END USER FACTOR MODEL FOR ADOPTION OF MOBILE LEARNING

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End User Factor Model for Adoption of Mobile Learning

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DECLARATION

This thesis is my original work and has not been submitted for a degree in any other university

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This research report has been submitted for examination with our approval as university supervisors.

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DEDICATION

I dedicate this Research to my son Joshua Nyakundi.

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LIST OF ACRONYMS

EUFM	End User Factor Model
ICT	Information and Communication Technology
IT	Information Technology
KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
ML	Mobile Learning
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
SMS	Short Message Service
TAM	Technology Acceptance Model
TOI	Trust on Internet
UNESCO	United Nations Educational, Scientific and Cultural Institution
UTAUT	Unified Theory of Acceptance and Use of Technology
USAID	United States Agency for International Development
HTML	Hyper-Text Markup Language
XML	Extensible Markup Language
CSS	Cascading Style Sheet

UI	User Interface
DHTML	Dynamic Hyper-Text Markup Language

ABSTRACT

Education systems around the world are transitioning from the conventional educational practices to digitized learning for better service delivery. However, the adoption remains largely unrealized in economically transitioning countries due to low adoption of usage factors. This is as a result of learning institutions' focus on the technical supply-side factors with little emphasis on the end user factor perspective of mobile learning. There has been inadequate research and development in IT usage factors to inform education sector's uptake of Mobile Learning adoption in learning institutions. While a number of adoption models have been proposed and applied to the developed countries, they require domestication in order to address the specific consumer needs of developing nations. This thesis therefore aims to determine the usage factors that explain the low Mobile Learning adoption rates in learning institutions in order to develop a model which best support learner centered learning adoption in educational institutions. Questionnaires were used as research instruments to collect data. Data was then arranged and coded for analysis. Percentages, frequency distributions and means were used to analyze the collected data with the aid of the Microsoft Excel and Statistical Package of Social Sciences. Data was presented using tables, histograms, line graphs and pie charts which led to the findings and conclusions. Finally the results obtained indicated that training of mobile learning, enhancing attitude towards mobile learning and education on the internet and computer operations will increase usability of mobile learning.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Mobile learning is a natural extension of electronic learning that has the potential to further expand where, how and when we learn and perform in all the learning aspects (Sofia & Dobrica, 2013). One of its key benefits is its potential for increasing productivity by making learning available anywhere and anytime, allowing learners to participate in educational activities without the restrictions of time and place (Moon & Kim, 2010). According to Moon and Kim, mobile technologies have the power to make learning more widely available and accessible than we are used to in existing e-learning environments. M-learning could be the first step towards learning that is truly just-in-time where you could actually access education and training at the place and time that you need it. End user refers to people who are not professional software developers but can use tools to create or modify software artifacts and complex data objects without significant knowledge of a programming language (Matthew, 2014). He defines factor model as a fundamental focus on economic factors that affect a particular industry or market. According to Wikipedia free encyclopedia, end user factor model is a set of methods, techniques and tools that allow users of a software system who are acting as non-professional software developers at some point to create modify and extend a software artifact.

Mobile Learning adoption refers to the intention of mobile users to engage in mobile learning to achieve their educational needs. The resulting benefits of adoption of mobile learning are diverse and long lasting including an easy-to-use online classroom system, round-the-clock technical support, a faculty that is engaged in every aspect of learning, ability to join class discussions and group projects, access to academic support services and the freedom to study from any location around the world. (Moon & Kim, 2010).

In Northern America, 13 out of 24 countries included in 2013-2018 North America Regional Mobile Edugam Market Report have mobile learning growth rate, with Luthuania followed by Slovakia and Romania above 25% while others are breath taking (UNESCO, 2013).

In Western Europe the proliferation of smartphones and tablets in particular has created a huge delivery channel for mobile learning contact supplies (UNESCO, 2013). Direct carrier billing that include: Google, Microsoft, Samsung, Nokia, Blackberry and Amazon is now fueling the consumer demand for mobile learning content (InfoDev 2012). In the Middle East, 9 out of 12 countries have significantly higher growth rate than the aggregate growth rate of 18.4% of the region, where 6 of them have a growth rate of over 50%. This indicates that the Middle East is a vibrant region in mobile learning. Nikam *et al.*, (2012) cites three major catalysts leading to high growth rate of mobile learning. They include; mobile learning value added products, larger scale deployment of tablets in the academic segments and countrywide content digitization efforts across the primary and secondary school systems. The catalyst has created a massive demand for packaged content and content development service in the academic segment.

The growth rate custom content development service in the Middle East 39.9% which is the highest for the custom service for any region in the world (InfoDev, 2012). The region cites major reasons for its success in mobile learning that include analysis by product providing the insight into buying behavior and identifies the top buying segment in each country. It also provides revenue forecast of five types mobile learning products and services including: Packaged content, value added service, authoring tools and platforms and personal learning devices.

Africa has the highest mobile learning growth rate in the world. 5 year compound annual growth rate in Africa is 38.9% (InfoDev, 2012). A 2012-2017 African mobile learning market report by (Soumitra, 2013) that focus 14 countries in Africa that include: Algeria,

Angora, Ghana, Kenya, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda, Zambia and Zimbambwe, 7 of this have a growth rate higher than the aggregate. Major catalysts identified that have made Africa the most vibrant mobile learning market on the planet are similar to those of the Middle East.

In Kenya mobile learning methods specifically those involving cellphones for both informal and formal learning hold great promise for learners (MoICT, 2013). With proper instructional design, it promises educational opportunities with an increased flexibility for learners, satisfying the any time / anywhere component of learners.

Traditional systems are often slow to change and subject to various existing constraints (Sofia & Dobrica, 2013). The potential of ML is clear and evident, but to have this potential realized is problematic. However, before an educational technology can be used, it must be adopted. Conventional approaches to innovation suggest that adoption decisions are related to characteristics of at most 20% technology and at least 80% about people, processes, and institutions (Maziar & Zuraini, 2013).

Although ML adoption is important, its implementation continues to be constrained by low adoption rates (Hung, 2012). The concept of ML services revolves around the training and in order to develop this training focused vision, policymakers need to keep the ordinary learners in mind when designing systems. This is because mobile learning is not just a cost cutting or efficiency initiative, but rather is directed at bettering the education system. (InfoDev, 2012). Focusing solely on technological solutions does not change the mentality of bureaucrats who view the learners as neither a customer of an institution nor a participant in decision-making.

The role of end user factors in bridging the mobile learning adoption gap has not been emphasized and developing countries are far behind in its implementation (Nikam *et al.*, 2012). In order to realize efficiency, users require a model whose input will lead to use of a system that do respond to their needs (InfoDev, 2012). Institutions agencies do not

as a rule engage learners in the development of their mobile learning system (Al Sawafi, 2011). Rather, many applications are internally driven to meet cost savings and other institutional mandates regarding efficiency in learning.

1.2 Statement of the Problem

Mobile learning initiatives in the education sector remain constrained by low adoption rates and its usage is far from reaching maximum potential until the gap between what is offered and what is used is bridged (Ghaziri 2013; Al-adawi *et al*, 2012). The unrealized potential of mobile learning adoption to the end users in Kenya is partly because learning institutions have focused more on the supply side (institutions related issues) and disregarded the demand or end users perspective (Choudrie *et al*, 2012; Arslan 2011). The role of the demand-side factors (end user-based) in bridging the gap between what is offered and what is used has not been emphasized, making learners in developing countries lag behind in usage of mobile learning system (Nikam *et al*, 2012).

There is inadequate research and development in mobile learning to inform the education sector's uptake of relevant applications. While attention has been focused on the technical issues of mobile learning adoption like infrastructure, registration, policy and process, the role of non-technical (end user-based) factors in the adoption of mobile learning has not been emphasized. The result has been a low usage level of mobile learning (Farrel, 2011) with existing installed mobile learning systems not being optimally utilized (Arslan 2013). Thus, the end user based factors that define the rate of mobile learning usage have not been addressed yet. The question of what model can best support bridging the gap between the availability of better mobile learning services and its adoption in the Kenyan education system forms the basis of this research.

1.3 Justification of the Study

This research sought to develop an end user factor model for adoption of mobile learning services. Results will contribute to the development of a customized model for successful mobile learning adoption in technical institutions. The results will provide technical training institutions with a new toolkit for adoption of mobile learning and guide them to be more responsive to end user-based factors as an option to increase the adoption rates. It will therefore be vital for technical training institutions to put these factors at the forefront of mobile learning implementation, help the other educational institutions both public and private deter from dissipating mobile learning services that may eventually not bring benefits because of low adoption rates. Once the model is applied, it is hoped to bridge the gap between the services offered and services used.

1.4 Objective

The main objective of this thesis was to develop a model that facilitates the end user factor model for adoption of mobile learning.

1.4.1Specific Objectives

The specific objectives of this dissertation were:

i. To identify usage factor requirements for successful mobile learning
ii. To describe a theoretical end user factor model that supports mobile learning
iii. To evaluate the proposed model with technical training institutions in Kenya

1.5 Research Questions

i. What are the usage factor requirements for a successful mobile learning?
ii. How well do these requirements relate to a theoretical model for mobile learning in Kenya?

iii. How can the proposed theoretical model be evaluated to establish its need in technical training institutions in Kenya?

1.6 Scope of the Study

The scope for this thesis covered the mobile learning subject, the area that was covered and the users who were selected for analysis as outlined below:

Subject Scope

The study focused on the mobile learning adoption model. It examined the existing mobile learning adoption models; identified the usage factors for mobile learning adoption with a focus on developing an end user factor model for adoption of mobile learning in Kenya.

Geographical Scope

This thesis was carried out with the technical training institutions in Kisii County (Kenya) and included learners, lecturers and principals.

1.7 Limitations of the Study

i) The study concentrated on mobile learning system and mobile learning end users thus caution needs to be taken when generalizing the findings and discussion to other electronic learning services and end users.

ii) The extended TAM model leaves out some of the factors that affect end users like subjective norms, power, distance, and self-efficacy among others. A few factors with technological effects were selected for this thesis .

iii) The limitation in terms of delays due to policy issues forced the research to be undertaken over a longer period than was anticipated for in the proposal. This increased the effects of technological updates.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review with a discussion on the theoretical review and conceptual framework, critique of the existing literature relevant to mobile learning, summary and the gaps expected to be filled.

2.2 The Theoretical Review

This thesis adopted nine models. To start with The Technology Acceptance Model by Davis;

2.2.1 The Technology Acceptance Model by Davis (1989);

The technology acceptance model (TAM) was proposed by Davis (1989). The Model was developed in light of concerns that workers were not using ITs made available to them. It is based on the theory of reasoned action, a social behavioral theory useful for understanding a variety of behaviors, (Fishbein, & Ajzen, (1975).

Carter and Belanger (2004) as cited in Maziar and Zuraini (2010) highlighted that Technology Acceptance Model (TAM) has been used by many researchers especially in information systems to achieve a better understanding of IT adoption and its success in organizations: Biasiotti and Nannucci (2006), Bhatnagar (2004) and such related work included Mobile learning, healthcare, and physicians: Park, (2009); Chau and Hu (2002); Chismar and Sonja (2003). TAM has proven to be a strong and robust framework to clarify adoption pattern of users, (Horton *et al*, 2001), cited in Maziar and Zuraini (2010). Chuttur (2009) admitted that several studies found significant statistical results for the high influence of perceived usefulness on behavioral intention to use a

specific system and these studies provided a strong evidence to support TAM as a model for predicting systems usage behavior.

2.2.2 Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003)

The UTAUT model posits four core determinants of intention and usage, namely performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh *et al*, 2003). The model considers gender, age, experience and voluntariness of use as moderators influencing the four direct determinants.

2.2.3 Factors Influencing Students' Acceptance of M-Learning in Higher Education by Ahmad Abu-Al-Aish and Steve Love

The results of Ahmad Abu-Al-Aish and Steve Love research extend the UTAUT in the context of m-learning acceptance by adding quality of service and personal innovativeness to the structure of UTAUT that provide practitioners and educators with guidelines for designing m-learning system. Venkatesh *et al*. (2003) proposal attempts to integrate and empirically compare elements from different technology acceptance models in technology acceptance. UTAUT theorizes that performance expectancy, effort expectancy, social influence, and facilitating conditions are direct determinants of behaviour intention or user behaviour.

2.2.4 The Mobile Learning Acceptance Model.

The Mobile Learning Acceptance Model by Sahu *et al*, (2004). In addition to PU and PEOU, has included perceived strength of control, top leadership involvement, policy and regulation that influence attitude towards using creating behavior intention to use and Mobile learning acceptance. Figure 2.1 demonstrates the Mobile learning acceptance model:

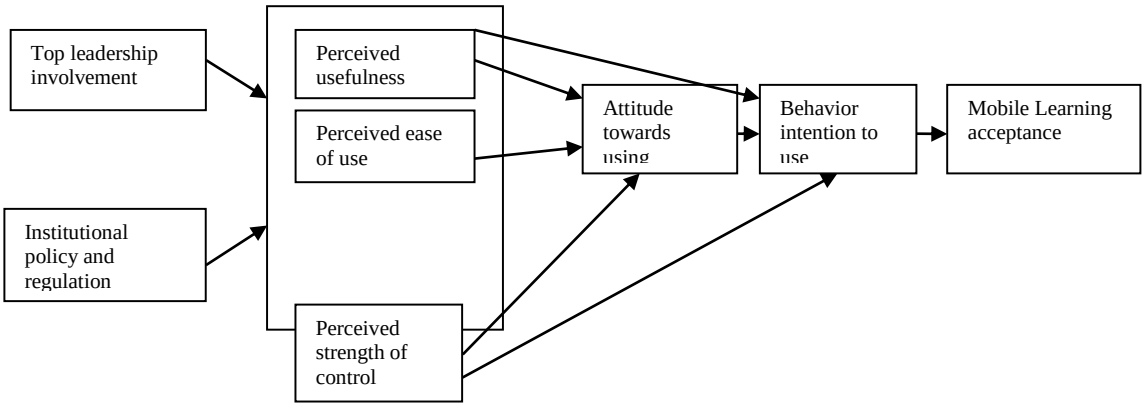


Figure 2.1: Mobile Learning Acceptance Model (From: Sahu *et al*, 2004)

This model sidelines most of the consumer-based factors including trust, attitudes, benefits, education, user support and training that are vital for successful Mobile learning adoption.

