Design of Mobile Tracking Application System for Postgraduate Office at UUM

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Design of Mobile Tracking Application System for Postgraduate Office at UUM

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بسم الله الرحمن الرحيم قال تعالى:

((وقل اعملوا فسيرا الله عملكم ورسوله والمؤمنون))

صدق الله العظيم

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ABSTRACT

Mobile devices technology developed rapidly, most of students have mobile devices and they use the communication technologies devices to accomplish their tasks. Students face problems to track their application forms status since they have to call or go to the postgraduate office to check about their application forms status, this study led to the development of Mobile web-based prototype to help the students to submit their application forms from their mobiles and track their application forms by using the mobile application tracking system which reduces the efforts. Postgraduate office can view and change the status of application forms directly by using web tracking system which has been developed. Two systems prototype has been developed and tested successfully. The future work is how to implement those systems online web world and make some enhancements to meet the requirements of technologies.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter describes the background study of mobile and wireless devices technologies. This chapter continues to discuss the problem statement which is related to the WAP Tracking System for UUM Postgraduate Application, which gives the motivation of pursuing to this study. It also discussed research questions and research objectives in Section 1.3 and Section 1.4 respectively. The scope of the study and its significance of the study are explained in the Section 1.5 and Section 1.6 respectively.

Recent advances in hardware technologies as such portable wireless communication networks lead and computers to the emergence of mobile computing systems (Dunham & Helal, 1995). Zheng and Lee (2001) mentioned that the advance of the wireless network and the popularity of the portable devices improved the growth of mobile computing and becomes one of the hottest issues in academic and manufacturing. In other word, technological wireless developments as such 3G wireless application protocol (WAP), mobile phones, General Packet Radio Services (GPRS) and others plays an essential significant role in our life in communicating, entertaining and transacting information (Agrawal and Zeng, 2003). Furthermore, Nadia (2006)

believed that mobile devices play a significant role in the consumer as a result percentage of users need for mobile devices are increasing everyday. This can be viewed that young people consider a mobile phone the most important item of all of than access to the Internet or television (Williams, 2006). Therefore, it can be concluded that mobile computing emergence as an important role due to the growth and increase of the technologies.

Mobile application brings a number of significant advantages in the real world life. One of the advantages is information can be effort to access and the information is a common condition for working in many landscapes. This is proof by Chan and Roddick (2003) who mentioned that mobility and the remote access to information is encouraged by mobile generation, laptop and palmtop computers. These computers, matching with the developments in wireless networking technologies, provide users with the facility to access information almost at anytime and anywhere. Nor Shahriza *et al.* (2006) also supported this statement and stated that mobile communication technologies facilitate communication and the transformation of information from business to business, business to customers, employers to employees in more added value services. Thus, with the increasing number of UUM members who have the mobile devices and together with the available hotspot installations in UUM campus, mobile application can provide good services.

Therefore, the mobile and wireless devices technologies are adopted in obtaining the information delivery of available postgraduate application in UUM. Thus,

the WAP Tracking System is developed by using mobile and wireless device technologies in order to obtain the available information about student's postgraduate application and increase the flexibility to access the services.

1.2 Problem statement

The application form for university admission has been used for a long time and for many purposes. For administrations that cannot deal with all applications instantly, the applications will be recorded and filed in a queue to be processed later. It usually takes quite a long time (around 4 months) for an application to be processed after it has been submitted. Meanwhile, the applicants can do nothing but wait.

According to Mr. Abd.Rahman assistant register office (2008) agrees that there is a problem for student when tracking the registration application and for staff also. Furthermore, if the applicants can check the status of their application anytime anywhere by using mobile or any Personal Device Assents (PDA) device, it will comparatively make the waiting less dreary and reduce the anxiety, time and the cost especially those from overseas. The main issues are what features exist in the general application mobile tracking system model for university application designed in a WAP environment.

Thus, this study proposes the prototype of a WAP Tracking System for Postgraduate application at UUM by using the mobile device for tracking application System. Hopefully, it can make the tracking application process by easy and flexible

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way for the Postgraduate students to make their application via mobile device; otherwise the proposed application system provides the Postgraduate students with the facility to tracking their application via the system

1.3 Research questions

The research questions of this study are as follows.

1. What are the requirements for the WAP Tracking System for UUM Postgraduate Application?

2. What are the criteria to be used for testing the WAP Tracking System for UUM Postgraduate Application?

1.4 Research objectives

The main objective of this study is to develop a WAP Tracking System for UUM Postgraduate Application. The prototype would have two functions; one function is for postgraduate Office at University Utara Malaysia by using Web application and the other function is for students by using WAP application. The specific objectives of this study are as follows.

1 To design the requirements of WAP Tracking System for UUM Postgraduate Application Status at UUM

2 To develop WAP Tracking System for UUM Postgraduate Application Status at UUM based on the requirements objective one.

3   To evaluate the proposed prototype WAP Tracking System for UUM Postgraduate Application.

1.5   Scope of the study

This study focuses on the designing of a prototype of WAP Tracking System for UUM Postgraduate Application at UUM by utilizing the Wireless Application Protocol (WAP) technology. In more specific, the prototype would have two functions; one function is for staff of postgraduate Office in Universiti Utara Malaysia by using Web application to give information delivery of available services to be submitted and the other function is for student by using WAP application to tracking the application or to report about their problem. This study would be used for UUM students.

1.6   Significance of the study

To enhance the services between the postgraduate center of UUM and their prospective students is the benefit of this study, by developing an application mobile tracking system. Moreover, the purpose of this study is to develop an application mobile tracking system for the postgraduate Centre of Universiti Utara Malaysia (UUM) which will provide the necessary online facilities, and use to help student using the mobile application tracking system will reduce the effort and the time for student when come to ask or call to enquiry about the states of application, this will help student at anytime anywhere.

1.7 Outline of the report

Chapter Two discusses the related work of studies and the background of Wireless Application Protocol (WAP) and its solution in related environment.

Chapter Three presents object-oriented system analysis and design (OOSAD) approach by Hoffer *et al.* (2004) would be adopted in this study. These research methodologies include of five stages that are selection and planning, requirement analysis, design requirements model, usability testing and lastly documentation.

Chapter Four describes the implementation of the prototype for the WAP Tracking System for UUM Postgraduate Application. The prototype of WAP Tracking System for UUM Postgraduate Application design takes account of UML diagrams. The UML diagrams consist of the use case diagram and sequence diagrams in order to assist the development stage.

Chapter Five discusses the finding of the study. The system would be tested by end user. 10 questionnaires would be distributed to the respondents among UUM students.

Chapter Six is the last and final chapter that reviews back the study by providing a general idea based on the research objectives. It is not excluded the recommendations, directions of future work and limitation are also discussed in this chapter.

1.8 Summary

This chapter explains in detail about the background of the Wireless Application Protocol (WAP) and its solution in related environment and the problem statement which is related to the tracking the application at UUM that necessarily to be solved and gives the motivation to this study. The aim of this study is to design a WAP Tracking System for UUM Postgraduate Application. The related previous studies of the background of Wireless Application Protocol (WAP) and its solution in related environment are discussed in the next chapter.

CHAPTER 2

LITERATURE REVIEW

This chapter continues with the previous studies of mobile and wireless devices technologies and its solution in familiar environment. A review of mobile and wireless devices technologies application in other environment problem is also discussed.

2.1   Wireless and mobile technology

The WAP protocol is intended to operate over a range of wireless services consists of Code Division Multiple Access, General Packet Radio Service (GPRS), Cellular Digital Packet Data, 3G mobile phones and so forth (Agrawal and Zeng, 2003). The mobile network consists of Wireless LAN (IEEE 802.11 protocol), Inferred (IrDa), Bluetooth or cellular network such as GSM, Code Division Multiple Access (CDMA), Universal Mobile Telephone System (UMTS or 3G) or (GPRS) (Cervera, 2002; Antovski & Gusev, 2003; Kalliola, 2005) and wireless local area networks (WLANs), Wireless Local Loops (WLL), satellite-based networks, wireless Asynchronous transfer Mode (ATM) and mobile Internat protocol(IP) (Abdul Hamid, 2003; Mohd, 2005). WAP consists of mobile devices (for example, handheld, cellular phones or palm-sized computers, and even vehicle mounted interfaces), applying wireless networks and other wired e-commerce technologies (Lin and Wang, 2006).

Furthermore, Turker (2000); Mobilocity (2002); Shoniregun (2004) mention that it can be carry out similar kinds of business transaction and is innovate new ways of creating value about doing business.

Based on Internet standards as such HTTP, WAP wireless protocols requests to transfer huge text-based data. The WAP based on its elements which are application environment end-to-end and application protocol. The application protocol is a communication stack embedded in each WAP-enabled wireless device (user agent). The server side defined as a WAP gateway implements the other end of the protocol, which can communicate with any WAP client (Kumar *et. al*, 2003).

The Wireless Application Protocol network structural design is shown in Figure 2.1 and is briefly illustrated. The steps where WAP network structure sets up a session by Kumar *et. al.* (2003) are illustrated as in follows:

i.   Mobile devices send WAP requests to a WAP gateway.

ii. The gateway, upon receiving a WAP request, sends an HTTP request to a plain Web server, which gives the content through a normal HTTP response.

iii. The gateway converts the HTTP response into a WAP response for the mobile device.

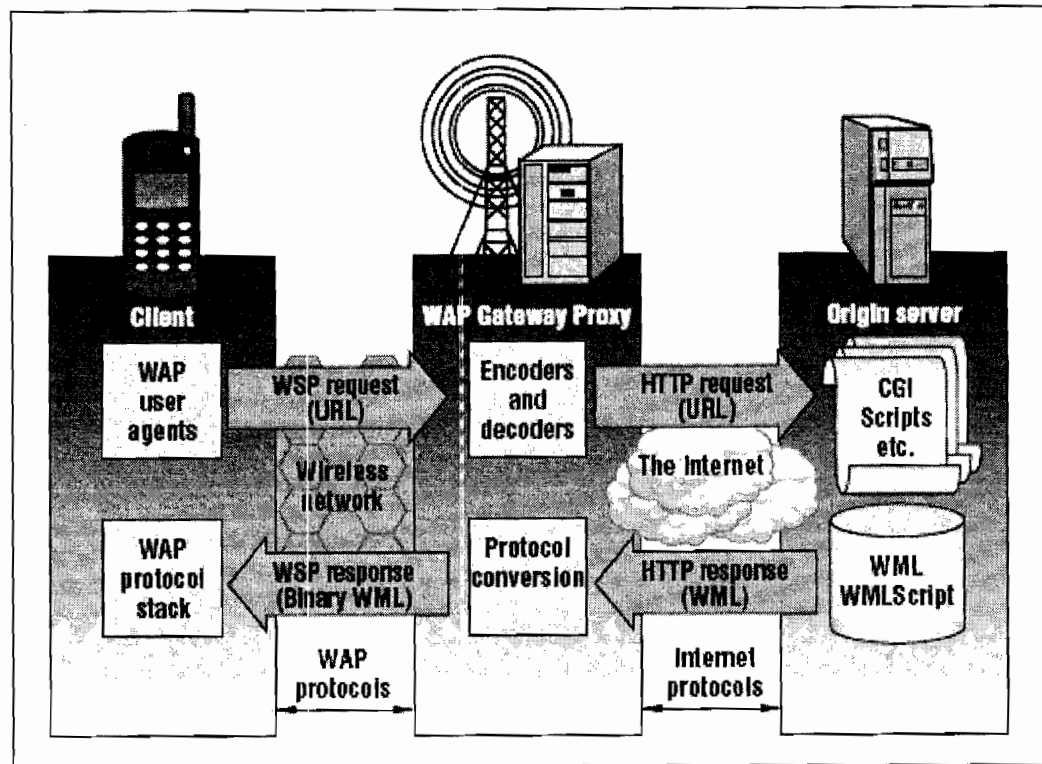iv. The micro browser in the mobile terminal interprets the response and demonstrates it appropriately.

