Sudan University of Science and Technology
College of Graduate Studies

A Proposed Model for the Evaluation of Mobile Learning Systems in Sudanese Institutes

نموذج مقترح لتقويم أنظمة التعلم المتنقلة في المعاهد السودانية

A Thesis Submitted as a Partial Fulfillment of the Requirements for the Award of the Degree of Master in Information Technology

By:
Sufian Abu Elgasim Suliman Hamid

Supervisor:
Dr. Nisreen Beshir Osman

April 2019

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Abstract

Mobile learning (m-learning) as a kind of learning model allowing learners to obtain learning materials anywhere and anytime using mobile technologies and the Internet. The quality of mobile learning systems is one of the factors that determine the usability of these systems. The quality of mobile learning systems is needed to be evaluated and investigated. There is also a need to determine the attributes that affect the quality of these systems.

The main objectives of this study is to determine the attributes that affect the quality of mobile learning systems and propose a model for evaluating the mobile learning systems. The model introduced the factors (technical feasibility, didactic efficiency, cost effectiveness, user friendliness) as the attributes that affect the quality of mobile learning systems. The attributes of the model were verified using a questionnaire. The data from questionnaire were collected and analyzed.

The results showed that the average mean of technical feasibility and didactic efficiency and cost effectiveness and user friendliness with comparison between students and lecturers show that the lecturers more efficiently than students. The results also showed that the correlation between quality factors were positive. After the completion of this study, it is recommended that more techniques should be used to enhance the mobile learning systems. In addition mobile learning systems must be usable, learnable, more efficient and more effective.

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المستخلص

التعلم المتنقل (التعلم المتنقل) كنوع من نماذج التعلم التي تتيح للمتعلمين الحصول على مواد تعليمية في أي مكان وفي أي وقت باستخدام تقنيات الهاتف المحمول والإنترنت. تعد جودة أنظمة التعلم المتنقلة أحد العوامل التي تحدد قابلية استخدام هذه الأنظمة. هناك حاجة إلى جودة أنظمة التعلم المتنقلة ليتم تقييمها والتحقيق فيها. هناك أيضًا حاجة لتحديد السمات التي تؤثر على جودة هذه الأنظمة.

الأهداف الرئيسية لهذه الدراسة هي تحديد السمات التي تؤثر على جودة أنظمة التعلم المتنقلة واقتراح نموذج لتقييم أنظمة التعلم المتنقلة. قدم النموذج العوامل (الجدوى الفنية والكفاءة التعليمية وفعالية التكلفة وسهولة الاستخدام) باعتبارها السمات التي تؤثر على جودة أنظمة التعلم المتنقلة. تم التحقق من سمات النموذج باستخدام استبيان. تم جمع البيانات من الاستبيان وتحليلها.

أظهرت النتائج أن متوسط متوسط الجدوى الفنية والكفاءة التعليمية وفعالية التكلفة وسهولة الاستخدام مقارنة مع الطلاب والمحاضرين يدل على أن المحاضرين أكثر كفاءة من الطلاب. وأظهرت النتائج أيضا أن العلاقة بين عوامل الجودة كانت إيجابية. بعد الانتهاء من هذه الدراسة ، يوصى باستخدام المزيد من التقنيات لتعزيز أنظمة التعلم المتنقلة. بالإضافة إلى ذلك ، يجب أن تكون أنظمة التعلم المتنقلة قابلة للاستخدام وقابلة للتطبيق وأكثر كفاءة وفعالية.

الإهداء

(وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ)

صدق الله العظيم

إلى من كلله الله بالهيبة والوقار .. إلى من علمني العطاء بدون انتظار .. إلى من أحمل أسمه بكل افتخار ..

والدي العزيز

***

إلى ملاكي في الحياة .. إلى معنى الحب وإلى معنى الحنان والتفاني .. إلى بسمة الحياة وسر الوجود

إلى من كان دعائها سر نجاحي وحنانها بلسم جراحي إلى أغلى الحبايب

أمي الحبيبة

***

إلى إخوتي الأعزاء

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Chapter One: Introduction

1.1 Background

Mobile learning (m-learning) as a kind of learning model allowing learners to obtain learning materials anywhere and anytime using mobile technologies and the Internet[1].Mobile learning increases flexibility and gives freedom feelings to students[2].M-learning is generally considered to increase the performance of learners by making learning accessible[3]. Mobile learning technologies eliminates geographic boundaries and provides collaborating learning environment between foreign groups. Furthermore, advances in handheld devices have facilitated the use of multimedia in mobile applications, which allows mobile learners to have access to a wide variety of richly diversified learning resources[4]. M-learning is being the digital support of adaptive, investigative, communicative, collaborative, and productive learning activities in remote locations, proposes a wide variety of environments in which the teacher can operate[5]. M-learning was an array of ways that people learn or stay connected with their learning environments including their classmates, instructors, and instructional resources while going mobile[3].

1.2 Research Problems

1. There is a need to evaluate the quality of mobile learning system.
2. The attributes that affect the quality need to be determined, verified and investigated.

1.3 Research Objectives

1. To determine the attributes that affect the quality of mobile learning systems.
2. To propose a model for evaluating the mobile learning systems.
3. To verify the model.

1.4 Research Contribution

1. Proposing a model for evaluating the quality of mobile learning systems.
2. The model is useful for developers to make mobile learning systems.

1.5 Research Methodology

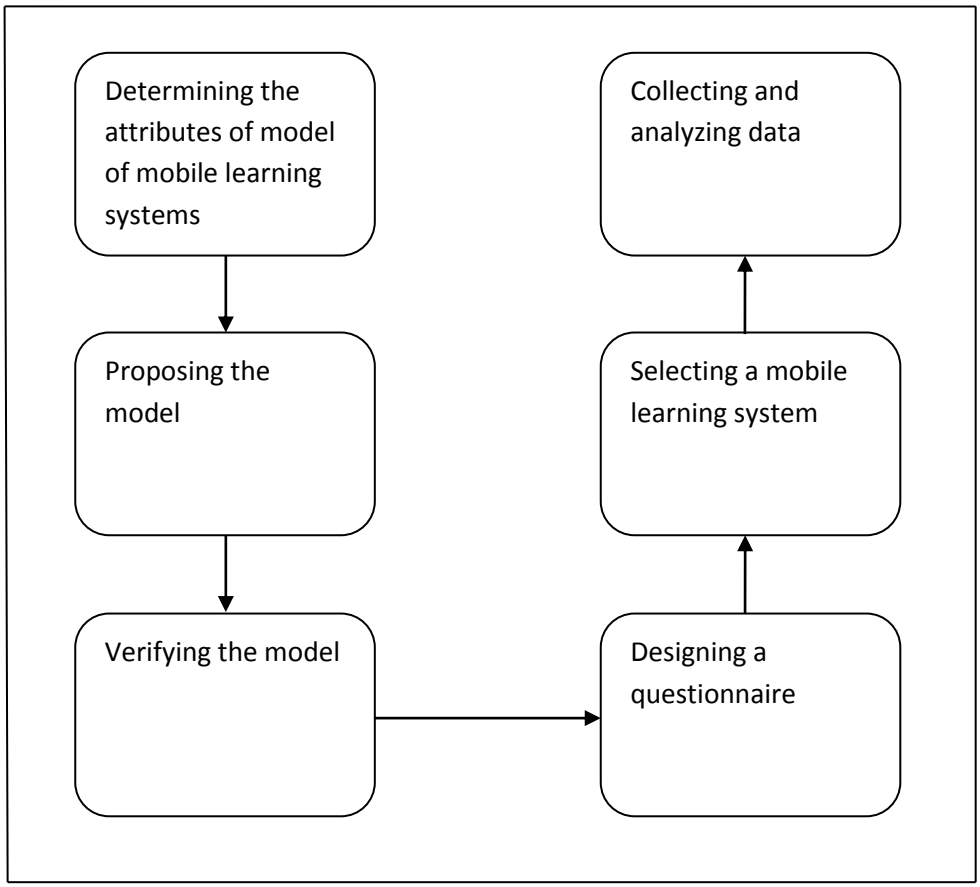


Figure (1.1): Research Methodology Steps

1.6 Structure of the Thesis

This study includes five chapters. Chapter one include the introduction, problem statement and the objective of the research. Chapter two is about literature Review, on the other hand chapter three present research methodology. Chapter four includes the results and discussion. And finally chapter five is about the conclusion and the future recommendation.

Chapter Two: Literature Review

2.1 Background

2.1.1 Definition of Mobile Learning

M-learning or mobile learning is defined as learning across multiple contexts, through social and content interactions, using personal electronic devices[6]. A

form of distance education, m-learners use mobile device educational technology at their time convenience[7].

M-learning technologies include handheld computers, MP3 players, notebooks, mobile phones and tablets. M-learning focuses on the mobility of the learner, interacting with portable technologies. Using mobile tools for creating learning aids and materials becomes an important part of informal learning[8].

M-learning is convenient in that it is accessible from virtually anywhere. Sharing is almost instantaneous among everyone using the same content, which leads to the reception of instant feedback and tips. This highly active process has proven to increase exam scores from the fiftieth to the seventieth percentile, and cut the dropout rate in technical fields by 22 percent[9]. M-learning also brings strong portability by replacing books and notes with small devices, filled with tailored learning contents.[10]. Figure 2.1 Shows The Mobile Learning Model.

Figure (2.1): The Mobile Learning Model [20]

2.1.2 Benefits of M-Learning

Some advantages of mobile learning can be drawn as follows [11],[12]:

- The efficiency: Recalling information depends on our sensory capabilities, while the response depends on the individual features and learning impulse. It is therefore imperative for the transferring posts to provide the replicability for the learner, according to different sensory modalities, which can rarely be provided by the traditional educational methods, giving the opportunity for learners to interact

immediately electronically among themselves and between them and the teacher in the other way, through the means of Email, discussion boards, chambers of dialogue and so on.

