CERTIFICATION OF APPROVAL

Mobile Learning and Micro Web Portal

By

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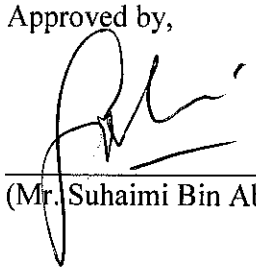
Approved by,



(Mr. Suhaimi Bin Abdul Rahman)

UNIVERISITI TEKNOLOGI PETRONAS
TRONOH, PERAK
JUNE 2004

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in the project, that the originality work is my own expect as specified in the references and acknowledgements and that the original work contain herein have not been undertaken or done by unspecified sources or persons.

Mohd Shah Bin Dolah

ABSTRACT

The purpose of this report is to study on the student nature and how e-learning technology can be implemented in order to improve the productivity of the student especially in time management. The problem arose when wired network connection limit the mobility of the user to access the current e-learning web pages. The disadvantages create a problem to the UTP student because the nature of the student itself where they are always in moved for example like walking to the classes, waiting for meals orders or queue at ATM. The product development focuses on developing prototype of e-learning micro web portal. This technology called M-Learning (mobile learning) application and can be used by student to access any related academic information same as normal portal of e-learning. This micro web portal will assist the student in managing their time more productively and efficiently by providing them a tool that can be used to increase their productivity and learning curve.

ACKNOWLEDGEMENT

Alhamdulilah, I have successfully complete the final report for my Final Year Project to fulfill the requirement for my Bachelor of Technology (Hons) in Information System. I was lucky to have the opportunity to study at Universiti Teknologi PETRONAS that are highly putting effort to produce well rounded graduates by offering the Final Year Project to final year students. Each process involved during the initial stage until at the end enhance the students' skills in applying knowledge and skills, expanding thoughts and solving problems independently. Here, I would like to express my appreciation to these people who have lent their helping hands and conduct me during the accomplishment of this project.

First of all, I would like to give my special thanks to my respective supervisor, Mr. Suhaimi Bin Abdul Rahman, who always guided and supervised me from the beginning till the end of the project. Thanks for all the valuable knowledge. This acknowledgement is also dedicated to FYP Coordinator, to all UTP lecturers who always give some advice, support and encouragement, treat me as their own friend and make me enjoy study here. Lastly, thanks to all my colleagues who has supported me till I completed my degree. Thanks again and may Allah bless all of you.

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ABBREVIATIONS

m-Learning
Mobile Learning

e-Learning
Electronic Learning

Palm Pilot
Small devices that work like a normal computer but have limited capability.

Palm OS
Operating System for Palm Pilot

PDA
Personal Digital Assistant, normally refer to PALM Pilot or Pocket PC

Pocket PC
Palm devices that support mini version of Window OS

UML
Unified Modeling Language

CHAPTER 1
INTRODUCTION

1.1 Background of Study

The M-Learning project has been introduced 3-year ago, the collaboration of pan-European countries like Italy, Sweden and the UK with the aim to use portable technologies to provide learning experiences relating to literacy and numeracy skill development for young adults aged 16–24 who are outside full-time formal education settings, and to promote the development and achievement of lifelong learning objectives. Today, align with technology enhancement in hardware devices especially in PDA likes Pocket PC or Palmtop. The researcher still continues their research in M-Learning to ensure that the enhancement of technology will benefit the users that have dynamic and complex preferences.

This study will focus on how e-learning technology can be implemented in order to improve the productivity of the student especially in time management. The product development will focus on M-Learning application that runs on PDA platform. Even though there are limitations on PDA like small display screen, low processing power, low storage capacity and limited functionality will restrict the usage of that device compared to desktop and laptop. But PDA or Palmtop actually has a powerful capability which is mobilize and small compared to desktop and laptop. Even the prices are cheaper. This project will manipulate these capabilities to ensure that this device can be used as a part of learning process in student life.

1.2 Problems Statement

1.2.1 Problem Identification

The problem arose when wired network connection limit the mobility of the user to access the current e-learning web pages. The disadvantages create a problem to the UTP student because the nature of the student itself where they are always in moved for example like walking to the classes, waiting for meals orders or queue at ATM. Time spend to perform such activities is so significant in student daily life. Because of this matter the student cannot use their time efficiently in manageable manner. The writer will cater this issue by providing a solution that reliable to the student nature via development of solution prototype.

1.2.2 Significant of the project

The outcomes of this project will assist the student in using their time effectively and productively especially in managing their daily life during their time at campus. Besides that, the project will help the student in increasing their learning curves through the self learning capability that will be embedded in mobile application.

1.3 Objectives and Scopes of Study

1.3.1 Objectives

The objectives of this report are listed below

- To research on UTP student natures by obtaining specific information that can be used as a result for prototype development.
- To develop a solution prototype based on finding from the research about student natures.

1.3.2 Scopes of Study

- To research on UTP student natures by focusing on three main activities perform by the student which are walking to the classes, waiting for a meal order and queue at ATM (Automated Teller Machine).
- The prototype development product will only have limited functionality such as login, view and edit profile, enroll subject and view subject.

CHAPTER 2
LITERATURE REVIEW

"I wonder why we missed an opportunity to increase the learning potential of mobile phones. We would not have any problem convincing the students to use them. The PDA could go the same way. The potential for it to be a multi-functional device that students can take total ownership of and which has endless 'communication' applications is surely something we want?"

Ron Hinshaw, Hermitage School, quoted in Perry 2003

2.1 The use of PDA as a learning tool

It is claimed that handheld computers are at the forefront of the fourth wave in the evolution of technology (Pownell and Bailey 2001). In the first wave computers were large, expensive mainframes, which were used in education to make administration and managerial tasks easier. The second wave started with the advent of desktop computers in the 1970s, where computers became 'personal' and schools introduced computer literacy courses for students to learn about the technology and how to use it. The third wave in the 1990s was characterized by the development of the internet and worldwide web, which highlighted electronic communication and collaboration. The fourth wave was said to be just beginning in 2001 and involves very small computers and wireless connectivity delivering 'anyone, any time, anywhere learning'.

The main reasons given for using PDA for learning are that they assist students' motivation, help organizational skills, encourage a sense of responsibility, help both independent and collaborative learning, act as reference tools, and can be used to help track students' progress and for assessment. The following synopsis of the studies elaborates on these reasons.

2.1.1 PDA is relatively '*inexpensive*'

The relatively low cost of PDA makes it feasible to provide every student with a personal machine, thus offering 'ownership' of the computer and continuous access in and out of the formal setting of the school or college. People can get one PDA with the price below than RM 1000 complete with wireless functionality. A disadvantage of using PDA is that they have less functionality than desktop computers. However, it is argued that without one-to-one and continuous access to computers for both teachers and students, the long-standing problems of the integration of computers into education will continue (Robertson, 1997). According to Soloway (2001), personal computers have changed how professionals conduct their 'knowledge work', making them more productive and effective, but they have singularly failed to revolutionize schools (particularly at grade level K-12, which is defined by them as for students aged 6–18). They suggest that a fundamental problem is that students (and often teachers) have not, up to now, had anything like 'personal' access to networked desktop computers. The potential for ubiquitous 'ready-at-hand' PDA's to change this situation is great; there is mounting evidence that daily, pervasive use of computing leads to increased learning (Soloway, 2001). PDA support flexible 'cycles of doing and reflecting' (not tied to infrequent, timetabled access to a computer laboratory) and collaboration and sharing (especially via infra-red 'beaming' between others PDA's). However, both these aspects pose the challenge of revising the curriculum to exploit them.

2.1.2 Promote the development of information literacy

This aspect is common to the use of all computers in educational settings. However, it is argued that this feature can be particularly important when a student has personal ownership of a (PDA) computer, which can be used anywhere and any time. Pownell and Bailey (2000) describe the concept of 'information literacy as an information-age problem-solving process resulting in [the] productive use of information', which they consider to be at the heart of lifelong learning. Furthermore, referring to the work of Bailey and Lumley (1999), they state: 'In the coming century, the ability to identify, access, apply and create information will be the equivalent of literacy.' This concept seems relevant to research focusing on basic skills, as it puts the basic notion of literacy (reading and writing) into the context of using IT/ICT tools for 'real life' or 'real world' purposes. Electronic books (e-books) are a much-discussed issue in PDA computing (Harrison 2000; Poftak 2001) as a form of information access. An e-book is an electronic version of the content of a book, which can be viewed using a specialised e-book reader device, or on a PDA using (usually free) reader software. Electronic books have great educational potential but their take-up and availability remain slow.

2.2 Mobile Learning (M-Learning)

Mobile learning can be defined as "... any service or facility that supplies a learner with general electronic information and educational content that aids in acquisition of knowledge regardless of location and time ..." (Lehner & Nosekabel, 2002). Vavoula and Sharples (2002) suggest three ways in which learning can be considered mobile as "... learning is mobile in terms of space; it is mobile in different areas of life; it is mobile with respect to time ...". These definitions suggest that mobile learning systems should be capable of delivering educational content *anytime* and *anywhere* the learners need it.

From a pedagogical perspective, mobile learning supports a new dimension in the educational process. Characteristics (Chen, 2002) of mobile learning include:

1. Urgency of learning need;
2. Initiative of knowledge acquisition;
3. Mobility of learning setting;
4. Interactivity of the learning process;
5. 'Situated ness' of instructional activities; and
6. Integration of instructional content.

These characteristics make mobile learning quite different compared with traditional classroom learning environments, where all the educational activities are carried out at a designated time and place. Desktop computerized education extends the range of education to places where wired connection is available. Now with mobile technologies, the range of education can be further extended by wireless connection to places where wired connection is not available or feasible.

Mobile technology also provides adaptively towards contextual life-long learning, which is defined as the knowledge and skills people need to prosper throughout their lifetime. These activities are not confined to pre-specify times and places and are difficult to achieve through traditional education. Mobile technologies fulfill the general requirements to support contextual life-long learning by being highly portable, individual, unobtrusive and adaptable to the context of learning and the learner's evolving skills and knowledge (Sharples, 2000).

