M-Learning Campus Course Development Tool

by

Nurfatin Hamimah Ahmad

Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Technology (Hons)
(Information and Communication Technology)

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
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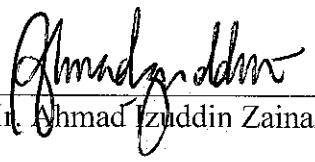
Approved by,



(Mr. Ahmad Izuddin Zainal Abidin)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

DECEMBER 2006

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that original work contain herein have not to be undertaken or done by specified sources or person.

NURFATIN HAMIMAH AHMAD

ABSTRACT

The objective of M-Learning is to integrate technology with education in order to enhance the effectiveness of students' traditional learning process. The main purpose of M-Learning is to create a flexible learning environment for students where the implementation of just-in-time learning is applied here. Education is the key element to an economic success in any nation. Thus the computer and internet become essential tools in education which provides opportunities for widening participation in to access the Internet. A system is targeting to introduce the new way of learning environment to the students as a learning tool. In Chapter 3, the author will discuss about the methodology used; waterfall model, architecture of the system and tools used in developing the system. The system prototype consists of five modules; announcement module, courses module, grades modules, assignments module and schedule module which will be discussed in Chapter 4. The system evaluation is done by conducting a survey and the result analysis is presented based on Technology Acceptance Model (TAM) concept. As in conclusion, the scope of this project has been achieved and should provides new experience of learning style and environment.

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My warmest gratitude goes to my supervisor, Mr. Izuddin for his unwavering support throughout the completion of this project. His generosity and help have been an inspiration to me. My sincere appreciation goes to the FYP Committee for all their patience and understanding in guiding and assisting me in this project.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The rapid emergence of new technologies outpaces the ability of learning communities to apply the technological infrastructure in any universal or sustainable fashion. As for now, E-learning communities are still struggling with significant educational, cultural and business issues which are often under-estimated by the technologists. Over the past couple of years, there has been widespread recognition of the need to place e-learning in the much broader context. There are serious technical challenges inbuilt in developing such infrastructure and these technical complexities are equally relevant to the describing m-learning paradigm.

"In the midst of this information revolution, we are now confronted with a third wave of novel technologies, that of mobile and wearable computing, where computing devices are already becoming small enough so that we can carry them around on us at all times, and in addition, they have the ability to interact with devices embedded in the environment. The emergence of this new wave of technologies offers many opportunities in the education sector." [20]. M-learning is based on the use of mobile devices combined with wireless infrastructure. There are of course close links between e-learning and m-learning and they represent a range based on the deployment of ever-more sophisticated technologies.

1.2 OVERVIEW

As with any emerging paradigm, there are many attempts to define the essence of M-Learning. M-Learning, learning through mobile devices that promises continued extension towards "anywhere, anytime" learning. It is worth quoting some of these definitions by the experts in order to capture the common threads inherent in the term m-

learning. The following quotes are obtained from "The Future of Learning: From E-Learning to M-Learning" [1]:

"The ability to receive learning anytime, anywhere and on any device" [2].

"The point at which mobile computing and E-Learning intersect to produce an anytime, anywhere learning experience" [3].

M-Learning – "it's E-Learning through mobile computational devices: Palms, Windows CE machines, even your digital cell phone" [4].

Based on these definition, for the purpose of this report, the author conclude m-learning definition as learning that can take place anytime, anywhere with the help of a mobile computer device. The device must be capable of presenting learning content and providing wireless two-way communication between teacher(s) and student(s). Typically, an educational organization administrates both the course content and the communication services.

1.3 PROBLEM STATEMENT

1.3.1 Problem Identification

Education is the cornerstone of economic development in any nation. Traditionally, formal classroom-based education has been adopted, allowing teachers and students to have face to face interactions [20]. This form of learning craft technology acts as a supplement to the students whereby they download the files from e-learning and print it out. There are problems in which students are rushing to attend classes and afterwards they have to sit for tests, waiting for friend to fetch them up and waiting for bus and meals to ready for serve. On the other hand, it is often emphasized, that the main advantage of e-learning is independence of both location and time. However, in traditional e-learning the minimum requirement is still a personal computer (PC), consequently an absolute independence in location is not provided. These independencies are still not fulfilled with the use of notebooks because a real independency in location depends on the rapid advancement and affordability of the

necessary technology. Mobile learning (m-learning) offers solutions that address the shortcomings of the regular learning style and traditional classroom. It marks a new era in additional ways of gaining access to educational content.

In addition, as computers and the internet become essential educational tools, the technologies become more portable, affordable, effective and easy to use. This provides many opportunities for widening participation in and access to the internet. Mobile devices such as phones and PDAs are much more reasonably priced than desktops, and therefore represent a less expensive method of accessing the internet (though the cost of connection can be higher), and the introduction of tablet PCs now allow mobile internet access with equal, if not more, its more functionality than desktops. The need for M-Learning arises from the facts that students can and wish to access information they want anywhere, anytime at their own convenience. The implementation of M-learning also means that it eliminates the long wait to use the computer labs.

1.3.2 Significance of the project

This system is an addition to the current learning method where users will be able to access information or learning materials using a mobile device. Thus, this project will concentrate on the construction and testing of the system. Through this system, it provides the concept of flexibility where users can have information on the go. Users can also access other modules such as their schedule, grade, and announcement apart from the learning materials.

1.4 OBJECTIVES AND SCOPE OF PROJECT

1.4.1 Objectives

M-Learning Campus Course Development Tool is one effort to add values in learning style. The objectives of this project are:

- To maximize the use of PDAs or mobile devices holding notes and e-books are lighter, less bulky and easier to carry rather than bags full of files, paper and textbooks, or even laptops.
- To increases motivation and personal commitment to learning if a student can "own" a device and take it with him/her wherever he/she goes, and encourages responsibility
- To be used anywhere, anytime, and just-in-time learning/reference tool for quick access to data in the field.
- To able students and lecturer interact effectively as the student find difficulties in understanding the subject.

1.4.2 Project Scope

The M-Learning application is based on the E-Learning system, only that its functionality is enhanced further through the mobility and flexibility concept. Since the concept of M-Learning is still new, this application will be minimized to as basic and simple as possible so that students will get a quick grasps of how to use and apply the system in their current learning style easily. It is also designed in a way that makes it easy for students to adapt to it. The main concern here is how users view will be affected in M-Learning due to screen limitation as compared to information that is available on wide screen PCs to mobile devices without losing its integrity and accuracy.

1.5 RELEVANCE AND FEASIBILITY OF THE PROJECT

1.5.1 Relevancy of the Project

With respect to the increasing number of use of mobile technology devices among teenagers, the opportunity of implementing M-Learning in academic institutions is on the rise and some educational institutions are already implementing this. Basically, this project will revolved a lot on the research of the technology involved, the limitations and advantages of M-Learning as a guide towards the development and implementation. In M-Learning, the concept of just-in-time learning is apply where students will be able to

access the information they want on the go with the available devices they have, the most common being mobile phones. Although there are a lot of constraints involved in this project such as cost and user acceptance, it is becoming an interesting issue in the future as some people are adapt to technology change and new wave of development and some are left behind.

1.5.2 Feasibility of the Project within the Scope and Time frame

The feasibility of the project can be evaluated through economic and technical aspects.

- **Economic Feasibility**

  This application is seen feasible in economic aspects by increasing effectiveness and productivity of current learning system. Thus, with this application the learning process will be more efficient, consequently enhancing the flexibility and mobility of learning process.

- **Technical Feasibility**

  This application can be implemented practically using available technology and expertise. The skills and information to develop this application is available on the Internet and other sources of information.

CHAPTER 2

LITERATURE REVIEW

2.1 M-LEARNING: LIFELONG LEARNING

2.1.1 Introduction to M-Learning

There are currently having varieties of options in mobile technologies to provide learning experience for its users namely mobile phones, 'smart phones', PDAs (personal digital assistants also known as palms or handheld Personal Computers (PCs)), game consoles and Tablet PCs and laptops that have wireless capabilities. There are estimated to be 1.5 billion mobile phones in the world today (Prensky, 2004). This is more than three times the number of personal computers (PCs), and today's most sophisticated phones have the processing power of a mid-1990s PC. These facts are leading to some observers to speculate that many people will start to see the mobile phone as an alternative to a PC.

There are many differences between M-Learning and E-Learning. The key difference would be that M-Learning offers greater flexibility in where and when learning happens [6]. Since mobile technologies emergence rapidly, it could expand the learning possibilities and solve the problem of being tied to a particular location. Another important difference is that ownership of mobile devices (and of mobile phones in particular) is penetrating parts of various communities that were in the past disadvantaged by the "digital divide".

M-Learning has the promise of providing rich mobile internet experiences that are ubiquitous, accessible, rich in content, efficient, flexible, secure, reliable and interactive [7].

2.1.2 E-Learning vs M-Learning

Electronic Learning: E-Learning

E-Learning is considers the Web-based learning, embraced by many educators. It's an evolution of traditional learning method which extends study beyond physical classrooms and separation of teachers and learners which distinguishes it from face-to-face.

One great advantage of the World Wide Web is that it is platform independent and supports several media types, for instance, audio and video and also available globally. From an educational perspective, it meant that teaching could now take place both synchronously and asynchronously [1]. The impact on students is that they may study course content from their computer screens, and thus are not dependent on being physically present at school.

Time and place are no longer restrictions as the learning experience can be tapped anywhere one has a computer and access to the Internet. The teacher's role is made more flexible in that they can now tutor from the confines of their offices or homes. Student-teacher / student-student interaction in E-Learning is mediated through the use of e-mail, discussion forums, chat rooms and the like.

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Mobile Learning: M-Learning

As a new wave of development, M-learning is based on the use of mobile devices combined with wireless infrastructure. There are of course close links between e-learning and m-learning and they represent a range based on the deployment of ever-more sophisticated technologies. Generally, it promises the access to applications that support learning anywhere, anytime.

This is where wireless technology comes in. Coupled with the use of a hand-held wireless device and software / hardware solutions that make it possible to access educational content, students are exposed to a new educational experience, mobile education or M-Learning.