2.2.5 A Model of Mobile Learning Adoption

Proposed by Kumar *et al* (2007) in Canada, it added a new dimension of satisfaction on some of the factors identified in the other models. User characteristics (Perceived Risk, Perceived Control, Internet) and website design (Perceived Usefulness, Perceived Ease of use) are considered to have a direct influence on Mobile learning adoption, while service quality affects users satisfaction, which leads to recurring use of Mobile learning services and contributes to adoption as described by figure 2.2 below:

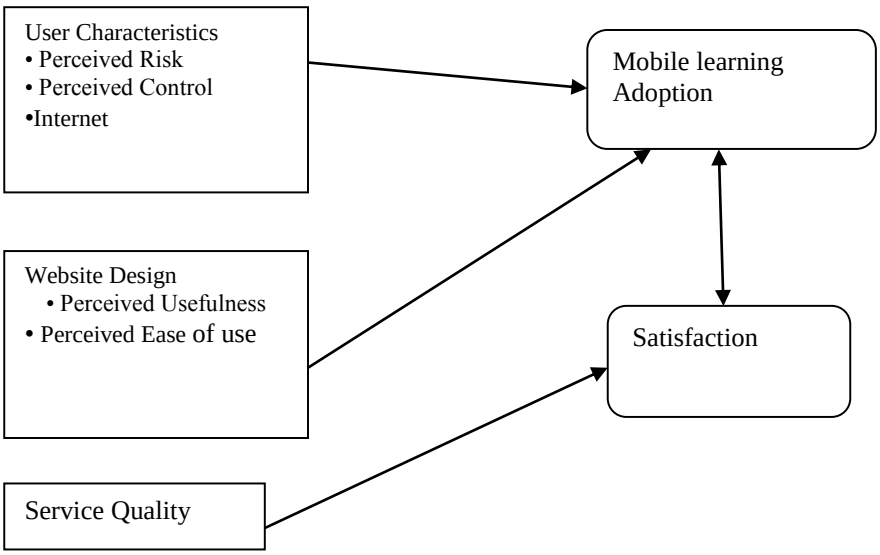


Figure 2.2: A Model of Mobile learning Adoption (From: Kumar *et al.*, 2007)

The conceptual model of Mobile adoption in the figure above is premised on the belief that Mobile learning adoption is largely shaped by the extent to which a training institution can provide a rich, engaging, and hassle-free experience that is reliable and can provide higher levels of satisfaction. This model ignores factors like trust, attitudes, education, training and user support that are seen as crucial for consumers in adopting Mobile learning service.

2.2.6 The Conceptual Model of User Adoption of Mobile learning By Al-Adawi *Et Al,* (2005)

The Conceptual Model of User Adoption of Mobile learning (Al-adawi *et al*, 2005) explained the intention towards the actual use of the website by postulating four direct determinants: perceived usefulness, perceived ease of use, trust, and perceived risk. This model agrees with TAM on perceived usefulness and perceived ease of use, but extends it further to include trust and perceived risk in access of technology which influence the individual's behavior that impact on Mobile learning adoption.

Much as it is a conceptual model of user adoption of Mobile learning, most of the factors that directly affect these users like attitudes, training and user support are left out.

2.2.7 A Model for Successful Mobile adoption.

A model for successful Mobile learning adoption is developed by Sarkar, (2007**)**. It addresses the policy makers, advisory committee, consultants, decision makers, development agency groups, implementing agencies or groups, stakeholders and progress monitoring committees.

This model addresses the supply-side factors of Mobile learning adoption which is enforced from the learning institution but does not consider the demand-side factors which are the consumer-based factors that include trust, attitudes, education, training and user support as being core in Mobile learning adoption.

2.2.8 A Model for Mobile Learning Adoption

It was proposed by Bwalya and Healy, (2010) in the SADC region includes other factors - language of content (both English and local language), perceived risks and local culture, ICT infrastructure and lower costs, data privacy, a dedicated and appropriate user support mechanism, appropriate legal, regulatory and institutional frameworks in addition to the variables in TAM as illustrated in figure 2.3 below:

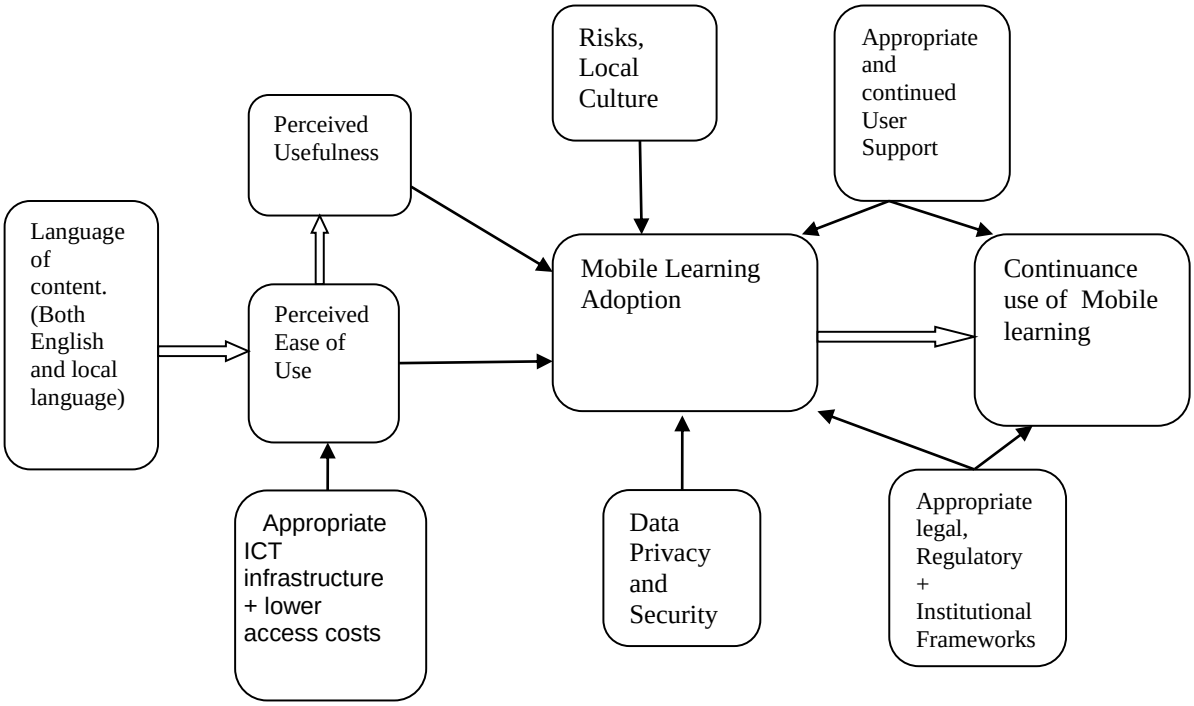


Figure 2.3: A model for Mobile adoption (From: Bwalya & Healy, 2010)

All these factors in figure 2.3 above are seen to influence Mobile learning adoption and continuance in the use of Mobile learning processes. However, some of the factors that affect consumers like trust, attitudes, education and training, are sidelined.

2.2.9 A Model of Mobile Learning Adoption

Warkentin *et al,* (2002) proposed a conceptual model of Mobile learning adoption with users trust as the underlying catalyst for adoption. The variables in the conceptual model are perceived risk, perceived behavioral control, perceived usefulness, and perceived ease of use, power distance and uncertainty avoidance. Perceived risk is defined as "the fear of losing personal information and fear of being monitored on the internet. If a user had control over how personal information is going to be used, and the

control of how and when information can be acquired, adoption of Mobile learning could be possible according to this model." Power distance is considered as the "distance between the upper and lower castes of the society stating that users in higher power distance countries are more likely to adopt Mobile learning than those in lower power distance countries", (Warkentin *et al.* 2002). This model however ignores some factors like trust, attitudes, education, accessibility, user support and training that are important for Mobile learning adoption.

Having considered the nine models this thesis summarizes them as presented in the following table 2.1.

Table 2.1: The Adoption Models Compared Against Identfied Consumer Based Factors

Consumer-based factors	Davis [1989]	Venkatesh et al. 2003)	Sahu et al [2004]	Al-adawi* [2005]	Sarkar, [2007]	Bwalya &Healy, [2010]	Kumar et al [2007]	Warkentin et al, [2002]
Trust	X	X	X		X	X	X	
Benefits	X	X	X	X	X	X	X	X
Attitudes	X	X	X	X	X	X	X	X
Training	X	X	X	X	X	X	X	X
User support	X		X	X	X		X	X
Education	X	X	X	X	X	X	X	X

It is evident that most of these adoption models agree with TAM model on perceived usefulness and perceived ease of use: (Venkatesh *et al*, 2003) (Al-Adawi *et al*, 2005); (Bwalya & Healy, 2010); (Kumar *et al*, 2007); (Sahu *et al*, 2004) and (Warkentin *et al*, 2002) except (Sarkar Saibal, 2007). However, in comparison with the consumer factors

identified, it's evident that most of these models do not consider the consumer-based factors for Mobile learning service adoption. This confirms the argument that they need to be customized to suit the different contexts of individual developing countries (Prattipati, 2003). Secondly, these models have largely been used in more developed countries and cannot easily be applied in developing countries without taking into consideration the country's specific conditions and context.

In conclusion, from the different Mobile learning / IT adoption models presented above, this literature review reveals that the question of what model best supports Mobile learning adoption remains unanswered.

From the comparison this thesis purposively opted for TAM model.

2.3 The Critiques of the Existing Literature Relevant to the Study

Usage factors are the reasons people buy (and use) certain products over others, (Briggs, 2012). Daniel (2012) observe that mobile learning adoption is more than a technological matter since it is influenced by many factors including infrastructure, human resource, and cultural issues which are important forces and they relate to the nature of institutions and responsibility in the society. In addition, the adoption of mobile learning in education systems requires time and a framework approach to adopt such systems (World Bank 2013). Usage factors that affect learners in the adoption of mobile learning include trust, benefits, attitudes, education, training and user support.

Trust: McKnight (2008) defined trust as an expectation that alleviates the fear that one's exchange partner will act opportunistically, while Hevner (2012) defined it as a belief that others will behave in a predictable manner. Trust is an important catalyst of Mobile learning adoption, (Hevner, 2013). Hevner further asserted that users must have a strong trust in the security of electronic communications in order for Mobile learning to succeed and prosper. According to Matthew (2014), trust is the single most determining factor for people to engage in Mobile learning applications dealing with sensitive

information such as fee payment (bank card details, etc) or personal information, trust is a central defining aspect of many economic and social interactions and define trust as a belief that others will behave in a predictable manner. Tolnatsky (2011) defined mobile learning as a way to develop learners trust. TOI has been identified as a key predictor of web-service adoption (Maja & Mitja 2011). Kumar (2010) considered TOI as institution-based trust which refers to an individual's perceptions of the institutional environment, including the structures and regulations that make an environment feel safe. Shapiro (2012) argued that institution-based trust is basically trust in the Internet: trust in the security measures, safety nets and performance structures of this electronic channel. Trust of the Mobile learning in the education sector refers to one's perceptions regarding the integrity and ability of the agency providing the service, (Lee & Turban, 2011). Gefen *et al* (2012) affirmed that trust in the agency has a strong impact on the adoption of a technology arguing that before endorsing Mobile learning initiatives, users must believe on institutions agencies possess the astuteness and technical resources necessary to implement and secure these systems.

Benefits: Kamal and Themistocleous (2012) stated that for an African perspective, the intention to engage in mobile learning is also partially influenced by the perceived benefit of using such a platform and this perceived benefit can be looked at as a return on investment (ROI) of one's time, effort, financial investment, and psychological, of engaging technology to seek a platform with the training institution. If the return on such basic investment is low, it is anticipated that an ordinary African will go for the traditional way of interaction with the institution.

Attitudes: Schwitzgebel (2012) defined attitudes as constructs that represent an individual's degree of like or dislike for something. Attitudes are generally positive or negative views of a person, place, thing, or event. Vassilakis *et al* (2012) observed that some people may have a negative attitude towards electronic services and that they would prefer to stay with traditional methods, which for most is the paper-based way

and in this case attitudes toward using mobile learning represent one of the main barriers for Mobile learning adoption.

Education: It is any act or experience that has a formative effect on the mind, character or physical ability of an individual and in its technical sense; it is the process by which society deliberately transmits its accumulated knowledge, skills and values from one generation to another, (Wikipedia, 2013). Pons (2013) observed that there are three key elements of education that should be considered for successful adoption for any technology: awareness of the internet; understanding of the internet; and workers with information technology skills. Jaeger (2013) described education as one of the problems related to mobile learning adoption, suggesting that as users' education rises, their knowledge in using the internet increases. The most frequent use of mobile learning information and services comes from populations who are experienced in using the internet as a technology (Hamilton, 2012).

Facilitating Conditions (training): Facilitating conditions include dimensions like resource factors (such as time and money needed) and technology factors regarding compatibility issues that may constrain usage. Training and provision of support are included in the context of workplace technology use, (Thompson, 2013; Venkatesh & Davis, 2012). Triandis (2009) on the other hand viewed facilitating conditions as external controls related to the environment. The author believes that behavior cannot occur if objective conditions in the environment prevent it or if the facilitating conditions make the behavior difficult. Policies, regulations, and legal environment are therefore all conditions critical to technology acceptance. Individual's facilitating resources are possible barriers to user acceptance of Mobile services (Thompson, 2013).

User support: Bwalya (2010) hypothesized that a dedicated and appropriate user support mechanism may assure individual users of appropriateness of engaging in mobile learning and this will positively impact on both mobile learning adoption and continuance use of the web in learning.

2.4 Conceptual Framework

This thesis adopted TAM and factor model as presented in the figure 2.4 below.

According to Nigel (2010), usability is closely related to ease of use and Usage factors that enhance perceived usefulness are trust, training, user support, benefits, attitudes and education. Davies defined PU as "the degree to which a person believes that using a particular system would enhance his or her job performance and Perceived Ease of Use as the degree to which a person believes that using a particular system would be free of effort".

The following figure represents the conceptual model for the end user factor model for mobile learning.

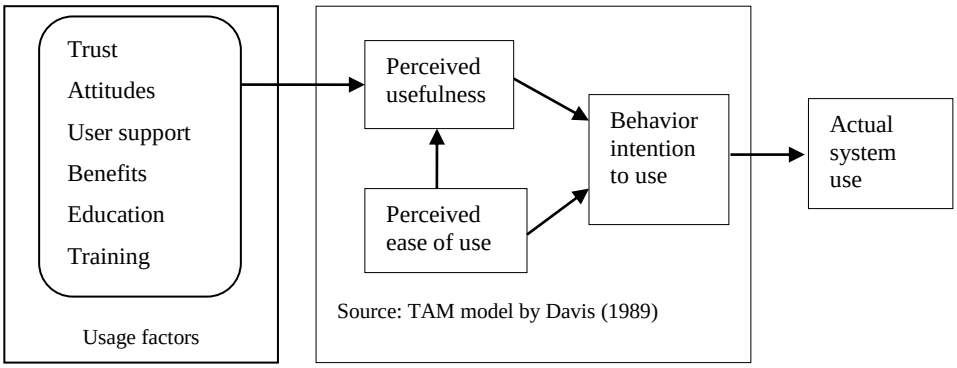


Figure 2.4: A Proposed Conceptual Model for End User Factor Model for Adoption of Mobile learning

The conceptual framework for the end user factor model for adoption of mobile learning illustrated in figure 2.4 above combines the strengths of the Technology Adoption Models with the usage factors. The usage factors are independent variables and perceived usefulness is a dependent variable while perceived ease of use is a moderating variable. For end users to perceive mobile learning as useful, usage factors must be addressed.