2.3 The Gist of Literature Review

M-learning is often defined as e-learning through mobile computational devices. In general by mobile device the writer mean PDAs and digital cell phone, but more generally people might think of any device that is small, autonomous and unobtrusive enough to accompany us in every moment in our every-day life, and that can be used for some form of learning. These small tools can be seen as instruments for accessing content, either stored locally on the device or reachable through interconnection. They can also be

a tool for interacting with people, via voice and through the exchange of written messages, still and moving images.

CHAPTER 3
METHODOLOGY

3.0 Introduction

This project methodology will be divided into several parts which are research methodology and design methodology. Next sub topic is about software and hardware architecture required for the development and deployment of M-Learning project. Lastly is about project deliverables and tool required to complete this paperwork and prototype development.

3.1 Research Methodology

Questionnaire has been used as a *method* for the *elicitation,* and *recording* and *collecting* of information from the specific group type of respondent. Target respondents are UTP students from various background of programme with distinctive preferences. The set of questionnaire consist of five main sections with 16 questions that must be answer by the respondent. Five main section are listed as below.

- Section 1: Demographic Information
- Section 2: E-Learning Experience
- Section 3: Campus Environment Experience
- Section 4: Student Nature Experience
- Section 5: Respondent Opinion

These sections has been specifically develop to achieve the objective of this Final Year Project which are to research and develop M-Learning web

application called as a micro web portal that fulfils the nature of student life. 23 respondents have been randomly selected in order to obtain required information from them. Detail of each section will be explained in the finding and discussion part.

3.1.1 The Questionnaire

As mentioned before in section 3.1, the questionnaire have been divided into five main sections which are demographic information, e-learning experience, campus environment experience, student nature experience and respondent opinion. The purpose of having these five main sections is listed below. To view the sample of questionnaire you may refer to appendix 1.

Demographic Information

The purpose of having this section is to ensure that the result obtain from the respondent is came from various background of UTP student. It can be various in term of their ages range, gender, course, current semester and credit hours taken for current semester. The questions that have been design for this section are as below.

Q1. Age Group

Q2. Gender

Q3. Course

Q4. Current semester of study (By semester)

Q5. Credit hours taken this semester

E-Learning Experience

The reason why did the writer include this section in the questionnaire is to obtain information about the student nature in accessing the UTP e-learning. The focus of this section is to understand the behavior of the student when they access the e-learning in term of the frequency and the best time to access it. The questions that cater for this section are as below.

Q6. Have you register for your e-learning account?

Q7. How frequent you access the e-learning in a week?

Q8. When is the best time for you to access the e-learning?

Q9. Why you choose that time?

Campus Environment Experience

The objective of this section is to obtain information about the student nature in campus environment. Kind of information that required from the respondent is about their hostel, vehicle using in the campus and time taken to access from their hostel to the class location. The rational of having such question in this section is to understand the relationship between time taken from respondent hostel to the classes and how we can use this time in efficient manner example like accessing an e-learning web page. Below are list of questions for this section.

Q10. Select your hostel

Q11. Usually how you go to the lecture, lab and academic block?

Q12. Select your class location and time taken to access to that location from your hostel and also include with frequency of particular classes in a week.

Student Nature Experience

The purpose of this section is to gather information about the respondent on time spend in meals per day including the time taken for food to be serve to them. The result obtain from this section can be use as a complement for a result obtain from campus environment section. Beside that the writer also requires information about the time spends in queue at ATM (Automated Teller Machine) in normal and peak condition. The questions propose for this section is listed below.

Q13. How much you spend your time in your meals in a day including time for you meal order to be ready.

Q14. Usually how much you spend your time in queue at BCB ATM (Automated Teller Machine) at UTP.

Respondent Opinion

This sections focus on the general opinion from the respondent about the mobile learning. Two questions that cater this purpose are listed below.

Q15. The cutting edge of technology enables student to get access to the e-learning (a.k.a micro portal of e-learning) from the PDA like PALM or Pocket PC as well as hand phone. If there is opportunity given, are you prefer to access micro portal of e-learning in this condition.

Condition: Walking to the class, waiting for meals order, queue at ATM

Q16. What kind of information that you prefer to access or task that you prefer to do from this micro portal?

Type of information or task: new announcement from lecturer, SMS my lecturer, download related lecture material, read lecture material (notes, etc), email my lecturer

3.2 M-Learning Design Methodology

The UML (Unified Modeling Language) has been choosing in design phase of M-Learning project to design the architecture of M-Learning application. It help developer in software development efforts builds models that will enable the team to visualize the system, specify the structure and the behavior of that system, construct the system and document the decision made along the way. In UML methodology phases, there include analysis, design coding, testing and deployment. UML allows iterative, incremental development which is risk-driven - tackles areas of high-risk reducing risk as the system development progresses

3.2.1 Use Case Analysis

The Use Case model is about describing **WHAT** the system will do at a high-level and with a user focus for the purpose of scoping the project and giving the application some structure. The use cases are the unit of estimation and also the smallest unit of delivery. Each increment that is planned and delivered is described in term of the use cases that will be delivered in that increment. Below is the use case diagram that purposely designs for m-Learning micro web portal and analysis on how the user will interact with the system.

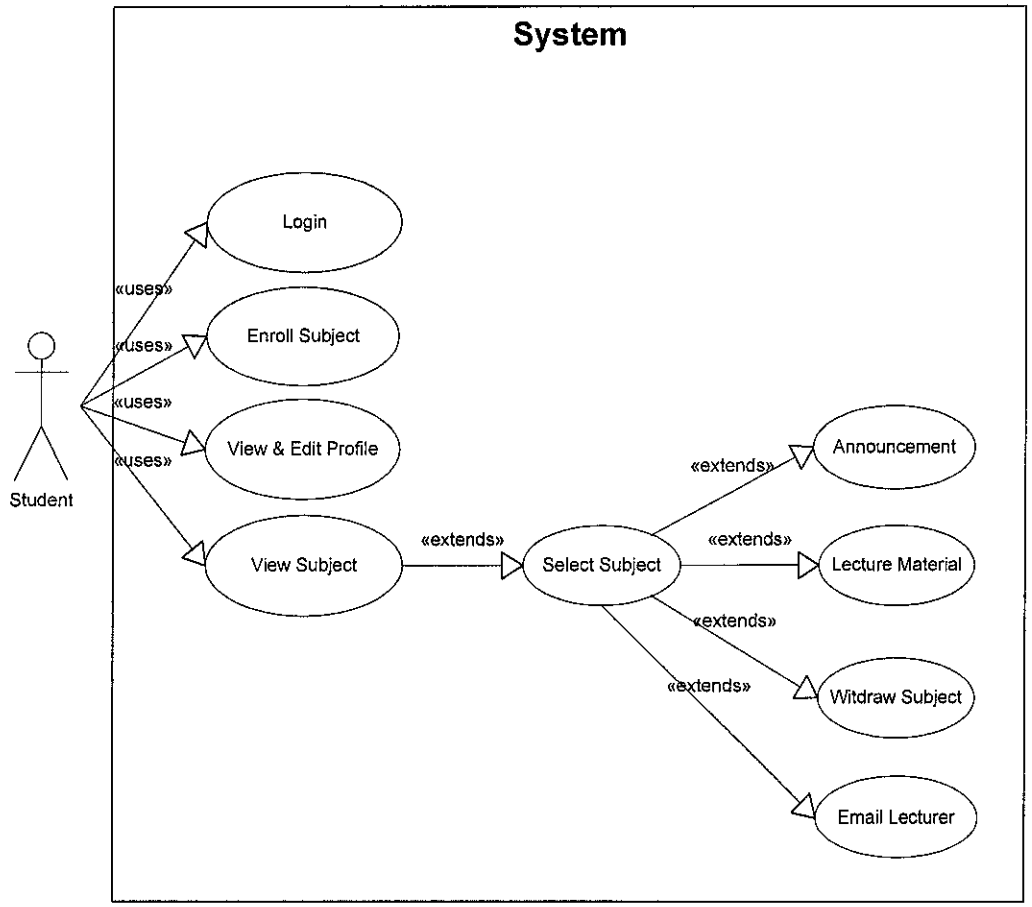

Figure 3.2.1: Use Case

Referring to **Figure 3.2.1**, this use case diagram only involves one actor which is student and involves about 5 normal use cases (e.g. Register for new user, Login, View and Edit profile, Enroll subject and View subject).

Below are detail descriptions for each uses cases:

1. Register (new user)

- Each new user is required to register for them to access the micro web portal of M-Learning.
- Users then are required to enter their user name, password and personal information.
- Next, the user will validate their information
- Submit the information and the system will verify the registration process.
- The system will return error if the user name has been choose by other people and current user are require to enter new user name.

2. Login

- Users are required to enter their username and password to enter the system.

3. View and Edit Profile

- After user successfully login the M-Learning system, they may change their password periodically and other personal information except their username.
- They may click view and edit profile hyperlink to display the information.
- Click update, then the information will be updated.

4. Enroll Subject

- User can select Enroll subject hyperlink to display the available subject that has been offer currently by the university.
- Select the Program (e.g. IT/IS, EE, MECH, CHEM, CIVIL)
- The system will display all subject available under each program.
- Click to enroll subject

5. View Subject

- Consist of 4 modules (Withdraw subject, Announcement, Lecture material and email lecturer)
- To withdraw the subject, the user may choose which subject they want to enroll. Then click withdraw button.
- To view new announcement or archive, click related hyperlink and the system will display the announcement from lecturer.
- The user also can access the lecture material (example note, etc) by clicking the lecture material hyperlink.
- The user also can communicate with lecturer by using email.

3.2.2 Class Diagram

A class is a description of a group of objects with similar properties (object attributes), common behavior, and similar relationships to other object. Classes and their relationship are delineated in a class diagram. The diagram below will illustrate the class diagram for m-Learning micro web portal.