Figure 2.1: A Wireless Application Protocol network architecture (Kumar *et. al*, 2003).

2.2 Wireless Application Protocol (WAP)

Wireless Application Protocol (WAP) as outcome of continuous work to determine industry-wide specification to develop applications that function over wireless communication networks. The scope for the WAP Forum is defining a set of specifications used by service applications (Wireless Application Protocol Forum, 1999). The wireless university grows quickly and reaches new students and services. To enable operators and manufacturers to gather the challenges in advanced services, differentiation and fast service creation, defines WAP as set of protocols in transport, session and application layers. (Wireless Application Protocol Forum, 1999).
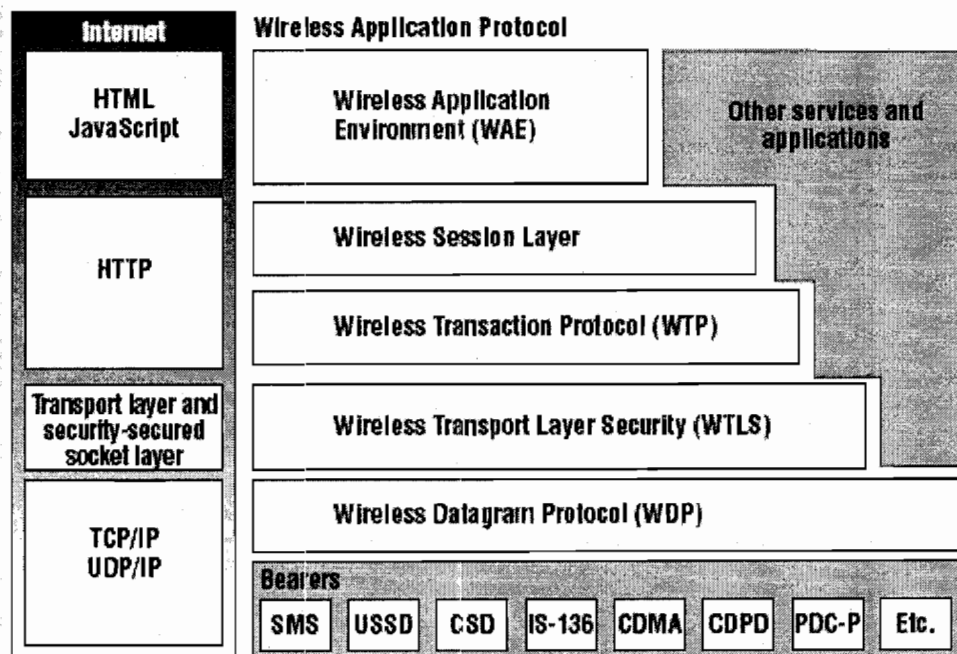
In the beginning wireless web, companies generated their own proprietary application protocol. Wireless web application developed and followed a company standards to merely to watch by the mobile phone utilizes that standard communication protocol. Thus, in June in 1997 Ericsson, Nokia and Motorola Phone.com have funded the WAP forum. Thus, WAP produced by a group of mobile devices as Phone.com, Ericsson, Nokia and Motorola (Schaumann, 2002; Wan, 2005).

The objectives of the WAP forum are according to (Agrawal and Zeng, 2003). Are:

  i. To bring Internet content and higher data services to wireless terminals and digital phones cellular.

  ii. To build a global wireless protocol specification that will work athwart differing wireless network technologies.

  iii. To allow the design of content and applications that scale across a very wide collection of bearer networks and device types.

  iv. To hold and extend existing standards and technology everywhere appropriate

The five layers of Wireless Application Protocol which are Wireless Session Protocol (WSP), Wireless Application Environment (WAE), Wireless Datagram Protocol (WDP), Wireless Transaction Protocol (WTP) and Wireless Transport Layer Security (WTLS). Each layer of Wireless Application Protocol presents nearly the similar functions as the linked layers of the Internet model (Wireless Application Protocol Forum, 1999). These can be showed as in the Figure 2.2 below.

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Internet	Wireless Application Protocol		
HTML JavaScript	Wireless Application Environment (WAE)	Other services and applications	
HTTP	Wireless Session Layer		
	Wireless Transaction Protocol (WTP)		
Transport layer and security-secured socket layer	Wireless Transport Layer Security (WTLS)		
TCP/IP UDP/IP	Wireless Datagram Protocol (WDP)		
	Bearers		
	SMS	USSD	CSD	IS-136	CDMA	CDPD	PDC-P	Etc.		

SMS: Short messaging service   CDMA: Code Division Multiple Access
USSD: Unstructured Supplementary Service Data   CDPD: Cellular Digital Packet Data
CSD: Circuit Switched Data   PDC-P: Personal Digital Cellular Packet
IS-136: Interim Standard-136

Figure 2.2: The five Wireless Application Protocol layers (Kumar *et. al*, 2003).

2.2.1   Wireless Application Environment (WAE)

The Wireless Application Environment (WAE) provides for dealings between wireless devices containing a WAP microbrowser and WAP/Web applications (WAP Forum, 2002). The major reason of the WAE is to set up an interoperable environment in   letting the operators and service providers can complete a wide and diversity of different wireless platforms with capable and functional approach.

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2.2.2 Wireless Session Protocol (WSP)

WSP provides the upper-level application layer of WAP with a regular interface for two session services (WAP Forum, 2002). The first is a connection-oriented service that works with the Wireless Transaction Protocol (WTP) and work with each other. The later is a connectionless service that works with above a secure or non-secure datagram service (WDP) and Wireless Transport Layer Security which let server to build connectionless oriented session.

2.2.3 Wireless Transaction Protocol (WTP)

Wireless Transaction Protocol (WTP) is as a light credence transaction oriented protocol that is suitable for Wireless Datagram Protocol (WDP) and suitable to be executed in mobile devices. The aims of using WTP are illustrated as in the follows (WAP Forum, 2002).

i.   Enhanced reliability over datagram services. WTP relieves the upper layer from re-transmissions and acknowledgements that are needed when datagram services are used.

ii.   Enhanced efficiency over connection oriented services. WTP has no plain connection set up or tear down phases.

iii. Benefit of using a message oriented protocol, designed for services oriented towards transactions.

2.2.4 Wireless Transport Layer Security (WTLS)

The Wireless Transport Layer Security layer is designed to give privacy, data reliability and authentication between two communicating applications (WAP Forum, 2002). The WTLS implements many features to ensure secure data transmissions and to defend the users, the network and service operators, and the functionality of the upper layers of the WAP stack (Kumar *et. al*, 2003).

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2.2.5 Wireless Datagram Protocol (WDP)

Wireless Datagram Protocol is the transport layer in WAP architecture. The WDP layer works above the data carrier services which supported by many types of network. WDP functions as general transport services where offers services to the upper layers always. Simultaneously the WDP layer also builds a communication over one of the available bearer services transparently Kumar *et. al*, 2003).

2.3 Related Works

Several researchers proposed the mobile and wireless devices technologies in organization environment with different purposes. The management and services can be enhanced in the academic landscape such as students can be accessed the academic results by the mobile and wireless devices technologies which are mentioned in the Lim (2004), who success developed a multimodal-based mobile application based on Unified Modelling Language (UML) as modeling system and PHP as programming

language and MySql as Database engine. Lim (2004) hoped that his prototype can be sustained by other researchers in the future with much complexity.

Teng *et al* (2007) investigated the mobile G-Portal system in a local secondary school which involved 39 students in Singapore as a respondent. Mobile G-Portal for geography fieldwork has obtained a positive encourages signal of acceptance among the respondents. Teng *et al* (2007) concluded that this mobile G-Portal system is successful used as a component in the geography syllabus which helps the students to study the outdoor microclimate around the neighborhood of a local school.

Campbell (2007) identified factors to the contribute of the successful implementation and utilization of ICT to enhance learning and the construction of a sense of community to assist the professional development and learning in Goulburn, Dubbo, Manly, Orange and Bathurst (GDMOB) campuses of Charles Sturt University. Result that the implementation and utilization of ICT is successful contribute to somewhere there is a higher level of personal interaction or at most the sense of it, then the technology is new readily accepted to be helpful (Campbell, 2007).

Ahmad Hisham (2002) utilized the mobile and wireless devices technologies to present a prototype of the Internet banking web site. Results of Ahmad Hisham (2002) exposed that the benefit of the proposed framework architecture is that it utilizes current web infrastructure used by banks without the require for high investment setup.

The usability testing conducted in this research revealed that the web-based mobile application is effective to be implemented by financial intuitions.

The services and management can be enhanced in the education landscape. For instance, Luchini (2004) noted that handheld computers are mobile, flexible devices that can provide real-time, one-to-one support for students from their learning activities. Aleahmad and Slotta (2002), Bick (2005), Vahey and Crawford (2002) claimed that the potential of PDAs for use in education for classroom learning and also for outdoor education in Science and Humanities (e.g. Geography and History) field studies. This is cleared at the secondary and primary school levels, PDAs have been used for various learning activities such as writing during journalism lessons (Vahey and Crawford, 2002) and simulation games on life-cycle and reproduction of fishes during science lessons in the classroom (Danesh, 2001).

The management and services can be improved in the transportation landscape, for instances, airline, buses, trains and so on. This can be viewed as in the study of Abdualromae Hawor (2004), Hinze and Buchanan (2006), Maclean and Dailey (2001). Thus, the related works involved mobile and wireless devices technologies and its solution in organization environment is studied.

Abdualromae Hawor (2004) presented a mobile tracking airline ticketing reservation by using the mobile and wireless technologies in order to help and improve the business performance. Abdualromae Hawor (2004) claimed that the results for the

development of mobile tracking reservation ticketing system for Airline Company gain much satisfaction among the respondents.

Hinze and Buchanan (2006) proposed a mobile Tourist Information Provider (TIP) system in order to introduce a mobile infrastructure for cooperating information services. The results of Tourist Information Provider 2.9 system are compared with the related existing systems. The findings proved that no systems fully address the problems of modular integration and cooperation between various (existing) services in a mobile information delivery system. The Tourist Information Provider 2.9 system enable in giving wider set of choices than any existing system and does so through exploiting the inter-service communication capacity.

Hinze and Buchanan (2005) discussed their TIP 2.9 prototype of mobile Tourist Information System. This TIP provides a new mobile infrastructure to work together with information services which is based on an event-based communication layer in order to support continually changing information. Besides that, Hinze and Buchanan (2005) also discussed about the number of difficulties and challenges to create an event-based communication framework for mobile systems. Their TIP 2.9 prototype of a Mobile Tourist Information System accepted by the users and thus, they would complete of redesigning TIP into a Service-Oriented Architecture (SOA) using web services (TIP 3.0).