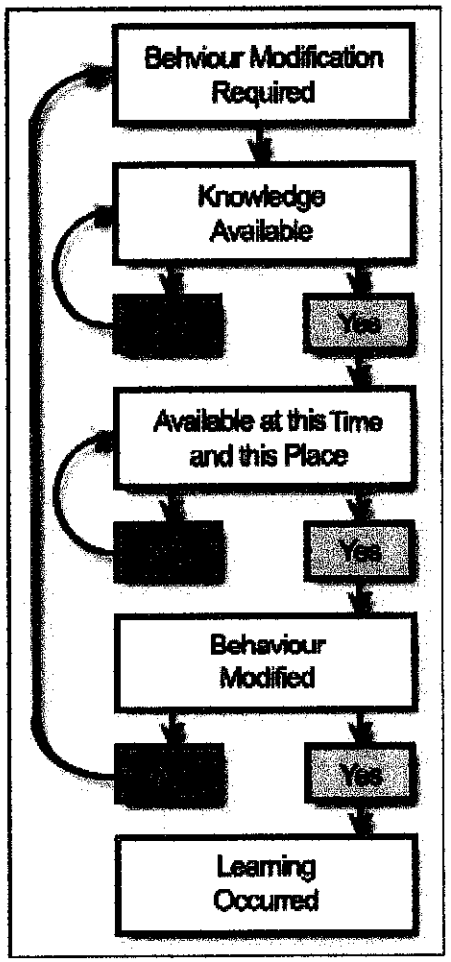

Figure 2.0: Mobile Learning

Figure 2.0 illustrates a graphic representation of M-Learning, which in this instance is synonymous with flexible learning. It details the time issue by showing that if information is not available, not available at a certain time or place, or is the incorrect information, and does not result in the required behavioural change, then time is expended unproductively. M-Learning here shows the acquisition of any knowledge and skill through using mobile technology anywhere anytime that results in an alteration in behaviour of the user. The behaviorists idea of an 'alteration in behaviour' is used because as the information age continues to progress, more people will be gaining more knowledge, more often and more easily. However, without an alteration in behaviour, it is not deemed to be learning [5].

2.1.3 The Theoretical framework for M-Learning

Consider that one of the most useful contributions that m-learning research can make is in designing a new and innovative learning environment guided by theory. Educational theory comprises a wide range of differing activities, such as behaviourism and social constructivism. These are seen relate to the M-Learning main theories and areas of learning relevant with mobile technologies.

2.1.3.1 Behaviourists Theory

Behaviourists are concerned with activities that promote learning as a change in learner's observable actions [21] and the use of mobile devices to present learning materials, obtain responses from learners, and provide appropriate feedback, fits within the behaviourist learning paradigm. In the behaviourist paradigm, learning is thought to be best facilitated through the reinforcement of an association between a particular stimulus and a response [21]. Applying this to educational technology, computer-aided learning is the presentation of a problem (stimulus) followed by the contribution of the solution (response) by user. Feedback from the system then provides the reinforcement. In a mobile learning context, classroom response systems like quiz; 'Classtalk' (Dufresne et al 1996) and 'Qwizdom' (Qwizdom: Assessment for Learning in the

Classroom 2003) fall in this category, as well as examples of content delivery by text messages to mobile phones (BBC Bitesize 2003, 2004; Thornton and Houser 2004).

2.1.3.2 Constructivist Theory

Constructivists emphasizes on the activities in which learners actively construct new ideas or concepts based on both their previous and current knowledge [21]. Within a constructivist learning framework, instructors should encourage students to discover principles for themselves. In order to transform learners from passive recipients of information to active constructors of knowledge, an environment in which to participate in the learning process, and the appropriate tools to work with that knowledge should be prepared. Mobile devices give a unique opportunity to have learners embedded in a realistic context at the same time having access to supporting tools. The most convincing examples of the implementation of constructivist principles with mobile technologies come from a brand of learning experience termed participatory simulations. This approach needs the learner to carries their own mobile devices so that the simulation can be done away from computer screen. Thus, learner is engaged to the learning process.

2.1.3.3 Situated Learning Theory

This theory accentuate on the activities that promote learning within an authentic context and culture [21] in which where the learning takes place has a great impact on learning process. Situated learning requires knowledge to be presented in knowledge-based application and learners to participate within a community of practice. By developing appropriate context-based teaching strategies with mobile technologies, it can fulfill both of these requirements. Three strands those are especially relevant to the use of mobile devices can be considered in relation to the situated learning paradigm. They are problem based learning, case-based learning, and context-aware learning [21].

Problem-based learning requires learner to use their critical thinking to respond to the ill-defined problems. Case-based learning consequently relies on more well-defined

problems that may or may not be representative of what learner might encounter in the real world. Context-aware learning on the other hand represents gathering information from the environment to provide a measure of what is currently going on around the user and the device [21]. Mobile devices are especially well suited to context-aware applications simply because they are available indifferent contexts, and so can draw on those contexts to enhance the learning activity.

2.1.3.4 Experiential Learning Theory

Kolb's version of experiential learning theory (1984) applies to all learners but primarily concerns adults and is therefore relevance to M-Learning. Kolb sees autonomy as independence and interdependence, which fits the constructivist learning, referred to above [22]. Kolb proposes four primary stages of a cycle of learning which follow from each other:

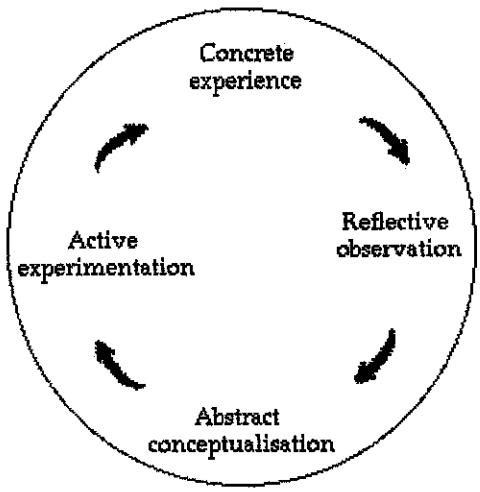

Figure 2.1: Kolb's learning cycle

This suggests that there are four stages which follow from each other: Concrete Experience is followed by Reflection on that experience on a personal basis. This may then be followed by the derivation of general rules describing the experience, or the application that lies theories against it (Abstract Conceptualization), and hence to the construction of ways of modifying the next occurrence of the experience (Active Experimentation), and next Concrete Experience. All this may happen in a flash, or over days, weeks or months, depending on the topic, and there may be a "wheels within

wheels" process at the same time. A key advantage of Kolb's theory for M-Learning is that he sees individual differences in the four phases relating to people's ability, learning strategies and ultimately, learning styles. Although the reliability of trying to simplify learning styles and personalities in these ways has to be called into question, experiential learning theory will be important in informing M-Learning design because it is concerned with individuality in learning and because it invites conscious attention to the importance of the learner's subjective experiences, attitudes and feelings about his own learning [22].

2.1.4 Challenges and Limitation in M-Learning

M-Learning is often defined as an access of E-Learning via mobile devices. Generally, we might not came across of this tiny devices that accompany us in every single moment in our daily life can be used to access learning contents. The learning contents can be reach either it is stored locally onto the device or through the interconnection.

The connectivity is one of the main challenges encountered in mobile learning environment if comparing a mobile device with the PC (the usual medium for delivering e-learning). Nowadays mobile devices might be connected to the 'Net' via many technologies such as WAP, GPRS, UMTS, Bluetooth, WiFi, etc. Mobile devices often have periods of disconnection, either intentionally (when the connection is too expensive) or not (when no infrastructure is provided).

Devices' hardware and software characteristics have a big impact on what content is possible and meaningful to be delivered. Usually the web content is designed for desktop PCs, thus unpleasant and even rarely useful from a small-screened device. Nowadays mobile phones are rapidly becoming increasingly, however the screens will remain comparatively small and the navigation is hard. Even though equipped with a small phone-style keyboard or a touch-screen (for the PDAs) the users might lose more time in searching where on the page the information they need is than in reading it. The memory available on a mobile device is also relatively small. It is possible to use extension packs on some devices like PDAs, which reduces some of the restrictions.

Thus, existing PC applications (especially text heavy applications like email, word processing etc) are not easily integrated into mobile technology.

Apart from that, another important factor is that ownership of mobile devices (pre-requisite of engagement) is penetrating parts of various communities that were in the past disadvantaged by the "digital divide"[23]. Some individuals and groups do not have adequate access to or the capacity to use networked digital technologies, this barrier which forbids them to benefit this new wave of development.

When mobile tools exchanges data with other devices via a potentially unreliable or narrow communication line, as in wireless communications, user interfaces for management of database communications of mobile tools are required to meet user's needs such as fast response, high usability, reliability and easy-to-use features. Standardizing these new user-interfaces will be very beneficial and convenient for mobile users. However, due to limited dial-up access to a network, small screens, slow processing, and limited storage capabilities, these challenges should be accountable for this new learning environment.

On the other hand, the use of mobile computing technologies supported by portable devices, as for instance, Palmtops and Pocket PCs, has contributed to form the concept of M-Learning, whose main purpose is to allow a high degree of mobility for learning process. Some researches have used concept maps to support navigation in m-Learning applications. Nevertheless, if this navigation support is not very flexible, learner isn't able to adapt to it. Navigation in m-Learning applications presents certain limitations mainly due to the reduced screen size of mobile devices and the requirement of being easy of use in order to provide a more efficient learning process.

This new technology needs intensive development that include the variety of platforms now being used and non-compatibility between these platforms needs to be taken into account. Transferring services provided by an E-learning platform directly into M-Learning platform is impracticable in certain context because such limitations of small

devices. For example, access to the Web via mobile devices with limited capability of small screen size has been a major concern lots researcher in the field.

In general, the main limitation of a handheld device is the small screen size, which lacks a mechanism for horizontal scrolling. Input is often with a stylus, not a mouse. Downloading to the device is likely to be both expensive and slow, the processors are slow, and the memory is limited. A lot of users choose to turn off while image loading. Small size is a virtue in these devices, but developing effective interactive applications for low-resolution monochrome displays requires thoughtful planning.

2.1.5 Guidelines for M-Learning Applications

In order to create a usable M-Learning application, there are a few basic standards that need to adhere to. First, use simple language (some name, some date), without detailing those circumstances under which simple language might be misleading, or what constitutes simple language. It allows users ease to understand and use the application.

The second one is to create short, not more than 5-10 minutes long modules. Users should be able to use their small fragments of waiting or idle time for learning, by reading small pieces of data, doing quizzes or using forums or chat [11].

Thus, the application should be simple and has added value functionality. It should be possible to use an M-Learning system without reading a user manual and the experience of studying with the help of such devices should be interesting and engaging [11].

Besides that, area/domain specific content is must be delivered just in time/place. The mobility should bring the ability to guideline and support students and teachers in new learning situations when and where it is necessary.

In designing mobile web application, cost factor should also take into account. Different infrastructure and services imply different cost [24]. For example, if WAP is used, the cost lies with the student to pay for access to learning content and services, if SMS is

used to provide push-like information, the cost lies with the institution. To keep costs down, services should be designed that do not require special hardware.

