

MOBILE HAJJ GUIDE FOR MALAYSIAN PILGRIMS

Abdalma. K al. alssayh

Universiti Utara Malaysia

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MOBILE HAJJ GUIDE FOR MALAYSIAN PILGRIMS

**A Thesis submitted to college Arts & Sciences in partial
Fulfillment of the requirement for the degree master
(Information Communication Technology)**

Universiti Utara Malaysia

By

Abdalma. K al .alssayh (800001)

Abdalma. K al. alssayh

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ABSTRACT

Mobile Hajj for Malaysian Pilgrims gives the flexibility and the easy way to the Malaysian pilgrims to access anytime and anywhere for their hajj enquire. However, the current enquire system unable to provide those pilgrims with the appropriate information via mobile device. Hence, the study proposed to Design Mobile Hajj Guide for Malaysian Pilgrims to simplify for those pilgrims to get their enquires about hajj, furthermore, the proposed system supports the pilgrims to view the hajj information. Moreover, Mobile Hajj Guide for Malaysian Pilgrims has been tested to make sure that it's satisfying with the pilgrim's requirements.

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CHAPTER ONE

INTRODUCTION

This Chapter presents and elaborates the research details of the proposed Mobile Hajj Guide for Malaysian Pilgrims. This Chapter also provides answers to the research questions as to why the study was conducted and what the main elements involved in the study are. The first sub-topic describes the overall idea in this study and the motivation that led to the implementation of the whole project. This is followed by the problem statement, objectives, significance and scope of the study. The last sub-topic elaborates the way this project is organized, and finally, the summary of this Chapter is provided.

1.0 Introduction

One of a Muslim's duties, as described in the Five Pillars of Islam, is to go on Hajj at least once during his or her lifetime. This is a pilgrimage to Mecca in Saudi Arabia. According to (Bookwork & Norwich ,1999), approximately two million Muslims went in 1999 (Islamic Wills, 2004). Every year, the number of Hajjaj (pilgrims) going from Malaysia increases, regardless of the economical or political factors. According to

Islamic Wills (2004), approximately more than twenty thousand Malaysians have performed their Hajj since 2008.

Pilgrims depend a lot on the right and reliable information while performing their Hajj duties, either at Mecca or Madinah. On a daily basis, they have specific duties to perform, and sometimes, they have to move fast from one place to another. Pilgrims from Malaysia normally move in a big group, or sometimes in a small group. However, in certain situations, they individually need to get information from their leader or from other sources. In this situation, a very efficient way to search and access information is needed by every pilgrim.

The fast growing technology of Mobile Internet can assist in making this a reality. With mobile application, information about places and religious duty can be accessed via hand-held mobile devices just about from anywhere and at anytime, as long as the service is available in that particular area. This study is conducted to find the requirements needed by the pilgrims in a situation where they need to search information about Hajj through mobile phone. Since nowadays, almost everyone owns a mobile phone, it is hoped that pilgrims can access information related to Hajj at anytime and from anywhere.

1.1 Problem Statement

Although there are Hajj guides allocated to the pilgrims whenever they come to visit Mecca, which provide the needed information and guide to particular interesting

locations, sometimes it is difficult as they have to approach personally the Hajj tour guides or check for the required information manually or access the Internet. Sometimes, pilgrims, especially when they are not in groups, find problems to get the appropriate information about place and religious duty as well as other related information, such as accommodation, meals, etc. As for Malaysian pilgrims, they might need to view certain information from the Malaysian environment, travel agents, etc. Invariably, there is always a need for them to check specific information, easily and quickly, so that they can practice the Hajj properly.

1.2 Research Questions

The main questions of this study are:

- What are the requirements for the Mobile Hajj Guide for Malaysian Pilgrims?
- How can the requirement be collected through mobile devices?

1.3 Research Objectives

The objectives of this study can be viewed as follows:

- To identify the requirements for Mobile Hajj Guide for Malaysian pilgrims.
- To develop a prototype of the Mobile Hajj Guide for Malaysian pilgrims.
- To evaluate the prototype usability of using Mobile Hajj Guide for Malaysian pilgrims.

1.4 Research Scope

This study will focus only on a Wireless Application Protocol (WAP) prototype; the main functionality of this project is to enable Malaysian Hajjaj (pilgrims) to access information about places and Hajj duties by using a Mobile Hajj Guide System. The proposed Hajj Guide System will be accessible 24 hours a day seven days a week, from anywhere and at anytime.

1.5 Research Significance

This project significantly gives an impact to the Malaysian pilgrims sector, especially to the development of a Hajj guide. The Mobile Hajj Guide which provides relevant information on places and other information about Hajj duties, is a new avenue and prospect for everyone to benefit from, with the rapidly growing development of Hajj tourism.

With the application of mobile technology, it will be easy for the public, especially Malaysian pilgrims to access the information they want at anytime and from anywhere, via mobile devise.

1.6 Report Structure

This Chapter explains in detail about the background of the study and the research problems that need to be solved and motivation for this study. The objectives, scope and its significance are identified and described as well.

Chapter Two presents a review on the mobile technology, mobile tourism technology, mobile application, and other related work and subjects.

Chapter Three describes the research methodology which is developed by (Barry, B. (2000) adopted in this study. The overview of the methodology and the executive summary is briefly discussed.

Chapter Four discusses the Mobile Hajj Guide for Malaysian Pilgrims System design implementation and the UNIFIED MODELING LANGUAGE (UML) diagrams.

Chapter Five highlights the evaluation techniques of the proposed Mobile Hajj Guide for Malaysian Pilgrims System, testing performed and its results.

Chapter Six describes the research conclusions and future work.

1.7 Summary

The research is heavily involved in developing requirements to build the system development successfully through managing the requirements with the research objectives in mind. This study suggests a prototype to be designed to help pilgrims to access the information they want at anytime and from anywhere.

CHAPTER TWO

LITERATURE REVIEW

The background of this study was briefly explained in the previous Chapter. In this Chapter, the literature review related to the issue of mobile technologies and its applications in other fields, which gives a detailed background for the objectives of this study, is discussed. Finally, a summary is made in the last section of this Chapter.

2.1 Introduction

Hajj is the fifth pillar of Islam. Furthermore, Muslims can go for Umrah, which can be performed independently of the Hajj. This pilgrimage is optional. Most pilgrims visit Mecca for their Umrah and Hajj and usually require a long time to access information they require.

Nowadays, mobile device plays a very important role by providing users a quick and easy way to send and receive information. Many of today's mobile and hand-held devices are capable of making use of these mobile technologies, including WAP (Wireless Application Protocol), GPRS (General Packet Radio Service) and Bluetooth,

as well as the new 802.11b and 802.11f Wi-Fi standards to access WLANS (Wireless Local Area Networks) (Gronmo, R., et. al., 2004).

2.2 Overview on Wireless Application Protocol (WAP)

WAP refers to a collection of an application environment and set of communication protocols for wireless devices to communicate with each other and with any external application. It was designed to enable the manufacturers, vendors and technology users around the world to independently access the Internet and advanced telephony services. With that ability, the WAP technology eliminates the gap between the mobile world and the Internet and this is good news to the subscribers as it offers an unlimited range of mobile variety services (WAPForum, 2001); (WAPForum, 2002).

Stallings. W, (2001), and Thomas (1998), referred the term WAP as a protocol that enables information transfers between servers connected to computer networks and wireless devices. The protocol specifies how the communication between mobile phones and other wireless terminals, wireless networks, WAP gateways, computer networks, and web application servers, occur within each other (Darrell B., 2008). The WAP is supported by some new mobile phones in the market these days and the implementation of the WAP technology makes it possible to deliver web applications over the wireless telephone network.

2.2.1 Web and WAP Definition

Web application is a computer programming system created by Donald Knuth as the first implementation of what he called literate programming: the idea that one could create software as works of literature, by embedding source code inside descriptive text, rather than the reverse.

WAP is defined by International Engineering Consortium as an application environment and set of communication protocols for wireless devices to communicate with each other and with any external application. In other words, WAP technology can be defined as an open international standard for application layer network communications for different communication fields, it's aim is to provide and support the users with internet access from a mobile phone or PDA (WAP, 2008).

2.2.2 Web -WA Architecture

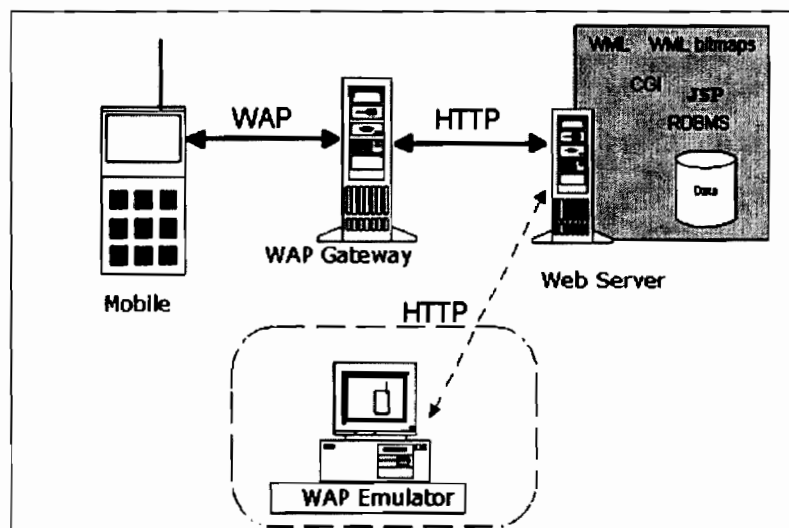


Figure 2.1: WAP Forum, (2002)

Figure 2.1 shows the WAP architecture for Hajj system. The client initiates service request (Hajj activity) using client software called WAP browser. The WAP browser communicates with the WAP Gateway Server. The function of the WAP gateway is to route requests from the WAP client to a web server (Raffaele, 2005); (Yiwei, 2006).

WAP gateway translates WML, Java script code (WAP request). The server accepts the request, then searches information and builds a dynamic page. Finally, the server responds by sending a template Information Systems through Wireless means (Mesh Networks, 2006). If there are any references included within the document, the WAP browser will request these from the servers on which they are located. Finally, the WAP browser will display all of the information on the screen.

The administrator (admin), on the other hand, is connected via web browser instead of WAP browser. Because the administrator application is built on JSP code, the System will instantaneously update the database enabling the admin to add, delete, edit and view the information.

2.3 Mobile Guide Services

One example of mobile guide services is Guidebooks Services (Figure 2.2), which provides interested users using mobile devices to enquire or search for the various information that the Guidebooks provide. The two quintessential tourist publications are the guidebook and the map by the Organization for the Advancement of Structured Information Standards (OASIS, 2004). These are often used in combination when tourists navigate and find out about what to do in different places and how to get

between them. While guidebooks have been given some attention in guide studies, they have generally been seen as texts by critiques. There is little discussion of how guidebooks have become incorporated into activity (IBM, 2006).



Figure 2.2: Guidebooks Services

Guidebooks provide the tourists with the appropriate guide services by reducing their uncertainty. However, this information needs interpretation guidebooks to be 'put in place'. Furthermore, a guidebook has to be combined with other information, in particular information on maps, or advice from locals, to be usable (Matthias, 2005). Frequently, tourists hold a map and a guidebook, and use these in combination. Guidebooks are also collaborative artifacts; conversation would take place around the guidebook with tourists pointing at the guidebook, and then pointing either at a map or in a direction, so as to link together the establishments being discussed with their position. Guidebooks thus need to be converted from general prose to activity (Andrews, 2003).

2.4 Related Works on Mobile Guide Application

Barbara, (1999), Dunham (1995) and Imielinski & Badrinath (1994), presented the usefulness of mobile device which is rapidly growing and expanding day after day.

The study by Koichi & Yahiko (2003), and Bhattacharyya (1997), presents the mobile transportation service to determine the users' location during their transport by using some function to calculate the user destination and mapping to the current user location. This function is very useful for visually or aurally handicapped passengers because the guide information is given by visual or voice messages in the public transport and these passengers cannot use some of them (Goto, & Kambayashi, 2002).

The study by Cheverst (2000), determines the inadequacies faced by the tourists during their travel. The study presents a mobile terminal application to provide passengers and tourists with concrete travel plan and tickets. The mobile terminal gets several information such as the current location of the passenger, operation schedule of vehicles, information about the facilities of stations and so on. During the travel, the mobile terminal checks the travel plan and offers the passenger appropriate guidance (Cheverst, 2000).