2.5 Summary

From the above discussion, there is little doubt that a learner centered approach to technical training is the most effective and sustainable way forward. Whether in developed or developing economies, the real needs of the constituents must be given paramount consideration and it is over-simplistic to believe that there can be a "one size fits all" model of mobile learning. Models and solutions that work well for one economy may not work for another, therefore every institution needs to feel the pulse of its people, and be able to design and deploy its programs accordingly.

Apart from the Technology Acceptance Model developed by Davis, the following also developed theories in support and criticize of Davis (1989) where: (Al-Adawi *et al*, 2005); (Bwalya & Healy, 2010); (Kumar *et al*, 2007); (Sahu *et al* ,2004) and (Warkentin *et al*, 2002) except (Sarkar Saibal 2007) models agree with TAM model on perceived usefulness. However, in comparison with the consumer factors, most of these models do not consider the consumer-based factors for mobile learning adoption. This confirms the argument that they need to be customized to suit the different contexts of individual developing countries (Prattipati, 2011). Secondly, these models have largely been used in more developed countries and cannot easily be applied in developing countries without taking into consideration the country's specific conditions and context.

That is the essence of an end user factor model for adoption of mobile learning in Kenya as a learner centered curriculum delivery in technical training institutions.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology of the study. Research design, target population, Sampling techniques and illustrations are presented. Also presented in this chapter are the reliability of the questionnaires and data collection procedures. Model description and evaluation is also presented in this chapter.

3.2 The research Design

Research design is a plan of action that gives direction to your efforts, enabling you to conduct research systematically rather than haphazardly, (Ferguson, 2005). The two broad methods of reasoning designs are the deductive and inductive logic approaches, (Aqill & Mahmood, 2006).

In this thesis both inductive and deductive research designs were used. Inductive design is a theory building strategy and in this case end user factors are important for mobile learning model to be adopted. Deductive strategy is a theory testing research strategy. Models of Mobile learning adoption do exist and end user factors important for Mobile learning adoption also exist. In this thesis therefore, deductive research strategy was used to criticize the existing models and confirm the end user factors for mobile learning adoption with the aim of developing a model that best suits user adoption. Questionnaires were used to answer both quantitative and qualitative descriptive field study.

Qualitative and quantitative research are the two main types of research and reflect differing underlying philosophies and assumptions as reflected in the methodologies used and type of problem investigated, (Strauss and Corbin 2004). The other types are mixed method research and design science.

Mixed method research was used in this thesis. Mixed research is a general type of research (it's one of the three paradigms) in which quantitative and qualitative methods, techniques, or other paradigm characteristics are mixed in one overall study, Tashakkori &Teddlie, 2003)

Muhammad (2012) defines quantitative research as a formal, objective, systematic process in which mathematical data are utilized to obtain information about the world. According to Shank (2009), qualitative research is a form of systematic (following rules) empirical (grounded in experience) inquiry into meaning. Inquiry into meaning says researchers try to understand how others make sense of their experience.

To answer the research questions and attain the stated objectives, a mixed research design which combines both quantitative and qualitative methods of study were used: Mixed research method was chosen because it provides several advantages over use of only quantitative or qualitative research method or other approaches. Some of these advantages include:

i. Mixed methods provide researchers with the ability to design a single research study that answers questions about both the complex nature of phenomenon from the participant's point of view and the relationship between measurable variables, (Williams, 2010).
ii. Mixed methods approach to research helps to draw from the strengths and minimize the weaknesses of the quantitative and qualitative research approaches, (Johnson & Onwuegbuzie 2004)
iii. A mixed method complements results from one type of research with another thus helping to research a process or a problem from all sides, (Johnson & Onwuegbuzie, 2004).

The mixed methods research process suggested by Woodgate and Wilkins (2011) was followed and the nine step process is briefly explained in relation to this thesis.

Step one provided for definition of the problem and this thesis identified the problem of mobile learning as low adoption rates caused by users focusing more on the supply-side factors with less emphasis on the demand / end user-side factors.

Step two determined the rationale for conducting mixed methods research for this thesis. The rationale used in this thesis was development because the researcher used the results from one method to help develop or inform the use of the other method, the quantitative results was used to develop an end user factor model for adoption of mobile learning for educational system in Kenya.

In step three a mixed methods research design was selected. Giddings and Grant, (2010) and Tashakkori and Teddlie, (2003) asserts that the two primary mixed method research designs are concurrent and sequential designs mixed method research. In the concurrent design, quantitative and qualitative methods are used at the same time, while in the sequential design one method is used first, followed by the other. For this thesis, sequential design was used because the purpose of the sequential design was for the data from one method to build on the other. Driscoll *et al*, (2010) observe that there is no discrete list of mixed methods design options as yet; thus, researchers should plan to develop a design that answers their own research questions within the constraints and boundaries of the study context.

In step four, a sample is selected. In this thesis, Nasiuma (2000) formula was used to determine the sample size of respondents from a wider population.

Step five provided for data collection from the respondents in the sample size. In the sequential design, one data set is collected first and the results inform the second data set. In this thesis, quantitative data was collected on the end user factors for mobile learning using semi-structured close-ended questionnaires and qualitative data collected through an open-ended interview guide and the information used as requirements for developing the end user factor model for mobile learning adoption model.

Step six provided for the analysis of data. Data collected in this thesis was compiled, entered, edited for accuracy and clarity, sorted and classified using a computerized data analysis package /tool known as Statistical Package for Social Science 17.0 (SPSS) and MS-Excel statistical packages for analysis.

Step seven provided for interpretation of data. In this thesis, interpretation was carried out by relating findings to existing theories (literature) and the analysis was carried out according to the research questions. This culminated into the development of the end user factor model for Mobile learning.

Step eight provided for the validation of data. In this thesis, the developed model was evaluated using semi-structured close-ended questionnaires given out to users.

The last step provided for reporting of findings.

Mixed model research (concurrent) – is research in which the researcher mixes both qualitative and quantitative research approaches within a stage of the study or across two of the stages of the research process, Tashakkori and Teddlie (2003). Driscoll *et al,* (2007) observes that there is no discrete list of mixed methods design options as yet; thus, researchers should plan to develop a design that answers their own research questions within the constraints and boundaries of the study context.

Philosophy in Mixed Research Methods

According to Trochim *et al* (2011) as cited by Yonazi (2013), a research philosophy refers to the perspectives that researchers possess in the process of knowledge development. It provides an understanding of the values and assumptions underlying a particular investigation and encompasses issues concerning the nature of reality, what can be known, and how it can be known (Crossan, 2011). Greene, (2012) identifies four philosophies in using the mixed methods researcher: positivism, constructivism, pragmatic perspectives, and transformative perspectives. Pragmatism asserts that

researchers should use the approach or mixture of approaches that works the best in a real world situation. In short, what works is what is useful and should be used, regardless of any philosophical assumptions, paradigmatic assumptions, or any other type of assumptions. A transformative perspective suggests an orienting framework for a mixed methods study based on creating a more just and democratic society that permeates the entire research process, from the problem to the conclusions, and the use of results (Vaishnavi & Kuecheler, 2013).

This thesis adopted the pragmatic research philosophy because according to Burke *et al*, (2011), today, the primary philosophy of mixed research is that of pragmatism. Pragmatism allows mixing data collection methods and analysis procedures within the research process in a way that suits the research questions and researchers should use the approach or mixture of approaches that works the best in a real world situation. Pragmatism supports using both quantitative and qualitative methods, a mixed research design and methodological triangulation. It also provides several advantages over mono-methods approaches (Creswell *et al.*, 20011; Greene, 2012).

The major activities that were conducted to achieve the specific objectives of the research include the following:

i. Literature Review on examination of the current information on mobile technologies, a discussion on end users of mobile learning, end user factors important for mobile learning adoption, existing technology adoption models applicable to ML and finally the conceptual model for mobile learning adoption for end users.
ii. A descriptive field study for requirements determination
iii. Description of the end user factor model for adoption of mobile learning
iv. Designing of the model and evaluate it with the technical training institutions in Kenya

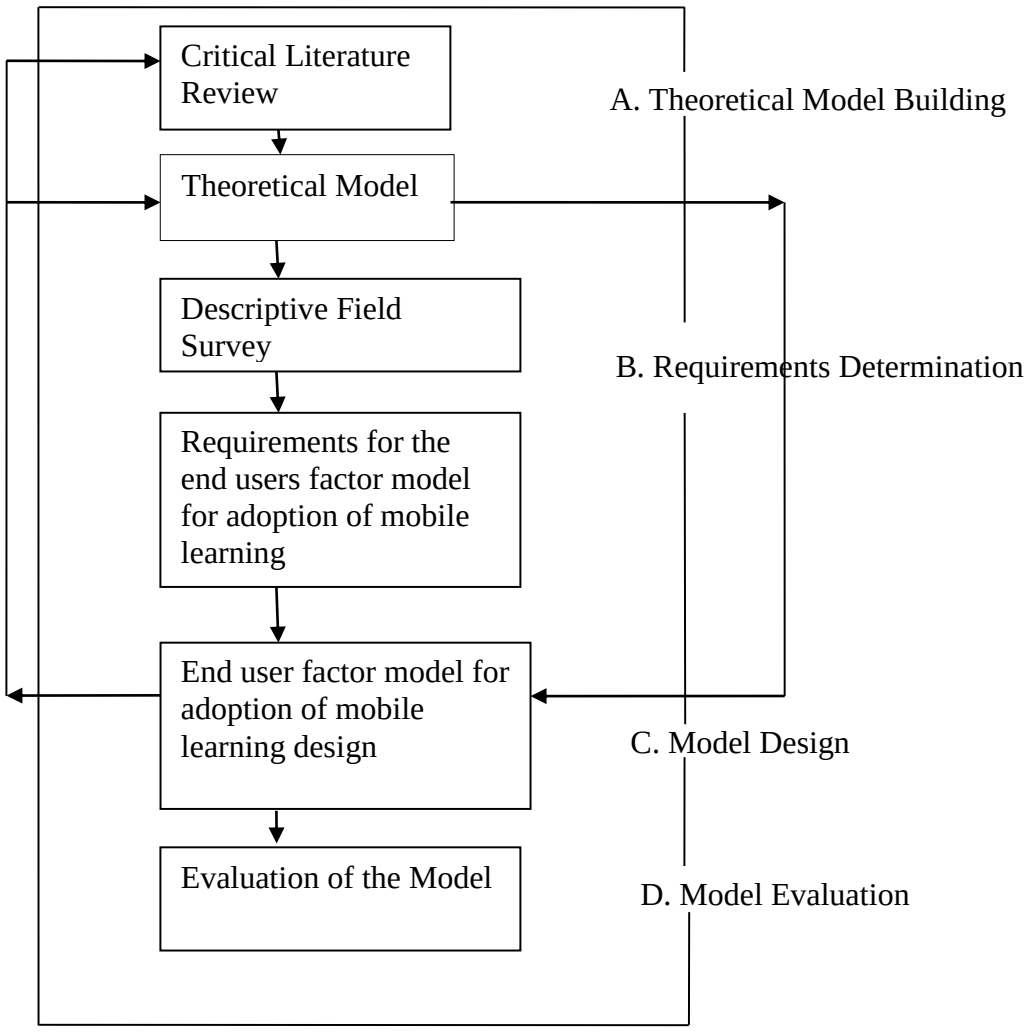


Figure 3.1: Overview of the Major Activities in the Research Design

3.3 The Target Population

The study targeted 6 technical training institutes and 34 youth polytechnics in Kisii county. Included in the study were 12 principals, 456 lecturers and 9,685 students in the Kisii county Kenya. This gave an approximate target population of 10,153 respondents.

3.4 Sampling Techniques and Illustrations

Sampling is process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group (Mugo, 2006). Mugo further explains that a sample is capable of capturing the important factors for successful mobile learning of the defined population as long as it's properly constituted. The quality of any research is influenced by the appropriateness of methodology, instrumentation and suitability of the sampling strategy that has been adopted (Woodgate and Wilkins, 2011). Purposive, stratified and simple random sampling will be used in the study. Table 3.1 and 3.2

Table 3.1: Sample size of end users to be selected from each category of institutions

Category for Institution	**N**	**N**
Technical institutes	6	2
Youth polytechnics	34	10
Total	**40**	**12**

Source: compiled from field data 2013

From the 40 institutions the researcher used random sampling to obtain 30% of the institutions. Gay (1992) observes that a sample of 10% is considered minimum for a small population and 30% for a large population.

Nasiuma (2000) asserts that the sample size is determined by the following formulae.

$n = (Ncv^2) / (cv^2 + (N-1)\, e^2)$

Where N is the target population, CV is the coefficient of variation; e is tolerance at desired level of confidence at 95% level of confidence (take 0.05) and n is the sample size.

$$n = \frac{9685 \times 0.5^2}{0.5^2 + (9684)\, 0.05^2}$$

$$= \frac{2421.5}{24.46}$$

$$= 99 \text{ students}$$

The proportion of the respondents was obtained using the formulae below;

$$N = \sum pi\, n$$

Where:

n is the sample population (99 students) as calculated above.

P_i is the proportion in the sub- group in the target population.

For each sub – group:

Technical institutes represents (2/12 x 99) = 17 students

Youth polytechnics (10/12 x 99) = 82 students

Using the same formulae, sampling for teachers was shown below:

$$n = \frac{456 \times 0.5^2}{0.5 + (455)\, 0.05^2}$$

$$= \frac{114}{1.3875}$$

$$= 82 \text{ lecturers}$$

By using the above formulae the proportion of the respondents (teachers) were;

Technical institutions = 2/12 x 82 = 14 lecturers

Youth polytechnics = 10/12 x 82 = 68 lecturers

Category of institutions	Sampled institutions	Lecturers	Students
Technical institutions	2	14	17
Youth polytechnics	10	68	82
Total	**12**	**82**	**99**

Table 3.2: Number of lecturers and students selected from sample technical institutions

The 34 youth polytechnics from Kisii county were put into 3 strata and the 6 technical institutes into 2 strata based on their status as enrolment and capacity of staff. Random sampling was used to pick 10 youth polytechnics and 2 technical institutes from all the strata. All principals from the selected institutions were included in the study hence the study sample size constituted of 82 lecturers, 99 students and 12 principals making a total of 193 respondents.

