The study had to make do with results from the remaining three colleges.

At the implementation stage, only one of the colleges (the Federal college) was used. This was in view of the high level of cooperation and commitment that was required to achieve the desired results.

Secondly, as stated in chapter four (theoretical framework), the objectives of the study could not be achieved without balancing the acceptance of mobile learning with the success of the technology in improving teaching and learning conditions in the study context. While the UTAUT model was found suitable in ascertaining the acceptance of

mobile learning, it was handicapped in assessing the success of the use of the technology. The closest theory that was found relevant to fill this gap is the information system (IS) success model. Although several studies in the literature (Alharbi & Drew, 2014; Danila & Abdullah, 2014; Ramayasa, 2015) have integrated either TAM or UTAUT with the IS success theory to address similar situations, the fact that the two models use different units of analysis may be viewed as a limitation in their integration. However, viewed from another dimension, a social networking site such as *Facebook* which served as the mobile learning platform in this study represents an information system to a large extent. This has implications on both individuals as well as the Colleges of Education as institutions. Thus integrating UTAUT and the IS success model to measure the acceptance and success of mobile learning using the *Facebook* may not been completely out of place.

Thirdly, the first stage of the study (the preliminary investigation) explored the acceptance of mobile learning as well social networking sites by stakeholders in Colleges of Education. While the quantitative component of the investigation considered only the four constructs (performance expectancy, effort expectancy, social influence, and mobile learning conditions) of UTAUT, the qualitative component revealed two additional factors (personal innovativeness and anxiety) that might also be affecting the intention of stakeholders to accept mobile learning. These results necessitated the collection of another set of data to be able to ascertain the effect of all acceptance factors on the intention of stakeholders to accept mobile learning. This data was collected in the second stage of the study including acceptance factors that had emerged from the preliminary investigation and the data for testing the success of mobile learning using *Facebook*.

At this point, the study had two sets of quantitative data that had been analysed in relation to the acceptance of mobile learning. Since the results of the quantitative analysis of the first set of data have been published, for the sake of balancing complexity and parsimony, the quantitative analysis of only the second set of data in relation to the acceptance factors of mobile learning have been presented in this thesis. However, the results of the first set of data have been acknowledged and used in the thesis.

## 9.6 Conclusion

In general, the study concludes that stakeholders in Colleges of Education in Nigeria have positive perceptions towards mobile learning and that these perceptions implied their readiness to accept the use of the technology. The positive views of stakeholders

regarding mobile learning led to the influence of various factors on the intention of stakeholders to use mobile learning and social networking sites to facilitate teaching and learning. Although there were some reservations on the use of mobile learning with a social networking site, the positive impact of mobile learning and the feedback obtained from the findings of the study provides an assurance of the viability of the technology in improving the teaching and learning conditions in Colleges of Education. By implication, the continuity of using mobile learning to support teaching and learning may be guaranteed. It is therefore necessary to harness the power of mobile learning to increase access and possibly improve learning.

## 9.7 Implications for practice

To ensure the full and successful implementation of mobile learning, the following recommendations are considered appropriate. Some of the recommendations are suggestions that came from the participants.

1. To encourage mobile learning, colleges should consider liaising with mobile service providers to provide special data rates for academic institutions.
2. Various institutions can also consider discussing with vendors to subsidize cost of mobile devices for students and lecturers.
3. The Nigerian Government should provide an enabling environment for mobile learning by reviewing relevant policies to provide room for the integration of mobile learning.
4. Colleges of Education should give computer literacy some priority by having regular hands-on training and workshops for staff and students.

## 9.8 Recommendations for further research

1. Further research should be carried out to clarify some gray areas such as the influence of the actual use of mobile learning on user satisfaction.
2. The conceptual framework proposed in the study could only explain a variance of 32% of the overall independent variable (Improved Educational System). The framework may be further explored in other contexts with the aim of improving on it.