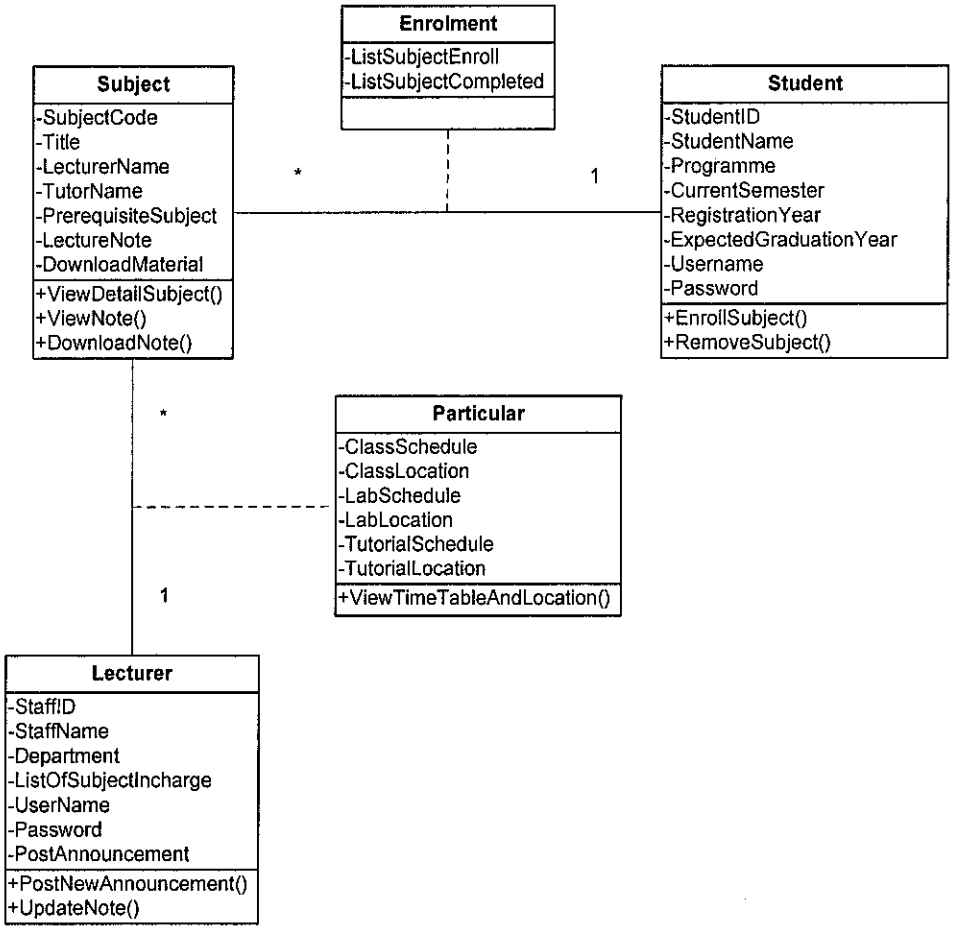

Figure 3.2.2: Class Diagram

Referring to **Figure 3.2.2**, these class diagrams consist of 3 main classes which are Class Subject, Class Student and Class Lecturer. Besides that the diagrams also consist of two association class which are Enrolment Class and Particular Class.

3.2.3 User Interface Design

Below are the designs of user interface for M-Learning micro web portal. These designs are just storyboard created by using Microsoft Visio 2003. These four figures will demonstrate the overview of the application in general point of view. Please be pleasure to review those designs.

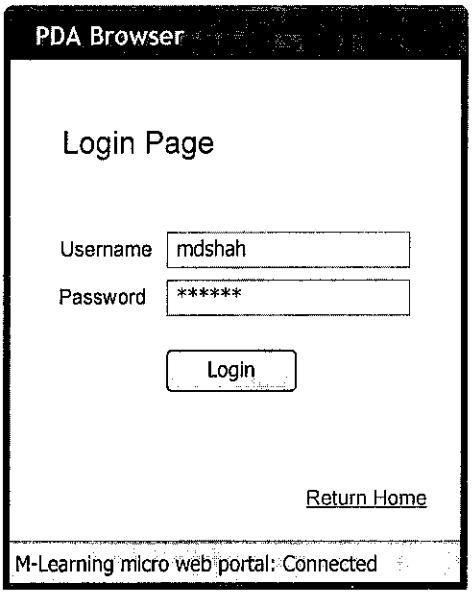

Figure 3.2.3a: Login Page

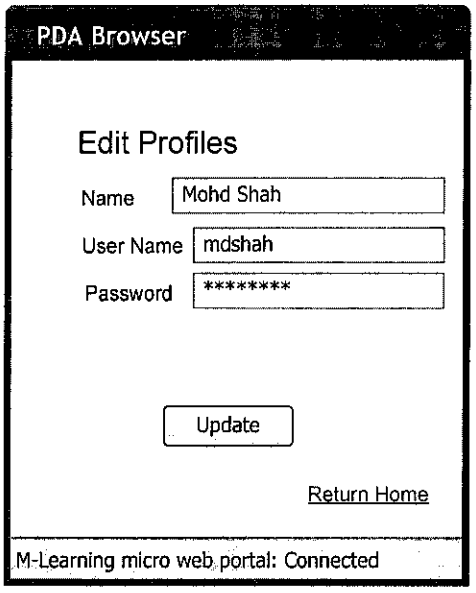

Figure 3.2.3b: Edit Profile Page

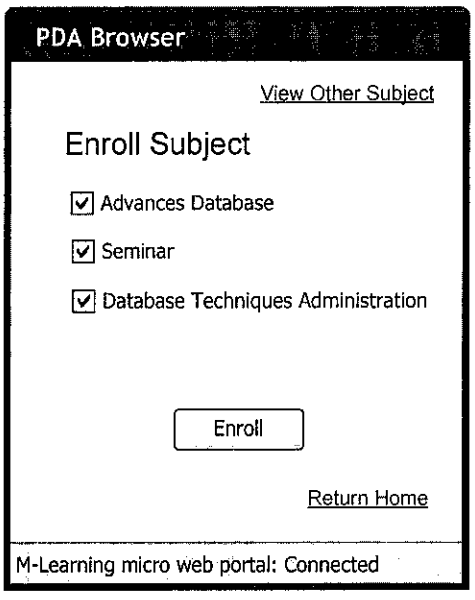

Figure 3.2.3c: Enroll Subject Page

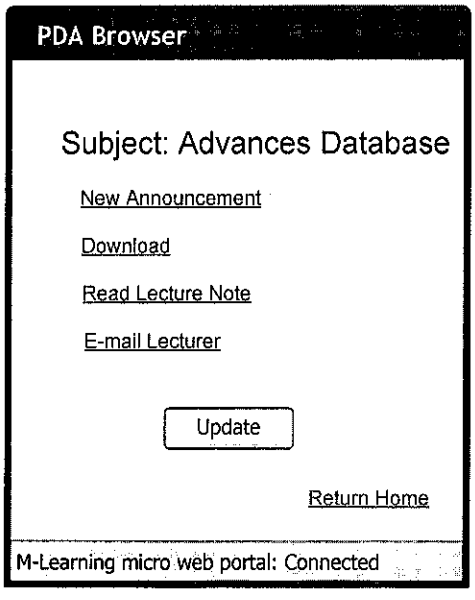

Figure 3.2.3d: View Subject Page

3.3 M-Learning Hardware and Software Architecture

After several tests and evaluation on server application software like Web Sphere by IBM, Oracle9*i* Lite and Oracle *9iAS* by Oracle also Cape Clear 4.7 by Cape Clear Studio. The writer found that Oracle 9*i* AS is the best software architecture that currently available to support the development and deployment of M-Learning micro web portal.

3.3.1 Oracle 9*i* Application Server (Oracle9*i*AS)

Oracle9*i*AS is a complete standards-based application server that provides a comprehensive and fully integrated platform for running Web sites, J2EE applications, and Web services. The combination of oracle web portal, wireless component and Oracle HTTP server inside the Oracle9iAS create perfect solution for wireless web application like M-Learning micro web portal to be developed by using this platform.

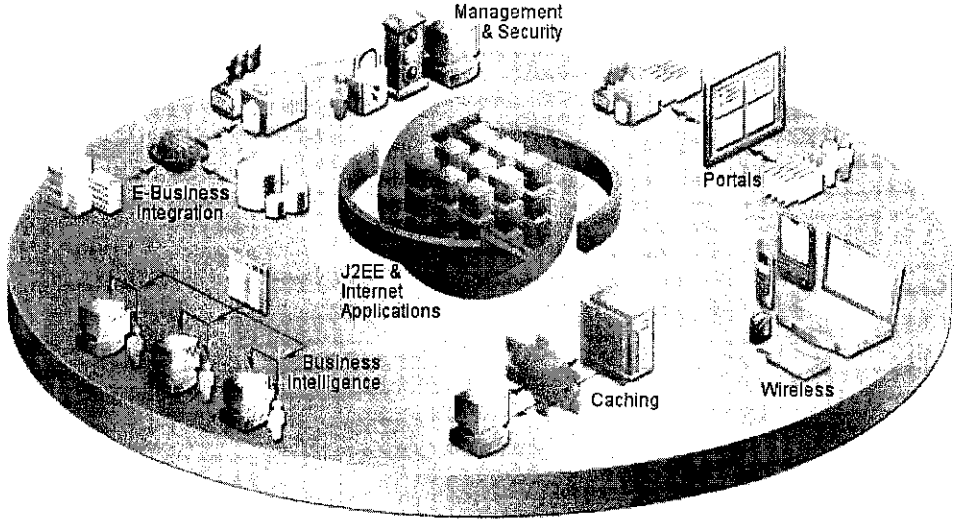

Figure 3.3.1a: Oracle9i Application Server (Oracle9iAS) Solutions

Source: Oracle9i Application Server Concepts Release 2 (9.0.2) Documentation

Description about Figure 3.3.1a and Figure 3.3.1b, these diagram show the areas contained in Oracle9i Application Server. In the center are Java2 Enterprise Edition (J2EE) and Internet applications runtime environments and libraries, which are the core functionality of Oracle9iAS. This core is surrounded by other clusters of functionality referred to as solution areas. These solution areas are 1) Portals, 2) Wireless, 3) E-Business Integration, 4) Business Intelligence, 5) Management and Security, and 6) Caching. These six solution areas surround the core J2EE and Internet applications core functionality in wheel-like configuration.