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Based on the related literature review, the information services application through the mobile and wireless devices technologies have been successful implemented in management area are adopted and studied.

2.4 Usability testing

The concept of usability has been in existence since the 1980s. It has its roots in usability engineering, where HCI or human-computer interaction examines how users interact with computer technology and looks at ways of creation this interaction effective (Bury, 2005). In the computer science context, usability testing methodologies have been developed normally towards testing software applications and websites that operate in non-real-time environments. Current procedures in usability testing prove to be cumbersome and inefficient for usability studies in real-time systems (Georgievski and Sharda, 2006).

Usability refers to the measure of success a user achieves when utilizing a product or system (King and Jannik, 2005). In other mean that usability testing involves measuring the quality of user experience in deploying a particular application, such as software applications, websites, electronic devices, mobile phones and so on (Georgievski and Sharda, 2006).

The usability method can be applied in other landscapes such as in the business. Businesses desire to please existing customers and attract new ones; they need to

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understand their customers and the current business climate. One way they accomplish this is through usability testing (Porter, 2007).

2.5 Summary

This chapter discussed the previous studies of mobile and wireless devices technologies and its solution in organization environment. A review of mobile and wireless devices technologies application in other environment problem is also discussed. The constructive suggestion on some previous studies by Abdualromae Hawor (2004), Hinze and Buchanan (2006), Goto and Kambayashi (2002), Maclean and Dailey (2001) and so on which is successful used and proved that application of mobile and wireless devices technologies in organization environment can be persuaded us for developing the proposed application in this study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The previous studies about the Wireless Application Protocol (WAP) technology and its solutions in tracking and other similar related environment are discussed in the previous chapter. This chapter proposes the object-oriented system analysis and design (OOSAD) approach which is built by Hoffer *et al.* (2004) would be adopted in this study.

3.2 Object-oriented system analysis and design (OOSAD)

The object-oriented system analysis and design (OOSAD) approach built by Hoffer *et al.* (2004) would be selected and adopted in this study due to its suitable for developing the proposed. These research methodologies incorporated of five stages that are selection and planning, requirement analysis, design requirements model, usability testing and lastly documentation. These stages are briefly illustrated as in the Figure 3.1 below.
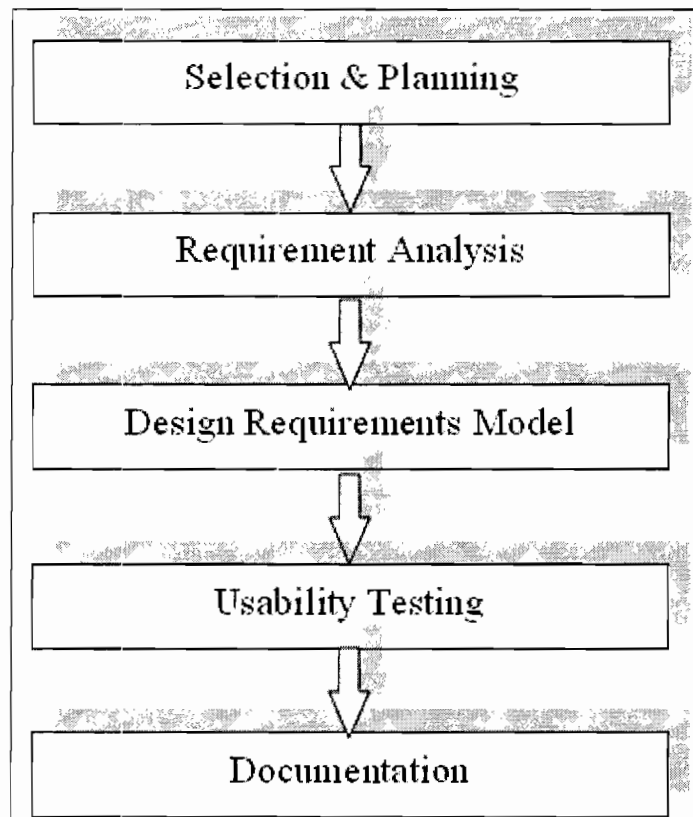
Figure 3.1: Object-oriented system analysis and design (OOSAD) (Hoffer *et al.*, 2004).

3.2.1 Stage1: Selection and planning

Zhang, *et al.* (2004) mentioned that in this stage the organization's total information needs are analyzed and arranged, a potential information system project is identified and an argument for continuing or not continuing the project is presented as well as a decision is made. Thus, in this study the requirement and information for the WAP tracking application are analyzed and arranged, a potential information system project is identified and the achievement at the end of the project is comprehensive and clear. In this stage, the ideas, information, issues and problems can be done by the gathering books, proceedings, journals, white papers, reports and news. At the end, a

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decision is made that is to develop a WAP Tracking System for UUM Postgraduate Application.

3.2.2 Stage2: Requirement analysis

In the requirements analysis phase, the requirement of the WAP Tracking System for UUM Postgraduate Application will be recognized and analyzed carefully. In this phase, the information about the previous existing mobile tracking system would be gathered as well as the features and functions of the prototypes of the mobile tracking before developing an appropriate model of the prototype. In additional, the literature review related to the mobile tracking would be collected. The suggestion on some previous studies by Emiliani (2000), Halstead and Becherer (2003), Parente *et. al.* (2004), Yen and Lu (2008) and so forth evidenced that tracking application via WAP application technologies bring new and unique distribution alternative as well as the effectiveness telecommunication tool to tracking would be considered and analyzed. Besides that, these previous studies ensure that the proposed system would be achieved better to develop a logical model by appropriate methods.

Thus, in this stage, how the current system works, determine and analyze facts and documents how system should work better is defined in order to support, develop a logical model of the proposed WAP application is collected.

3.2.3 Stage3: Design requirements model

All the necessary requirements and suggestion from previous studies are translated into a more detailed design as well as the eye-catching interface into a more understanding format for the purpose of well implementation well as the attractive users' interest way to the system. Afterwards, the prototype of WAP Tracking System for UUM Postgraduate Application is built via the WAP application technology. The prototype of the WAP tracking application for UUM Students design takes account of UML diagrams. The UML diagrams consist of the use case diagram, sequence diagram and class diagram in order to assist the development stage. Afterwards, the Wireless Application Protocol (WAP) utilized MySQL database engine and PHP for the developing the prototype. At the end of this phase tracking application via Wireless Application Protocol (WAP) will be achieved.

3.2.4 Stage4: Usability testing

After developing the prototype of WAP Tracking System for UUM Postgraduate Application, the proposed prototype would be evaluated by the students who want to tracking the application by expert-walk via test to which are depend on questionnaire and interview. The questionnaire is constructed and answered by students while using the systems. The questionnaire has two sections, the first is the prototype usefulness; the second the user satisfaction. Afterwards, the questionnaire is analyzed to know the level of the usage and user satisfaction which can be found through their comment and enthusiasm.

3.2.5 Stage: Documentation

This is the last stage of a research effort. The purpose of the documentation is to parallel to the system development and with the same quality controls. In other word, it means that the documentation is often slacking behind in the process. When the system finishes one phase, the documentation should be always followed or else this makes it hard for the people to actually perform any control on the documents (Andersson *et al.*, 2008). Finally, a complete documentation would be written for WAP Tracking System for UUM Postgraduate Application which included detailed description and information.

3.3 Summary

The Wireless Application Protocol (WAP) technologies would be executed in helping the UUM students to tracking the application and gain the information delivery of the application which interested at anytime and anywhere. The object-oriented system analysis and design (OOSAD) methodology has been selected carefully for developing the proposed system to this study. The five stages of the object-oriented system analysis and design (OOSAD) methodology to carry out the WAP Tracking System for UUM Postgraduate Application are explained. The implementation and results of the proposed system would be discussed in the next chapter.

CHAPTER FOUR

ANALYSIS AND DESIGN

The sequences of the five phases in the Object-oriented system analysis and design methodology that is Selection and planning, Requirement analysis, Design requirements model, Usability testing and lastly Documentation for carrying out the WAP Tracking System for UUM Postgraduate Application are discussed in the previous chapter. In this chapter the requirement of analysis and design phases will be discussed. In the first section which has Number 4.1, the system requirements analysis is presented to use the use case diagram and sequence diagrams. The design requirement model as well is described in Section 4.2. The summary is tense in Section 4.3.

4.1   System Requirements Analysis

Earlier it is mentioned that the system design considered the UML diagrams which includes the use case diagram and sequence diagrams. Use Case Diagram is used to draw the diagrams that can aid the development phases. The overall interaction between system and user is described in the next sub-section.

4.1.1 Use Case Diagram Specification for mobile application

Based on the use case for the mobile application in Figure 4.1, the functions available in the WAP Tracking System for UUM Postgraduate Application for the utilization of student are:

1.   Apply application (New reservation or update reservation)

2.   Check application status
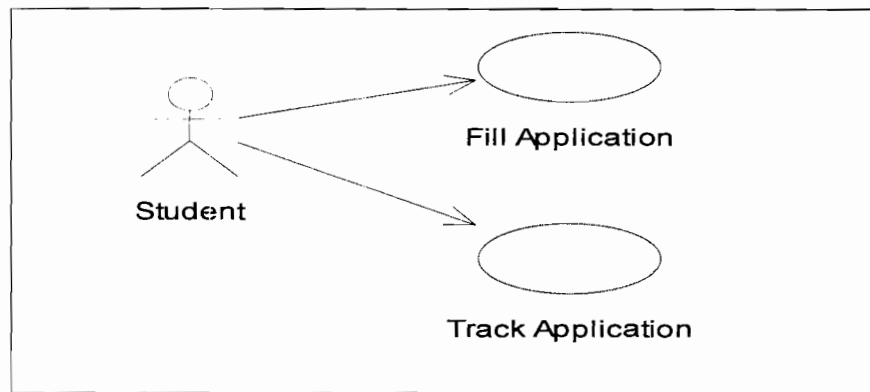
Figure 4.1: Use Case Diagram for WAP Tracking System for UUM Postgraduate
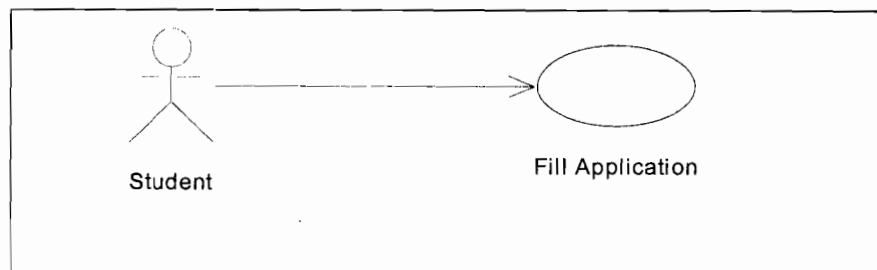
Application

Figure 4.2: Use Case for Filling Application

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User choose fill the application form. Then, the user insert the data to the form by using mobile emulator which display the application on the screen. This is depicted in the use case diagram as in the Figure 4.2.
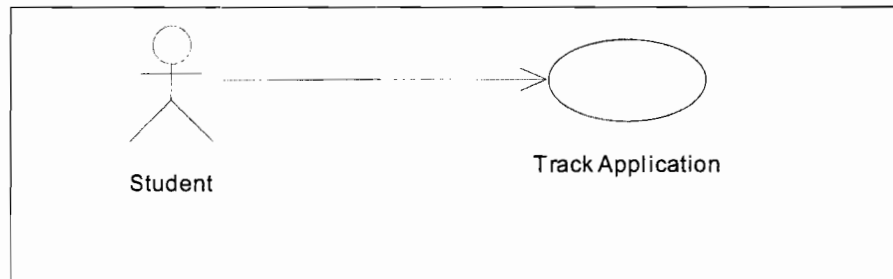
Figure 4.3: Use Case for Check Status

The user can track the application status; mobile emulator would display the application status on the screen. This is depicted in the use case diagram in Figure 4.3.