- Less expensive: The cost of mobile devices is much less than the personal computers and laptops.
- Easy access to curriculum: mobile learning curricula are available all the time, allowing the learner to follow it, through his machinery at any time, overcoming the constraints of space and time in the learning process.
- Enhancing participation: The learning theories enhance the participation, that human interaction is considered as a vital element in the learning process. It is noteworthy, that mobile learning provides such participation across rows default chat rooms, educational emails, and export files from the learning platform to mobile phone and other activities.
- The integration: Integration provides mobile learning for the learner, and provides the knowledge and learning resources in an integrated manner, through assessment tools that allow the analysis of learner's knowledge and the progress that he achieves.
- The flexibility: The learner can work with a large group of teachers who are in various parts of the world, through his machinery by using internet at any time that is matching with his agenda. And can therefore learn at home or at work or anywhere which allows him to use the Internet at any time.
- Taking into account the situation of the learner: The mobile learning can offer the possibility of choosing speed pace of learning, which means the learner can speed up or slow down the learning process as needed. It also allows him to choose content and tools that fit his interests and needs and the level of skills, especially if it involves several teaching methods which adopt various methods to transfer knowledge to different learners, which makes it more effective for some, and it enables the student to receive Scientific material in a manner commensurate with his abilities through Visual, audio manner or read, etc. Taking into account the individual differences among learners and enabling them to complete the learning processes in suitable environments for them, according to their own capacities.

2.1.3 Mobile Learning Components

There is a set of basic components needed to implement successful mobile learning system, starting from the stage of adopting the idea through implementation and

development and down to the calendar, the redevelopment and improvement. Each of these components has a number of branches to cover a specific partial mobile learning which can be marked through a comprehensive scientific based mobile learning strategy adapted to the environment. These components are [13],[14]:

- Management component: Contains a number of principles of financial Department, admissions and registration, Alumni Affairs, student services, personnel service, e-learning service, quality and service recognition.
- Information and communication technology component: Contains a number of principles including, infrastructure, devices, networks and communications, software (design, content, Web design, etc.), standard setting, technical support.
- The learning component: Contains a number of principles including content analysis, learning strategies, learner, instructional support psychology, design trends, regulation.
- The learning ethics component: Contains a number of principles including different cultures, different time, with special needs, the digital divide (who owns and who doesn't), network etiquette, fraud and hacking content and exams, intellectual property rights.
- Evaluating component: Contains a number of principles including content and design calendar, calendar mobile learning environment for learners and learners' evaluation.

2.1.4 Mobile Technologies for M-Learning

Mobile technologies are an attractive and easy means to maintain literacy skills and gain constant access to information. They are affordable, can be easily distributed and thus hold great potential for reaching marginalized groups and providing them with access to further learning and development. Mobile technologies facilitate distance learning in situations where access to education is difficult or interrupted because of geographical location or due to post-conflict or post-disaster situations. Mobile devices and personal technologies that can support mobile learning include:

- E-book
- Out start, Inc.
- Handheld audio and multimedia guides, in museums and galleries.
- Handheld game console, modern gaming consoles such as Sony PSP.
- Personal audio player, e.g. for listening to audio recordings of lectures (podcasting)

- Personal Digital Assistant, in the classroom and outdoors
- Tablet computer.
- UMPC, mobile phone, camera phone and Smart Phone.

Technical and delivery support for mobile learning include:

- 3GP for compression and delivery method of audio-visual content associated with Mobile Learning.
- GPRS mobile data service, provides high speed connection and data transfer rate.
- Wi-Fi gives access to instructors and resources via internet.
- Cloud computing for storing and sharing files.

And also, we need baseline requirements for mobile technologies that support learning outside of school settings. These technologies should be:

- Highly portable: The technology is available whenever the user needs to learn.
- Individual: The technology can be personalized to suit the individual learner ‘s abilities, knowledge and learning style, and is designed to support personal learning rather than general office work.
- Unobtrusive: The learner can capture situations and retrieve knowledge without the technology becoming overly noticeable or imposing on the situation.
- Available: The learner can use the technology anywhere, to enable communication with teachers, experts and peers.
- Adaptable: The technology can be adapted to the context for learning and the learner‘s evolving skills and knowledge.
- Persistent: The learner can use the technology to manage learning throughout a lifetime, so that the learner‘s personal accumulation of resources and knowledge will be immediately accessible despite changes in technology.
- Useful: The technology is suited to everyday needs for communication, reference, work and learning.
- Easy to use: The technology is easily comprehended and navigated by people with no previous experience using it[15].

2.2 Previous Studies

With the rapid development of mobile technologies, mobile learning has become a new trend in education. A better understanding of how to effectively use communication technologies to improve mobile learning is important. The purpose of this paper is to evaluate the media richness of various message delivery methods in the proposed m-learning environment based on media richness theory. Regarding the implications of the media richness theory, this study has identified four factors to evaluate a content in respect to the media richness among SMS, Email, and RSS: timeliness, richness, accuracy and adaptability. By the repeated-measures one-way ANOVA analysis, the results show that:

(1) SMS has better performance than Email and RSS on content timeliness; thus SMS may be appropriate for immediate information delivery such as notifying or reminding of some time-sensitive matters.

(2) Email has better performance than SMS and RSS on content richness and so may be applied in exhaustive information delivery.

(3) RSS has better performance than SMS and Email on content accuracy and adaptability; thus RSS is more appropriate for supporting various front-end mobile devices to access and present the content in a mobile learning environment.

According to the results, this study suggests developer and designer of an m-learning environment could adopt suitable information delivery medium to support the corresponding learning activities in a mobile learning environment; moreover, current general e-learning systems, particularly those intending to provide a mobile learning environment, can take advantage of RSS techniques to support mobile access and achieve the goal of mobile learning anytime and anywhere[1].

Mobile devices such a mobile phones, PDAs and iPods can have more processing power, slicker displays, and more interesting applications than were commonly available on desktop machines ten years ago, and educators are quickly realising their potential to be used as powerful learning tools. However, the application of mobile technologies to learning contexts must take into account a number of factors. Above all other things, we must consider how mobile learning can be used to provide learners with better opportunities and enhanced learning outcomes. This position paper will suggest a foundation of good practice in mobile learning with a strong pedagogical basis underpinned by characteristics of both situated and networked learning, using the following structure:

(1) A differentiation between learning and technology as the driver for mobile learning approaches.

(2) Exploration of a situated, networked and distributed educational design approach to mobile learning, with references to social constructivist principles of learning, and how these can be supported by, and support, a mobile learning approach;

(3) The classification of mobile learning activities, using the themes "Record, Recall, Relate and Reinterpret" (the "Four R's" of Mobile Learning), providing specific examples of practical teaching and learning activities utilising this model;

(4) The construction of parallels between computer-based and mobile learning, demonstrating parallels in technological considerations (such as screen size, processing power, memory and storage capacities) as well as human considerations for implementation;

(5) A summary of considerations for designing, developing and delivering mobile learning for high-quality learning outcomes[2].

With the proliferation of mobile computing technology, mobile learning (m-learning) will play a vital role in the rapidly growing electronic learning market. However, the acceptance of m-learning by individuals is critical to the successful implementation of m-learning systems. Thus, there is a need to research the factors that affect users' intention to use m-learning. Based on an updated information system (IS) success model, data collected from 350 respondents in Taiwan were tested against the research model using the structural equation modeling approach. The data collected by questionnaire were analyzed to check the validity of constructs. Then hypotheses describing the relationships between the identified constructs and users' satisfaction were formulated and tested[3].

Mobile learning (m-learning) as a kind of learning model allowing learners to obtain learning materials anywhere and anytime using mobile technologies and the Internet. It is necessary that the elements of mobile learning are organized correctly and the interactions between the various elements are combined in an efficient and optimum way so that the mobile learning is successful and the implementation is efficient. In addition, the characteristics of mobile learning should be organized, and the way they are applied to mobile learning activities and the application methods and the duration of the application time should be planned well in advance. Consequently, a deeper insight into theory-based research is

required to better understand the underlying motivations that lead academics to adopting mobile learning elements and characteristics. These reasons have motivated authors to carry out this study. Learner, teacher, environment, content and assesstment are basic elements of the complete mobile learning. The core characteristics of mobile learning are ubiquitous, portable size of mobile tools, blended, private, interactive, collaborative, and instant information. They enable learners to be in the right place at the right time, that is, to be where they are able to experience the authentic joy of learning. The aim of this study is to describe the basic elements and characteristic of mobile learning according to new trends in developing technology. The paper might be useful for anyone interested in designing, preparing and implementing a mobile learning[4].

The mobility of digital technologies creates intriguing opportunities for new forms of learning because they change the nature of the physical relations between teachers, learners, and the objects of learning. Even the traditions of distance learning cannot offer the flexibility of these new kinds of interaction, so the rise of interest in 'm-learning' is understandable. The process begins, inevitably, as a technology solution devised for other requirements, in search of a problem it can solve in education. The history of technology in education has repeated this process so many times, with less than optimal effects for education, that educators need a means by which education holds the reins of the investigation, stating our requirements, and using these to evaluate each new technology, on our terms. Otherwise, we fail to optimise its value by underestimating what it might do, and by over-adapting education to accommodate to what it offers[5].

A consideration of all the various historical and cultural events that have led to mobile learning (m-learning) would trace back through history far beyond the invention of Gutenberg's printing press and the influence of the Industrial Revolution. Although it needs to be acknowledged that these events have enabled the mobile age to reach where it is today, this chapter looks more specifically into recent history, starting when the mobile technological epoch began to take shape. In order to explain the history, *mobile* and *learning* have been separated, before I explicitly detail the interconnections for what has now become this young field of m-learning. The chapter will begin by explicating the philosophical, pedagogical, and conceptual underpinnings regarding learning, particularly toward learner-centered pedagogies. This will be followed by a discussion of the technology, covering the evolution of the hardware/software, its adoption into society, and how

these technological advancements have led to today's new affordances for learning[6].

E-learning can be broadly defined as content designed for access through electronic communication, such as the Internet, intranets, digital versatile discs, and synchronous and asynchronous modules. M-learning carries the idea of e-learning a step further by adapting its content to handheld devices such as iPods (a digital audio and storage device from Apple Corporation), personal digital assistants, and smartphones. The main objective of m-learning is to provide the learner the ability to assimilate learning anywhere and at any time[7].