3.5 Reliability of the Questionnaire and Validity of the Constructs

Reliability is the extent to which results are consistent over time. If the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable, Joppe (2009). The constructs in the study were examined for reliability using the Cronbach's alpha on all the sections of the questionnaires. Before making the final questionnaire, 20 questionnaires were administered to twenty (20) respondents to check for validity and reliability and their corrections effected.

Validity determines whether the research truly measures that which it is intended to measure or how truthful the research results are, (Muhammad *et al,* 2013). Factor analysis was conducted to examine convergent and discriminant validity using SPSS. Factor analysis is statistically used to determine the correlation among variables in a dataset and provides a structure to group variables based on strong correlations helping to detect misfit variables. Principal Component Analysis was used with Varimax Kaiser

Normalization as it considers all the available variance. Convergent validity indicates the degree to which the items that are measuring the same construct are correlated. Discriminant validity on the other hand is indicated by the degree to which the variables on the factors are distinct and uncorrelated.

3.6 Data Collection Procedures

An interview guide was used to collect qualitative data that helped gain understanding of the end user factor requirements for mobile learning adoption model. Data was then collected using semi-structured close-ended questionnaires in a descriptive survey to determine the requirements for the end user adoption model. Semi-structured close ended questionnaires were administered to principals, lecturers and students of technical training institutions in Kisii county who constituted the key informants. This instrument was chosen because it had the ability of collecting accurate primary data. The questionnaires were therefore checked for reliability and content validity before distribution was done to the respondents to minimize errors.

3.7 Data Processing and Analysis

To identify the requirements for designing the end user factor model for adoption of mobile learning, the researcher analyzed the findings from the respondents to determine their views on the subject matter of this research. A descriptive analysis of the data using frequency tables, bar charts and pie charts were carried out prior for estimation of the model. Factor analysis was used with Principal Component Analysis and Varimax rotation method (with Kaiser Normalization) to determine the rotated component matrix that identified the most significant requirements needed to design the end user factor model for adoption of mobile learning.

Before data collected was analyzed, it was first coded. Data Coding is assigning key numbers or values to each response to ease input while data analysis involves the process of summarizing the data collected. Data collected was both quantitative and

qualitative. The researcher designed simple codes to ease the entering and analysis of data. The respondents' opinions was numbered at ranges of 1 – 5 for section B. Data collected was then compiled, entered, edited for accuracy and clarity, sorted and classified. Data was then analyzed using a computerized data analysis package tool known as Statistical Package for Social Science 17.0 (SPSS) and MS-Excel statistical packages for analysis. A frequency distribution was used to show the variable name and description, frequency counts for each value of the variable, and cumulative percentages for each value associated with a variable" (Hair *et al*, 2010). Statistical tools such as means and standard deviation were carried out to determine the reliability and validity of the data. The researcher then interpreted the data collected by relating findings to existing theories and the analysis was carried out according to the research questions.

3.8 Model Description

The end user factor model for adoption of mobile learning requirements was identified in a field study: trust, benefits, attitudes, education, training, and user support. These end user factor requirements were used together with the Technology Acceptance Model (TAM) developed by Davis (1989) to develop the theoretical end user factor model for adoption of mobile learning Unified Modeling Language. This will answer the second research question.

3.9 Model Evaluation

To establish the need for the end user factor model for adoption of mobile learning, the instrument was pre-tested with 10 questionnaires administered to ten (10) respondents and the corrections effected before data collection. This was then used to collect data for validation of the developed end user factor model for adoption of mobile learning.

Multiple regression analysis was used to explain the relationship between perceived usefulness and the perceived ease of use (dependent variable) and the end user factors (independent variables). This step addressed the third research question.

CHAPTER FOUR

RESULTS PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents the findings and the analysis of the field study used to elicit requirements for the End User Factor Model for adoption of Mobile learning. The output of this chapter answers a research question and meets one specific objective of this thesis : To identify end user factor model factors for successful adoption of Mobile learning. The results on demographic data is presented. Findings on end user factors for mobile learning adoption are also presented in this chapter. Also presented is the analysis of the results findings from descriptive field study focusing on demographic data and the end user factors for adoption of mobile learning model. Information on the model design is discussed in this chapter starting with the theoretical contribution of TAM, requirements for designing the model and the actual design of the model using UML Use Cases.

4.2 Presentation of the Findings of the Field Study

The section presents the summary and interpretation of the findings analyzed from data collected through questionnaires issued to the end users of mobile learning at Kisii county Kenya. The respondents included students, lecturers and principals of technical training institutions. Out of a total of 193 (one hundred and ninety three) respondents who were given the questionnaires, 146 (one hundred and forty six) returned valid filled questionnaires showing a response rate of 75.6%. The data collected was then categorized, quantified, coded and arranged in themes with respect to the objectives of the study using frequency tables bar charts and line graphs. Data analysis was done using statistical package for social sciences (SPSS). The analyzed data is presented along the themes of general information, End User Factor Model for Adoption of mobile learning.

4.2.1 Technical Institution of the Respondents

Figure 4.1 below shows the number of respondents from the technical institutes and those from youth polytechnics that were selected to represent the technical training institutions.

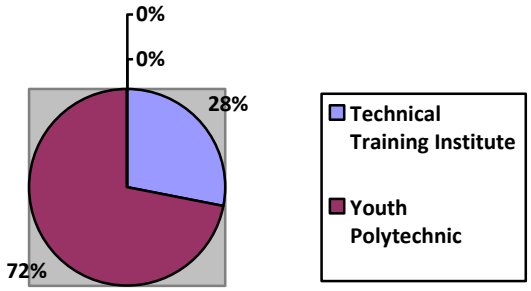


Figure 4.1: Technical Training institution the respondent was attached to

Results obtained from the study indicates that the 105 of the respondents were from the youth polytechnics and 41 were from the technical training institutes that comprised of 71.9% and 28.1% respectfully.

4.2.2 Position of the Respondents at the Institution

This thesis investigated the position of the respondents at the institution and the results are presented in figure 4.2 below:

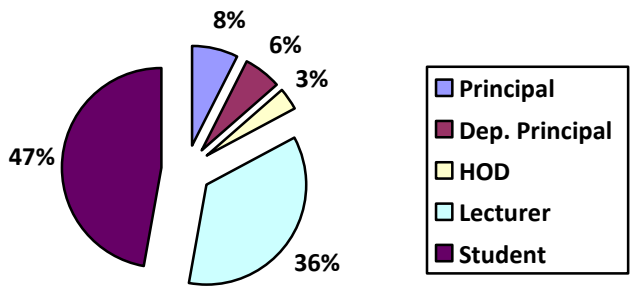


Figure 4.2: Position of Respondents at Institution

Results in the figure above indicated that 47% of the respondents were students with. Others were; Lecturers, principals, deputy principals and heads of departments with representations of 36%, 8%, 6% and 3% respectively.

4.2.3 Duration the Respondent had stayed at the Institution

The study investigated the duration the respondents had stayed at institution Results in the table below indicated that most respondents had stayed at the institution for less than 2 years and constituted 43.8%. Respondents who had stayed between 6 and 10 years were 24.7% and those of between 3 and 5 years, and more than 10 years were 13.7% and 17.8% respectively. This data is shown in the primary data source in table 4.1 below.

Table 4.1: Duration the Respondent had stayed at the Institution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 2 years	64	43.5	43.8	43.8
	3-5 years	20	13.6	13.7	57.5
	6-10 years	36	24.5	24.7	82.2
	More than 10 years	26	17.7	17.8	100.0

4.2.4 Age group of the respondents

This thesis investigated the age group of different respondents in the institutions and the results are presented in table 4.2 below.

Table 4.2: Age group of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 20 years	7	4.8	4.8	4.8
	20-30 years	70	47.6	47.9	52.7
	31-40 years	52	35.4	35.6	88.4
	Above 40 years	17	11.6	11.6	100.0
	Total	146	99.3	100.0	
Missing	System	1	.7		

4.2.5 Highest Formal Education and Training Attained

The study investigated the highest formal education and training by the respondents in the various institutions and the results are summarized in figure 4.3 below;

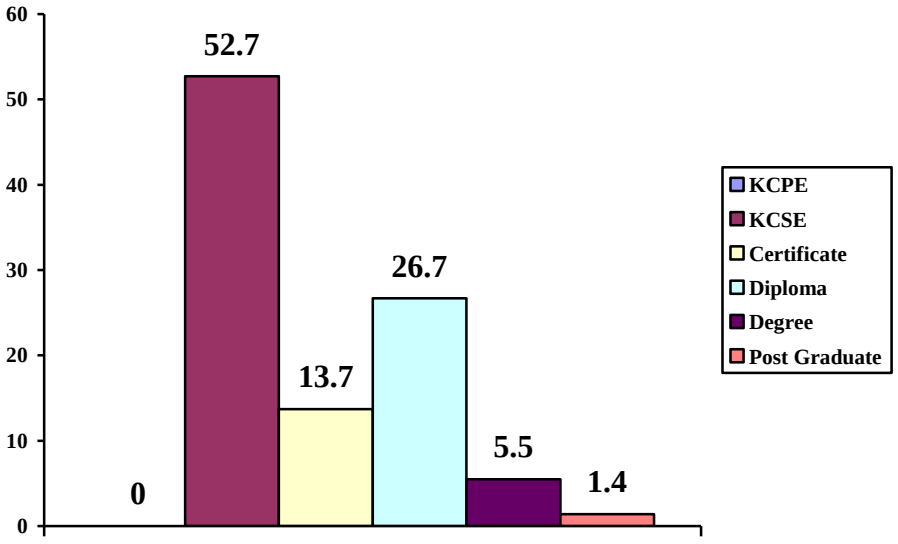


Figure 4.3: Highest formal education and training attained by respondents

The findings on the highest formal education training attained by respondents indicated that most of the respondents had basic education of KCSE with 52.7%, 26.7% were diploma holders, degree holders were 5.4%, 1.4% had post graduate, 13.7% were certificate holders and no respondent had KCPE. This implied that the respondents understood the instrument as shown in the primary data.

4.2.6 Mobile learning Adoption Benefits

Data was collected on the respondents' level of agreement that adopting mobile learning services was beneficial and the results are presented in figure 4.4 below:

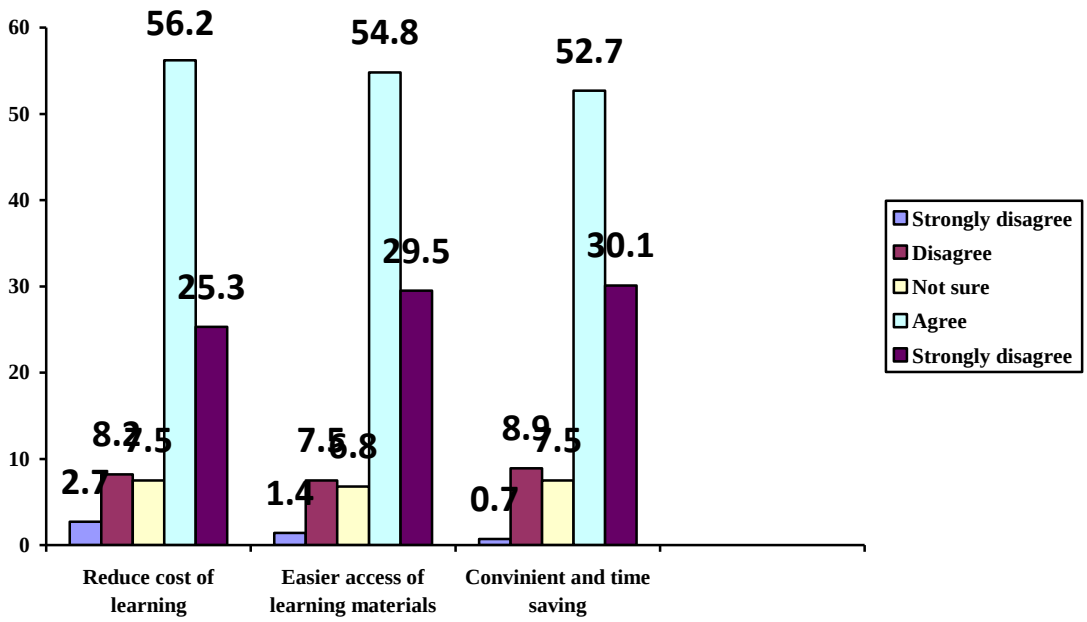


Figure 4.4: Mobile learning adoption benefits

Results on the benefits of mobile learning adoption in show that 2.7% of the respondents strongly disagreed that the mobile learning is capable of reducing the cost of learning, 8.2% disagreed, 7.5% were not sure, 56.2% agreed while 25.3% strongly disagreed. Findings also revealed that 29.5% of the respondents strongly agreed that it was easier to access learning materials with mobile learning and 54.8% agreed while 7.5% disagreed, 6.8% were not sure and 1.4% strongly disagreed. Only o.7% of the respondents strongly disagreed that the mobile learning is capable of ensuring convenience and saves time in

the learning process, 8.9% disagreed and 7.5% were not sure while 52.4% agreed and 29.9% strongly agreed.