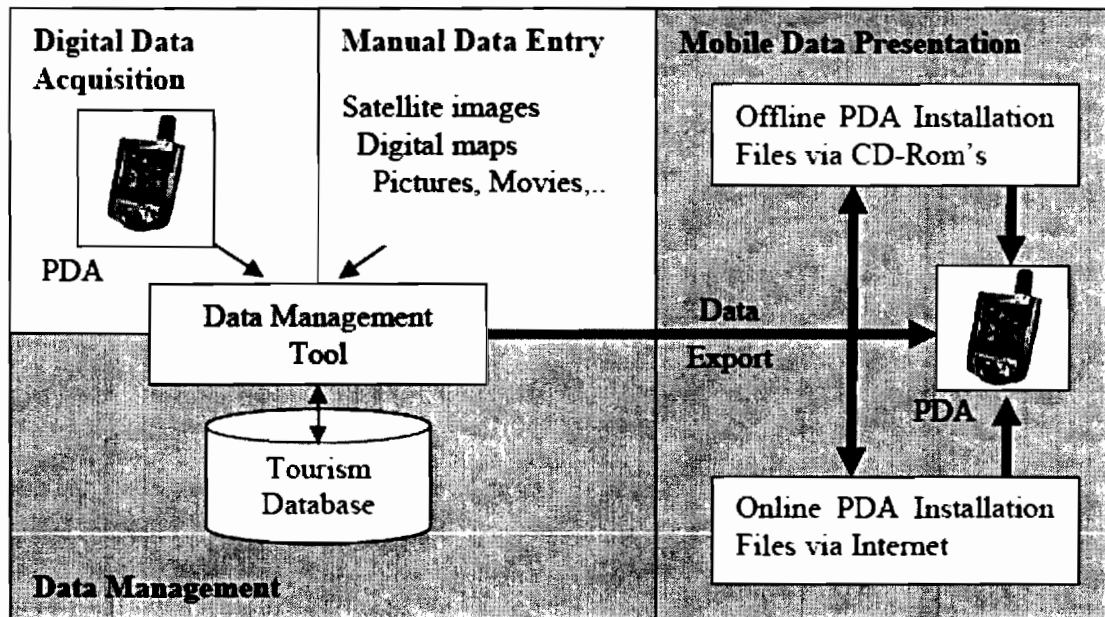


Figure 2.3: Mobile Tourist Guide Information

Mobile tour guides are the result of years of research in the areas of recommenders, ambient intelligence and pervasive computing. Cyber guide (Abowd, 1997) was one of the first mobile tour guides. Personal preferences are not analysed to compute a tour plan but the user can retrieve information or request a route to a desired Point of Interest (PoI). GUIDE is a mobile tour guide very similar to the hereby presented Dynamic Tour Guide (DTG) (Kramer, 2005); (Cheverst, 2000).

The visitor chooses attractions from various categories. These attractions are then sequenced taking into account the opening hours, best time to visit and the distance between attractions. The sequence can be modified manually. Navigation is achieved by a map with a list of instructions. Differences to the DTG are the use of cell-based positioning instead of GPS and the selection of concrete sights instead of deriving the selection from generic preferences.

The Crumpet project (Schmidt B., 2003) is one of the few projects that has performed a usability evaluation for its personalized, location-aware multi-agent system, which recommends tourist attractions and provides interactive maps and directions to find a selected sight. Users have to complete several tasks observed by a research assistant.



Figure 2.4: Mobile Information System

The majority recognized the system as added value to conventional information sources. Examples for user studies on spatial behavior without human observation are the path analysis of shoppers in a supermarket with RFID tags located on their shopping carts and an analysis of visited locations within a city via GPS (Ashbrook et al. (2003); (Larson et al., 2005).

The study by Svanas D. (2001), states that the variety of mobile devices is growing and the users expect to be able to use the same or the same kind of services on the different devices. The study also provides the methods to locate the user location; however these technical and service infrastructure may differ and they may even change (Lieslehto, K., 2000).

According to Davies et al. (1998), these methods can give the facilities to the users from the point of view of the service; the simplest method of locating the user is to let him/her identify the location. From the point of view of the user, this method requires extra effort because the user needs to define his/ her location and input it to the system as a part of the search.

2.4.1 Mobile Application for Tourist Guides

Mobile guide services for tourists not only solve the current tourist problems during their trips, but also enable them to request about the place information (maps, restaurants, shops, hotels, etc) (Jenny, 2008). This study produced the Mobiguide, Udiovisual Tour Guides and Mobitalk, all of which could help the tourist to get the appropriate information by providing these services with flexible communication and content management technology (Imulienski, T., & Badrinath, B., 2001). This study provided the visitors information about landmark areas in Australia to support those visitors with the appropriate mobile guide services. Moreover, these devices provided the tourists with simple and easy guides with useful details about that place (Landmarks) as well as other relevant details in their own language.

According to Francica J. (2001), and the World Wide Web Consortium (2002), the content of the audio-visual guides is delivered via cell phones or other media players in three languages: English, German, and French.

According to Jenny (2008), future plans include Portuguese, Spanish, Italian, Japanese, Zulu, Sotho and Xhosa. "Foreign visitors spent R18bn in the first quarter of 2007, with

the leading attractions being shopping, nightlife, socialising, scenic attractions and beaches, in that order of preference, with cultural, historic and heritage sights at the bottom of the list”.

Tourist always change their destination from time to time. Their changing needs can be determined through Mobiguide (Kray, C., Baus, J., 2003). It gives tourists access to historical information with exciting footage in a language they know; at the same time promoting the heritage. These services also give quick and convenient details about the areas tourists are visiting. This company suggested that Mobiguide will never replace conventional tourist guides (Bisdikian, 2001).

2.4.2 Mobile Guide for Rural Communities

The study by Alexander (2008) presented a prototype of the Mobile Tourism Information System which was developed for a Pocket PC in connection with a GPS device. Pocket PC's are high performance mobile multimedia computers with high resolution colour displays and have the operating system “Microsoft Pocket PC 200x”. According to Raggam (1999), the memory card was used to expand the internal memory of the Pocket PC (Schmuller, J., 2002).

The mobile technology highlighted the way for those who interact with mobile devices to optimise their requirements. This first prototype is realised as fully offline mobile solution, only the GPS functionality can be permanently available (Kees, 2000).

According to Kees (2000), many generations of the mobile showed the ability of these hand-held devices to provide the efficiency in order to obtain the presentation of outdoor activities (e.g. hiking and biking tours, etc.), on the basis of satellite images and digital maps. All pieces of information about the tours, region, impressions, and infrastructure and information points are shown in a multimedia presentation (video, audio, animation, text, images) and are linked to the user's current position (Hofmann, 1997); (Fritsch, 2001). Currently, the prototype offers the following information levels and functionalities:

- General Information and impressions about the regions' multimedia representation.
- Infrastructure database with detailed infrastructure information, thematic and geographic search functionalities for hotels, restaurants, leisure time institutions, etc.
- List of outdoor activities e.g. hiking and biking tours with detailed information related to the tours like co-ordination, descriptions, audio and movie objects, etc.
- 2D visualisation of the different spatial information using satellite images and common maps with the possibility of interactive navigation and zoom.
- 3D image map for each tour to get an impression of the third dimension, which is important information for e.g. bike tours.
- Interactive selection of different layers for the spatial presentation e.g. tour course, infrastructure layer for the 2D representation.
- Supporting the actual position using a GPS module and shown in the 2D map and satellite image with the selected tour.

The following application screenshot (Figure 2.5) shows the multimedia data presentation capabilities of the prototype:

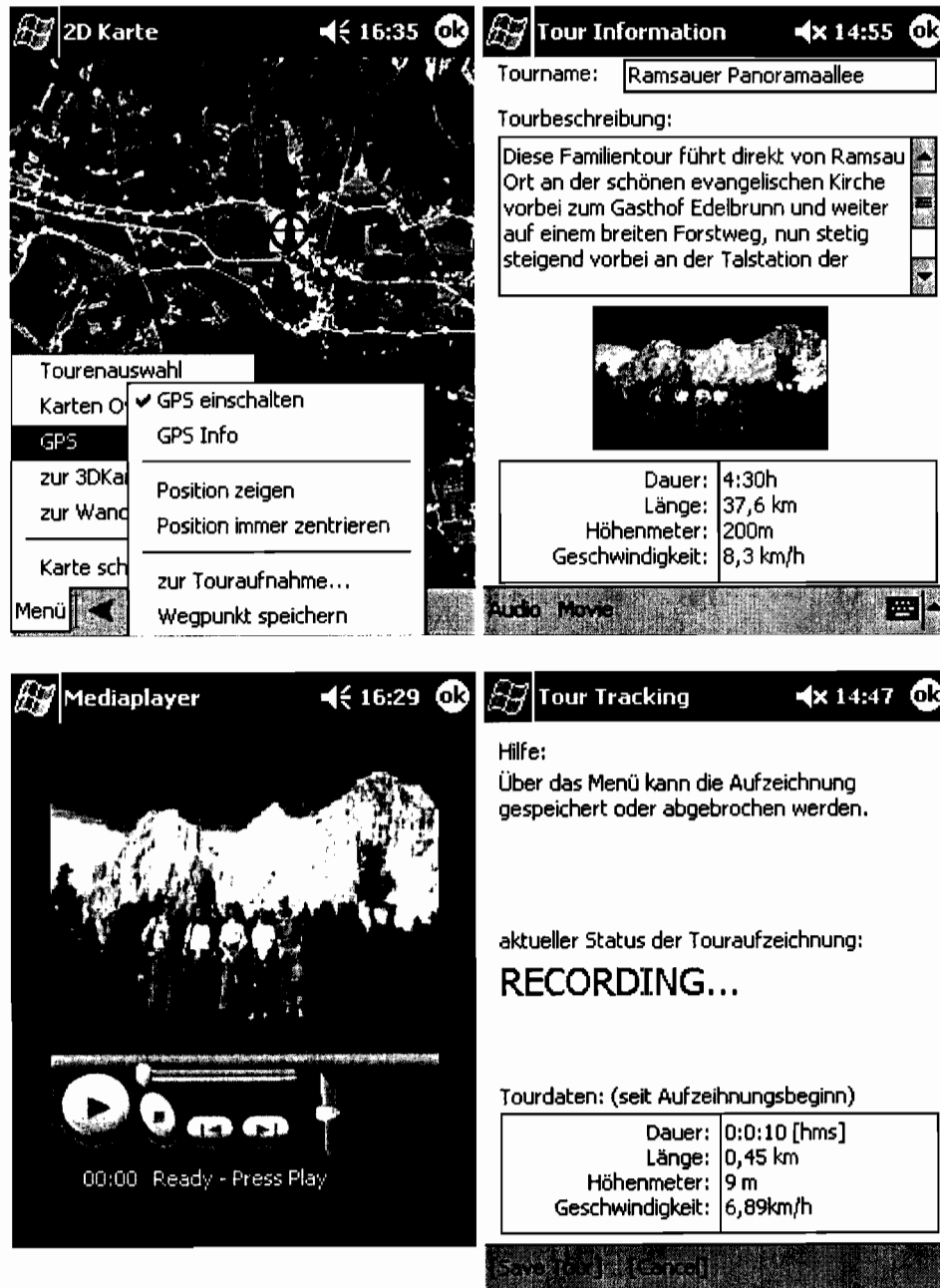


Figure 2.5: A Mobile Solution for Location Based Tourism Information in Rural Areas by Alexander, A., & Patrick, M. (2008)

2.5 Summary

In this Chapter and according to the related works on the mobile application that were explained towards the end of this Chapter, the issue of mobile technologies and its applications via the WAP technology were explained as well as the mobile guide for tourists. This review will help to reduce the gap between the Mobile Hajj Guide application and mobile tourists guide systems. More information about the methodology used is outlined in the next Chapter.

CHAPTER THREE

RESEARCH METHODOLOGY

This Chapter presents the research methodology used for the Mobile Hajj Guide for Malaysian Pilgrims application. To develop this prototype, it is necessary to identify the information requirements for pilgrims, and to understand the WAP application requirements. Hence, the methodology used to determine the system requirements, design of the requirements, building, testing and evaluating the system is discussed in this Chapter.