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# Appendices

## Appendix A: Sample size table – Krejcie and Morgan (1970)

| N | S | N | S | N | S | N | S | N | S |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 10 | 100 | 80 | 280 | 162 | 800 | 260 | 2800 | 338 |
| 15 | 14 | 110 | 86 | 290 | 165 | 850 | 265 | 3000 | 341 |
| 20 | 19 | 120 | 92 | 300 | 169 | 900 | 269 | 3500 | 346 |
| 25 | 24 | 130 | 97 | 320 | 175 | 950 | 274 | 4000 | 351 |
| 30 | 28 | 140 | 103 | 340 | 181 | 1000 | 278 | 4500 | 354 |
| 35 | 32 | 150 | 108 | 360 | 186 | 1100 | 285 | 5000 | 357 |
| 40 | 36 | 160 | 113 | 380 | 191 | 1200 | 291 | 6000 | 361 |
| 45 | 40 | 170 | 118 | 400 | 196 | 1300 | 297 | 7000 | 364 |
| 50 | 44 | 180 | 123 | 420 | 201 | 1400 | 302 | 8000 | 367 |
| 55 | 48 | 190 | 127 | 440 | 205 | 1500 | 306 | 9000 | 368 |
| 60 | 52 | 200 | 132 | 460 | 210 | 1600 | 310 | 10000 | 370 |
| 65 | 56 | 210 | 136 | 480 | 214 | 1700 | 313 | 15000 | 375 |
| 70 | 59 | 220 | 140 | 500 | 217 | 1800 | 317 | 20000 | 377 |
| 75 | 63 | 230 | 144 | 550 | 226 | 1900 | 320 | 30000 | 379 |
| 80 | 66 | 240 | 148 | 600 | 234 | 2000 | 322 | 40000 | 380 |
| 85 | 70 | 250 | 152 | 650 | 242 | 2200 | 327 | 50000 | 381 |
| 90 | 73 | 260 | 155 | 700 | 248 | 2400 | 331 | 75000 | 382 |
| 95 | 76 | 270 | 159 | 750 | 254 | 2600 | 335 | 1000000 | 384 |

## Appendix B: Proposal Approval Letter

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

**TO:** Mr. J Chaka (Student Number: 213573272)
**FROM:** SCHOOL OF MANAGEMENT, IT & GOVERNANCE
**DATE:** 3 December 2013
**SUBJECT:** Approval of Doctoral Research Proposal

**Title:** Mobile Learning for Colleges of Education in Nigeria
**Supervisor**: Dr. I Govender

This memo is to confirm that the Research Proposal Review Committee has accepted your Doctoral Research proposal presented on the 14 November 2013. Please take note of the following suggestions/comments:

- 300 respondents for quantitative study: justify the number more clearly and look at population of each specific college you are looking at. Random sampling is complex; perhaps convenience sampling would be easier. Don't assume all 3 colleges are the same size, do proportional sampling. Take the 3 colleges and look at their populations and then estimate sample size for the 3 colleges;
- Case study requires in-depth analysis-perhaps avoid the term "case study";
- Caution: Literature review is preparing you to go into the field. Perceptions cannot be facts until they are tested or proved to be reliable. Be careful of the language you use. You are exploring perceptions;
- Study assumes that the outcomes for mobile learning and classrooms will be the same;
- Study appears a bit disjointed – align title research questions and methodology;
- Be open to other opportunities that emerge from the data – avoid seeing mobile learning as "the" solution;
- How will you ensure that the research instruments selected will produce stable and consistent results? What measures have you put in place?
- Stakeholders-unclear, who are they?
- Careful with research questions, all start with 'what' – very descriptive;
- Theoretical frameworks used very fluidly –need coherence between philosophical underpinning of these theories; and
- What is the purpose of the interviews? Be clear as to why you want to interview people.

Please note that the above comments/suggestions are intended to develop and strengthen your study, thus you need to consider them seriously. Your supervisor(s) will provide further guidance on how to factor the suggestions into your study.