4.1.2 Use Case Diagram Specification for web application

According on the use case for the web application in Figure 4.4, the functions which can access by the postgraduate office in the model requirement of the Tracking Application of user are:

1. Manage application

2. Manage Employee

3. Manage Requirement

4. Manage Admin Account
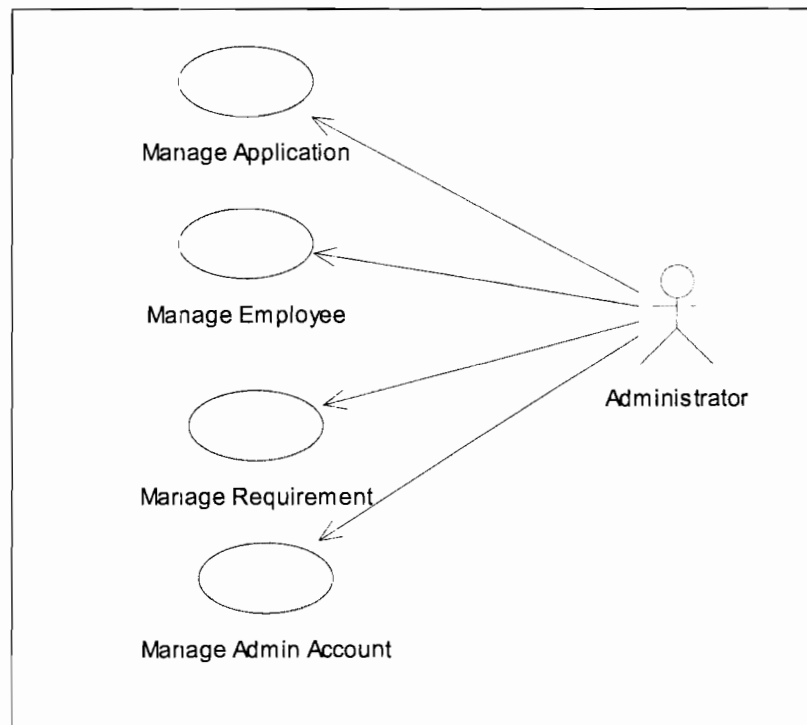
Figure 4.4: Use Case Diagram for Model Requirement of the Managing Application.

The administrator of postgraduate office can access the web site option through login the username and password in order to manage the application and enter the application status. Then, the web site will pass the username and password after verify in the database weather the user username and password correct and validate. If the users' username and password is validate, then web site will let the administrator to enter to second page of web site and access the web site option which are manage the application, manage employee account, manage requirement and manage administrator account. If the user username and password incorrect, the web site will display sorry login failed, please try again. This is depicted in the use case diagram in Figure 4.4.
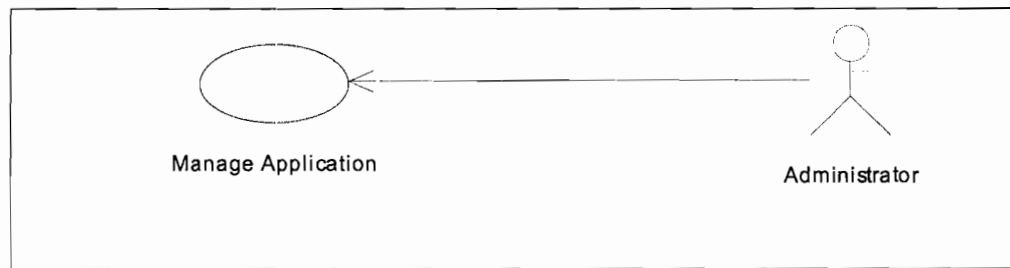
Figure 4.5: Use Case for Manage Application

Administrator of postgraduate office can select manage application in order to check and verify the application, edit the application status, and delete application. This is depicted in the use case diagram in Figure 4.5.
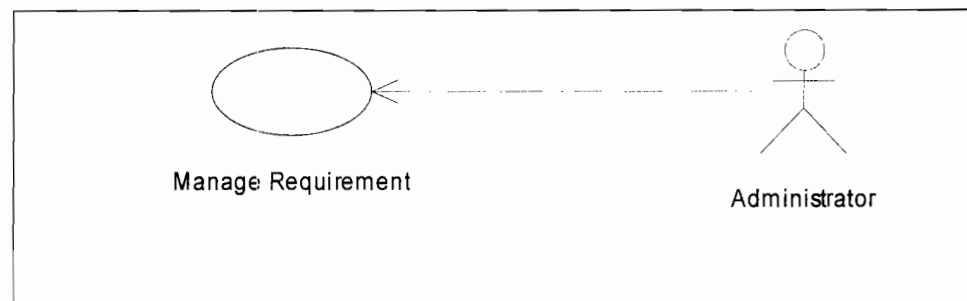
Figure 4.6: Use Case for Manage Requirement

The Administrator of postgraduate office can add new requirement for the application form in order to let the student to insert information for the new requirement. This is depicted in the use case diagram in Figure 4.6.
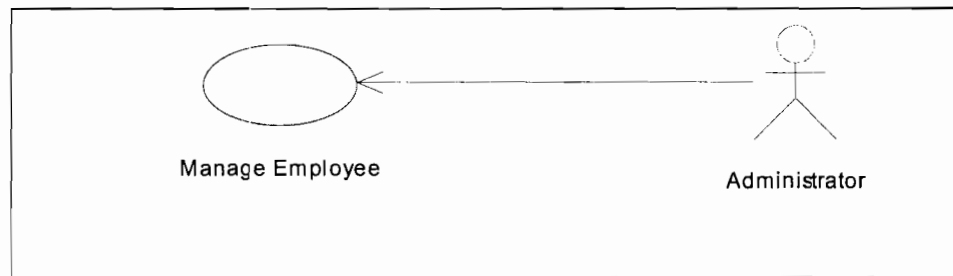
Figure 4.7: Use Case for Manage Employee

The Administrator of postgraduate office can add new employee to manage applications form in order to delegate the control to the employees to update application form status. This is depicted in the use case diagram in Figure 4.7.
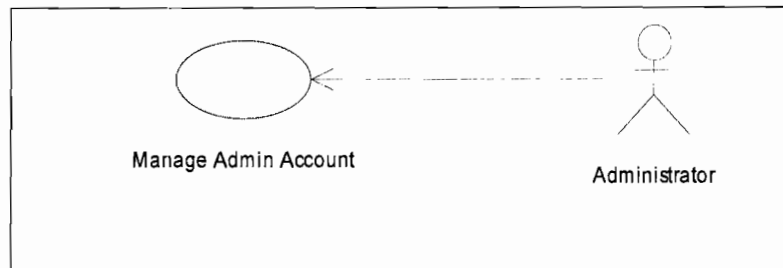
Figure 4.8: Use Case for Manage Admin Account

The Administrator of postgraduate office can edit his account. This is depicted in the use case diagram in Figure 4.8.

4.1.3   Sequence Diagram for mobile application
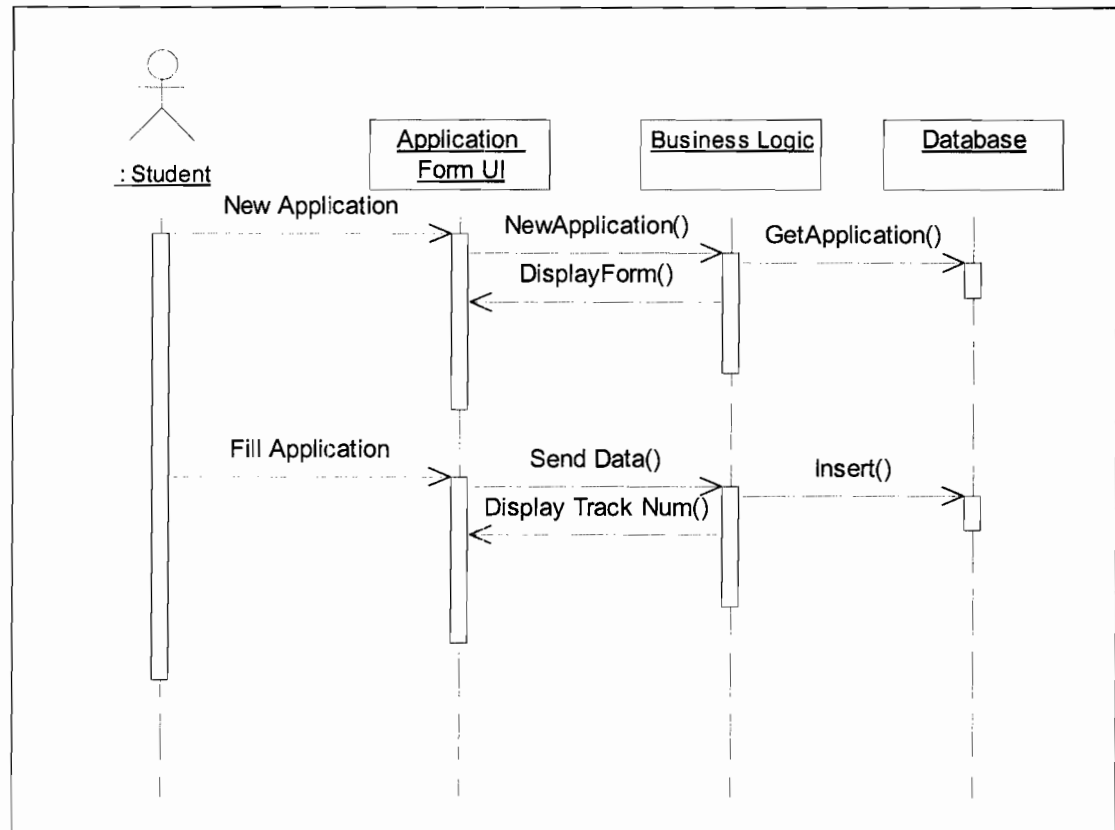
Figure 4.9: Sequence Diagram for Fill-in Application Information