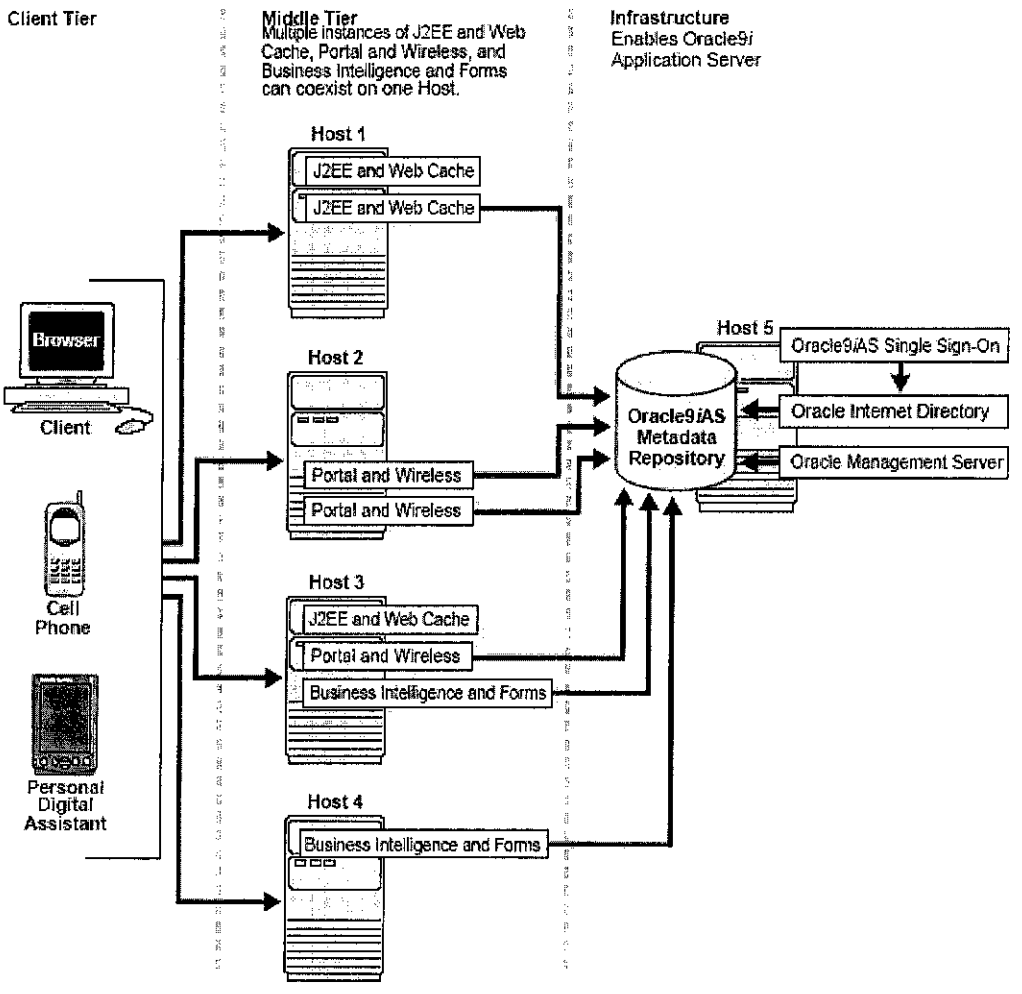

Figure 3.3.1b: Shows an overview of the architecture of Oracle9*i*AS

Source: Oracle9i Application Server Concepts Release 2 (9.0.2) Documentation

3.3.2 Oracle9*i*AS HTTP Server

Oracle HTTP Server is the underlying deployment platform for all programming languages and technologies Oracle9*i*AS supports. It provides a Web listener for OC4J and the framework for hosting static and dynamic pages and applications over the Web. Based on the proven technology of the Apache HTTP Server, Oracle HTTP Server includes significant enhancements that facilitate load balancing, administration, and configuration. It also includes a number of enhanced modules, or mods, which are extensions to the HTTP server that extend its functionality for other enterprise applications and services

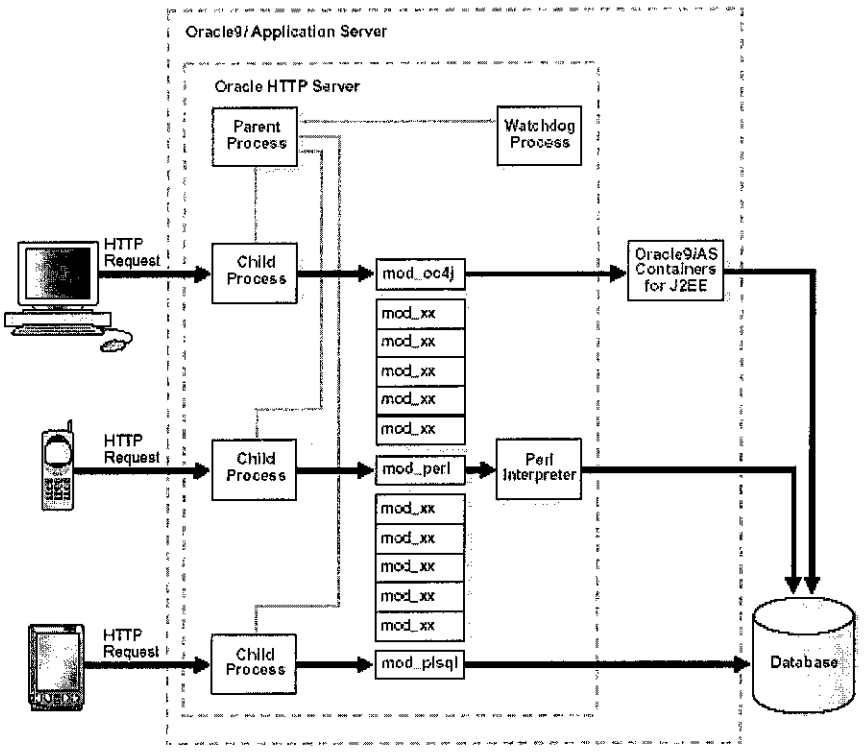

Figure 3.3.2: Oracle9i HTTP Server Process Architecture

Source: Oracle9i Application Server Concepts Release 2 (9.0.2) Documentation

Description about Figure 3.3.2, this figure describes the Oracle HTTP Server process architecture. It shows a client machine, a cell phone, and a personal digital assistant sending HTTP requests, which are picked up by child processes running on the HTTP server. Each process handles only one HTTP

request, and sends the request to the appropriate module. The mod_oc4j module routes appropriate requests to OC4J, the mod_perl module routes requests to the Perl interpreter, and the mod_plsql module routes requests to the database.

3.3.3 Oracle9*i*AS Portal

Oracle9*i*AS Portal is a Web-based tool for building and deploying e-business portals. It provides a secure, manageable environment for accessing and interacting with enterprise software services and information resources. It efficiently manages, access, and interacts with information by enabling the developer to create portal pages. A portal page makes data from multiple sources accessible from a single location and from different web devices such as hand phone, PDA and laptop that have wireless capability.

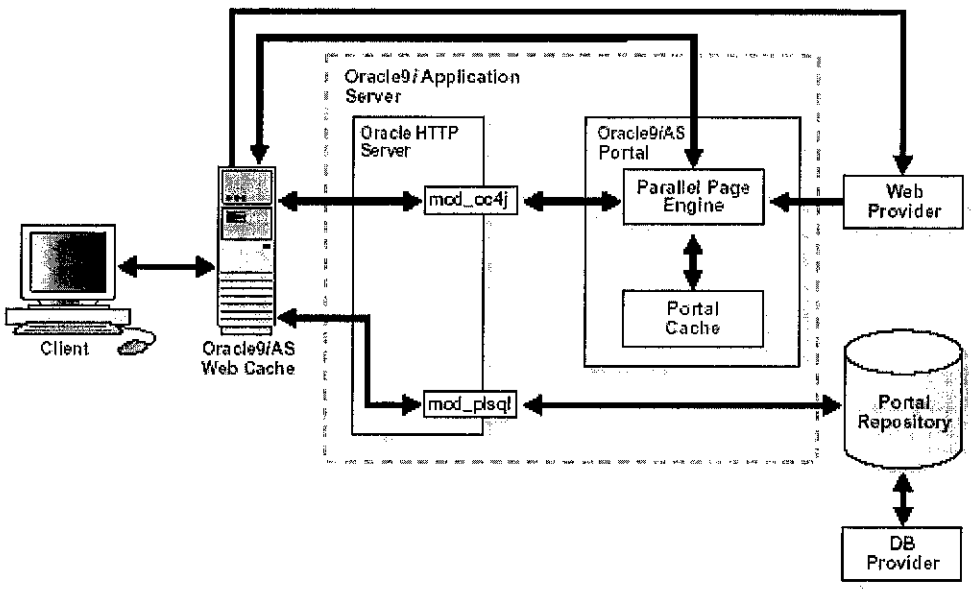

Figure 3.3.3: Oracle9iAS Portal Architecture and Request Flow

Source: Oracle9i Application Server Concepts Release 2 (9.0.2) Documentation

Description about Figure 3.3.3, the diagram shows the process of request flow when a client requests an Oracle9*i*AS Portal page

1. The client browser requests a portal page. Oracle9*i*AS Web Cache receives this request.
2. Oracle9*i*AS Web Cache forwards the request to the Oracle9*i*AS Portal Parallel Page Engine (PPE) through Oracle HTTP Server and mod_oc4j.
3. The PPE retrieves the portal page definition. The page definition contains information about the portlets on a page and their layout.
    a. First, it checks if Oracle9*i*AS Web Cache has a valid, cached copy of the definition.
    b. Next, it checks if the portal cache has a valid, cached copy.
    c. Finally, if no cached copy of the definition exists, then the PPE generates a page definition from data in the portal repository. The portal repository is either in the Oracle9iAS Metadata Repository or in your customer database.
4. The PPE parses the page definition. If a fully cached copy of the page exists, then the page is returned to the client browser through Oracle9*i*AS Web Cache. If a fully cached copy of the page does not exist, the PPE builds the page from cached and non-cached data with the remaining steps.
5. For each portlet on the page, the PPE checks if a cached copy of the portlet content exists in the portal cache. Then the PPE forwards a request to the appropriate provider through Oracle9*i*AS Web Cache.
6. Each provider either validates the cached portlet or generates content for the portlet. Web providers return this directly to the PPE. Database (DB) providers return the results to the PPE through Oracle HTTP Server, mod_plsql, and Oracle9*i*AS Web Cache.