3.1 Spiral Methodology

The spiral methodology is used in this project because it reflects the relationship of tasks with rapid prototyping, increased parallelism, and concurrency in designing and building activities. The spiral method should be planned methodically, with tasks and deliverables identified for each step in the spiral. As shown in Figure 3.1, the selected methodology has four stages (understanding the requirements, designing the system, building stage, as well as testing and evaluating).

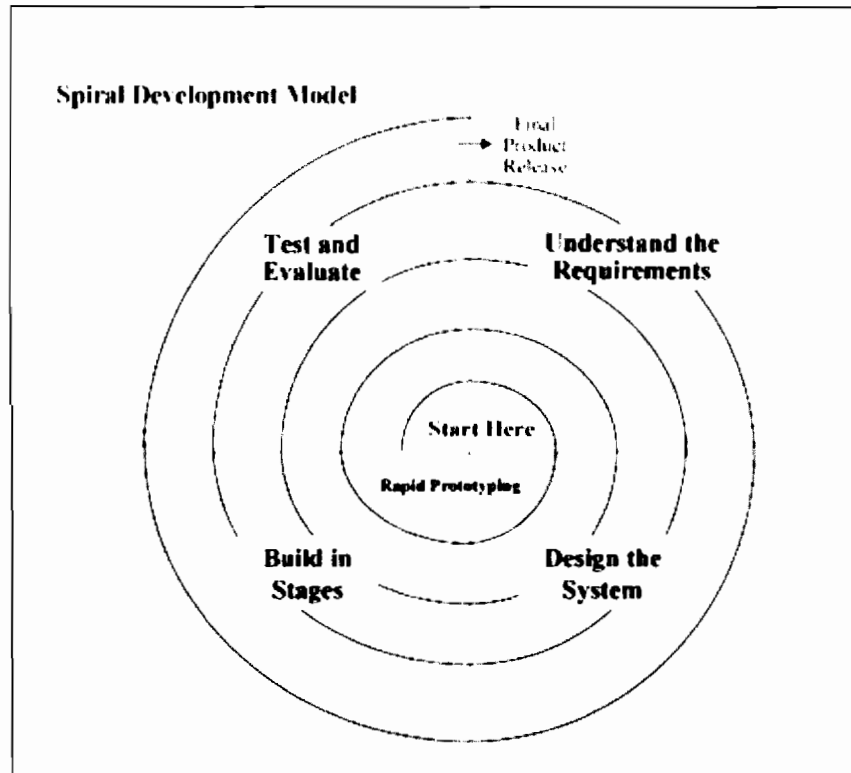


Figure 3.1: Spiral Development Model by Barry, B. (2000)

3.1.1 Understanding the Requirements

This phase is about determining the target system to understand the WAP requirements. This phase requires understanding the purpose of the system, and how that purpose has changed over its lifetime. A complete understanding of the Mobile Hajj Guide for Malaysian Pilgrims in the future is required as well. This understanding should include both technical details and information regarding the users and others affected by any potential changes. The final result from this phase are the WAP system requirements and analysing these requirements.

The interview is the most commonly used information-gathering technique. In general, interviews are conducted on a one-to-one basis. But sometimes, owing to time constraints, several people are interviewed at the same time (Rubin, 2004). There are five basic steps to the interview process:

1. Selecting interviewees

This step presents the way to select the interviewees for Mobile Hajj System for requirement gathering. Selecting the interviewees was based on user satisfaction with the Mobile Hajj System.

2. Designing interview questions

This step presents the final design for the interviewees' questions about their opinions on Mobile Hajj System.

3. Preparing for the interview

This step presents the preparation for the interview with different users; the preparation was based on five users.

4. Conducting the interview

This phase presents the way to conduct the interview about Mobile Hajj System. During this step, the researcher identified the system requirements.

5. Follow- up

Finally, the system requirements for using Mobile Hajj System were determined based on the previous steps.

The interviewees comprised different Malaysians. The questions focused on the problems in the current system, and what their opinions about the proposed Mobile Hajj Guide for Malaysian Pilgrims system were.

3.1.2 Designing the System

In this phase, the researcher identified the proposed mobile pilgrims system and designs that would be suitable for Malaysian pilgrims depending on the requirement processes and the components of the system. Moreover, the design stage takes as its initial input, the requirements identified in the approved requirements document.

In the case of this study, object oriented approach is implemented in the system's requirement design. During the design phase, UML is introduced. The UML diagrams involved general use cases such as (a) use case diagrams: this diagram is used to show the system components and the user retaliations (b) use case specification: this diagram is used to give details about the use cases that were introduced in the previous step (c) sequence diagram: this diagram is used to show how the system works based on the use case diagram (d) collaboration diagram: this diagram is used to illustrate the main components of the sequence diagram and the relation between them. All of these diagrams were produced by Rational Rose 2000. These diagrams are presented in Chapter Four.

3.1.3 Building Stage

In this phase, the researcher evaluated the proposed pilgrims WAP application and iterated the steps to arrive at the final pilgrims WAP application requirement, and then constructed the final system. In the development or building step, all requirements and suggestions from end users which are needed to fulfill this study were identified. Subsequently, the idea of implementing Mobile Hajj Guide for Malaysian Pilgrims was

developed. The system is completely developed by using the Wireless Markup Language (WML) and Java script (Schmuller, J., 2002). SQL server database Engine is used to build the database relations between the tables. The study also provides the Web-base developed in JSP language to manage the Hajj information.

3.1.4 Testing and Evaluating

In this phase, the WAP application for Malaysian pilgrims was evaluated and tested. This phase ensures that the whole set of project (system) works together. This project was tested by end-users using real data over an extended time of period. It is the final test before the system is taken over by the end user. Finally, users provided their feedback via pilgrims WAP questionnaire. Questionnaires have advantages over some other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardised answers that make it simple to compile data.

All data that was gathered from questionnaires was analyzed by using the Statistical Package for the Social Sciences (SPSS) program. Data analysis was carried out in the form of descriptive statistics.

3.2 Summary

The research methodology above was carefully chosen in order to develop the proposed Mobile Hajj System. Additionally, Spiral Methodology was used based on WAP technology. All Spiral Methodology phases were discussed. In the next Chapter, the findings of the proposed system are discussed.

CHAPTER FOUR

ANALYSIS AND DESIGN

In the previous Chapter, the methodology applied in this study was discussed. This methodology or spiral methodology is considered as an application development methodology which consists of four parts, i.e. understanding the requirements, designing the requirements, building stage, as well as testing and evaluation. In this Chapter, the middle phase which is analysis and design phase is elaborated in more detail.

4.1 Understanding the Requirements

The understanding of the requirements process takes as its input the goals identified in the high-level requirements section of the project plan. Each goal is refined into a set of one or more requirements (Bahrami, A., 1999). These requirements define the major functions of the intended application, define operational data and reference data areas, and define the initial data entities (Bennett, S., et al., 2002); (Bennett, S., et al., 2005). Major functions include critical processes to be managed, as well as mission critical inputs. For this study, the requirements gathering was conducted through interviews with a few pilgrims in different places in Malaysia.

All the requirements for the Mobile Hajj Guide were thoroughly studied so as to make sure that the system meets the needs of the end user. The eventual aim of this phase is to identify what users would require from the Mobile Hajj Guide for Malaysian Pilgrims. Basically, analysing the system involved two major activities, i.e. requirements determination and then structuring the determined requirements. The interviews done (questions asked) with pilgrims is as in Appendix A. The Table 4.1 below illustrates the answers of five pilgrims:

Table 4.1: Interview Answers

No	user 1	user 2	user 3	user 4	user 5	Percentage (%)
1.	Male	Male	Male	Female	Female	Males (60%) Females (40%)
2.	35-44	44-54	35-44	18-25	18-25	35-44 (40%) 44-45 (20%) 18-25 (40%)
3.	Malay	Malay	Arab	Malay	Malay	Malay (80%) Arab (10%)
4.	Master	PhD	Master	PhD	Master	Master (60%) PhD (40%)
5.	One	One	More than two	One	Two	One (60%) Two (20%) More (20%)
6.	Through regular scheme under Tabung Haji	Through package scheme under Tabung Haji	By myself	Through package scheme under Tabung Haji	Through package scheme under Tabung Haji	Package (60%) Regular (20%) Myself (20%)
7.	Place and religious duty	Place and religious duty	I know the place but I still have some problem sometimes	Place and religious duty	Place and religious duty	Place and religious duty (80%) Others (20%)
8.	Ask people , Pamphlet	Pamphlet, Website	Ask people	Pamphlet, Website	Pamphlet, Website	Ask (40%) Website (60%)

No	user 1	user 2	user 3	user 4	user 5	Percentage (%)
9.	Information not clear and its huge number	Not friendly	I don't go there	Huge number	Need to search by your self	Not clear (20%) Not friendly (20%) Huge Number (20%) Search (20%) Others (20%)
10.	Simple information for place and religious duty	General information	Simple information for place and religious duty	About place	Simple information for place and religious duty	Simple Info (60%) General Info (20%) About Place (20%)
11.	Multimedia	Multimedia	Multimedia	Free and easy	Text and direct information	Multimedia (60%) Free and easy (20%) Others (20%)
12.	Mobile application	Mobile application	Mobile application	Mobile application	Mobile application	Mobile application (100%)

As shown in the above Table 4.1, the users agree that it is not easy to deal with huge numbers of Hajjaj (pilgrims) and problems are faced in getting information when they are in Mecca. Hence, the high consensus for using the mobile application to get the Hajj information supported and motivated the design and building of the Mobile Hajj Guide for Malaysian Pilgrims.

4.1.1 System Requirement Results

A) Functional Requirements

The main functional requirements of the Mobile Hajj Guide for Malaysian Pilgrims that were carried out are:

- 1) Mobile Hajj Guide for Malaysian Pilgrims provides the pilgrims with the registration process in order to get their username and password for this service.

- 2) The proposed system allows all the users and administrators to login by using their username and password.
- 3) The proposed Mobile Hajj System provides pilgrims with the search tool where users can enter words to find certain information about the Hajj such as places, duties, and other related information.
- 4) The proposed Mobile Hajj System enables the administrator to manage the Hajj information by post and update the Hajj information.

B) Non-Functional Requirements

Non-functional requirements describe all aspects in an optional way. Furthermore, the proposed system determines some of these requirements that help the system to achieve its goals clearly and rapidly.

- Usability:

- 1) The system should be easy to use by the pilgrims.
- 2) The system should be simple for the user during the Hajj. The proposed system must provide pilgrims with useful information about the Hajj such as places, duties, and other related information.
- 3) The system should have user-friendly functions that can enable users to practice their activities using their respective accounts.

- Performance:

- 1) The system should respond in optimal time, without any delay or non-consistency in database.

- 2) The system should present the error messages to the users to notify him or her about any inadequacies in the system during their usage.
- 3) The system should notify the administrator about the system's shortcomings and the system's performance by generating these errors and coming out with useful suggestions.

- Reliability:

- 1) The proposed Mobile Hajj System should not generate errors during usage by pilgrims.

- Privacy:

- 1) Information in this system is confidential; only approved administrators can access this information; the privacy of such information is an important factor in the process.

- Completeness:

- 1) The system should be compatible with current systems implemented in the Hajj places.

- Safety and Security:

- 1) The system should prevent illegal access to the database, while maintaining a high level of flexibility.

- 2) The system should reject any person whose ID is not identical to the one which is stored in the database.

4.2 Designing the Requirements

The following phase in spiral methodology involves the process of designing the system, which in this study, is the Mobile Hajj Guide. During this phase, the descriptions from the requirements stage in the previous phase were converted into logical and physical specifications. All necessary documents were produced in this phase to guide the coding process during this phase. Unified Modeling Language (UML) is introduced in this Chapter, such as sequence diagram, collaboration diagram, etc.

4.2.1 Use Case Diagram

The use case diagram of the Mobile Hajj Guide for Malaysian Pilgrims (Figure 4.1) identifies the user of the system (pilgrims and administrators). There are four functions that are provided for the user such as registration, login, search topic, and view Hajj information. The registration process supports users to register for this service by providing them with username and password for the login. The search process is also provided to the users to view their request topics. The Mobile Hajj System allows users to view different information based on their choice such as places, duties and dates. The administrator is considered as the Hajj information provider, and manages the Hajj information after successfully logging-in to his or her page.