On the other hand, from usability aspect, attention should be drawn to the two sets of users that usability should account for; one, for developers and those who will be using the mobile applications and will access the mobile content (users).

Besides those above factors, security and privacy aspects are important issues in the implementation of any network-based system or sharing-based system [24]. In the case of mobile technologies in schools and institutions, one needs to consider who has access to the educational materials (for example, implement password-enabled access) and applying security levels to student information (for example lower to higher security levels for names, addresses and phone numbers, grades)

2.1.6 Advantages of M-Learning

The convergence of mobile technology and e-learning has generated considerable excitements among both practitioners and academics. Learning with mobile technologies constitutes to a new learning experience. Thus, ubiquitous access through the use of mobile device is perhaps the most persistent driver in learning paradigm.

There are a few properties of mobile devices produce unique educational affordance. The small size and weight of mobile devices means the devices can be take to different sites or moved around within a site which describes the portability advantage of mobile devices. Hence, the concept of delivery and access the learning contents anywhere anytime is applied.

M-Learning application is prudent to context sensitivity as of the limitation of mobile devices. However, mobile devices can both gather and respond to real or simulated data unique to the current location, environment and time to produce the experiential learning environment.

CHAPTER 3

METHODOLOGY

3.1 PROCEDURE IDENTIFICATION

The project requires good understanding about workflow process in order to evaluate the effectiveness learning practice being adopted. The methodology that has been used in this project is as below.

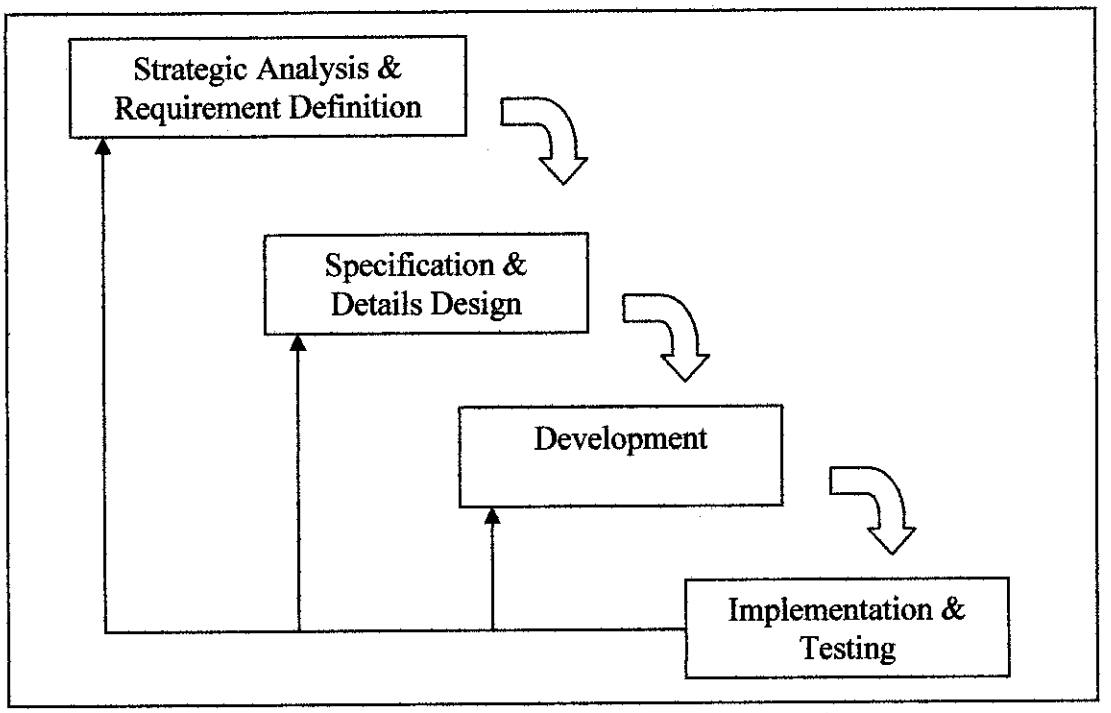

Figure 3.0: System Methodology Approach/Model

3.1.1 Strategic Analysis and Requirement Definition

The author chooses to establish the system's services, constraints and goals among several factors so that overall goals for the application can be set. These include anticipating and deciding on the target audience, purpose, and objectives for the project. In order to improve the application's overall quality, the process of gathering and

comparing information about the application and its functionality are the main concern. Therefore, a thorough analysis needs to be carried out to grasp the exact concept and information lay behind it. A survey has been conducted to obtain a precise feedback from the users upon the awareness and understanding of m-learning. In this case, two parties are seen as the suitable candidates; the lecturer and student. The survey has been distributed among the UTP students and lecturer in which the respective target users for the system. Based on the feedback, majority of students willing to use the system to improve their knowledge and communication and the information gathered then used to detail out the requirements.

3.1.2 Specification and Details Design

It is at this phase system services, constraints and goals are then defined in detail and serve as a system specification. The author has identified systems design process partitions the requirements to either hardware or software systems to establish an overall system architecture. Also, describing the fundamental system concept and their relationships is part of application design. During this phase, the author has done a research on the design issues and classified them in which an obstacle and challenges in developing mobile web application.

3.1.3 Development

In this phase, the author constructs the system using all the available tools identified earlier in specification and design phase. The author uses Microsoft Visual Studio.NET as the development tool and ASP.NET as the language to build it. As for the database part, the author has chosen to use Microsoft Access 2003 database. The process relies heavily on the specification and requirements of the application and other processes and elements in system development. This phase emphasize on the user interface of the system.

3.1.4 Implementation and Testing

During this phase, the author integrates all the individual program units and tested as a complete system to ensure the requirements are met. Survey is conducted to obtain precise feedback from users upon the project completed and successfully through the testing processes. A survey report on the project feedback is prepared to analyze the successfulness of the project in meeting certain criteria based on technology acceptance model (TAM); perceived of usefulness, perceived ease-of-use, mobility and compatibility.

3.2 ARCHITECTURE

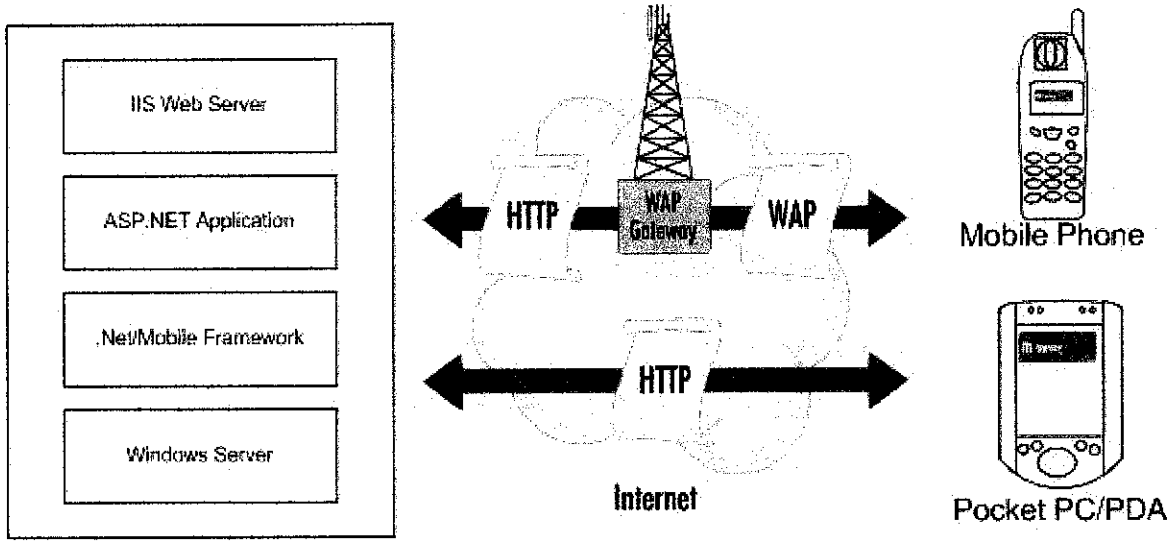

Figure 3.1: Mobile Learning Architecture

Figure 3.1 shows the architecture of this project which only applied and focusing on mobile phone. When an ASP.NET page request (web browser) comes from a web client such as mobile devices to WAP gateway provided by wireless carrier, WAP gateway translates the WAP request to an HTTP request and passes it to the Web Server over the internet. The HTTP request contains the User Agent string, Header information and URL that is being requested. The User Agent string is matched against entries in the machine.config file. The URL from the HTTP request is then locating the corresponding

mobile Web page which will have an .aspx file extension. If the ASP.NET page is requested for the first time then the .NET framework will compile the ASP.NET page into the intermediate language (IL). Then IL code will be compiled into native code by a Just-In-Time (JIT) compiler.

The request is returned to the gateway in an HTTP response. The gateway then processes the response, compiles the code the phone can understand, and send a WAP response back to the requesting browser. Thus, .NET framework is the heart of the ASP.NET application and will supply the need resources and the language compiler of your choice to compile the code.

3.2.1 Work Flow of the System

This project is focusing on client perspective. In general, the users will need to login first into the system. For the login part, the author use forms authentication as a security measure so that when there users who try to access a page in the system without being authenticated first, then they will be redirected back to the login page. Once they have been logged in then they will be able to access other pages in the system. Please refer to Figure 3.2 for the work flow diagram of M-Learning of client/user.