7. The PPE aggregates the content into a single page. This page is sent to Oracle9*i*AS Web Cache.
8. Oracle9*i*AS Web Cache returns the final page to the client browser.

3.3.4 Oracle9*i*AS Wireless

Oracle9*i*AS Wireless makes Web and database applications, such as web content, e-mail, news, and directory services, accessible to mobile device users without having to rewrite content for every target platform. It converts any Internet content to XML and transforms the XML to any markup language supported by any device such as HTML, WML, HDML, VoiceXML, VoxML, and SMS.

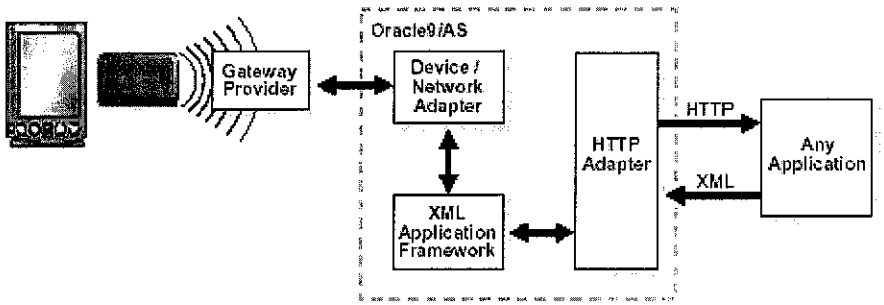

Figure 3.4.4: Oracle9iAS Wireless

Source: Oracle9i Application Server Concepts Release 2 (9.0.2) Documentation

Description about Figure 3.4.4, when users request wireless service, the following steps occur:

1. The wireless device connects to the Gateway Provider.
2. The provider provides subscriber, device identification, and user preferences to the Device/Network Adapter.
3. The Device/Network Adapter invokes the XML Application Framework and HTTP Adapter.
4. The HTTP Adapter forwards the request to the application.
5. The HTTP Adapter retrieves the XML result from the application.
6. The result is forwarded to the client.

3.4 Project Deliverables

Project Deliverables	Start Date	Finish Date
M-Learning Project Proposal	20/1/ 2004	23/1/ 2004
M-Learning Project Scheduling	23/1/ 2004	26/1/ 2004
M-Learning Project Work Plan	23/1/ 2004	28/1/ 2004
M-Learning Analysis and Requirement	1/2/ 2004	7/2/ 2004
M-Learning Design	10/2/ 2004	21/2/ 2004
M-Learning Development	27/2/ 2004	26/3/ 2004
M-Learning Testing	28/3/ 2004	30/3/ 2004
M-Learning Documentation	20/1/ 2004	30/3/ 2004
M-Learning Presentation	27/4/ 2004	1/5/ 2004
M-Learning Project Dissertation Submission	1/6/ 2004	5/6/ 2004

Table 3.4: Project Deliverables Dates

3.5 Tool Required

The tools consist of hardware and software. Below is the list of tools that required in this development.

Tool	Type
Oracle9*i*AS	Software
Oracle9*i* Database	Software
Oracle9*i* Portal	Software
Oracle9*i* Wireless	Software
Palm Device	Hardware
Wireless Access module for Palm Device	Hardware
Wireless Access Point	Hardware

Table 3.5: Tool Required

CHAPTER 4
RESULT AND DISCUSSION

4.0 Introduction

In general the discussion part will be divided into 2 major parts, which are discussion on research, the finding as well as the analysis extracted from the finding. Next part will discuss on the development of M-Learning project. Last but not least is a recommendation for this project paper.

4.1 Research on Student Nature

23 UTP students have been randomly selected as respondents for questionnaire session that has been held at UTP Resource Centre on 29th March 2004. The objective of this session is to obtain required information from the respondent. The set of questionnaire consist of 5 main sections with 16 questions that must be answered by them. The result obtain can be viewed at section *4.1.1 Finding*. This discussion will focus on 5 main sections which are listed as below

- Section 1: Demographic Information
- Section 2: E-Learning Experience
- Section 3: Campus Environment Experience
- Section 4: Student Nature Experience
- Section 5: Respondent Opinion

4.1.1 Finding

Section 1: Demographic Information

Q1. Age Group

17- 18	19-20	20-21	22-23	24 and above
34.78%	43.47%	4.34%	17.39%	-

Q2. Gender

Male	Female
86.95%	13.04%

Q3. Course

IS	IT	EE	CHEM	MECH	Civil
8.69%	8.69%	30.43%	26.07%	4.34%	21.73%

Reference:

IS: Information System

IT: Information Technology

EE: Electrical & Electronic Engineering

CHEM: Chemical Engineering

MECH: Mechanical Engineering

Civil: Civil Engineering

Q4. Current semester of study (By semester)

1	2	3	4	5	6	7	8	9	F
8.69%	8.69%	4.34%	13.04%	-	-	4.34%	21.73%	-	34.78%

Reference:

F: Foundation year

Q5. Credit hours taken this semester

Average Credit hour taken by student
17

Section 2: E-Learning Experience

Q6. Have you register for your e-learning account?

Yes	No
100%	-

Q7. How frequent you access the e-learning in a week?

Once per week	2-3 times	More than 4 times	None
13.04%	13.04%	60.86%	13.04%

Q8. When is the best time for you to access the e-learning?

Morning	Afternoon	Evening	Night
30.43%	39.13%	21.73%	17.39%

Q9. Why you choose that time?

Type of answer	%
Because my time table is full at another time	39.13
Because I busy with other thing	17.59
Because I have no computer so that I need to go to the library or computer lab to get access to the e-learning.	30.43
Other reason	13.04

Section 3: Campus Environment Experience

Q10. Select your hostel

V1	V2	V3	V4	V5	Outside UTP
13.04%	17.39%	8.69%	17.39%	43.47%	-

Reference:

Alphabet V refer to term 'Village'

Q11. Usually how you go to the lecture, lab and academic block?

Walking	Motorcycle	Bicycle	Car/MPV/SUV
69.56%	8.69%	1.44%	21.73%

Q12. Select your class location and time taken to access to that location from your hostel and also include with frequency of particular classes in a week.

Class Location	Time taken walking from hostel to the class location (average in minutes)				
	V1	V2	V3	V4	V5
USM Building (LR1-LR10)	5	4	15	-	8
USM Building (Test Room, LR11, LR12)	10	3	15	13	9
USM Building (LR13-LR15)	5	4	-	15	10
UTP Academic Block (LR16-LR18) : near UTP mosque	10	5	-	-	-
USM Building (DK1-DK3)	5	6	12	15	9
UTP new academic block (base on your programme block) example block 1: Information Techology	20	13	10	10	14
UTP new academic block (Pocket D)	20	12	7	8	14
UTP new academic block (Pocket C)	30	18	18	14	19
Other	-	-	-	15	-

Section 4: Student Nature Experience

Q13. How much you spend your time in your meals in a day including time for you meal order to be ready.

Meal Type	Average Time (in minute)
Breakfast	25
Morning Tea	18
Lunch	24
Evening Tea	13
Dinner	30
Supper	25
Total time spend in a day for meals	135

Q14. Usually how much you spend your time in queue at BCB ATM (Automated Teller Machine) at UTP.

Condition	Average Time (in minute)
Normal Time	5
Peak Time	13

Section 5: Respondent Opinion

Q15. The cutting edge of technology enables student to get access to the e-learning (a.k.a micro portal of e-learning) from the PDA like PALM or Pocket PC as well as hand phone. If there is opportunity given, are you prefer to access micro portal of e-learning in this condition.

Condition	Yes	No
Walking to the class	82.60%	17.39%
Waiting for your meal order	91.30%	8.69%
Queue-up at ATM	86.95%	13.04%

Q16. What kind of information that you prefer to access or task that you prefer to do from this micro portal?

Information / Task	Percentage (%)
New announcement from lecturer	91.30
SMS my lecturer	43.47
Download related lecture material	86.95
Read lecture material (notes, etc)	82.60
Email my lecturer	56.52

4.1.2 Discussion and Analysis

Section 1: Demographic Information

Basically this section explains about the background of the respondent. From the survey that have been done. 86.95% respondents are males with balance are females. Most of the respondent within the ages ranges of 19 and 20 years old. The respondent involved also came from various programme offers at UTP as showed in table below:-

IS	IT	EE	CHEM	MECH	Civil
8.69%	8.69%	30.43%	26.07%	4.34%	21.73%

Table 4.1a: Percentage of respondent by program

This is to ensure the data obtain from this survey is reliable and can be used to represent the overall overview about the nature of student at UTP.

Section 2: E-Learning Experience

From the survey 100% respondents stated that they have e-learning account. Only 60.86% respondents get access into e-learning more than 4 times a week. Surprisingly there is about 13.04% respondents never access the e-learning and most of them are foundation student. There reason why they never access the e-learning is because of the difficulty in accessing the e-learning web. This is due to the network connection facility which is not provide at village 1 and village 2 where by most of foundation student is staying at those villages. 39.13% respondents stated that the best time for them to access e-learning is on evening time and about 30.43% prefer to access e-leaning in morning time. Most of the respondent agree that the main reason why they choose that particular time are because of their time table is full at other time and 30.43% respondents stated that they need to go to the resource centre just to get access to the e-learning.

Section 3: Campus Environment Experience

The survey found that 69.56% respondents walking to the classes, 21.73% drive car to the classes and others by either motorcycles or bicycles. 43.47% respondents staying at Village 5, 17.39% staying at village 2 and village 4, 13.04% staying at village 1 and about 8.69% respondents staying at village 3. This statistics actually extract very important result which is most of the respondent who are walking actually staying at village 5. Table 4.1b indicates the average time taken walking from each village to the class location. The longer time taken by respondent is 30 minutes just to walk from village 1 to Pocket C which is located at new academic building. Column which indicate with symbol (-) referring to unavailable information.