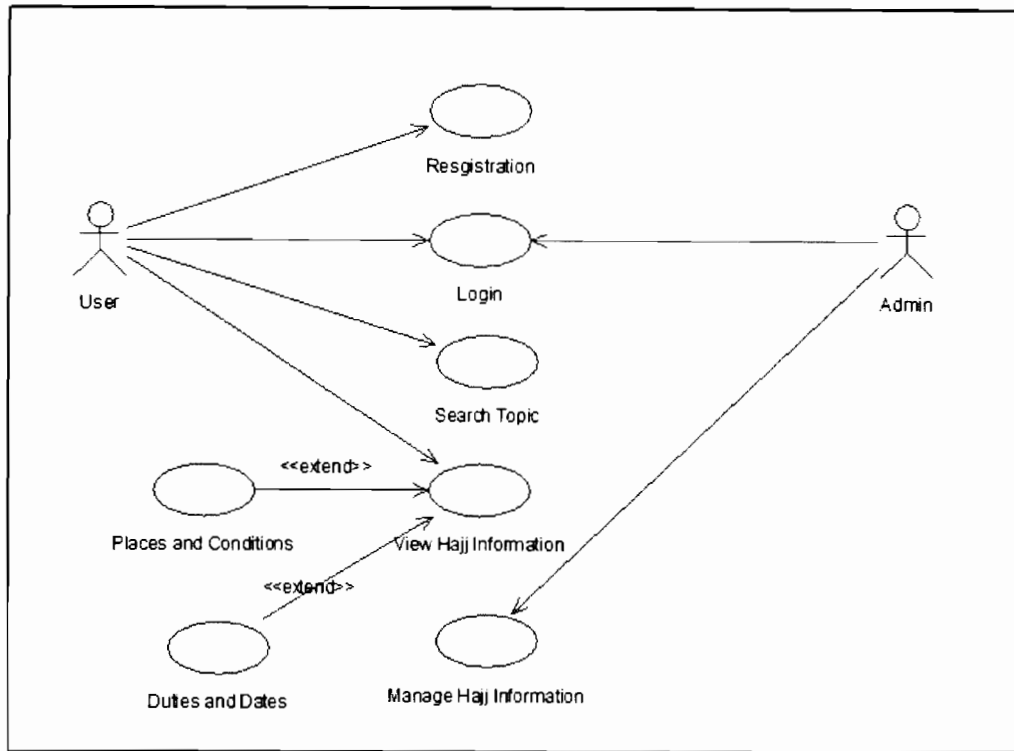
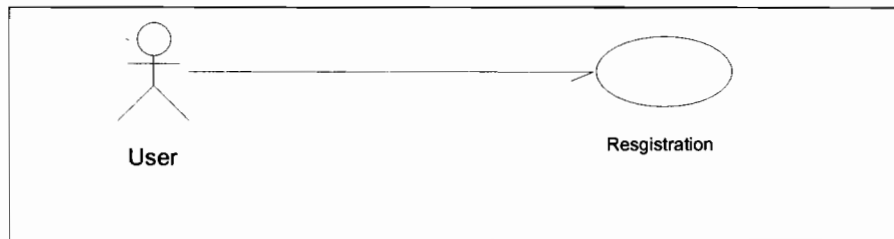


Figure 4.1: Use Case Diagram for Mobile Hajj Guide for Malaysian Pilgrims

4.2.2 Use Case Specification

The study provides detailed specifications or use case specification for each use case. These specifications can help document the specific attributes of the use case, such as the use case name, description, pre-condition, post-condition, exception, and stereotype. The use case specification is used to set the use case elements in order to specify its details. Each use case in the model is given a unique name. The use case should be named from the perspective of the user, as the use cases will help determine the project scope. The use case name should also be independent of implementation.

4.2.2.1 USE CASE: REGISTRATION



1.1 BRIEF DESCRIPTION

This use case initiates the new users as members to the system.

1.2 PRE-CONDITIONS

- Fill the registration form fields requirements
- Press submit

1.3 BASIC FLOW

The flow of this step includes:-

- The user is required to press the registration button
- After the system responds to his or her order, the system will view the registration form for registration
- The new user must fill all the registration fields
- After the user finishes filling his or her registration information that the system requires, he or she can press the register button to add.

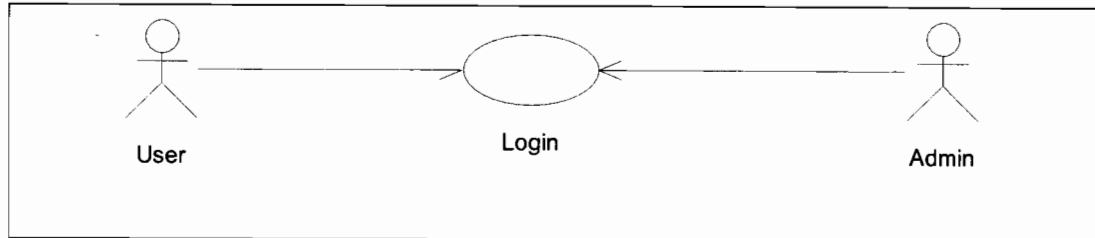
1.4 POST-CONDITIONS

- Registration successful

1.5 EXCEPTIONAL FLOW

- Wrong information provided

4.2.2.2 Use Case: Login



1.1 BRIEF DESCRIPTION

This use case initiates the administrator and user to access his or her page respectively.

1.2 PRE-CONDITIONS

The administrator and the user must login to his or her account by using the login username and password

1.3 BASIC FLOW

- The administrator and the user must insert his or her username and password
- Both of them need to confirm the login process by pressing the login button
- The system will respond to his or her order by verifying the login information
- The system will send them to their pages

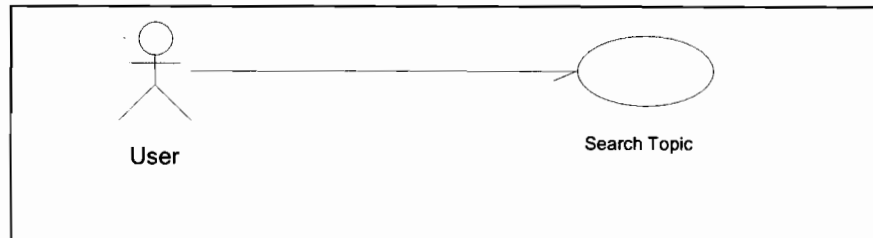
1.4 POST-CONDITIONS

View user page

1.5 EXCEPTIONAL FLOW

- Wrong username and password
- Fill fields required

4.2.2.3 Use Case: Search Topic



1.1 BRIEF DESCRIPTION

This use case initiates the user to do the search process about Hajj information.

1.2 PRE-CONDITIONS

- The user needs to login by using his or her username and password to the system
- User needs to fill the search field to get the search result
- Press the search button

1.3 BASIC FLOW

- The user selects the search option
- The system will show the search page
- User needs to insert the words that are required to get the result using this function
- User needs to press the search button, to make the system respond to his or her order

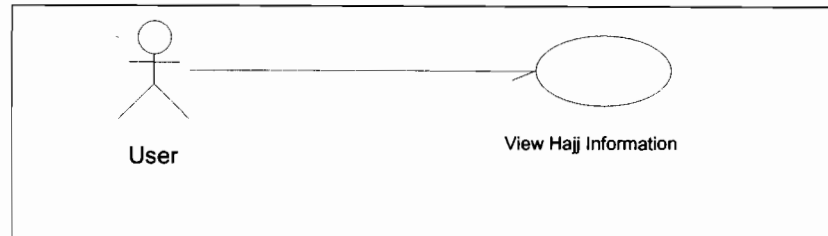
1.4 POST-CONDITIONS

- View search result

1.5 EXCEPTIONAL FLOW

- Search does not match

4.2.2.4 Use Case: View Hajj Information



1.1 BRIEF DESCRIPTION

This use case initiates the user to view his or her Hajj enquires after successfully logging-in.

1.2 PRE-CONDITIONS

- The user needs to login by using his or her username and password to the system
- User needs to select topic

1.3 BASIC FLOW

- The user selects the view Hajj information choice
- The system will show the Hajj information topics page
- User can select topic to view

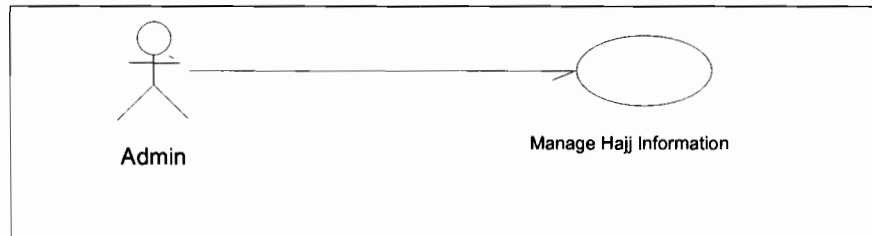
1.4 POST-CONDITIONS

- View Hajj information

1.5 EXCEPTIONAL FLOW

- None

4.2.2.5 Use Case Manage Hajj information



1.1 BRIEF DESCRIPTION

This use case initiates the administrator for adding and editing the Hajj information.

1.2 PRE-CONDITIONS

- The administrator needs to login to the system by using his or her username and password
- The administrator must fill the manage Hajj information field

1.3 BASIC FLOW

- The administrator can add new Hajj information topics to the system by selecting the add/edit topic button
- The system will respond to his or her order and will show the add/edit Hajj information field
- The administrator can fill the Hajj information and press the add/edit button

1.4 POST-CONDITIONS

- Add successful
- Edit successful

1.5 EXCEPTIONAL FLOW

- Complete fields required

4.3 Sequence Diagram

According to (Eriksson, H., & Penker, M. (1998)); (Hoffer, J., et al., 1999); (Hoffer, J., et al., 2002), the sequence diagram is a UML diagram that shows the processes that are executed in sequence. The diagram also shows the sequence of messages, which are exchanged among roles that implement the behaviour of the system (Jacobson, I., 2004). Arranged in time, it shows the flow of control across many objects that collaborate in the context of a scenario (Silva, P., 2008).

The sequence diagram captures the behaviour of single use case by showing the messages passed between those objects of the case and describes the sequence of operations in that use case.

4.3.1 Registration Sequence Diagram

Figure 4.2 illustrates the sequence diagram for the registration process. This process provides users with the login information after successful registration.