4.2.7 Trust in mobile learning

The study evaluated the respondents' level of agreement that the identified factors contribute to trust and therefore mobile learning adoption. The findings are as summarized below;

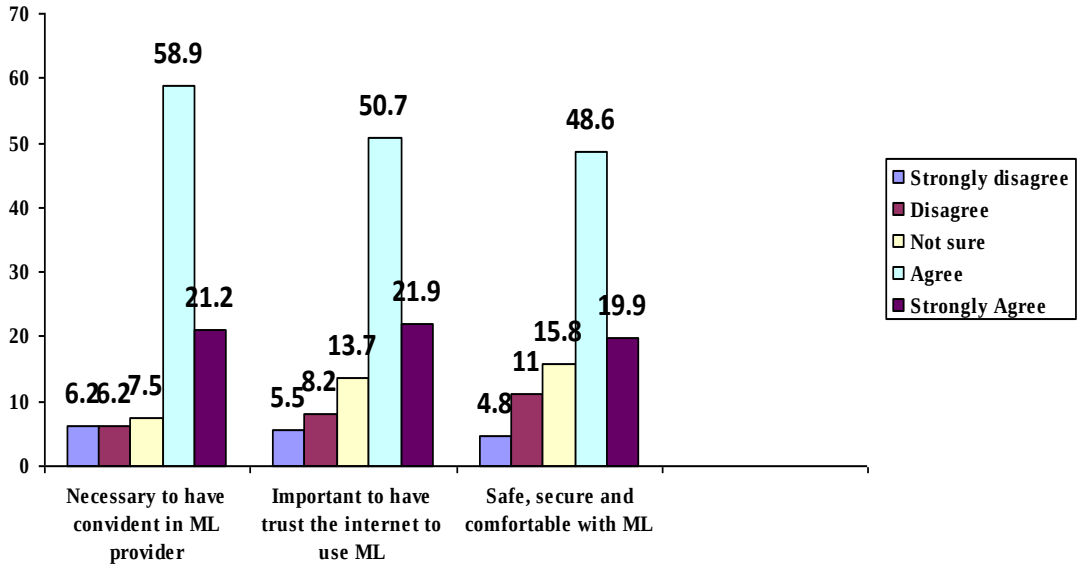


Figure 4.5: Trust Factors Contribution to Mobile Learning Adoption

Results in figure 4.5 above on the factors that contribute to trust and therefore mobile learning adoption showed that 21.2% of the respondents strongly agreed that it is necessary to have confidence in the mobile learning provider (institution) to trust the system and hence mobile learning adoption, 58.9% agreed, 7.5% were not sure, 6.2% disagreed and 6.2% strongly disagreed. 21.9% of the respondents strongly agreed that it is important to trust the internet to use the mobile learning system that contribute to trust hence mobile learning adoption and 50.7% agreed while 13.7% were not sure, 8.2%

disagreed and 5.5% strongly disagreed. 19.9% of the respondents strongly agreed that they felt safe, secure and comfortable when using the mobile learning system that contribute to trust hence mobile learning adoption, 48.6% agreed, 15.8% were not sure, 4.8% disagreed and 11% strongly disagreed.

4.2.8 Attitudes towards Use of mobile learning

Respondents' view on their level of agreement that these attitudes/perceptions make them shy away from use of mobile learning systems was analyzed and the findings are as summarized below;

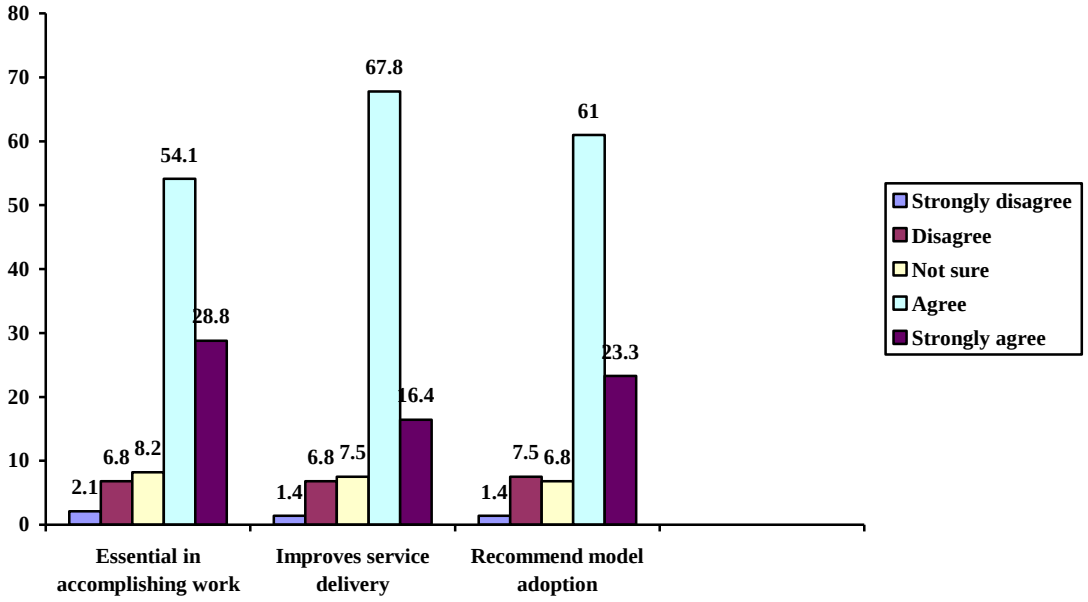


Figure 4.6: Attitudes Towards Mobile Learning

According to the findings in figure 4.6 on the agreement that these perceptions make people shy away from mobile learning, 28.8% of the respondents strongly agreed that mobile learning is essential in work accomplishment and 54.1% agreed while 8.2% were not sure, 6.8% disagreed and 2.1% strongly disagreed. 16.4% of the respondents

strongly agreed that adoption of the mobile learning system will improve service delivery in a learning institution, 67.8% agreed, 7.5% were not sure, 6.8% disagreed and 1.4% strongly disagreed. 23.3% of the respondents strongly agreed with the recommendation that the end user factor model for adoption of mobile learning be adopted in Kenya and 61.0% agreed while 6.8% were not sure, 7.5% disagreed while 1.4% strongly disagreed.

4.2.9 Responses on training (TRN) on mobile learning Services

The study also evaluated the training on the mobile learning services and the findings are as indicated in figure 4.7 below;

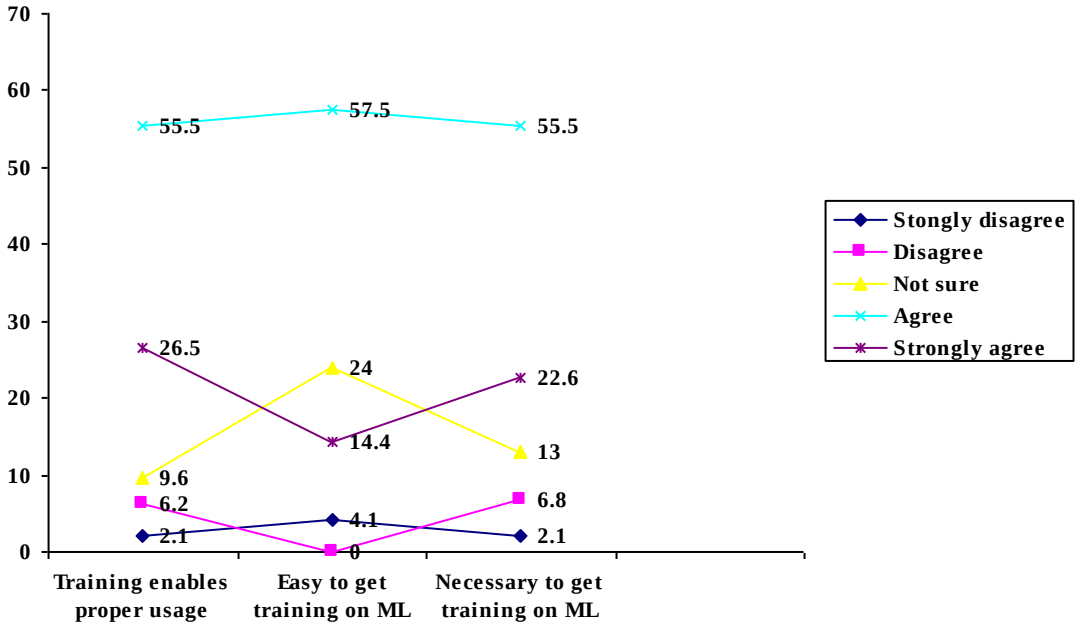


Figure 4.7: Training On Mobile Learning Usage

According to the findings of the respondents' on training and proper usage of mobile learning, 26.7% of the respondents strongly agreed that training in the use of mobile learning system will enable them the system properly and 55.5% agreed while 9.6%

were not sure, 6.2% disagreed and 2.1% strongly disagreed. 14.4% of the respondents strongly agreed that to get training in the use of mobile learning system is easy and 57.5% agreed while 24% were not sure, 4.1% disagreed and 4.1% strongly disagreed. 22.6% of the respondents strongly agreed the necessity of training in the use of mobile learning and 55.5% agreed, 13.0% were not sure, 6.8% disagreed, 2.1% strongly disagreed.

4.2.10 Prior Education to Mobile Learning Adoption Model

Respondents' view on their level of prior education on mobile learning adoption model was analyzed and the findings are as summarized in figure 4.8 below;

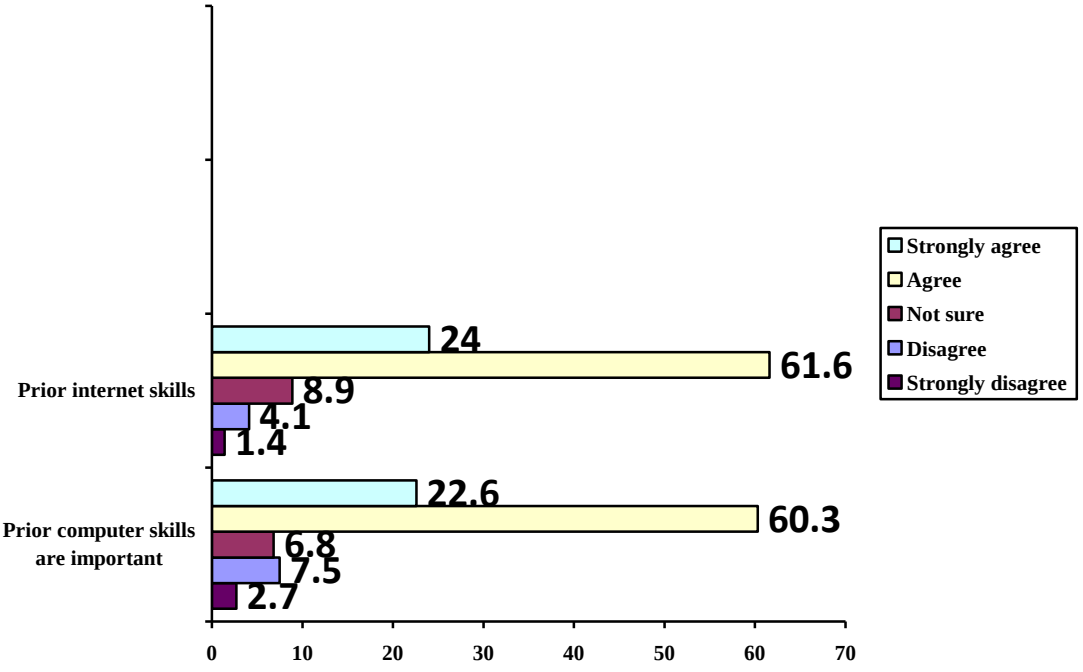


Figure 4.8: Educations on Mobile Learning

According to the findings of the respondents' on prior skills in using the computer, 22.6% of the respondents strongly agreed that prior skills in using the computer are

important in mobile learning adoption and 60.3% agreed while 6.8% were not sure, 7.5% disagreed and 2.7% strongly disagreed. 19.9% of the respondents strongly agreed that prior skills in using the internet are important in mobile learning adoption and 64.4% agreed while 4.8% were not sure, 4.8% disagreed and 6.2% strongly disagreed.

4.2.11 User Support in mobile learning

The study evaluated the respondents' level of agreement on user support that contribute adoption of mobile learning. The findings are as summarized in figure 4.9 below;

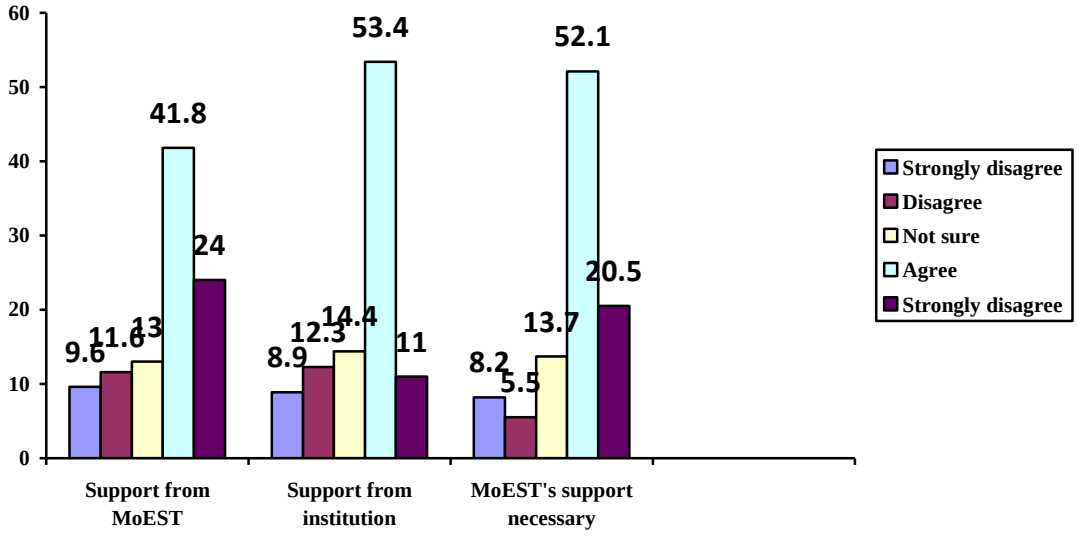


Figure 4.9 : User Support on Mobile Learning

Results on the user support on mobile learning and therefore mobile learning adoption showed that 24.0% of the respondents strongly agreed that support from the ministry of education makes it easy to use mobile learning and 41.8% agreed while 13.0% were not sure, 11.6% disagreed while 9.6% strongly disagreed. 11.0% of the respondents strongly agreed that their institutions supports the use of mobile learning and 53.4%

agreed while 14.4% were not sure, 12.3% disagreed and 8.9% strongly disagreed. 20.5% of the respondents strongly agreed with the necessity of getting support from the ministry of education and 52.1% agreed while 13.7% were not sure, 5.5% disagreed and 8.2% strongly disagreed.

4.2.12 Perceived Usefulness on Mobile Learning

The study evaluated the respondents' level of agreement on perceived usefulness on mobile learning and results obtained are as shown in the figure 4.10 below;

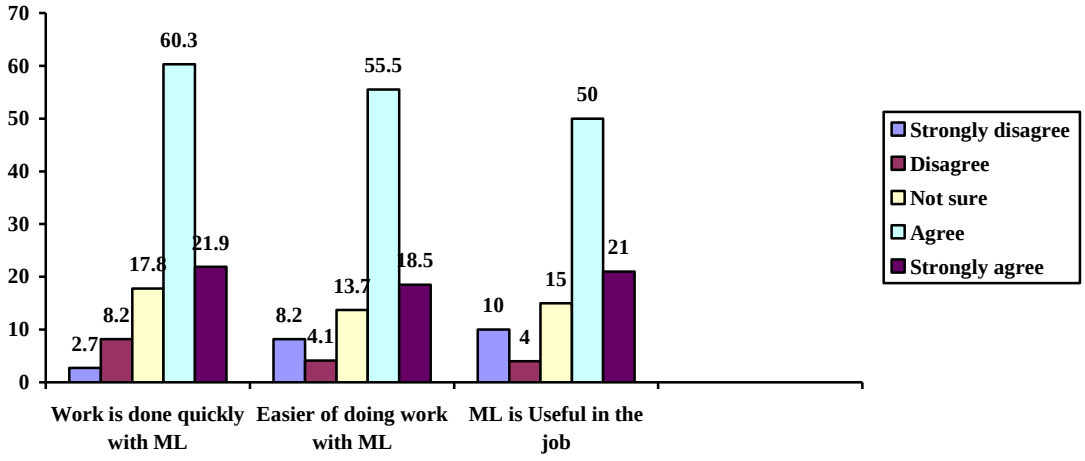


Figure 4.10: Perceived Usefulness on Mobile Learning

Results in figure 4.10 above on speed of working with mobile learning showed that 21.9% of the respondents strongly agreed that using the mobile learning system in learning enables them to do their work more quickly and 60.3% agreed while 17.8% were not sure, 8.2% disagreed and 2.7% strongly disagreed. 18.5% of the respondents strongly agreed that mobile learning system makes it easier to do their job and 55.5% agreed while 13.7% were not sure, 4.1% disagreed and 8.2% strongly disagreed. 21% of the respondents strongly agreed that they find the mobile learning system useful in their learning, 50% agreed, 15% were not sure, 4% disagreed, 10% strongly disagreed.