[redacted]es, and we look forward to your successful completion.

[redacted]es: School of Management, IT & Governance
[redacted]tal - Westville Campus

School of Management, IT & Governance- Research & Higher Degrees
**Postal Address:** Room 237, 2nd Floor, M Block, Westville Campus, Westville, 3630
**Telephone:** +27 (0) 31 260 8162 Pearcea2@ukzn.ac.za **Website:**www.ukzn.ac.za

## Appendix C: Ethical Clearance Letter


02 April 2014

**Mr John Gyang Chaka 213573272**
**School of Management, Information Technology and Governance**
**Westville Campus**

**Protocol reference number: HSS/0182/014D**
**Project title: Mobile Learning for Colleges of Education in Nigeria**

Dear Mr Chaka

**Full Approval – Expedited**

This letter serves to notify you that your application in connection with the above has now been granted full approval.

**Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach/Methods must be reviewed and approved through an amendment /modification prior to its implementation. Please quote the above reference number for all queries relating to this study. Please note: Research data should be securely stored in the discipline/department for a period of 5 years.**

**The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.**

Best wishes for the successful completion of your research protocol.

Yours

.....
**Dr Sh**

**/px**

cc Supervisor: Dr Irene Govender
cc Academic Leader Research: Professor B McArthur
cc School Administrator: Ms A Pearce

**Humanities & Social Sciences Research Ethics Committee**
**Dr Shenuka Singh (Chair)**
**Westville Campus, Govan Mbeki Building**
**Postal Address:** Private Bag X54001, Durban 4000
**Telephone:** +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** simbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
**Website:** www.ukzn.ac.za

**Appendix D: Gate Keeper's Letters**

**NATIONAL COMMISSION FOR COLLEGES OF EDUCATION**

Plot 829 Cadastral Zone A01, Ralph Shodeinde Street, P.M.B. 0394. Garki, Abuja.
**Tel:** 092346531 **Email:**info@ncce.edu.ng

3rd February, 2014

**The Provost,**
Federal College of Education,
P.M.B. 27, Pankshin,
Plateau State.

Sir,

**MR. JOHN GYANG CHAKA**

The bearer named above is a PhD Student in the Department of Information Systems and Technology, University of Kwazulu-Nata (UKZN), South Africa.

He approached the Commission to provide him with a letter of introduction to your highly esteemed College. He is conducting a research on ***"Mobile Learning for Colleges of Education in Nigeria"***. Kindly assist him to fully accomplish his research.

Please accept the assurances and warm regards of the Executive Secretary.

[redacted] **Aliyu**
Acting Director, Academic Programmes
**For:** The Executive Secretary

# FEDERAL COLLEGE OF EDUCATION

P.M.B. 27, Pankshin, Plateau State, Nigeria.

## OFFICE OF THE REGISTRAR

08060967629
fcepankshin@yahoo.com

Prof. David Longwap Wonang
B.Sc., M.Sc., Ph.D., PGDE, FIGA
Provost:
Chief C.D. Yakse, ND, BA. AMNIM, ANIPR.
Registrar

FED. COLLEGE OF EDUCATION
P.M.B. 27, PANKSHIN
29
[redacted]

Our Ref: FCEP/SS/PER/287/VOL.I/124

Your Ref:

Date: 22/01/2014.

***John Gyang Chaka,***
Department of Information System and Technology,
University of Kwazulu-Natal,
South Africa.

***RE: APPLICATION FOR PERMISSION TO CONDUCT A RESEARCH IN YOUR INSTITUTION***

Yours dated 09/01/2014 is under reference, please.

I am directed to inform you that approval has been given to enable you Collect data to facilitate your research on the topic "Mobile Learning for Colleges of Education in Nigeria" here in the College in facilitation of your Ph.D at the University of Kwazulu-Natal, South Africa.