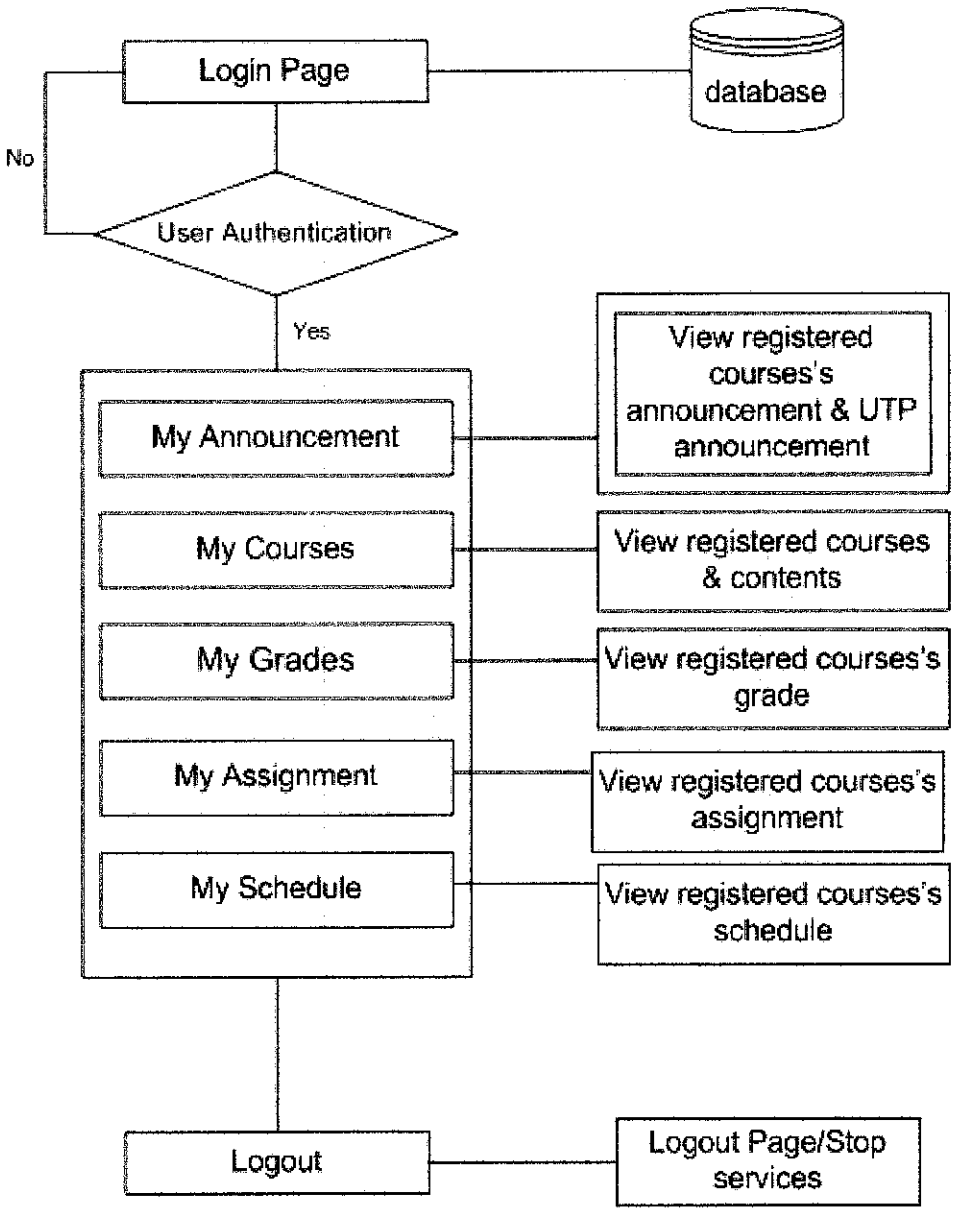

Figure 3.2: Work Flow Diagram of M-Learning

3.3 TOOLS AND UTILITIES

These are the tools that are used throughout the project:

Table 3.0 Tools and Utilities

NO	ELEMENTS	TOOLS
1	**Project Management**	Microsoft Visio
2	**Documentation**	Microsoft Word
3	**System Modeling**	Microsoft Visio
4	**Hardware**	• 166 MHz processor or higher • Hard disk space 1.5 GB (at least) • 256 MB RAM or higher
5	**Software**	• Active Server Page (ASP) Web Matrix • Microsoft Visual Studio.NET 2003 • Microsoft Mobile Internet Toolkit • Microsoft Mobile Emulator (MME) • Microsoft Access 2000 • Microsoft .NET Framework • Internet Information Service

CHAPTER 4

RESULTS AND DISCUSSION

4.1 FINDINGS

4.1.1 M-Learning in the Education Field

M-Learning is a new extension of learning process originated from E-learning and has a potential to be widely used to make learning process more extensively available and accessible. In association with M-Learning, the concepts portable and personal have both been consistently applied. Portable solutions provide learning opportunities accessed as a person move through their environment and personal allows an individual to access one piece of learning from a variety of 'static' locations. Hence, the flexibility aspect plays an essential role to a success of this new learning environment.

It is within the context that M-Learning offers and represents "just-in-time learning", "on the go", "anywhere, anytime learning." The availability of wireless and mobile technologies also makes it possible to provide learning opportunities to learners that are either without infrastructure for access or continually on the move.

Thus, a wide range of issues has been discussed and need to be taken into consideration such as cost-effectiveness, user acceptance, convergence and interoperability, and connectivity and accessibility before M-Learning extensively put into practice as the effective new learning paradigm.

4.2 SYSTEM CONSTRUCTION – CLIENT MOBILE

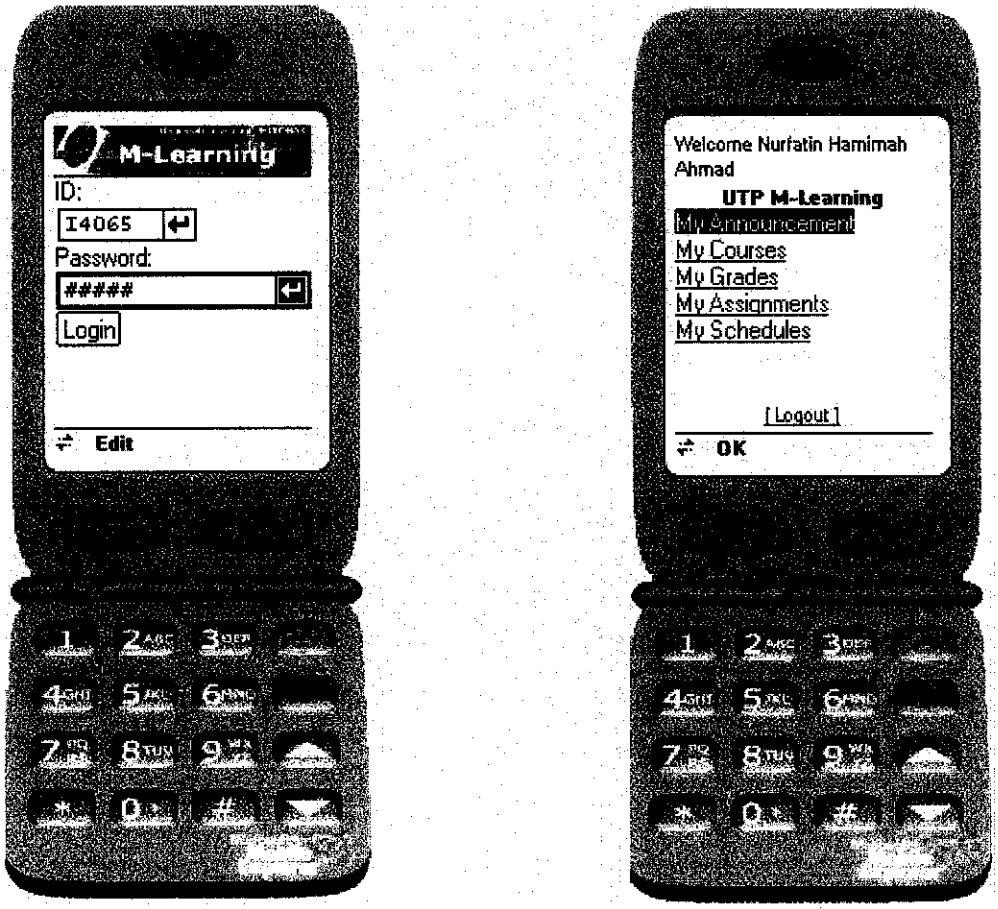

Figure 4.0 Login Page and Default Page of M-Learning

Figure 4.0 above shows the login page and the default page of the system. Once user has been logged in, they will be directed to the main page of the system and user's name will be displayed on top of the screen with respect to user's login ID. If user has entered either wrong password or ID, error message will be display below Login button to notify the user. The main page consists of five modules; announcement module, courses module, grade module, assignments module and the schedule module.

Figure 4.1(a) Announcement Module

Announcement module consists of courses's and general announcement. User will be able to view the registered courses's announcement posted including the UTP announcement which is known as 'general' In this module, user is able to navigate Main Index which consists of all listed modules and is allow to logout from the system (see Figure 4.1).

Figure 4.1(b) Announcement Module

Since the announcement is quite lengthy, user can use Next and Previous (see Figure 4.1 (b)) function to read back and forth the announcement. This module also provides with logout link to end the system and user is able to navigate through to the listed announcements.

Figure 4.2 Course Module

Based on the course(s) that has been registered, users will be able to view learning materials according to chapters as shown above. Users can navigate back and forth between the first page and the next page of the learning materials if the materials are lengthy in text.

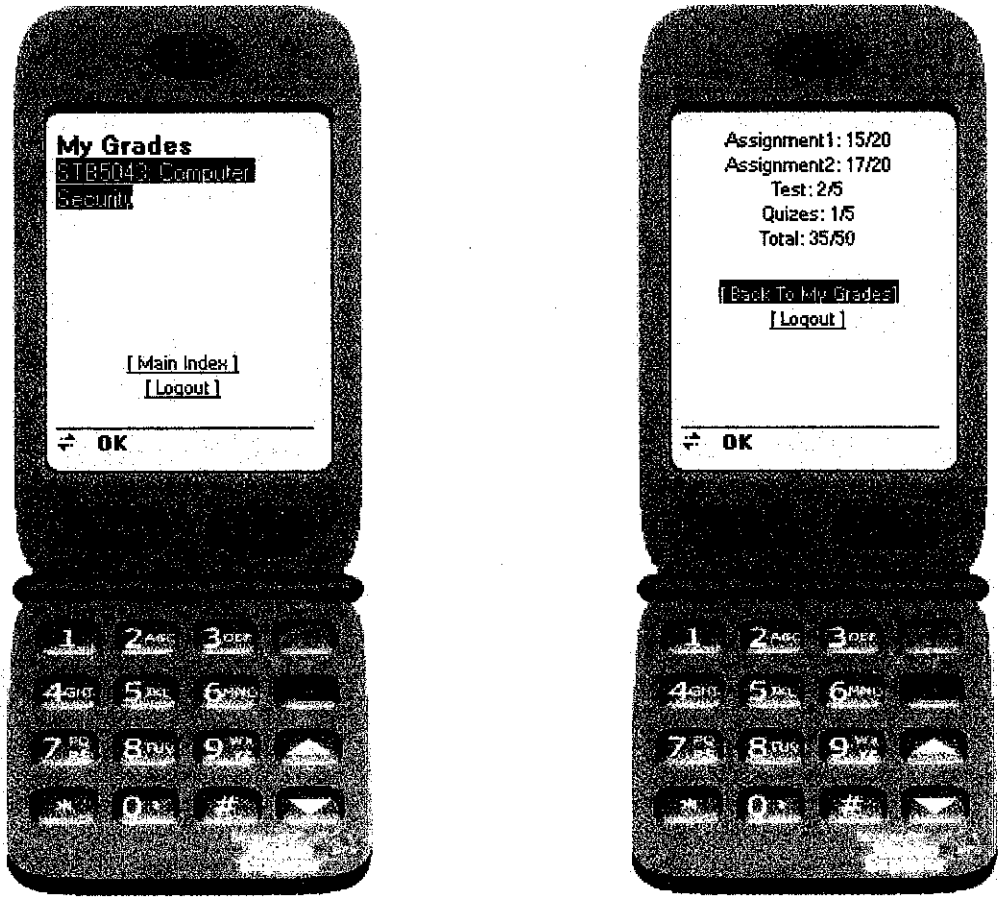

Figure 4.3 Grade Module

Figure 4.2 above shows the page for the grades module. This module shows the marks for quizzes, projects, tests etc. All the data are retrieved from the database. If the user has not register for the course input by them, an error message will be displayed.