1.   The student chooses new application form.

2.   The student fills the application form and sends it.

3.   The system will send the Application track number to the student.
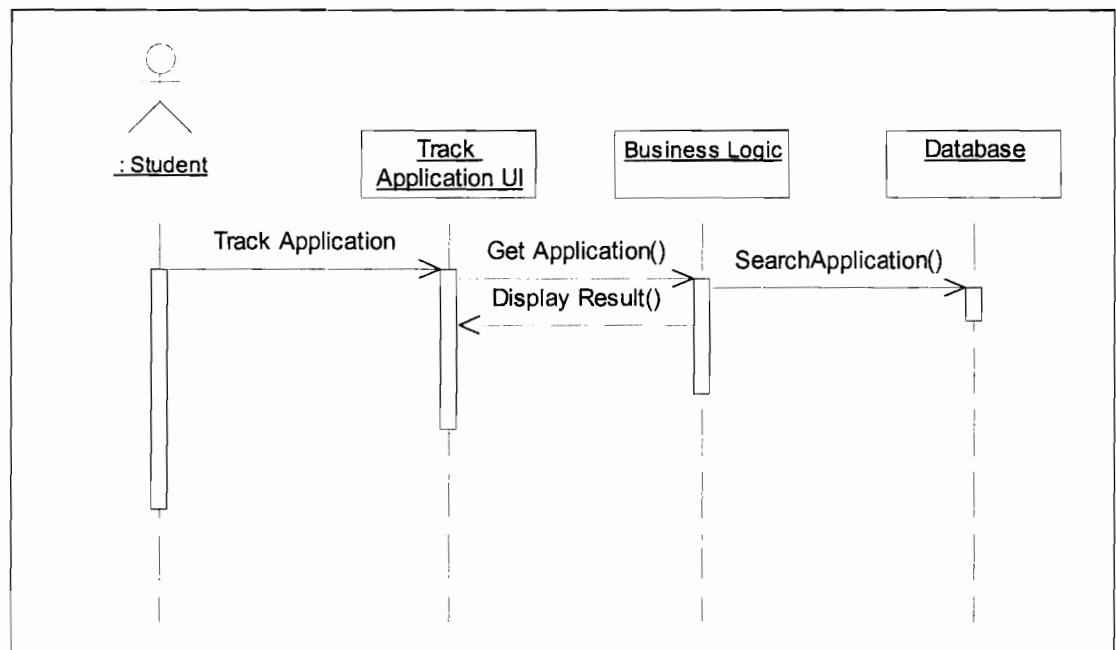
Figure 4.10: Sequence Diagram for Track Application Status

1. Student tracks the application by insert the track number.

2. The system would request the information from database.

3. The system will display the status on the screen

4.1.4 Sequence Diagram for web application
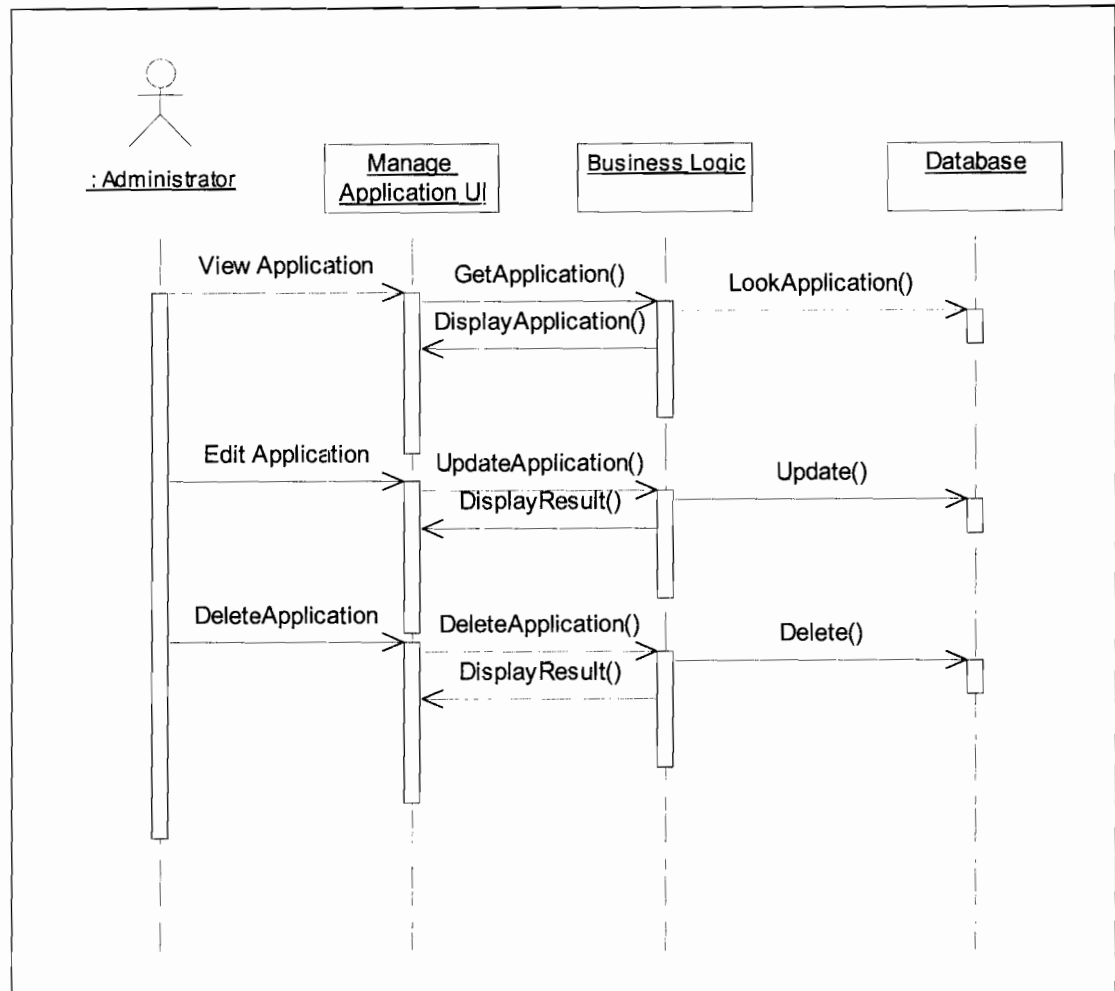
Figure 4.11: Sequence Diagram for Manage Application

The administrator could manage applications forms such as view the applications, edit specific application status and delete application form as shown in figure 4.11.
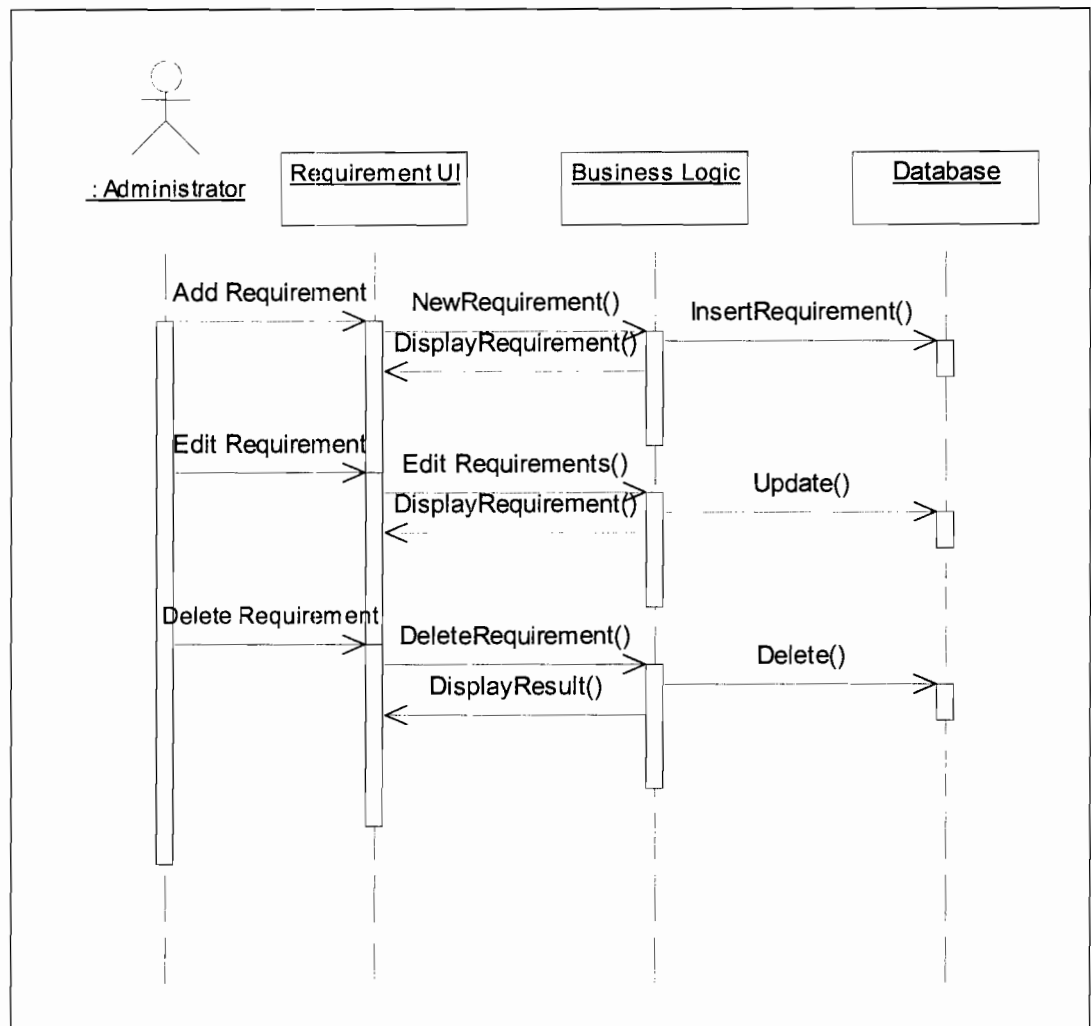
Figure 4.12: Sequence Diagram for Manage Requirement

In this sequence diagram the administrator of postgraduate office can add new requirement, edit existing requirement and delete requirement.
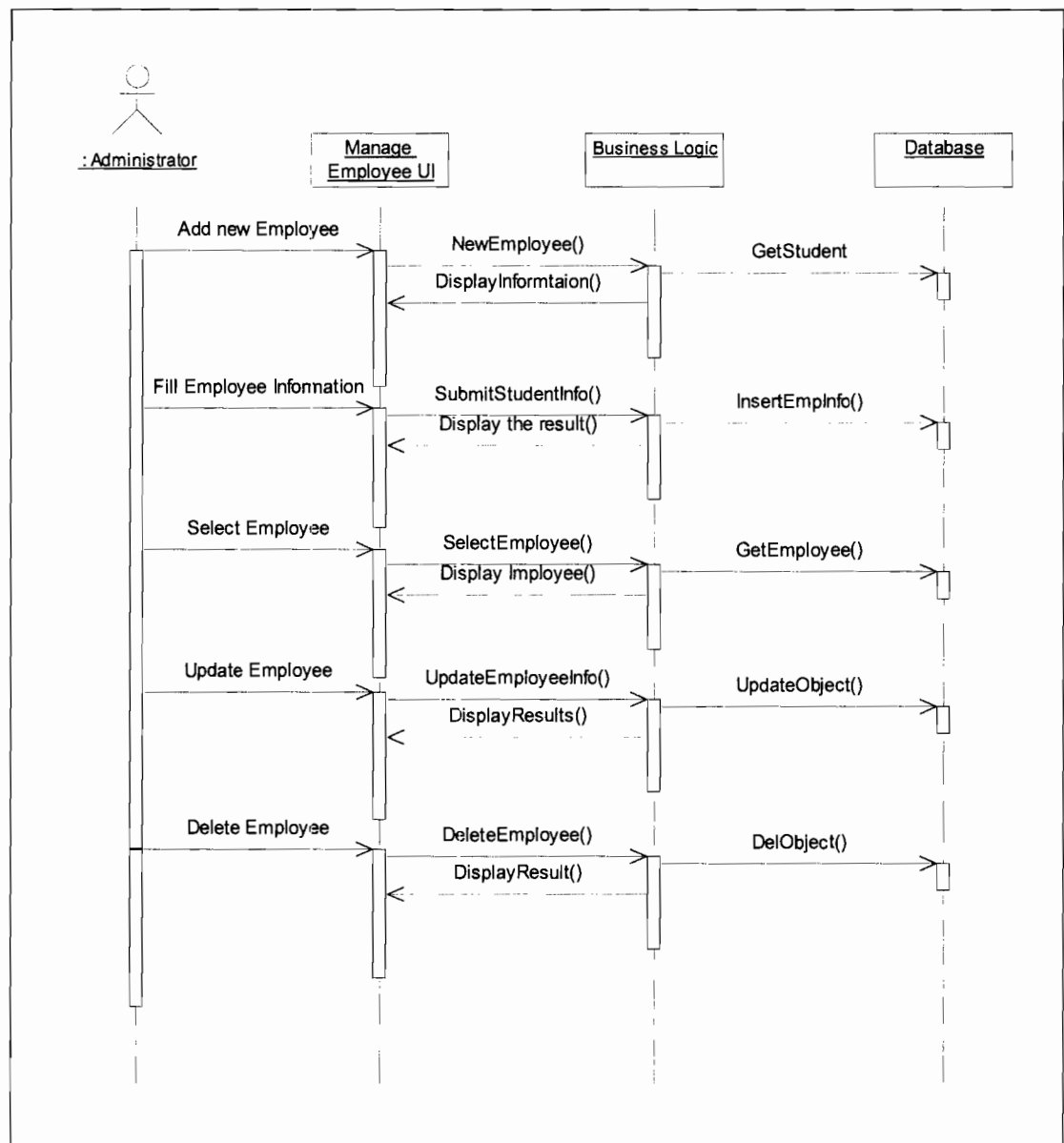
Figure 4.13: Sequence Diagram for Add Employee