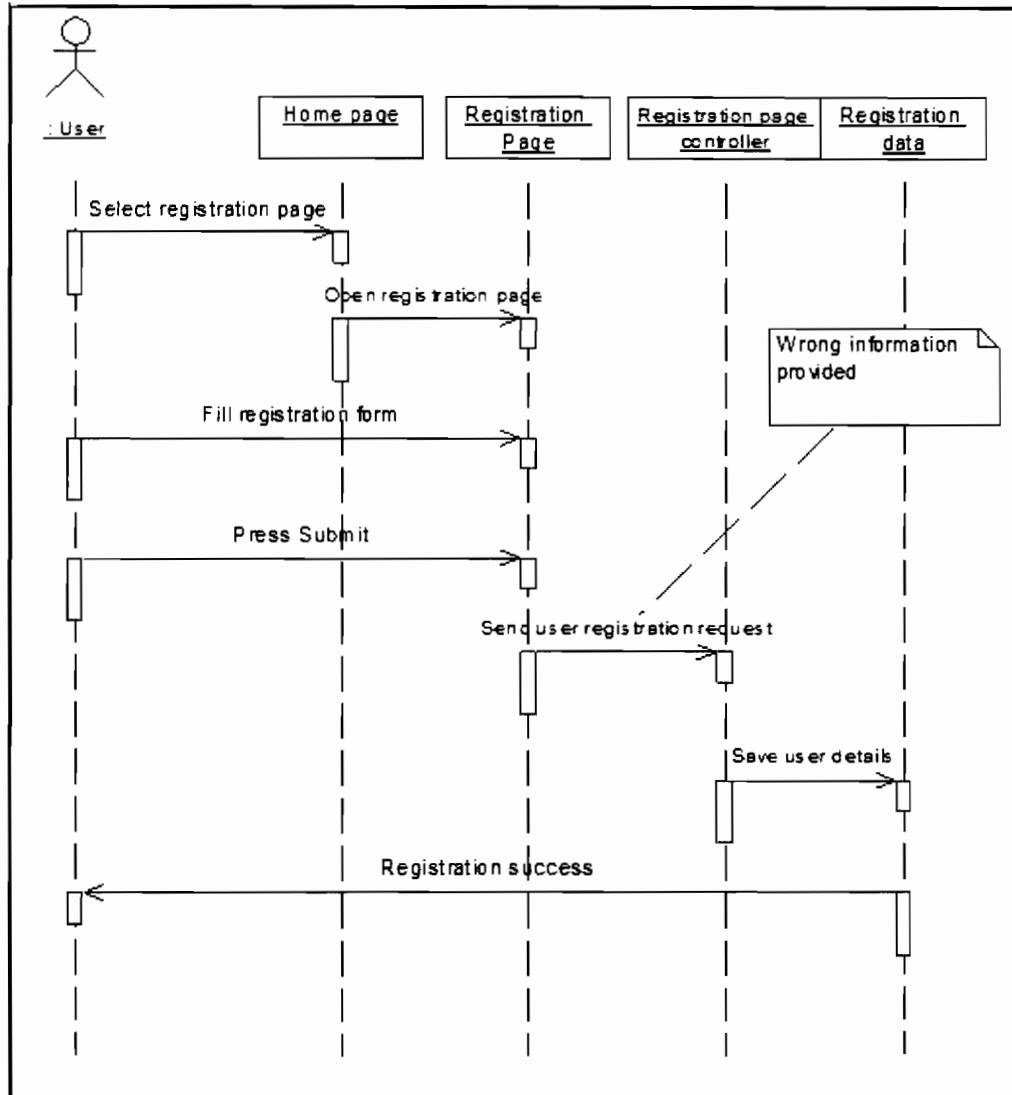


Figure 4.2: Registration Sequence Diagram

Figure 4.3 shows the collaborative diagram for the registration use case, which is created based on the registration sequence diagram.

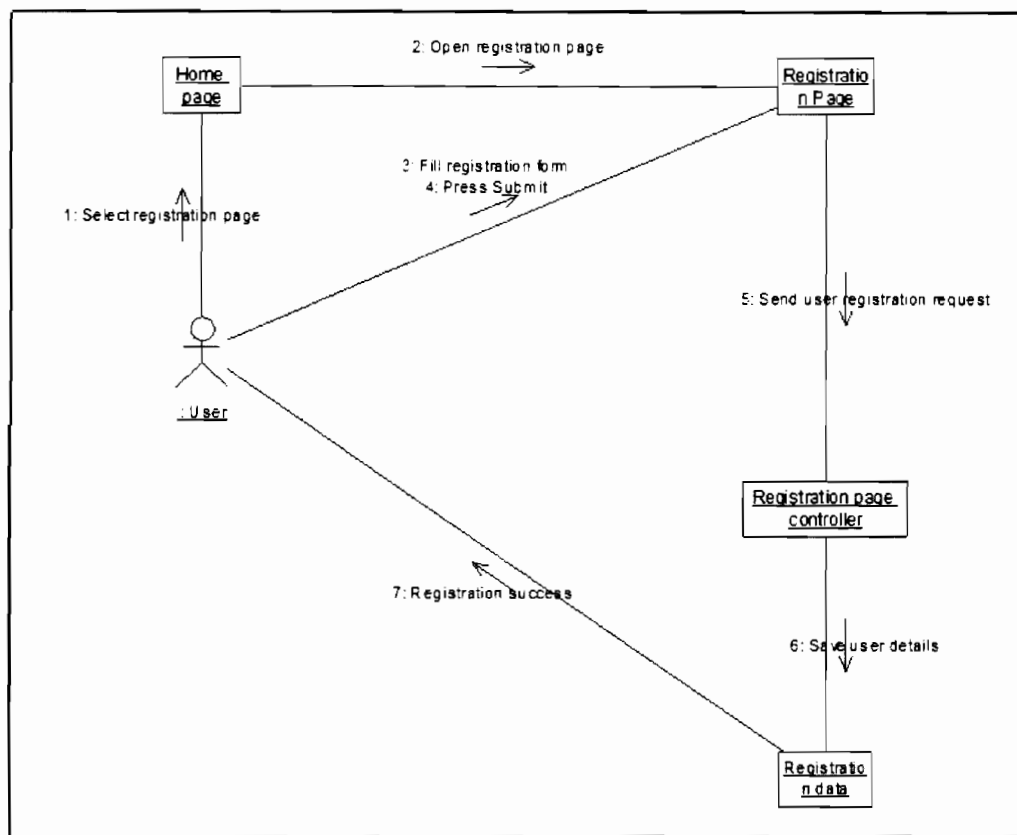


Figure 4.3: Registration Collaboration Diagram

4.3.2 Login Sequence Diagram

Figure 4.4 illustrates the sequence diagram for the login process. This process allows users to access their WAP page by using their username and password.

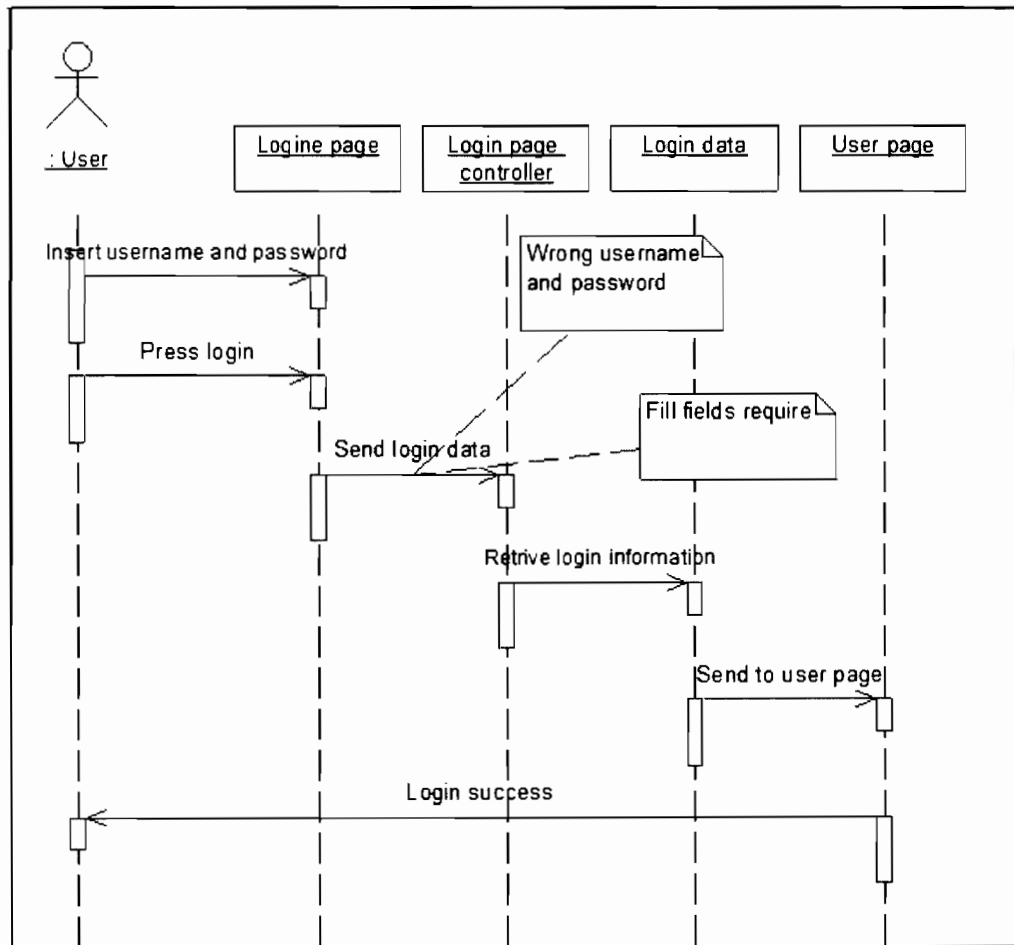


Figure 4.4: Login Sequence Diagram

Figure 4.5 shows the collaborative diagram for the login use case, which is created based on the login sequence diagram.

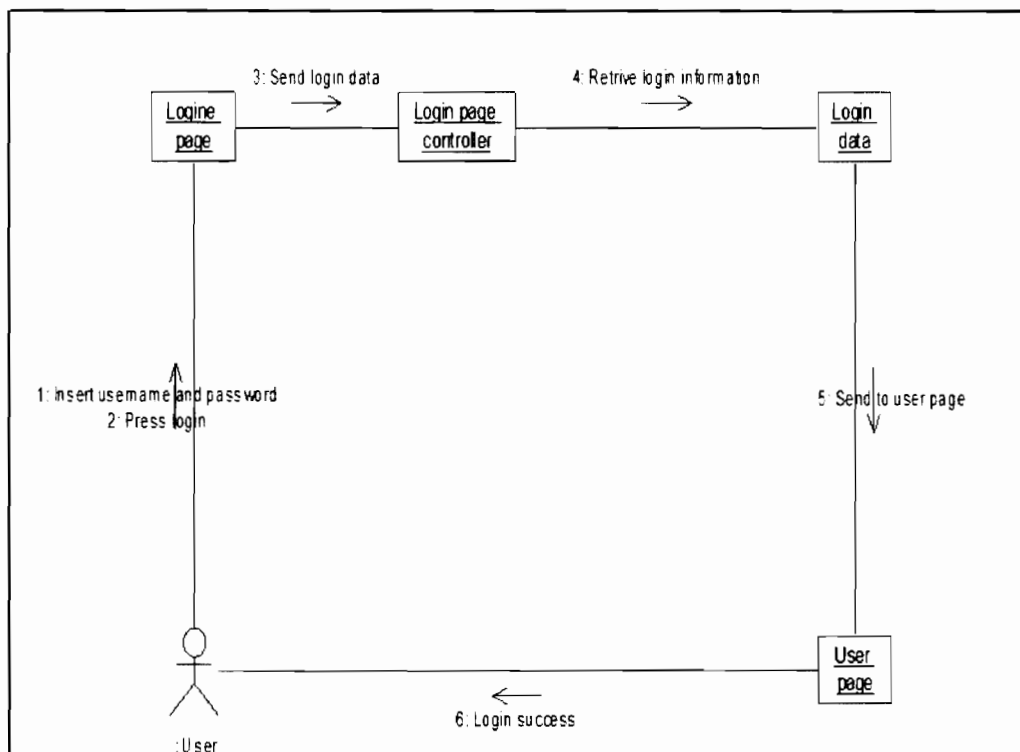


Figure 4.5: Login Collaboration Diagram

4.3.3 Search Topic Sequence Diagram

Figure 4.6 illustrates the sequence diagram for the search topic process. This process allows users to search the required information through the search request.