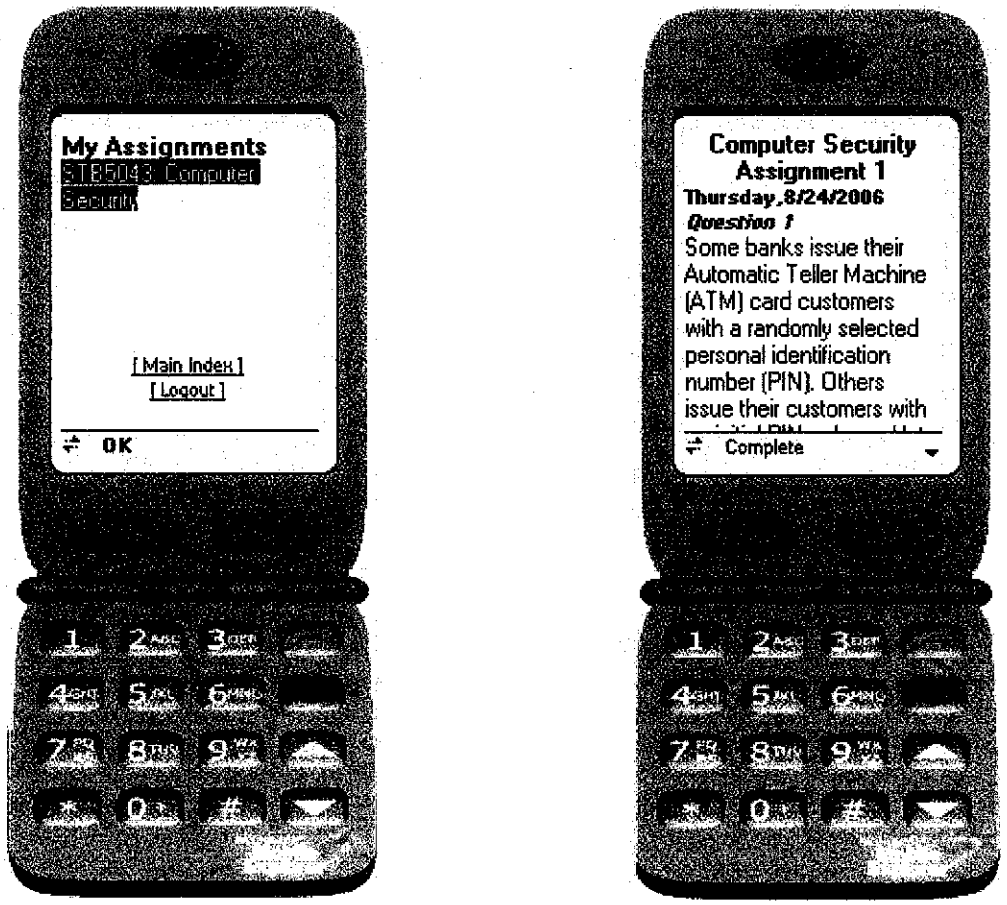

Figure 4.4 Assignment Module

The assignment module enables students to view the assignments that have been given. The figure above shows a sample page of the assignment module.

Figure 4.5 Schedule Module

The schedule module allows users to search for a schedule according to their preferences where they have to enter a day that they would like to view the schedule. All the schedule information is retrieved from the database. Students able to navigate back and forth using the links provided.

Figure 4.6 Logout

Figure 4.6 shows the notification when user ended or logout from the system. It's an alert to notify user that the system take into account the security measure.

4.3 SYSTEM EVALUATION

4.3.1 Evaluation Model

For the system evaluation, the author had decided to adopt Technology Acceptance Model (TAM) for explaining relevant means of mobile services and use. Technology Acceptance Model (TAM) was developed to predict end-user acceptance of information systems within organizations [25].TAM proposes a behavioral model where two beliefs, perceived ease of use and perceived usefulness [26] are the primary indicators to predict

intentions of use. This approach claims that these two beliefs determine the attitude towards using the system and that attitude together with perceived usefulness determines the intention. Use intention then determine the actual use of the system.

TAM has been applied by some researchers in different platforms for example acceptance of handheld Internet devices [27] and physicians acceptance of mobile medical information [28]. Klejnen et al. found evidence of applicability of TAM in their study on consumer intentions to adopt WAP financial services. Hun et Al. studied the adoption of WAP services in Taiwan [26] and found that ease of use and usefulness were among the critical factors affecting the WAP services. Based on the prior findings, the author proposes the following hypothesis:

H1: Perceived ease of use has a direct positive effect on users' intention to use mobile learning

H2: Perceived usefulness has a direct positive effect on users' intention to use mobile learning

The author also adopts diffusion of innovations theory by Rogers. The theory determines five innovation characteristics; relative advantage, complexity, compatibility, triability and observability [26]. Prior research has noted the similarity between perceived usefulness and ease of use elements in TAM and relative advantage and complexity that constructs in diffusion theory [29]. The relative advantage or usefulness and ease of use constructs can be considered as parallel and together with compatibility in which been found as the most constant determinants of adoption. Therefore, author proposes the following hypothesis:

H3: Compatibility has a direct positive effect on users' intention to use mobile learning

The most significant feature of mobile technology is the mobility which provides technologies anytime, anywhere. The author also found the effect of ease of use situation has been an important determinant for user behavior. User situations are expected to mediate the benefits of mobility and perceived usefulness of mobile services. For

example, when a person is on the move and needs to access the email quickly, the benefit of mobility take place and in turn is perceived as useful. The author proposes the following hypothesis:

H4: Use situation mediates the effect of usefulness on user intention to use mobile learning

H5: Use situation mediates the effect of mobility on user intention to use mobile learning

Based on the above theories; TAM and diffusion of innovations theory are constructed to a model shown in Figure 4.6.

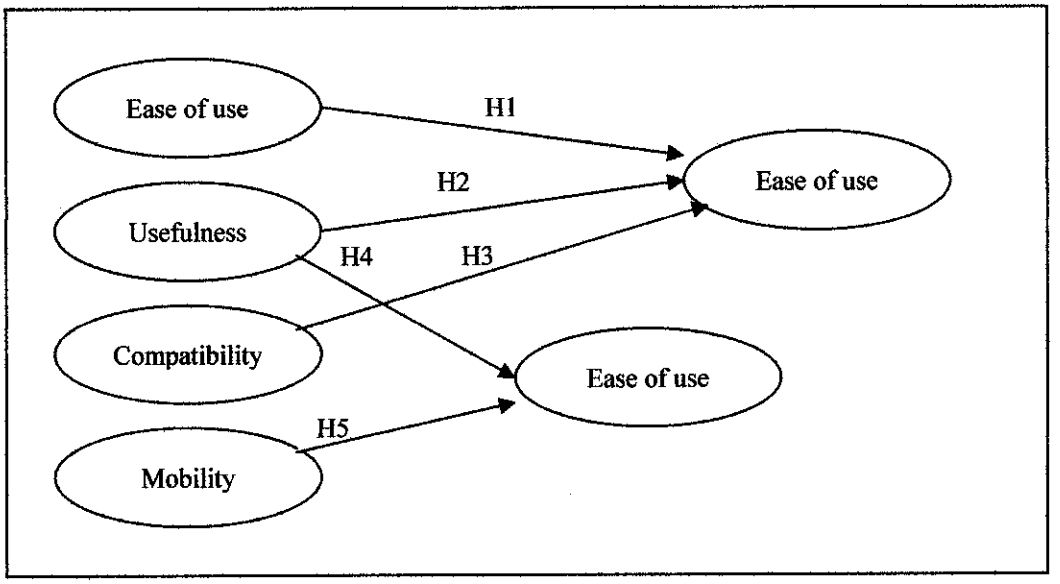

Figure 4.6 Evaluation Model

4.3.2 Data Collection

Questionnaire is used as a mechanism to evaluate users' experience in using the system. The purpose of the questionnaire is to elicit information on the effectiveness of M-Learning as a learning tool. It is an excellent way of obtaining either quantitative or qualitative data, since the user responses are written and can be tallied to illustrate user preferences.

Respondents were selected with a random sampling among Universiti Teknologi PETRONAS students. The questionnaire is aimed to be distributed to 100-200 respondents from different programme. The author will use emailed and give hand to hand approaches in distributing questionnaires to the respondents.

One of the benefits of questionnaires is that they can be administered without evaluator present where forms can be distributed to users. Another benefit is that questionnaires can be distributed to large groups or geographically isolated populations. But, one of the drawbacks of using questionnaires that is faced by user is that questions cannot be rephrased as they can during verbal interviews.

4.3.3 Analysis of Responses to M-learning

First responses to the idea were mixed, as many were immediately accepting, some were immediately rejecting. Irrespective of their initial views, most responded with questions about the nature, format and purpose of M-Learning. Respondents are quite difficult to adapt to the term M-Learning, largely because it was still a new concept in education, and this was used for the remainder of the discussions.

The initial tendency was for the respondents to consider the benefits and drawbacks of M-Learning for themselves as individuals. Those initially most favorable towards the idea argued that they would benefit from it. However, the ones that disagree towards the idea argue that they would benefit more from the traditional learning system.