Class Location	Time taken walking from hostel to the class location (average in minutes)				
	V1	V2	V3	V4	V5
USM Building (LR1-LR10)	5	4	15	-	8
USM Building (Test Room, LR11, LR12)	10	3	15	13	9
USM Building (LR13-LR15)	5	4	-	15	10
UTP Academic Block (LR16-LR18) : near UTP mosque	10	5	-	-	-
USM Building (DK1-DK3)	5	6	12	15	9
UTP new academic block (base on your program block) example block 1: Information Technology	20	13	10	10	14
UTP new academic block (Pocket D)	20	12	7	8	14
UTP new academic block (Pocket C)	30	18	18	14	19
Other	-	-	-	15	-

Table 4.1b: Time taken walking from hostel to the class location

Section 4: Student Nature Experience

Section 4 focuses on the usual activity performs by the respondent which are ingestion and queue at ATM (Automated Teller Machine). *Table 4.1c* indicates the average time spending by each respondent in their meals. The longer time taken is during dinner which is about 30 minutes. While *Table 4.1d* indicate the average time queue and perform the ATM transaction by respondent. Average normal time is 5 minute and during peak time is about 13 minutes for each respondent to queue and make a transactions.

Meal Type	Average Time (in minute)
Breakfast	25
Morning Tea	18
Lunch	24
Evening Tea	13
Dinner	30
Supper	25
Total time spend in a day for meals	135

Table 4.1c: Average time spending in meals by each respondent by day

Condition	Average Time (in minute)
Normal Time	5
Peak Time	13

Table 4.1d: Average time spending in queue at ATM

Section 5: Respondent Opinion

82.60% of the respondents agree that they prefer to access e-learning micro web portal from the devices like PDA and hand phone while walking to the classes. 91.30% wanted to access the micro web portal during their time waiting for a food order and 86.95% during their time queue at ATM. Kind of information that they prefer to access from this micro web portal like read new announcement from lecturer with 91.30% of the respondents like to do that, 86.95% prefer to download lecturer material and 82.60% like to read lecturer note.

Analysis on Discussion

Based on 3 main activities that usually perform by UTP student which are walking from the hostel to the class location, ingestion and queue at ATM. The writer found that those activities are the most activities or frequent activities perform by the student of UTP. The issue involved here is about time that the student has spent just to perform these activities. People always said that "time is prestigious", same in this matter. The student should use their time wisely in order to improve the beneficiaries that they would obtain by managing their time accordingly. The results obtain from this survey clearly indicate that there is a need for e-learning micro web portal that can be access from anywhere in the campus compound at any time by using cheaper devices like PDA or hand phone. By hoping that this technology will improve the student life and creating an opportunity to the student to increase the quality of life especially in time management. While in the same time eliminate the difficulties in accessing the e-learning that cause from the nature of the student itself like too busy (time table full with classes, lab or tutorial) until haven't have a time to update to the latest information about academic.

4.2 General Architecture for M-Learning

The idea of interoperation between a Learning Information Systems (LIS) and mobile technology is still weakly explored. In this sense the writer think that the provided m-learning architecture should:

(1) Sit on the top of e-learning platform, i.e. be an extension to traditional LMS and should provide adapted and additional services for the mobile users;

(2) Be general, i.e. the system should be able to carry out all the services of the e-learning and all the services for M-Learning;

(3) Be generic, i.e. it should be easily extensible for different nowadays devices and also for the new generation mobile phones and PDAs thus not excluding their usage in the future.

In first place it is best if a mobile device is able to access all the available system's functionalities through either a specific application or through a web/wap browser. This means that the system should be able to automatically detect the devices' capabilities and limitations (software and hardware) and to check what services can be provided. Expertise's called this functionality "Context Discovery" service.

The second step should be to select the services proper for the device and adapt them the best way. Nowadays the main service in e-learning is the presentation of content. Adapting e-learning material for a mobile scenario might imply something more than a simple reshaping of material or translating from one presentation language into another. It should be more precise and could involve different presentation logic than in e-learning (Mobile Content Management). The presentation adaptation can include adaptation of the structure, adaptation of the media format, quality or even type, etc. This module should be also used to adapt the presentation for auxiliary services, not only presentation of content.

Lastly, for allowing offline usage there is a mechanism for selecting what is needed by the user and also for taking care of content's coherence and

synchronization with the system. During the offline usage it is better to continue the tracking of the user activities and feedback the statistics to the LMS.

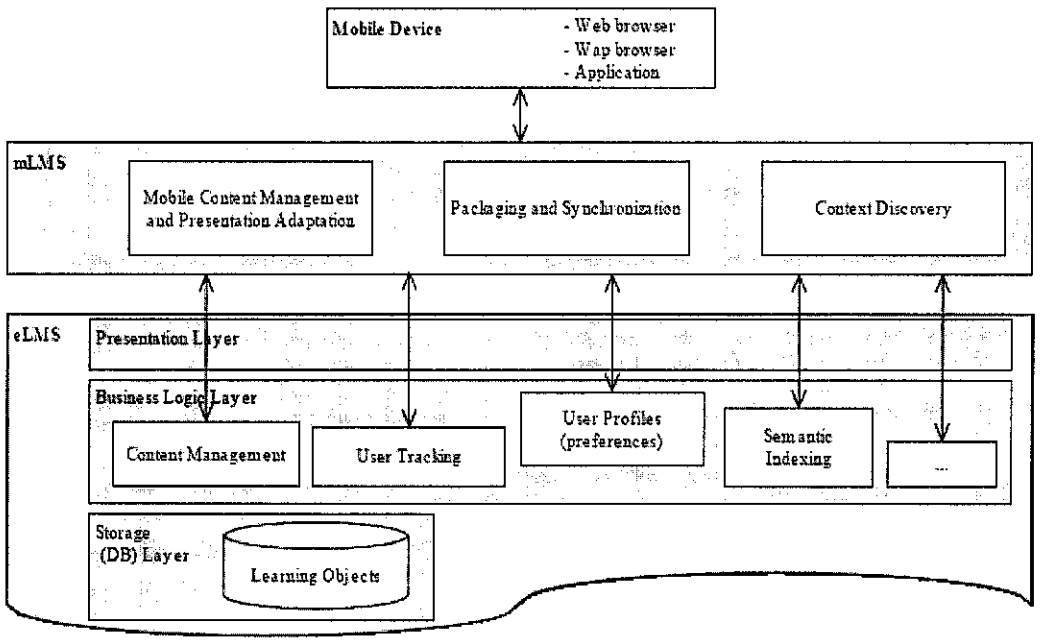

Figure 4.2: General and Generic M-Learning Architecture

By referring to figure 4.2 above, the architecture shows only some of the services that should be provided by eLMS (e-learning management system). In the business logic layer these services might not be so clearly separated. In the mLMS (m-learning management system) the different modules also interact to provide the full range of functions. For example to display the content of a lecture to a user that uses PDA the "Context Discovery" detects the characteristics of the device, then the needed content is retrieved from the eLMS and is redesigned by the "Mobile Content Management" to best fit the device. Meanwhile the reshaped content might be packaged and seamlessly uploaded for offline usage.

4.3 Screen Captures of the M-Learning Micro Web Portal

Screen captures below show the welcoming page and login page for M-Learning Micro Web Portal.

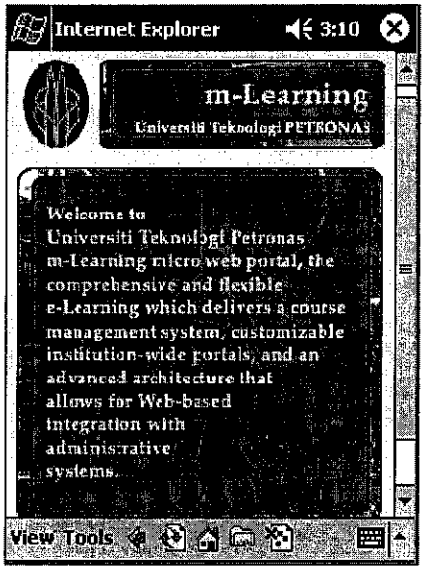

Diagram 4.3a: Welcoming Screen

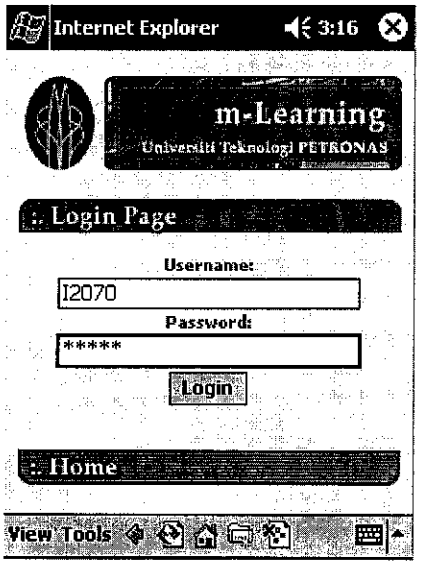

Diagram 4.3b: Login Page

For further detail on screen captures or snapshots of the interface design of m-Learning Micro Web Portal please refer to Appendix 2.

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter will focus on overall conclusion about the project as well as recommendation for futures expansion.

5.1 Conclusion

In conclusion the writer believes that the student can increase the quality of time used by managing it wisely. The result from the study showed that the UTP student spent about 9.38% of their time for ingestion and about 5.85% for walking to the classes per day. This calculation is obtain by adding up the average time for each activity and divided into 24 hours per day. Most of the time has significantly been used. The cutting edge of technology especially in mobile technology enables the student to use their mobile devices like PDA or hand phone to get access to the M-Learning web portal. So it is important for such university like Universiti Teknologi PETRONAS to have their own M-Learning micro web portal so that the student can use to get any important information that normally can be access by using desktop. This micro web portal has been proved as an effective tool for student to access latest announcement from the lecturer, read the lecturer note as well as download necessary lecture materials. By hoping that the student difficulty in accessing the e-learning can be solved and in the same time increase the quality of time use by the student.

5.2 Recommendation

For future upgrade and expansion, the developer and the designer of the system should consider several issues before develop or deploy the M-Learning application.

- The developer should consider to build the application that may support more devices and others platform such as Pocket PC.
- The developer should develop an interface for user like lecturer to access M-Learning micro web portal via their desktop.
- The developer may consider performing usability test to enhance the HCI (Human Computer Interaction) elements in the user interface designs.
- The developer may think to expand the functionality of current M-Learning micro web portal.