Speaking about the integration of communication technology into teaching and learning processes we cannot ignore the wide and indeed ever-widening gap that divides the students' personal/daily use of web 2.0 and mobile technology and the way schools propose them for educational activities: on the one hand, there are the newest generation of students (sometimes called "digital natives") with their innate capacity for mastering technologies, using them for both social and learning purposes, albeit with little or no method; on the other hand, there are the teachers ("digital migrants") who, while making admirable attempts to innovate their teaching, tend to propose an educational use of 2.0 resources based on conventional methods and practices of study, anchored to old teaching schemes. It would instead be necessary to conceive and introduce new methodologies inspired by the so-called *e-pedagogy*, which are able to fully exploit the potential of network technologies both for social interaction and for accessing information[8].

Technological change in the second decade of the twenty-first century is both disruptive and transformational and is amplified by two major technological currents: the universal access to mobile computing and the pervasive use of social networks. The mobile phone has become a mobile computer and apps are the way these devices interact with people. This is a seismic shift away from brick-and-mortar, paper, credit cards, and the keyboard-mouse. The mobile computer will be the way people will receive services from businesses and governments, as well as the way they will interact with each other.The mobile computer allows manufactures to establish a 1-to-1 relationship directly with their customers. Businesses and meetings will/do have an immediate access to information, similar to social networks today[9].

The purposes of the present study are to describe the design of mobile learning scenarios based on learning sciences theories, and to discuss implications for the future research in this area. To move beyond mere speculations about the abundant possibilities of mobile learning and to make real impact in K-12 school settings, it is critical to conduct school-based research grounded on the learning sciences theories. Towards this end, this paper describes school-based mobile learning projects conducted by a research team at the Learning Sciences Lab in Singapore, and then discusses the possibilities and challenges of mobile learning to further inform future research. Specifically, this paper explores the affordances of mobile technology, such as portability, connectivity and context-sensitivity, to design seamless learning scenarios that bridge formal and informal learning experiences.
The authors present a framework for re-conceptualizing different types of learning based on physical settings and intentionality, and then describe two seamless learning scenarios, namely 3Rs and Chinatown Trail, which were implemented in one primary school in Singapore. In conclusion, the authors discuss the affordances of seamless mobile learning for enhancing one's lived experiences to build a living ecological relationship between the person and the environment, and how mobile technology can play a critical role for enabling such lived experiences[10].
This study applies a comprehensive set of measures to document teaching practice and instructor responses when integrating new mobile technology devices in the classroom. The triangulated measures include a rubric for observing teaching with mobile learning devices in higher education, an interview protocol for capturing faculty levels of mobile learning knowledge, and a survey of faculty understanding and implementation of the adopted four pillars of mobile learning. The pillars were chosen as foundations to guide why, what, where, and how mobile learning technology supports student learning. The authors offer suggestions for collecting data regarding large-scale mobile learning implementation over time with input from a range of stakeholders to capture how they characterize and disseminate pedagogies that are developed in the new learning environment[11].

The use and abundance of mobile devices in the workforce, both company issued and personally owned has exploded worldwide. The propagation of the smartphone has led companies to consider how conducting mobile or m-business can improve their organization by increasing the productivity and efficiency of the workforce. This paper will explore and compare the current usage of smartphones in United States and Chinese businesses, the advantages and disadvantages of

mobile learning and mobile business and the manager's part in overseeing their use by employees while understanding the security risks of the devices and protecting company data[12].

This study employed a survey to examine the perceptions of 92 preservice teachers enrolled at a small Midwestern liberal arts university regarding their support of the use of cell phones in the classroom, the benefits of specific cell phone features for school-related work, and the instructional benefits of and barriers to using cell phones in the classroom. The study also compared the perceptions of the preservice teachers classified as digital natives with those of the preservice teachers classified as digital immigrants (Prensky, 2001) to determine if there was a relationship between perceptions and age. Results from the analysis of the survey indicated that although most of the preservice teachers were unsure about allowing cell phones in the classroom, they indicated that the devices' calculator, access to the Internet, and audio player features provided instructional benefits. In addition, more than half identified anywhere/anytime learning opportunities, increased student engagement, opportunities for differentiation of instruction, increased communication, and increased student motivation as benefits of using cell phones in the classroom. Their leading concerns included classroom disruptions and cheating. Pearson Chi Square tests found no relationship between preservice teachers' perceptions and age. The results of this study have implications for teacher education programs that are interested in teaching/modeling the use of mobile technology in classroom instruction as well as bring your own device (BYOD) initiatives[13].

Two previous literature review-based studies have provided important insights into mobile learning, but the issue still needs to be examined from other directions such as the distribution of research purposes. This study takes a meta-analysis approach to systematically reviewing the literature, thus providing a more comprehensive analysis and synthesis of 164 studies from 2003 to 2010. Major findings include that most studies of mobile learning focus on effectiveness, followed by mobile learning system design, and surveys and experiments were used as the primary research methods. Also, mobile phones and PDAs are currently the most widely used devices for mobile learning but these may be displaced by emerging technologies. In addition, the most highly-cited articles are found to focus on mobile learning system design, followed by system effectiveness. These findings

may provide insights for researchers and educators into research trends in mobile learning[14].

Education and training is the process by which the wisdom, knowledge and skills of one generation are passed on to the next. Today there are two forms of education and training: conventional education and distance education. Mobile learning, or "M-Learning", offers modern ways to support learning process through mobile devices, such as handheld and tablet computers, MP3 players, smart phones and mobile phones.This document introduces the subject of mobile learning for education purposes. It examines what impact mobile devices have had on teaching and learning practices and goes on to look at the opportunities presented by the use of digital media on mobile devices. The main purpose of this paper is to describe the current state of mobile learning, benefits, challenges, and it's barriers to support teaching and learning. Data for this paper were collected through bibliographic and internet research from January to March 2013. Four key areas will be addressed in this paper:

1. An analysis of Mobile Learning.
2. Differentiating E-Learning from Mobile Learning.
3. Value and Benefits of Mobile Learning.
4. Challenges and Barriers of Mobile Learning.

Study showed that M-Learning as a Distance learning brought great benefits to society include : Training when it is needed, Training at any time; Training at any place; Learner-centred content; Avoidance of re-entry to work problems; Training for taxpayers, and those fully occupied during university lectures and sessions at training centres; and The industrialisation of teaching and learning. And also, notebooks, mobile Tablets, iPod touch, and iPads are very popular devices for mobile learning because of their cost and availability of apps[15].

Table 2.1 Summary of previous studies:

No	Author	Research name	Research methodology	Research findings
1	Yu-Feng Lan and Yang-Siang Sie (2010)	Using RSS to support mobile learning based on media richness theory	ANOVA analysis	1. SMS has better performance than Email and RSS on content timeliness. 2. Email has better performance than SMS

				and RSS on content richness. 3. RSS has better performance than SMS and Email on content accuracy and adaptability.
2	Leonard Low and Margaret O'Connell (2006)	Learner-centric design of digital mobile learning	"Record, Recall, Relate and Reinterpret" (the "Four R's" of Mobile Learning)	1.A differentiation between learning and technology as the driver for mobile learning approaches. 2. Exploration of a situated, networked and distributed educational design approach to mobile learning. 3. The construction of parallels between computer-based and mobile learning.
3	Chin-Cheh Yi, Pei-Wen Liao, Chin-Feng Huang, and I-Hui Hwang (2010)	Acceptance of Mobile Learning: a Respecification and Validation of Information System Success	Questionnaire	This model includes the following factors that influence users' satisfaction: Information Quality, System Quality, Perceived Value, Users' Satisfaction, and Intention to Reuse.
4	Fezile Ozdamli , Nadire Cavus (2011)	Basic elements and characteristics of mobile learning	Systematic Review	Describe Basic elements and characteristics of mobile learning.
5	Laurillard, D. & Pachler, N. (2007)	Pedagogical forms of mobile learning: framing research questions	Conversational Framework	----------
6	Helen Crompton (2013)	A historical overview of mobile learning: Toward learner-centered education	----------	----------
7	*Crescente, Mary Louise; Lee, Doris (March 2011)*	*Critical issues of m-learning: design models, adoption processes, and future trends*	----------	----------
8	Trentin G. & Repetto M. (Eds) (2013)	Using Network and Mobile Technology to Bridge Formal and Informal Learning	----------	----------
9	*Saylor, Michael (2012)*	*The Mobile Wave: How Mobile*		

		Intelligence Will Change Everything	----------	----------
10	Hyo-Jeong SO, Insu KIM, Chee-Kit LOOI (2008)	Seamless Mobile Learning: Possibilities and Challenges Arising from the Singapore Experience	framework for re-conceptualizing different types of learning based on physical settings and intentionality	authors discuss the affordances of seamless mobile learning for enhancing one's lived experiences to build a living ecological relationship between the person and the environment, and how mobile technology can play a critical role for enabling such lived experiences.
11	Hargis, J., Cavanaugh, C., Kamali, T., & Soto, M. (2013)	Measuring the difficult to measure: Teaching and learning with an iPad	Rubric + interview+ survey	The authors offer suggestions for collecting data regarding large-scale mobile learning implementation over time with input from a range of stakeholders to capture how they characterize and disseminate pedagogies that are developed in the new learning environment.
12	Kahle-Piasecki, Lisa; Miao, Chao; Ariss, Sonny (2012)	Managers and the Mobile Device: M-Learning and m-business - Implications for the United States and China	Systematic Review	explore and compare the current usage of smartphones in United States and Chinese businesses. advantages and disadvantages of mobile learning and mobile business and the manager's part in overseeing their use by employees while understanding the security risks of the devices and protecting company data.
13	& Blanche Kevin Thomas O'Bannon (2013)	Cell Phones in the Classroom: Preservice Teachers' Perceptions	survey approach	Results from the analysis of the survey indicated that although most of the preservice teachers were unsure about allowing cell phones in the classroom, they indicated that the devices'

				calculator, access to the Internet, and audio player features provided instructional benefits. In addition, more than half identified anywhere/anytime learning opportunities, increased student engagement, opportunities for differentiation of instruction, increased communication, and increased student motivation as benefits of using cell phones in the classroom. Pearson Chi Square tests found no relationship between preservice teachers' perceptions and age.
14	Wen-Hsiung Wu, Yen-Chun Jim Wu, Chun-Yu Chen, Hao-Yun Kao, Che-Hung Lin, Sih-Han Huang (2012)	Review of trends from mobile learning studies: A meta-analysis	meta-analysis approach	Major findings include that most studies of mobile learning focus on effectiveness, followed by mobile learning system design, and surveys and experiments were used as the primary research methods.
15	Yousef Mehdipour, Hamideh Zerehkafi (2013)	Mobile Learning for Education: Benefits and Challenges	Systematic Review	Study showed that M-Learning as a Distance learning brought great benefits to society include : 1.Training when it is needed. 2. Training at any time. 3. Training at any place. 4. Learner-centred content. 5. Avoidance of re-entry to work problems. 6. Training for taxpayers. 7. The industrialisation of teaching and learning.