In this sequence diagram the administrator able to add new employee which could update application form status, edit employee information and delete existing employee in Post Graduate office.
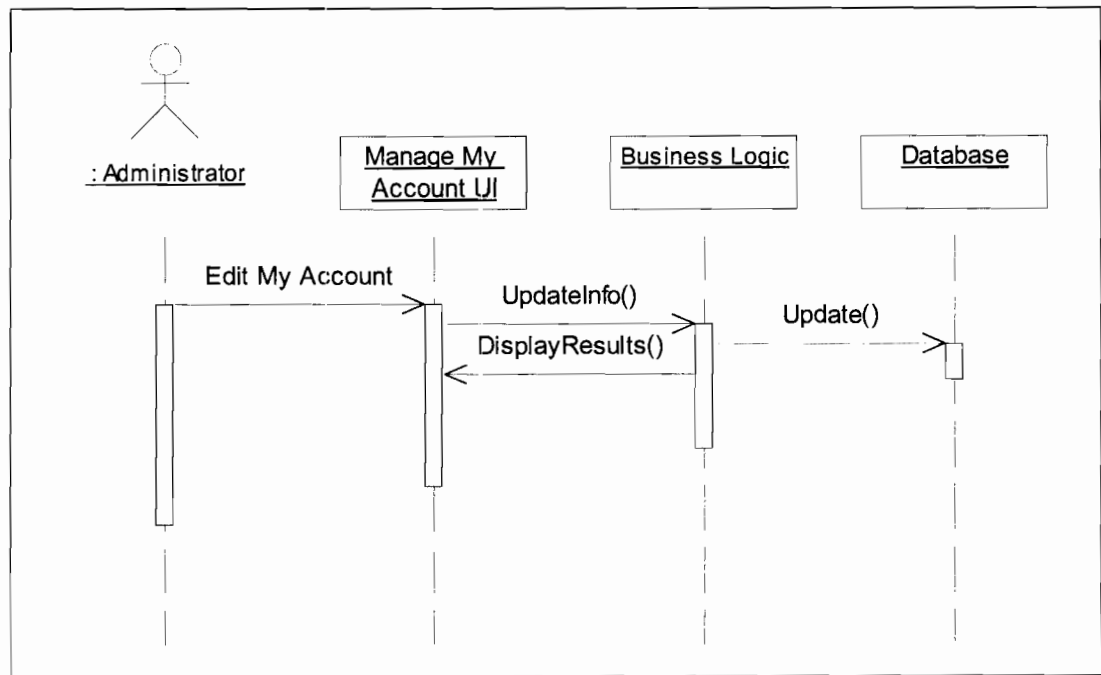
Figure 4.14: Sequence Diagram for Edit Admin Account

4.2   Design Requirement Model

After manipulative all the requirements and needs of the system, the physical system specifications can be transferred to the programmer to design the requirement of the model. The design of a system consists of coding and installation (Kendall, 1996).

4.2.1   Coding

Coding is one of the most important requirements which have to be written in the programming in order to construct well the system. An investigation of System Development process Models is conducted by Centre for Technology in government, University at Albany in 1998 supposed that coding is a programming process phases which is the creativity and innovative of the system software. The condition, needs and systems specifications from the System Design phases can be converting into machine

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readable computer code. Consequently, the implementation is the critical phase in the study. The prototype of the WAP Tracking System for UUM Postgraduate Application was successful developed by using Wireless Application Protocol (WAP) devices (Kwok *et al.*, 2004). PHP is the programming language used in developing this prototype and the Database is Mysql.

4.3   Summary

In this chapter the requirement analysis phase of the system is discussed. The use case diagram and sequence diagrams in order to build the system are discussed. Wireless Application Protocol (WAP) Tracking Application of technology is successful developed and implemented.

CHAPTER FIVE

IMPLEMENTATION AND EVALUATION

5.1 Introduction

This chapter presents the outcome of the study. The five main phases of the methodology are implemented and discussed. All the screenshots were presented and explained in details. The findings of the test conducted for this study. As a result, it could be concluded that the running system showed the objective of the study is done successfully and the student could track their application by using mobile.

5.2 Design Requirements Model

For the system design, PHP was used in coding Mobile Tracking Application System for the students and the web-based system for the administrator and employees of Postgraduate office employees.

The screenshots of mobile prototype for the students and web-based prototype for administrator of Postgraduate office are presented.

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5.3   Screenshots of the Web-Based System with Explanation
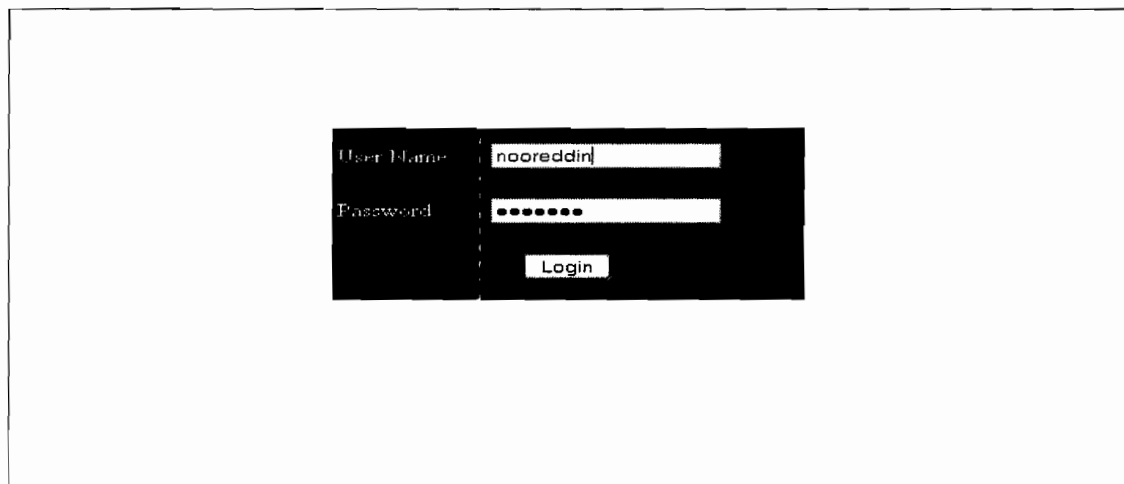
Figure 5.1: Login Page for the Web Tracking Application System

Figure 5.1 shows the screenshot for Login page, in which the admin of postgraduate office can access by entering his username and password.
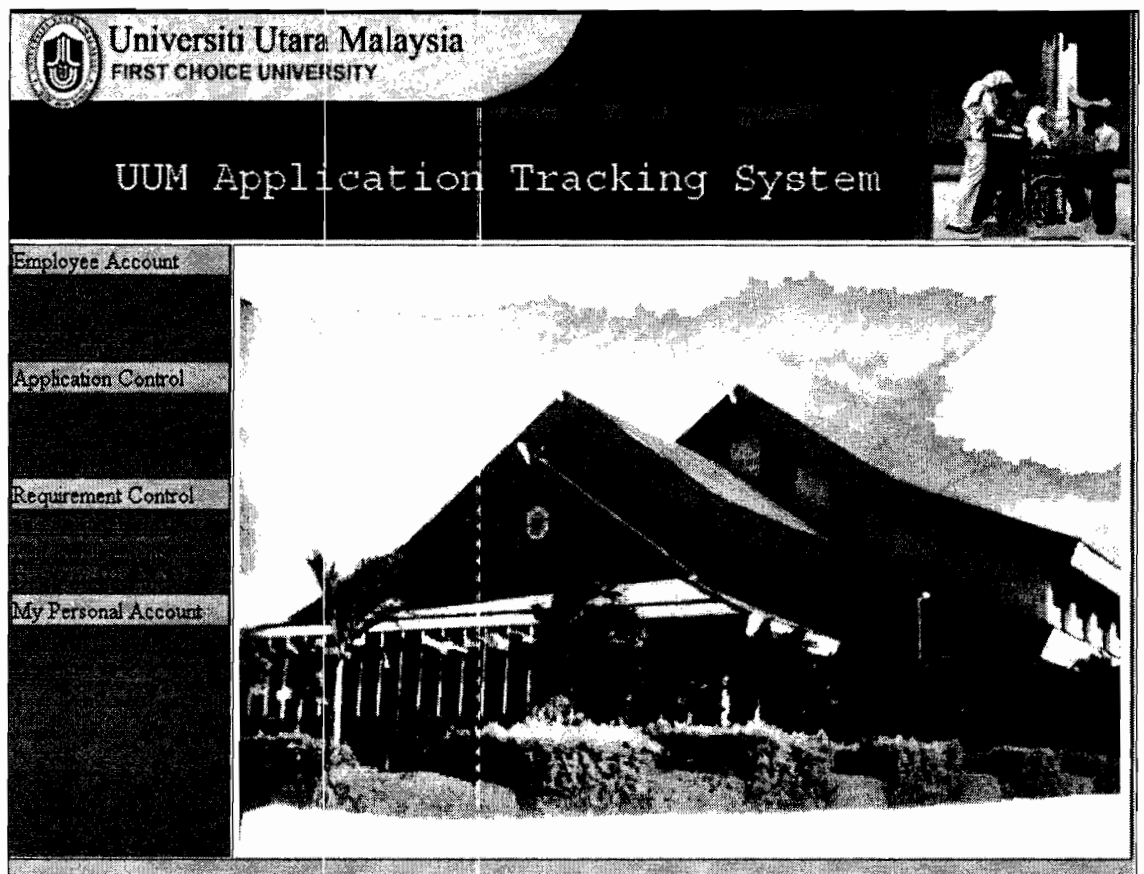
Figure 5.2: Control Panel of Tracking Application System

Figure 5.2 shows the screenshot for the administrator of Postgraduate office, in which admin can administrate his employees' account who work in postgraduate office, control application form, control requirements for the application forms and control his account.