4.2.13 Perceived Ease of Use on Mobile Learning

Respondents' view on perceived ease of use on mobile learning was analyzed and the findings are as presented in the figure 4.11 below;

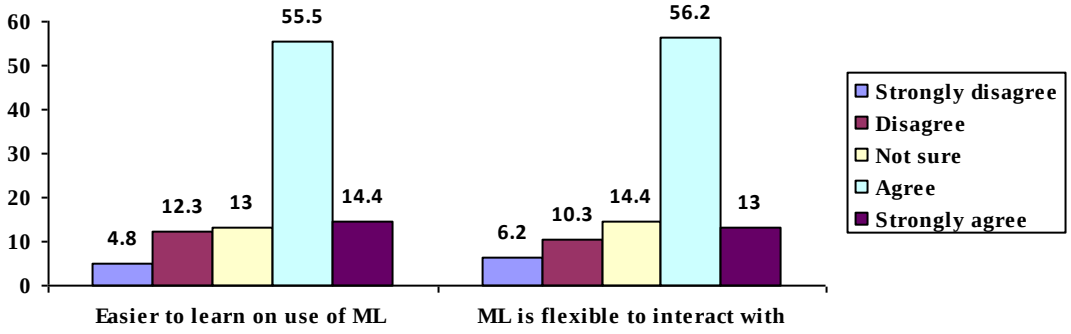


Figure 4.11: Perceived Usefulness on Mobile Learning

Results on ease of use of mobile learning showed that 14.4% of the respondents strongly agreed that learning to use the mobile learning system is easy for them and 55.5% agreed while 13.0% were not sure, 12.3% disagreed and 4.8% strongly disagreed. 13.0% of the respondents strongly agreed that they find mobile learning system flexible to interact with and 56.2% agreed while 14.4% were not sure, 10.3% disagreed and 6.2% strongly disagreed.

4.3 Analysis of the Results Findings from the Descriptive Field Study

From the presentation of the findings of the field study, the results are discussed below:

Category of technical training institutions: results revealed that the majority of the respondents were from youth polytechnics where the government subsidizes their tuition fee.

Period stayed in the institution: Findings showed that majority of the respondents had stayed in the institution in less than 2 years as most course take 2 years for completion.

Highest formal education training attained: results showed that majority of the respondents were KCSE holders and were students of technical training institutions. The lowest percentage of the respondents had KCPE indicating that technical institutions rarely admit primary school levers in their trainings.

Age: results revealed that majority of the respondents were in the age bracket of 21-30 which is the appropriate age group for technical training students.

Gender: results indicated that majority of the respondents were female. However the difference was small indicating that the number of female in technical training institutions was slightly higher due to attractive courses offered by these institutions to female.

Lack of benefits: Results from figure 4.4 revealed that majority of the respondents agreed that lack of benefits in using mobile learning was a reason for not using the services.

Trust: figure 4.5 revealed that lack of trust in the mobile learning system was a reason for not using the mobile learning in Kenya. It revealed that trust factors were important and contributes to the adoption of mobile learning services.

Attitudes: Concerning attitudes, findings in figure 4.6, and respondents agreed that their negative attitudes made them shy away from mobile learning systems.

Education: findings revealed in figure 4.8 where lack of formal education limited use of mobile learning services in Kenya.

Training: This is revealed in figure 4.7 where lack of computer skills was a reason for not using mobile learning services.

User support: results in figure 4.9 revealed that the respondents agreed that limited user support was a reason for not using mobile learning in Kenya.

4.3.1 Reliability of Questionnaire

The instrument was then examined for reliability within the context of mobile learning consumers. Reliability was examined using Cronbach's alpha values and as summarized in table 4.12 most values were above 0.70 which is the recommended acceptable range and most were above 0.80 which is considered very good, except the value for training (0.676). This means the questionnaire can be relied upon.

Table 4.3: Reliability statistics of questionnaire

Variable	Cronbach's Alpha	No of Items
PU	0.907	3
PEOU	0.879	2
User support	0.889	3
Benefits	0.759	3
Training	0.676	3
Trust	0.859	3
Attitudes	0.873	3
Education	0.928	2

4.4 Discussion of the Results

4.4.1 Questionnaire Reliability

Reliability is the extent to which results are consistent over time. If the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable, Joppe (2000). The constructs in the study were examined for reliability using the Cronbach's alpha. The results for reliability tests are presented in table below.

Table 4.4: Summary of Reliability of Scales (Alpha) Measures

End User Factors for Successful Mobile learning Adoption	Cronbach's Alpha Value
Mobile learning adoption benefits	.949
Trust	.876
Attitudes towards use of mobile learning services	.931
Training	.925
User support	.925
Education	.903

Table 4.4 above shows that all the constructs met the required level of Cronbach's Alpha as the values were above 0.70 which is the acceptable level and all were above 0.80 which is considered very good (Nunnally, 1978). This means that the results of the questionnaire can be relied upon since the constructs present an acceptable level of reliability. The details of the questionnaire reliability are given in Appendix 5.

4.4.2 Validity of the Research Constructs

Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. (Muhammad et al, 2008). Factor analysis was conducted to examine convergent and discriminant validity using SPSS. Factor analysis is statistically used to determine the correlation among variables in a dataset and provides a structure to group variables based on strong correlations helping to detect misfit variables. Principal Component Analysis was used with Varimax Kaiser Normalization as it considers all the available variance. Convergent validity indicates the degree to which the items that are measuring the same construct are correlated. Discriminant validity on the other hand is indicated by the degree to which the variables on the factors are distinct and uncorrelated. Communality shows the extent to which a

factor correlates with all the other factors and if the communality of a variable is low (0.0-.04), that variable will struggle to load significantly on any factor. Low values indicate candidates for removal after examining the pattern matrix. According to Farrel and Rudd (2009), if factor analysis is misinterpreted and discriminant validity is not established, then measurement scales used in research may not function correctly and conclusions made regarding relationships between the constructs under investigation may be incorrect.

4.4.3 Validity of the Benefits on mobile learning adoption

Statistical Package for Social Sciences (SPSS) was used to calculate both convergent and discriminant validities. For convergent validity to be satisfactory in factor analysis, the rule is that the items should load high on their respective factors (item loading higher than 0.50) and Eigen Values above one (>1.0). Discriminant validity was used to determine if each item loaded higher on the construct it measured than on any other constructs and results are presented in the table 4.2 below.

Table 4.5: Component Factor Loading on the Benefits of Mobile Learning Adoption

Constructs on benefits of mobile learning	Component
	1
1. Using the mobile learning reduces cost of learning	.866
2. Using the mobile learning system makes it easier for me to access learning materials	.918
3. Using the mobile learning system is convenient and time saving for me	.805

The results as presented in table 5.2 show that factors have loaded highly on their own factors and all the items after extraction had loading higher than 0.50. This means there was a desirable measurement on convergent validity. Basing on these results, convergent and discriminant validities were achieved.

4.4.4 Validity on Trust Factors for mobile learning Adoption

The study evaluated trust factors for mobile learning adoption and the results on discriminant validity are presented in the table 5.3 below:

Table 4.6: Factors that Contribute to Trust and Therefore Mobile Learning Adoption

Constructs on benefits of mobile learning	Component
	1
1. It is necessary have confidence in the mobile learning provider to use the system	.792
2. It is important to trust the internet to use the mobile learning system	.697
3. It is safe, secure and comfortable when using the mobile learning system	.615

Discriminant validity according to the results presented in table 5.3 was achieved. All the factors loaded highly on their own factors. Convergent validity on the factors that contribute to trust and therefore mobile learning adoption was achieved all loadings were higher than 0.5.

4.4.5 Validity on Attitude towards mobile learning Services

The attitude of respondents on mobile learning services was also evaluated for discriminant validity and the results are presented in table 4.7 below:

Table 4.7: Component Factor Loading On Attitude Towards Learning Services

Constructs on benefits of mobile learning	Component
	1
1. Mobile learning is essential in accomplishing work	.817
2. Adoption of the mobile learning system improve institutional service delivery	.919
3. Recommend the model to be adopted in Kenya	.742

On discriminant validity, according to the results presented in table 5.4, three factors were extracted after rotation. All the factors loaded highly on their own factors. Basing on these results, discriminant validity was achieved. Convergent validity on the attitudes towards mobile learning 2services was achieved as all the factors after extraction were above 0.50 implying that there was desirable convergent validity.

4.5 A Model for Mobile Learning Adoption

Technology Acceptance Models have been developed by different authors: Davis, (1989), Sahu *et al*, (2004), Al-adawi *et al*, (2005), Sarkar, (2007), Bwalya and Healy, (2009), Kumar *et al* (2007), Warkentin *et al*, (2002), Yusniza and Azmi (2010), Wang (2002), Ramlah *et al* (2010), Boone (2012), Ahmet et al (2011), Azmi and Bee (2010), Cheng-Tsung *et al* (2010), Ozgen and Turan (2007). This presents a difficulty for transiting countries like Kenya to adopt any of these adoption models that may not take into consideration specific factors (conditions) within the country.

The technology acceptance model (TAM) proposed by Davis (1989) is used in this thesis . The Model was developed in light of concerns that workers were not using ITs made available to them. It is based on the theory of reasoned action, a social behavioral theory useful for understanding a variety of behaviors, (Fishbein, & Ajzen, 1975). TAMs major independent construct(s) are the Perceived usefulness. According to Moon and Kim, (2001), TAM has been tested empirically in different parts of the world, yielding statistically reliable results and it has proved to be one of the most reliable and easy models of explaining individual's intention of adoption of a technology.

Carter and Belanger (2004) as cited in Maziar and Zuraini (2010) highlighted that Technology Acceptance Model (TAM) has been used by many researchers especially in information systems to achieve a better understanding of IT adoption and its success in institutions: Biasiotti and Nannucci (2006), Bhatnagar (2004) and such related work included e-learning, healthcare, and physicians: Park, (2009), Chau and Hu (2002),

Chismar and Sonja (2003). TAM has proven to be a strong and robust framework to clarify adoption pattern of users, (Horton *et al*, (2001, cited in Maziar and Zuraini (2010).

TAM has been used to model for adoption of mobile learning by different authors as presented in the literature. Chuttur (2009) admitted that several studies found significant statistical results for the high influence of perceived usefulness on behavioral intention to use a specific system and these studies provided a strong evidence to support TAM as a model for predicting systems usage behavior.

The requirements were identified through a field study used to develop the End User Factor Model for mobile learning adoption in Kenya that is an extension of an existing Technology Acceptance Model (TAM) developed by Davis (1989). They include: training, user support, trust, benefits, attitudes and education.

4.5.1 End User Factor Model for adoption of Mobile Learning Using UML Use Cases

To model the end user factor model for adoption of mobile learning system, Unified Modeling Language was used with use cases and a scenario for the model was created. Ambler (2010) defines an actor as a person, institution, or external system that plays a role in one or more interactions with your system. Actors are drawn as stick figures, they use a Use Case to perform some piece of work which is of value to the business and the set of Use Cases an actor has access to define their overall role in the system and the scope of their action. Three actors were identified:

i. Student: is a major actor in the system for all the processes involved are for the wellbeing of the trainee. A student uses the system for educational purposes. He is made aware of the mobile learning, access the services, get mobile learning training and support from the providing institution

ii. Lecturer: in enrollment of successful trainees, training them and conducting evaluation processes.
iii. Administrator: involved in inspection of the filled forms and enrollment of qualified trainees. He is also in charge of fee collection, training processes and evaluation of trainees who would have successfully completed the course requirements.

Use cases: A use case describes a sequence of actions that provide something of measurable value to an actor and represents a discrete unit of interaction between a user and the website, (Ambler, 2010). The End User Factor Model for adoption of mobile learning use cases include: registration, enrollment, fee collection, training process and evaluation.

Communication/ Associations: Associations between actors and use cases are indicated in use case diagrams by solid lines. An association exists whenever an actor is involved with an interaction described by a use case. Associations are modeled as lines connecting use cases and actors to one another, with an optional arrowhead on one end of the line. The arrowhead is often used to indicate the direction of the initial invocation of the relationship or to indicate the primary actor within the use case, (Ambler, 2010).

CHAPTER FIVE

MODEL DESIGN

5.1 Introduction

The End User Factor Model for adoption of mobile learning in Kenya was designed basing on the requirements obtained from the field study. The findings identified these factors as requirements for the end user factor model for adoption of mobile learning in Kenya: training, attitudes, education, user support, trust and benefits. These requirements could be used as measures to overcome the challenges of mobile learning adoption from end users' perspective.

However, this thesis examined the need for the end user factor model for mobile learning adoption to determine the factors that significantly influenced perceived usefulness. This was done using regression analysis and the results revealed that the factors that had a significant effect on perceived usefulness were training, attitudes and education while that had significant effect on perceived ease of use was training and these should be considered as most important requirements for successful adoption of mobile learning.

With respect to training, the results showed that training had significant influence on perceived usefulness implying that in practice, training of the mobile learning users in mobile learning use would make them perceive mobile learning as useful leading to adoption of mobile learning and must be taken into account while implementing mobile learning. This agrees with Thompson, (2001) and Venkatesh and Davis, (2000) who argue that training and provision of support should be included in the context of workplace technology use.

Regarding attitudes, the results showed that it has a significant effect on perceived usefulness. This means that if the negative attitudes of the mobile learning end users are

addressed, they will perceive mobile learning to be useful. This result is in agreement with Vassilakis *et al*, (2005) who observed that some end users may have a negative attitude towards electronic services and that they would prefer to stay with traditional methods, which for most is the chalk to board way and in this case attitudes toward using mobile learning services represent one of the main barriers for mobile learning adoption.