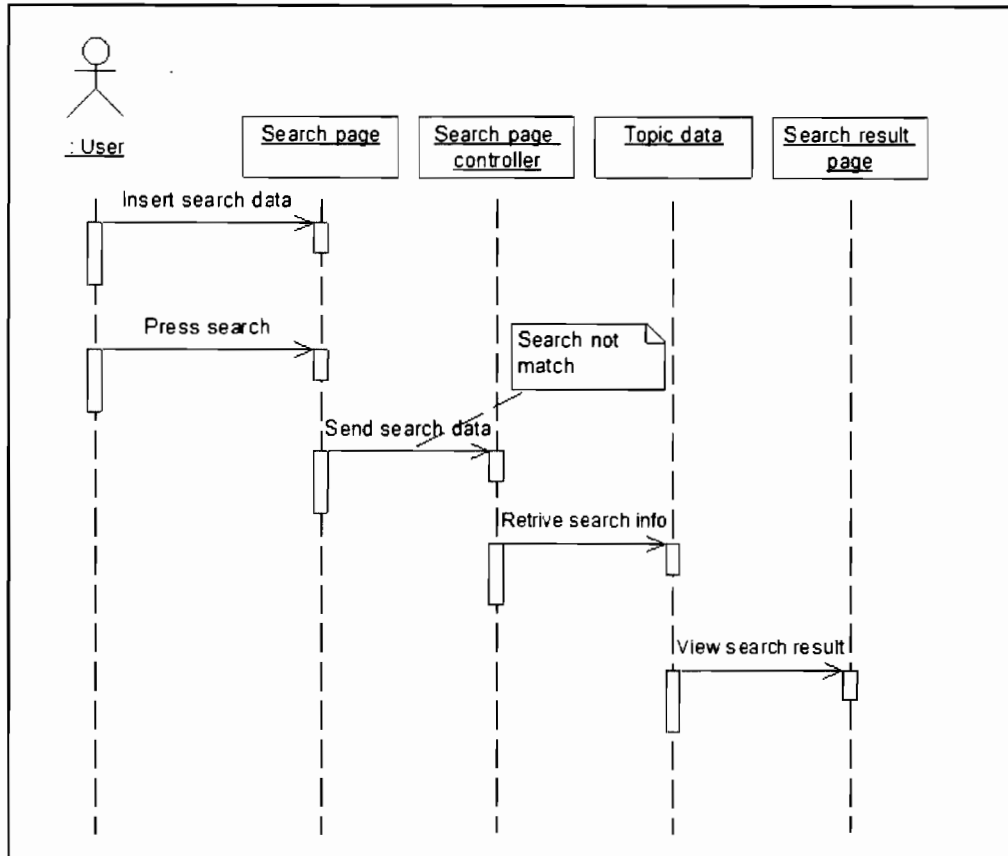


Figure 4.6: Search Topic Sequence Diagram

Figure 4.7 shows the collaborative diagram for the search topic use case, which is created based on the search topic sequence diagram.

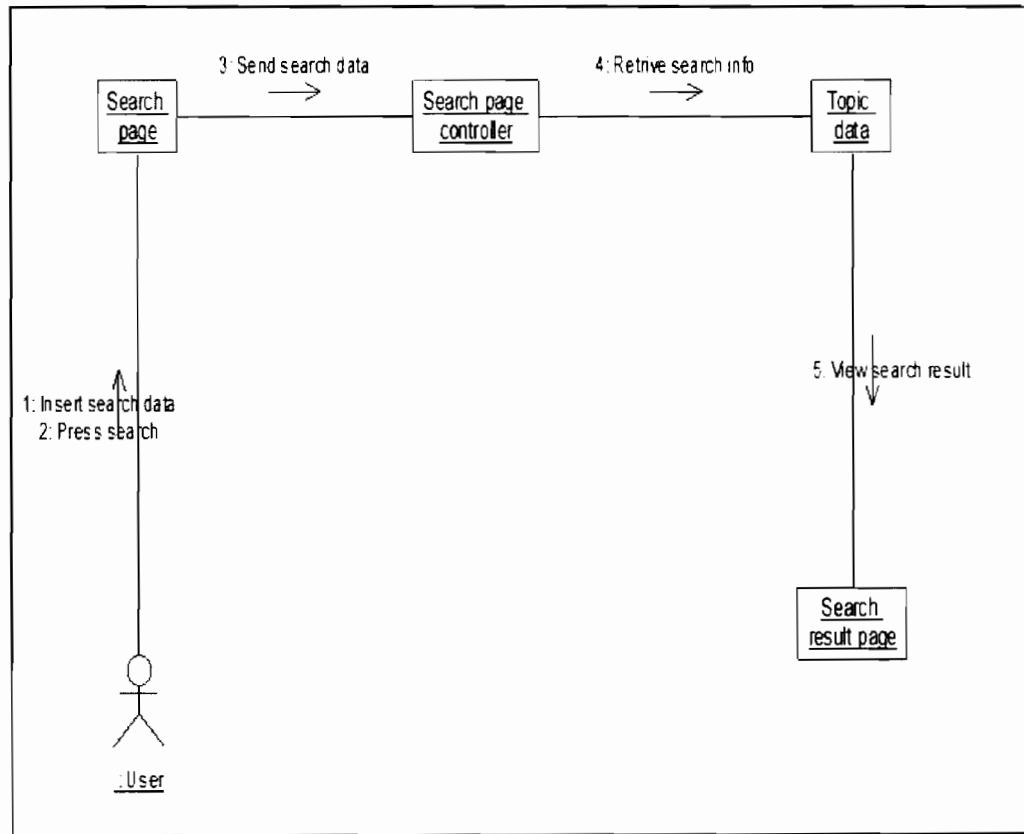


Figure 4.7: Search Topic Collaboration Diagram

4.3.4 View Hajj Information Sequence Diagram

Figure 4.8 illustrates the sequence diagram for the view Hajj information process. This process allows users to view the Hajj information such as places, duties, and dates.

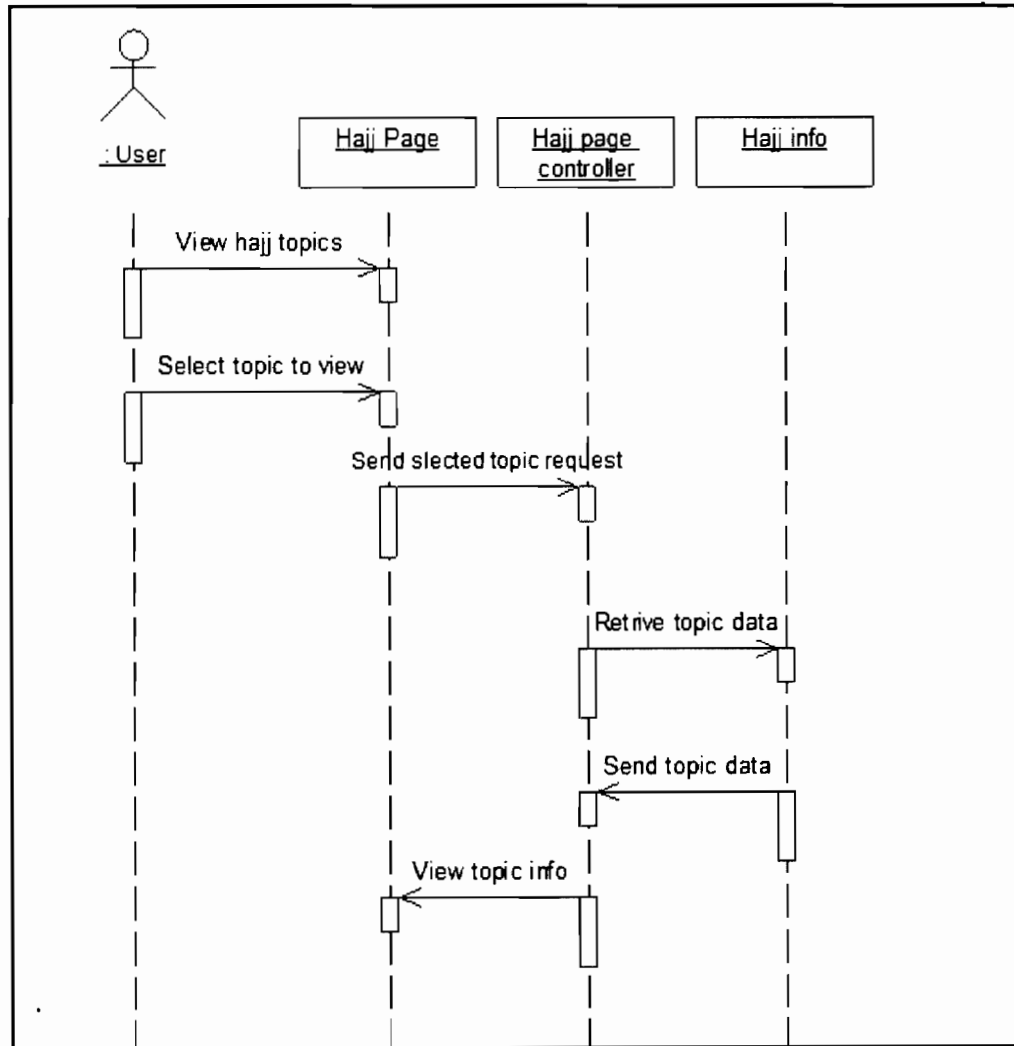


Figure 4.8: View Hajj Information Sequence Diagram

Figure 4.9 shows the collaborative diagram for the view Hajj information use case, which is created based on the view Hajj information sequence diagram.

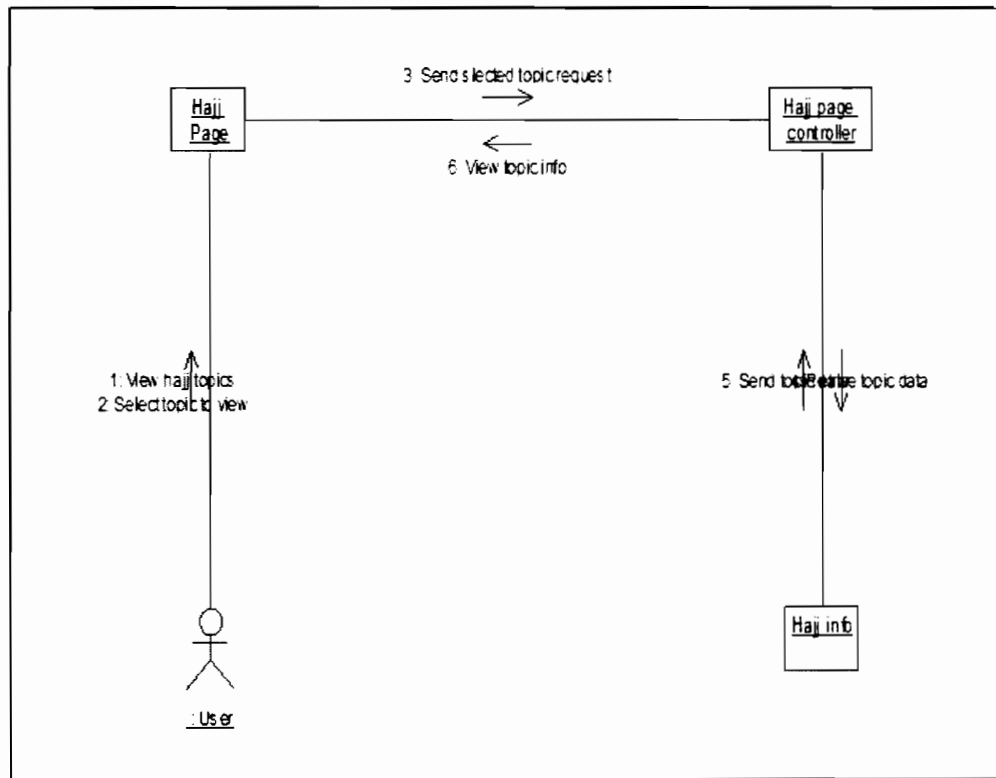


Figure 4.9: View Hajj Information Collaboration Diagram

4.3.5 Manage Hajj Information Sequence Diagram

Figure 4.10 illustrates the sequence diagram for the manage Hajj information. This process allows the administrator to manage the Hajj information by adding, updating and deleting Hajj information.