Figure 5.3: Administrator Main Page to Add New Employee

Figure 5.3 shows the screenshot for the administrator main page, in which he can add employee account who works in postgraduate office and the admin could set this account as manager or normal employee since we have to level of administrating in this system.

Employee Accounts				
Full Name	Phone Number	Email	case of a Manager	
administrator	797897	nooreddin@yahoo.com	Manager	Not allowed
Ali Mohd	0172095511	ali_mohd@yahoo.com	General Manager	Edit
arafat	8788868	arafat@yahoo.com	Manager	Not allowed
Ali Saed	0173446211	Asaed@yahoo.com	Employer	Edit
nooreddin	0173491529	nuri_hamidat@yahoo.com	Manager	Not allowed
employee1	0193784905	mansoor_hamidat@yahoo.com	Employer	Edit

Figure 5.4: Edit Employee Page

Figure 5.4 shows the screenshot for the employee page to edit his account. The administrator can edit any employee information who works in postgraduate office but he can not edit any account in manager level (as administrator) since administrator can not edit another administrator account.

Universiti Utara Malaysia FIRST CHOICE UNIVERSITY							
UUM Application Tracking System							
Employee Account							
	Application Account						
	Student Name	Student Nationality	Program Name	College	Tracking Number	Application State	
	Hane	malaysian	DBA	COB	Done	2	View
Application Control	Abd Elmenaem	libyan	IS	FTM college	Under Processing	3	View
	Mohammed	LIBYAN	accounting	app_college	Under Processing	5	View
	Ezzedin	libyan	IT	app_college	Under Processing	8	View
Requirement Control	Hasen	malaysian	IT	app_college	Reject	9	View
	ali	Iranian	Master ICT	CAS	Sending Done	10	View
My Personal Account							

Figure 5.5: View Applications Page

Figure 5.5 shows the screenshot for the administrator or employee page in Postgraduate office to see the applications forms and they can view any applications details.

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Figure 5.6: Add New Requirement Page

Figure 5.6 shows the screenshot for the administrator page to add new requirement for the application form. The administrator can add new requirement then the student from his mobile system fulfill this requirement in the application form.
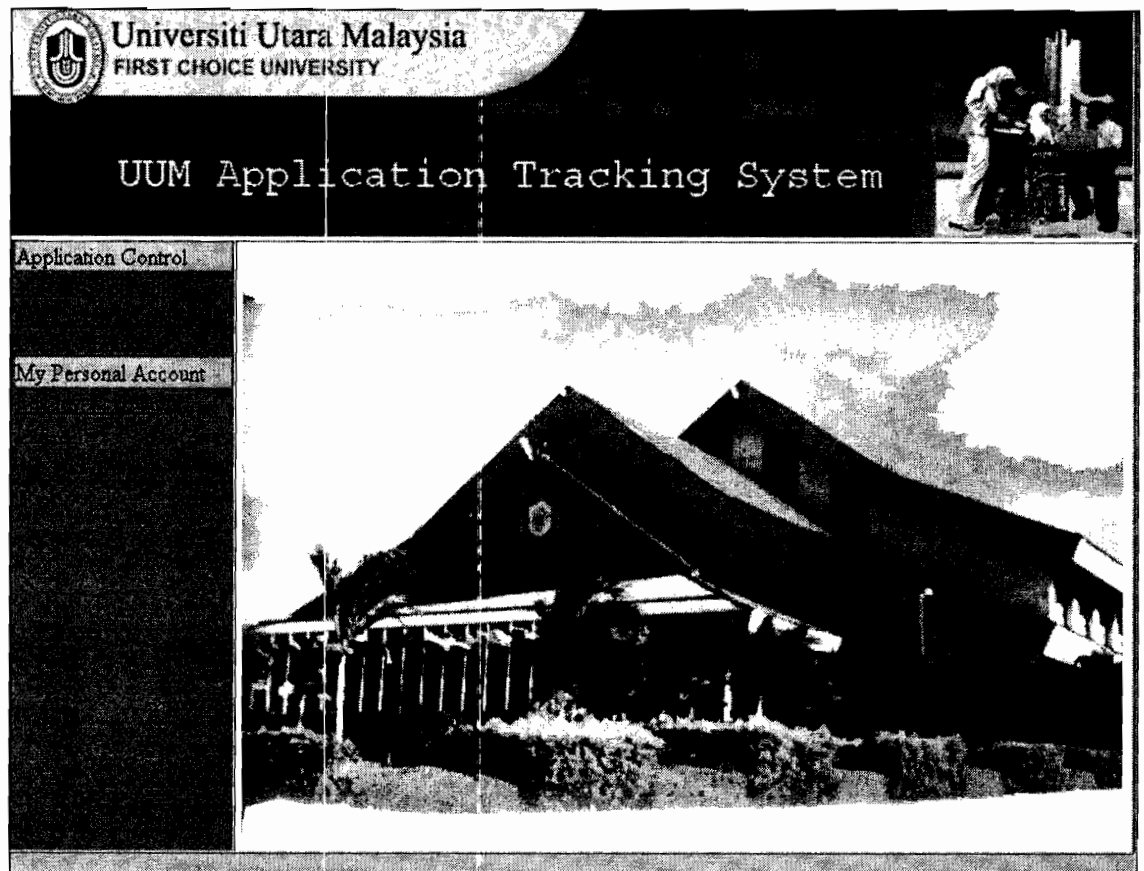
Figure 5.7 Control Panel for Employee

Figure 5.7 shows the screenshot for the employee control panel page. Employee can view application forms, edit application form, delete application form and edit his account.

Figure 5.8: View Application Page

Figure 5.8 shows the screenshot for administrator of Postgraduate office to view

all application forms then the administrator can view any application form details.

Figure 5.9: View Application Form Page

Figure 5.9 shows the screenshot for employee of postgraduate office. In this page the employee can edit the Application Form status and check the Application Forms status.

Figure 5.10: Edit Employee Account

Figure 5.10 shows the screenshot for the employee of postgraduate office to edit his accounts and change his information.

5.4 The Screenshots of the Mobile System and its Explanation

Figure 5.11 shows the screenshot of the main Page of mobile prototype for the student. The student can choose to add new application form or track his application form in this page.
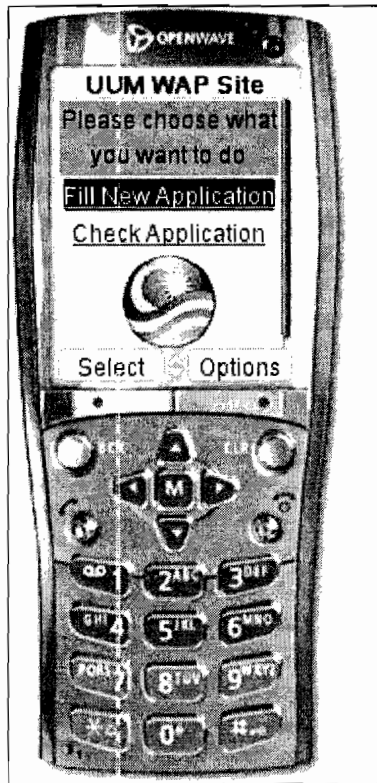
Figure 5.11: Mobile Tracking Application System Main Page

The figure 5.12 demonstrates how the students add new application form. In the screen, as it can be seen, there is a display of the fields which the student has to fill in such as applicant name, country, passport number, nationality and his CGPA. The student can submit the application and after that he will get number to track his application form later.
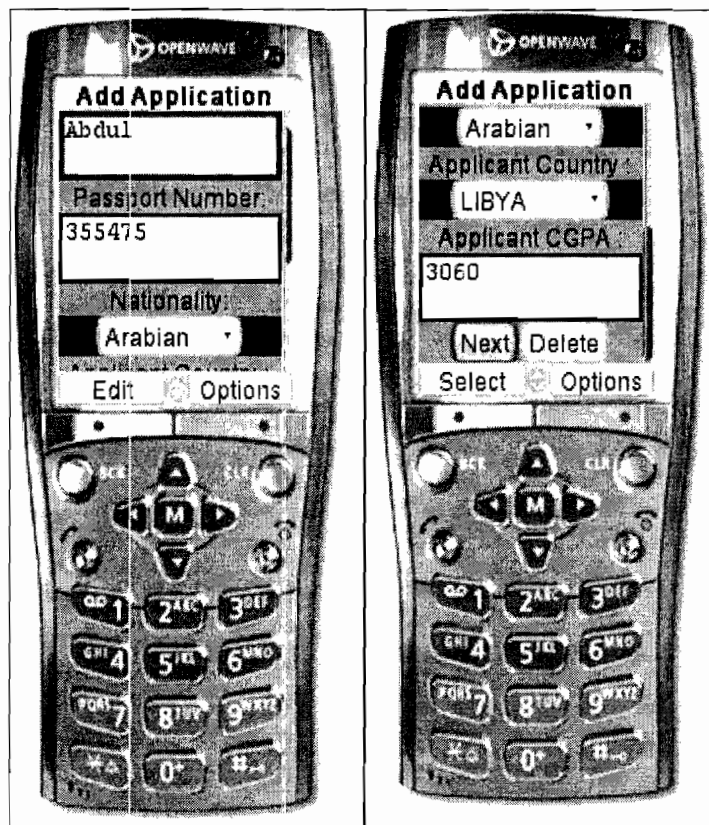
Figure 5.12: Add New Application Form in Mobile Application Tracking System

The figure 5.13 demonstrates how the student can track his application, the student has to write the tracking number first and press search then he will get the information about his application form.
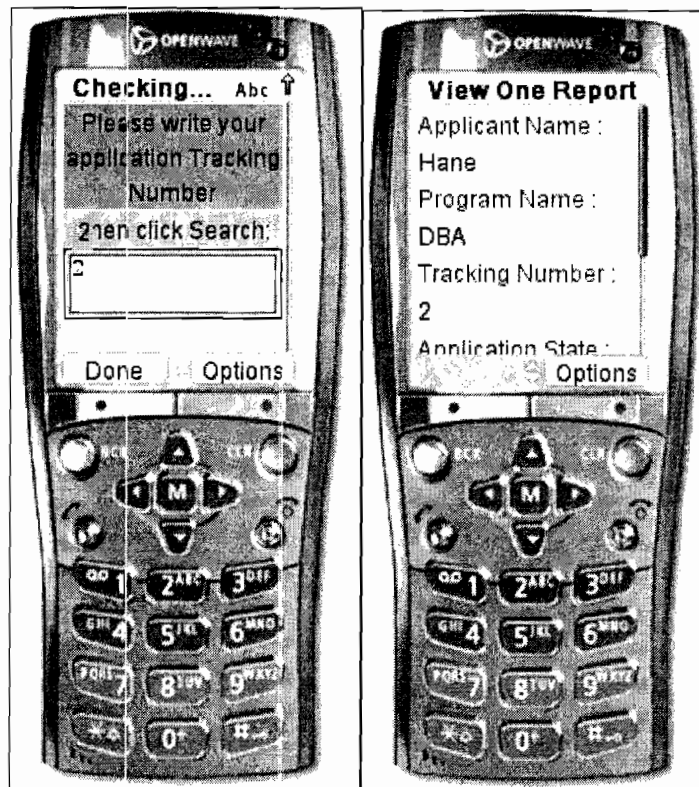
Figure 5.13: Track Application Form Pages

5.5 Results of the Usability Testing

The Usability testing and users evaluation for the Mobile Tracking Application System for Postgraduate students are highlighted in the upcoming sections.