Education equally has a significant effect on perceived usefulness. Jaeger (2003) argued that education is one of the problems related to mobile learning adoption and as end users' education rises, their knowledge in using the internet increases. This means that if the mobile learning end users are educated in information technology skills and internet use, they will perceive mobile learning as useful. This is in line with Pons, (2004) who identifies three key elements of education that must be considered for successful adoption of any technology (awareness of the internet, understanding of the internet and workers with information technology skills) as Hamilton (2002), confirmed that the most frequent use of mobile learning information and services comes from populations who are experienced in using the internet as a technology.

The results also show that training has a direct significant effect on perceived ease of use.

5.2 Factor analysis

Convergent validity

Convergent validity was performed using principal component analysis method of extraction and the results presented in table 5.1 below.

Table 5.1: Communality: convergent validity of the validation questionnaire

Validation Questions	Initial	Extraction
Training in the use of mobile learning system will enable me to use it properly	1.000	0.792
It is easy for me to get training in the use of mobile learning system	1.000	0.697
It is necessary for me to get training in the use of mobile learning	1.000	0.615
Support from ministry of education makes it easy for me to use mobile learning	1.000	0.868
My institution supports the use of mobile learning	1.000	0.822
It is necessary for me to get support from ministry of education	1.000	0.731
It is necessary for me to have confidence in the mobile learning provider for me to use the system	1.000	0.899
It is important for me to trust the internet to use the mobile learning system	1.000	0.798
I feel safe, secure and comfortable when using the mobile learning system	1.000	0.716
Using the mobile learning reduces cost of learning	1.000	0.866
Using the mobile learning system makes it easier for me to access learning materials	1.000	0.918
Using the mobile learning system is convenient and time saving for me	1.000	0.805
Mobile learning is essential in accomplishing my work	1.000	0.817
Adoption of the mobile learning system improve service delivery in my institution	1.000	0.919
I would recommend the model to be adopted in Kenya	1.000	0.742
Prior skills in using the computer are important in mobile learning	1.000	0.833
Prior skills in using the internet are important in mobile learning	1.000	0.833
Using the mobile learning system in my learning enables me to do my work more quickly	1.000	0.907
Mobile learning system makes it easier to do my job	1.000	0.901
I find the mobile learning system useful in my job	1.000	0.834
Learning to use the mobile learning system is easy for me	1.000	0.872
I find mobile learning system flexible to interact with	1.000	0.872

Extraction Method: Principal Component Analysis.

Convergent validity is considered to be satisfactory when items load high on their respective construct or factor. All the items after extraction exhibited a loading higher than 0.50 on their respective factors. This means there was a desirable measurement on convergent validity.

Discriminant validity

This was evaluated by examining whether each item loaded higher on the construct it measured than on any other construct, the results are presented in table 5.2 below:

Table 5.2: Component factor loading: discriminant validity of questionnaire

	Component				
	1	2	3	4	5
PU1	0.809				
PU2	0.824				
PU3	0.761				
PEU1		0.806			
PEU2	0.424	0.746*			
TR1	0.675				
TR2	0.710				
TR3	0.716				
US1	0.826				
US2	0.688				
US3	0.474	0.587*			
TRN1	0.708				
TRN2	0.453				
TRN3	0.634				
B1	0.751				
B2	0.735				
B3	0.773				
AT1	0.646*		0.526		0.304
AT2	0.637*		0.506		0.329
AT3	0.725*				0.208
ED1	0.721				
ED2	0.577	0.629*			

Extraction Method: Principal Component Analysis. 5 components extracted.

The table above shows results of discriminant validity. There were cross-loadings for PU2, US3, AT1, AT2, AT3 and ED2 which were differing by more than 0.2 as per the cross loading rule. Factor loadings below 0.40 were suppressed except for component item 5 where all factor loadings were below 0.40. Basing on the results, discriminant validity was achieved since the factors loaded higher on the construct it measured than on any other construct.

5.3 Regression Analysis Results

Multiple regression analysis was used to explain the relationship between perceived usefulness (dependent variables) and training, trust, attitudes, user support, benefits and education (independent variables). Multiple regression is a technique that allows a number of factors to enter the analysis separately so that the effect of each can be estimated. It is valuable for quantifying the impact of various simultaneous influences upon a single dependent variable. To explain perceived usefulness, multiple regression analysis was performed between the dependent variables and independent variables and the results are presented in tables 5.3 and 5.4 below:

Table 5.3: Multiple regression analysis of independent variables with perceived ease of use

Variables	**Unstandardized Coefficients**		**Standardized Coefficients**	**Sig.**
	B	**Std. Error**	**Beta**	
(Constant)	.034	0.471		0.943
Training	0.741	0.153	0.547	0.000
Trust	0.217	0.149	0.169	0.150
Attitudes	-0.172	0.106	-0.178	0.109
User support	0.114	0.120	0.097	0.346
Benefits	-0.045	0.057	-0.044	0.435
Education	-0.172	0.106	-0.178	0.109

Table 5.4: Multiple Regression analysis of independent variables with perceived Usefulness

Variables	Unstandardized Coefficients		Standardized Coefficients	Sig.
	B	Std. Error	Beta	
(Constant)	-.622	.167		.000
Training	.536	.073	.453	.000
Trust	-.030	.050	-.031	.542
Attitudes	.417	.079	.365	.000
User support	-.045	.057	-.044	.435
Benefits	.092	.074	.089	.217
Education	.184	.066	.180	.006

In tables 5.3 and 5.4, *B* coefficients (the plus or minus sign) help to interpret the direction of the relationship between variables. If a *B* coefficient is positive, then the relationship of this variable with the dependent variable is positive and if the *B* coefficient is negative then the relationship is negative, if the *B* coefficient is equal to 0 then there is no relationship between the variables. In table 5.3, the independent variables that have positive relationships with perceived ease of use are training, trust and user support the ones with negative relationship are attitude benefits and education. In table 5.4, the independent variables that have positive relationship with perceived usefulness are training, attitudes, benefits and education; those with negative relationships are trust and user support.

Standard error, which is the distance between the line and all the points, indicates whether the regression analysis has captured a relationship that is strong or weak. The closer a line is to the data points, overall, the stronger the relationship.

The Beta value is a measure of how strongly each independent variable influences the dependent variable. The beta is measured in units of standard deviation. The Beta value is used to assess the strength of the relationship between each independent variable to

the dependent variable and the higher the beta value the greater the impact of the independent variable on the dependent variable. The independent variable with higher beta values in table 5.3 is training (b=.547) and the independent variables in table 5.4 with higher beta values are training (b=.453), attitudes (b=.365) and education (b=.180)

The significance value (*P* value) gives the impact of each independent variable on the dependent variable. A smaller P value suggests that the independent variable is having a significant impact on the dependent variable. Tables 5.3 and 5.4 present the results of the multiple regression showing the influence of the independent variables on Perceived usefulness (the dependent variables). For independent variables to have significant influence on the dependent variables, their significance value should be 0.05 and below. The summary of the multiple regression analysis shows the values of coefficients and the direction of relationship with the dependent variable including their respective p-values (significance values).

Evidence derived from table 5.3 shows that out of the six independent variables, only one was found to exert a significant influence on perceived ease of use. This is because its respective p-values was less than the level of significance ($p<0.05$) and according to the results, this variable is Training (p=.000). This suggests that holding other factors constant perceived ease of use in the context of this thesis is dependent on training, other variables playing a negligible role. In table 5.4, out of the six independent variables, three are found to exert a significant influence on perceived usefulness as their respective p-values are less than that the level of significance ($p<0.05$). These variables are training (p=.000), attitudes (p=.000) and education (p=.006). These results suggest that holding other factors constant, perceived usefulness is dependent on the three independent variables, others playing a negligible role.

The following factors were not significant at the 0.05 level in this table 5.3: trust (beta .169 and significance level 0.150), attitude (beta .097 and significance level 0.346), user support (beta -0.178, significance level 0.109), benefits (beta -.045 and significance

level 0.435), education (beta .172 and significance level 0.109) and in table 5.3: trust (beta -0.031, significance level 0.542), user support (beta -.044 and significance level 0.435), benefits (beta 0.089, significance level 0.217). This is because their significant levels are above the 0.05 significance level in this thesis.

The factors determining perceived usefulness were training (B=.453, p<.000), attitudes (B=.365, p<.000), education (B=.180, p<.006) and the factor determining perceived ease of use is training (B=.547, p<.000). Trust, user support, benefits were not significant at the 0.05 level in this model. The researcher used Amos Software and constructed the model shown in figure 5.1 below:

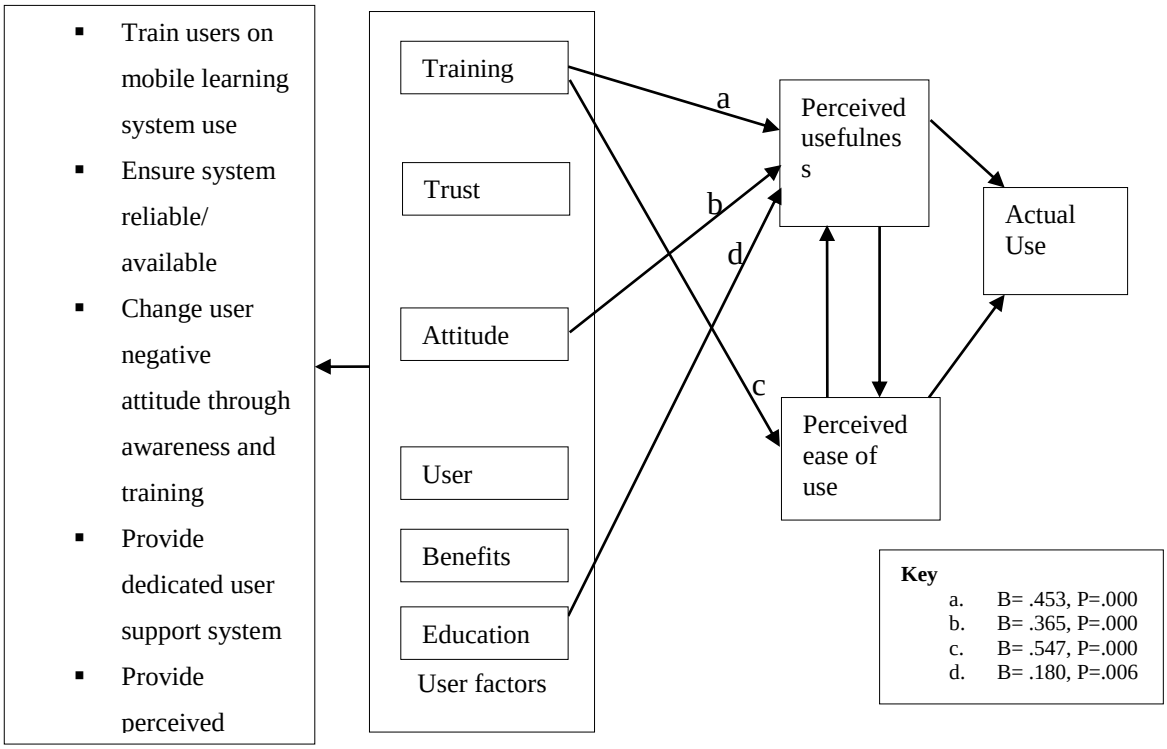


Figure 5.1: Results of the Regression Analysis (Significant relationships at p<.05)

The understanding of the end user factor model for adoption of mobile learning in Kenya is important if users are to use the mobile learning. This thesis examined the need of the end user factors that significantly influenced perceived usefulness so as to adopt mobile learning. The results show that the factors that have significant and strong influence on perceived usefulness are training, attitudes, and education. This means that the extended model is adequate and can be used for mobile learning adoption in Kenya.

With respect to training, the results showed that training had significant influence on perceived usefulness implying that in practice, training of the end users of mobile learning would make them perceive mobile learning as useful leading to adoption of mobile learning and must be taken into account while implementing the end user factor model for mobile learning.

Regarding attitudes, the results showed that it had a significant effect on perceived usefulness. This means that if the negative attitudes of the end users of mobile learning are addressed, they will perceive mobile learning to be useful.

Education equally has a significant effect on perceived usefulness. This means that if the mobile learning end users are educated in information technology skills and internet use, they will perceive mobile learning as useful.

The results showed that training has a direct significant effect on perceived ease of use. This means that training the end users of mobile learning would make them perceive the system as easy to use.

Results from the multiple regression analysis shows that user support, trust and benefits have no significant effect on perceived usefulness nor perceived ease of use.

5.4 End User Factor Model for Adoption of Mobile Learning

To establish the need for this model in Kenya, a group of one hundred and twenty (120) mobile learning users and especially technical training students and lectures were availed with the model and asked to rank it according to a basis on the questionnaire. Out of the 120 questionnaires distributed, 100 were returned completed and deemed usable yielding an effective response rate of 83% (100/120*100).

TAM has been tested empirically in different parts of the world, yielding statistically reliable results and it has proved to be one of the most reliable and easy models of explaining individual's intention of adoption of a technology. TAM has been used by many researchers especially in information systems to achieve a better understanding of IT adoption and its success in institutions. TAM has proven to be a strong and robust framework to clarify adoption pattern of users and several studies found significant statistical results for the high influence of perceived usefulness on behavioral intention to use a specific system and these studies provided a strong evidence to support TAM as a model for predicting systems usage behavior. Therefore, with the independent variables added to perceived usefulness in TAM model, the end user factor model for adoption of mobile learning is reliable and can be used to increase access to education in Kenya.

In developing the system, the designer included the User Interface design that not only encouraged learners towards learning but also attractive and socially acceptable.

Here web3 programming languages like HTML, CSS to style the web pages as well as XML are used to design the UI. JavaScript or VB script will be used to increase user-system interactivity through introduction of Dynamic HTML (DHTML).

Consideration of web graphics, flash cards and multimedia text plus animations and videos render learning content were considered carefully to avoid conflict with computer system utility software e.g. browsers.

The model design will provide the way learning content will be submitted in the best way for the learners to understand and gain knowledge. This will consider device usability, interaction technology and social technology as illustrated in figure 5.2 below.