[redacted]

**NATIONAL COMMISSION FOR COLLEGES OF EDUCATION**
Plot 829 Cadastral Zone A01, Ralph Shodeinde Street, P.M.B. 0394. Garki, Abuja.
**Tel:** 092346531 **Email:**info@ncce.edu.ng

**31st January, 2014**

**The Provost,**
Niger State College of Education,
P.M.B. 39, Minna,
Niger State.

Sir,

**MR. JOHN GYANG CHAKA**

The bearer named above is a PhD Student in the Department of Information Systems and Technology, University of Kwazulu-Nata (UKZN), South Africa.

He approached the Commission to provide him with a letter of introduction to your highly esteemed College. He is conducting a research on ***"Mobile Learning for Colleges of Education in Nigeria"***. Kindly assist him to fully accomplish his research.

Please accept the assurances and warm regards of the Executive Secretary.

[redacted]iyu
demic Programmes
**For:** The Executive Secretary

# NIGER STATE COLLEGE OF EDUCATION

Private Mail Bag 39,
Minna,
Niger State, Nigeria.
Telegrams: COEDU, Minna.
Telephone: 066-222205.

Your Ref: COEM/ADM/G/585/I Our Ref: Date: 22nd January, 2014

**Mr. John Gyang Chaka,**
**Department of Information Systems and Technology,**
**University of Kwazulu-Natal,**
**South Africa.**

Sir,

**RE: APPLICATION FOR PERMISSION TO CONDUCT A RESEARCH IN YOUR INSTITUTION**

With reference to your letter on the above subject matter received on 16th January, 2014, I hereby convey the College Management approval for you to carry out the research in the College.

The College look forward to work with you in this area and assure you of our co-operation towards the success of your research work.

It is the hope of the College that the success of your work will be to the benefit of the College, the country and the humanity in general.

Thank you.

[redacted]

*oko

# NATIONAL COMMISSION FOR COLLEGES OF EDUCATION

Plot 829 Cadastral Zone A01, Ralph Shodeinde Street, P.M.B. 0394. Garki, Abuja.
**Tel:** 092346531 **Email:**info@ncce.edu.ng


**3rd February, 2014**

**The Provost,**
City College of Education, Mararaba
P.O. Box 3094, Garki – Abuja

Sir,

**MR. JOHN GYANG CHAKA**

The bearer named above is a PhD Student in the Department of Information Systems and Technology, University of Kwazulu-Nata (UKZN), South Africa.

He approached the Commission to provide him with a letter of introduction to your highly esteemed College. He is conducting a research on ***"Mobile Learning for Colleges of Education in Nigeria"***. Kindly assist him to fully accomplish his research.

Please accept the assurances and warm regards of the Executive Secretary.

[redacted]
Acting Director, Academic Programmes
**For:** The Executive Secretary

# CITY COLLEGE OF EDUCATION

SANI ABACHA ROAD MARARABA GURKU, NASARAWA STATE
P.M.B. 3094, GARKI FCT ABUJA

*Our Ref:*..... *Your Ref:*..... *Date:*.....

3rd Feb., 2014.

Mr. John Gyang Chaka
Department of Information System and Technology
University of Kwasulu-Natal (UKZN)
South Africa.

Dear Sir,

**RE: APPLICATION FOR PERMISSION TO CONDUCT A RESEARCH IN YOUR INSTITUTION.**

Yours on the above subject matter here refers.

This is to notify you that the Management of City College of Education, Mararaba, has granted your request to use the College for data collection.

Congratulations.

[redacted] **rovost**

# NATIONAL COMMISSION FOR COLLEGES OF EDUCATION

Plot 820 Cadastral Zone A01, Ralph Shodeinde Street, P.M.B. 0394. Garki, Abuja.
Tel: 092346531 Email:info@ncce.edu.ng


3rd February, 2014

**The Provost,**
FCT College of Education,
P.M.B. 61, Garki,
FCT - Abuja.

Sir,

**MR. JOHN GYANG CHAKA**

The bearer named above is a PhD Student in the Department of Information Systems and Technology, University of Kwazulu-Nata (UKZN), South Africa.