Chapter Three : Research Methodology

Methodology of the Study

1. Determining the attributes that affect the quality of mobile learning system.
2. Proposing the model.
3. Verifying the model.
4. Designing a questionnaire.
5. Selecting a mobile learning system.
6. Collecting and analyzing data.

3.1 The Attributes that Affect the Quality of Mobile Learning Systems

- Technical Feasibility.
- Didactic Efficiency.
- Cost Effectiveness.
- User Friendliness.

3.2 The Proposed Model

The model specified the following attributes that impact the quality of mobile learning systems. These are:

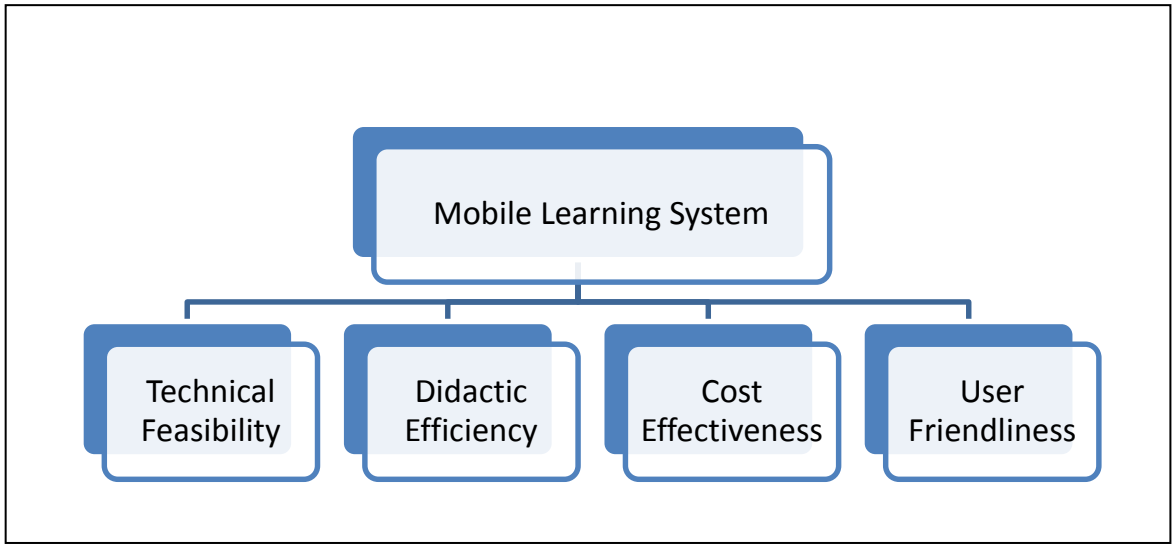


Figure 3.1 : The Proposed Model of Mobile Learning System

3.2.1 Technical Feasibility

Technical feasibility is the process of validating the technology assumptions, architecture and design of a product or project. The following are common types of technical feasibility.

- **Infrastructure**

The capacity, performance characteristics and functionality of infrastructure. For example, a project may validate an assumption that a new system can use an organization's existing network infrastructure.

- **Facilities**

Confirming that facilities such as data centers will support project requirements.

- **Architecture & Design**

Validating the architecture and design of a project against functional and non-functional requirements. This can include a peer review process.

- **Platforms & APIs**

Evaluating platforms and APIs in areas such as functionality and reliability.

- **Components**

Tests and prototypes of component parts and materials.

- **Tools**

Validating technologies such as systems and applications. For example, confirming that an application can be customized to meet user interface requirements.

- **Integration**

Looking at how processes, systems, applications and data will work together.

- **Information Security**

Evaluating the security of infrastructure, architecture, designs, products and components.

- **Equipment**

Investigating the capabilities or performance of equipment such as robotics.

- **Procurement**

Checking that project inputs can be procured and confirming quality, functionality and commercial terms such as price.

- **Operations**

The feasibility of deploying, managing and operating the project including consideration of operational risks such as downtime technical feasibility assessment both at the early concept stage, to identify potential weaknesses or gaps in the approach, and when the project proposal has been finalized and is ready for implementation.[16]

3.2.2 Didactic Efficiency

Imagine how frustrating culinary school would be if the only feedback a student chef received was “Make this taste better.” Now imagine the same problem applied to school improvement. How does one become a ‘better’ teacher? What are the characteristics of effective teaching that distinguish the most effective teachers? How does one become a ‘better student’? What are the characteristics of effective learning that distinguish the most effective students?

Clearly teachers, administrators, mentors and evaluators would benefit from a defined set of characteristics describing high quality teaching and learning. In an effort to create such a tool the Riyadh International College has began to compile and organize the Characteristics of Highly Effective Teaching and Learning. A common set of characteristics as well as content specific characteristics are currently being developed and reviewed.

The Characteristics of Highly Effective Teaching and Learning are intended to create a common point of reference for discussing effective practices in teaching and learning by describing the role of the teacher and student in an exemplary instructional environment. It allows teachers, administrators and evaluators to have discussions around a set of research-based descriptors of effective classroom practice. The document is divided into five components. Each of these components is supported with a list of characteristics of effective teacher practice and student actions. The Characteristics are based upon some of the most current findings from several resources.

- Learning Climate
- Classroom Assessment and Reflection
- Instructional Rigor and Student Engagement
- Instructional Relevance. [17]

3.2.3 Cost Effectiveness

A cost effectiveness evaluation is more complex than the cost benefit method because it involves more components. This method may be favored before the cost benefit method to narrow down a list of potential programs or new equipment to purchase. Rather than looking solely at the monetary value of the change, this method looks at the broader effects of the program. For example, a company may evaluate which employees will receive the greatest benefits from a specific training program and whether the costs of that training program will still be beneficial if certain employees leave the company.[18]

3.2.4 User Friendliness

User-friendly describes a hardware device or software interface that is easy to use. It is "friendly" to the user, meaning it is not difficult to learn or understand. While "user-friendly" is a subjective term, the following are several common attributes found in user-friendly interfaces.

1. **Simple.** A user-friendly interface is not overly complex, but instead is straightforward, providing quick access to common features or commands.
2. **Clean.** A good user interface is well-organized, making it easy to locate different tools and options.
3. **Intuitive.** In order to be user-friendly, an interface must be make sense to the average user and should require minimal explanation for how to use it.
4. **Reliable.** An unreliable product is not user-friendly, since it will cause undue frustration for the user. A user-friendly product is reliable and does not malfunction or crash.[19]