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APPENDICES

Appendix 1: Set of Questionnaire

Appendix 2: Screen Captures

UNIVERSITI
TEKNOLOGI
PETRONAS

Questionnaire

Project Title: Mobile Learning and Micro Web Portal

Student's Name: Mohd Shah Bin Dolah (2070)

Department: Information System

Supervisor's Name: Mr. Suhaimi Bin Abdul Rahman

Project Purpose:

To research and develop m-learning web application called as micro web portal that fulfils the nature of student life. This portable e-learning will enable the student to get access to the information through the wireless medium like PDA or Hand phone. The information that can be access by student like lecture material, latest announcement from the lecturer and any related information that require by the student.

Notice:
All data given by the respondent will only uses in the dissertation discussion and finding only.

Instruction: This questionnaire consists of 16 questions and has been divided into 5 main sections. Please answer all questions. Your co-operation is highly appreciated by writer. Thank you very much.

Student Name: .....

Section 1: Demographic Information

1. **Age Group**

☐ 17 - 18 ☐ 19 - 20 ☐ 20 - 21

☐ 22 - 23 ☐ 24 and above

2. **Gender**

☐ Male ☐ Female

3. **Course**

☐ IS ☐ IT ☐ EE

☐ CHEM ☐ MECH ☐ CIVIL

4. **Current semester of study**

☐ First Semester ☐ Second Semester ☐ Third Semester

☐ Fourth Semester ☐ Fifth Semester ☐ Sixth Semester

☐ Seventh Semester ☐ Eighth Semester ☐ Foundation

5. **Credit hours taken this semester**

☐ Credit Hours

Section 2: E-Learning experience

6. **Have you register for your e-learning account**

☐ Yes ☐ No

7. **How frequent you access the e-learning in a week?**

☐ At least once per day ☐ 2 – 3 times

☐ More than 4 time ☐ none

8. **When is the best time for you to access the e-learning?**

☐ Morning ☐ Afternoon ☐ Evening ☐ Night

9. **Why you choose that time? (you may select more than one answer)**

☐ Because my time table is full at other time

☐ Because I busy with another things

☐ Because I have no computer so that I need to go to the library or computer lab to get access to the e-learning.

☐ Other reason: .....

Section 3: Campus Environment Experience

10. **Select your hostel**

☐ Village 1 ☐ Village 2 ☐ Village 3

☐ Village 4 ☐ Village 5 ☐ Staying outside UTP

11. **Usually how you go to the lecture, lab and academic block ?**

☐ I'm walking

☐ Motorcycle

☐ Bicycle

☐ Car /MPV /SUV

☐ Other (please specify :.....)

12. **Select your class location and time taken to access to that location from your hostel and also include with frequency of particular classes in a week.**

✔	Class Location	Time (in minute)	Frequency in a week
☐	USM Building (LR1-LR10)		
☐	USM Building (Test Room, LR11, LR12)		
☐	USM Building (LR13-LR15)		
☐	UTP Academic Block (LR16-LR18) : near UTP mosque		
☐	USM Building (DK1-DK3)		
☐	UTP new academic block (base on your programme block) example block 1: Information Techology		
☐	UTP new academic block (Pocket D)		
☐	UTP new academic block (Pocket C)		
☐	Other		

Section 4: Student nature experience

13. How much you spend your time in your meals in a day including time for you meal order to be ready.

Meal Type	Time (in minute)
Breakfast	
Morning Tea	
Lunch	
Evening Tea	
Dinner	
Supper	
Total time spend in a day for meals	

14. Usually how much you spend your time in queue-up at BCB ATM (Automated Teller Machine) at UTP.

Condition	Time (in minute)
Normal Time	
Peak Time	

Section 5: Respondent Opinion

15. The cutting edge of technology enables student to get access to the e-learning (a.k.a micro portal of e-learning) from the PDA like PALM or Pocket PC as well as hand phone. If there is opportunity given, are you prefer to access micro portal of e-learning in this condition

a. Walking to the class ☐ Yes ☐ No

b. Waiting for your meal order ☐ Yes ☐ No

c. Queue-up at ATM ☐ Yes ☐ No

16. What kind of information that your prefer to access from this micro portal (You may select more than one answer)

☐ New announcement from lecturer ☐ Read lecture material (notes, etc)

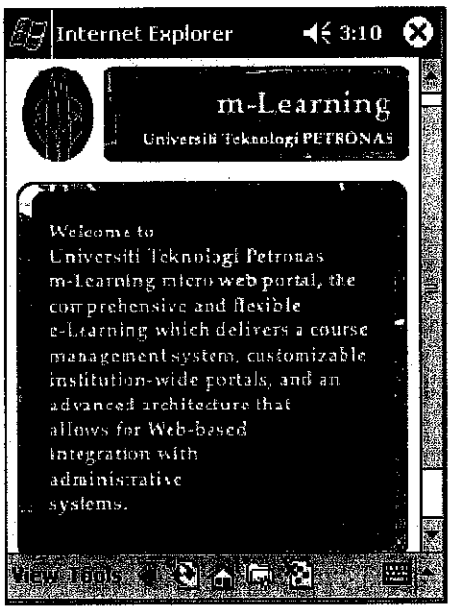
☐ SMS my lecturer ☐ Email my lecturer

☐ Download related lecture material

☐ Other (please specify):.....

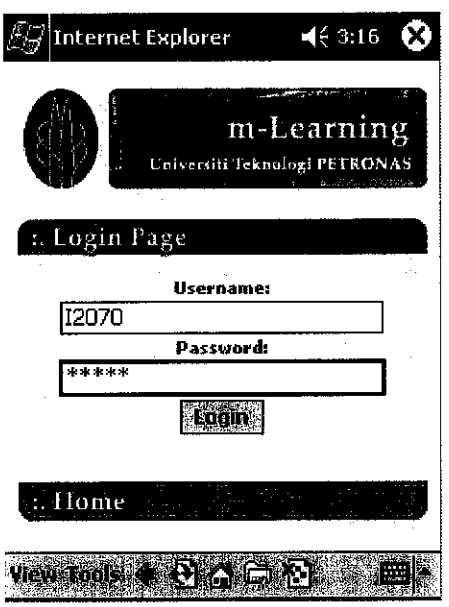
<-----Question Finish------->

Appendix 2: Screen Captures of the m-Learning micro web portal

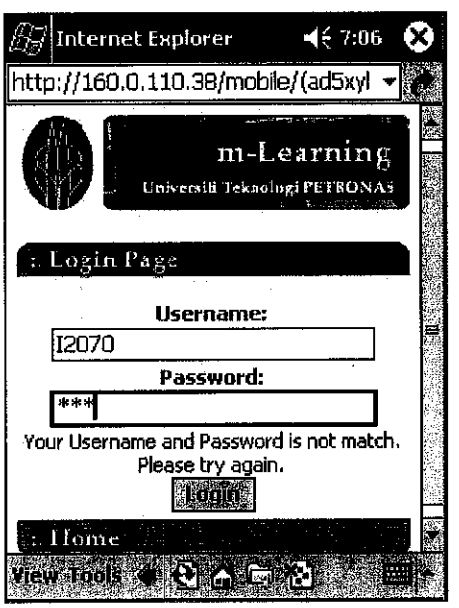


Screen 1: Welcoming Page

A. Login Module

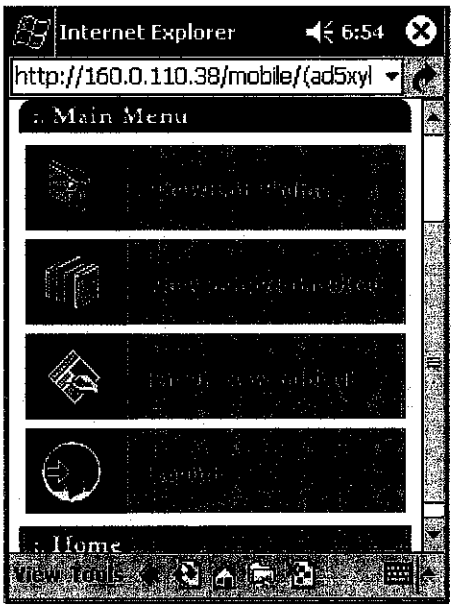


Screen 2: Login Page



Screen 3: Error Handler

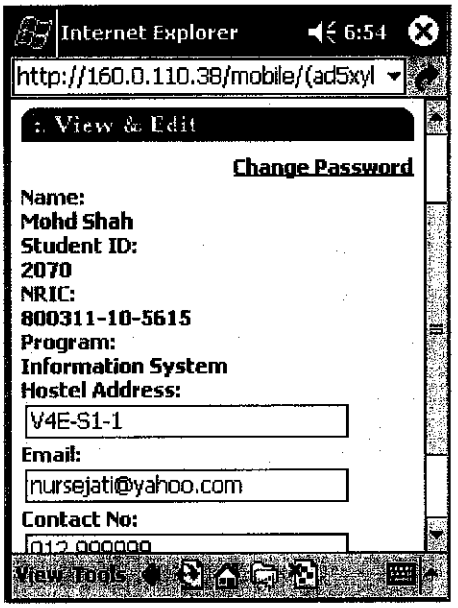
Appendix 2: Screen Captures of the m-Learning micro web portal