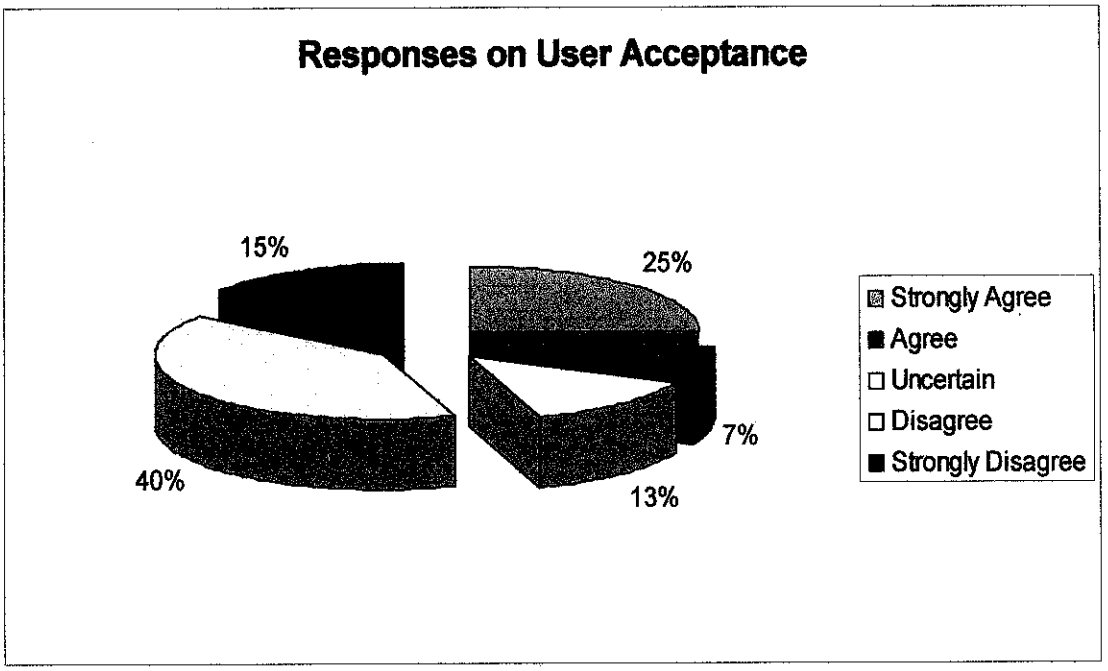

Figure 4.7 Responses on User Acceptance

Generally, students are interested in the kind of technology that M-Learning can offer them. Another plus factor is that most of them own at least one mobile device, the most common being mobile phones. Figure 4.7 shows that 15 percent and 40 percent both strongly agree while 25 percent strongly disagree. Another 13 percent disagree while the remaining is uncertain.

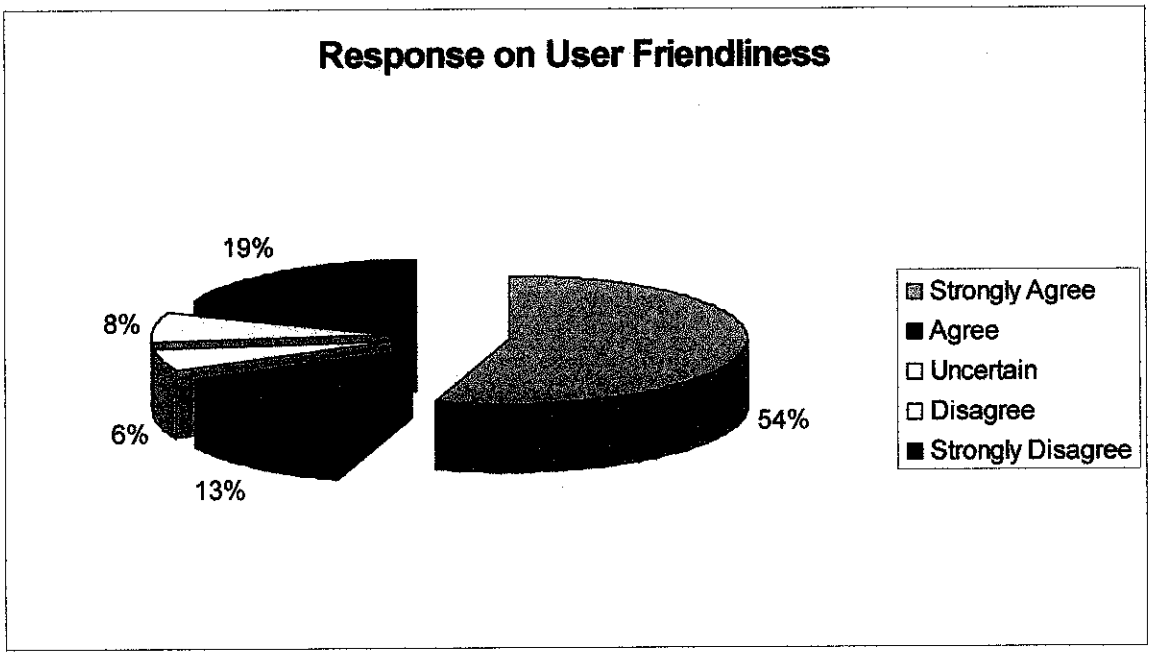

Figure 4.8 Responses on User Friendliness

Based on Figure 4.8, the author found that 54 percent strongly agree that the system that is user friendly and easy to use. Another 13 percent agree, while 6 percent are uncertain whether it is user friendly or not. Both 8 percent and 19 percent disagree and strongly disagree on the user friendliness of the system.

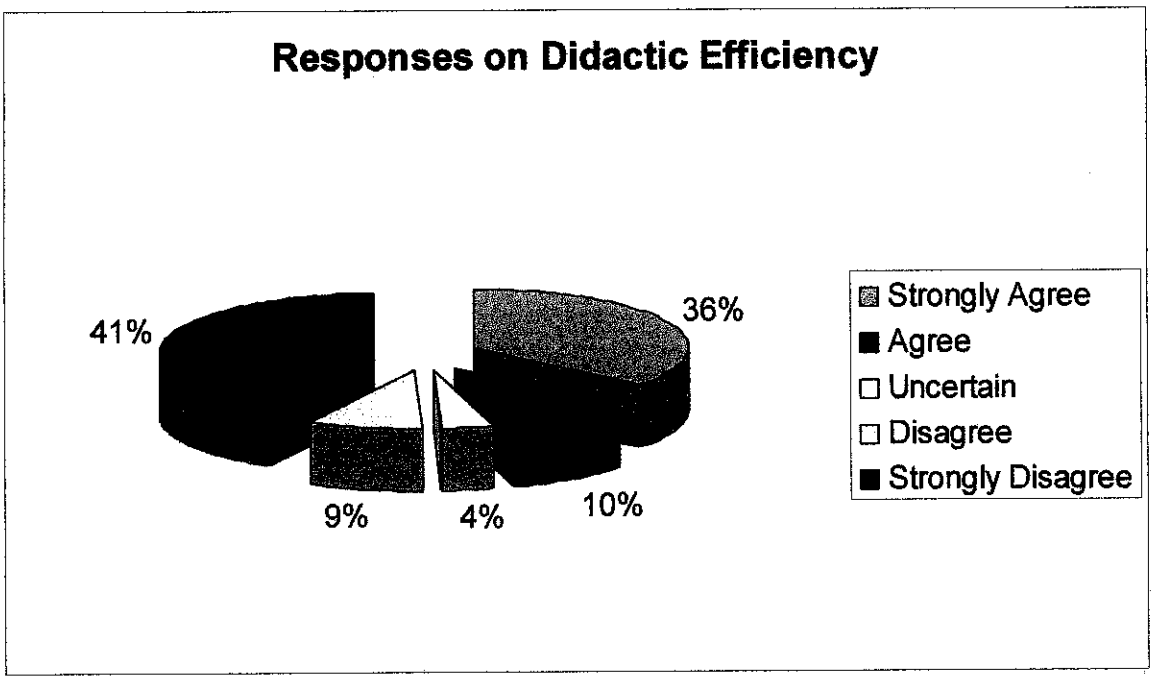

Figure 4.9 Responses on Didactic Efficiency

Figure 4.9 shows an almost balance distribution between those that agreed and those who did not.36 percent strongly agree that M-Learning improves educational efficiency while 41 percent strongly disagree and still prefers the current learning styles. The rest shows that 10 percent agree, 9 percent disagree while another 4 percent are uncertain.

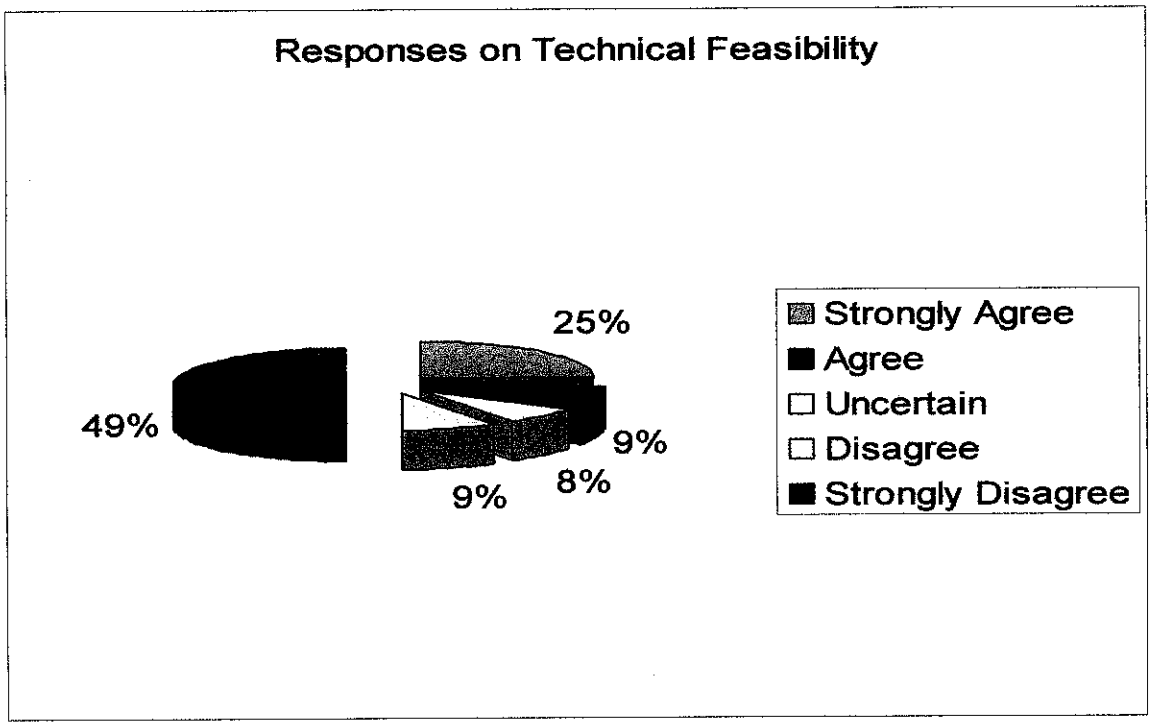

Figure 4.10 Responses on Technical Feasibility

Figure 4.10 shows that 9 percent disagree on technical feasibility, with most of them disagree that it is not necessary to use graphics and illustrations in order for M-Learning to be effective, considering the screen limitation factor. 49 percent strongly disagree while 8 percent remain uncertain. Both 25 percent and 9 percent strongly agree on technical feasibility

4.3.4 Conclusion Derived From Questionnaires

After analyzing the survey data, the author found that the concept of M-Learning might be of an interest to the users, provided that it can assist them in their learning process. Apart from that, it seems that M-Learning can be more easily acceptable if it is able to provide almost the same learning experience based on the current education style, and able to provide an interactive learning environment for the users. Those that disagree prefer to stick to the current learning style or might be resistant to technology changes. Users are very concern with the usability of the system as this will be the main factor whether the system will be easy to use or not.