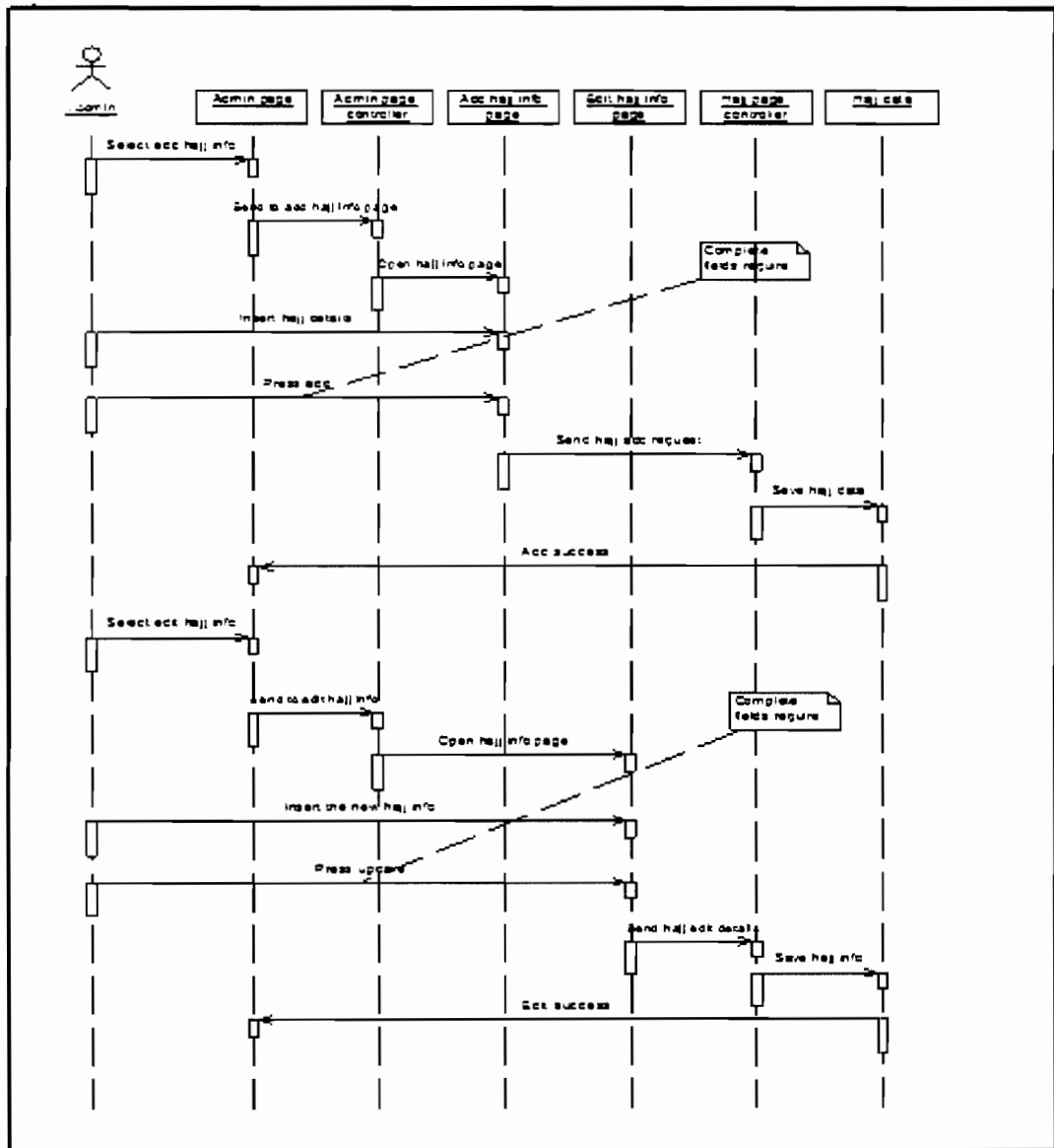


Figure 4.10: Manage Hajj Information Sequence Diagram

Figure 4.11 shows the collaborative diagram for the manage Hajj information which is created based on the manage Hajj information sequence diagram.

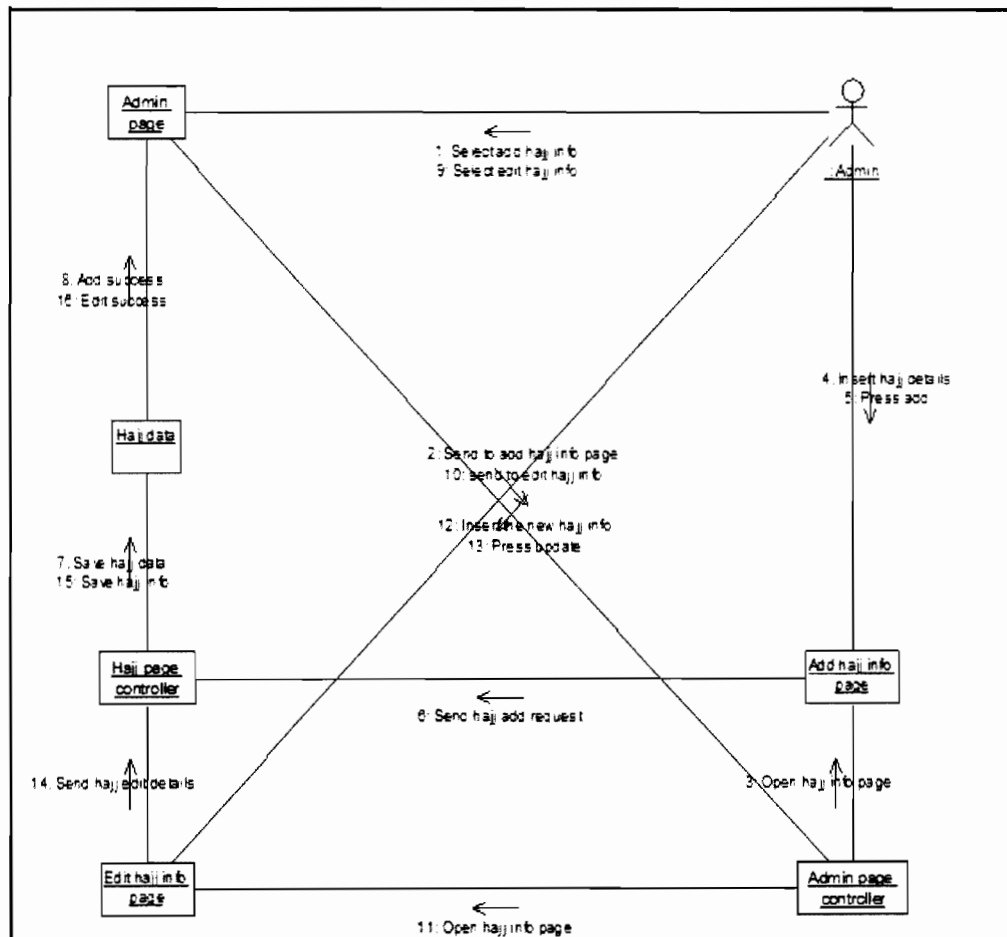


Figure 4.11: Manage Hajj Information Collaboration Diagram

4.4 Building Stage

4.4.1 Wireless Markup Language (WML)

WML is a markup language which is specially designed for specifying and displaying content on WAP devices. It is similar to the use of HTML in developing webpage except that it is purposely created for implementation of web-like application in wireless devices.

4.4.2 Java Server Pages (JSP)

JSP technology is an excellent architecture for delivering Web applications, but one of its most important facilities, custom tag libraries, is often poorly leveraged. The primary reason for the failure to properly exploit the tag library facility is not technological, but linguistic. JSP expert and consultant, Noel J. Bergman, exposes the nature of the problem and offers some workable solutions.

In most large development projects, programmers implement the back end, and presentation is left to one or more Web page designers. This breakdown ensures a final product that is both technologically solid and well-presented, but it does require the two teams to communicate and work together effectively. This can be a challenge, given that each team is working from a different knowledge base and attending to a very different set of concerns.

4.5 Interface Design

4.5.1 Pilgrims' Registration

Figure 4.12 shows the registration page for the pilgrims. The pilgrims must fill their personal information in order for them to be verified by the administrator.


Mobile Hajj Guide for Malaysian Pilgrims																			
Home About Us Admin Registration																			
	<table border="1"><tr><td>First Name</td><td><input type="text"/></td></tr><tr><td>Last Name</td><td><input type="text"/></td></tr><tr><td>Gender</td><td><input checked="" type="radio"/> Male <input type="radio"/> Female</td></tr><tr><td>Country</td><td><input type="text"/></td></tr><tr><td>Birth Date</td><td>1 <input type="text"/> 1 <input type="text"/></td></tr><tr><td>Mobile</td><td><input type="text"/></td></tr><tr><td>Email</td><td><input type="text"/></td></tr><tr><td>User Name</td><td><input type="text"/></td></tr><tr><td>Password</td><td><input type="text"/></td></tr></table>	First Name	<input type="text"/>	Last Name	<input type="text"/>	Gender	<input checked="" type="radio"/> Male <input type="radio"/> Female	Country	<input type="text"/>	Birth Date	1 <input type="text"/> 1 <input type="text"/>	Mobile	<input type="text"/>	Email	<input type="text"/>	User Name	<input type="text"/>	Password	<input type="text"/>
First Name	<input type="text"/>																		
Last Name	<input type="text"/>																		
Gender	<input checked="" type="radio"/> Male <input type="radio"/> Female																		
Country	<input type="text"/>																		
Birth Date	1 <input type="text"/> 1 <input type="text"/>																		
Mobile	<input type="text"/>																		
Email	<input type="text"/>																		
User Name	<input type="text"/>																		
Password	<input type="text"/>																		
<p>Links</p> <p>Haji Information</p> <p>Haji Committee</p>	<p><input type="button" value="Submit"/> <input type="button" value="Reset"/></p>																		

Figure 4.12: Pilgrims' Registration Page

4.5.2 Pilgrims' Main Page

Figure 4.13 shows the pilgrims' main page after successful registration. The main functionalities that appear here are places, duties, and searching.



Figure 4.13: Pilgrims' Main Page

4.5.3 Admin / Manage Places Information Page

Figure 4.14 shows the manage places information page which is initiated by the administrator. The manage places page concentrates on adding, updating and deleting. The administrator is required to insert the place name and its description.

Mobile Hajj Guide for Malaysian Pilgrims

Home | ADD | UPDATE | DELETE | VIEW | LOGOUT

Places

Place Name

Description

Links

[Hajj Information](#)

[Hajj Committee](#)

Submit Reset

Figure 4.14: Pilgrims' View Places Information Page

4.5.4 View Places information Page

Figure 4.15 shows the view places information page for the pilgrims. The pilgrims must select the place name to retrieve its description.

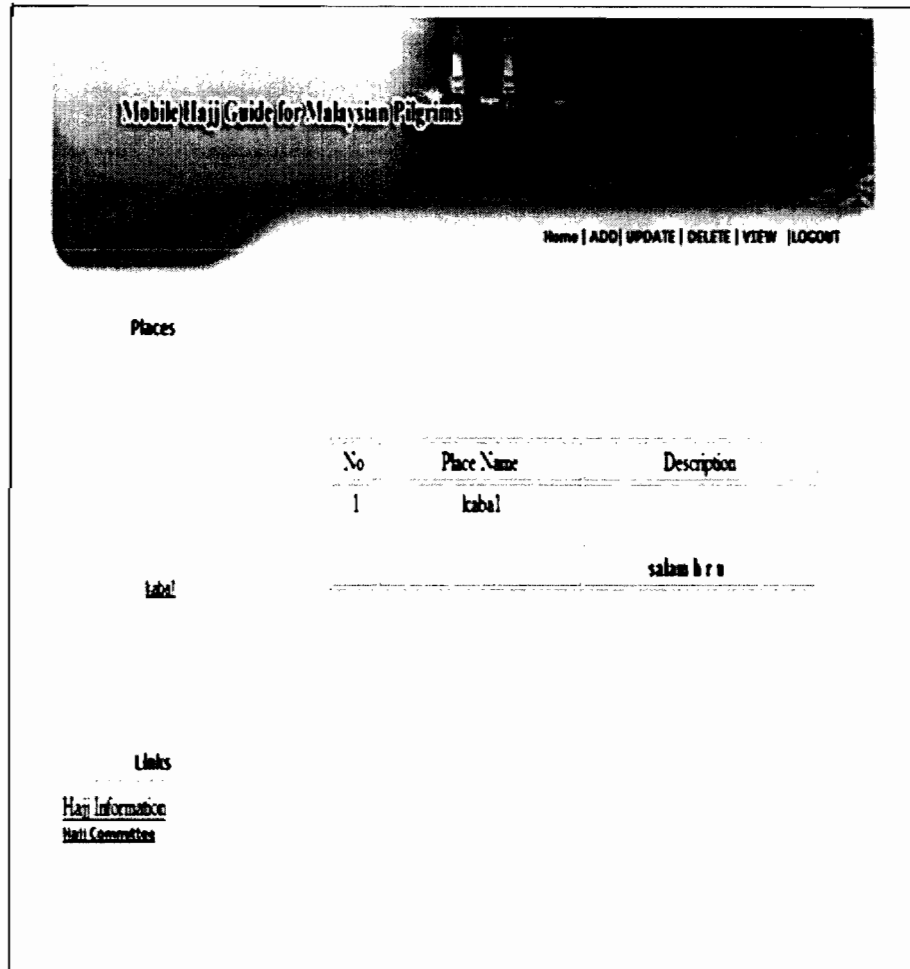


Figure 4.15: View Places Description Page

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This Chapter discusses the results of the evaluation of the system. The proposed system was tested by running the system on Internet explorer with local host server. The user evaluation of the prototype was conducted on 40 users from different Hajj offices and other Malaysian pilgrims who presented the (N) value during the evaluation process; each of them was given a brief explanation regarding the usage and the user interface of the proposed Mobile Hajj Guide for Malaysian Pilgrims.