3.3 Verifying Mobile Learning System

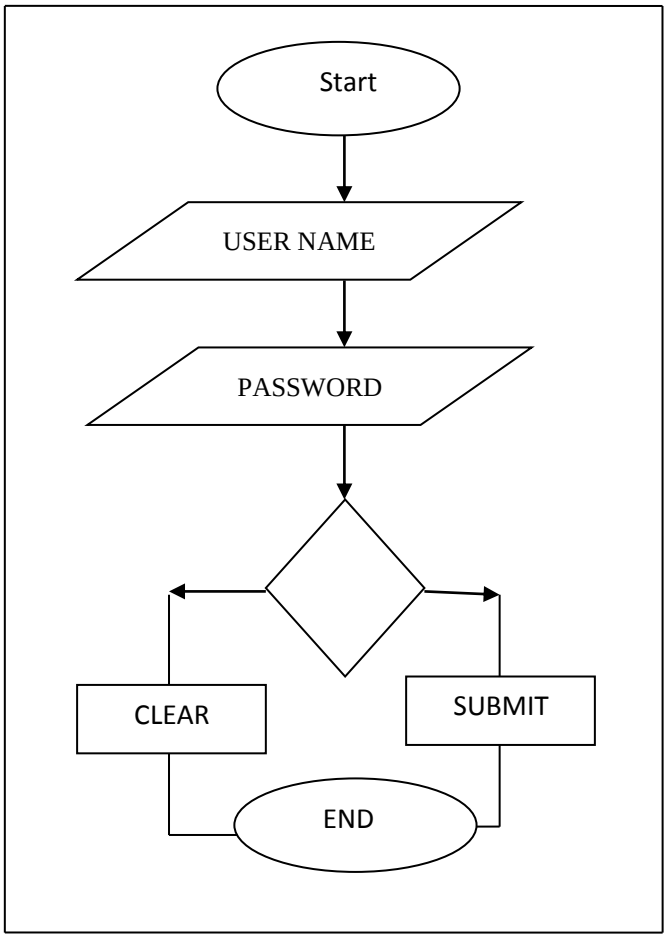


Figure 3.2 : Login Flowchart

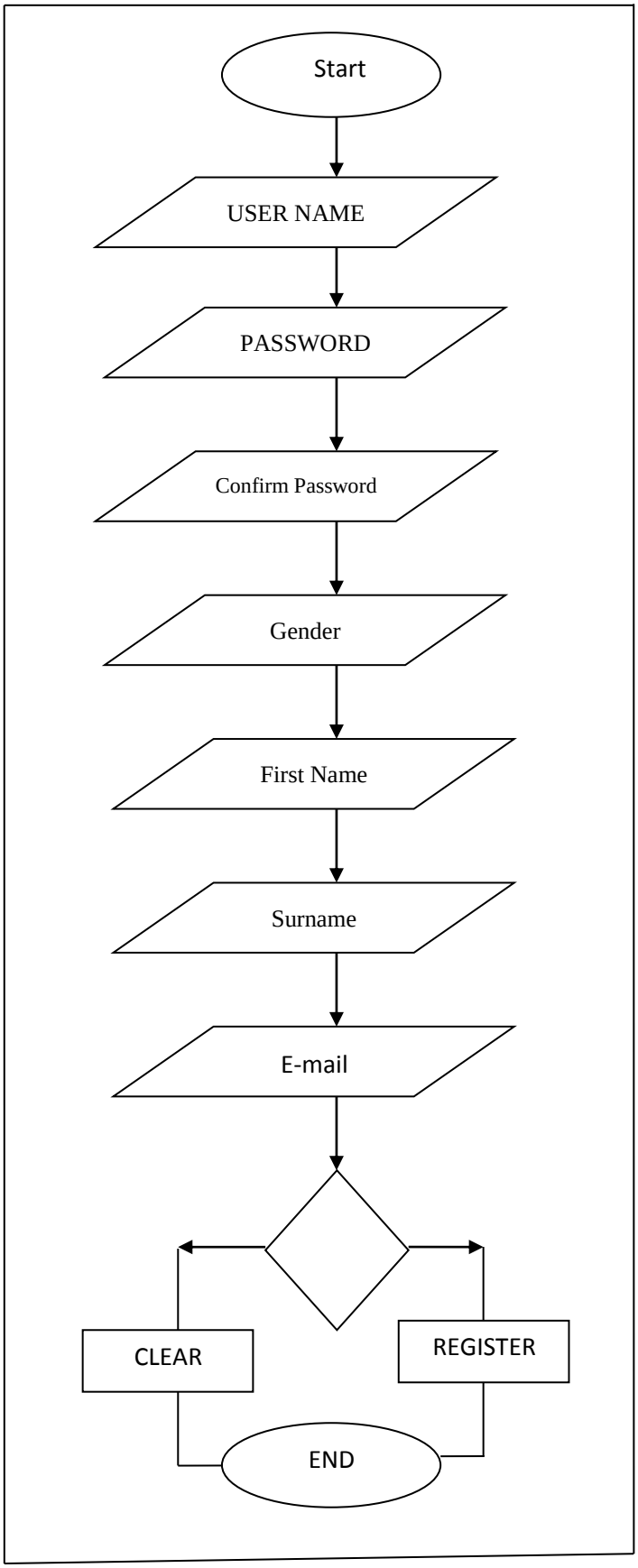


Figure 3.3: Registration Flowchart

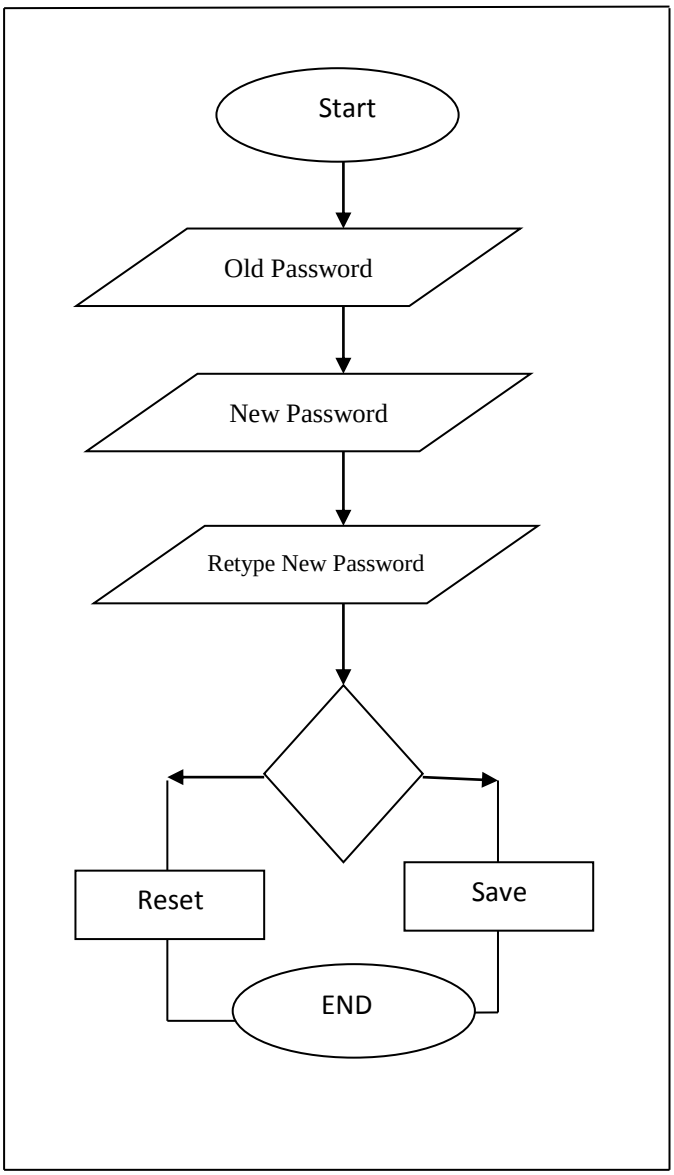


Figure 3.4 : Change User Password Flowchart

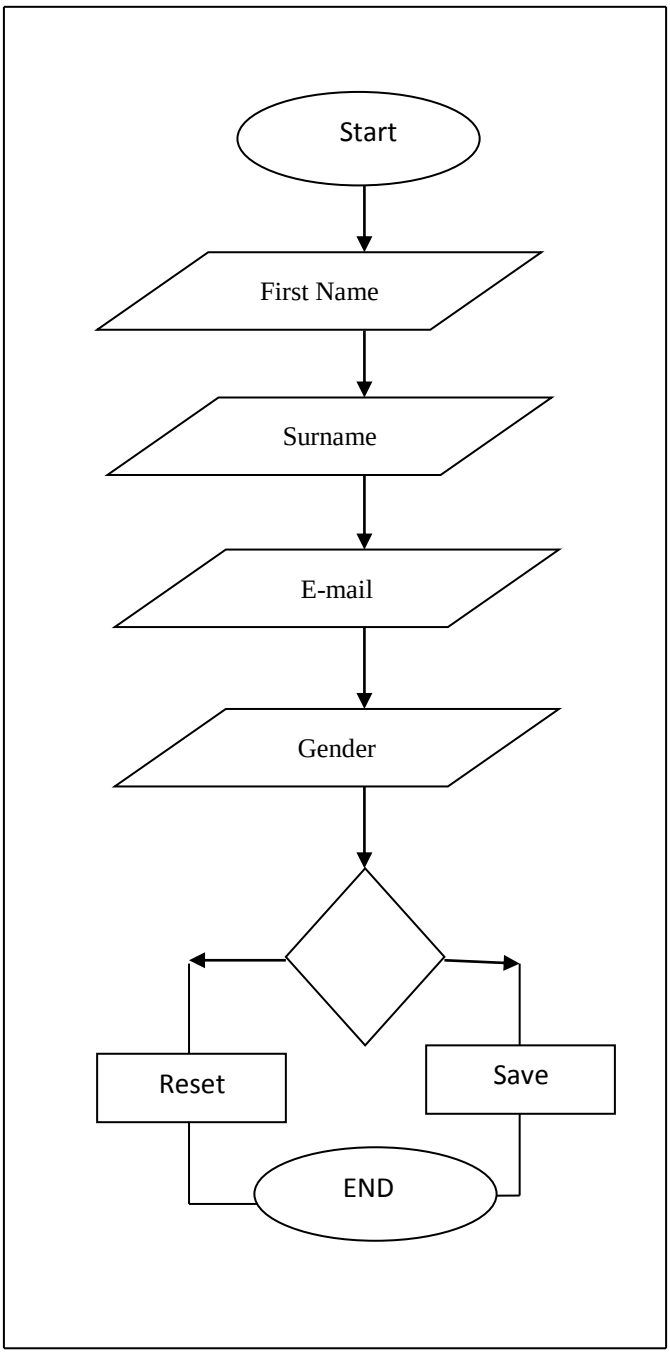


Figure 3.5 : Change User Profile Flowchart

3.4 Designing the Questionnaire

This study is looking for evaluation of Mobile Learning System – to UNESCO Institutes in Khartoum - for easy communication between the students and provide learning for students and facilitate communication between students.

First: Personal Data

1. **Gender** 1. Male ◯ 2. Female ◯
2. **Years**: _____

3. **Level of Experience**
   Have experience using/design/read the system Yes ◯
   With no experience No ◯

Second: the Basic Data

1. Technical Feasibility

Question	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree

2. Didactic Efficiency

Question	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree

3. Cost Effectiveness

Question	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree

4. User Friendliness

Question	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree

3.5 Selecting a Mobile Learning System

3.5.1 FLAGMAN Mobile Learning System

The name FLAGMAN of the software platform for mobile learning is acronym of Foreign LAnGuage Mobile LeArning ENvironment.

The purpose of the development of this mobile learning system is to allow creation of training courses for language learning, to provide access to them anytime, anywhere via mobile devices and to support professionals in the tourism sector to learn the language of their customers using a PDAs (Personal Digital Assistants), smart phones or wireless Laptops.

The interface of the system and the learning content is translated in the following seven languages: Bulgarian, English, German, Spanish, Greek, French and Portuguese. It provides ability to create and edit learning resources suitable for foreign language learning. The system has built in software modules for user's device recognition and for content adaptation. It adapts the visualization of the user interface and learning materials according to the type of recognised user's device.