5.6   Evaluation

To evaluate the usability of the Mobile Tracking Application System for Postgraduate students, feedback using the Questionnaire for User Interface Satisfaction was gathered from UUM students. That is to judge two components. The first is the prototype usefulness; the second the user satisfaction. The questionnaire inspired from (Colafigi *et al*, 2001), (Ramsay and Nielsen, 2000), (Shaizan and Li, 2003).

After the mobile prototype and the web-based prototype has been developed, it has been tested by running the mobile prototype on mobile simulator and the web-based prototype on internet explorer based on the requirements of the system. The aim was to see the level of functionality and operability of the prototype.

There were 30 respondents who have given their feedback for the survey. The executed survey consisted user evaluation on the above mentioned features of the Questionnaire.

| Perceived Usefulness for Mobile Tracking Application System		Average out of (5)	percen tage
1	I would find WAP Tracking System practical in my daily tasks.	4	80%
2	Using WAP Tracking System to accomplish the tracking of the application is quick.	4	80%
3	Using WAP Tracking System would enhance my effectiveness	4	80%
4	Using WAP Tracking System would make it easier to do my tasks.	4	80%

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5	Using WAP Tracking System would increase my productivity	3	60%
6	Learning to operate WAP Tracking System would be easy for me	4	80%
7	I would find WAP Tracking System easy to get what do I intend to do.	4	80%
8	My interaction with WAP Tracking System would be clear and Understandable	4	80%
9	I would find WAP Tracking System to be flexible to interact	3	60%
10	It would be easy for me to become skilful at using WAP Tracking System	4	80%
11	I would find WAP Tracking System easy to use.	4	80%
		TOTAL	**76.36 %**
User Interaction Satisfaction			
11	I am satisfied with the number of steps included in WAP Tracking System.	5	100%
12	WAP Tracking System is easy to understand when is needed to interact with	4	80%
13	The procedure through WAP Tracking System was clear.	4	80%
14	It was easy to remember the steps in WAP Tracking System.	4	80%
		TOTAL	**85%**

Since the percentage is almost above 75% for all dimensions; this indicates that the prototype system has met the students' satisfaction. The graph for the two dimensions is shown in Figure 5.14.
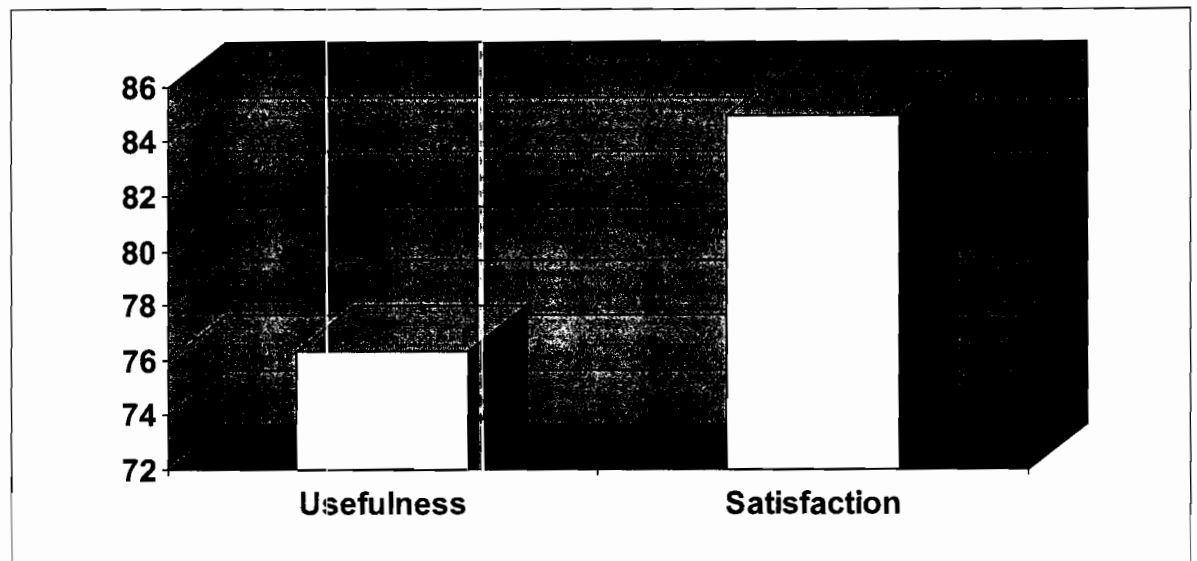
Figure5.14: Graph of the Usability Testing

5.7 The Level of study of respondents

Based on level of educational, most of the respondents are postgraduate students where, 20 of the respondents (66.66%) are studying Master degree, and 5 of the respondents are Doctoral degree students (16.66). And some respondents are belonging to first degree level 3 respondents (10%). In the last, there are 2 respondents are UUM lecturer (6.66%). Those information is Shown in table (5.1) follows;

Measure	Item	Respondent (N)	Percent (%)
	Diploma	0	0%
	Bachelor Degree	3	10%
Education	Master Degree	20	66.66%
	Doctoral Degree	10	16.66%
	Others (lecturer)	2	6.66%
	Total	30	100%

Table 5.1: Respondents Background

5.8 Summary

This chapter discussed the design and the usability testing of the prototype. In this chapter, all the screenshots of the system were presented. Thus, the objectives of the research are attained. Moreover, the Mobile Tracking Application System for Postgraduate students was implemented, tested, and evaluated via questionnaire; The testing proved that the prototype fulfils the students side and usability tests. The next chapter will determine the conclusion of this study.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

This is the last chapter which provides a holistic view based on the research objectives. This work was stimulated by the need to provide an alternative way to Tracking System for UUM Postgraduate Application.

6.1 Conclusion

In Chapter One described the main objective of this study is to develop a WAP Tracking System for UUM Postgraduate Application prototype. The following objectives were recognized in order to achieve the objective of this study:

Research Objective 1:

To design the requirement for WAP Tracking System for UUM Postgraduate Application at UUM, results are discussed in Chapter Four that is use case and sequence diagram. The objective has been achieved.

Research Objective 2:

To develop a WAP Tracking System for UUM Postgraduate Application at UUM based on identify requirements and design a developing, results are in chapter four that is design the use case sequence diagram and build the prototype by using

PHP as Programming Language and MySQL Database. Prototype has developed and tested.

Research Objective 3:

To evaluate the propose prototype WAP Tracking System for UUM Postgraduate Application, results are discussed in previous chapter.

Research Questions 1:

What are the requirements for the WAP Tracking System for UUM Postgraduate Application, results are discussed in chapter four that is design the use case sequence diagram build the prototype by using PHP and MySQL, mobile and wireless devices technologies.

Research Questions 2:

What are the criteria to be used for testing the WAP Tracking System for UUM Postgraduate Application, results are discussed in previous chapter that is the feedback from the user after they test the system

6.2 Future Work

There are some recommendations based on the finding of this study, which are as follows:

i.   WAP Tracking System should be implemented and tested via the actual wireless application protocol (WAP) connection on real mobile devices.

ii. WAP Tracking System can give better performance by improvement some of its features and helpful functions based on the requirements and needs of postgraduate center at UUM and their students.

6.3 Limitation

Limitations of this study are explained as follows:

I.   WAP Tracking System can function merely for those who have a mobile phone with GPRS enable only. Thus, user needed to subscribe for WAP or GPRS services before using the system.

II. The mobile phone's signal has limitation to coverage certain location only.

III. This proposed application just can apply by mobile emulator as Samsung Nokia, Motorola and laptop only.

6.4 Summary

As a summary, WAP Tracking System using mobile devices technology for obtained the information for tracking the application of postgraduate is developed. The system provides alternative for UUM students wherever and whenever they are to obtain information of their applications. It is hoped that with the combination of the Wireless Application Protocol (WAP) technology, the tracking application will increase

the effectiveness of services. Therefore, it can reduce the time for students and improve the tracking process for postgraduate office at UUM.

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APPENDIX

Questionnaire

WAP Tracking System for UUM Postgraduate Application

Dear Respondent,

The questionnaire is designed in order to understand current and new proposed for UUM Postgraduate Application. This study is being conducted as a partial fulfilment to complete the Master of Science (Information Technology) program. Completed questionnaires would not be published and it is used for research purposes only.

Contact

If you require assistance or have any question in completing this questionnaire, please

contact:

Faculty of Information Technology,

Universiti Utara Malaysia,

Email address:

QUESTIONNARIE

SECTION A: General Information

1. **Status:**

   ☐ 1. Student

   ☐ 2. Lecturer

   ☐ 3. Employee

   ☐ 4. Administrators

   ☐ 5. Other (please mention) _____

2. **Gender:**

   ☐ 1. Male

☐ 2. Female

3. **Education background**

☐ 1. STPM

☐ 2. Certificate

☐ 3. Diploma

☐ 4. Degree

☐ 5. PhD

☐ 6. Other (please mention) _____

Section B:	Perception on the Preference

Arrange from 1-4 based on the the priority.

1. In which way you prefer most in Tracking the application?

[　] telephone

[　] mobile only

[　] both mobile and web site

[　] web site only

Section C:	Perception on current system

This part is planned to get your opinion on the system aspects of the WAP Tracking System for UUM Postgraduate Application. Please state [√] where is appropriate to your answer.

1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree

		Perceived usefulness	Measurement				
			1	**2**	**3**	**4**	**5**
1)		I would find WAP Tracking System practical in my daily tasks.	☐	☐	☐	☐	☐
2)		Using WAP Tracking System to accomplish the tracking of the application is quick.	☐	☐	☐	☐	☐
3)		Using WAP Tracking System would enhance my effectiveness	☐	☐	☐	☐	☐
4)		Using WAP Tracking System would increase my productivity.	☐	☐	☐	☐	☐
5)		Using WAP Tracking System would make it easier to do my tasks.	☐	☐	☐	☐	☐
6)		Learning to operate WAP Tracking System would be easy for me	☐	☐	☐	☐	☐
7)		I would find WAP Tracking System easy to get what do I intend to do.	☐	☐	☐	☐	☐
8)		My interaction with WAP Tracking System would be clear and Understandable	☐	☐	☐	☐	☐
9)		I would find WAP Tracking System to be flexible to interact	☐	☐	☐	☐	☐
10)		It would be easy for me to become skilful at using WAP Tracking System	☐	☐	☐	☐	☐

	11)	I would find WAP Tracking System easy to use.	☐	☐	☐	☐	☐

Section D: User interaction satisfaction.					

	Attributes of Usability	**Measurement**				
		1	**2**	**3**	**4**	**5**
1.	I am satisfied with the number of steps included in WAP Tracking System.	☐	☐	☐	☐	☐
2.	WAP Tracking System is easy to understand what is needed to interact with	☐	☐	☐	☐	☐
3.	The procedure through WAP Tracking System was clear.	☐	☐	☐	☐	☐
4.	WAP Tracking System is more complex than most others.	☐	☐	☐	☐	☐
5.	It was easy to remember the steps in WAP Tracking System.	☐	☐	☐	☐	☐