The Statistical Package for Social Sciences (SPSS) version 16 was used to perform descriptive statistical analysis for the collected data. The SPSS was also used to determine the frequencies of each question.

5.1 Evaluation Results

Table 5.1 illustrates the descriptive statistics for all the questions. Most of the items with high number and percentage for 'very good', indicate that all of the participants agreed

on these items which meant that they agreed that the Mobile Hajj Guide for Malaysian pilgrims has good usability. (Refer to the Appendix A for the frequency analysis and the histogram). Many usability problems resemble issues identified during the early stage of WAP development. However, good user interface design can alleviate some of the usability problems for users. Drawing from their experience in developing WAP access to an information system for WAP application, Colafigi et al. (2001) illustrate the usefulness of using this method that presents several design guidelines for WAP application, including (a) use short links (b) include backward navigation (c) minimise the level of menu hierarchy (d) include headlines for each page.

Table 5.1: Descriptive Statistics for Usefulness

	N	Minimum	Maximum	Mode	Std. Deviation
Q1 The information provided for the WAP application form is easy to understand.	40	2	5	3.75	1.500
Q2 Most of the Hajj information and other services provided are simple and easy to follow.	40	3	5	4.00	.816
Q3 It is easy to find the information which I need about Hajj and related Hajj information.	40	4	5	4.75	.500
Q4 I would find it easy to use this mobile Hajj application to get what I want.	40	3	5	4.50	1.000
Q5 Mobile Hajj Guide for Malaysian pilgrims' application can be considered as user friendly.	40	2	5	3.75	1.500
Q6 The application has the ability to give the appropriate features that satisfy my requirements.	40	3	5	3.75	.957
Q7 Mobile Hajj Guide for Malaysian pilgrims' application gives me brief and simple information about the different Hajj places and duties that I have to follow during Hajj.	40	4	4	3.00	.816
Q8 However, the Mobile Hajj Guide for Malaysian pilgrims' application is useful to guide me to the useful services.	40	5	4	4.25	.500
Valid N (listwise)	40				

The Table above presents the consensus of the respondents during the evaluation of the Mobile Hajj Guide System. The information provided for the WAP application form is

easy to understand (Q1) has a mean =3.75 and STD = 1.500. Q2 - most of the Hajj information and other services provided is simple and easy to follow has mean = 4.00 and STD =.816. The high agreement of the usefulness has a mean = 4.75 and STD =.500. Q3 results in mean = 4.50 and STD =1.000. Q 5 regarding the Mobile Hajj Guide for Malaysian Pilgrims application being considered user friendly has a mean = 3.75 and STD =1.500. Q6 regarding the agreement that the application has the ability to give the appropriate features that satisfy user requirements has a mean =3.75 and STD =.957. The following question on Mobile Hajj Guide for Malaysian pilgrims' application gives me brief and simple information about the different Hajj places and duties that I have to follow during Hajj, presents a mean = 3.00 and STD = 816. The Mobile Hajj Guide for Malaysian pilgrims' application is useful to guide me to the useful services (Q8), has a mean = 4.25 and STD =.500.

The results were obtained from 40 respondents. These results were in reference to the survey on Using the Mobile Hajj Guide for Malaysian pilgrims can make it easier to find the information needed about Hajj and related Hajj information).

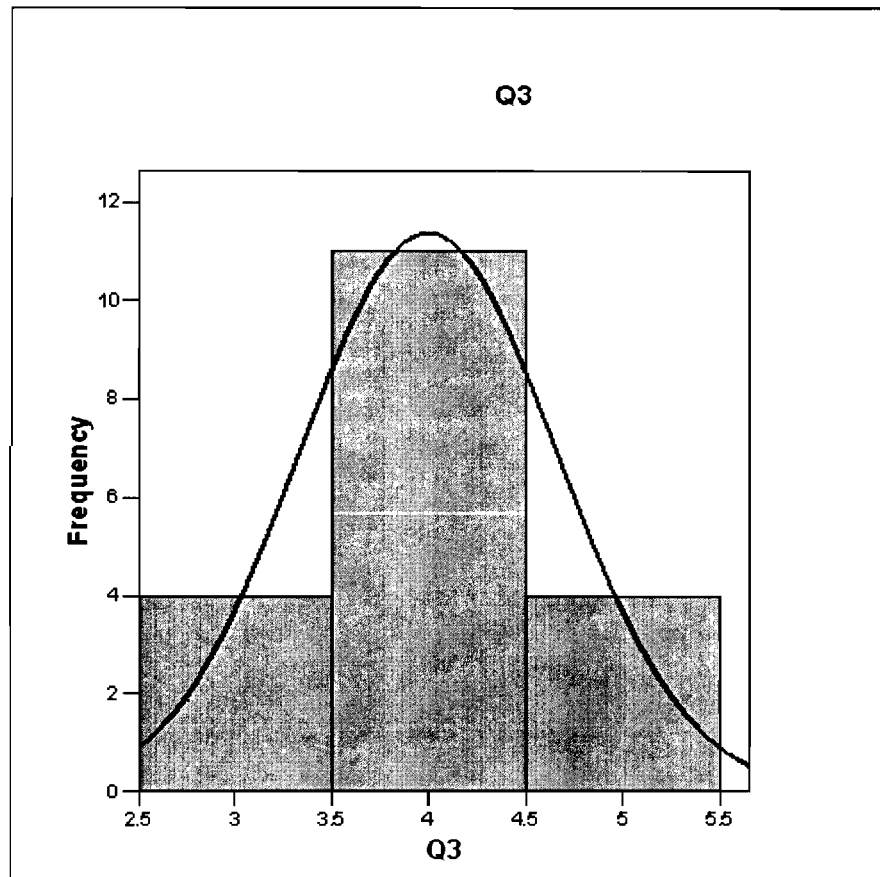


Figure 1.1: Descriptive Statistics for Usefulness Graph

According to the histogram above, (Using the Mobile Hajj Guide for Malaysian pilgrims), the mean = 4.75(95%). There is highest agreement on the Guide being easier for pilgrims to find the information needed about Hajj and related Hajj information totaling 95%.

5.2 Conclusion

Evaluation takes focus on the development process and can uncover usability deficits early during the design. In future works, more usability tests for the redesign application with real pilgrims should be conducted. Interviews with pilgrims and evaluation to reach more people helped to shape the application and better meet the users' opinion, requirements and expectations. The overall results were encouraging but improvement is definitely needed.

CHAPTER SIX

CONCLUSION

6.1 Introduction

This Chapter introduces the conclusion of the study. The execution of this project was motivated by the intention to provide more flexible and enhanced method of gathering information among the local community. Although the application of mobile technology is not that popular in the society, it is believed that users will turn to using these devices and its application. This Chapter introduces the discussion of the study, limitation of the study, as well as recommendations and conclusion.

6.2 Discussion

6.2.1 Research Objective

The main objective is to develop a Web/ WAP application for supporting Malaysian pilgrims with the appropriate information required. In developing the system, a set of design principles that focused on functionalities and interface of the system were used.

Based on these design principles and requirement, a prototype of the system called Mobile Hajj Guide for Malaysian Pilgrims was developed using JSP language for

designing the administrator Web page, WML, and Java Script for WAP application. The system has several advantages as follows:

- For security purpose, only the system administrator and the staff can use the system for managing the pilgrims' information.
- The system is user friendly, in a sense that the user can easily understand the system although the user is a first time user. This is because the design is simple, attractive and does not have too many graphical items.
- The system requires information similar to the manual forms.

6.3 Limitation of Study

Some limitations were encountered in this study, which must be overcome to enhance the performance of the Mobile Hajj Guide for Malaysian Pilgrims as follows:

- This project focuses only on the Web/WAP application part under the Mobile Hajj Guide for Malaysian Pilgrims.
- The system has limited functionality due to time limitation such as inability to provide time for pilgrims to do online search, inability to provide pilgrims with the enquiry service in case of any question, and not being uploaded in the internet.

6.4 Recommendation

For future work, some enhancement can be done to improve this system, including:

- Providing other services based on the multimedia tools for interactive user interfaces and ease of use.

- The Mobile Hajj System was developed and tested on Mobile open wave 0.7, therefore some of the test and illustration may be inconsistent on other mobile versions, such as open wave 0.6 version, open wave explorer, etc. There is a need to identify the system requirements.
- The system should be able to integrate different functions for more performance.

6.5 Conclusion

It is believed that the development of the Mobile Hajj Guide for Malaysian Pilgrims is going to give a new dimension of information gathering especially in the field of information society for multi-users in different places. Among others, it will help the pilgrims to get their information that they enquired about; furthermore, the study introduced different kinds of services to help and guide those pilgrims through the integration of WAP technology. It is hoped that this project will be part of a more promising growth of information technology in Malaysia.

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APENDIX (A)

INTERVIEW

MOBILE HAJJ SYSTEM INTERVIEW

- How the Malaysian pilgrims enquire about the hajj information?
- In your opinion, what are the other requirements which need to provide for Malaysian pilgrims?
- Do you think the current system able to provide the huge number of the Malaysian pilgrims with their questions about hajj?
- Currently do you provide any method or any facility to help the Malaysian pilgrims to guide them?
- Do you think the current pilgrims information system need to modify or enhance?
- Do you think the Mobile Hajj Guide for Malaysian Pilgrims can help to simplify the pilgrim's requests process?

APPENDIX (B)
QUESTIONNAIRE



Mobile Hajj Guide for Malaysian Pilgrims

This study aims to build an application for the Malaysian pilgrims, to provide them with the appropriate pilgrims information services.

One of a Muslim's duties, as described in the Five Pillars of Islam, is to go on Hajj at least once during his or her lifetime. This is a pilgrimage to Makkah (Mecca) in Saudi Arabia. According to Bookwork, Norwich (1999), approximately two million Muslims went in 1999, of which about one million were from Saudi Arabia (Islamic Wills, 2004). Every year the number of Hajjaj (pilgrims) going from Malaysia also increases without regard of the economical or political factors. According to Islamic Wills (2004), around more than 20 thousands Malaysian went to do hajj since 2008, either through Tabung Haji or through other packages.

- To identify the requirements for Mobile hajj Guide for Malaysian pilgrims.
- To develop prototype mobile hajj Guide for Malaysian pilgrims.
- To evaluate the usability of the Mobile hajj Guide for Malaysian pilgrims.

Thank you for your time cooperation.

Sincerely

Abd alma kal
Master of ICT
Graduate Department of Computer Science
College of Arts and Science
University Utara Malaysia

Section (A)

Please put (v) your answers to the given statements.

- What is your Gender?

Male

Female

- What is your Age?

18-25 Years old

26-34 Years old

35-44 Years old

45-54 Years old

Above 55 Years old

- What is your Race?

Malay

Indian

Other

- Marital Status

Married

Single

Section (B) Usability of Mobile hajj Guide for Malaysian pilgrims

Please circle on the appropriate answer.

This section contains eight questions to assess hajj guide application usability.

Strongly Disagree Disagree Neutral Agree Strongly Agree

1 2 3 4 5

Statements					
(1) The information provided for the WAP application form is easy to understand.	1	2	3	4	5
(2) Most of the hajj information and other services provided simple and easy to follow.	1	2	3	4	5
(3) It is easy to find the information which I needed about hajj and related hajj information.	1	2	3	4	5
(4) I would find it easy to use this mobile hajj application to get what I want.	1	2	3	4	5
(5) Mobile hajj Guide for Malaysian pilgrims application consider as user friendly.	1	2	3	4	5
(6) The application has the ability to give the appropriate features that satisfy with my requirements.	1	2	3	4	5
(7) Mobile hajj Guide for Malaysian pilgrim's application give me brief and simple information about the different hajj places and duties that I have to follow during hajj.	1	2	3	4	5
(8) However, the Mobile hajj Guide for Malaysian pilgrims application useful to guide me to the useful services.	1	2	3	4	5

THANKS