The system supports five groups of users depending on the functions they perform: administrator, teachers, translators of the interface and system messages, learners and guests. FLAGMAN supports the following 11 types of resources: Text, File, Media, Test, Message Board, Timetable, Forum, Workshop, Chat, Glossary and FAQ. The structure of the learning content is the following: Module [Chapter [Themes [Dialog (+Audio & Glossary), Exercises, Glossary, Messages, Forum, Chat], Revision]].

FLAGMAN supports four types of questions: Single choice, Multiple choice, Fill in the blank and Fill in the text.

All the exercises developed by the foreign language specialists are reduced to these four types. The most used types in the language training courses are Single choice and Fill in the text.

The number of published resources till now is 3970 and the number of published themes is 936. Twenty audio records in all seven languages are published in the system and added to respective dialogs. Multilingual glossary (500 words) is published in the system. All published resources and themes are tested with the integrated simulator and with PDAs.

3.6 Collecting and Analyzing Data

For the purposes of the evaluation of the FLAGMAN mobile learning system an investigation method is used. A questionnaire which consists of 26 questions divided in five sections was developed. The first section contains questions about personal background of the user, while the next ones contains questions about technical feasibility, didactic efficiency, cost effectiveness and user friendliness. For the sections from 2 to 5 all questions use a Likert 5-point scale format. Users must provide their level of agreement/disagreement using the scale from 1 = I strongly disagree to 5 = I strongly agree.

Totally 37 users (students and lecturers) are asked to fill in the questionnaire after using the system. These users are divided in two groups:

- 25 users are students from UNESCO Institutes in Khartoum.
- 12 users are lecturers from UNESCO Institutes in Khartoum.

Table 3.1 Average Mean of Technical Feasibility

Statements	Students		Lecturers	
	Mean	SD	Mean	SD
Graphical user interface is well designed.	4.47	0.51	4.76	0.44
Multilingual support is very useful.	4.94	0.24	4.88	0.33
Navigation through the mobile learning course was easy.	4.29	0.92	4.72	0.46
Learners always know where they are in the course.	4.18	0.95	4.52	0.59
Fonts (style, color, saturation) are easy to read.	4.76	0.44	4.48	0.51
The courses offer tools (help, resources, glossary, etc) that support learning.	4.18	0.95	4.80	0.50
The course is free from technical problems (hyperlink errors, programming errors etc.).	3.53	1.07	4.56	0.77
For mobile learning to be effective it is necessary to use graphics, illustrations and sound.	4.35	0.93	4.68	0.48
Average mean	**4.34**	**0.75**	**4.68**	**0.51**

Table 3.1 The analysis of the results shows that the greatest approval among all users receives the statement that multilingual support is very helpful, and the second is placed claim that fonts (style, color, saturation) are easy to read.
Lowest results obtained statement that the system has no technical problems.
Averages of responses to all statements from this section show that the highest marks are given by the lecturers (Mean = 4.68) and also their standard deviation is lowest (SD = 0.51). The lowest marks are given by the students (Mean = 4.34) and their standard deviation is the highest (SD = 0.75).

Table 3.2 Correlation Test of the Quality Factors (Technical Feasibility)

No	*Quality Factors*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	Graphical user interface is well designed	1							
2	Multilingual support is very useful	0.997	1						
3	Navigation through the mobile learning course was easy	0.996	0.991	1					
4	Learners always know where they are in the course	0.998	0.993	0.999	1				
5	Fonts style color saturation are easy to read	0.994	0.999	0.987	0.990	1			
6	The courses offer tools (help resources glossary etc) that support learning	0.995	0.987	0.999	0.998	0.982	1		
7	The course is free from technical problems hyperlink errors etc	0.982	0.968	0.988	0.986	0.959	0.993	1	
8	For mobile learning to be effective it is necessary to use graphics illustrations and sound	0.997	0.992	0.999	0.999	0.989	0.998	0.985	1

Table 3.3 Average Mean of Didactic Efficiency

Statements	Students		Lecturers	
	Mean	SD	Mean	SD
Mobile learning increases the quality of traditional learning.	4.76	0.56	4.88	0.44
Course learning objectives can be met by mobile learning	4.47	0.62	4.52	0.59
The courses include activities that are both individual-based and group-based.	4.18	0.88	4.60	0.58
Mobile learning is convenient for communication with other course students.	4.41	0.62	4.60	0.50
Communication with the tutor was easy in this course.	4.65	0.49	4.76	0.52
Learners can start the course using only online assistance	4.18	0.95	4.52	0.59
The course incorporates novel characteristics.	4.18	0.81	4.80	0.50
The course stimulates further inquiry.	4.41	0.81	4.84	0.37
The course is enjoyable and interesting.	4.82	0.39	4.80	0.41
The course provides the learner with frequent and variable learning activities that increase learning success.	4.29	0.77	4.52	0.51
Vocabulary and terminology used are appropriate for the learners.	4.06	0.66	4.60	0.50
Evaluation and questioning in the mobile learning course was effective.	4.47	0.80	4.68	0.48
Average mean	**4.41**	**0.67**	**4.68**	**0.50**

Table 3.3 The analysis of the results shows that the highest approval among all users receives the claim that mobile learning increases the quality of traditional education, and secondly is placed the statement that the course is enjoyable and interesting. The lowest score receives the claim that vocabulary and terminology used are appropriate for the learners. Averages of responses to all statements from this section show that the highest marks are given by the lecturers (Mean = 4.68) and also their standard deviation is lowest (SD = 0.50). The lowest marks are given by the students (Mean = 4.41) and their standard deviation is the highest (SD = 0.67).

Table 3.4 Correlation Test of the Quality Factors (Didactic Efficiency)

Quality Factors	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***
Mobile learning increases the quality of traditional learning.	1											
Course learning objectives can be met by mobile learning	0.999	1										
The courses include activities that are both individual-based and group-based	0.997	0.996	1									
Mobile learning is convenient for communication with other course students	0.999	0.999	0.998	1								
Communication with the tutor was easy in this course	0.999	0.999	0.996	0.999	1							
Learners can start the course using only online assistance	0.997	0.996	0.999	0.998	0.995	1						
The course incorporates novel characte	0.994	0.993	0.999	0.996	0.993	0.998	1					
The course stimulates further inquiry.	0.996	0.995	0.999	0.997	0.995	0.999	0.999	1				
The course is enjoyable and interesting	0.999	0.999	0.994	0.999	0.999	0.994	0.991	0.993	1			
The course provides the learner	0.999	0.998	0.999	0.999	0.998	0.999	0.997	0.999	0.997	1		
Vocabulary and terminology used are appropriate for the learners	0.996	0.995	0.999	0.997	0.995	0.998	0.999	0.998	0.993	0.998	1	
Evaluation and questioning in the mobile learning course was effective	0.999	0.998	0.999	0.999	0.997	0.999	0.997	0.999	0.997	0.999	0.997	1

Table 3.5 Average Mean of Cost Effectiveness

Statements	Students		Lecturers	
	Mean	SD	Mean	SD
Mobile learning increases access to education and training	4.76	0.44	4.60	0.71
The cost of using the mobile course material was acceptable	4.53	0.80	4.44	0.71
The cost of communicating in the mobile learning course with the tutor and other students was acceptable	4.53	0.80	4.40	0.76
Average mean	**4.61**	**0.68**	**4.48**	**0.73**

Table 3.5 The analysis of the results shows that the highest approval among all users receive the statement that mobile learning increases access to education and training. The lowest score receives the claim that the cost of communicating in the mobile learning course with the tutor and other students was acceptable. Averages of responses to all statements from this section show that the highest marks are given by the students (Mean = 4.61) and also their standard deviation is lowest (SD = 0.68). The lowest marks are given by the lecturers (Mean = 4.48) and their standard deviation is the highest (SD = 0.73).

Table 3.6 Correlation Test of the Quality Factors (Cost Effectiveness)

No	Quality Factors	1	2	3
1	Mobile learning increases access to education and training	1		
2	The cost of using the mobile course material was acceptable	0.997	1	
3	The cost of communicating in the mobile learning course with the tutor and other students was acceptable	0.998	0.999	1

Table 3.7 Average Mean of User Friendliness

Statements	Students		Lecturers	
	Mean	SD	Mean	SD
It was easy to use the equipment in this mobile learning course.	4.65	0.49	4.68	0.56
According to my experience I would take another mobile learning course if relevant to my learning needs.	4.76	0.56	4.80	0.41
I would recommend mobile learning as a method of study to others.	4.47	0.72	4.84	0.37
Average mean	**4.63**	**0.59**	**4.77**	**0.45**

Table 3.7 The analysis of the results shows that the greatest approval among consumers receive the statement that the users would take another mobile learning course if relevant to their learning needs. The lowest score receives the claim that users would recommend mobile learning as a method of study to other users. Averages of responses to all statements from this section show that the highest marks are given by the lecturers (Mean = 4.77) and also their standard deviation is lowest (SD = 0.45). The lowest marks are given by the students (Mean = 4.63) and their standard deviation is the highest (SD = 0.59).

Table 3.8 Correlation Test of the Quality Factors (User Friendliness)

No	***Quality Factors***	***1***	***2***	***3***
1	It was easy to use the equipment in this mobile learning course	1		
2	According to my experience I would take another mobile	0.999	1	
3	I would recommend mobile learning as a method of study to Others	0.995	0.997	1

3.6.1 Correlation Analysis

Correlation analysis is a method of statistical evaluation used to study the strength of a relationship between two, numerically measured, continuous variables (e.g. height and weight). This particular type of analysis is useful when a researcher wants to establish if there are **possible connections** between variables. It is often misunderstood that correlation analysis determines cause and effect; however, this is not the case because other variables that are not present in the research may have impacted on the results.

If correlation is found between two variables it means that when there is a systematic change in one variable, there is also a systematic change in the other; the variables alter together over a certain period of time. If there is correlation found, depending upon the numerical values measured, this can be either **positive** or **negative**.

- Positive correlation exists if one variable increases simultaneously with the other, i.e. the high numerical values of one variable relate to the high numerical values of the other.

- Negative correlation exists if one variable decreases when the other increases, i.e. the high numerical values of one variable relate to the low numerical values of the other.