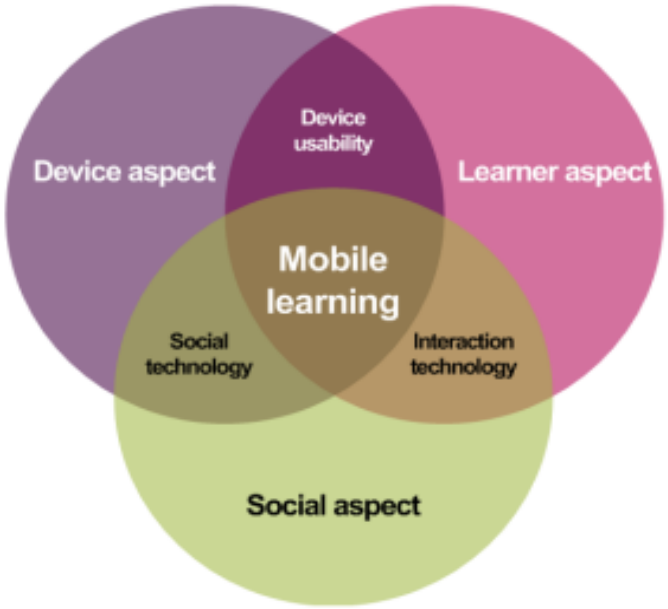


Figure.5.2: Mobile learning aspects

The model will also be responsible for designing accessibility options such as authentication and grant of permissions to the users of the mobile learning system.

Here PHP as the front end and MySQL database as the back end will be used to store leaner data and in LOGGIN IN as well as updating learner data.

5.5 Use Case Diagrams

The proposed functionality of the End User Factor Model for Adoption of Mobile Learning system is described by the Use Case Diagram as shown in fig. 5.3.

i) Student: log on the mobile learning system to get awareness of the mobile learning service in providing institution, access the services, get training, and continuous user support and finally evaluation of the training.

ii) Lecturer: log on the mobile learning system to get awareness of the applicants of the mobile learning, enrolls successful students, train them and conduct evaluation processes

iii) An administrator: log on the mobile learning system, access the services, inspects the application forms and enrolls qualified applicants. He then directs on fee payment, training processes and evaluation of trainees who would have successfully completed the course requirements.

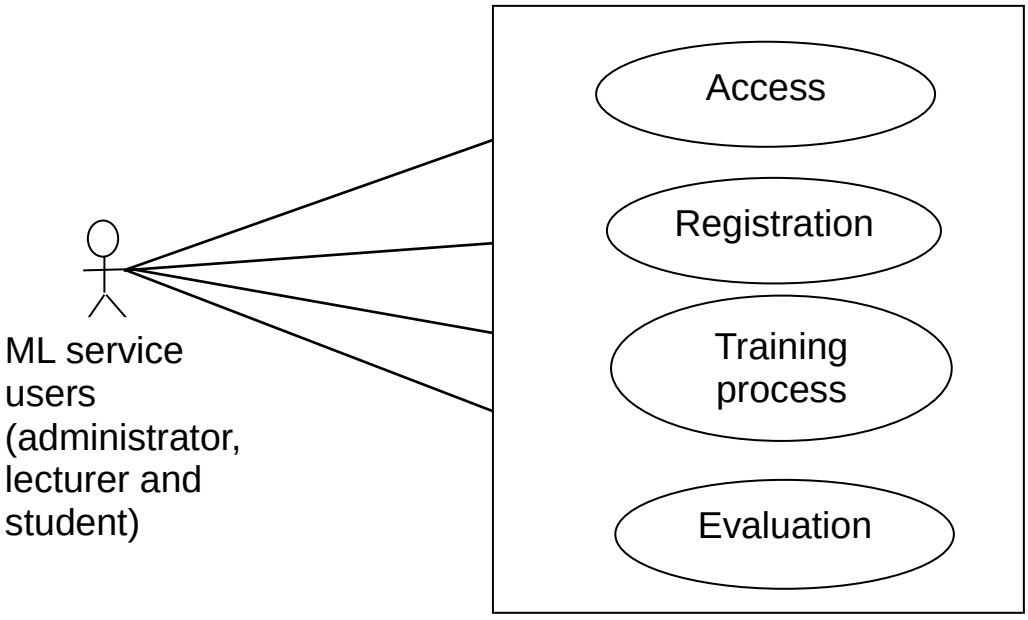
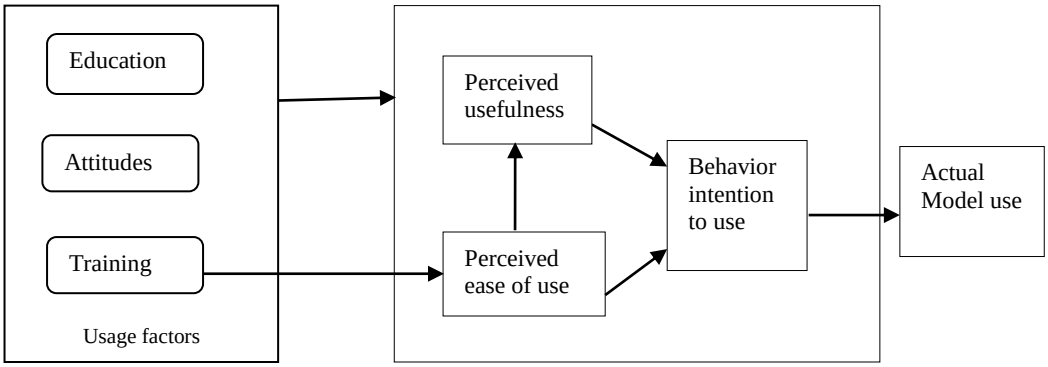


Figure 5.3: Use case diagram

5.6 Component Diagram Adoption

Amber (2010) defines component diagrams as physical analogs of class diagram. The study has outlined the end user factors for adoption of mobile learning and all the requirements for modeling the system and adoption as used to enhance the Technology Acceptance Model by Davis (1989). Three factors enhance perceived usefulness and perceived ease of use which are: attitudes, training and education as illustrated below in the end user factor model for adoption of mobile learning.



Source: TAM model by Davis (1989)

Figure 5.4: The Theoretical End User Factor Model for Adoption of Mobile Learning

The model developed is an extension of the Technology Acceptance Model (TAM) by Davis (1989) using requirements obtained from the field study. Apart from the two factors established in TAM: perceived usefulness and perceived ease of use; the new model adds three additional theoretical constructs: training, attitudes and education.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 The Summary

Mobile learning adoption in transiting countries like Kenya has remained constrained by low adoption rates. This is partly because learning institutions have focused more on the supply side factors and disregarded the end user (consumers') which are; training, attitude and education.

Although TAM has been used by many authors, a number of theoretical limitations have been identified. Existing models are found to be limited because they concentrate majorly on two factors, PU and PEOU and does not take into account the fact that technology can be abandoned even after it had been earlier accepted. Consumer factors are important for mobile learning to fully succeed but are ignored.

6.2 Conclusions

This thesis found out that there is low usage rate of mobile learning in Kenya as presented in chapter four, and the reasons for this are lack of benefits, lack of trust, negative attitudes of end users, little user support, lack of training in mobile learning and lack of education in internet use.

Differently said, the end user factor model approach of adoption of mobile learning can be costly and will require a shift in learning institutions from chalk to board system in a four corner classroom to End User Factor Model that Supports Mobile Learning. However, the model approach can bridge the identified gaps between learning provided and used, thus increase the use of mobile learning; increasing the impact of those services; and increasing user interaction with learning institutions. Kenya is one of the countries not utilizing optimally mobile learning and this is caused by learning institutions focus on supply-side factors, therefore, a model needs to be developed to

address the demand-side perspective of mobile learning and mobile learning adoption. The End User factor model presented in this thesis outlined the requirements for successful mobile learning adoption. Findings show these factors as important for mobile learning adoption: training, attitudes, and education. These requirements are added as external (independent) variables to TAMs perceived usefulness (dependent variable) and are used to provide an extended model for mobile learning adoption in Kenya. These factors should be paramount during the inception, development, implementation, and ultimately use of the mobile learning and other mobile learning services. Theoretically, the model is important to the implementers of mobile learning and other mobile learning services in Kenya. It is hoped that once this model is adopted and applied in Kenya, the adoption rates of mobile learning will increase. The model is also generic and can be applied to other developing countries that have similar contexts as Kenya.

From the results in this thesis, the end user factor model of mobile learning adoption requires great investment by learning institutions and the MoEST in training and educating end users, changing attitudes of end users if these services are to be adopted in the short and long run. Not making these investments will however minimize the benefits of including end users in the design, development, implementation and hence adoption of mobile learning in Kenya.

For the mobile learning system developers, it is worth noting that training, attitudes, education and trust are key factors influencing user perceived usefulness of the mobile learning. Therefore, to support mobile learning adoption, service providers should focus on these end user factors at the forefront of mobile learning implementation and adoption.

6.3 Purpose of Future Research

Due to rapid change of technology, there is need for further research on electronic learning acceptance. Based on the results of this thesis, the directions for future research to better understand and enhance mobile learning adoption and use are as follows:

i) The extended version of TAM needs to be modified and in developing this new model, new constructs need to be tested as independent variables to TAM and independent variables need to be identified and tested especially for perceived ease of use.
ii) This research also proposes that further research be carried out on the level of adoption of mobile learning in Kenya both in rural and urban settings. The results can be used to devise specific strategies for increasing adoption both in rural and urban areas.
iii) This research proposes the adoption process to be studied in future to understand the difference stages, activities and responsible persons

6.4 Recommendations

The study established the end user factors for successful mobile learning adoption in Kenya and the study was summed up by developing an end user factor model for adoption of mobile learning. The researcher therefore recommends the following:

Training of mobile learning end users should be highly effected throughout the implementation of mobile learning if these services are to be adopted and this should be done before, during and after the implementation of any mobile learning endeavor to subdue the possibility of its failure and increase benefits from adoption and usage of the services. The research found that training had a significant effect on perceived usefulness; therefore, the MoEST when intending to offer mobile learning -services should address the training needs of the end users (especially training in the specific

mobile learning service/software) and provide continuous user support if they want those services to be adopted successfully.

Implementation of mobile learning should focus on changing the negative attitudes of consumers towards mobile learning. Results revealed that respondents' negative attitude towards mobile learning deterred them from using the services; also, validation results showed that training had a significant effect on perceived usefulness. This research therefore recommends that training be undertaken to reduce on such negative attitudes before implementing mobile learning and other mobile learning services because this is one of the main barriers for mobile learning adoption.

Finally, a policy for mobile learning and mobile learning adoption needs to be formulated and implemented that will address end user issues. This can guide mobile learning service providers in implementation of the mobile learning-services and ensure successful adoption.

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APPENDICIES

Appendix 1: Letter of Introduction

RICHARD KAYANGA NYAKUNDI

P.O.BOX 2278

KISII- KENYA

13TH FEBRUARY 2014

Dear Respondent,

REF: REQUEST TO FILL IN THE RESEARCH QUESTIONNAIRE.

I am a post graduate student at Jomo Kenyatta University of Agriculture and Technology (JKUAT) studying for a Masters Degree in Computer Systems. I am now undertaking a research which is part of the requirements for the programme. My research is on End User Factor Model for Adoption of Mobile Learning. A case study of Kisii County.

Iam kindly requesting you to assist me in the data collection by filling in the questionnaire attached. The information you provide will be treated with utmost confidentiality and the results of the research will be for academic purpose only. However the findings will be availed to you upon request.

Thanks in advance.

Yours faithfully,

RICHARD KAYANGA NYAKUNDI

Appendix 2: Questionnaire

Introduction:

The aim of this questionnaire is to seek your response for the usage factors important for successful adoption of mobile learning in Kenya. This questionnaire tests your level of agreement of the proposed factors. You are requested to respond to the questions basing on your own experiences and understanding. All responses shall remain anonymous and confidential.

Section A: Demographic Data

Q1. Which institution do you belong in? (***Select one option***)

☐ Technical training institute ☐ Youth polytechnic

Q2. What is your position at the institution? ***(Select one option)***

☐ Principal ☐ Deputy Principal ☐ Teaching staff

☐ Head of Department ☐ Student

Others specify

……

Q3. How long have you been in this institution? ***(Select one option)***

☐ Less than 2 years ☐ 3-5 yrs ☐ 6-10 yrs ☐ More than 10 yrs

Q4. What is your age group? ***(Select one option)***

☐ Below 20 ☐ 20-30 ☐ 31-40 ☐ 41- 50 ☐ Above 50

Q.5. State your sex. ***(Select one option)*** ☐ Male ☐ Female

Q.6. What level (highest) of formal education / training have you attained? ***(Select one option)***

☐ ☐ ☐ ☐ ☐ ☐

KCPE KCSE Certificate Diploma Degree Postgraduate

Section B: Consumer Based Factors for Successful Mobile learning Adoption

State your level of agreement with the following as being essential factors for the successful adoption of mobile learning and generally other online learning services in Kenya. Choose only one option by **TICKING** either: Strongly Disagree, Disagree, Not Sure, Agree, and Strongly Agree.

Q7: Training (TR)

Item	**Measurement**	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
TR1:	Training in the use of mobile learning system will enable me to use it properly……					
TR2:	It is easy for me to get training in the use of mobile learning system……					
TR3:	It is necessary for me to get training in the use of mobile learning ….....					

Q8: User Support (US)

Item	**Measurement**	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
US1:	Support from ministry of education makes it easy for me to use mobile learning……					
US2:	My institution supports the use of mobile learning..					
US3:	It is necessary for me to get support from ministry of education ……					

Q9: Trust (TR)

Item	Measurement	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
TR1:	It is necessary for me to have confidence in the mobile learning provider for me to use the system……					
TR2:	It is important for me to trust the internet to use the mobile learning system ……					
TR3:	I feel safe, secure and comfortable when using the Mobile learning system……					

Q10: Benefits (B)

Item	Measurement	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
B1:	Using the mobile learning reduces cost of learning…...					
B2:	Using the mobile learning system makes it easier for me to access learning materials ……..……...					
B3:	Using the mobile learning system is convenient and time saving for me……..					

Q11: Attitudes (AT)

Item	Measurement	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
AT1:	Mobile learning is essential in accomplishing my work..					
AT2:	Adoption of the mobile learning system improve service delivery in my institution ……..….					
AT3:	I would recommend the model to be adopted in Kenya..					

Q12: Education (ED)

Item	Measurement	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
ED1:	Prior skills in using the computer are important in mobile learning.....					
ED2:	Prior skills in using the internet are important in mobile learning.....					

Section C: TAM Based Factors for Successful Mobile learning Adoption

Q13: Perceived Usefulness (PU)

Given mobile learning opportunity, how do you perceive the following statements?

Item	Measurement	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
PU1:	Using the mobile / online learning system in my learning enables me to do my work more quickly.....					
PU2:	Mobile learning system makes it easier to do my job.....					
PU3:	I find the mobile learning system useful in my job					

Q14: Perceived Ease of Use (PEU)

Item	Measurement	Strongly Disagree (1)	Disagree (2)	Not Sure (3)	Agree (4)	Strongly Agree (5)
PEU1:	Learning to use the mobile learning system is easy for me					
PEU2:	I find mobile learning system flexible to interact with……....					

Thank you very much for your contribution in this thesis