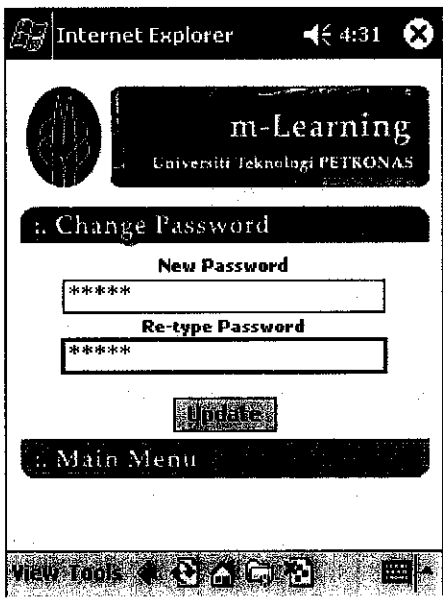
Screen 4: Main Menu

Appendix 2: Screen Captures of the m-Learning micro web portal

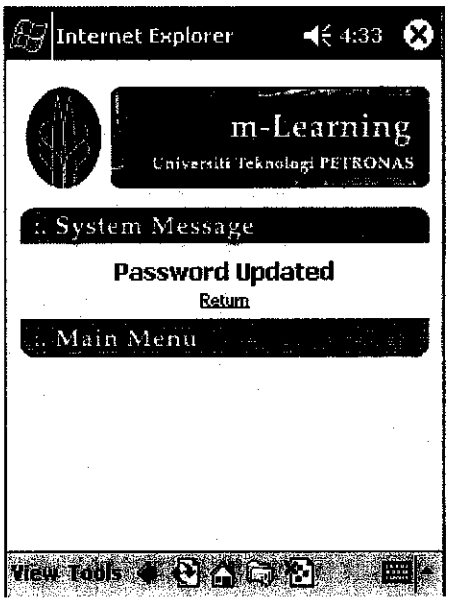
B. View & Edit Profiles' Module



Screen 5: View & Edit Profile's



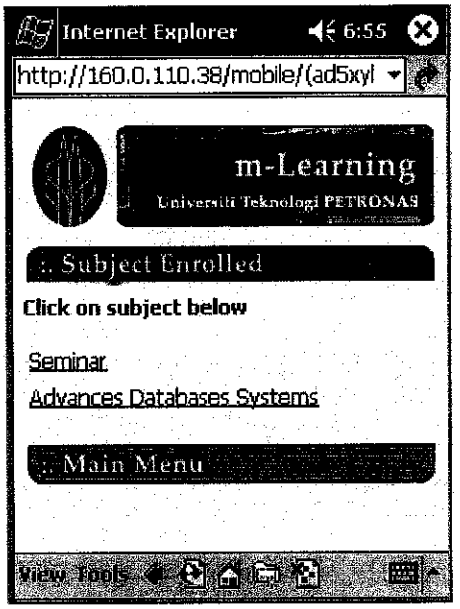
Screen 6: Change Password



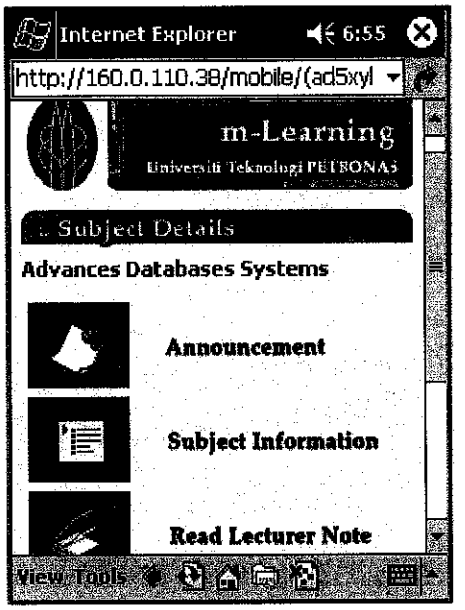
Screen 7: System Message

Appendix 2: Screen Captures of the m-Learning micro web portal

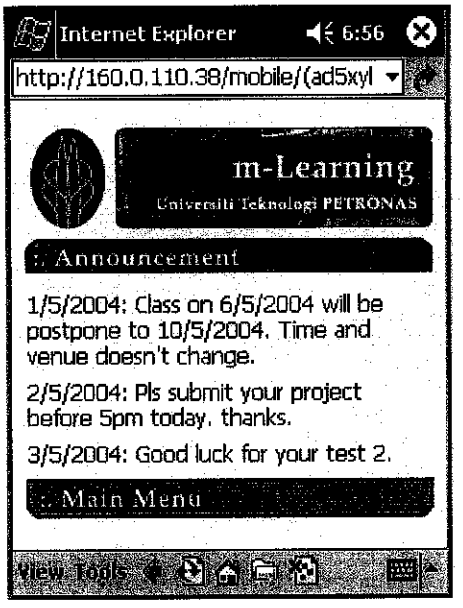
C. Subject Enrolled Module



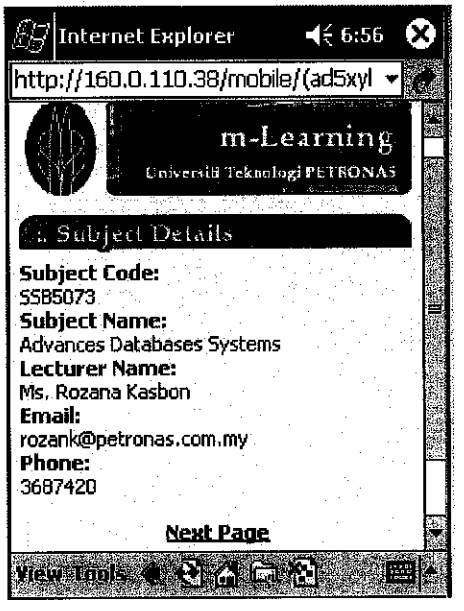
Screen 8: Subject Enrolled



Screen 9: Subject Details Menu

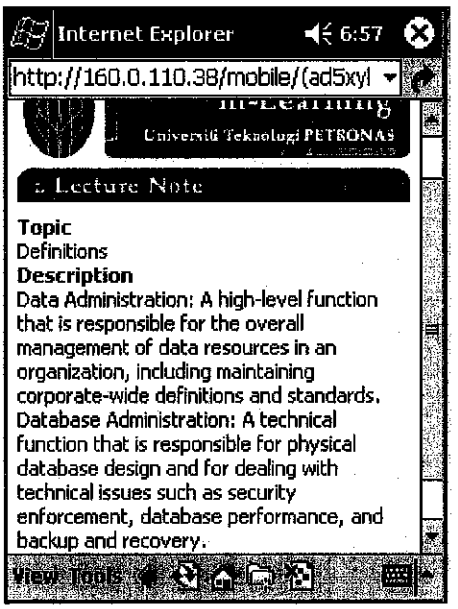


Screen 10: Announcement



Screen 11: Subject Information

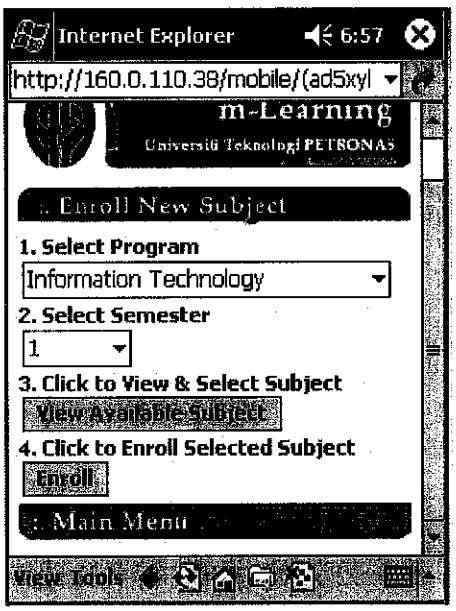
Appendix 2: Screen Captures of the m-Learning micro web portal



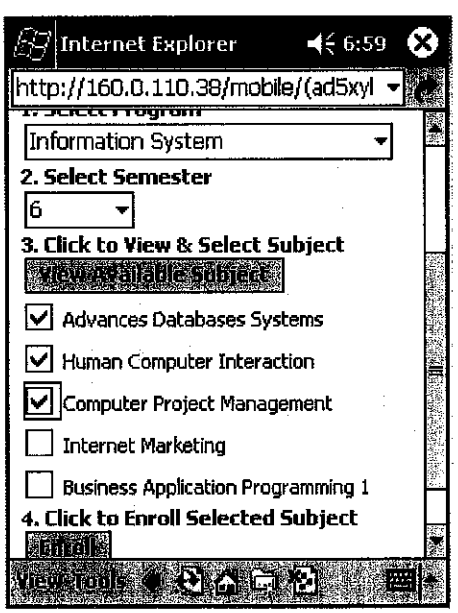
Screen 12: Lecture Note

Appendix 2: Screen Captures of the m-Learning micro web portal

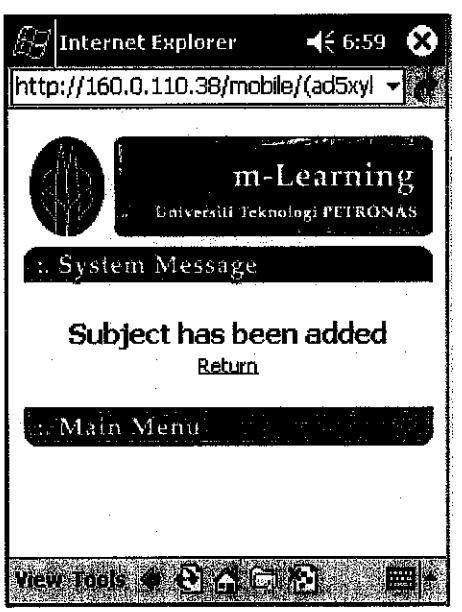
D. Add New Subjects Module



Screen 13: Enroll New Subject



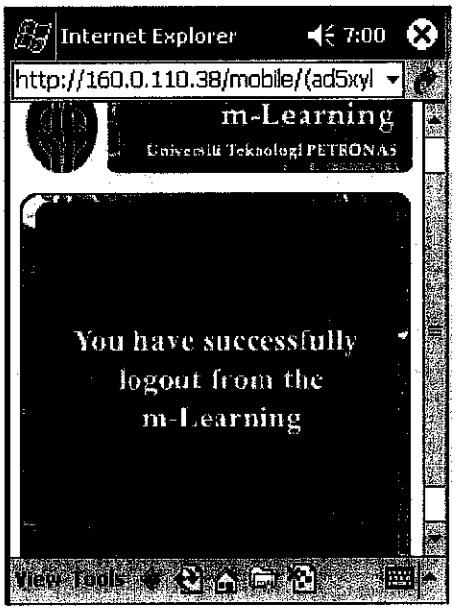
Screen 14: Selection New Subject



Screen 15: System Message

Appendix 2: Screen Captures of the m-Learning micro web portal

E. Logout Module



Screen 16: Logout