Pearson's product-moment coefficient is the measurement of correlation and ranges (depending on the correlation) between +1 and -1. +1 indicates the strongest positive correlation possible, and -1 indicates the strongest negative correlation possible. Therefore the closer the coefficient to either of these numbers the stronger the correlation of the data it represents. On this scale 0 indicates no correlation, hence values closer to zero highlight weaker/poorer correlation than those closer to +1/-1.

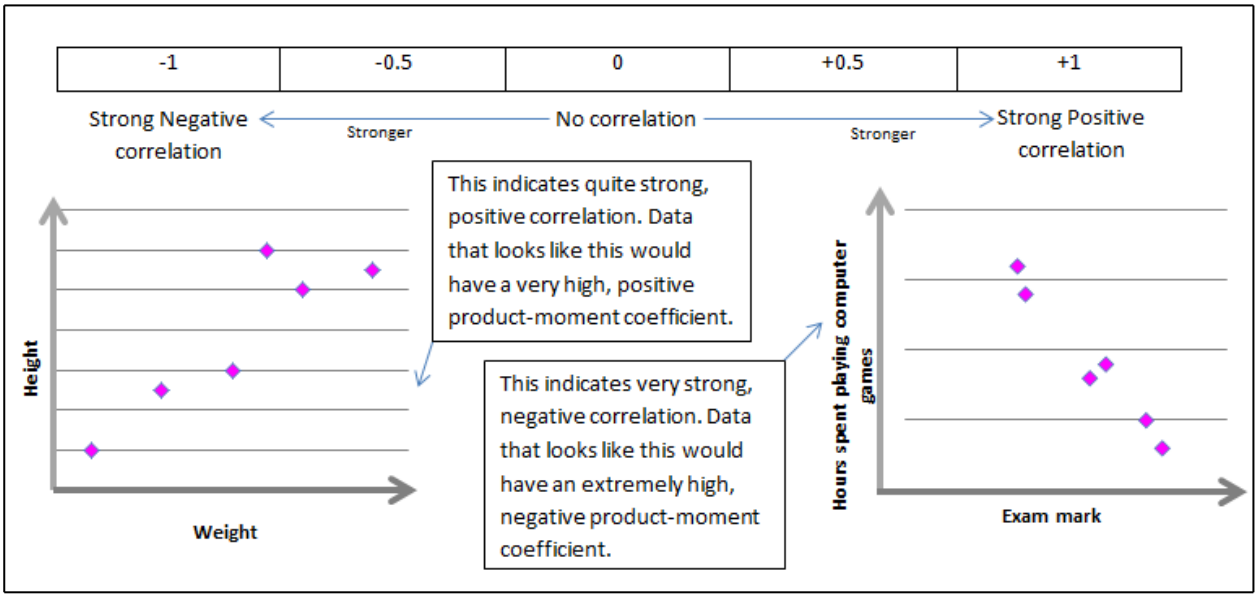
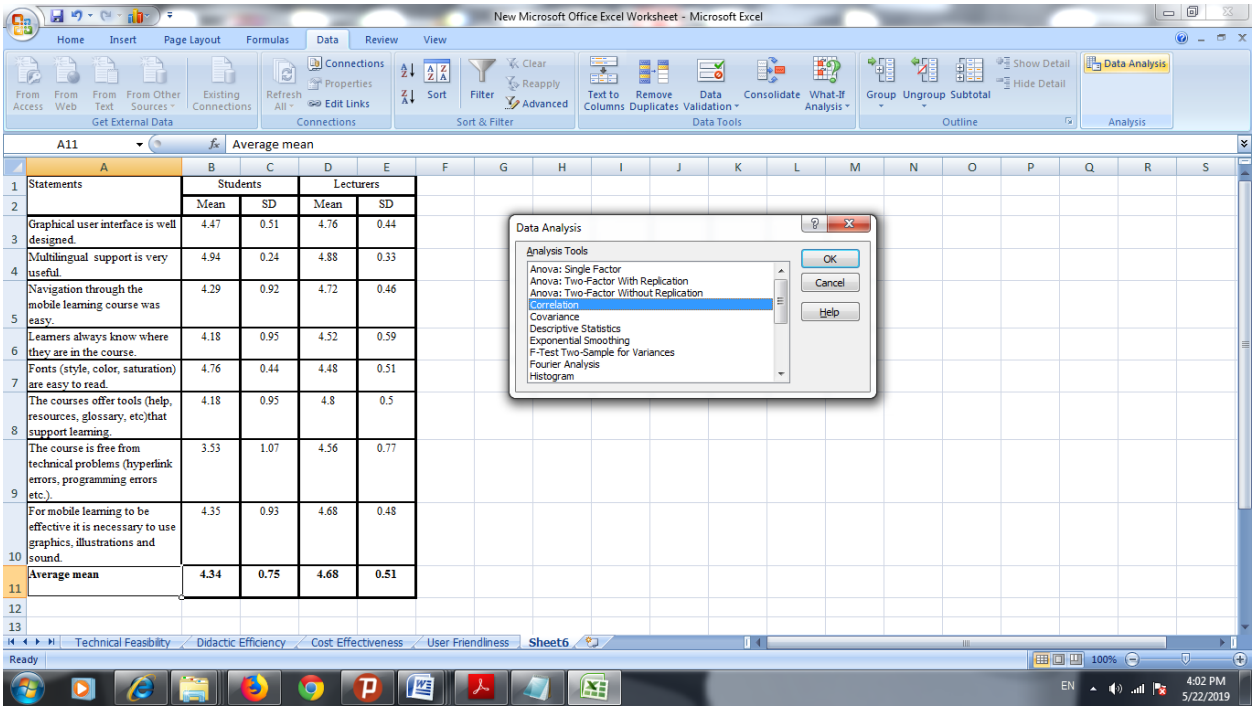


Figure (3.6): Correlation Analysis Method

If there is correlation between two numerical sets of data, positive or negative, the coefficient worked out can allow you to predict future trends between the two variables. However, you must remember that you cannot be 100% sure that your prediction will be correct because correlation does not determine cause or effect.



Statements	Students		Lecturers	
	Mean	SD	Mean	SD
Graphical user interface is well designed.	4.47	0.51	4.76	0.44
Multilingual support is very useful.	4.94	0.24	4.88	0.33
Navigation through the mobile learning course was easy.	4.29	0.92	4.72	0.46
Learners always know where they are in the course.	4.18	0.95	4.52	0.59
Fonts (style, color, saturation) are easy to read.	4.76	0.44	4.48	0.51
The courses offer tools (help, resources, glossary, etc)that support learning.	4.18	0.95	4.8	0.5
The course is free from technical problems (hyperlink errors, programming errors etc.).	3.53	1.07	4.56	0.77
For mobile learning to be effective it is necessary to use graphics, illustrations and sound.	4.35	0.93	4.68	0.48
Average mean	**4.34**	**0.75**	**4.68**	**0.51**

Figure (3.7): Correlation Analysis Method in Excel Sheet

The correlation between these quality factors for four attributes of mobile learning system are positive correlation because the results the greater than zero.

Chapter Four : Results and Discussions

4.1 Results

4.1.1 Technical Feasibility

The results of figure (4.1): shows the Averages of Technical feasibility the highest marks are given by the lecturers (Mean = 4.68) and also their standard deviation is lowest (SD = 0.51). The lowest marks are given by the students (Mean = 4.34) and their standard deviation is the highest (SD = 0.75)

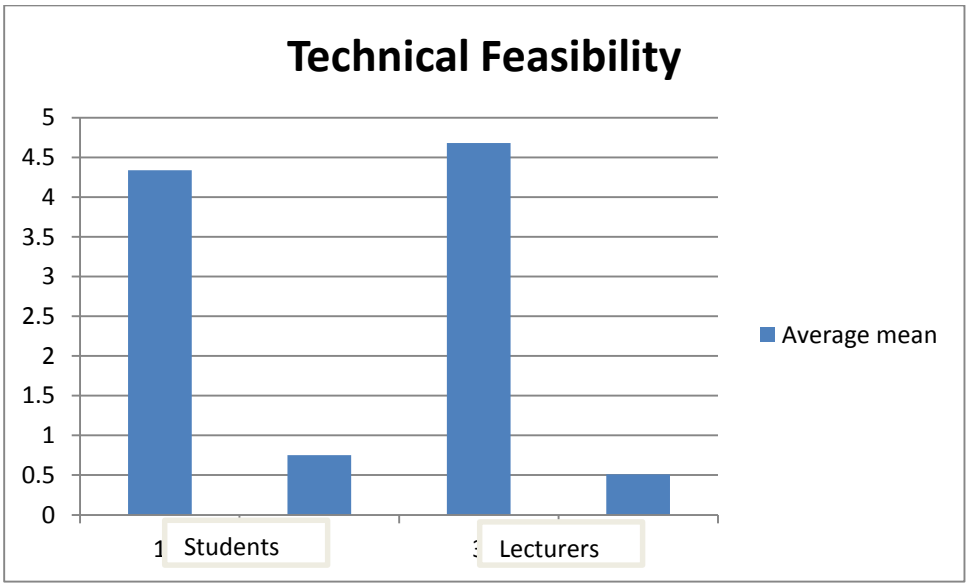


Figure (4.1): Average Mean of Technical Feasibility

4.1.2 Didactic Efficiency

The results of figure (4.2): shows the Averages of Didactic efficiency the highest marks are given by the lecturers (Mean = 4.68) and also their standard deviation is lowest (SD = 0.50). The lowest marks are given by the students (Mean = 4.41) and their standard deviation is the highest (SD = 0.67).

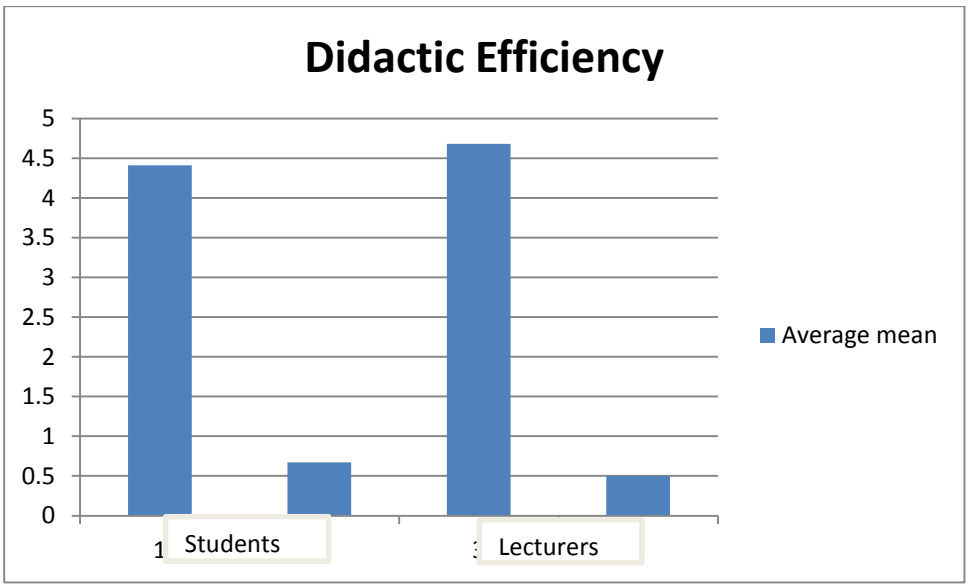


Figure (4.2): Average Mean of Didactic Efficiency

4.1.3 Cost Effectiveness

The results of figure (4.3): shows the Averages of Cost effectiveness the highest marks are given by the students (Mean = 4.61) and also their standard deviation is lowest (SD = 0.68). The lowest marks are given by the lecturers (Mean = 4.48) and their standard deviation is the highest (SD = 0.73).

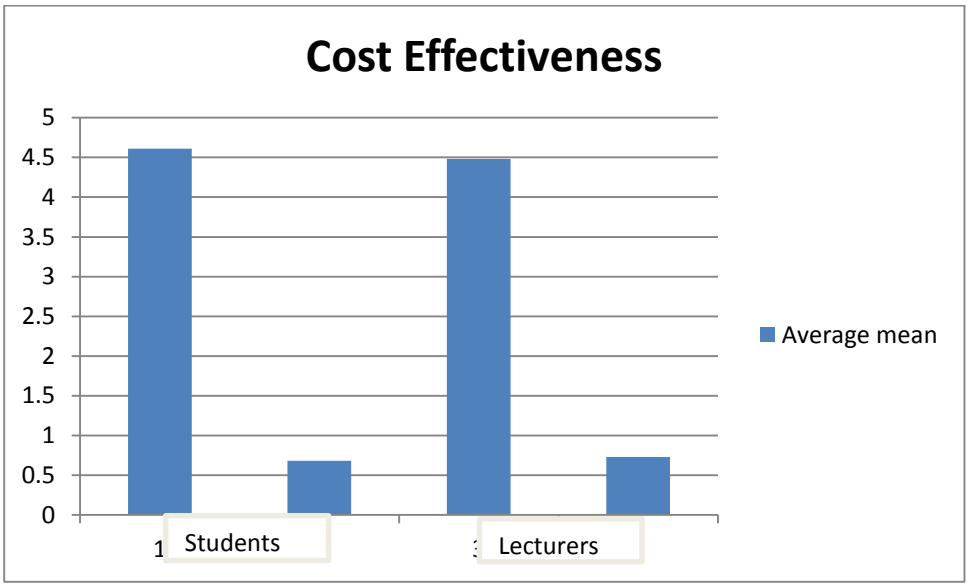


Figure (4.3): Average Mean of Cost Effectiveness

4.1.4 User Friendliness

The results of figure (4.4): shows the Averages of User friendliness the highest marks are given by the lecturers (Mean = 4.77) and also their standard deviation is lowest (SD = 0.45). The lowest marks are given by the students (Mean = 4.63) and their standard deviation is the highest (SD = 0.59).

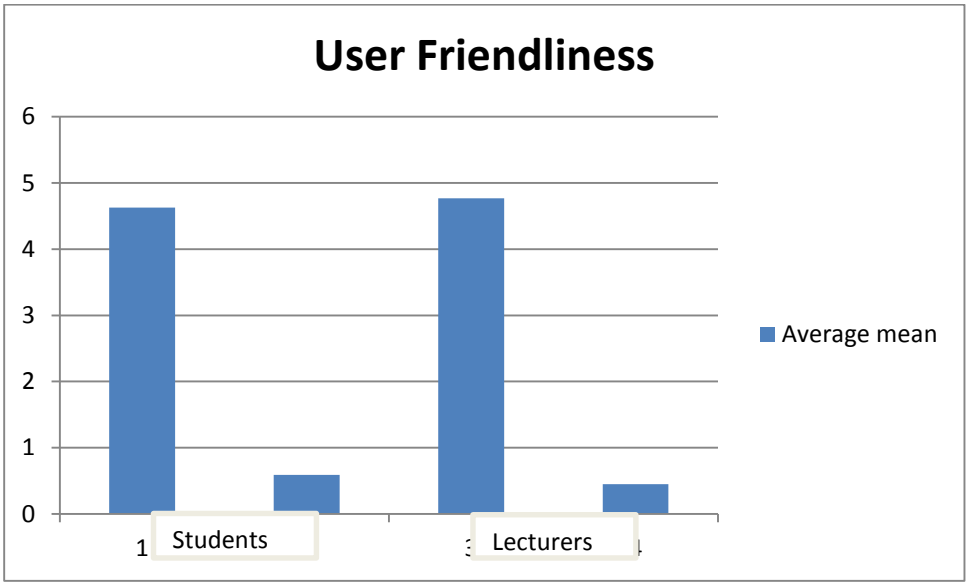


Figure (4.4): Average Mean of User Friendliness

4.2 Discussions

We have evaluated the Technical feasibility and Didactic efficiency and Cost effectiveness and User friendliness in mobile learning system. Questionnaire and FLAGMAN mobile learning system.

- According to the results in figure (4.1) it was found that the technical feasibility the highest marks are given by the lecturers (Mean = 4.68) and also their standard deviation is lowest (SD = 0.51). The lowest marks are given by the students (Mean = 4.34) and their standard deviation is the highest (SD = 0.75).

- According to the results in figure (4.2) it was found that the Didactic efficiency the highest marks are given by the lecturers (Mean = 4.68) and also their standard deviation is lowest (SD = 0.50). The lowest marks are given by the students (Mean = 4.41) and their standard deviation is the highest (SD = 0.67).

- According to the results in figure (4.3) it was found that the Cost effectiveness the highest marks are given by the students (Mean = 4.61) and also their standard deviation is lowest (SD = 0.68). The lowest marks are given by the lecturers (Mean = 4.48) and their standard deviation is the highest (SD = 0.73).

- According to the results in figure (4.4) it was found that the User friendliness the highest marks are given by the lecturers (Mean = 4.77) and also their standard deviation is lowest (SD = 0.45). The lowest marks are given by the students (Mean = 4.63) and their standard deviation is the highest (SD = 0.59).

Chapter Five : Conclusions and Recommendations

5.1 Conclusions

The attributes (Technical Feasibility, Didactic Efficiency , Cost Effectiveness , User Friendliness) that affect the quality of mobile learning system was determined, verified and investigated. A model of mobile learning system was proposed. The model contain the four attributes that affect the quality of mobile learning system. The mobile learning system FLAGMAN was selected. The questionnaire was designed. The questionnaire contain two sections , section one is personal data (Gender , Year , Level of Experience), section two is basic data (Technical Feasibility, Didactic Efficiency , Cost Effectiveness , User Friendliness). Data was collected and analysed , the results of the analysis was showed. The results show that the lecturers more efficiently than students and correlation between quality factors were positive.

5.2 Recommendations

- More techniques must be used to enhance the mobile learning systems.
- Mobile learning systems must be usable, learnable, more efficient and more effectiveness.

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Appendix : Questionnaire

Sudan University for Science and Technology
Faculty of Graduate
Master of Information Technology

Questionnaire for Evaluation of Mobile Learning System

This study is looking for evaluation of Mobile Learning System – to UNESCO Institutes in Khartoum - for easy communication between the students and provide learning for students and facilitate communication between students

Please answer as it deems appropriate

First: personal data

1. **Gender** 1. Male ◯ 2. Female ◯
2. **years**: _____

3. **Level of Experience**

- Have experience using/design/read the system Yes ◯
- With no experience No ◯

Second: the basic data

1. Technical Feasibility

Question	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree
Graphical user interface is well designed.					
Multilingual support is very useful.					
Navigation through the mobile learning course was easy.					
Learners always know where they are in the course.					
Fonts (style, color, saturation) are easy to read.					
The courses offer tools (help, resources, glossary, etc) that support learning.					
The course is free from technical problems (hyperlink errors, programming errors etc.).					
For mobile learning to be effective it is necessary to use graphics, illustrations and sound.					

2. Didactic Efficiency

Question	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree
Mobile learning increases the quality of traditional learning.					
Course learning objectives can be met by mobile learning					
The courses include activities that are both individual-based and group-based.					
Mobile learning is convenient for communication with other course students.					
Communication with the tutor was easy in this course.					
Learners can start the course using only online assistance					
The course incorporates novel characteristics.					
The course stimulates further inquiry.					
The course is enjoyable and interesting.					
The course provides the learner with frequent and variable learning activities that increase learning success.					
Vocabulary and terminology used are appropriate for the learners.					
Evaluation and questioning in the mobile learning course was effective.					

3. Cost Effectiveness

Question	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree
Mobile learning increases access to education and training					
The cost of using the mobile course material was acceptable					
The cost of communicating in the mobile learning course with the tutor and other students was acceptable					

4. User Friendliness

Questions	Strongly Agree	Agree	Netural	Disagree	Strongly Disagree
It was easy to use the equipment in this mobile learning course.					
According to my experience I would take another mobile learning course if relevant to my learning needs.					
I would recommend mobile learning as a method of study to others					