4.4 RESULT

Table 4.0 Construct Reliability Measures

Construct	Item t-values	Cronbach α (>0.7)	Composite reliability (>0.7)	Variance extracted (>0.5)
Ease of Use	4.42 - 4.68	**0.88**	**0.88**	**0.75**
Usefulness	4.07 - 6.45	**0.85**	**0.85**	**0.72**
Compatibility	3.53 - 4.21	0.61	0.61	0.46
Mobility	2.74 - 5.82	**0.72**	**0.72**	**0.52**
Use Situation	1.66 - 3.37	**0.64**	**0.65**	**0.49**

Table 4.0 shows the measured five elements; ease of use, usefulness, compatibility, mobility and use situation to determine the reliability of the system. Cronbach α, composite reliability and variance extracted measures to assess construct reliability. Composite Reliability depicts the internal consistency of indicators, whereas variance extracted reflects the overall amount of variance in the indicators accounted. All the figures shows in Table 4.0 are extracted from the survey result. Bold figures shows that each element meet above the minimum values indicates. Thus, below are the hypothesized casual paths derived based on the measurement above and the hypothesis that been discussed earlier.

- **H1:** Perceived ease of use has a direct positive effect on users' intention to use mobile learning
- **H2:** Perceived usefulness has a direct positive effect on users' intention to use mobile learning
- **H4:** Use situation mediates the effect of usefulness on user intention to use mobile learning
- **H5:** Use situation mediates the effect of mobility on user intention to use mobile learning

Throughout the development of this project, the author finds out that although M-Learning is a natural evolution of E-Learning, to effectively build and deliver M-Learning requires rethinking, reinvestigating, and re-evaluating the human-computer interaction in the M-Learning environment. Existing E-Learning frameworks may not work very well with M-Learning. The interaction experience in M-Learning is different from other types of learning.

Learning with mobile devices constitutes a new learning-interaction experience and a lot is still unknown about the M-Learning experience. It is believed that interaction experience can be an important, mediating towards the success of M-Learning.

To understand the interaction experience in the mobile environment, three important components are examined:

- Understanding of the mobile learners - including their characteristics, psychological (affective and cognitive), and physical capability
- Understanding of the M-Learning environment - the motivations and circumstances surrounding mobile device use and adoption; and how and why people adopt M-Learning
- Understanding of the mobile experience - completely different from desktop experience as it has specific characteristics that need to be factored into the design of a mobile application

Based on the research theme above, a prototype of M-Learning was developed using the specified tools. The M-Learning has several modules; course module, schedule module, grade module and assignment module. Each of these modules has its own element which constitutes the findings of the research, i.e. how the research element is applied into the development of M-Learning.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The use of mobile computing technologies has contributed to form the concept of Mobile Learning or m-Learning, whose main purpose is to allow a high degree of mobility for learning. This system provides users with a new wave of learning environment and experience, where they can access information they want using a mobile device constituting to the anytime, anywhere learning. This in turn introduces the concept of flexibility and mobility. However, it demands a lot of research to face the challenges of mobile technologies to deliver a course. In development processes, all the research elements; usefulness, ease of use and mobility are integrated to achieve user-friendliness.

During the development of the system, the author faced a lot of challenges and hurdles which at times delayed the development of the system. Lack of resources and time constraint is the main limitation factor in the development of the system. Apart from that, lack of knowledge and expertise on the subject are the most challenging elements in completing the system.

The author found that a success of learning with mobile technologies will be measured by how seamlessly it weaves itself into daily lives. The challenge for technology developers of the future will be to find ways to ensure that this new way of learning is highly situated, personal, collaborative and long term; in other words, truly learner-centred learning.

5.2 SUGGESTED FUTURE WORK FOR EXPANSION AND CONTINUATION

There are some aspects that can be enhanced through some modifications and adjustments to maximize the potentials and values that can be derived from this application. Below are some suggested potential future enhancements that can be done to this M-learning application:

- A real mobile device, such as a mobile phone, is use to test the system, instead of an emulator as this will give users a more accurate view of how the system look and feel will be. Apart from that, if possible it is also suggested that a Pocket PC is used to test the system as the author feels that it has more functionality to offer than a mobile phone.

- More modules to be included in the system, such as a quiz module that enabled users to take a short quiz and get instant results from the system. This way, users can test their knowledge while on the go, for example while waiting for the bus etc.

- Users will be able to view documents such as Word document etc. on the system and if possible to download the documents into the device, so that the documents can be viewed later on.

- Allow communication between students to students and students to lecturers so that an interactive learning environment will be available.

- User's personalization to be included into the mobile system. This means that when users log in to the system, the interface of the system will be displayed according to their preferences.

- Integrate the system with audio/video streaming to create a more conducive learning environment for users to fully benefit from it.

- Develop portal for specifically for administrator / lecturer to administer and monitor the contents of M-Learning system through a more appropriate way.

- Integrate My Announcement capabilities with SMS notifications, to alert user for important announcements related to the courses they registered or university general announcements, as well as reminder for dateline for assignments or projects.

- Expand M-Learning usage for lecturer also, whereby access level will have three types – student, lecturer and administrator. Example of functionality that can be added is that allow lecture to send or submit announcement using M-learning application in case of class cancellation or class postponed.

- Real- Time Quizzes submission via the system where users able to take quizzes and submit at real-time.

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APPENDIX A

Questionnaire

Appendix A (1): QUESTIONNAIRE ON DATA GATHERING

Survey Questionnaire

Tajuk/Title : M-Learning
Disediakan oleh/ Prepared by : Nurfatin Hamimah Ahmad
e-mel/e-mail : fatin.ahmad@gmail.com

***Pendahuluan*/ Preface:**

Pendidikan merupakan asas kepada pembangunan ekonomi di setiap negara. Menyedari kepentingan untuk mempunyai servis pendidikan yang lebih baik, di sinilah teknologi tanpa wayar mengambil peranan. Dengan penggunaan alat-alat mudah alih, ia membolehkan untuk melayari kandungan pembelajaran dan pelajar akan terdedah kepada pengalaman pendidikan yang baru iaitu pembelajaran bergerak atau m-pelajaran. M-pelajaran adalah subset kepada 'perkhidmatan pembelajaran di Internet' atau lebih dikenali sebagai e-pelajaran. M-pelajran dapat membantu informasi dan kandungan pembelajaran diperolehi pada bila-bila masa dan dimana jua.

Tujuan kaji selidik ini diadakan adalah untuk mengetahui tahap penerimaan penghuni Universiti Teknologi Petronas (UTP) terhadap inisiatif m-pelajaran sebagai medium pembelajaran dan komunikasi di antara penghuni-penghuni UTP. Kajiselidik ini mengandungi empat seksyen, iaitu Seksyen A, Seksyen B, Seksyen C dan Seksyen D. Anda dikehendaki menjawab soalan pada keempat-empat seksyen tersebut.

Education is the cornerstone of economic development in any nation. Realizes that the importance for better learning services, there is where the wireless technology comes in. Coupled with the used of mobile devices that make it possible to access educational content, and students are exposed to a new educational experience, mobile learning or m-learning. M-learning is a subset of 'learning services on the internet' or better known as e-learning. M-learning can help make information and learning content available anytime and anywhere.

The objective of this survey is to study the acceptance of UTP residents towards the m-learning initiatives as a medium of learning and communication among the residents. This survey consists of four sections, which is Section A, Section B, Section C and Section D. Respondent are required to answer all sections.

Seksyen A: Latar Belakang Responden
Section A: Respondent's Background

***Arahan/* Instruction**
Sila tandakan [x] di *kotak yang disediakan/*
Please tick [x] in the box given.

1. *Lingkungan umur*/Age range

	15 – 20 *tahun*/years		41 – 45 *tahun*/years
	21 - 25 *tahun*/years		46 – 50 *tahun*/years
	26 – 30 *tahun*/years		51 – 55 *tahun*/years
	31 – 35 *tahun*/years		56 – 60 *tahun*/years
	36 – 40 *tahun*/years		> 60 *tahun*/years

2. *Jantina*/Gender

	Lelaki / Male		*Perempuan* / Female

3. *Bangsa*/Race

	Melayu / Malay		*India* / Indian
	Cina / Chines		*Lain-lain* / Others

4. *Adakah anda pelajar ataupun pensyarah?* /Are you a student or lecturer?

	Pelajar/ Student		*Pensyarah* / Lecturer

5. Di jabatan manakah anda berada?/ Which department are you in?

	Kejuruteraan Mekaninal / Mechanical Engineering
	Kejuruteraan Awam/ Civil Engineering
	Kejuruteraan Elektrik dan Elektronik/ Electrical and Electronic Engineering
	Kejuruteraan Kimia / Chemical Engineering
	Teknologi Maklumat & Sistem Maklumat / Information Technology & Information System
	Pembelajaran Am/General Studies

Seksyen B: Penggunaan Internet
Section B: Internet Usage

***Arahan/* Instruction**
Sila tandakan [x] di kotak yang disediakan/
Please tick [x] in the box given.

1. *Sekerap manakah anda menggunakan perkhidmatan Internet?*
   How frequent do you utilize Internet connection?

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Langsung tidak/ Never	*Jarang/* Rarely	*Sederhana/* Moderately	*Kerap/* Frequent	*Sangat Kerap/* Very frequent

2. *Apakah tujuan utama anda menggunakan Internet?*
   What is your main reason using Internet? (You can select more than one)

	Pelajaran / Education
	Kerja / Occupation
	Mengisi masa lapang / Leisure
	Berurusan untuk berjumpa / Arranging to meet up
	Berbual dengan rakan / Chatting to friends
	Hiburan / Entertainment
	Lain-lain (sila nyatakan) / Others (Please justify) : _____

3. *Dimanakah anda selalu menggunakan Internet?*
   Where do you usually access Internet?

	Rumah / Home
	Makmal Komputer/ Computer Laboratory
	Kafe siber / Cyber Café
	Sekolah/Universiti / School/University
	Lain-lain (Sila nyatakan) / Others (Please specify) : _____

Seksyen C: Pekhidmatan Khidmat Elektronik Pelajaran melalui Internet
Section C: Use of E-Learning Services via Internet

***Arahan/* Instruction**
*Sila tandakan **[x]** di kotak yang disediakan*
Please tick [x] in the box given.

1. *Sekerap manakah anda menggunakan perkhidmatan E-Learning?*
   How frequent do you utilize *E-Learning*?