He approached the Commission to provide him with a letter of introduction to your highly esteemed College. He is conducting a research on ***"Mobile Learning for Colleges of Education in Nigeria"***. Kindly assist him to fully accomplish his research.

Please accept the assurances and warm regards of the Executive Secretary.

[redacted]
c Programmes
ary

# FCT COLLEGE OF EDUCATION

**ZUBA P.M.B. 61 GARKI - ABUJA**

**OFFICE OF THE REGISTRAR**

***Provost:*** *Prof: Tijjani Isma'il (FNAE)*
***Registrar:*** *Muhammad M. Liman (B.B. Ed, MBA, MIMC)*
***Location:*** *Km 1 After Kaduna/Lokoja Flyover, Z u b a - Abuja.*

***Our Ref:*** ***FCT/COE/Z/REG/CWOO/029/VOL. II***
***Date:*** ***February 7, 2014***

***Mr. John Gyang Chaka,***
Department of Information System & Technology,
Unversity of Kwazulu-Natal (UKZN),
South Africa.

**RE-APPLICATION FOR PERMISSION TO CONDUCT A RESEARCH IN YOUR INSTITUTION**

I am directed to acknowledge the receipt of your letter dated ***January 9, 2014*** and to inform you that approval has been granted to you to conduct the research in line with the prescribed ethical standards.

2. You should therefore report to the Registrar of the College for further [redacted]e.

E-mail: fctcezuba89@yahoo.com
ABUJA
The Heart of Nigeria
Web Site: fctcoezuba.org

## Appendix E: Approval for Change of Title


05 June 2017

**Mr John Gyang Chaka (213573272)**
**School of Management, IT & Governance**
**Westville Campus**

Dear Mr Chaka,

**Protocol reference number: HSS/0182/014D**
**New project title:** Towards Improving Teaching and Learning in Colleges of Education using Mobile Learning – The Nigerian perspective

**Approval Notification – Amendment Application**

This letter serves to notify you that your application and request for an amendment received on 25 May 2017 has now been approved as follows:

- Change in Title

**Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.**

**PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.**

**The ethical clearance certificate is only valid for period of 3 years from the date of original issue. Thereafter Recertification must be applied for on an annual basis.**

Best wishes for the successful completion of your research protocol.

You[redacted]

.....
Dr S[redacted]hair)

**/ms**

cc Supervisor: Dr Irene Govender
cc Academic Leader Research: Professor B McArthur
cc School Administrator: Ms Angela Pearce

**Humanities & Social Sciences Research Ethics Committee**
**Dr Shenuka Singh (Chair)**
**Westville Campus, Govan Mbeki Building**
**Postal Address:** Private Bag X54001, Durban 4000
**Telephone:** +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** ximbap@ukzn.ac.za /snymanm@ukzn.ac.za /mohunp@ukzn.ac.za
**Website:** www.ukzn.ac.za

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**Appendix F: Declaration of English Language Editing**

Asoka ENGLISH language editing

Cell no.: 0836507817


# DECLARATION OF ENGLISH LANGUAGE EDITING

This is to certify that I have English Language edited the thesis

***Towards improving teaching and learning in Colleges of Education using mobile learning – The Nigerian perspective***

**Candidate: Chaka JG**

[redacted]

DISCLAIMER
Whilst the English language editor has used electronic track changes to facilitate corrections and has inserted comments and queries in a right-hand column, the responsibility for effecting changes in the final, submitted document, remains the responsibility of the author in consultation with the supervisor.

Director: Prof. Dennis Schauffer, M.A.(Leeds), PhD, KwaZulu (Natal), TEFL(London), TITC Business English, Emeritus Professor UKZN. Univ. Cambridge Accreditation: IGCSE Drama. Hon. Research Fellow, DUT. Durban University of Technology.