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Langsung tidak/ Never	*Jarang/* Rarely	*Sederhana/* Moderately	*Kerap/* Frequent	*Sangat Kerap/* Very frequent

2. *"E-learning merupakan saluran informasi yang penting dalam pembelajaran" Adakah anda bersetuju dengan pernyataan tersebut?*
   "E-learning is the most important information channel in education" Do you agree with statement?

	Ya / Yes		*Tidak* / No

3. *Apakah tujuan anda menggunakan E-Learning*?
   What is your reasons using *E-Learning*? (You can select more than one)

	Mengambil nota/ Downloading notes
	Kursus dan UTP terkini/ Course and UTP Updates
	Berkomunikasi dengan pensyarah /pelajar/ Communicate with lecturer/students
	Perbincangan Terbuka / Discussion board
	Mendaftar Kursus diambil / Enroll courses taken
	Lain-lain (sila nyatakan) / Others (Please justify) : _____

4. *Apakah perkhidmatan E-Learning yang anda rasakan paling penting?*
   What *E-Learning* services that is most useful to you? (You can select more than one)

	Mengambil nota/ Downloading notes
	Kursus dan UTP terkini/ Course and UTP Updates
	Berkomunikasi dengan pensyarah/pelajar / Communicate with lecturer/students
	Perbincangan Terbuka / Discussion board
	Mendaftar Kursus diambil / Enroll courses taken
	Lain-lain (Sila nyatakan) / Others (Please specify): _____

Seksyen D: Penggunaan Khidmat Elektronik Pelajaran Melalui Telefon Mudah Alih
Section D: Use of E-Learning via Mobile Phone

***Arahan/* Instruction**
*Sila tandakan **[x]** di kotak yang disediakan/*
Please tick **[x]** in the box given.

1. *Adakah anda mempunyai alat-alat mudah alih?(cth:telefon bimbit,PDA)*
   Do you own any mobile devices?(eg:handphone,PDA)

	Ya / Yes		*Tidak* / No

   (*Jika jawapan anda tidak, sila abaikan soalan 2 dan seterusnye*)
   (If your answer is no, skip question 2 onwards)

2. Jenis *alat-alat mudah alih*
   Type of your mobile devices manufacturer

	Nokia
	Sony Ericsson
	Samsung
	Motorola
	Hewlet Packard
	Sagem
	Panasonic
	Lain-lain (Sila nyatakan) / Others (Please specify): _____

3. *Aplikasi manakah yang anda gunakan dari telefon mudah alih atau apakah penggunaan telefon mudah alih anda? Sila nilai dari skala 1 hingga 5 akan kepentingan aplikasi telefon mudah alih*
Which applications do you use on your mobile phones or what is/are the usage/s of your mobile phone? In a scale of 1 to 5, please rate the importance of the following mobile phone applications

i. *Membuat panggilan* / Telephone calls

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit*/ Of little importance	*Sederhana penting*/ Moderately important	*Penting*/ Important	*Sangat penting*/ Very important

ii. *Pesanan* / Text Messaging

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit*/ Of little importance	*Sederhana penting*/ Moderately important	*Penting*/ Important	*Sangat penting*/ Very important

iii. *Permainan* / Games

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit*/ Of little importance	*Sederhana penting*/ Moderately important	*Penting*/ Important	*Sangat penting*/ Very important

iv. *Mencari informasi menggunakan GPRS* / Access for information using GPRS

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit*/ Of little importance	*Sederhana penting*/ Moderately important	*Penting*/ Important	*Sangat penting*/ Very important

v. *Mengambil gambar* / Taking pictures

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit*/ Of little importance	*Sederhana penting*/ Moderately important	*Penting*/ Important	*Sangat penting*/ Very important

vi. *Belajar* / Studying

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit*/ Of little importance	*Sederhana penting*/ Moderately important	*Penting*/ Important	*Sangat penting*/ Very important

vii. *E-mel* / Email

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit*/ Of little importance	*Sederhana penting*/ Moderately important	*Penting*/ Important	*Sangat penting*/ Very important

4. *Adakah anda menyedari wujudnya perkhidmatan pembelajaran melalui telefon mudah alih (m-pelajaran)?*
   Are you aware of learning services through mobile phone (m-learning)?

	Ya / Yes		*Tidak* / No

   (*Jika jawapan anda tidak, sila abaikan soalan 5 dan teruskan ke soalan 7*/
   If your answer is no, skip question 5 and proceed to question 7)

5. *Dari manakah anda pertama kali mengetahui wujudnya perkhidmatan m-pelajaran?*
   How did you first know about m-learning?

	Televisyen / Television
	Radio / Radio
	Majalah/ Magazine
	Rakan / Friend
	Internet / Internet
	Lain-lain (Sila nyatakan) / Others (Please specify): _____

6. *Bagaimanakah tahap kefahaman anda mengenai konsep m-pelajaran?*
How far is your understanding with regards to m-learning concept?

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak faham langsung/ Don't understand at all	*Sedikit /* A little	*Sederhana/* Moderate	*Faham/* Understand	*Sangat Faham/* Really understand

7. *Adakah anda setuju menggunakan alat-alat mudah alih untuk meningkatkan pengetahuan dan komunikasi dengan lecturer/pelajar?*
Would you be willing to use mobile devices for improving your knowledge and communication with lecturers/students?

	Ya / Yes		*Tidak* / No

8. *Sila nilai dari skala 1 hingga 5 akan kepentingan elemen multimedia terhadap m-pelajaran*
In a scale of 1 to 5, please rate the importance of the following criteria's toward m-learning.

i. *Penggunaan tulisan sahaja*
Use of text only

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit/* Of little importance	*Sederhana penting/* Moderately important	*Penting/* Important	*Sangat penting/* Very important

ii. *Penggunaan graphic dan tulisan*
Use of graphics and text

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit/* Of little importance	*Sederhana penting/* Moderately important	*Penting/* Important	*Sangat penting/* Very important

iii. *Penggunaan graphic, animasi dan tulisan*
Use of graphics, animations and text

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit/* Of little importance	*Sederhana penting/* Moderately important	*Penting/* Important	*Sangat penting/* Very important

iv. *Penggunaan audio, animasi dan tulisan*
Use of audio, animations and text

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit/* Of little importance	*Sederhana penting/* Moderately important	*Penting/* Important	*Sangat penting/* Very important

v. *Penggunaan audio, video, animasi dan tulisan*
Use of audio, video, animations and text

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]
Tidak penting/ Unimportant	*Penting sedikit/* Of little importance	*Sederhana penting/* Moderately important	*Penting/* Important	*Sangat penting/* Very important

9. *Sila nilai penerimaan anda dari skala 1 hingga 7 terhadap perkhidmatan m-pelajaran di dalam kehidupan anda seharian*
In a scale of 1 to 7, please rate the acceptance of the m-learning towards your daily life activities.

i. *Saya mendapati bahawa perkhidmatan m-pelajaran sangat berguna dalam aktiviti harian saya*
I would find m-learning services useful in my daily life activities.

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]	6 [ ]	7 [ ]
Sangat tidak munasabah/ Very unlikely		*Tidak munasabah/* Unlikely		Munasabah/ Likely		Sangat munasabah/ Very likely

ii. *Dengan menggunakan perkhidmatan m-pelajaran, ia dapat memudahkan saya mendapatkan informasi tentang pengumuman berkenaan dengan kursus yang didaftarkan*
Using m-learning service would make it easier for me to get information regarding updates pertaining the enrolled courses.

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]	6 [ ]	7 [ ]
Sangat tidak munasabah/ Very unlikely		*Tidak munasabah/* Unlikely		Munasabah/ Likely		Sangat munasabah/ Very likely

iii. *Dengan menggunakan perkhidmatan m-pelajaran, saya dapat memperbaiki mutu komunikasi dengan pensyarah*
Using m-learning services, would improve my communication with lecturers

1 [ ]	2 [ ]	3 [ ]	4 [ ]	5 [ ]	6 [ ]	7 [ ]
Sangat tidak munasabah/ Very unlikely		*Tidak munasabah/* Unlikely		Munasabah/ Likely		Sangat munasabah/ Very likely

Soalan kajiselidik tamat. Terima kasih atas kerjasama yang diberikan.
End of questionnaire. Thank you very much for your cooperation.

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The purpose of this questionnaire is to elicit information on the efficiency of M-Learning in education field.

Appendix A (2): QUESTIONNAIRE ON MOBILE LEARNING (M-LEARNING)

Section 1 Personal background

1. Which department are you in?
- ☐ Mechanical Engineering
- ☐ Electrical and Electronic Engineering
- ☐ Chemical Engineering
- ☐ Civil Engineering
- ☐ Information, Communication & Technology (ICT) , Business Information System (BIS)

2. What is your age grouping?
- ☐ less than 19
- ☐ 20
- ☐ 21
- ☐ 22
- ☐ over 23

3. Gender?
- ☐ Male
- ☐ Female

4. Mobile device ownership
- ☐ Do you own a mobile phone?
- ☐ Do you own a PDA (personal digital assistant), pocket PC or palmtop?
- ☐ Do you own both a mobile phone and a PDA?

Section 2 Acceptance on M-Learning

1. If you are provided with a state-of-the-art mobile device, would you use it to access M-Learning?

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

2. Do you think M-Learning have the potential to be a common thing in the future?

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

3. Would you consider M-Learning to be part of your education mode?

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

Section 3 Student user friendliness

4. It was easy to use the equipment in this mobile learning course

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

5. This mobile learning experience was fun

☐ Strongly agree
☐ Agree
☐ Uncertain
☐ Disagree
☐ Strongly disagree

6. According to my experience I would take another mobile learning course if relevant to my learning needs

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

7. I would recommend mobile learning as a method of study to others

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

8. Where did you study the mobile learning course?

- ☐ At home
- ☐ At the office or work
- ☐ While travelling
- ☐ Other

Section 3. Didactic efficiency

9. Mobile learning increases the quality of e-learning

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

10. Course learning objectives can be met by mobile learning

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

11. Mobile learning is convenient for 'on-the-go' information

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

Section 4. Technical feasibility

12. Navigation through the mobile learning course was easy

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

13. For mobile learning to be effective it is necessary to use graphics and illustrations

- ☐ Strongly agree
- ☐ Agree
- ☐ Uncertain
- ☐ Disagree
- ☐ Strongly disagree

Comments:

Comments on equipment functionality and user friendliness:
