Faculty of Computer Science & Information Technology
University of Malaya

UNIVERSITY OF MALAYA ONLINE VEHICLE MANAGEMENT SYSTEM(OVMS)

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ABSTRACT

With the established of Internet technology, any computer can be linked from anywhere and anytime to gain the necessary information. Today, a huge numbers of the people connected to the Internet, and this inspire the creation of OVMS (Online Vehicle Management System) for University of Malaya.

The current summon and transport registration system which handle by *Pejabat Keselamatan* is done by manually and outdated in this information world. Thus, the main objectives of OVMS is to make the registration of transport easier and more convenient, to reduce administrative work for the *Pejabat Keselamatan* personnel, and to generate reports from the web-based system

Once the OVMS is developed, it is enable any authorized person to register their transport via this online system. It also ease the administrators' works in maintaining the database. This system is targeted to be as simple as possible because most of the users for this system is non-technical users.

The Waterfall Model with Prototyping methodology is chosen to develop this online system. Besides, development tools such as Active Server Pages (ASP), Microsoft Server SQL 7.0, and VB Script are used to develop the OVMS system.

ACKNOWLEDGEMENT

Many good people contributed their precious time, gave freely of their invaluable advice and in one manner or another , helped me towards the completion of this reports. So, by this opportunity, I would like to express my heartfelt gratitude to the following persons without whom this project would never have been completed.

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Then, I would like to thank En. Abdul Rashid bin Abdullah from Pejabat Keselamatan, who takes fully responsibility on the current summon and transport registration system, had consume his invaluable tim to share his information with me.

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INTRODUCTION

CHAPTER ONE : INTRODUCTION

1.1 INTRODUCTION

At University of Malaya, every student an staff is compulsory to register their vehicle in purpose to gain a pass to bring their own vehicle in the campus.

The current vehicle registration system is done by manually. Students and staffs who want to register their vehicle have to travel themselves to *Pejabat Keselamatan* to fill up the registration from and buy the sticker as a permit to bring vehicle in campus. At least an attendant must be there for checking the necessary documents. After registration, the staff of *Pejabat Keselamatan* need to retype the students' and staffs' detail into computer as a record keeping.

Besides, *Pejabat Keselamatan* also responsible in issuing summons fr those are involved in traffic offence in the campus of university. Anywhere, the records are kept by manually without systematically. It is very hard for administrators to keep track the summon and registration records and maintain the database.

The problems mentioned above motivate this project to be carried out. Now, with the help of Internet intelligence software, OVMS (Online Vehicle Management System) will provides us with the best deal. This project will be going to change the manually registration system to the

online registration system. Using an online management system will make the registration of vehicle easier and more convenient to reduce either the students or administrators works.

OVMS is a web-based system with develop a stable connection or link between the system server and the *Pejabat Keselamatan* database. A student or staff no longer need to present to the registration process. It also not to mention spending sometime filing all the necessary forms. They can be able to register their vehicle anyway is given the access authority. Hopefully, this system will bring benefits to *Pejabat Keselamatan.*

1.2 PROJECT OBJECTIVES

The objectives of developing this OVMS are as follows:

i. ***To design and develop a user-friendly website for online vehicles registration***

The design and development of a user-friendly website with attractive and interactive interfaces for online vehicle registration to ease the students or staffs to register their vehicle and get further information from *Pejabat Keselamatan.*

ii. ***To make the registration of vehicle easier and more convenient***

As with the current registration system, students or staffs of University of Malaya need to travel to *Pejabat Keselamatan* on a particular day that has

been set by *Pejabat Keselamatan* for register their vehicle. The students have to fill in a registration form and queue up for staff checking. This is very complicated and time-consuming. With the OVMS, the process of registration will be make easier and convenient to the students. It can done form the user's own faculty's computer laboratory, library. Office or actually anywhere as long as it is with the campus where provides the Internet facility.

iii. To reduce administrative work for the Pejabat Keselamatan personnel

Instead of the administrators doing the typing of data (personal and vehicle detail) into the system, the users will have input it themselves. It will be easier for both users and administrators to complete tasks. In addition, it can reduce the processing errors due to lower of human intervention because all of the information need not key in again by the administrators at *Pejabat Keselamatan.*

iv. The generate reports from the web-based system

Using the web-based system, generating of reports can be done easier and systematically. From here, the administrators of *Pejabat Keselamatan* can use the reports to do the report to do analytical and statistical calculation. Also, it is easier for them to manage the registration rules, maintain the integrity of database, manage the registration process and improve the control of registration.

1.3 PROJECT SCOPE

This is a web-based project. *Pejabat Keselamatan* that implemented OVMS enables all the administrators to keep track each student's vehicle registration and summon records through a database. Currently, this online vehicle management system would be limited and ill only cover the UM students and staffs, and the administrators of *Pejabat Keselamatan*. It is no involved any transaction of money.

This project's scope will all coves the activities for summon and vehicle registration, which *Pejabat Keselamatan* usually done by manual. There were be three main modules under this online management system. That are, the General Module, Administrator Module and User Module.

The **General Module** can be access by anybody without authority. This module provides several information about *Pejabat Keselamatan*, announcement, procedure to register a vehicle and etc.

The **Administrator Module** will only allows authorized administrators to access and maintain the database. They can keep track the student's and staff's vehicle registration and summon records.

The **User Module** consists of series of pages that can be accessed by any UM student of staff. Users can register their vehicle and view their summon records via this online management system.

1.4 EXPECTED OUTCOME

The main target of this system is become as simple as possible. This is because most of the users for this system, the UM students ad staffs, and administrators from *Pejabat Keselamatan*, are non-technical users. The system should be easy to understand and easy to use.

Once the OVMS is developed, every student or staff of University of Malaya is expected to able to register their vehicle from anywhere within the campus by using this system, as long as the computer is connected to the networked in the university.

In addition, the development of this system should also help *the Pejabat Keselamatan*'s administrators in ease their work in database maintenance, keep track the students or staffs record. Reports can be generated from a selected student, selected vehicle or selected summon, selected chassis number, and selected faculty. In addition, the total of registered vehicle ad summons record for each semester can be generated by this online management system.

There are some specification for the expected outcomes from the system after the completion of this web-based vehicle management system for University of Malaya students and staffs.

i. Only authorized users are allowed to access to the system
ii. Users are allowed to change their password

iii. The whole system is a foundation model of OVMS for future growth and implementation.

iv. The proposed of system is not expected to be a complete application rather than a basic module

v. System can perform some basic functions of OVMS reasonably and meet some criteria, such as reliable, consistent, user-friendly and open system based.

vi. The system can access easier within the UM campus

vii. Students or staffs can register their vehicle using this system and be able to view their summon record too

viii. Administrators of *Pejabat Keselamatan* can keep track the vehicle registration and summon records of each students and staff, and maintain it as well as needed

1.5 PROJECT LIMITATIONS

This project has its limitations. It will only covered the students and staffs of University of Malaya.

In addition, after online registration, the students are also required to travel themselves to *Pejabat Keselamatan* for showing the necessary documents and buying the sticker as a permit to bring vehicle in campus. This system will only helps the students in saving the time without queue up *at Pejabat Keselamatan* to get and fill up the registration form.

This system also not involved any transaction of money. The students or staffs cannot pay their summon by using this system.

1.6 PROJECT SCHEDULE

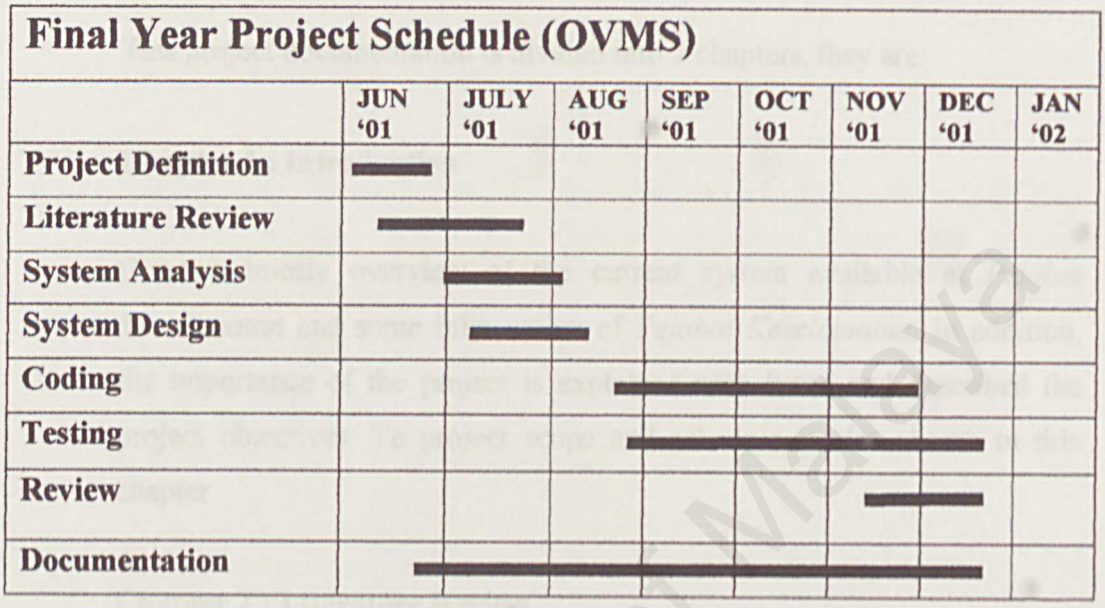

Figure 1. 1 : Final Year Project Schedule

1.7 CHAPTER SUMMARY

This project documentation is divided into 7 chapters, they are:

Chapter 1 : Introduction

Gives a briefly overview of the current system available at *Pejabat Keselamatan* and some information of *Pejabat Keselamatan*. In addition, the importance of the project is explained with listed and described the project objectives. Te project scope and schedule is also shown in this chapter.

Chapter 2 : Literature Review

Divided into four parts. The first part described the current vehicle management system with *Pejabat Keselamatan* following by the second part, the registration system with Road Vehicle Department of Malaysia (JPJ). Then, the third part is gives some explanation of information gathering process and researches strategies that are relevant to the project. The similar existing system is discussed here. The last part is describes the needed tools to develop a web-based system, eg. Programming language, software needed, web application, web architecture and others.

Chapter 3 : System Requirements and Analysis

This chapter determine the functional and non-functional requirements of the system. User's requirements and administrative software and hardware

are listed here. The reasons why this software and hardware are chosen is discussed.

Chapter 4 : System Design

This chapter discusses the various aspects of the user interface design, database design, system architecture, process design ad system functionality design of the system. The structure charts and data flow diagrams (DFD) for this system are shown here.

Chapter 5 : System Implementation

Describes the development environment and development tools for this project.

Chapter 6 : System Testing

Discusses the various forms of testing that are needed to be carry out to ensure that the system developed is high of quality.

Chapter 7 : System Evaluation and Conclusion

The problems encountered during the development of the system are given. An evaluation of the system in terms of problems, system strengths and limitations are also given together with suggestions for future enhancements for the system. This chapter ends with conclusion of this project.

CHAPTER 2 :

LITERATURE REVIEW

CHAPTER TWO : LITERATURE REVIEW

2.1 THE UNIVERSITY OF MALAYA CURRENT VEHICLE MANAGEMENT SYSTEM

2.1.1 A Brief History of Pejabat Keselamatan

Pejabat Keselamatan is one of the administration offices in University of Malaya which established with the objectives to ensure the safety and security of the University's community and properties, to promote, provide and secure a peaceful, harmonious environment in the campus, maintain peace, law and order by executing the University Act, and maintain a smooth traffic flow/parking in the University campus.

Therefore, *Pejabat Keselamatan* responsible in current vehicle management system for the students and staffs of University of Malaya with issuing car stickers/passes in order to obtain the above objectives. Also, any student or staff who had committed with an offence against the act in the university campus may issued with a summon by the staffs of *Pejabat Keselamatan*.

The following shows the organization structure for *Pejabat Keselamatan*.

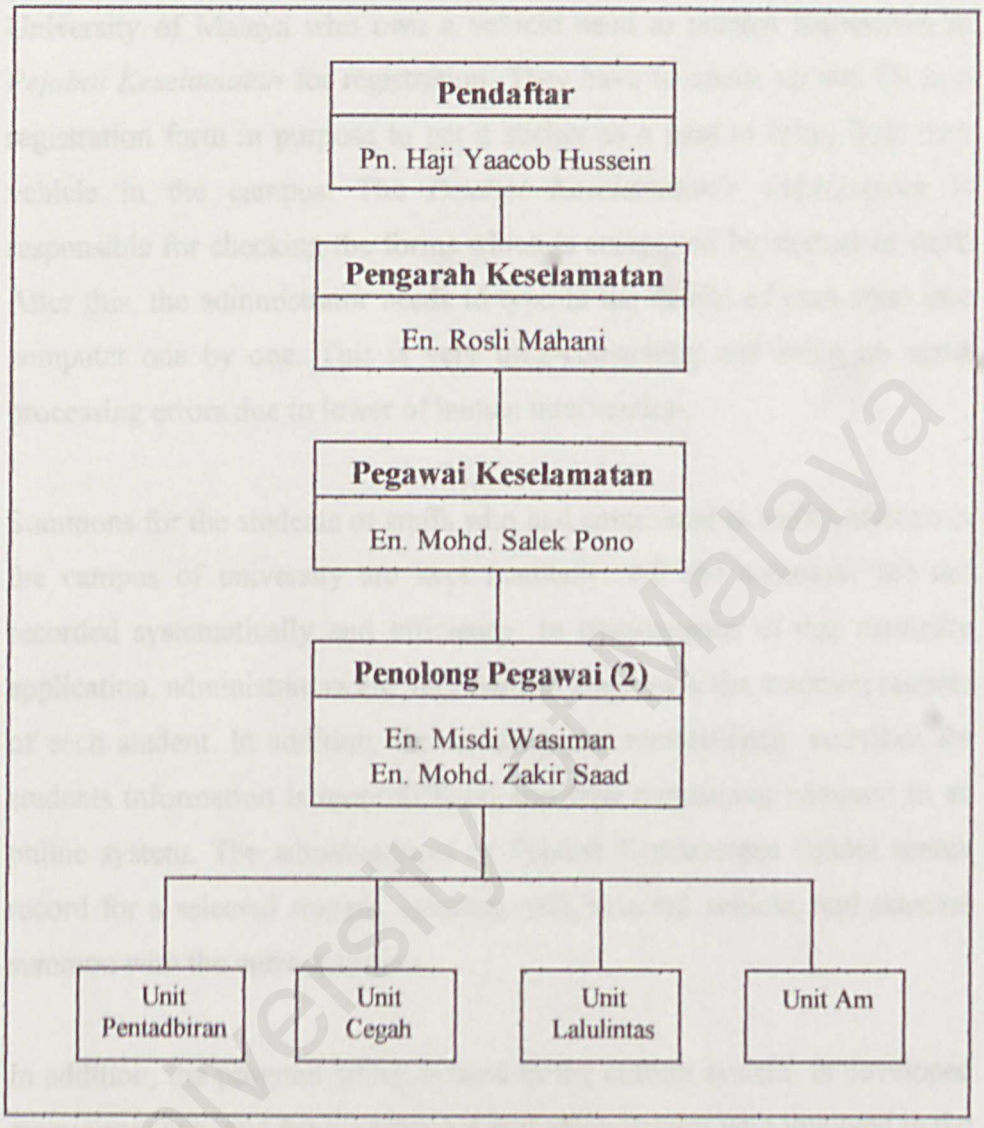

Figure 2. 1: Organization Structure of Pejabat Keselamatan

2.1.2 Introduction about the Current System

The current vehicle management ssytem which is handled by *Pejabat Keselamatan* is done by manually. This system is used since the established of *Pejabat Keselamatan* until nowadays. Every student or staff of

University of Malaya who own a vehicle need to present themselves to *Pejabat Keselamatan* for registration. They have to queue up and fill in a registration form in purpose to get a sticker as a pass to bring their own vehicle in the campus. The *Pejabat Keselamatan's* administrator is responsible for checking the forms which is completed by student or staff. After this, the administrator needs to type in the details of each form into computer one by one. This is very time-consuming and bring on some processing errors due to lower of human intervention.

Summons for the students or staffs who had committed in traffic offence in the campus of university are kept manually. All the summons are not recorded systematically and efficiency. In consequence of this manually application, administrators are very hard to keep track the summon records of each student. In addition, the updating and maintenance activities for students information is more difficult and time-consuming compare to an online system. The administrators of Pejabat Keselamatan cannot search record for a selected student, selected staff, selected vehicle, and selected summon with the current system.

In addition, the program which is used in the current system is developed many years ago, and the programmer and administrator who involved in the development of this program are resigned already without provide any user manual for this program. Hence, the administrators who responsible for current vehicle management system had only know how to perform the basically functions of the system. They cannot utilized the functionality of the program as well as possible.

Category	Type of Vehicle	1998/1999	1999/2000	2000/2001 (until 14.10.00)
Staff	Car	5953	6132	6420
	Motorcycle	1700	1700	1643
	Subtotal	**7653**	**7832**	**8063**
Student	Car	2455	2486	2730
	Motorcycle	5000	6000	4810
	Subtotal	**7455**	**8486**	**7540**
Total		**15108**	**16318**	**15603**

Table 2. 1: The statistic for Registered Motor Vehicle with *Pejabat Keselamatan*

YEAR	SUMMONS
91	218
92	185
93	300
94	40
95	No record
96	1195
97	2875
98	3280
99	2710
00	2696

Table 2. 2: Summon notice issued by *Pejabat Keselamatan* from 1991 to 2000 year

From the Table 2.1 and Table 2.2, we can conclude that the amount of the registered motor vehicle and summons notice which are issued by *Pejabat*

Keselamatan are increasing in the recently years. The current manual vehicle management system which the *Pejabat Keselamatan* used in all this years is not suitable in handle a huge amount of data. Searching a record of selected student, vehicle or summon is very hard if done by manually. The weakness of current vehicle management system is the main factor to motivate the development of OVMS.

2.2 ROAD VEHICLE DEPARTMENT OF MALAYSIA (JPJ)

(http://jpj.gov.my)

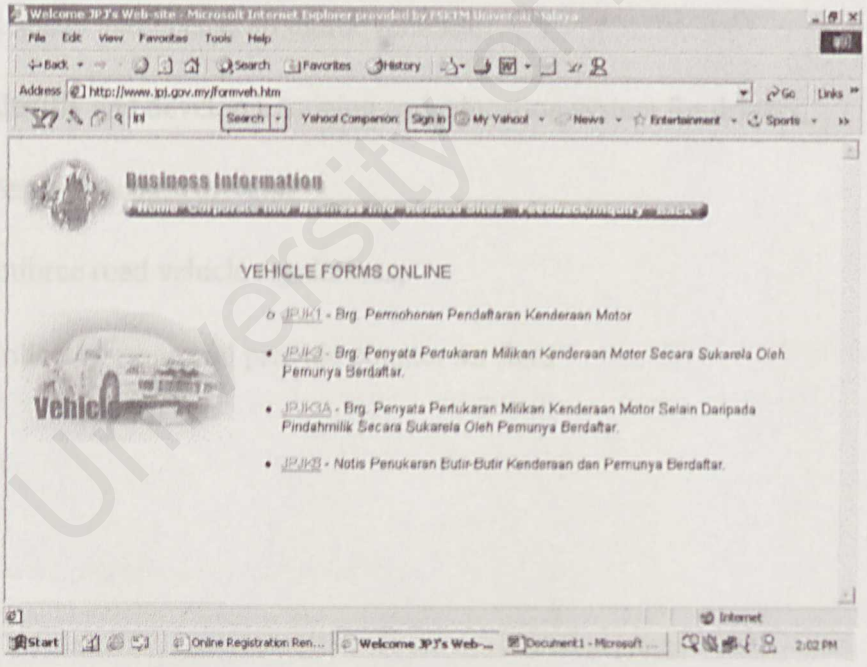

Figure 2. 2 : Road Vehicle Department's Website

JPJ is the department of Ministry of Vehicle, Malaysia. It is responsible for providing counter services in matters pertaining to vehicles and driving licences, and enforcing the Road Vehicle Act 1987 to ensure competent drivers and safe vehicles. Bellows are the same of the objectives of JPJ.

- Register and license all motor vehicles;
- Identify and develop a training and education system for drivers;
- Test and license drivers;
- Enforce road vehicle regulations;
- Collect revenue and provide counter services
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- Enforce road vehicle regulations;
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The following shows the organization structure for JPJ

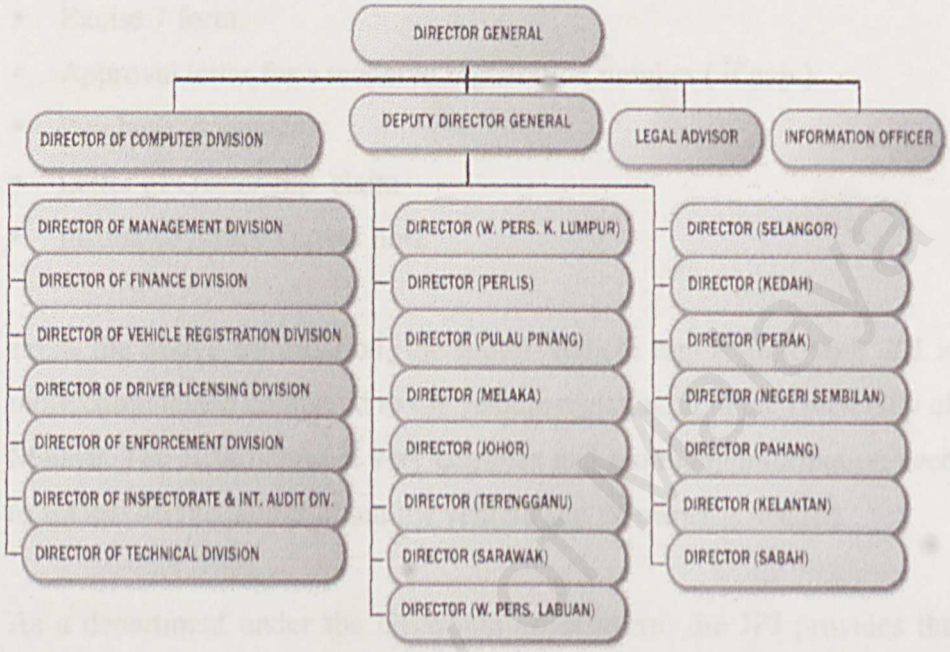


Figure 2. 3 : JPJ Organization Structure

The JPJ web site provides a lot of information for vehicle registration. The procedure and documents needed is listed very clear and detail. Below is the guide for registration of motor vehicle with JPJ.

1. ***Pre-registration arrangements***

   (must do before registering a vehicle with JPJ)

   - Settlement of all duties levied by Custom an Excise Department

2. ***Completed JPJK1 form***

3. *Required documents*

- National Identity Card an its photocopy
- Appendix A (letter of Indemnity)
- Excise 7 form
- Approval letter for a tendered registration number (if any)
- Purchase documents
- Letter of Ownership claim
- Insurance policy / cover note

From the above information, the motor vehicle registration with JPJ is more complicated compared to the vehicle registration in the University of Malaya. The JPJK1 form is very complex and too many information need to fill up. All the details about the vehicle and its owner is needed.

As a department under the electronic government, the JPJ provides the online vehicle registration. However, this system is not efficient. It did not shown a positive feedback from users because the lack of instruction how to register a motor vehicle with an online system.

As an online registration system, it is not so user-friendly and efficiently. The electronic forms for vehicle registration are only provided in Microsoft Power Point format. In addition, the forms are exactly same with the paper-based registration form without adapted into a format which is convenient for users to fill in. The registration form is very complicated and not suitable used as an electronic form. The instructions about how to complete an online vehicle registration is also never be described in this web site.

Besides, JPJ also responsible for issuing summon notice for any person who had committed an offence against the Act. The particulars to be filled when the summons' notice is being issued are shown as follows. It is including all necessary information – who, where, when, why a summon is created.

- Offender's Name
- Identity Card Number
- Address Of Offender
- Vehicle Registration Number/Make
- Type of Offences
- Place where offences committed
- Time of Offences
- Compoundable offence/Date of Compound
- Place of Magistrate Court and Mention Date
- Signature of Offender
- Signature of Road Vehicle Officer
- RTD office where payment of compound can be made

The following tables show the statistic of registered motor vehicle in Malaysia from 1987 to 2000 year and the number of summon notice from the year of 1995 to 1999.

YEAR	TYPES OF VEHICLES							
	Private		Public Service			Goods	Others	Grand Total
	Motorcycle	Motorcar	Bus	Taxi	Hire& Drive			
1987	1,929,978	1,356,678	19,439	24,868	3,741	233,103	106,677	3,674,484
1988	2,030,418	1,427,283	20,452	26,161	3,937	245,232	112,226	3,865,709
1989	2,182,468	1,534,166	21,984	28,120	4,232	263,597	120,629	4,155,196
1990	2,388,477	1,678,980	24,057	30,774	4,631	288,479	132,016	4,547,414
1991	2,595,749	1,824,679	26,147	33,444	5,033	313,514	143,472	4,942,038
1992	2,762,666	1,942,016	27,827	35,596	5,357	333,674	152,698	5,259,834
1993	2,970,769	2,088,300	29,924	38,278	5,762	358,808	164,199	5,656,040
1994	3,297,474	2,302,547	33,529	42,204	5,308	393,833	178,439	6,253,334
1995	3,608,475	2,553,574	36,000	46,807	8,195	440,723	203,660	6,897,434
1996	3,951,931	2,886,536	38,965	49,485	9,971	512,165	237,631	7,686,684
1997	4,328,997	3,271,304	43,444	51,293	10,826	574,622	269,983	8,550,469
1998	4,692,183	3,452,852	45,643	54,590	10,042	599,149	286,898	9,141,357
1999	5,082,473	3,787,047	47,674	55,626	10,020	642,976	304,135	9,929,951
2000	5,356,604	4,145,982	48,662	56,152	10,433	665,284	315,687	10,598,804

Table 2.3 : Statistic of registered motor vehicle in Malaysia (1987 to 2000 year)

YEAR	SUMMON
1995	1, 962, 095
1996	2, 169, 744
1997	3, 064, 758
1998	2, 742, 130
1999	2, 929, 490

Table 2.4 : The Number of Summons Notice from 1995 to 1999 year

From the statistic, the number of registered motor vehicle is shown a dynamically increasing from year to year. Although the total of summons notice had not shown an increasing as registered motor vehicle, but there were a huge amount of summons notice are issued in each year. As a conclusion, it is important for JPJ to improve their existing online registration procedure in order to convenient the Malaysia residents to do an online registration. In addition, with an efficient online registration system, the administrators of JPJ can ease their works in maintaining database which consists a huge number of data.

2.3 INFORMATION GATHERING

Information gathering is required to know what is needed in a system. Internet surfing, interviews, brainstorming, reviewing of current system are done to gather data and requirements for the development of the system.

2.3.1 Research

Research for this project was done via the Internet and though books. Anywhere, Internet is the most widely used as an information gathering. Internet is being used to seek information on client-server architecture, web technologies, web application programming etc. The discussion in the literature review for chapter two is a result from research. The results are very useful in determined the development approach in the coming sections.

2.3.2 Interviews

Interview is directed conversation with a specific purpose that uses a question-and-answers format. In the interview, the interviewer wants to get the opinions of the interviewee and his or her feelings about the current state of the system. Opinions may be more important and more revealing than facts. [26] The following show the conclusion as a result of the interview are done.

a) ***En. Rashid bin Abdullah from Pejabat Keselamatan***

An interview were conducted with En. Abdul Rashid bin Abdullah, Security Staff Assistant from *Pejabat Keselamatan*, who is the person takes fully responsibility to the UM current vehicle management sysem in order to understand the current system and the problems facing by administrators.

According to him, the current system is fully manually and very hard in managing and maintaining. The processing error is high due to human intervention because all of students' data need to key in to the computer manually by the administrators. In addition, the record of summons is not systematic and not updated as well as needed.

As a conclusion, he requirements are to make a system that is simpler to use and link it up the web.

b) Twenty Students From the Library

A random interview is also done with twenty students, who have own a vehicle, at the UM main library's parking lot. This place was chosen, as this is a strategic location where students from all faculties normally come.

From the twenty respondents, most of them said that the current vehicle registration system is very time-consuming and not efficient. This is because they need to present themselves to the *Pejabat Keselamatan* and queue up to fill the registration form. They show a high interested in put online the vehicle registration system. According to them, most of them are always exposed to Internet and it is more easily for them to register their vehicle via Internet.

The results of interview showed the most of the students wish to have the following features in the online vehicle registration system.

- Useful information from *Pejabat Keselamatan*
- User-friendliness
- Simple and easy to use
- Complete reference to the procedure of registration
- Well organized

2.3.3 Brainstorm

During the requirements elicitation, I always get advises from my supervisor, En.Mustaffa and my friends, especially course mates about this system. During this stage, we generates as many ideas as possible without

any analysis until all the idea have been exhausted. Besides, we study the feasibility of the requirements identified in this state.

2.3.4 Analysis On Existing and Similar System

A research was done to find various existing vehicle registration and renewal system due to develop the OVMS system. From the many types of online vehicle registration system, the following were chosen to be discussed.

2.3.4.1 Maryland's Online Vehicle Registration Renewal (MVA)

(http://www.mva.state.md.us/)

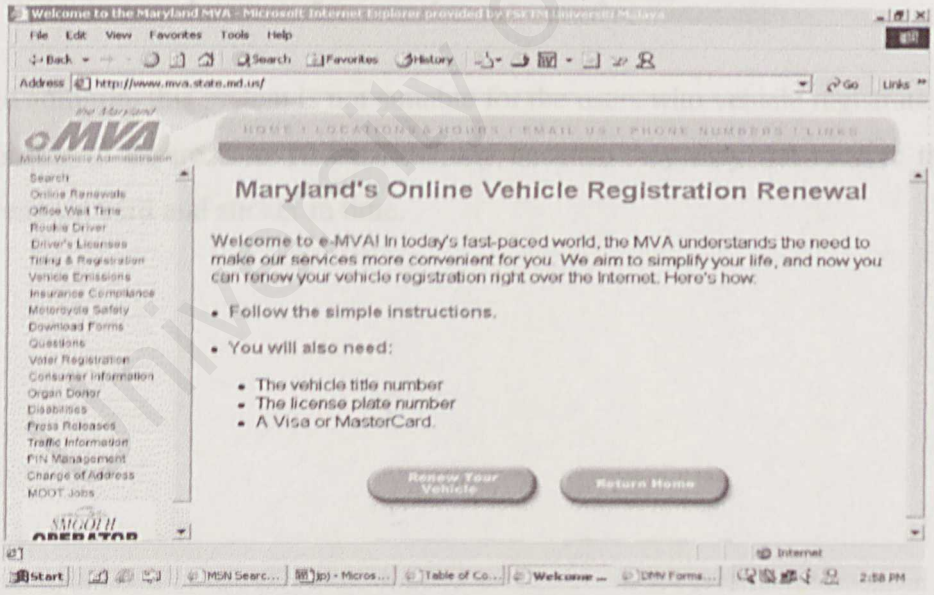


Figure 2. 4: Maryland's Online Vehicle Registration Renewal Web Site

This online vehicle registration renewal is only available for those who are Maryland residents with tags expire within two months, or have already expired. It is easy to complete and not a such complicated process. It is a very user-friendly web site with a simple registration renewal procedure. It only required user to enter three information, which is the vehicle title number, licence plate number, and a Visa or Master card number.

Anywhere, there are some limitation of this online system. This system is not available for vehicle registration. It can only use to renew the vehicle registration. The users who changed their address or have any insurance violation are also not allowed to register renewal for their vehicle via this online system. For those have any changes in insurance, they are required to notify MVA by mail. In other words, the users are not allowed to change or update their personality detail by using this system.

In addition, this system is not suitable for the users who vehicle registration is due to expire 5 to 10 business day because they may not receive the renewal card and sticker in time.

2.3.4.2 AccesDMV Online Registration Renewal

(http://accessdmv.ihost.com/home1..html)

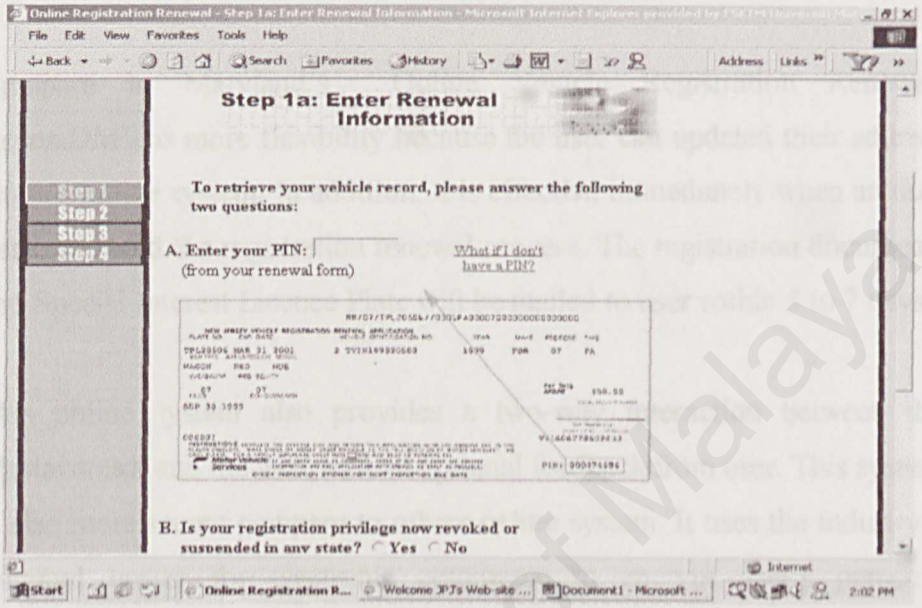


Figure 2. 5 : AccesDMV Online Registration Renewal

AccessDMV is an easy way for New Jersey residents to take care of Motor Vehicle Services business, almost any time of the day or night, from the comfort of their homes or offices.

This registration renewal is very user-friendly with a simple and easy 4 steps process:

Step 1 : Enter vehicle information

Step 2 : Enter owner information

Step 3 : Enter credit card number and expiration date

Step 4 : Provide optional feedback

This online registration renewal system has an attractive and user-friendly interface. The process of registration renewal is very easy to complete and users are being provided a very easy way to keep track their registration.

Compare to Maryland's Online Vehicle Registration Renewal, AccessDMV is more flexibility because the user can updated their address via this online system. In addition, it is effective immediately when an user has completed the registration renewal process. The registration documents and Special Interest Licence Plate will be mailed to user within 5 to 7 days.

This online system also provides a two-way interaction between the administrator and the user with an optional feedback from user. This system is also more secure compare to others online system. It uses the industry's standard bearer for electronic commerce to encrypt user's personal information before it ever leaves user's computer. All confidential records are kept locked inside an "electronic vault" protected by IBM's most advanced security technologies.

However, this system has its weakness. Same with Maryland's Online Vehicle Registration Renewal, this system is only available for vehicle registration renewal. Users are not allowed to register their vehicle by using this online system.

In addition, users are required to have a registration renewal form before using this system to renew their vehicle registration. This is because the PIN number from the bottom right corner or registration renewal form is needed in Step 1 which required to enter a nine digit PIN before the system can be continue to Step 2. For those who do not have renewal registration

form, they are not eligible to renew using the Internet and need to go into a Motor Vehicle Agency to renew their registration.

2.3.5 Conclusion

From the activities of information gathering, a user-friendly and easy to understand application needs to be develop. This is because most of the user of this system are students and administration staffs, who were non-technical users.

2.4 COMMAND KNOWLEDGE

2.4.1 Internet

The Internet, sometimes simply called "the Net," is a world wide system of computer networks, that is, a network for networks in which users at any one computer can, if they have permission, get information from any other computers.

The Internet began as a project in 1973 by the U.S Defense Advanced Research Agency (DARPA). At that time, DARPA wanted to initiate a research program to investigate techniques and technologies for connecting packet network of various kinds. DARPA ultimately wanted to develop

communication protocols that would allow networked computers to talk freely across different platforms and networks. And so, ARPnet was born. [1]

Today, the Internet is a public, co-operation, and self-sustaining facility accessible to hundreds of millions of people worldwide. Physically, the Internet uses a portion of the total resources of the currently existing public telecommunication networks. Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP (Transmission Control Protocol/Internet Protocol). [2]

The main advantage of Internet is that nobody really own the Internet, it is cheap and the information is mostly free and can be found all over the world. Below are some of the benefits that can gained through Internet :

a) Sharing data among individuals
b) Can be accessed from many platform – such as Windows and UNIX
c) Communicating with others and transmitting files via e-mail
d) Interactivity and rich content can illustrate certain concepts that would be difficult to illustrate in other ways
e) Giving a easy and cost-effective way for all the users to search for information that needed

2.4.2 WWW (World Wide Web)

One of the newest and most interesting Internet developments has been the World Wide Web (WWW). Its outstanding feature is hypertext, a method o

instant cross-referencing. In most Web sites, certain words of phrases appear in text of a different colour that the rest; often this text is also underlined. When one of these words or phrases is selected, this will then transfer to the site or page that is linked to these words or phrases. Sometimes there are buttons, images, or portions of images that are "clickable". If the pointer of the mouse is moved over a spot on a Web site and the pointer changes into a hand, this indicates that the spot can be clicked and be transferred to another site. [3]

The web works under the popular client-server model. It is a distributed set of communication applications and system software with two main components – the HTML language used to describe web, and the HTTP protocol used to transfer HTML across the net. Universal Resource Locators (URLs) are used both by HTML and HTTP to name pages. [4]

2.4.3 Intranet

Intranet is a term used to refer to the implementation of Internet technologies within a corporate organization rather than for external connection to the global Internet. [5]

It is a network of networks that is contained within an enterprise. It may concise of many interlined local area networks (LAN) and also use leased lines in the wide area network (WAN). [2]

Typically, an Intranet includes connections through one or more gateway computers to the outside Internet. The main purpose of an Intranet is to

share company information and computing resources among employees. An Intranet can also be used to facilitate working in groups and for teleconferencing.

An Intranet uses TCP/IP, Hypertext Transfer Protocol, and other Internet protocols. In general, it looks like a private version of the Internet. With tunneling, companies can send private message through the public network, using the public network with special encryption/decryption and other security safeguards to connect one part of their Intranet to another. Typically, larger enterprises allow users within their Intranet to access the public Internet through firewall servers that have the ability to screen messages in both directions so that company security is maintained. [3]

2.5 CLIENT / SERVER ARCHITECTURE

The client / server architecture can be determined by the number of tiers available for processing, and where each layer of functionality is placed. It described the relationship between two-computer program in which and program, the client makes a service request from either program, the server, which fulfills the request. In a network, the client-server model provides a convenient way to interconnected programs that are distributed efficiently across different locations. [6]

2.5.1 Single Tier (Host) Systems

This is the old mainframe and mini-computer model. The mainframe is the single tier responsible for all the presentation management, processing, and data functionality. There was virtually no logic at the desktop – instead, there was a dumb terminal. All that was sent down the wire to the terminal was the screen the screen layout information. [7]

The advantages of Single Tier System:

- Constant availability of computing resources, combined with reliability and security, make the mainframe ideal for mission-critical applications.
- Robust security and the ability to update software in a single place – eliminating distribution issues.

The disadvantages of Single Tier System:

- Mainframe solutions do not use open technologies
- Long development and maintenance cycles while the mainframe excels at capturing and storing large amounts of data
- The poor user interfaces and single tier processing do not allow end-users to make effective use of their time or analyze information outside of the host environment. [5] [8]

2.5.2 Two-tier Architecture

A Two-tier architecture is one in which only a client and a server are involved in the requests and the responses that flow between them over the

Internet. It is where a client talks directly to a server, with no intervening server. It is typically used in small environments(less than 50 users).

With A Two-tier client / server architecture, the user system interface is usually located in the user's desktop environment and the database management services are usually in a server that is a more powerful machine that services many clients. Processing management is split between the user system interface environment and the database management server environment. The database management server provides stored procedures and triggers.

Common error in client/server development is to prototype an application in a small, two-tier environment, and then scale up by simply adding more users to the server. This approach will usually result in an ineffective system, as the server becomes overwhelmed. To properly scale to hundreds or thousands of users, it is usually necessary to move to a three-tier architecture. [5] [6] [9]

The advantages of Two-tier architecture:

- Ease and flexibility to create application continue to be driving many smaller scale business applications.
- The open solutions philosophy that came with client/server technology promised cross-vendor interoperability between products and reduced costs in hardware and software.
- Sharing of network resources such as files, printers, faxes and database
- GUI interfaces that make applications easier to use

- Interoperability with multiple tools, databases and platforms that leads to greater flexibility in designing a client/server system
- Application Development Speed
- Ability to model data and populate a database on a remote server
- Robust [5] [6] [9]

The disadvantages of Two-tier architecture:

- Implementation of processing management services using vendor proprietary database procedures restricts flexibility and choice of DBMS for application.
- Limited flexibility in moving (repartitioning) program functionality from one server to another without manually regenerating procedural code.
- Version control and redistribution problems
- System security complications
- Client tools and middleware are volatile [5] [6] [9]

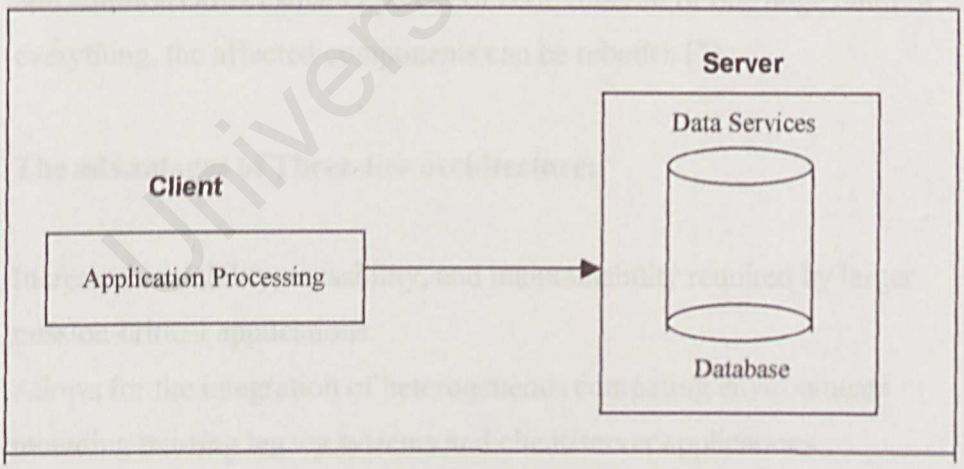


Figure 2. 6 : Two-tier Client/Server Architecture

2.5.3 Three-tier Architecture

The Three-tier, later to be called multi-user architecture grew out of this early experience with "distributed" applications. If someone talks about how everything needs to be done one way regardless of what it is – that someone is almost certainly talking three-tier or n-tier computing.

This model takes the approach of breaking up all three services levels into completely separate logical models. Clients are responsible for user interface issues only. The difference is that the business and data services are logically separated from each other. In addition, this approach moves the logical model into a distinctly separate realm from the physical model. This means that they can run on the same server, but do not have to. This adds a significant level of stability and scalability since the workload can be split onto two (and, depending no how it is done more 0 servers. In addition, this model has a tendency to be more extensible, since changes and additions affect smaller pieces of code (instead of one huge build of everything, the affected components can be rebuilt). [7]

The advantages of Three-tier architecture:

- Increased scalability, reusability, and maintainability required by larger mission-critical applications.
- Allows for the integration of heterogeneous computing environments including existing legacy systems and client/server applications.
- Separates presentation, processing, and data into separate, distinct software tiers.
- Middle tier is programmed in portable C code.

- Remote process call for calling technique
- Overall flexibility in resource allocation.

The disadvantages of Three-tier architecture:

- More complicated than the two-tier architecture
- Network infrastructure must provide stable and reliable communications while handling the additional traffic created by a distributed applications.
- Potential failure in an application, including network errors, lost connections and server bottlenecks.
- Lack of development tools.
- More code in more places.

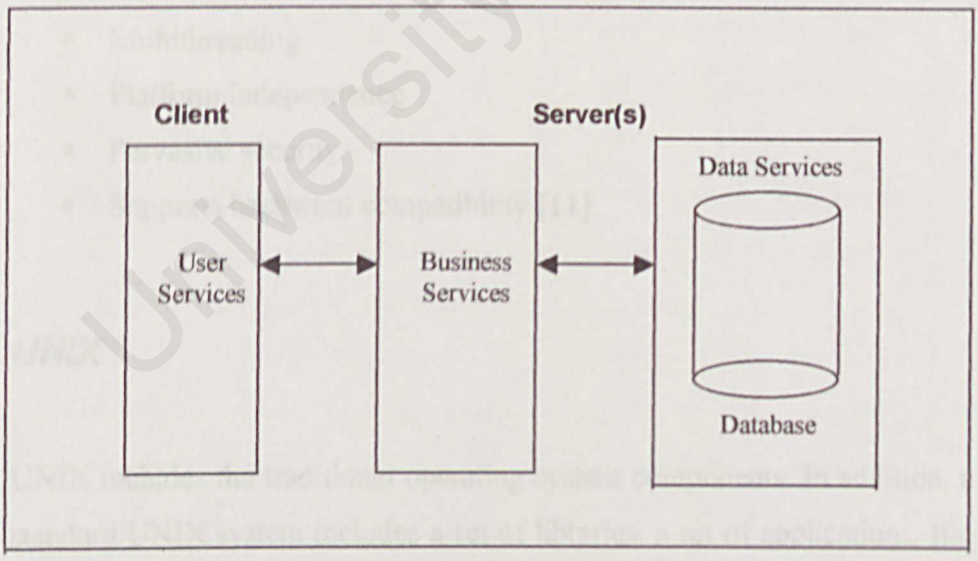


Figure 2. 7 : Three-tier Client/Server Architecture

2.6 OPERATING SYSTEM

2.6.1 Windows NT Server 4.0

Microsoft Windows NT Server 4.0 is a true multipurpose server operating system. It combines the ease-of-use of Windows 95 with the power and reliability of Windows NT. It is the most complete platform available for building and hosting web-based applications, and the easiest server operating system available. Multiple web sites on a single machine, innovative web publishing features, customizable tools and new wizard technologies make Windows NT the best platform to publish and share information securely over corporate Intranets and the Internet. [11] [13]
Windows NT supports important computing technologies like :

- Multithreading
- Platform independence
- Pervasive security
- Supports backward compatibility [11]

2.6.2 UNIX

UNIX includes the traditional operating system components. In addition, a standard UNIX system includes a set of libraries, a set of applications, file and process control. One of the greatest strength of UNIX is the consistent way in with treats files. It is very easy for the users to work with files because users don't need to learn special commands for every new task. On

the other word, UNIX provides a consistent buffer between user and the guts of the UNIX system.

2.6.3 Comparison between Windows NT and UNIX

Services	Windows NT	UNIX
Access control	two forms of access control, object-specific permissions and system-wide user rights.	provides access control on object permissions.
Authentication	provides a secure attention key to establish communication with the operating system, and only the operating system	most of the standard commercial UNIX implementations do not have a mechanism to establish a trusted path with the operating system
Integrity	uses ACLs to prevent access to the operating system. In addition, it has mechanisms to digitally sign operating system.	uses its files permissions to prevent access to the operating system. This is the only UNIX interface or facility for integrity services.

Table 2. 5: Comparison Between Windows NT and UNIX

2.6.4 Others comparison

- UNIX is hard to install compared to Windows NT
- To use a UNIX operating system, a lot of command needs to be entered. Compared to Windows NT, it provide user-friendly interface that ease the job of the user.

2.7 WEB SERVER

Web browsers like Internet Explorer or Netscape Navigator Communicate over a network with Web servers, using HTTP. The Intranet will utilize the HTTP protocol and all the other TCP/IP protocols it subsumes to provide point-and-click access to a wide variety of mission-critical information and services.

2.7.1 Microsoft Exchange Server 5.5

Microsoft Exchange Server is a powerful messaging system that enables members of one organization to exchange information with users on the Internet and other systems. It provides high level of performance and advanced security features. It is very easy to manage and it provides a set of tools that help the administrator to manage the system efficiently. In addition, it enhanced protocol support for the Internet mail service like Secure Multipurpose Internet Mail Extensions (S/MIME), Secure Sockets Layer (SSL) and also the Simple Authentication and Security Layer.

2.7.2 Internet Information Server 4.0 (IIS)

Microsoft Internet Information Server (IIS) provides a transactional-based Web server that is tightly integrated with the NT operating system. IIS protects applications and Web sites against failure from misbehaving components or Web applications on the server, by running them in separate memory spaces, a feature known as process isolation. [11]

IIS provides a high-speed, secure platform for publishing information on internal networks or Internet. The server is specifically designed to provide the kind of performance that is necessary for handling an increased number of web users and users who are connected with high-speed links, such as ISDN and leased lines. [12]

It rapidly creates scalable Web applications using built-in distributed application services that automatically scale to serve thousands of simultaneous users. IIS provides configuration and management of properties such as access permissions and logon requirement for clients, home and virtual directories, virtual servers. This option will be needed in the implementation of this project.

2.8 WEB CLIENT / BROWSER

A web client is a software program that knows how to contact a web server (by using the HTTP) protocol, requesting a document from that web server, and display that document returned by the server to the client.

There are many different types of web client, the most popular ones are Netscape Navigator and Microsoft Internet Explorer.

The table below shows the comparing the features and capabilities of Microsoft Internet Explorer 5 and Netscape Communicator 4.5 for the Microsoft Windows 95, Windows 98 and Windows NT operating systems.

FEATURES AND CAPABILITIES	Internet Explorer 5	Netscape Communicator 4.5
User Interface		
Full screen browser mode	2.2.1.1 Yes	No
Rich view of FTP contents	Yes	No
Friendly HTTP error messages	Yes	No
Interface consistency with Ms Office	Yes	No
Customizable toolbars	Yes	Limited
Security		
Permission-based Java security	Yes	Yes
Secure Sockets Layer (SSL)	Yes	Yes
Private Communications Technology (PCT)	Yes	No
Performance		
HTTP 1.1 performance enhancement	Yes	No
Dynamic HTTP behaviors	Yes	No

XML 1.0	Yes	2.2.1.2 No
AWT Java	Yes	Yes
Other		
Print preview	No	Yes
Integrated Windows Radio Toolbar	Yes	No

Table 2. 6 : Comparison Features and Capabilities Between Microsoft Internet Explorer 5 and Netscape Communicator 4.7

2.9 WEB DATABASE

A relational Database Management System (RDBMS) is required to keep and manage the records. The ability to integrate a database into applications that can be accessed by users using Web Browser is what makes a database a Web Database. In order to choose a reliable database, the database must be able to ensure the safety and security of the data.

2.9.1 Microsoft Access

One of the easier way of creating a database is by using Microsoft Access. This is because it has an easy menu driven interface that lets the user issue commands without an in depth understanding of Access. At is most basic level, Access can be used to develop simple personal database management systems. [8]

Microsoft can interact with data over the World Wide Web and to use the application as the front end of database engines such as Microsoft SQL

Server. With the new applications in the Microsoft Access, data can be dropped into HTML pages that can be shared and manipulated over the WWW and making it easy for users to get important information to others.

2.9.2 Visual Fox Pro 6.0

FoxPro has grown from a DOS-based Xbase language to a Visual GUI (Graphical User Interface) application development tool in just a few short years. The Visual FoxPro presents the best implementation of an object-oriented, Xbase-compatible, database programming language to date.

The advantages of using FoxPro are :

- Extremely fast data engine
- Flexible language to build complex business logic using a real database development tool rather that a general purpose scripting language.
- Object-oriented nature enables building an easily reusable framework for processing requests
- Can scaled the applications across the network

The following are the disadvantages of using FoxPro:

- It is single-threaded; requests require multiple Visual FoxPro sessions to process simultaneously
- It is essentially from the Web server and requires a separate maintenance scheme. [14]

2.9.3 Microsoft SQL Server 7.0

SQL server is an open source software, means that it is possible for anyone to use and modify. It is a very fast, reliable and easy to use. It was originally developed to handle very large database much vaster than existing solutions. It is a client/server that consists of multithreaded SQL server that supports different back ends, several different client programs and libraries, administrative tools and programming interface.

SQL server is a perfect example of an n-tier system. The user can manipulate the data directly from the client side. Most of time, the data is validated first before it is updated into the database in server side. It is tightly integrated with the Microsoft BackOffice family product to enable organization to improve decision-making and streamline the business process. It is the best database for Windows NT server.

SQL server delivers improved performance over previous versions through enhancements such as reduced checkpoint serialization, faster sorting and indexing, and improved integration with the NT operating system. Version 6.5 also offers several new counters to help tune SQL server for maximum performance. [15] [16] [17]

2.9.4 Oracle

Oracle is the leading vendor of database software. It is an open solution and it supports all kind of platform. Oracle's ability to have all data and documents stored in a small number of high-performance databases benefits customers by centralizing all their data, making information

management and access easier, more reliable and les expensive. In addition, Oracle's advanced security features allow for enforced granular privileges, advanced auditing, enhanced access control, secure distributed processing and replication, and the ability to use additional external authentication mechanisms. [18]

2.9.5 Comparison Between SQL Server and Oracle

- SQL Server is more ease-to-use system compared to the Oracle database. It provides more user-friendly graphical tools for installation, configuration and administration
- SQL Server can run only on Windows but Oracle supports all king of platform. Oracle is platform independence
- Oracle enable customers to take advantage of multimedia nature of the Web
- SQL Server tightly integrated with other Microsoft Products

2.10 WEB APPLICATION PROGRAMMING LANGUAGE (SERVER SIDE)

A web application is like any other application, except it resides on a web-server. To make dynamic web pages, server side language is used whereby it will reside in the server and do not need any special engine at browser to view it. This enables users to access to the Internet / Intranet. Also this

allows developers to modify the application without having to distribute updates to all of the users. [19]

2.10.1 JSP (Java Server Pages)

Java Server Pages if a new technology that allows the user to combine markup (HTML or XML) with Java code to dynamically generate web pages. The JSP specification is implemented by several web servers, and plus-ins are available that allow the user the user to use. [20]

2.10.2 ASP (Active Server Pages)

ASP is a Microsoft technology, and it works by allowing the functionality of a programming language; programming code can be written so that it will generate the HTML for the web dynamically. The power of ASP lies in two facts : first, the HTML is not created until the user wants to see the erb page, and second, it does not care what web browser is being used. ASP is the first technology to offer there features, but it is undoubtedly one of the most powerful and widely used in industry and crucially, it is the fastest. [20]

ASP provides the key to leveraging the rapidly evolving standards as well as the existing ones including :

- Internet networking standards
- Web browsers client standards
- Windows NT's evolving distributed computing architecture

- Open database connectivity standards [19]

Following are some of the benefit of Active Server Pages :

- It works with Window NT and IIS to provide a comprehensive set of technologies that enable secure exchange of information over public networks, access control to server resources and confident identification of server and client
- It supports client/serer programming. Thus, it can be set to build client/server application
- It is suitable for building multi-tier Internet and Intranet application
- It is an open, extensible application environment. It supports the use of virtually any scripting language, and components written in any programming language
- An ASP file is a simple file text, no different that a standard HTML file. Files can be edited with any text editor. [21]

2.10.3 CGI (Common Gateway Interface)

The Common Gateway Interface (CTI) is a mechanism for creating scripts on the server, which then be used to create dynamic applications. Now, the majority of dynamically-created pages on the web are created using CGI and a scripting language. The CGI provides a consistent way for data to be passed from the user's requests to the application program and that to the user. This means a CGI application is platform independent. [22]

However, CGI has some shortcomings. The major one is that it adds extra level to the browser-server model of interaction: namely, it is necessary to run a CGI program to create the dynamic page, before the page is processed on the server. Also, the format in which CGI receives and transmits data means that this data is not easily manipulated by many programming language, so a programming language that has good facilities for manipulating text and communicating with other software have to be used. [20]

2.10.4 Comparison Between ASP and CGI

ASP provides all of the functionality of CGI application in an easier to-use and more robust environment.

ASP is an easier way for server to access information in a form not readable by the client (such as an SQL database) and then act as a gateway between the two to produce information that the client can view and use.

With CGI, the server creates as many processes as the number of client requests received. The more concurrent requests there are, the more concurrent processes created by the server. However, creating a process for every requests is time-consuming and requires large amounts of server RAM. In addition, this can restrict the resources available for sharing from the server application itself, slowing down performance, and increasing wait times on the web.

ASP instead runs in the same process as the web server, more handling client requests faster and more efficiently. It is much easier to develop dynamic content and web application with ASP.

2.11 WEB APPLICATION PROGRAMMING LANGUAGE (CLIENT SIDE)

2.11.1 HTML

Without HTML, the World Wide Web wouldn't exist. HTML allows the individual elements on the web to be brought together and presented as a collection. It provides instructions to web browsers in order to control how documents are viewed and how they relate to each other. For all its simplicity, HTML is a very powerful language.

In addition, HTML is a standard recommended by the World Wide Web Consortium (W3C) and adhered to by the major browsers, Microsoft's Internet Explorer and Netscape Navigator, which also provide some additional non-standard codes. The current version of HTML is HTML 4.0. However, both Internet Explorer and Netscape Navigator implement some features differently and provide non-standard extension. [3]

2.11.2 VBScript

VBScript is a lightweight scripting language that provides programming functionality based on the Visual Basic programming language. It is natively executed on the Internet Explorer browser and can be executed in the browser through plug-in technologies. It is the default scripting language for the IIS.

When use in the Microsoft Internet Explorer, VBScript is directly comparable to Microsoft JavaScript (not Java). Like JavaScript, VBScript is a pure interpreter that processes source code embedded directly into HTML. Its code, like JavaScript too, does produces standalone applets. VBScript is a valuable alternative to JavaScript in activating web pages for those who know Visual Basic.

VBScript also play an important role in many ways, including validating data, pricing, providing impressive multimedia feedback, and initiating a data storage. The user can use VBScript to sequence the questions based on responses. VBScript can performs calculations on data, such as computing the cost of an item after taking into account sales tax. Another important aspect of this programming model is that is let us use the intrinsic HTML from controls and Microsoft's ActiveX controls with VBScript to give web pages an attractive look and feel.

2.11.3 JavaScript

JavaScript is an interpreted programming or script language form Netscape. It should not be confused with Java. JavaScript is interpreted at a higher lever, easier to learn than Java, but it lacks some of the portability of Java and the speed of byte-code. [20]

The biggest advantage of JavaScript is that it can be written directly within an HTML file. However, it also has some limitation where it cannot write a file to the web server's hard disk.

2.12 WEB SECURITY ISSUES

The most important factor that delays the Internet adoption is concerned with the security. Security on the web involves both client and the server. However, as services begin to include higher of personalization and clearly justified, the challenge is then to transmit and receive information over the Internet while insuring that :

a) ***Confidentiality***

Transmitted information is accessible only by authorized parties.

b) ***Authentication***

The origin of the message is correctly identified with an assurance that the identity is not false. The most common authentication mechanism is a password, in which only the authorized users know the key.

c) ***Integrity***

Transmitted information is capable of modification only by authorized parties.

d) ***Non-repudiation***

Neither the sender can or the receiver can deny the transmitted message. This means, uncontestable proof that a document or message was really originally, originated by oneself. As for this security problem, if requires some unforgettable electronic signature that can be used in a court of law.

e) ***Firewalls***

A firewall is a gatekeeper compute that sits in between the Internet and the network. It protects the provide network by filtering traffic to and from the Internet based on the defined policies.

CHAPTER 3 :

SYSTEM ANALYSIS

CHAPTER THREE
SYSTEM REQUIREMENTS AND ANALYSIS

In this chapter, the system requirements and analysis is done. System analysis and design is a systematic approach to identifying problems, opportunities, objectives, analyzing the information flows in organizations, and designing computerized information systems to solve a problem. The following sections in this chapter discuss the methodology for system development, analysis of the functional and non-functional requirements of the system and determined the development tools reference to the literature review that we done in previous chapter.

3.1 Methodology

The development method that I intend to use for OVMS System is **Waterfall Model with Prototyping**. It offered a means of making the development process more visible. A system prototype can be developed to give end-users a concrete impression of the system capabilities.

3.1.1 The Waterfall Model

The waterfall model is a model for the development of 'something' – not necessarily an entire system. It may be used for the development of a

subsystem, or in the case of evolutionary delivery, of a delivery. But the product, whatever it is, only emerges at the end of the process. Thus, when an entire system is being developed, the customer and users do not have the opportunity to test or use it until it is complete. [25]

The model of development reflects this 'natural order of events'. The horizontal spacing of stages, along an imaginary time axis, suggests that one stage should not begin until the previous one is completed. Thus, the output of one stage cascades down to be the specification for the next, leading to the title by which the model is known : the 'waterfall model'.

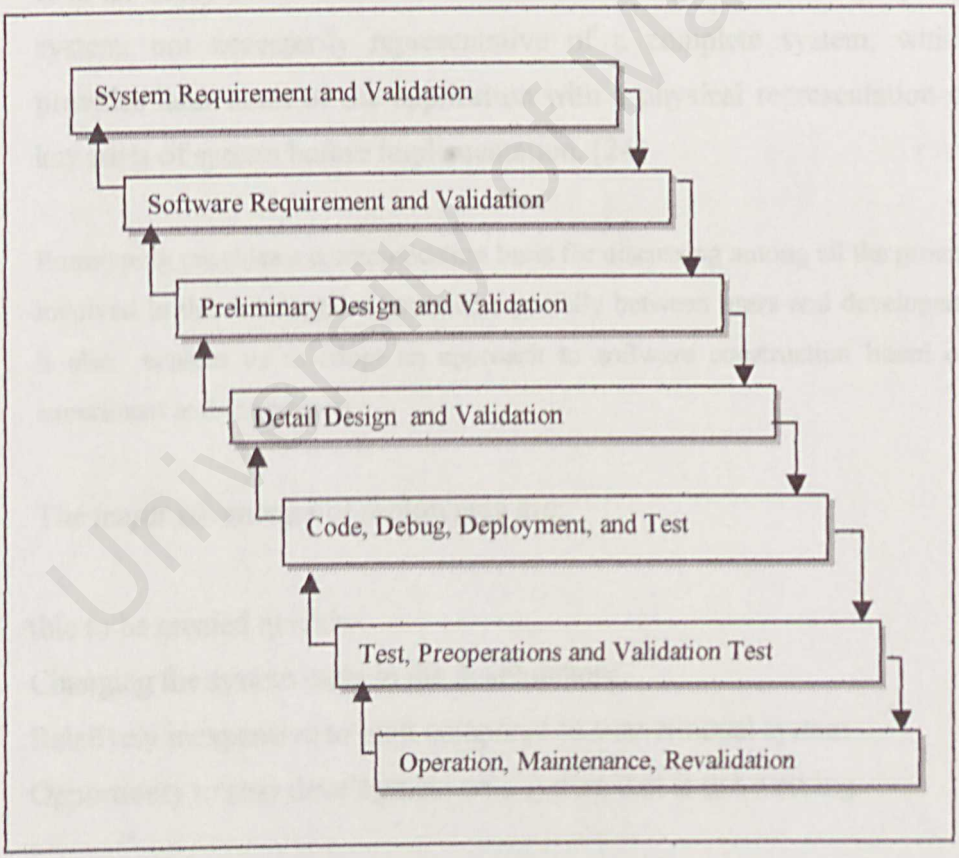


Figure 3. 1 : The Waterfall Model

3.1.2 Prototyping Model

Prototyping means creating a partially developed product that enables customers and developers to examine some aspects of the proposed system and decide if it is suitable or appropriate for the finished product. It is an approach for establishing a systems requirements definition that is characterized by high degree of iteration, by a very high degree of user participation in the development process and by an extensive use of approach.

It is an easily modifiable and extensible working model of a proposed system, not necessarily representative of a complete system, which provides later users of the application with a physical representation of key parts of system before implementation. [24]

Prototyping provides a communication basis for discussing among all the groups involved in the development process, especially between users and developers. It also enables us to adopt an approach to software construction based on experiment and experience.

The major advantages of prototyping are:

- Able to be created quickly
- Changing the system early in the development
- Relatively inexpensive to built compared to conventional system
- Opportunity to stop development on a system that is not working

- Can determine beforehand appropriateness of design application, the efficiency of computer algorithms, adaptability of operating system and platform in which the system is based
- Serves as risk reduction technique by determining if all aspects of the system are feasible before actual development
- Increases the likelihood that the trial product will be satisfying the needs of the ends users because through interaction the development stages are performed many times

In addition, a prototype model is not a complete system since it will be build quickly; only some essential functions will be included in the model. However, it is important to envision and then build the prototype as part of the actual system with which the user will interact. It must incorporate enough representative functions to allow users to understand that they are interacting with a real system[26]. The following figures show the diagram of a prototyping model.

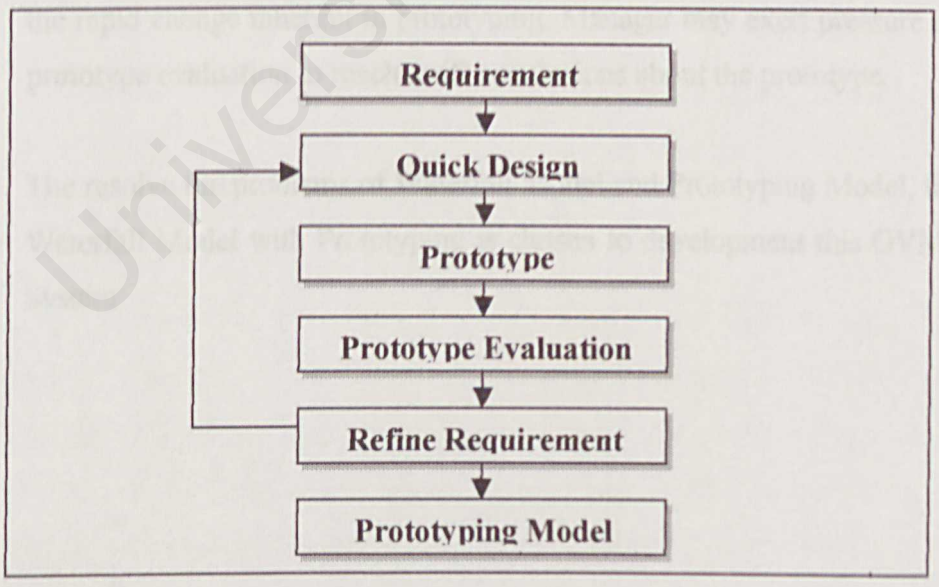


Figure 3. 2: Prototype Model

3.1.3 Why choose " Waterfall Model with Prototyping " ?

The combination between Prototyping Model and Waterfall Model will give a better solution for the problems that occur on their own.

The problem of Waterfall Model is it is a development process which is not available for testing or trial until the end of project. In addition, it is a unidirectional flow of activities through the project. It is inflexible partitioning of the project into these distinct stages. Delivered system are sometimes unusable, as they do not meet the users' real requirement. It does not make provision for assessing risks and taking steps to manage them.

Besides, the planning, costing, and estimating a prototyping project is outside the experience of many software project managers. Procedures for change and configuration management may be unsuitable for controlling the rapid change inherent in prototyping. Manager may exert pressure on prototype evaluation to reach swift conclusions about the prototype.

The resolve the problems of Waterfall Model and Prototyping Model, the Waterfall Model with Prototyping is chosen to development this OVMS System.

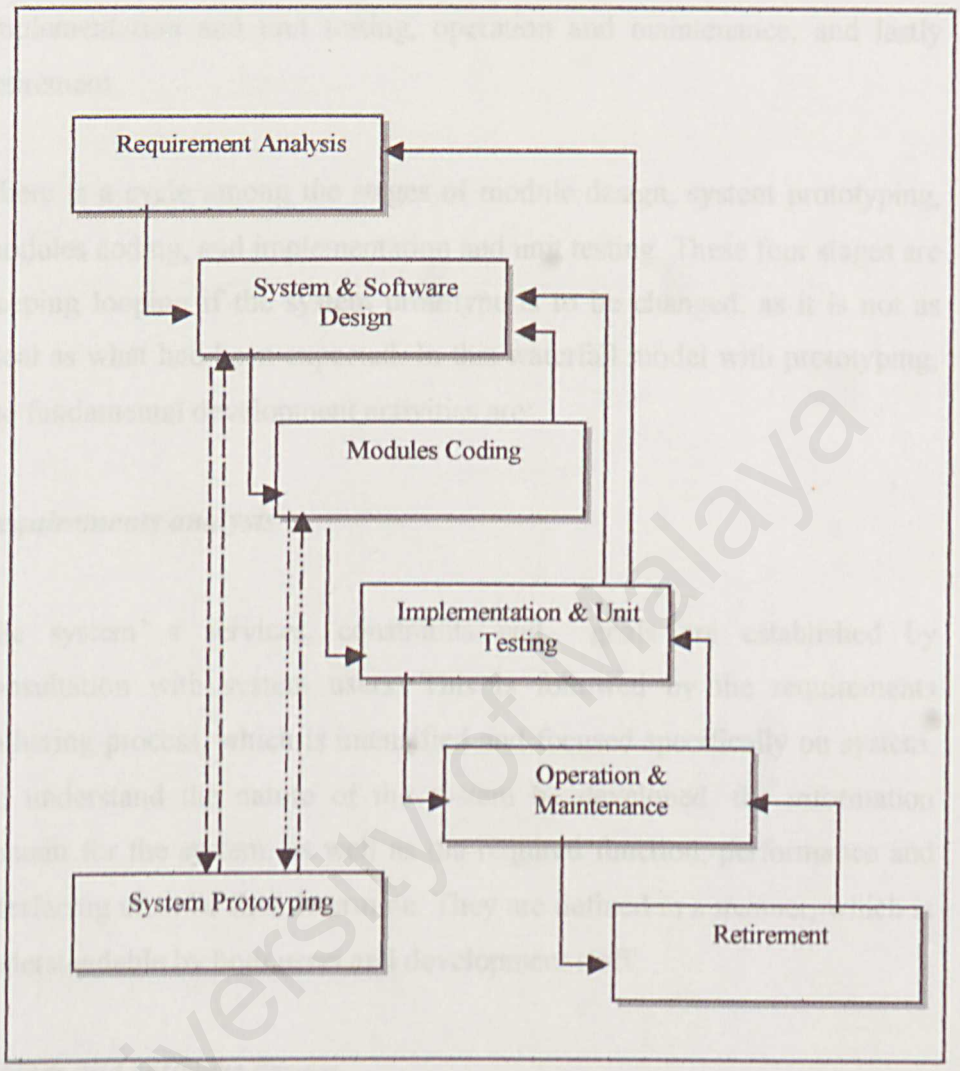


Figure 3. 3 : Waterfall with Prototyping Model

Figure above shows the 'waterfall model with prototyping' model. The waterfall with prototyping approach was used because the OVMS system consists of separate process phases, which cascade from one phase to another, except the system prototyping stage. The system consists of requirement analysis, modules design, modules coding, system prototyping,

implementation and unit testing, operation and maintenance, and lastly retirement.

There is a cycle among the stages of module design, system prototyping, modules coding, and implementation and unit testing. These four stages are keeping looping if the system prototype is to be changed, as it is not as ideal as what had been expected. In this waterfall model with prototyping, the fundamental development activities are:

- ***Requirements analysis***

The system' s services, constraints and goals are established by consultation with system users. This is followed by the requirements gathering process, which is intensified and focused specifically on system. To understand the nature of the system be developed, the information domain for the system, as well as the required function, performance and interfacing must be first determine. They are defined in a manner, which is understandable by both users and development staff.

- ***System and software design***

The system design process partitions the requirements to either hardware or software systems. It establishes an overall system architecture. Software design involves representations the software system functions in a form that may be transformed into one or more executable programs. During this phase, requirement will be translated into the configuration of the software.

Basically, it is a multi-step process that focuses on 4 distinct attributes:

(i) Database structure

(ii) Software architecture

(iii) Functional detail

(iv) User interface characterization (as shown in below)

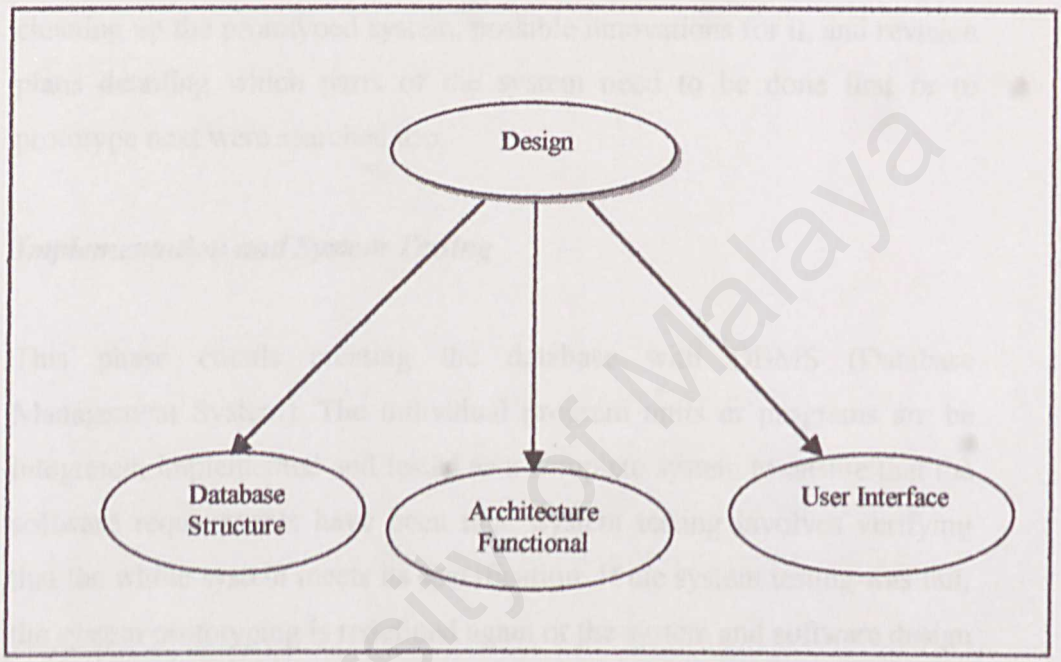


Figure 3. 4 : Design Architecture

- ***System Coding***

This phase transforms algorithms defined during the detailed design stage into a computer-understandable language.

- ***System Prototyping***

In this stage, system prototyping allows all or part of the system to be constructed quickly to understand or clarify issues. The requirements or design require repeated investigation to ensure that the developer, user, and customer have a common understanding both of what is needed and what is proposed. The initial reactions from users to the prototype were sought cleaning up the prototyped system, possible innovations for it, and revision plans detailing which parts of the system need to be done first or to prototype next were searched too.

- ***Implementation and System Testing***

This phase entails creating the database with DBMS (Database Management System). The individual program units or programs are be integrated, implemented and tested as a complete system to ensure that the software requirements have been met. System testing involves verifying that the whole system meets its specification. If the system testing was fail, the system prototyping is redefined again or the system and software design stage is reprocessed again.

- ***Maintenance***

Normally this is the longest life cycle phase. The planner system is installed and put into practical use. Maintenance involves correcting errors which were not discovered in earlier stages of the life cycle, improving the implementation of system and enhancing the system' s services as new requirements are discovered.

3.2 SYSTEM REQUIREMENTS ANALYSIS

Under the system requirement, the needs of the proposed browsers for the system are defined. A broad outline of the system, the technology to be used and the expected cost of the system will be planned. This covers the aspects of functional requirements and non-functional requirements of this online management system.

3.2.1 Functional Requirements

A functional requirement describes an interaction between the system and its environments. Further, functional requirement describes how the system should behave given the certain stimuli. [23]

The functional requirements in this online web-based registration system can divided into two parts, the user module and the administrator module.

3.2.1.1 User Module

There are two categories of user, Student and Staff. Anywhere, the functional requirements for this two categories are almost same.

a) Authentication and Authorization

An authentication and authorization process is vital to ensure that only authorized users are allow access to the OVMS system. Under this section, the authorized user is required to inserts it user identity and password to access into this online management system.

b) *Personal Detail*

Personal information such as name, metrics number, identity card number, current address, contact number and e-mail address are required.

c) *Vehicle Registration*

This module enables the students and staffs to register online via computer with Internet within the campus of University of Malaya. For register the vehicle, students and staffs are required to complete several forms that consists the vehicle information such as vehicle registration number, colour, insurance policy number ,and student' s driving license number and it validation date.

d) *Status Checking*

In this module, students and staffs can check whether they are in the blacklist because of contravene the traffic act in the campus of University of Malaya. The summons that students are impose will be shown here.

e) *Help Section*

This will provide the guidelines about the procedures to register a vehicle and steps have to take after registration. The documents requirement which need to present to the staff of *Pejabat Keselamatan* is listed here.

3.2.1.2 Administrator Module

The administrator module will only allow administrators to access and maintain the database. It has the following functions :

a) Authentication and Authorization

The authentication and authorization process is vital to the system to protect its database from the unauthorized users from accessing the protected section. Therefore, the section will prompt the users for login name and password as a means of providing security.

b) Information Section

Administrators can search up the database to view the specific record of a student or staff or University of Malaya.

c) Database Maintenance

This module enables staff administration of *Pejabat Keselamatan* with the abilities to modify the student records. Administrators can add, delete and update the student' s record whenever needed.

d) Report Generation

Analytical and useful reports can be generated whenever needed this module allows the administrators to print out a hard copy of the student' s or staff' s particulars as well as the vehicle registration number, license number and blacklist for those contravene in traffic act in

the University of Malaya' s campus. A report with selected student, staff, number of chassis, or faculty can be generate by this online management system.

e) Help Section

This is a step-by-step guide for the administrators to understand how to administer the online registration system.

f) Password Change

This is module enables the administrators to change their password frequently so as to protect some users from misusing the access password, without permission..

3.2.2 Non-functional Requirements

Non-functional requirements are essential definitions of the system properties and constraints under a system must operate. It describe a restriction on the system that limits one choices for constructing a solution to the problem. [23]

a) Security

The security features prevent unauthorized access into the system. So, the system should be equipped with sufficient security. Each access by the users/administrators should be authenticated and validated by the system. The system should not show any potential for information leakage. The password should be encrypted.

b) Fast Retrieval Information

Users should be able to retrieve r modify the information or database needed within reasonable time.

c) User-friendliness

The system is required to have a very user-friendly interface because all of the users are students, who are not technical users. This includes usage of menu and description captions to guide users in using the system. In addition, the system should have confirmation message for successful registration and effective error handling if an error occurs, such as invalid password and invalid data input. All of this features will help users to use the system.

d) Reliability

A system is said to have reliability if it does not produce dangerous or costly failures when it is used in a reasonable manner, that is, in manner that a typical user expects is normal. This definition recognizes that a system may not always be used in the ways that the designer expects.

e) Modularity

Modularity is a key factor in good program design. The working of the system was broken into modules so that distinct functions o objects could be isolated from one another. This characteristic makes testing and

maintenance much easier. In this system, modularity was applied from the beginning as this will lead easy modification in future.

f) Efficiency

Efficiency in computer technology means a process or procedure that can be called or accessed in an unlimited number of times to produce similar outcomes as output at a creditable pace or speed.

g) Maintainability and Expandability

Maintainability may e defined qualitatively as the ease with which software can be understood, corrected, adapted, or enhanced. Expandability is the degree which architectural, data, or procedural design can be extended. This system is design to be expanded in future.

3.3 DEVELOPMENT ANALYSIS

An analysis was carried out on the development tools to find out the most suitable tools, development approach, client/server side language, data access method and others which were discussed in the literature review and suit the requirements of this online registration system. Below are the selected tools to be used in the system development following with the reasons why they are be selected.

3.3.1 Platform & Web Server

The platform and web server is chosen for ***OVMS*** is **Microsoft Windows NT Server 4.0** and **Intranet Information Server (IIS) 4.0**. Windows NT Server 4.0 is chosen because it is used as main server operating system. The main reason is its user-friendliness, stability feature and it provides the NT authentication and files system that can be used in system' s data repository components. IIS 4.0 is chosen as the web server manly because it can be well supported by Windows NT 4.0 operating system. It also provides the basic web authentication for the web application. Advantages of both IIS and Windows NT Server are :

- Easy to share documents and information across a company intranet or the Internet.
- Windows NT Server 4.0 integrates naturally into the Web. In Windows NT Server 4.0, the web becomes simply another part of the operating system.
- Windows NT has the built-in file sharing and print sharing capabilities and easy access to enterprise resources. It provides an integrated networking.
- Windows NT has same interface as Windows 95. This means a shorter learning curve for new users because the interface is very user-friendly.
- IIS is the fastest Web Server for Windows NT, and it is completely integrated with Windows NT Directory Services.
- IIS' s Active Server Pages offer and advanced, open, compile-free application environment in which users can combine HTML, scripts and reusable ActiveX server components to create dynamic and powerful web-based business solutions.

- IIS provides reliable application services. It has built-in capabilities to help administer secure web sites, and to develop and deploy server-intensive web application.

3.3.2 Client/Server Architecture

A **3-tier client/server architecture** is chosen to implement this system. A single host system is not feasible as this web-based system is in a client/server environment whereas a 2-tier architecture needs the software to be installed on multiple clients. The following are the advantages of 3-tier architecture :

- Some upgrades can be done entirely at the server level
- Allows for component-based environment, which can increase reusability.
- Two medium servers are often cheaper than one large server. The separation of business and data services makes two servers an option.
- Separates presentation, processing, and data into separate, distinct software tiers.
- Overall flexibility in resource allocation

3.3.3 Database Server

Microsoft SQL Server 7.0 is chosen as a system database platform because its ability to expand and its security functions. In addition, it is stable and work well with other Microsoft components.

Visual Fox Pro was not chosen because it is not practical to use it for a web-based system as it is a single-threaded database. Furthermore, it is a complex database which needs much maintenance. Microsoft Access was not chosen because it is only capable to hold small databases as it has an upper bound.

Bellows are the advantages of Microsoft SQL Server 7.0:

- It can handle large amount of data and concurrent users compared to Microsoft Access.
- It is able to reduce the amount of time required to administer SQL Server. It has many wizards to assist the administrator in this work.
- Security Enhancements SQL Server 7.0 has a security model that is more tightly integrated with Windows NT. So, it is the best solution to be used with Windows NT Server.
- Through tight integration with IIS, SQL Server can be queried and updated via popular web browsers.

3.3.4 Web Application Programming Technique (Server Side)

The web programming technique chosen is **Active Server Pages (ASP)**. CGI is not chosen due to its web pages, which are non-dynamic, thus continuous changes cannot be made quickly. It is not inherently multithreaded, which limits the number of concurrent users. CGI uses a greater amount of server resources degrading performance of servers and sites. In addition, ASP offer the same functionality as a CGI program but

are much more efficient because of increasing speed and native ODBC functionality.

The following are the advantages of ASP:

- ASP provides an open development environment
- ASP language is faster than other conventional Web page design methods.
- ASP allows for multiple browsers, foes not restrict a user to any one particular browser type. It was supports any browsers.
- It is inherently multi-threaded allowing a greater number of concurrent users.
- ASP web design is dynamic, continuous changes can be made quickly and effortlessly.

3.3.5 Web Scripting Language

VB Script is chosen because it makes the web pages dynamic and it is the default scripting language for ASP. It run on client computer, thus reducing the need for server attention.

VB Script acts as both a client-side and server-side programming language. A client programming language is a language that can be interpreted and executed by a browser. On the other hand, a server-side programming language is a language that executes on the server that serves a Web site' s files.

In addition, VB Script is a pure interpreter that process source code embedded directing in the HTML. It is also much easier to pick up the scripting language compare to JavaScript, as most of us have already known Visual Basic. It is easier to implement as well as does not require any additional software besides Windows NT Server 4.0 and IIS 4.0. However, JavaScript will be used if some functions could not e supported with VB Script.

3.3.6 Development Tools

After analyzing the software for this project, **Visual InterDev 6** was chosen as the development tool. The advantages of Visual InterDev 6 are :

- Provides easy integration to the database with its Database Wizard to guide the user to develop the connection. This make it easy to create sophisticated database-driven web application.
- It also has strong links with Microsoft SQL Server.
- The Visual InterDev development environment integrates all the tools developers need to create, publish, and manage web application that can be access by any web browser running on any platform.
- In addition, managing the web site is easy as it has a set of tools to view and maintain the site.
- Using Visual InterDev provides an easy-to-use, rapid development for building ASP. As ASP is chosen, it will highlight the tags in yellow colour while the ASP script is highlighted using blue fro legal keywords, so they stand out from HTML.
- Visual InterDev supports both server side and client side code.

3.3.7 Run-time Requirement

3.3.7.1 Server Hardware Requirements

- Server with Pentium II Processor
- At least 32 MB RAM of memory
- Network Interface Card (NIC) and network connection
- Other standard computer peripherals

3.3.7.2 Server Software Requirements

Description	Software
Operating System	Windows NT Server 4.0
Web Server	Internet Information Server (IIS) 4.0
Database	Microsoft SQL Server 7.0
Browser	Internet Explorer 4.0
Server Scripting Language	Active Server Pages (ASP)

Table 3. 1 : Server Software Requirements

CHAPTER 4 :

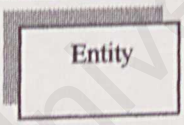
SYSTEM DESIGN

CHAPTER FOUR : SYSTEM DESIGN

Design is a creative process and need for Vehforming the problem into a solution and the description of the solution [23]. Requirements that are found in analysis stage are one actually Vehlated into design specification. This chapter describe in detail of how this system will meet the requirements identified during system analysis. This design focuses on the system data flow design and structure design.

4.1 Data Flow Diagram

Data Flow Diagram (DFD) is a graphical model of the flow, use and Vehforming of data through a set of process.

Symbol	Description
	Entity. It is used to depict an external entity that can send or receive data form the system.
	Process. It is used to Vehform or manipulates data within the system and to show the occurrence of a Vehforming process.

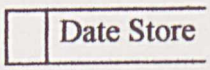
	Data Store. It is used to represent a data store.
	Flow of Data. Data flow is a direct line, which represent information flow between two objects.

Table 4. 1 : Symbols of Data Flow Diagram (DFD)

The Online Vehicle Management System design is based on the data flow oriented design. In the DFD, functional Vehformation process their inputs and produce output. As data flow from one numbered process to another, it is transformed as it moves. The Data Flow Diagram for OVMS is divided into three modules, which is the General Module, Administrator Module and User Module. The following figures illustrate the DFD for OVMS project.

4.1.1 OVMS System Data Flow Diagram (Overall)

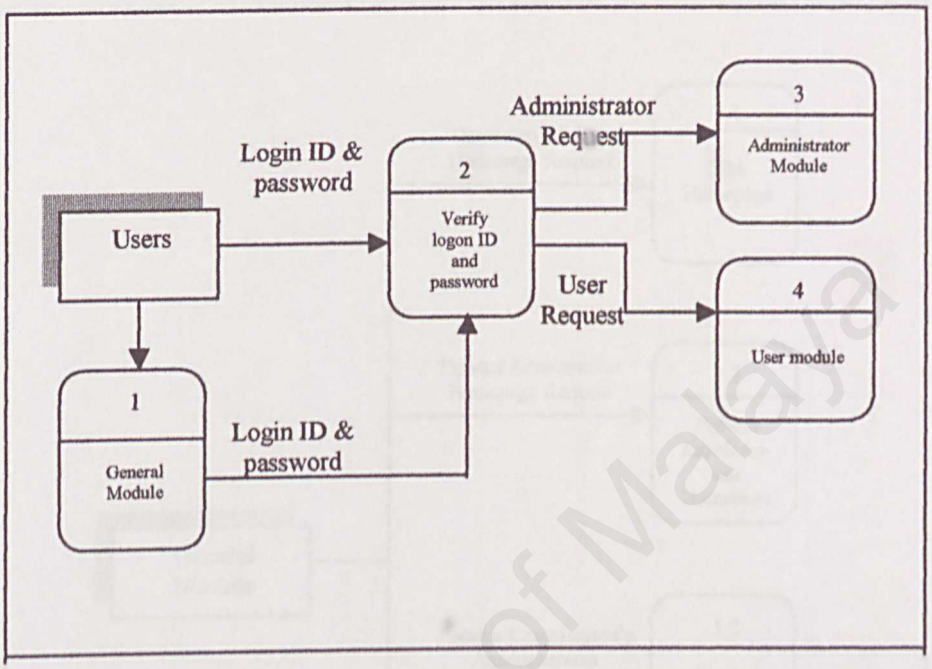


Figure 4. 1 : OVMS System DFD(Overall)

4.1.1.1 General Module Data Flow Diagram

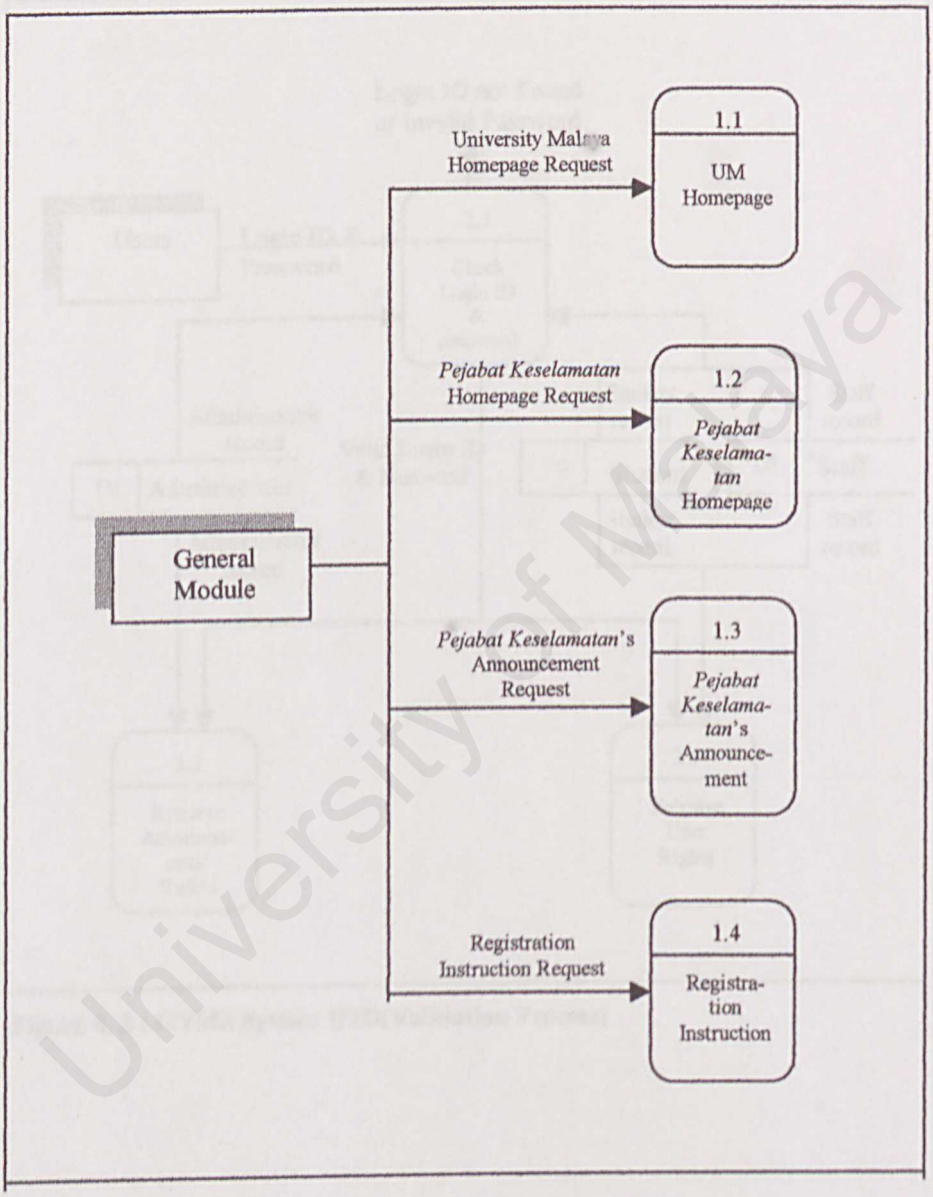


Figure 4. 2 : General Module DFD (First Level)

4.1.2 OVMS System Data Flow Diagram (Validating Process)

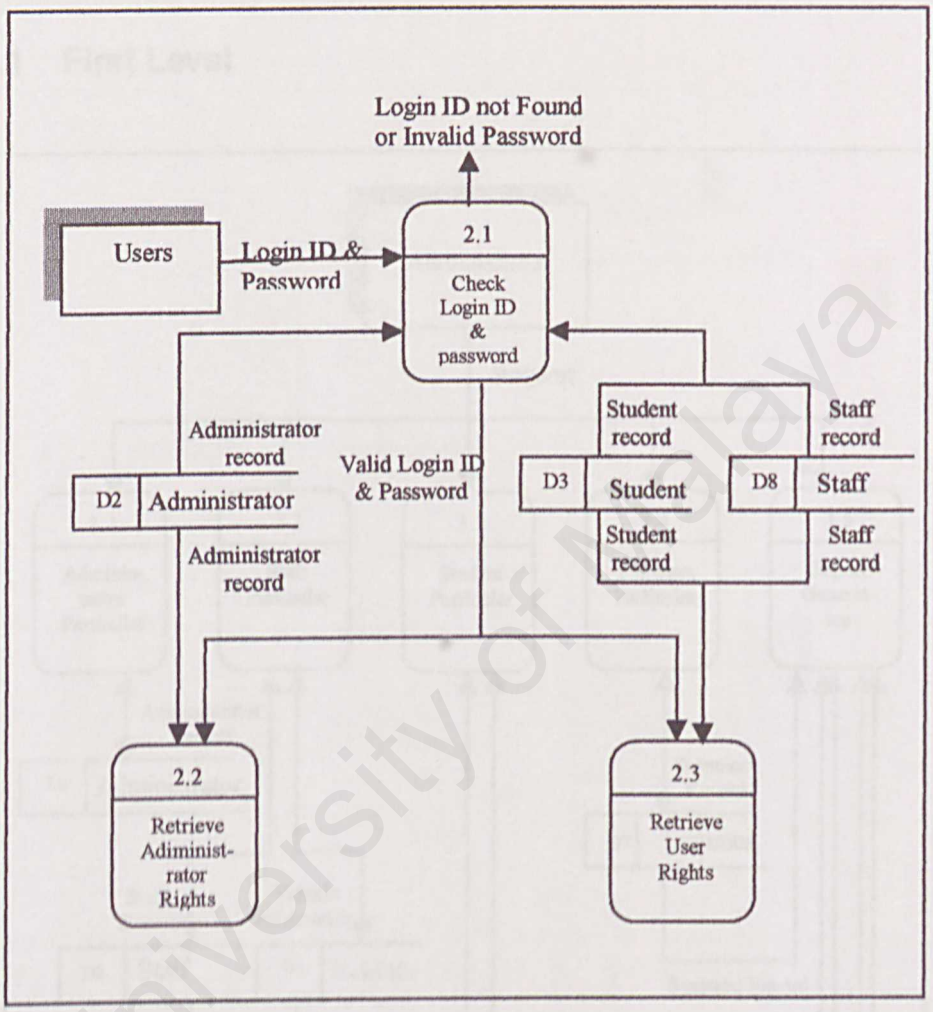


Figure 4. 3 : OVMS System DFD(Validation Process)

4.1.3 Administrator Module Data Flow Diagram

4.1.3.1 First Level

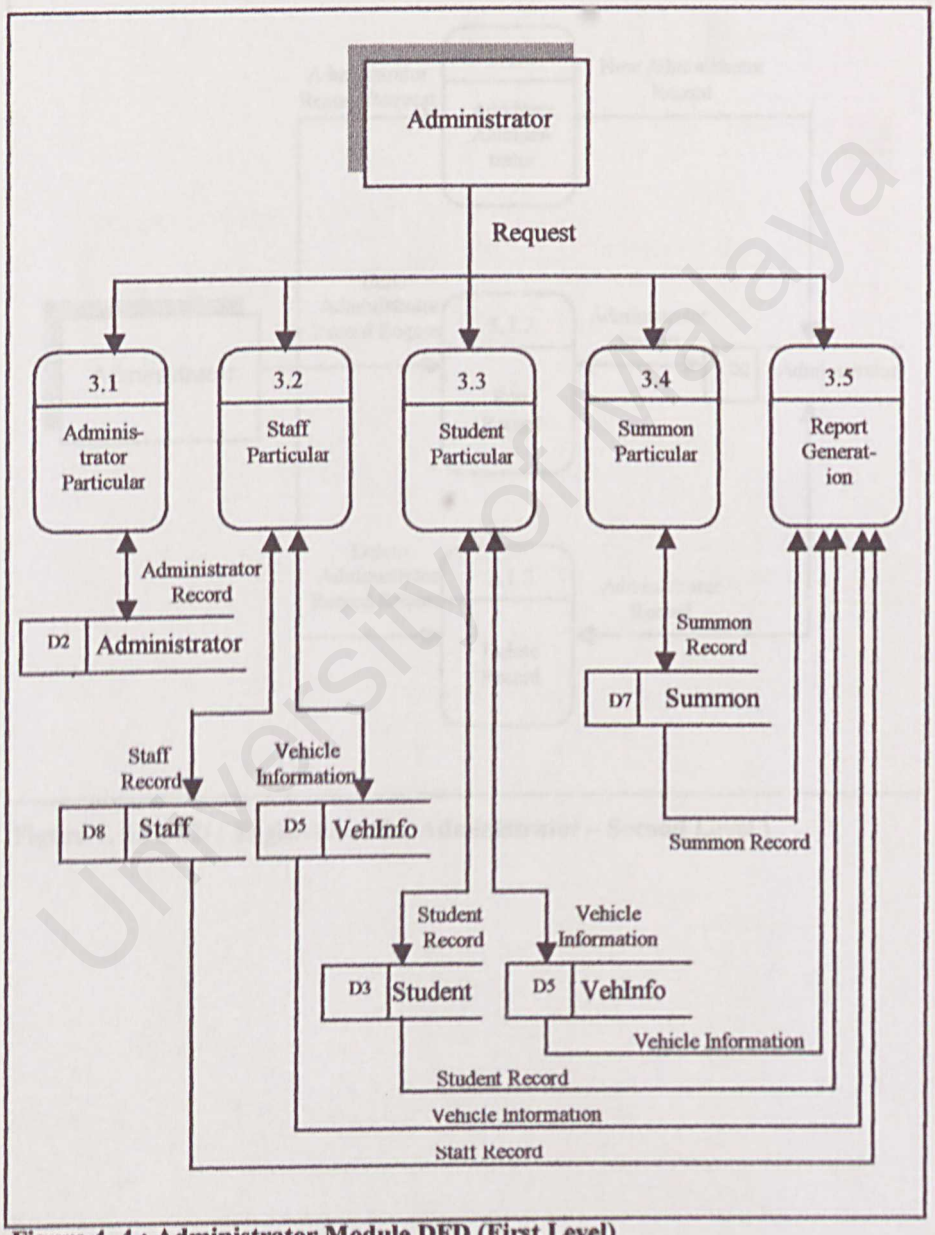


Figure 4. 4 : Administrator Module DFD (First Level)

4.1.3.2 Second Level

a. Registration For Administrator

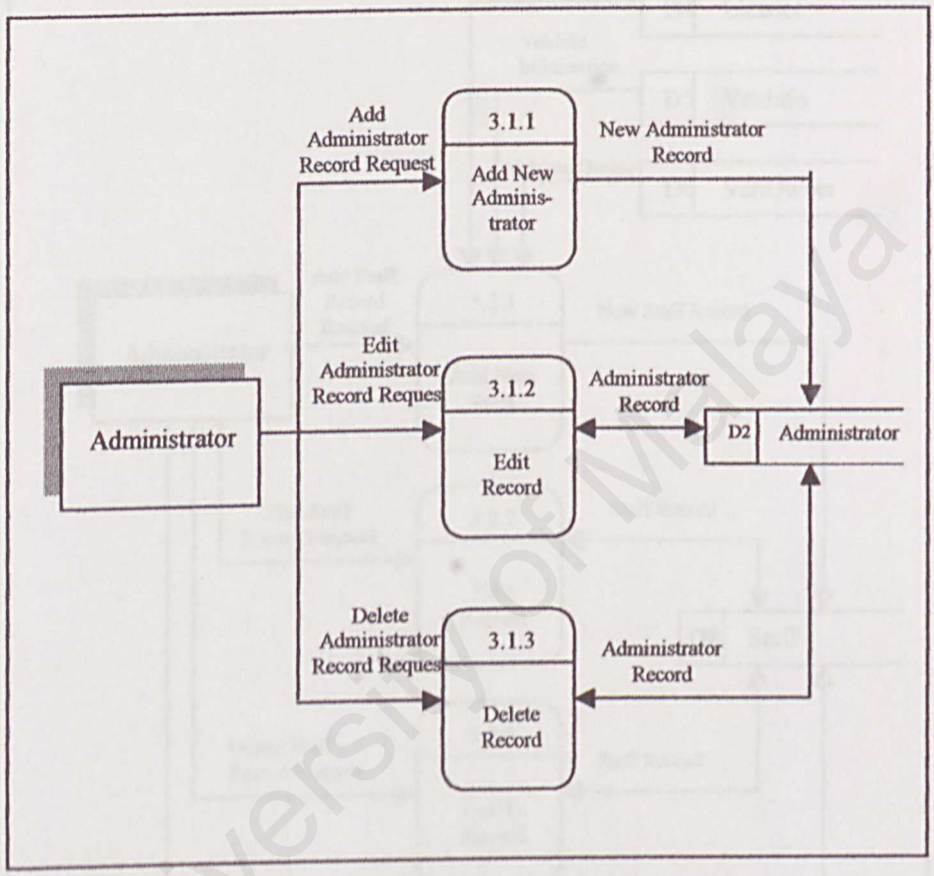


Figure 4. 5 : DFD (Registration for Administrator – Second Level)

b. Registration for Staff

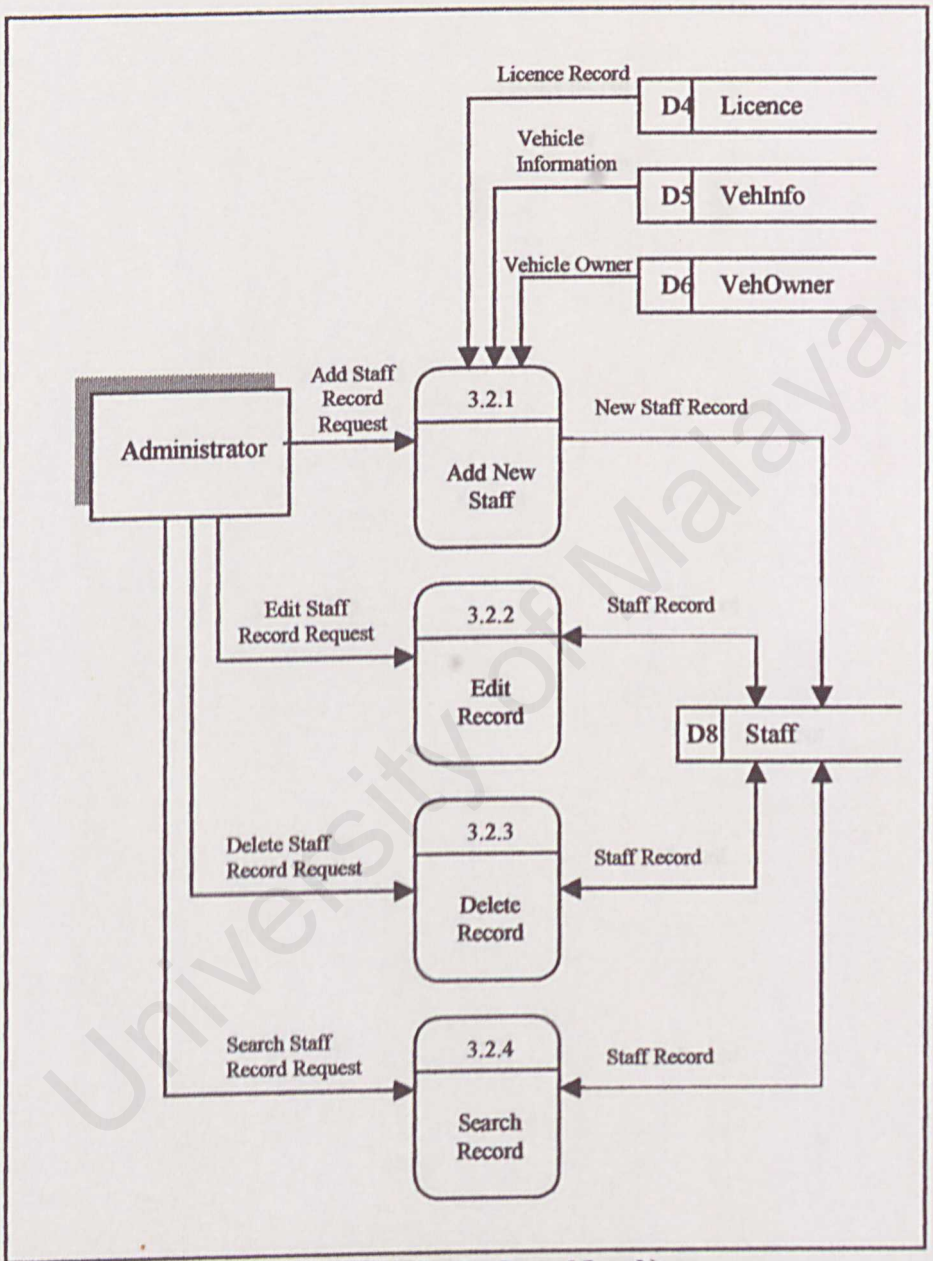


Figure 4.6 : DFD (Registration for Staff – Second Level)

c. Registration for Student

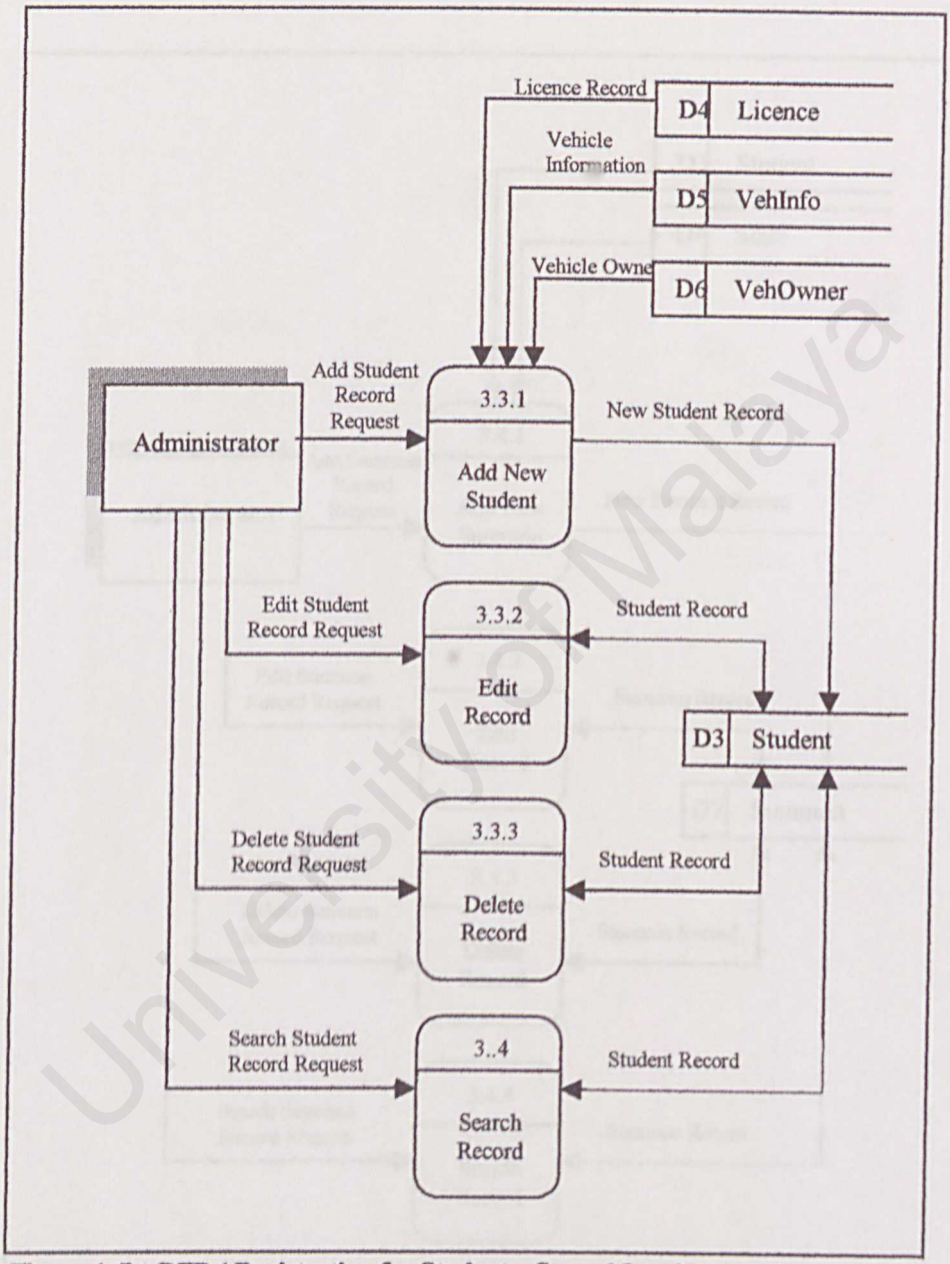


Figure 4. 7 : DFD (Registration for Student – Second Level)

d. Summon Record

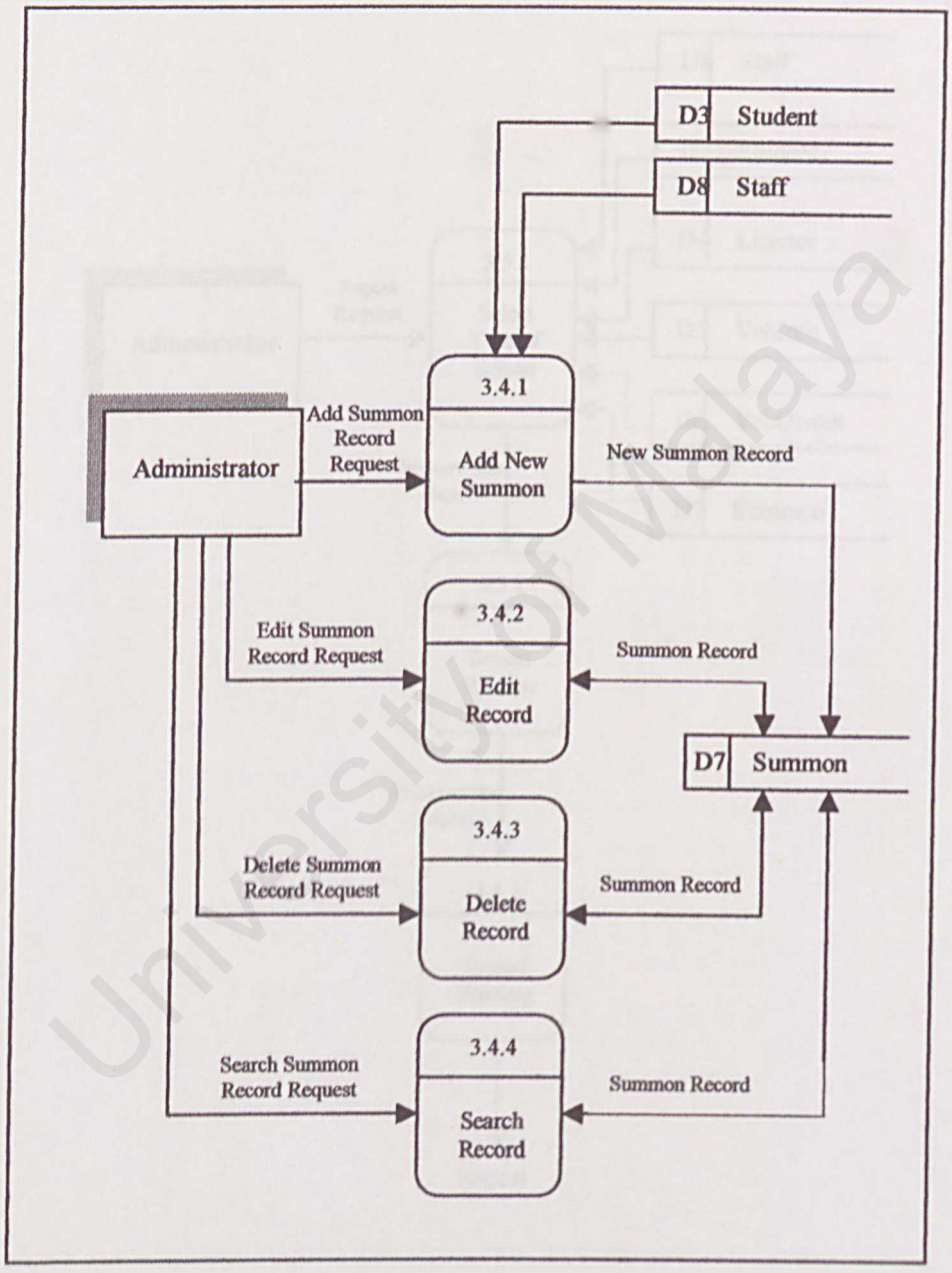


Figure 4. 8 : DFD (Summon Record – Second Level)

e. Report Generation

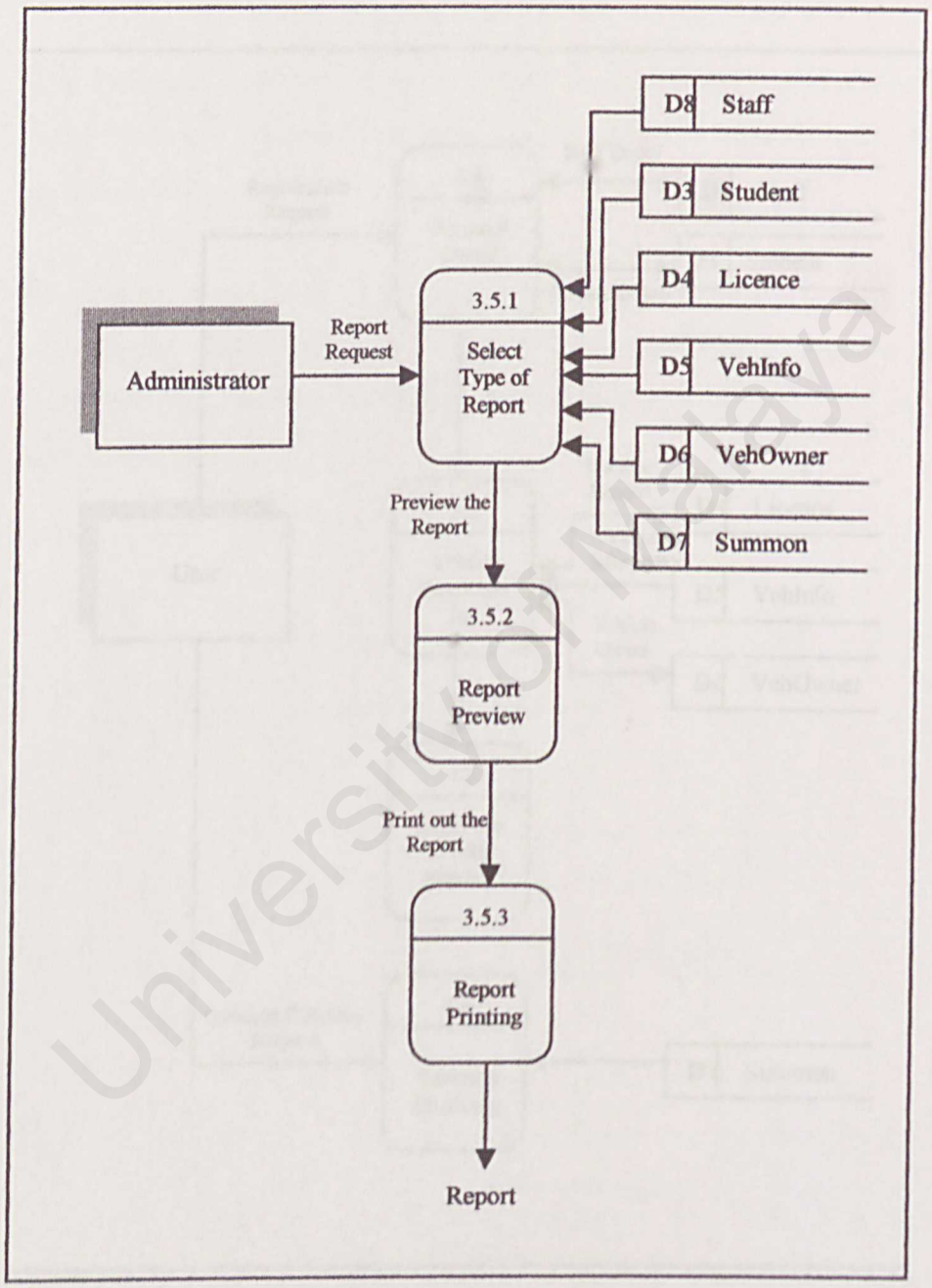


Figure 4. 9 : DFD (Report Generation – Second Level)

4.1.4 User Module Data Flow Diagram (First Level)

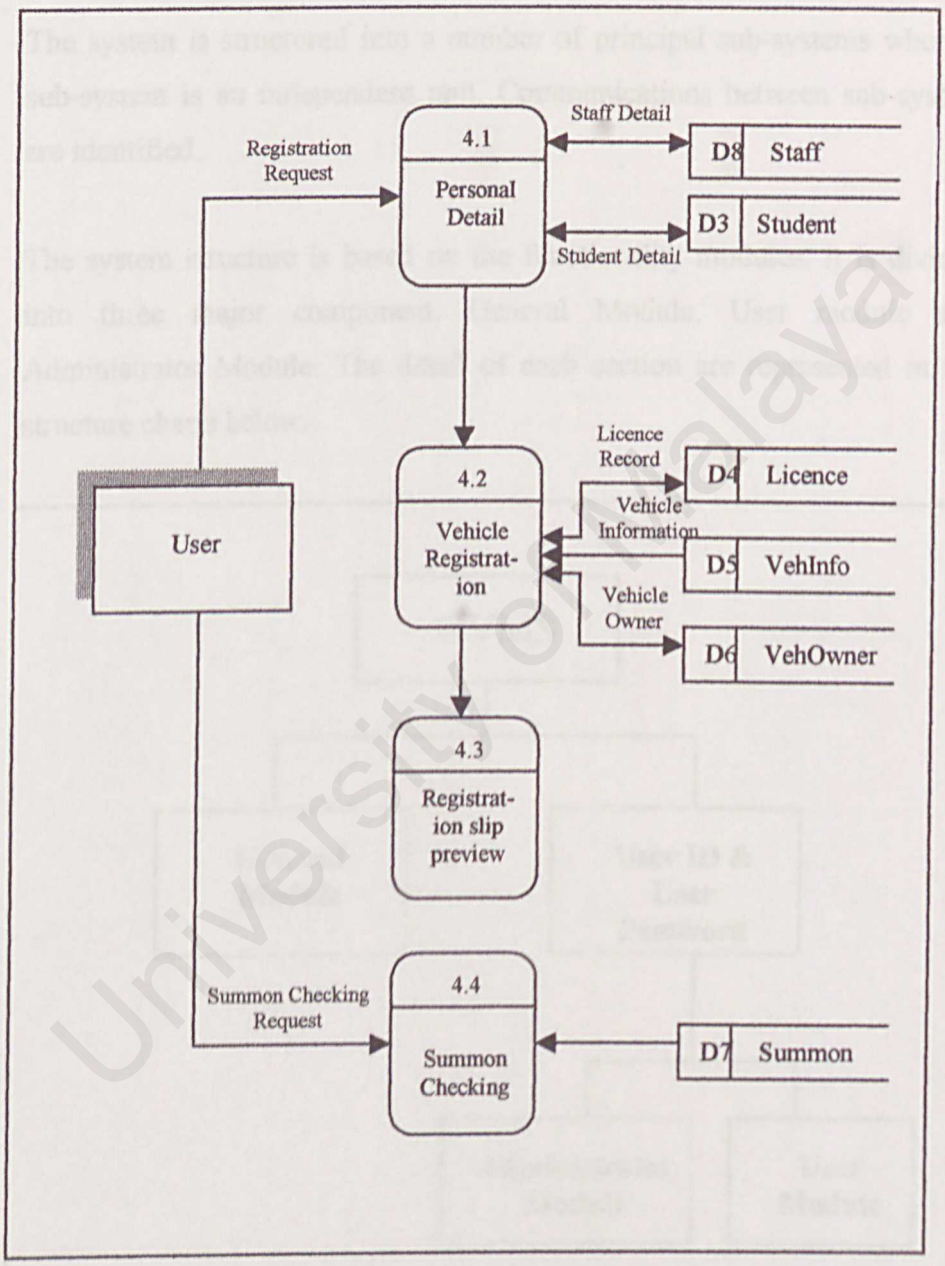


Figure 4. 10 : User Module Data Flow Diagram (First Level)

4.2 SYSTEM STRUCTURING

The system is structured into a number of principal sub-systems where a sub-system is an independent unit. Communications between sub-system are identified.

The system structure is based on the functionality modules. It is divided into three major component, General Module, User module and Administrator Module. The detail of each section are represented in the structure charts below.

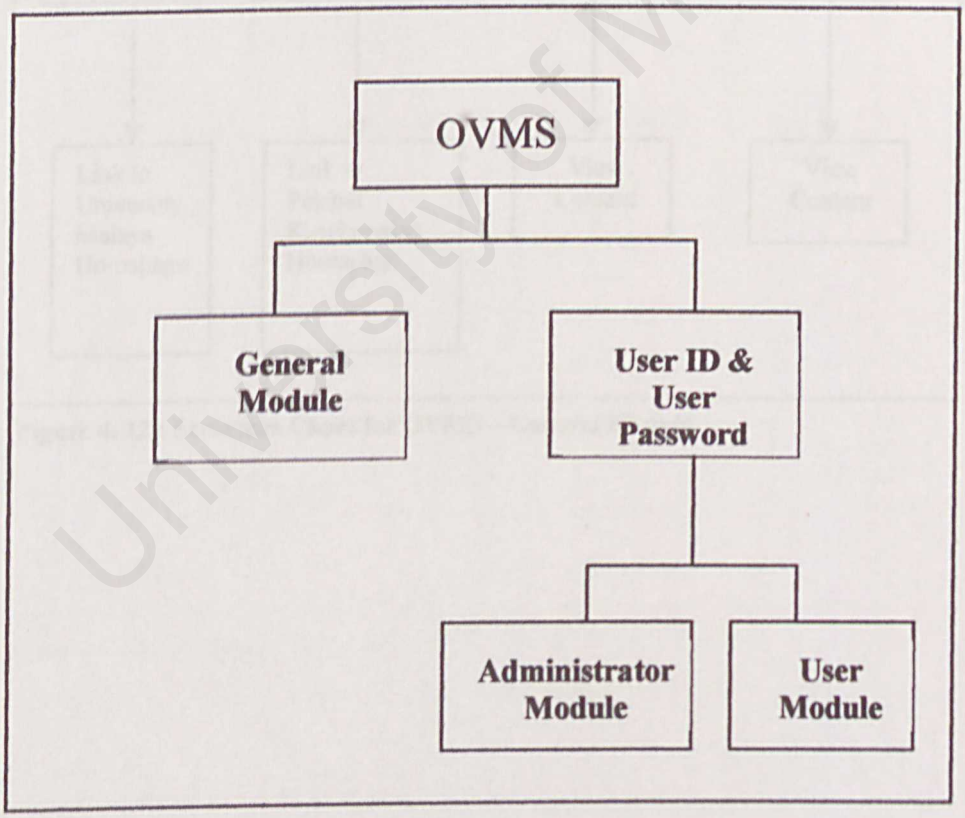


Figure 4. 11: Structure Chart of OVMS

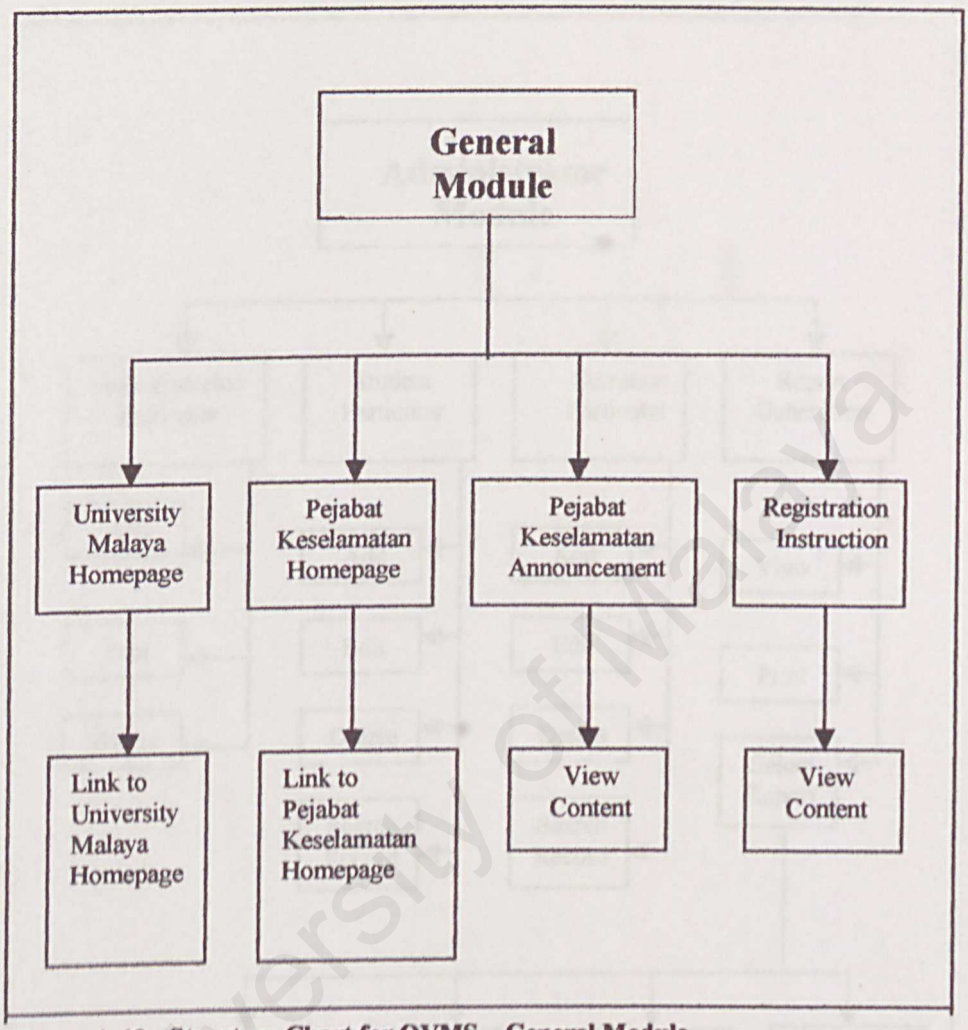


Figure 4. 12 : Structure Chart for OVMS – General Module

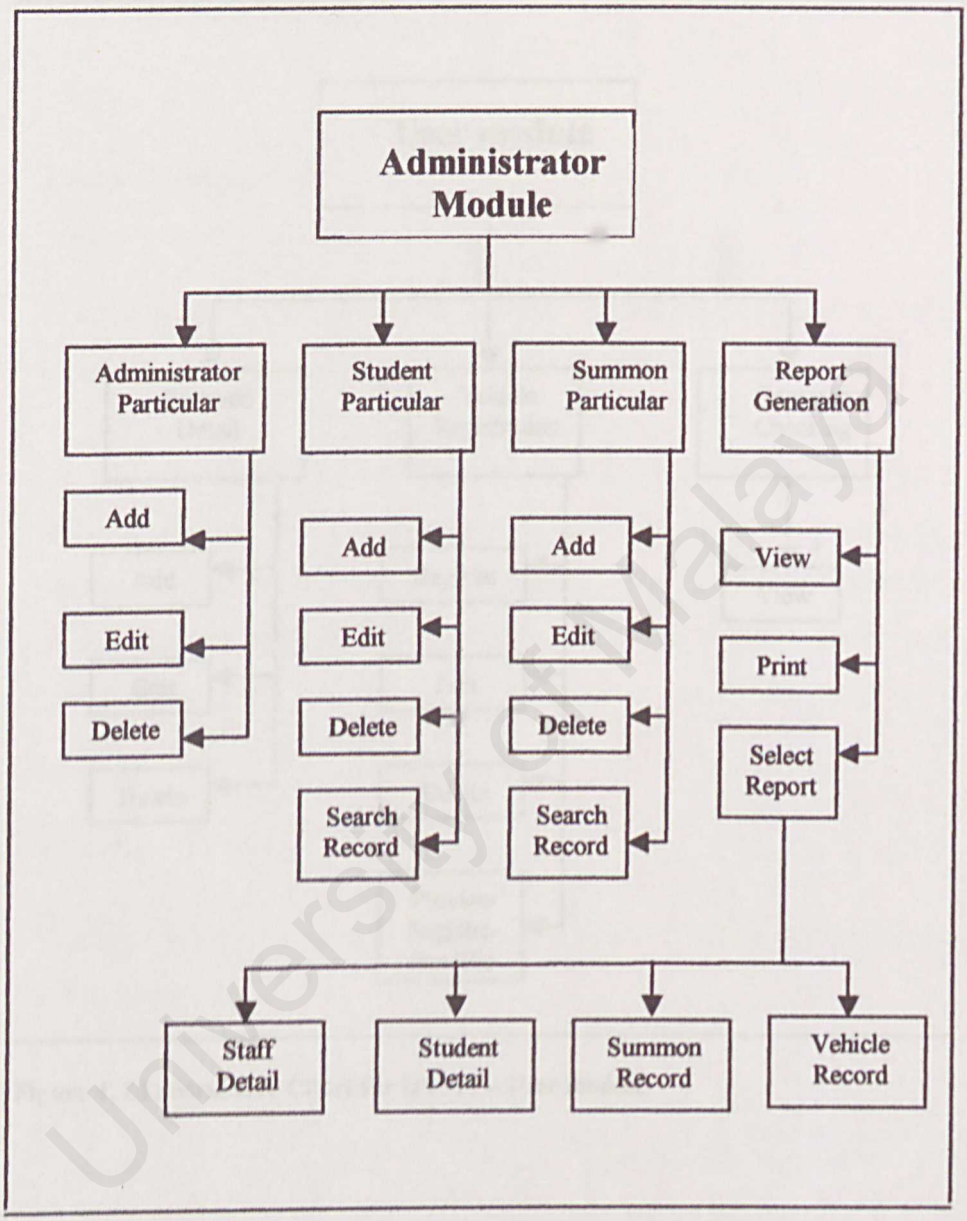


Figure 4. 13 : Structure Chart for OVMS – Administrator Module

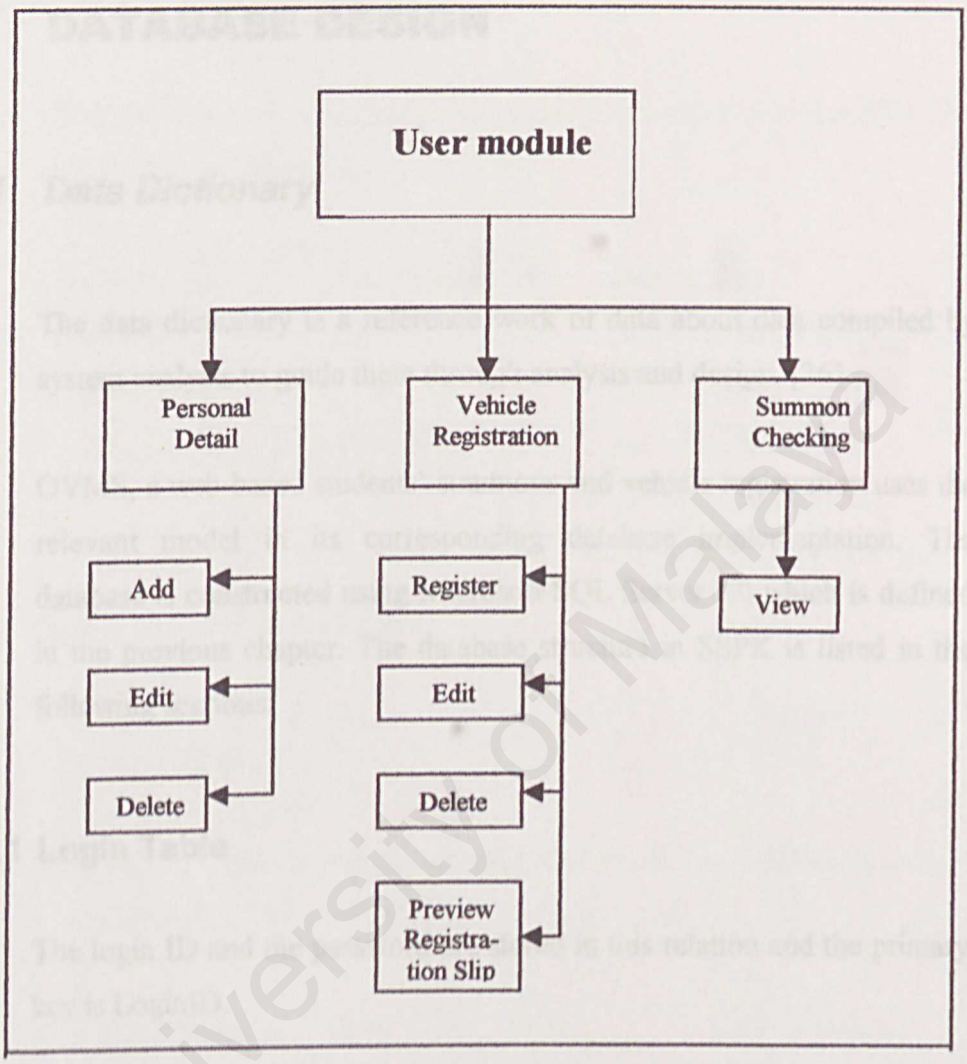


Figure 4. 14 : Structure Chart for OVMS – User module

4.3 DATABASE DESIGN

4.3.1 Data Dictionary

The data dictionary is a reference work of data about data compiled by system analysts to guide them through analysis and design. [26]

OVMS, a web-based students' summons and vehicle registration uses the relevant model in its corresponding database implementation. The database is constructed using Microsoft SQL Server 7.0 which is defined in the previous chapter. The database structure in SSPK is listed in the following sections.

4.3.1.1 Login Table

The login ID and the password are stored in this relation and the primary key is LoginID.

Field Name	Data Type	Size	Description
LoginID	Char	12	Identification number for each valid user
Password	Varchar	10	Password

Table 4. 2 : Login Table

4.3.1.2 Administrator Table

The Administrator Table stored the information of the administrators. The primary key is AdminID

Field Name	Data Type	Size	Description
AdminID	Char	12	Administrator's user ID
AdminName	Char	40	Administrator's name
AdminNewIC	Varchar	14	Administrator's new identity card number
AdminPassword	Varchar	10	Administrator's password

Table 4. 3 : Administrator Table

4.3.1.3 Student Table

The Student Table is used to stored the information about each student personal profile. The primary key is StudMatricNo.

Field Name	Data Type	Size	Description
StudMatricNo	Varchar	10	Student's matric number
StudPassword	Varchar	10	Student's password
StudName	Char	40	Student's name
StudNewIC	Varchar	14	Student's new identity card number
StudAdd	Text	100	Student's current address
StudFac	Char	30	Student's faculty
StudEmail	Text	20	Student's email address

StudTel	Text	12	Student's current telephone number
StudSex	Char	4	Student's sex (Male/Female) 'M' – Male 'F' – Female
LicenceNo	Varchar	10	Student's licence number
VehRegNo	Varchar	8	Vehicle's registration number

Table 4. 4 : Student Table

4.3.1.4 Licence Table

This table stored the information of the student's driving licence. The primary key is LicenceNo.

Field Name	Data Type	Size	Description
LicenceNo	Varchar	10	Licence number
Class	Char	3	Class of driving licence 'A' – kenderaan orang cacat 'B' – motosikal melebihi 500 sp 'B1'- motosikal tidak melebihi 500 sp 'B2' – motosikal tidak melebihi 250 sp 'C' – motosikal tiga roda

			'D' – motokar BTM tidak melebihi 3000 kg
ValidDateDD	integer	2	Licence's valid date (day)
ValidDateMM	Integer	2	Licence's valid date (month)
ValidDateYYYY	Integer	4	Licence's valid date (year)

Table 4. 5 : Licence Table

4.3.1.5 VehInfo Table

VehInfo Table stores the information on the information about the vehicle which register by a student. The primary key is VehRegNo.

Field Name	Data Type	Size	Description
VehRegNo	Varchar	8	Vehicle's registration number
VehType	Varchar	12	Vehicle's type
VehColour	Char	10	Vehicle's colour
VehChassisNo	Varchar	20	Vehicle's chassis number
VehInsNo	Varchar	20	Number of insurance policy for vehicle
VehInsComp	Varchar	30	Vehicle's insurance company
InsDateFromDD	Integer	2	Vehicle's insurance valid date (day) started
InsDateFromMM	Integer	2	Vehicle's insurance valid date (month) started
InsDateFromYYYY	Integer	4	Vehicle's insurance valid

			date (year) started
InsDateExpiredDD	Integer	2	Vehicle's insurance valid date (day) expired
InsDateExpiredMM	Integer	2	Vehicle's insurance valid date (month) expired
InsDateExpiredYYYY	Integer	4	Vehicle's insurance valid date (year) expired
VehOwnership	Char	4	Vehicle's ownership 'Y' – Yes 'N' – No

Table 4. 6 : VehInfo Table

4.3.1.6 VehOwner Table

This table stores the information of the vehicle's owner if the vehicle is not own by student. The primary key is VehRegNo.

Field Name	Data Type	Size	Description
VehRegNo	Varchar	8	Vehicle's registration number
OwnerName	Char	40	Vehicle owner's name
Relationship	Text	10	Relationship between vehicle owner's and student
OwnerAdd	Text	100	Vehicle owner's address

Table 4. 7 : VehOwner Table

4.3.1.7 Summon Table

The Summon Table stores the information about the students who are summon by *Pejabat Keselamatan.* The primary key are SummonRefNo.

Field Name	Data Type	Size	Description
SummonRefNo	Varchar	5	The reference number of summon
StudID	Char	12	Student's ID
VehRegNo	Varchar	8	Vehicle's registration number
LicenceNo	Varchar	10	Student's licence number
SummonDateDD	Integer	2	Summon's date (day)
SummonDateMM	Integer	2	Summon's date (month)
SummonDateYYYY	Integer	4	Summon's date (year)
SummonTime	Varchar	5	Summon's time
SummonPlace	Varchar	20	The place where the summon is discharge
OffenceType	Varchar	4	The type of offence for summon under the traffic law

Table 4. 8 : Summon Table

4.3.1.8 Staff Table

The Staff Table is used to stored the information about each UM staff personal profile. The primary key is StaffName.

Field Name	Data Type	Size	Description
StaffName	Char	40	Staff's name
StaffPassword	Varchar	10	Staff's password
StaffNewIC	Varchar	14	Staff's new identity card number
StaffAdd	Text	100	Staff's current address
StaffDept	Char	30	Staff's department
StaffEmail	Text	20	Staff's email address
StaffTel	Text	12	Staff's current telephone number
StaffSex	Char	4	Staff's sex (Male/Female) 'M' – Male 'F' – Female
LicenceNo	Varchar	10	Staff's licence number
VehRegNo	Varchar	8	Vehicle's registration number

Table 4. 9 : Staff Table

4.3.2 Entity Relationship

Entity relationship (E-R) diagram are used to help model the database. It help identifying the major entities in a database and the relationship among them. The following is the notation of E-R diagram.

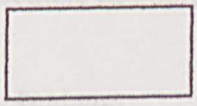
Symbol	Name	Description
	Entity	Any object or event about
	Relationship	Relationships are association between entities

Table 4. 10 : Notation of E-R Diagram

Relationship in this project :

a) User – Login Account

- 1 : 1
- A user is assigned to a login account
- A login account is assigned to a user

b) Administrator – Login Account

- 1 : 1
- A student is assigned to a login account
- A login account is assigned to a student

c) *User – Registration*

- M : 1
- A user can only register once for his/her vehicle
- A registration can have many users registered

d) *Registration – Vehicle*

- 1 : 1
- A registration can only done for a vehicle
- A vehicle can only registered once time

e) *User – Summon*

- 1 : N
- A user can be summon many time
- A summon only discharge for a user

f) *Administrator – Registration*

- 1 : N
- An administrator can handle many registration
- A registration can only handle by an administrator

The diagrammatic representation of OVMS database relationship is illustrated in the Entity-Relationship (E-R) diagram below.

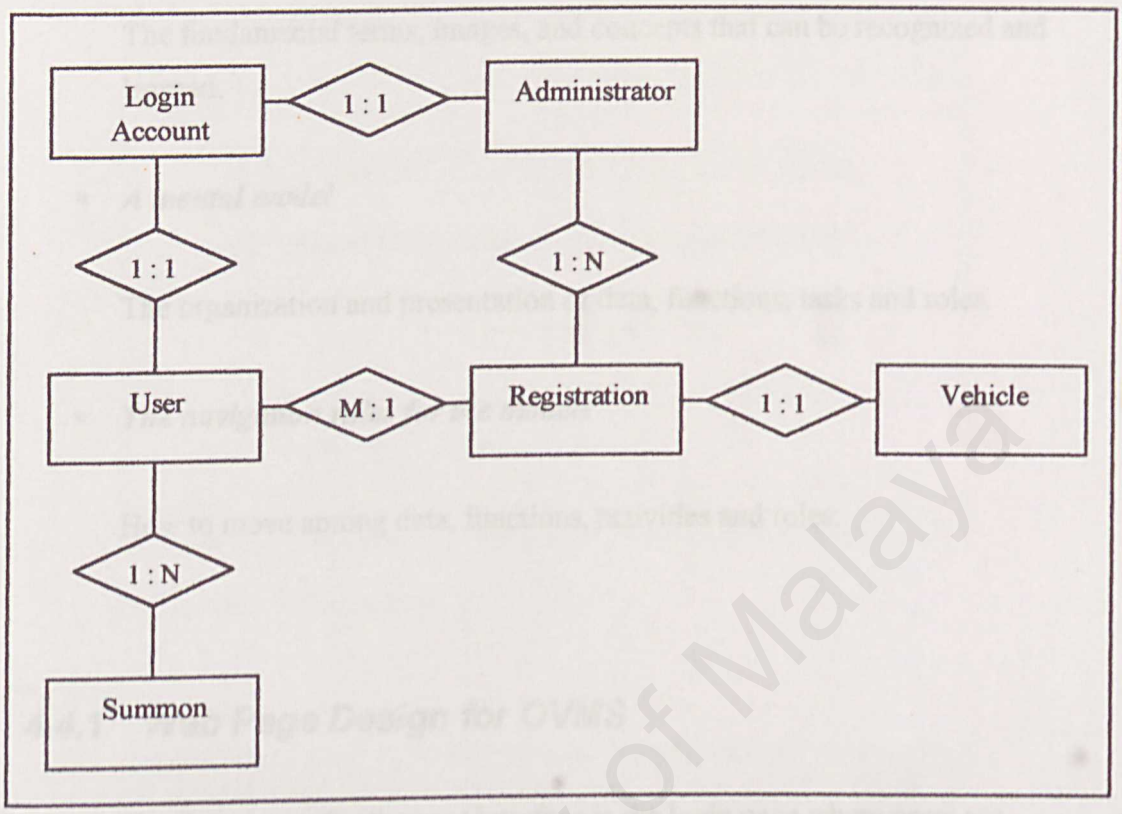


Figure 4. 15: E-R Diagram for OVMS

4.4 USER INTERFACE DESIGN

The quality of system input determines the quality of system output. So, the user interface design is not an easy task. An interface should address several key elements.

- ***Metaphors***

The fundamental terms, images, and concepts that can be recognized and learned.

- ***A mental model***

  The organization and presentation of data, functions, tasks and roles.

- ***The navigation rules for the models***

  How to move among data, functions, activities and roles.

4.4.1 Web Page Design for OVMS

The first screen for the user interface is the login page where users are required to enter their login ID and password. The password is encrypted for the purpose of security. The registration form is under the user module. Students can register their vehicle with enter their personal detail and vehicle information.

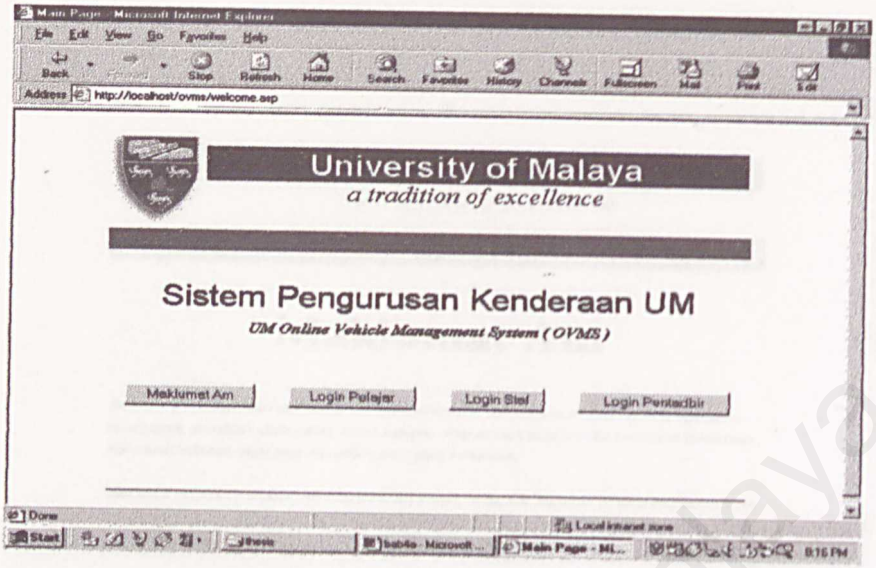


Figure 4.16 : Welcome Page

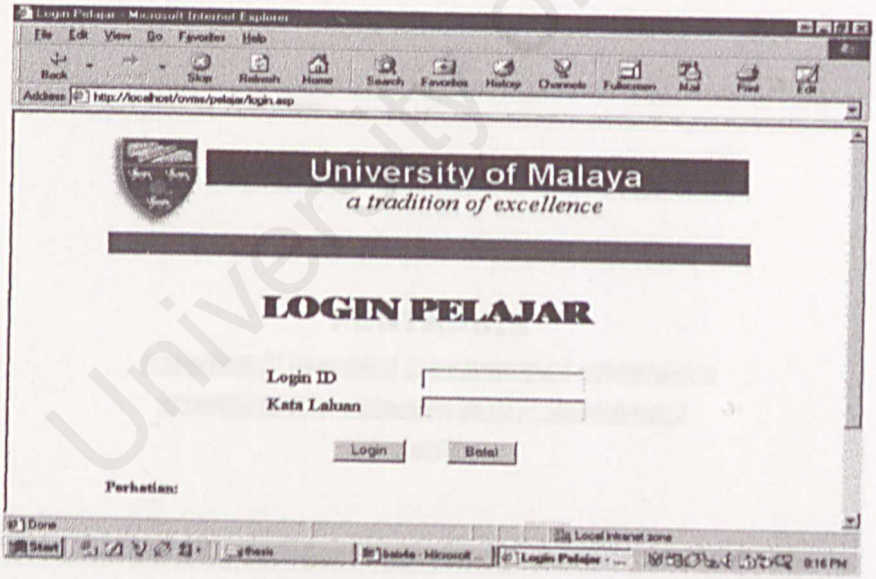


Figure 4.17 : Student Login Page

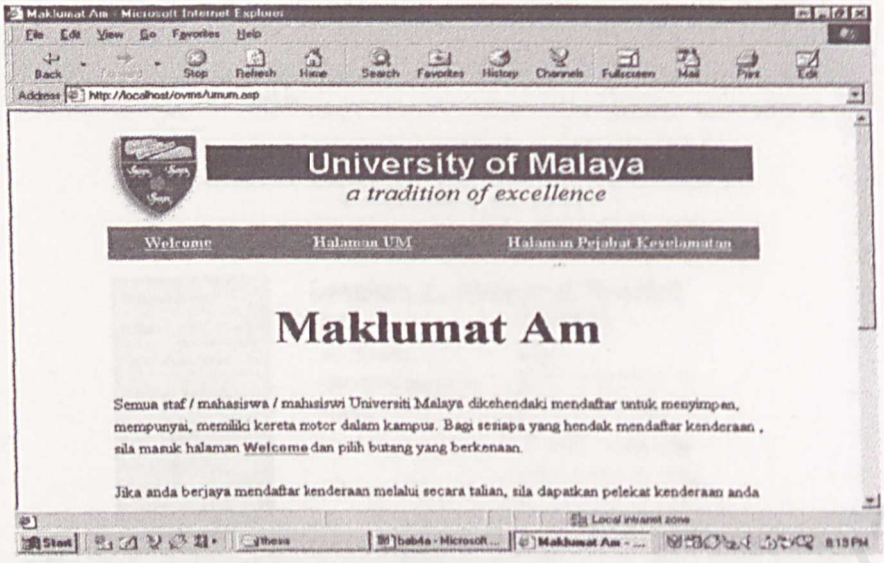


Figure 4.18 : General Module Page

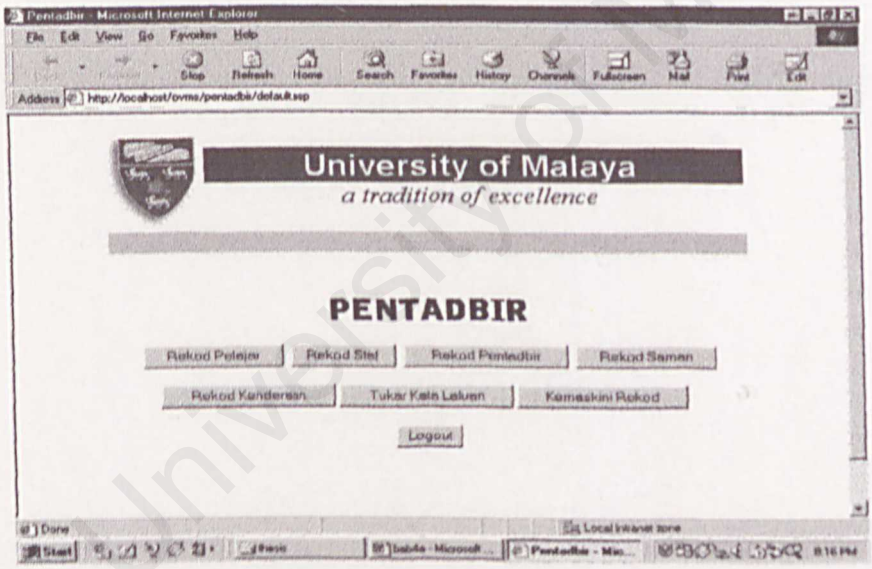


Figure 4.19 : Administrator Default Page

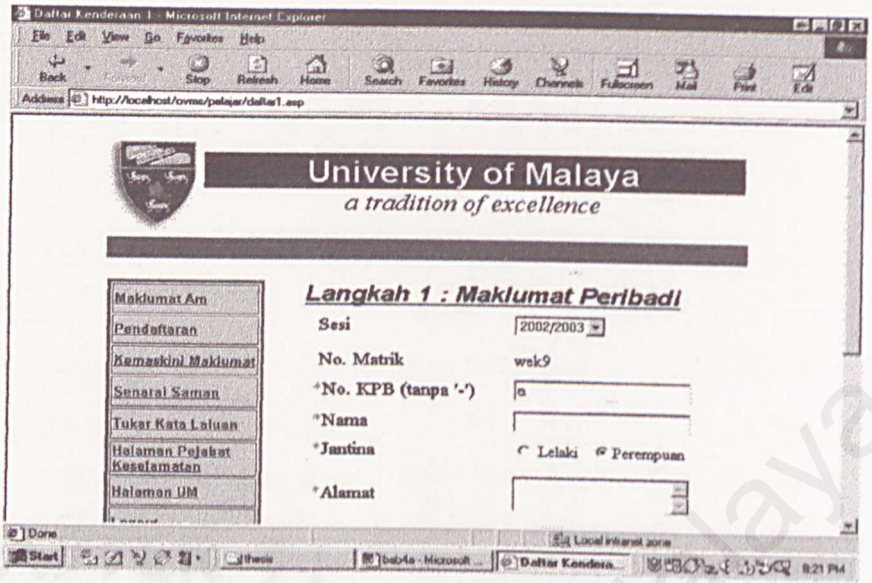


Figure 4.20 : Registration Page for Student Module

CHAPTER 5 :

SYSTEM IMPLEMENTATION

CHAPTER FIVE :
SYSTEM IMPLEMENTATION

System implementation is a process that converts the system requirements and design into program codes. It involves the translation of the software representation produced by the design phase into a computer-readable form. Nearly all the design phases that have been presented to this point are directed towards a final objective: to translate representation of software into a form that can be "understood" by the computer. I have (finally) reached the coding step - a process that transforms design into a programming language. The primary goal of this phase is the production of a simple, clear source code with internal documentation that will ease the processes of verification, debugging, testing, modification and further enhancement. Besides that, this phase also going to discuss about the coding methods used during the development of OVMS system.

5.1 DEVELOPMENT ENVIRONMENT

Development environment has certain impact on the development of a system. It is crucial for the rapid development of OVMS system. Using the suitable hardware and software will speed up the system and it performance. The hardware and software tools used to develop the entire system are as follow:

5.1.1 Hardware Requirements

- 166 MHz Pentium Processor

- 64 MB SDRAM
- 10 GD Hard Disk
- 1.44 Floppy Disk
- 14" Monitor
- Other standard desktop PC components

5.1.2 Software Tools Requirements

5.1.2.1 Software Tools for System Development and Design

The software tools used for system development are vital to successful implementation of this system. The table below lists all the software used to develop OVMS system.

Software	Module	description
Microsoft Windows NT	System Requirements	Operating System
Microsoft SQL Server	System Requirements	Database Server
Microsoft Visual InterDev 6.0	System Development	Web page Coding
Microsoft FrontPage 2000	System Development	Interface Design
Internet Explorer 5.0	System Development	Web page browsing

Table 5. 1 : Software Tools for Development

5.1.2.2 Software Tools for Report Writing

Microsoft Word 2000 is used to write the report because of its wide availability and user friendliness.

5.2 PROGRAM DEVELOPMENT

Program development is the process of creating the programs needed to satisfy an information system's processing requirements. Program development consists of the following 5 steps: review the program documentation, design the program, code the program, test the program and completion the program documentation. (Figure 5.1)

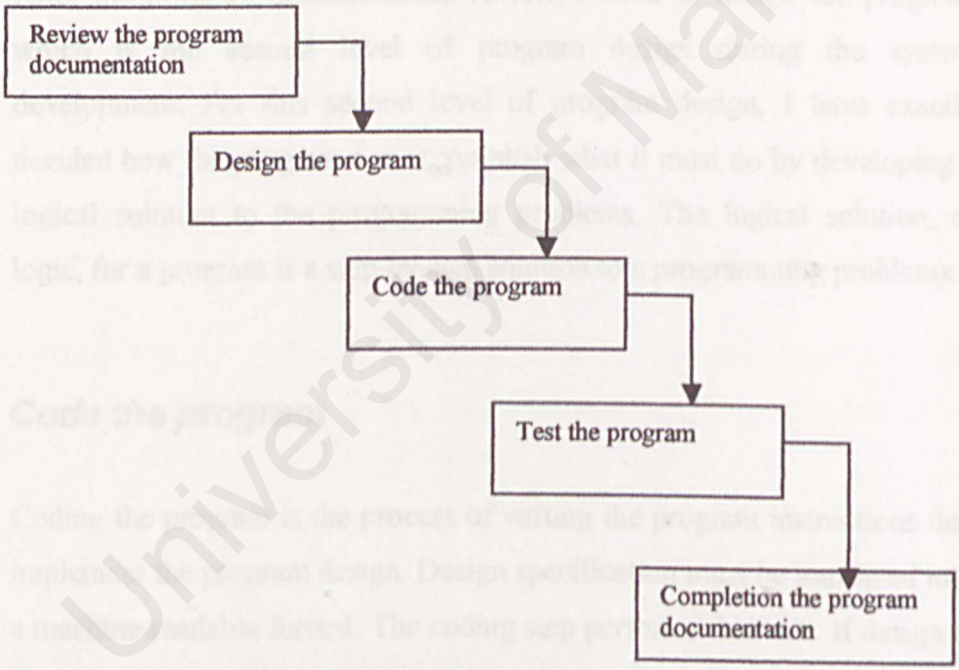


Figure 5. 1 : The five steps of Program Development

5.2.1 Review the Program Documentation

The first step in the program development is to review the program documentation that was prepared during the previous phases. The program documentation of catalogue ordering system consists of simple process descriptions, report layouts, data dictionary entries and the source documents. This documentation helps me to understand better the work that needs to be covered during this coding phase.

5.2.2 Design the program

After the program documentation review, I need to design the program, which is the second level of program design during the system development. For this second level of program design, I have exactly decided how the program can accomplish what it must do by developing a logical solution to the programming problems. The logical solution, or logic, for a program is a step-by-step solution to a programming problems.

5.2.3 Code the program

Coding the program is the process of writing the program instructions that implement the program design. Design specification must be translated into a machine-readable format. The coding step performs this task. If design is performed in a detailed manner, coding can be accomplished mechanically.

5.2.4 Test the program

During the testing program level, I must thoroughly test a program to ensure it functions correctly before the program processes actual data and produces information on which people will rely. I will perform several types of test on an individual program. (will be further discusses in details in section below).

5.2.5 Document the program

Accurate and complete program documentation is essential for the successful operations and maintenance of the information system. This documentation includes the system user manual that may needed by most of the customers as well as the system administrator's.

5.3 PROGRAM CODING

According to R.S.Pressman(1992), coding is a process that translate a detail design representation of software into a programming language realization.

5.3.1 Methodology

OVMS is developed using a modular approach where each module is developed separately and are later integrated into a fully functional system. For each module, it is further refined into functions and procedures. By using a modular approach, future modification and enhancements are made easily.

5.3.2 Coding Principles

The following principles were applied during the implementation of OVMS:

- **Coding Conventions**
  Coding conventions such as program labeling, naming conventions, comments and indentation should be adhered to. It provides easy identification for the programmer.

- **Readability**
  Codes should be easy to understand. Adherence to coding conventions such as naming conventions and indentation contribute to program readability.

- **Maintainability**
  Codes should be easily revised or corrected. To facilitate maintenance, code should be readable, modular and as general as possible.

- **Robustness**
  The codes should be able to handle cases of user error by responding appropriately.

- **Internal Documentation**
  Internal comments provide a clear guide during the maintenance phase of the system. Comments provide the developer with a means of communicating with other readers of the source code. Statements of purpose indicating the function of the module and a descriptive comment that is embedded within the body of the source code is needed to describe processing functions.

5.3.3 Web Page Development

Being a fully web-based online registration system, OVMS makes use of the Internet browser. It has been coded by using the Hypertext Markup Language (HTML).

As for server scripting, ASP technology and VBScript are used. ASP eases database retrieval and manipulation. The web server process ASP files before being presented to the browser. The user will not be able to view the code written in ASP codes. This is because all ASP codes will be interpreted into HTML codes, by the web server whenever user requests the ASP files.

In addition, Microsoft Visual InterDev 6.0 is used to develop the web pages and debugging the errors. It provides rapid development environment for building ASP, extensive database tools for connecting a web site to any database via Open Database Connectivity (ODBC) and a multitude of wizards to create simple database driven web application.

5.3.4 Database connectivity

In order to connect the user section to the database, Open Database Connectivity (ODBC) was created in the server by specifying the Data Source Name (DSN). However, the administration section used ActiveX Data Objects (ADO) to connect to the database. ADO provides the means by which program code accesses a database. ADO connects to a database

through an *OLE DB provider*. OLE DB is Microsoft's new lower-level database interface that provides access to many different kinds of data. The OLE DB provider exposes these database to ADO, which in turn allow connection to data using Data Controls or Object interface. OLEDB was used as it can access to other files such as word document, spreadsheet, mail and so on besides database files. This makes the application more flexible.

CHAPTER 6 :

SYSTEM TESTING

CHAPTER SIX : SYSTEM TESTING

Testing is the process of exercising of evaluating a system by manual or automatic means to verify that it satisfied requirements or to identify differences expected and actual results. By the other words, testing is a verification and validation process.

Verification refers to the set of activities that ensure that the software correctly implements a specific function. On the other hand, validation refers to a different set of activities that ensuring the software has been built traceable to user requirements. Software testing is a critical element of software quality assurance and represents the ultimate review of requirements specification, design and coding.

Rules that can serve well as testing objectives are:

- Testing is a process of executing a program with the intent of finding an error.
- A good test case is one that has a high probability of finding an undiscovered error.
- A successful test is one that uncovers an as yet undiscovered error.

According to C.Kaner, J.Falk, H.Q.Nguyen (1993), a good test must including the following features:

- A good test has a high probability of finding an error
- A good test is not redundant

- A good test should be "best of breed"

Thus, testing is only successful when a fault is discovered or failure occurs as a results of testing procedures.

The system has undergone 3 stages of testing. They are unit testing, integrating testing and system testing as shown in the Figure 6.1 below.

In Figure 6.1 the arrows from the top of the boxes indicate the normal sequence of testing. The arrows returning to the previous box indicate that previous testing stages may have to be repeated because of some problems. The stages in the testing process are:

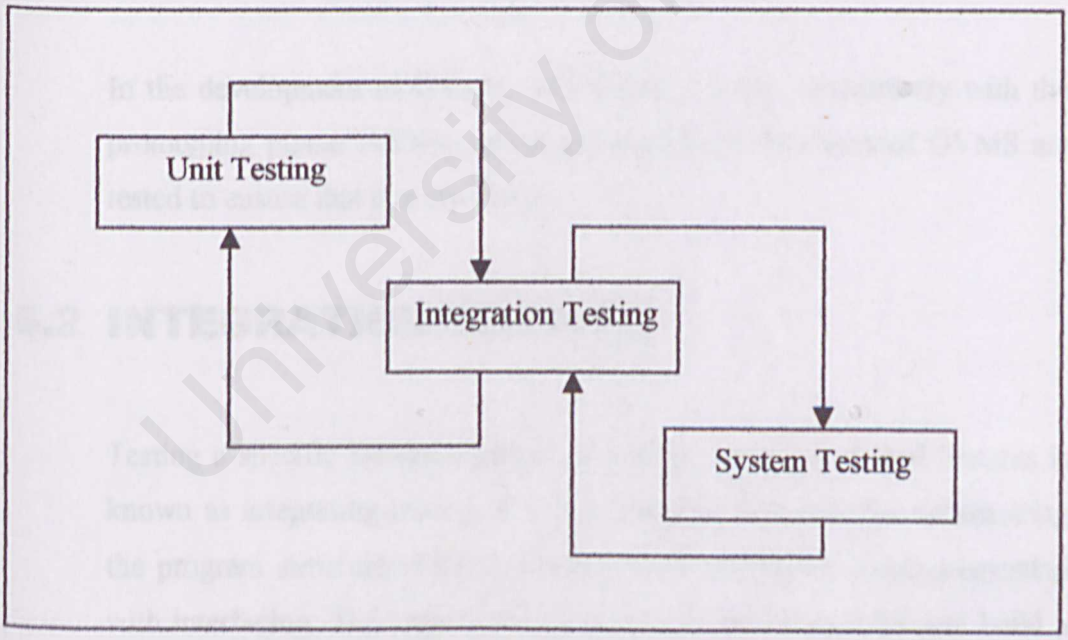


Figure 6. 1 : Testing Stages

6.1 UNIT TESTING

Historically, quality software is relied on testing each function or module. This practice called unit testing, which is extremely time-consuming. Unit testing verify that the component functions properly with the types of input expected from studying the component's design.

For OVMS, unit testing was done during the coding phase. The first step is to examine the program code by reading through it, trying to spot algorithm, data and syntax faults. This is followed by comparing the code with specifications and with the design to make sure that all relevant cases have been considered. Finally, test cases are developed to show that the input is properly converted to the desired output.

In the development of OVMS, unit testing is done concurrently with the prototyping phase. All the sub modules and sub functions of OVMS are tested to ensure that it is error free.

6.2 INTEGRATION TESTING

Testing a specific feature together with other newly developed features is known as integrating testing. It is a systematic technique for constructing the program structure while conducting tests to uncover errors associated with interfacing. The objectives is to take unit tested modules and build a program structure that has been dictated by design. This testing will ensure that the interfaces such as the module calling sequence in OVMS are arranged correctly.

In OVMS, an incremental integration strategy, the bottom-up integration and regression testing approach are used. In other words, when the individual components are working correctly and meet the objectives, these components are combined into a working system. Testing the interface of 2 components explores how components interact with each other.

The incremental integration is the antithesis of the high bang approach. OVMS's program is constructed and tested in small segments, where errors are easier to isolate and correct; interfaces are more likely to be tested completely. Error will be corrected before processing to the next integration.

6.3 SYSTEM TESTING

The last testing procedure done is system testing. Testing the system is different from unit testing and integration testing. Its objective is to ensure that the system does what the users want it to do.

System testing is designed to reveal bugs that cannot be attributed to individual component, or to the interaction among components and other objects. System tests study all the concerns issue and behaviors that can only be exposed by testing the entire integrated system or major part of it.

The OVMS is tested whether it meets the specific performance testing. Data integrity testing is used to verify that the data is stored in a manner where it is not compromised under updating, restoration or retrieval processing in OVMS.

CHAPTER 7 :

SYSTEM EVALUATION & CONCLUSION

CHAPTER SEVEN:
SYSTEM EVALUATION & CONCLUSION

As this project has to be done within a limited time, a lot of technical issues needed to be resolved and also a lot of problems had been encounter during the development of this system. Solutions have been sought during the time of developing and testing, via research and studies such as the system available in the Internet and samples codes from the reference books. Trial and error technique is using during coding phase in order to solve the problems. As a result, by encountering with these problems has been proven to be valuable learning experience.

7.1 PROBLEMS AND SOLUTIONS DURING SYSTEM STUDIES AND ANALYSIS

7.1.1 Determining Project Scope

Due to the time frame given, it was impossible to incorporate too many features into the system. So, building a full-fledged system is merely impossible within the given time frame. Inexperience with the current technologies and particular scripting language is another hindrance to implement true workable registration procedure.

A number of discussion were held with project supervisor to outline the scope of the project to be develop during the initial stages of the project.

7.1.2 Difficulties in Choosing a Programming Language

There are some well-known software tools available in the market that can be use to develop an web application as stated in the previous chapter. Choosing a suitable tool was a critical process as all tools have their strengths and weaknesses. In addition, the availability of the required tool for the development was also a major consideration.

So, seeking advises and views from project supervisor and also some of the course mates whom engaging in similar project are carried out. After much references, studies and surveys, ASP and VBScript are chosen prior to the short time span available to develop this web-based online vehicle management system. Therefore, all of the chosen languages are the most suitable programming languages as it incurs shorts learning curves.

7.1.3 Inexperience in Developing Web-based Programming

Since there was no prior knowledge of programming in ASP and VBScript, there was an uncertainty on how to organize the structure and codes during the coding process. This new programming language was never taught before and to implement such application requires a fair grasp of the language. As there is no prior knowledge in programming in a web-based environment, a lot of studies need to be done in short time span. Besides, programming concepts for web application is quite different from the traditional way of programming.

Most of the problems faced were manageable through surfing the Internet for related materials (source code) and referring to the reference books.

When a problem cannot be solved by this two ways, discussions with project supervisor or course mates are done. Trial and error technique is using during the coding phase.

7.2 SYSTEM STRENGTHS

All the system strengths are listed are below:

7.2.1 Custom Password Validation

OVMS is a password-protection site. Creating a custom password-authentication system prevents unauthorized users from accessing pages that they don't have permission to view. By giving the authorized user ID and password, unauthorized user are prohibited from accessing its records stored in the database. This is to make sure the system is always in a secure phase.

7.2.2 User-friendly Interface

This system is designed to be as simple as possible and user-friendly from the very first beginning. An authorized user is able to access all the functions in the system. Graphic User Interface (GUI) components such as command buttons, combo box and navigation button are used to minimize the user actions while performing certain task. User should be able to navigate through the web pages by simply pointing and clicking to the

relevant page. The learning curve is foreseen to be short and a user should be able to use the system within minutes.

7.2.3 Report Printing

This function has been built into OVMS that enables the administrators to view or to point the relevant reports.

7.2.4 Database Maintenance

Administrators are able to do housekeeping for database maintenance. They can add, delete or update the records of student, staff or administrators. This enable them always keep track the record in the database.

7.2.5 Relatively Fast Response Time

Each web page is designed to be lightweight. These pages load in a reasonable amount of time to ensure users need not wait too long to view the pages. OVMS is designed in such a manner that they are loaded from memory in a reasonable amount of time. Graphics are kept in minimum wherever possible during the interfaces design stage.

7.2.6 System Transparency

This is refers to the condition where the users do not need to know where the database resides, how is the system's structure, its database

management system and anything related to the building of the system. This is to ensure not to confuse users especially students in retrieving information.

7.2.7 Reliable System With Effective Error Recovery

OVMS is a reliable system as it caters for almost all possible errors encountered. Input by user is validated and verified. For example, a login failure will be handled by the system by displaying message on the screen to inform the user about the error. At the same time, the system would recover form the error and continues to be used.

7.2.8 Record Searching and Data Manipulation

OVMS allows administrators to search records either for student, staff, administrator, vehicle or summon by insert any appropriate identifier. For example, a student record can be search by his/her matrics number, identity card number, vehicle number or chassis number for his/her vehicle.

7.3 SYSTEM LIMITATIONS

7.3.1 Informal Report Format

Even though the report is provided, but it is not in a formal format in order to act as a valid registration slip. It can only be used as a reference for administrators but not for a verification purpose.

7.3.2 Backup and Restore Function

The backup and restore function was not considered earlier due to initial functional requirements. This function is very important if an accident occurred causing damage to the system and database. So, the contingency planning is needed because the disaster will cause loses to the organization.

7.3.3 Online Help File

Online help file is very important in any applications and once it implements in OVMS, it is definitely a good strategy. Due to time constraints, OVMS does not include the online help file.

7.4 EXPERIENCES GAINED

Through the process of developing of OVMS, a lot of useful experiences have been gained. Below describes some of the experiences :

a) Gain experiences in developing a web-based application
b) Able to learn the ASP and VBScript scripting language, which required to develop a web-based application.
c) Get to experience and use the knowledge gained from the database course in creating, inserting, updating and modifying a database record by using the SQL statements.

7.5 FUTURE ENHANCEMENTS

System development has no boundaries as new requirements and better implementation methods continue to arise an evolve. Future enhancements have to be done in order to make the system more advance and useful. There are some enhancements that could extend the usability of the developed system.

7.5.1 Online Help File and Demonstration Help System

Currently, OVMS does not include any online help file that can be use as a guide for users. So, in future, online help file can be incorporate into OVMS. A small demonstration help also can be included in order to reduce the system learning curve to enhance the usability among the users.

7.5.2 More Useful Reports

Even though report is provided, but it can still be improved by providing more useful and meaningful reports for the administrators to do analysis and evaluation.

7.5.3 Backup and Restore Function

The backup and restore function was not including in the system. For future enhancement, the backup must be schedule in one proper manner that the important and critical data must backup in daily basis.

7.6 CONCLUSION

Overall, OVMS has achieved and fulfilled the objectives and requirements as a online vehicle registration and management system as determined during the analysis phase. It is a start to computerized the vehicle registration for UM students and staffs towards the effort of paperless concept. Although development the whole system is not an easy task because various objectives has been targeted, but it still can be considered as a contemporary effort to achieve the goals.

In the process of developing the system, invaluable insight was gained into complexities and intricacies of programming. The application of software engineering principles throughout development has served to further enhance the required skills for developing a sound system. Adherence to a development schedule is very important in order to get a job done on time. This experience will definitely prove useful in future system development.

OVMS not a very complex system. It not only useful to all the UM students and staff in register their vehicle, it also giving an ease to the administrators to manage and keep track the vehicle records in University of Malaya. Besides, OVMS also provide a general module which can let all the unauthorized users to track on the announcement from the *Pejabat Keselamatan*, the office which managed the UM vehicle registration process.

However, OVMS can be further enhancing to become a more powerful and sophisticated vehicle management in future. There are still many rooms for improvements for OVMS in terms of implementing a comprehensive vehicle management system.

There was a lot of knowledge gained throughout the development of this system. The knowledge are including as below:

a) Get more used to Internet environment
b) Web application development
c) Internet Technologies
d) Several of web-based programming languages, such as ASP, HTML and VBScript.
e) Database server and web server

Finally, the problems and experiences gained during the system development should be useful in my future endeavors. It is hopes that this system can provide a foundation upon which more innovative and comprehensive system may be built to perform multiple tasks and fulfills various user requirements.

USER MANUAL

TABLE OF CONTENTS

LIST OF FIGURES

Chapter 1 : INTRODUCTION

Online Vehicle Management System (OVMS) is an internet application that consists of three modules, such as General Module, Administrator Module and User Module, which can divide into two parts, Student Module and Staff Module. It enables the users either administrators, students or staffs manage their personal and vehicle information in an efficient and effective way.

OVMS is an user friendly system which is easy to learn and use, where all of the functions in this system can be easily executed by a simple point and click on the available function button and hypertext link. In addition, all the system functionalities are meaningfully and clearly descriptive.

This manual provides a guideline for users about all the functionalities available in the system with some simple execution steps. This user manual includes the following part:

a) General Module
b) Administrator Module
c) User Module (Student and Staff)

1.1 HARDWARE REQUIREMENTS

This online system requires the following minimum hardware configuration for running and installation:

a) A 486 processor or above

b) Modem to connect to the Internet or Web Server
c) Keyboard and mouse as input device
d) Printer as output device

1.2 SOFTWARE REQUIREMENTS

OVMS requires the following software as its running platform:

a) Windows 95/98 or Windows NT Workstation
b) Microsoft Internet Explorer 4 or above

1.3 SUMMARY OF USER MANUAL

This user manual is divided into 6 chapters as following:

Chapter 1 : Introduction

A briefly introduction of OVMS is given, following by its minimum hardware and software requirements.

Chapter 2 : Getting Started With OVMS

This chapter contains instruction on how to access the OVMS System.

Chapter 3 : General Module

This chapter described the activities that can be done by an unauthorized user.

Chapter 4 : Administrator Module

The database accessibility and manipulation that can be done by an authorized user (administrator) is described in detail.

Chapter 5 : Student Module

Activities that allow the authorized users (students) to access and manipulate the data stored are described in detail.

Chapter 6 : Staff Module

This chapter described all the activities that allow the authorized users (staffs) to access and manipulate the data stored.

Chapter 2 : GETTING STARTED WITH OVMS

OVMS is an web-based system that no need any installation process before running it. What we need to do is connect to the Internet and then access the URL of OVMS. Anywhere, before accessing to OVMS, please make sure that your computer meets the minimum hardware and software requirements which stated in the previous chapter.

2.1 STARTING OVMS

For starting use OVMS, you need to startup the Internet Explorer browser. You can do it by clicking the Internet Explorer icon, which located on your desktop or you may go to the Start Menu and then find the Internet Explorer option and select it. Once you started the Internet Explorer successfully, you have to type the following URL into the URL location .

URL : **http://myServer/ovms/welcome.asp**

For this system, myServer=10.100.1.195

As a successful result of browsing to the URL above, the homepage of OVMS will be display on your computer monitor's screen as shown in Figure 2.1 below.

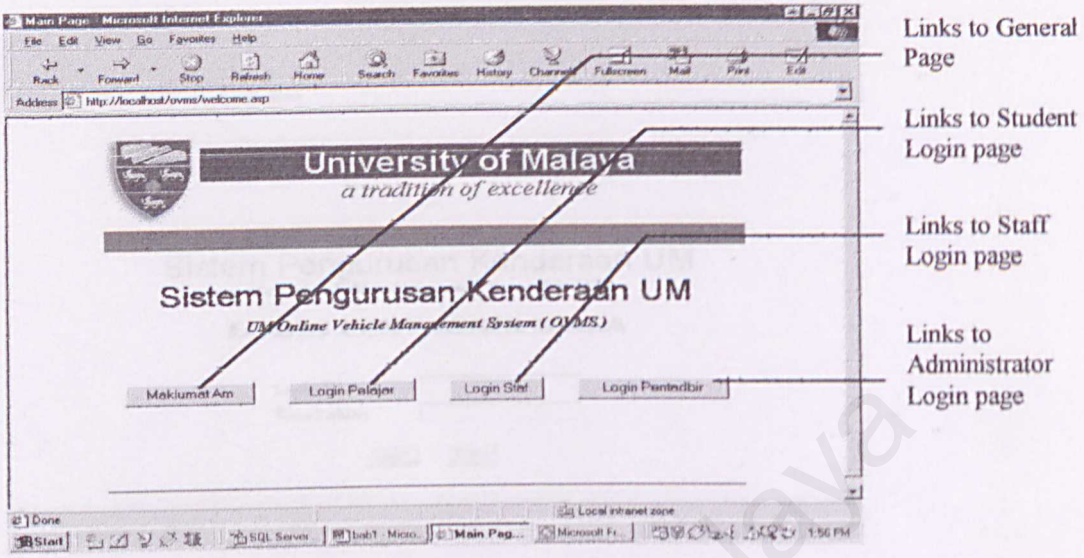


Figure 2. 1 : Welcome Page for OVMS System

Within this *Welcome Page*, you can select either you are an administrator, a student or a staff who is going to login to the system and do the activities which are allowed for an authorized user. If you only interested in getting information about the vehicle registration, you can access the information without any login procedures through the "Maklumat Am" button.

2.1.1 Administrator Login

If you are an administrator, you may click on the "Login Pentadbir" button and this will bring you to the *Administrator Login Page* as shown below.

Figure 2. 2 : Administrator Login Page

This page will enables you to key in your login ID and personal password. If you are an authorized user, the system will bring you to the administrator module where you can continue to do available activities in that module. If you click on the "Login" button without key in the login ID or password or both, an error message box will show you to key in the according fields as shown in Figure 2.3.

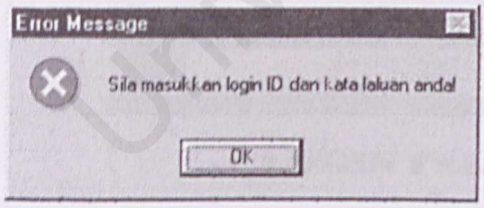


Figure 2. 3 : Error Message for Infill Login ID or Password

If you wrongly key in your login ID or password or both, you may see the login failed message on the login page. It will shown as figure below.

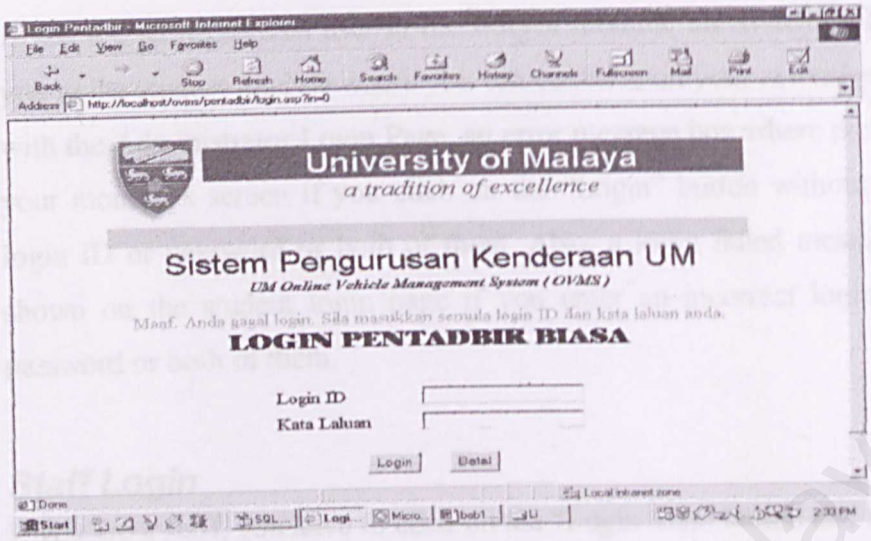


Figure 2. 4 : Administrator Login Page with Login Failed Message

2.1.2 Student Login

Else, if you are a student, you may click on the "Login Pelajar" button and the system will straight forward bring you to the *Student Login Page* as shown below.

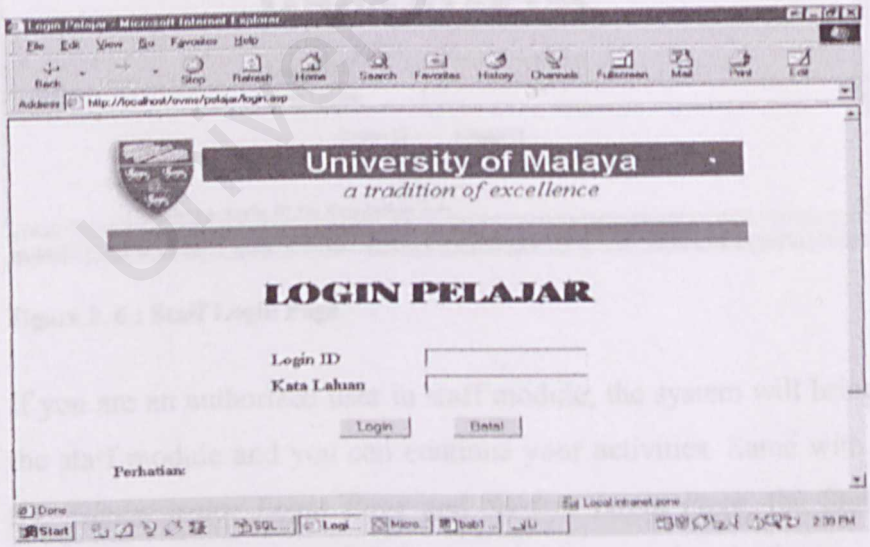


Figure 2. 5 : Student Login Page

If you are an authorized user in the student module, the system will bring you to the student module where you can continue on your activities. Same with the Administrator Login Page, an error message box where prompt on your monitor's screen if you click on the "Login" button without key in login ID or password or both of them. Also, a login failed message will shown on the student login page if you enter an incorrect login ID or password or both of them.

2.1.3 Staff Login

If you are a staff, you have to click on the "Login Staf" button and this will bring you to *Staff Login Page* as shown in figure 2.6.

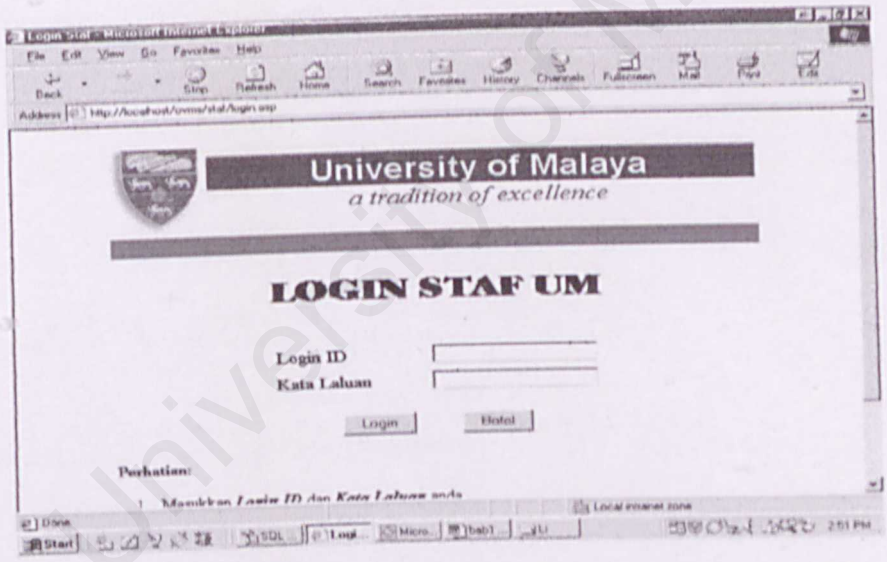


Figure 2. 6 : Staff Login Page

If you are an authorized user in staff module, the system will bring you to the staff module and you can continue your activities. Same with both of the *Administrator Login Page* and *Student Login Page*, the Staff Login Page will shown a login failed message when you key in the wrong login

ID or password or both. Also, if you click on the "Login" button without key in the login ID and/or password fields, an error message will prompt on your screen.

Chapter 3 : GENERAL MODULE

An unauthorized user can access general module by clicking the "Maklumat Am" button which displays on the *Welcome Page*. This page is used to display all of the activities, especially the vehicle registration activities and important announcement from Pejabat Keselamatan. The contains of this page is dynamically change depends on the Pejabat Keselamatan's current activities. Also, this page provides links to *University of Malaya Homepage* and *Pejabat Keselamatan Homepage*. The general module's page is shown as below.

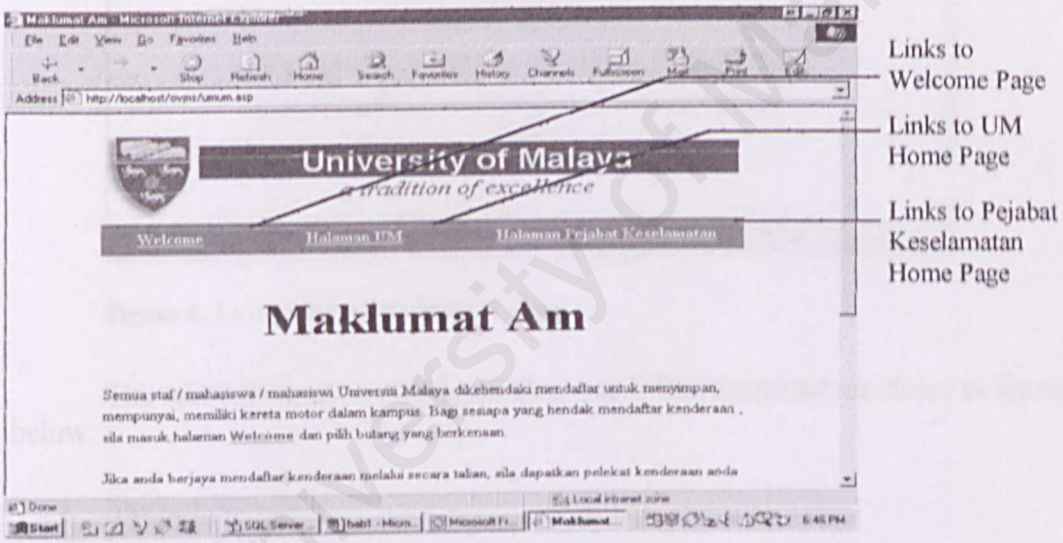


Figure 3. 1 : General Page

Chapter 4 : ADMINISTRATOR MODULE

Once you correctly key in the administrator login ID and password, you will be bring to the *Administrator Default Page* as shown below.

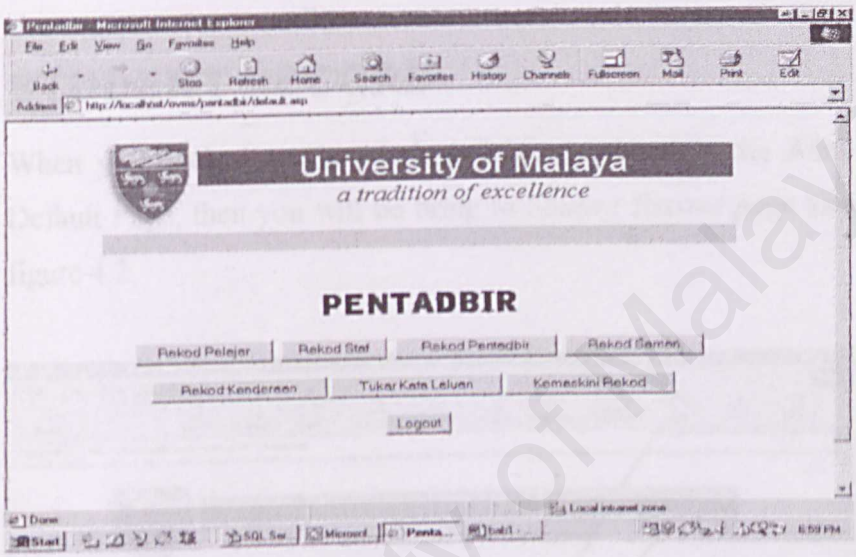


Figure 4. 1 : Administrator Default Page

The administrator module is divided into 8 functional sub modules as listed below:

- Student Record
- Staff Record
- Vehicle Record
- Summon Record
- Administrator Record
- Change Password
- Update Personal Details
- Logout

If you are an general administrator, you can access all of the functional sub modules as above except the Administrator Record. As a security protection, the Administrator Record can only access by a higher administrator who need to key in their login ID and password one more time as a permit to access the administrator data store. Anywhere, this will discuss later in this chapter.

4.1 STUDENT RECORD

When you clicked on the "Rekod Pelajar" button on the Administrator Default Page, then you will be bring to *Student Record page* as shown in figure 4.2.

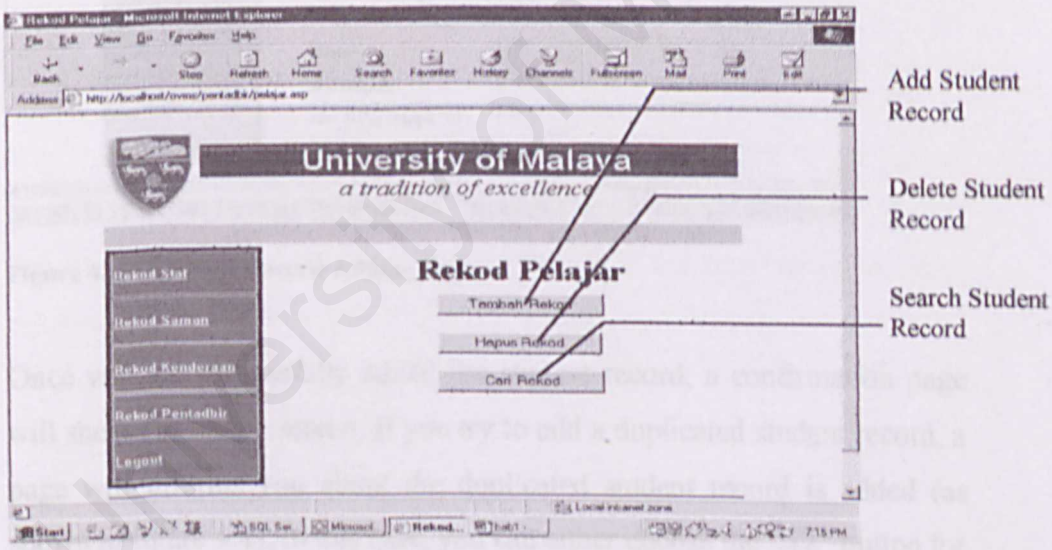


Figure 4. 2 : Student Record Page

This page will allows you to access the record of students who are done their vehicle registration from the data store. You can add, delete or search the necessary student records via this page.

4.1.1 Add Student Record

When you clicked on the "Tambah Rekod" button, the following page is showing and you can key in the student record into appropriate fields and then clicked on the "Tambah" button.

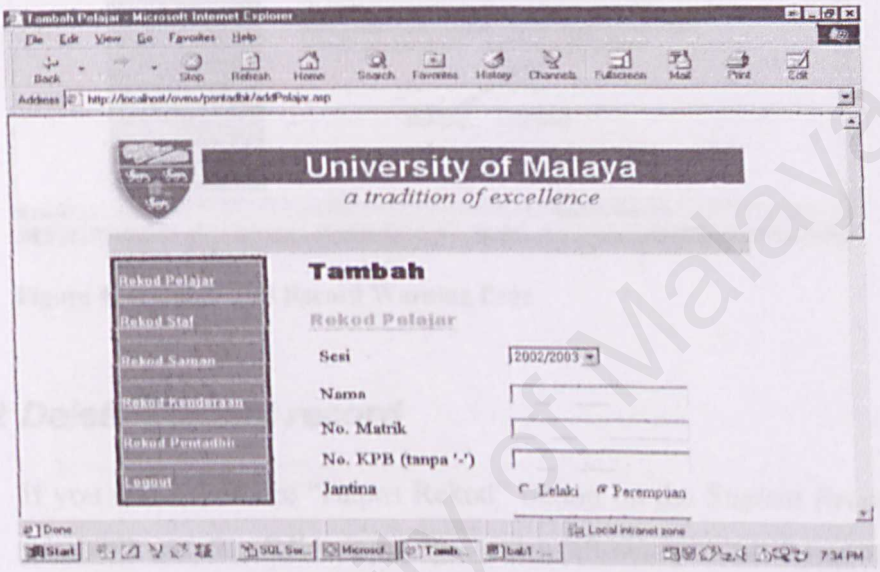


Figure 4. 3 : Student Record Adding Page

Once you are successfully added the student record, a confirmation page will shown to on the screen. If you try to add a duplicated student record, a page will informs you about the duplicated student record is added (as shown in figure 4.4). In this case, you can either choose the "Ya" button for continuing to add another student record or select the "Tidak" button to exit from this page.

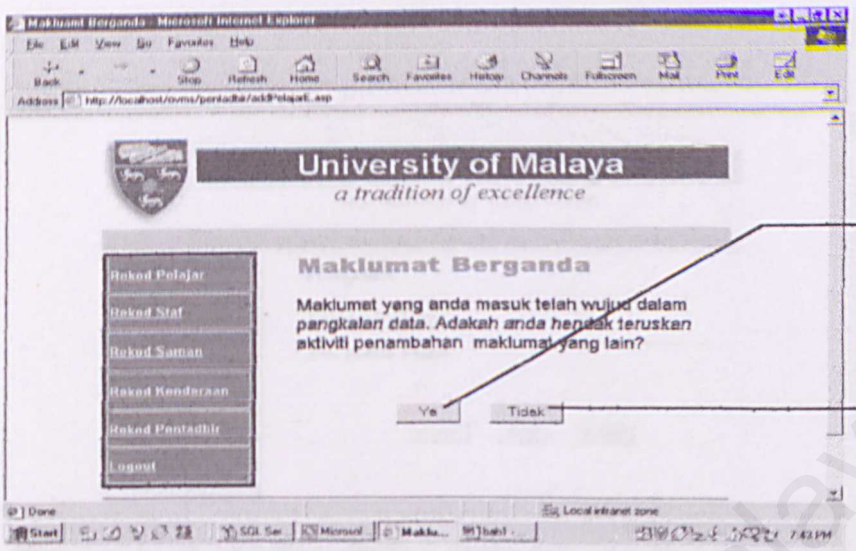


Figure 4. 4: Duplicated Record Warning Page

4.1.2 Delete Student record

If you clicked on the "Hapus Rekod" button on the *Student Record page*, you will see the following page which allows you to delete a student record. You can delete a student record by key in the appropriate student's matrics number into *No. Matrik Pelajar* fields.

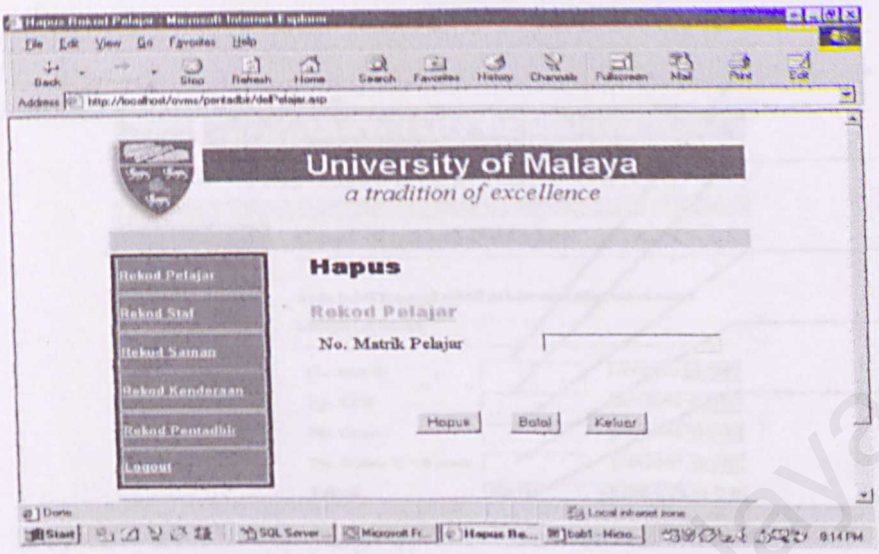


Figure 4. 5 : Student Record Deleting Page

A confirmation message will shown on the same page if the record is successfully been deleted. Else, a error message will be shown.

4.1.3 Search Student Record

Once you clicked on the "Cari Rekod" button on the *Student Record page*, you will see the following page (Figure 4.6). You can search a student record either by key in his/her matric number, new identity card number, vehicle number, vehicle chassis number or the student's faculty.

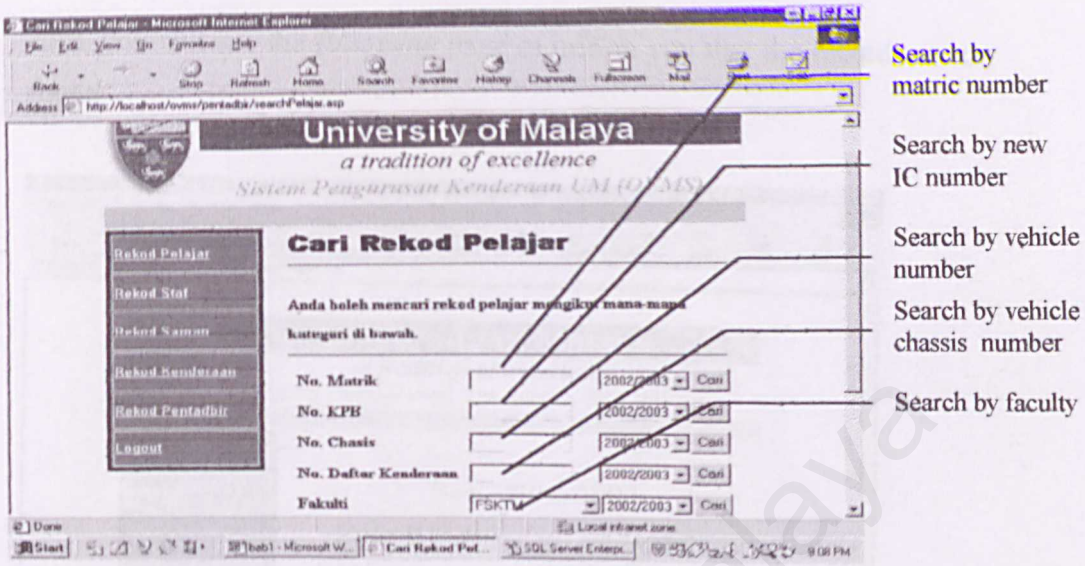


Figure 4. 6: Student Record Searching Page

If you want to search a student record by his/her matric number, you can key in the matric number into the "No. Matrik" field and then click the "Cari" button. If the student record exists in the database, a page will shown the detail about the student record (Figure 4.7).

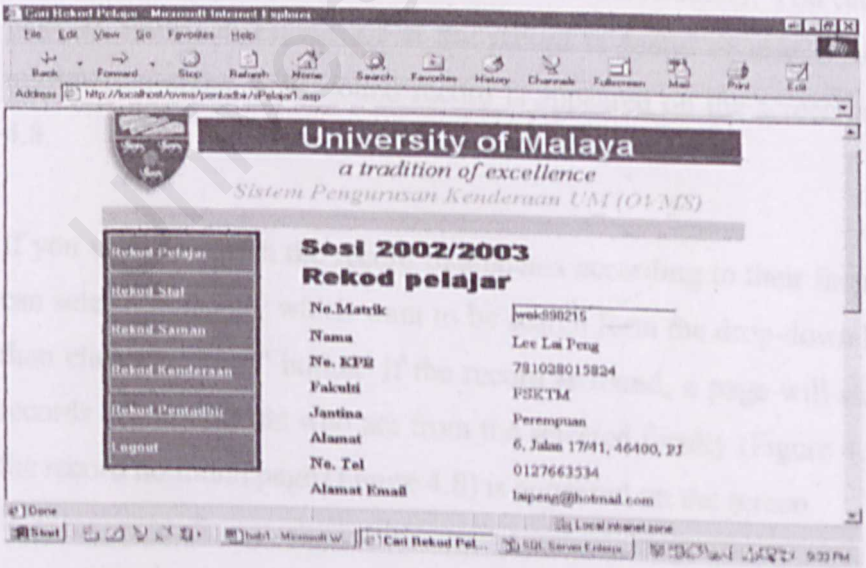


Figure 4. 7 : Student Record – Search by Matric Number

Else, you will see the following page to inform you that the record was no found.

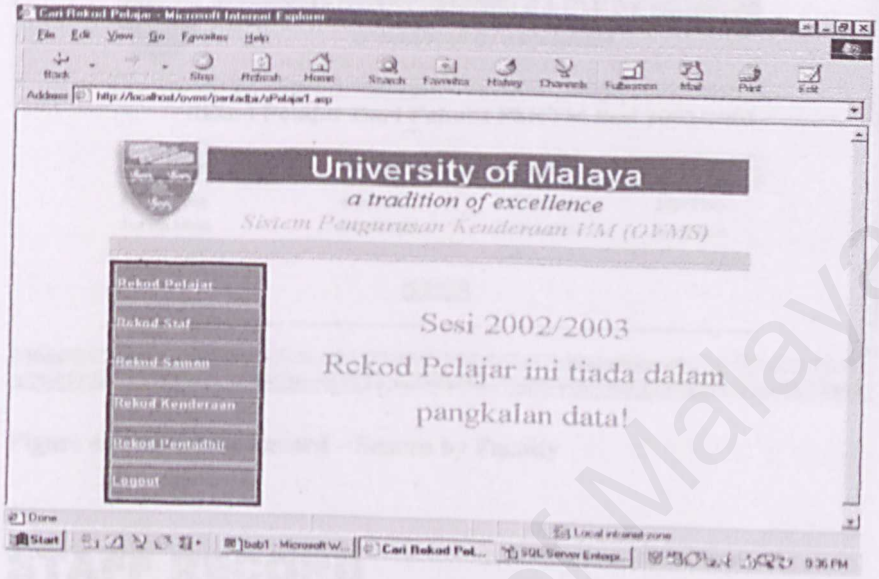


Figure 4. 8 : Student Record No Found Page

The same thing will happen when you search the student record by his/her new IC number, vehicle number or vehicle chassis number. You can see the page as shown in Figure 4.7 if the record is found or else a page with information about the unfound record is appeared on the screen as Figure 4.8.

If you want to search the record of students according to their faculty, you can select the faculty which want to be search form the drop-down box and than click the "Cari" button. If the record is found, a page will shown all records of the students who are from the selected faculty (Figure 4.9) Else, the record no found page (Figure 4.8) is appeared on the screen.

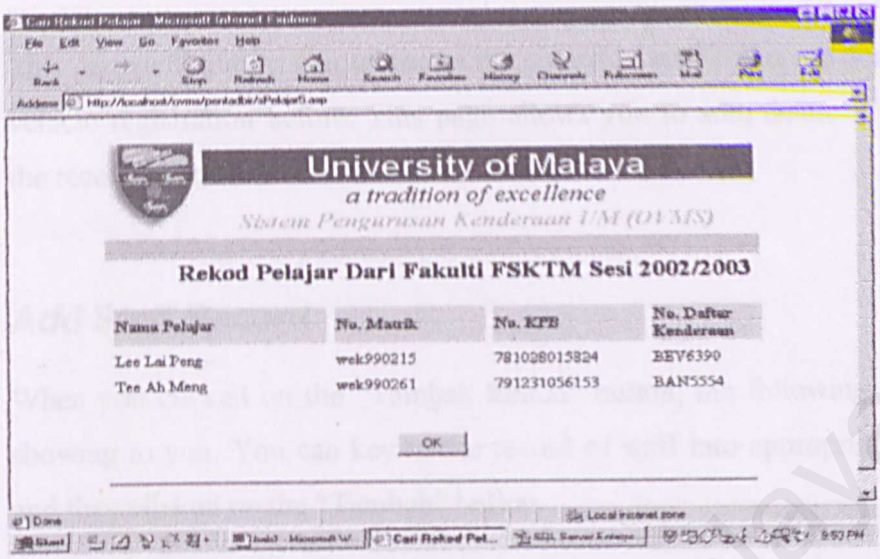


Figure 4. 9 : Student Record – Search by Faculty

4.2 STAFF RECORD

When you clicked on the "Rekod Staff" button on the Administrator Default Page, then you will be bring to Staff Record page as below.

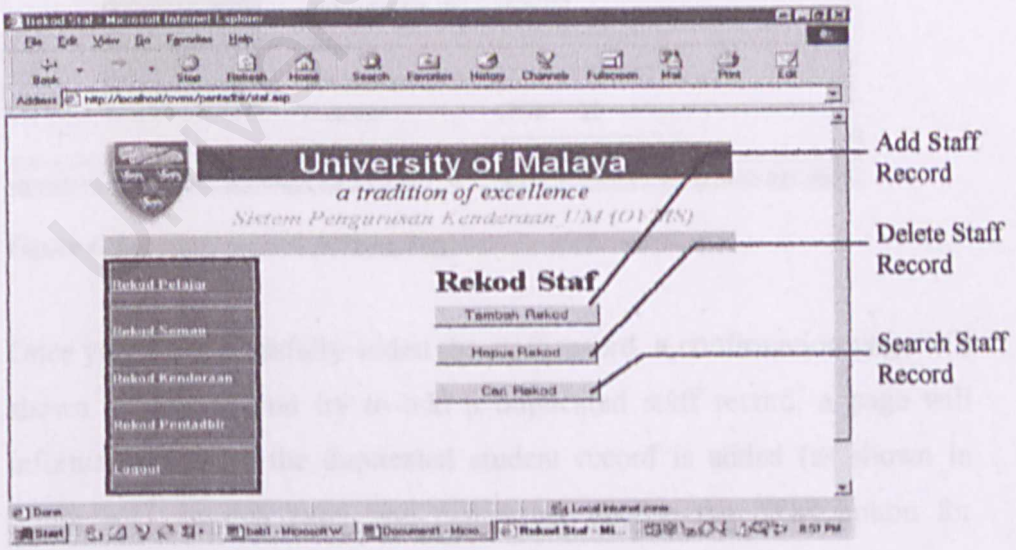


Figure 4. 10 : Staff Record Page

This page will allows you to access the record of staffs who are done their vehicle registration before. This page allows you to add, delete or search the record of staff.

4.2.1 Add Staff Record

When you clicked on the "Tambah Rekod" button, the following page is showing to you. You can key in the record of staff into appropriate fields and then clicked on the "Tambah" button.

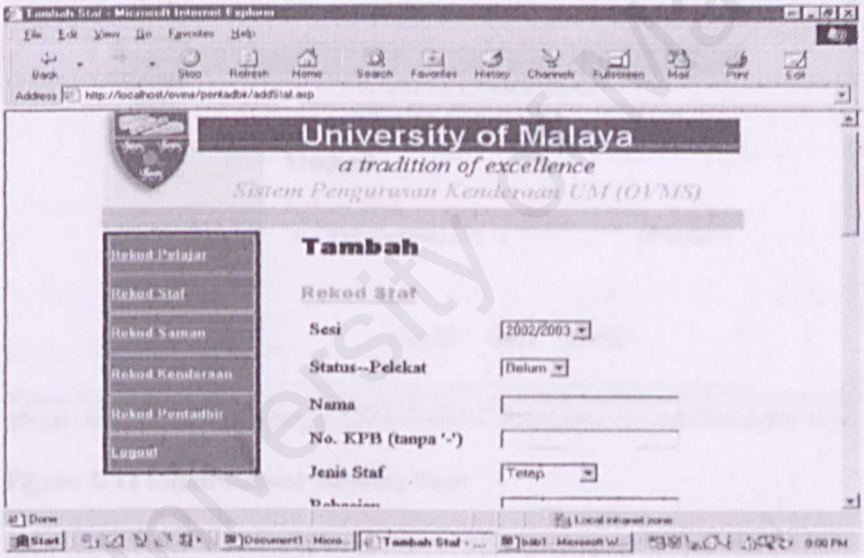


Figure 4. 11 : Staff Record Adding Page

Once you are successfully added the staff record, a confirmation page will shown to you. If you try to add a duplicated staff record, a page will informs you about the duplicated student record is added (as shown in figure 4.4). In this case, you can either choose the "Ya" button for

continuing to add another staff record or select the "Tidak" button to exit from this page.

4.2.2 Delete Staff record

If you clicked on the "Hapus Rekod" button, you will see the following page which allows you to delete a staff record by enter the appropriate staff's new identity card number into *No. KPB Staf* fields.

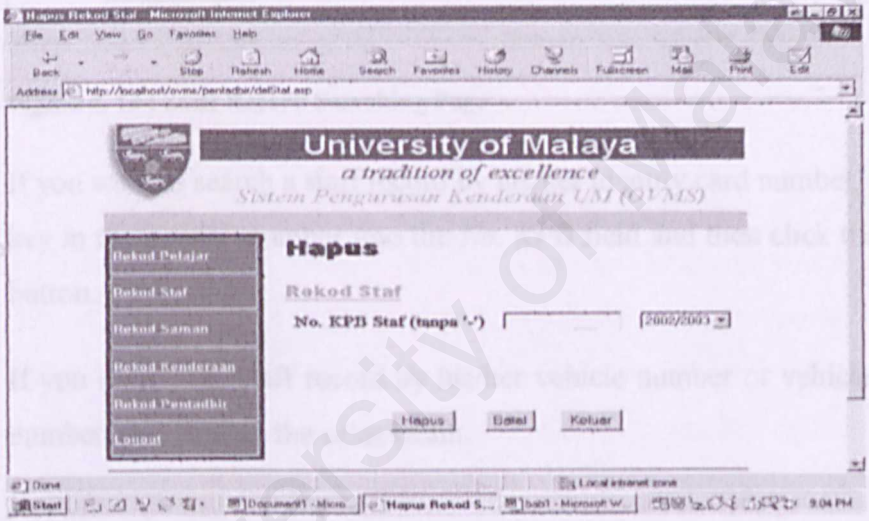


Figure 4. 12 : Staff Record Deleting Page

4.2.3 Search Staff Record

Once you clicked on the "Cari Rekod" button, you will see the following page (Figure 4.13). You can search a staff record either by key in his/her new identity card number, vehicle number or vehicle chassis number.

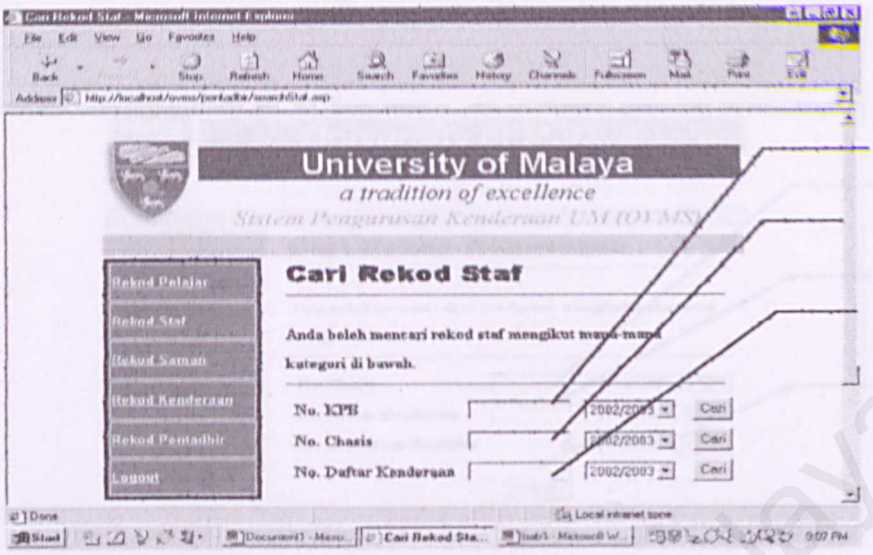


Figure 4. 13 : Staff Record Searching Page

If you want to search a staff record by his/her identity card number, you can key in the new IC number into the *No. KPB* field and then click the "Cari" button.

If you search the staff record by his/her vehicle number or vehicle chassis number, you can get the same result.

4.3 VEHICLE RECORD

If click on the "Rekod Kenderaan" button, this will bring you to the vehicle record page as shown below.

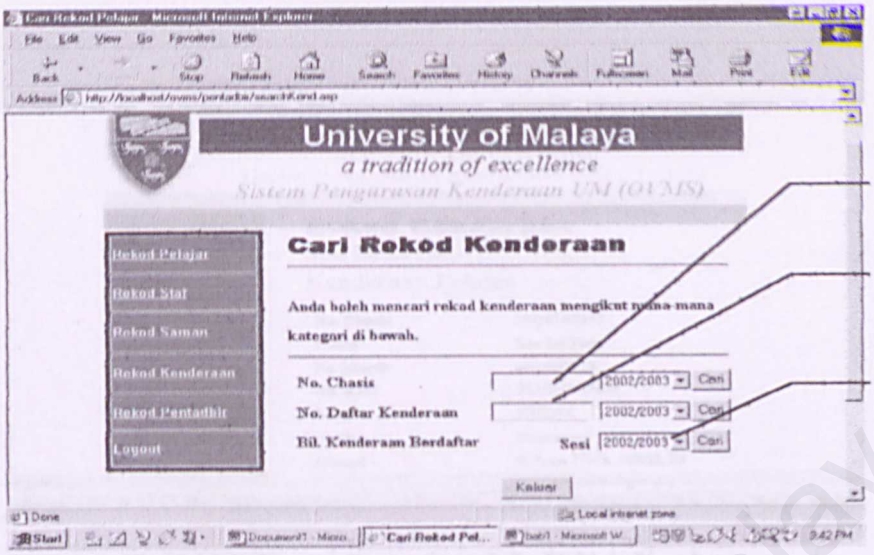


Figure 4. 14: Vehicle Record Searching Page

This page will allows you to search a vehicle information according to its registered number or chassis number. You can search the record by enter the vehicle registered number or chassis number into appropriate field and then click "Cari" button. If the vehicle record exists in the database, the complete information of that vehicle will shows to you as Figure 4.15. This page will shows you either this vehicle is belong to a student or a staff.

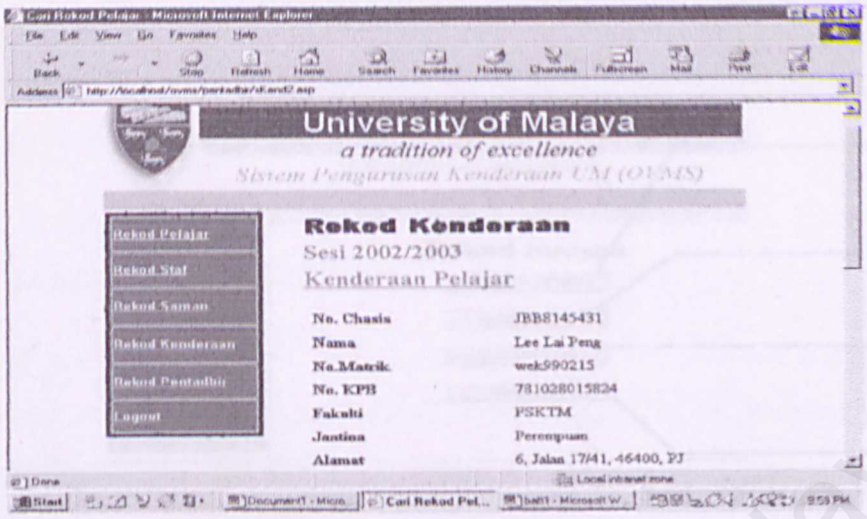


Figure 4. 15 : Vehicle Record Page – Search by Vehicle Number

If you want to get the total of registered vehicle for a selected session, you can select the session from the drop-down box besides the "Bil. Kenderaan Berdaftar" field and click the "Cari" button. The total of registered vehicle for staffs and students for selected session will be shown.

4.4 SUMMON RECORD

When you click on the "Rekod Saman" button, this will bring you to the Summon Record page (Figure 4.16). You can do several activities on this page, such as add, delete, update and search a summon record.

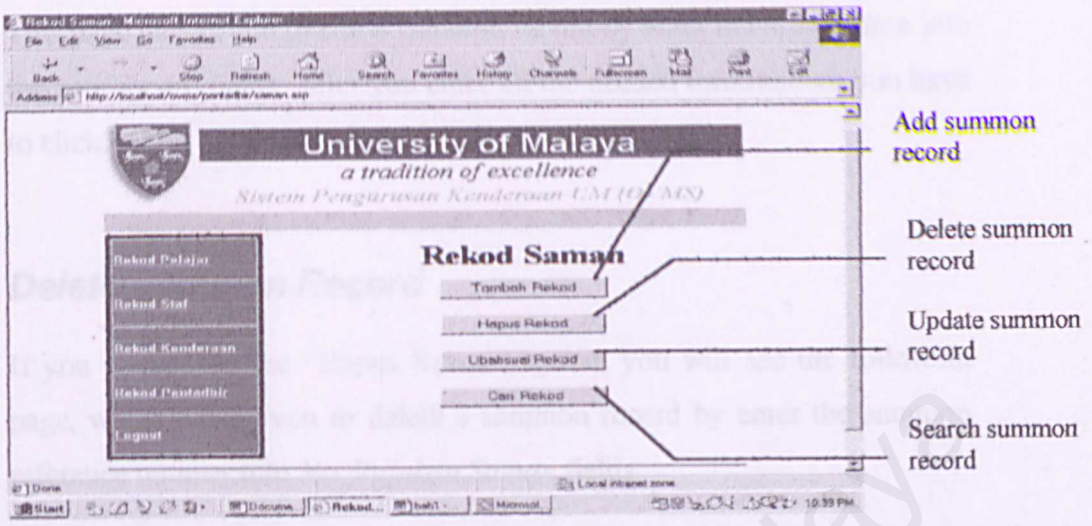


Figure 4. 16: Summon Record Page

4.4.1 Add Summon Record

If you click on the "Tambah Rekod" button, this will bring you to the following page.

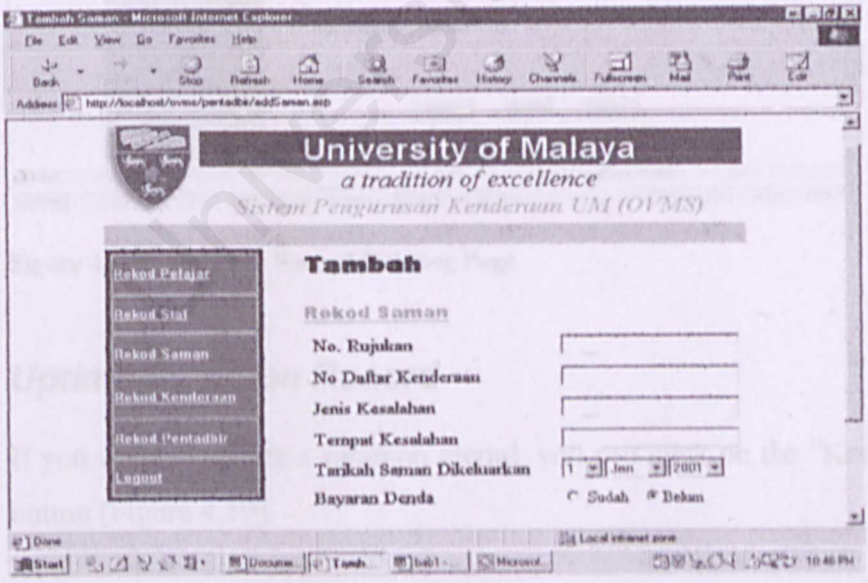


Figure 4. 17 : Summon Record Adding Page

This page allows you to add a summon record by enter the information into the appropriate fields. After you enter all the needed information, you have to click on the "Tambah" button.

4.4.2 Delete Summon Record

If you clicked on the "Hapus Rekod" button, you will see the following page, which allows you to delete a summon record by enter the summon reference number into *No. Rujukan Saman* fields.

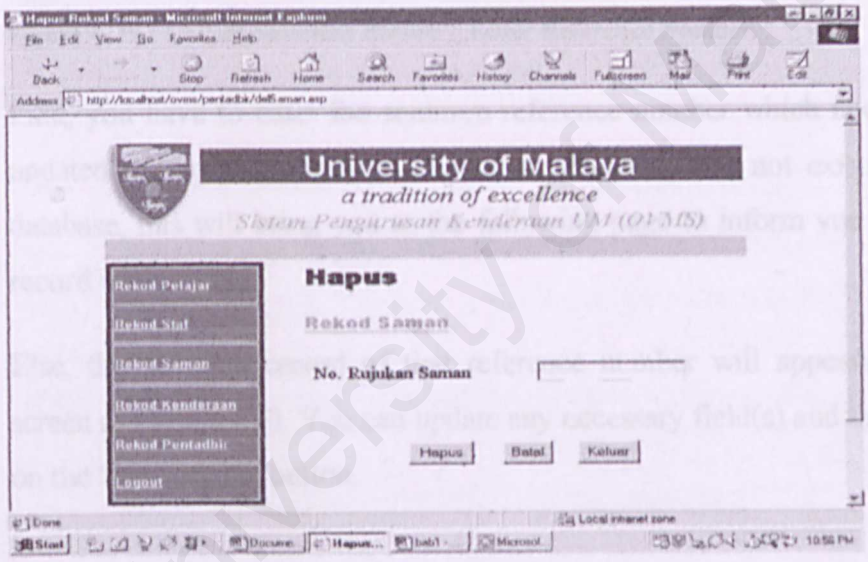


Figure 4. 18 : Summon Record Deleting Page

4.4.3 Update Summon Record

If you want to update a summon record, you can click on the "Kemaskini" button (Figure 4.19).

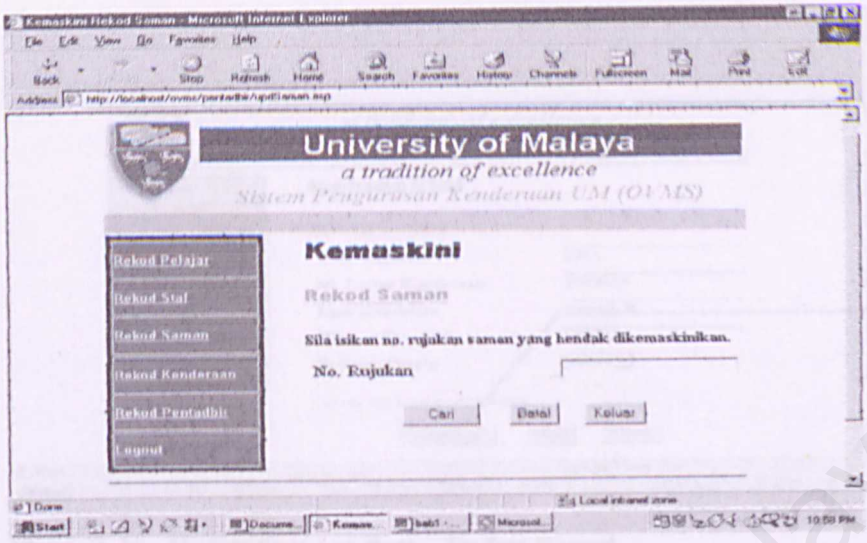


Figure 4. 19 : Update Summon Record – Enter Reference Number

First, you have to enter the summon reference number which need to be updated. If the summon with this reference number is not exists in the database, this will bring you to the following page to inform you that the record is not found.

Else, the summon record of that reference number will appears on the screen as Figure 4.20. You can update any necessary field(s) and then click on the "Kemaskini" button.

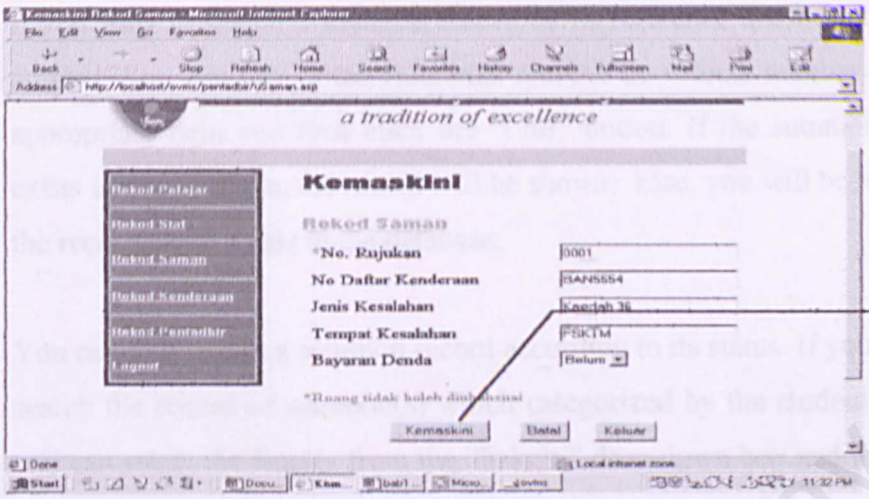


Figure 4. 20 : Update Summon Page – Update Record

4.4.4 Search Summon Record

Once you clicked on the "Cari Rekod" button, you will see the following page (Figure 4.21). You can search a summon record either by enter its reference number, vehicle number, faculty or summon status (for fine or graduate student).

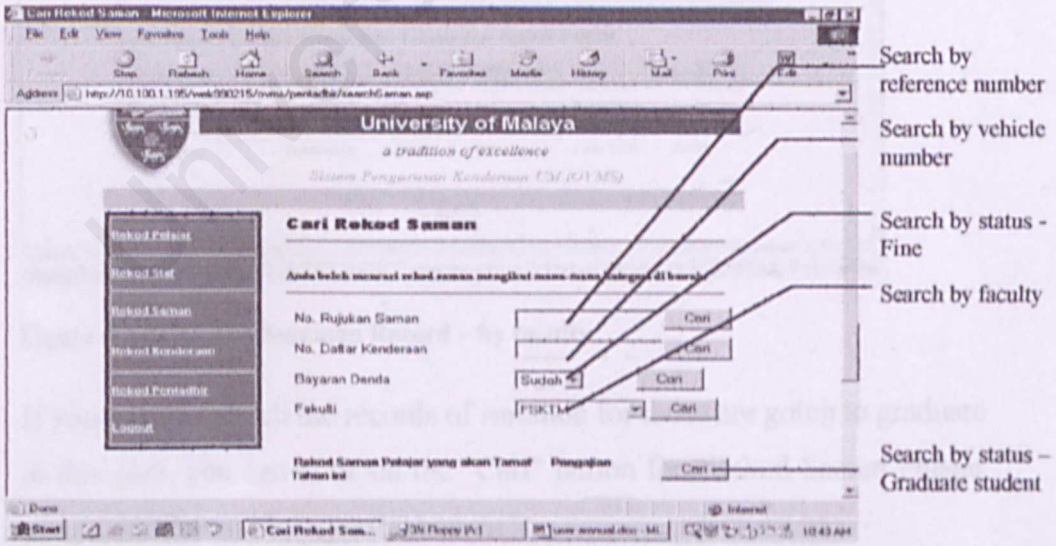


Figure 4. 21: Summon Record Searching Page

If you want to search a summon record by its reference number or vehicle number, you can key in the reference number or vehicle number into the appropriate field and then click the "Cari" button. If the summon record exists in the database, the record will be shown. Else, you will be informed the record is not exists in the database.

You can also search a summon record according to its status. If you want to search the record of summon(s) which categorized by the student faculty, you can select the faculty from the "Fakulti" drop-down box and then click on the "Cari" button. The record will be shown to you if the record(s) is exists in the database (Figure 4.22). The same case will happen if you search summon records by the other status.

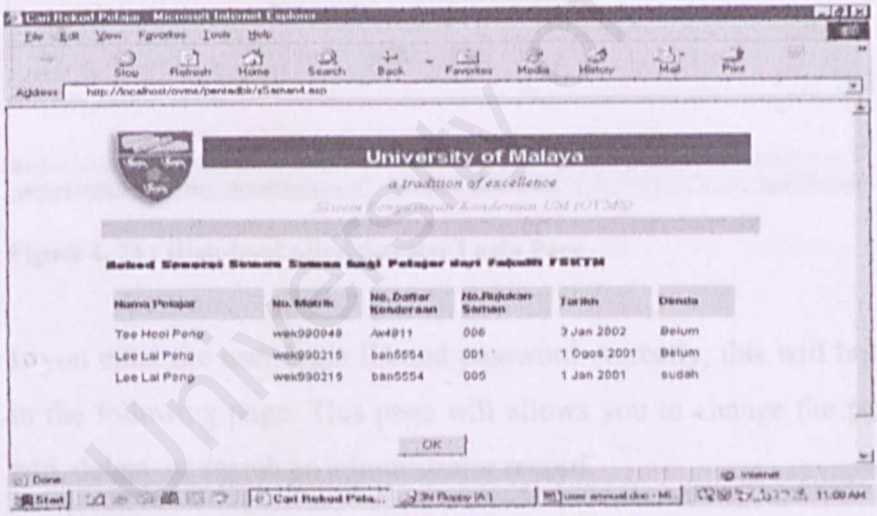


Figure 4. 22 : Search Summon Record – by faculty

If you want to search the records of summon for those are going to graduate in this year, you can click on the "Cari" button for "Rekod Saman Pelajar yang akan Tamat Pengajian Tahun ini".

4.5 ADMINISTRATOR RECORD

For OVMS, only high-level administrator can access the database for adding, deleting, updating or searching the record of administrator. When you click on the "Rekod Pentadbir" button, a login page will be shown as Figure 4.23.

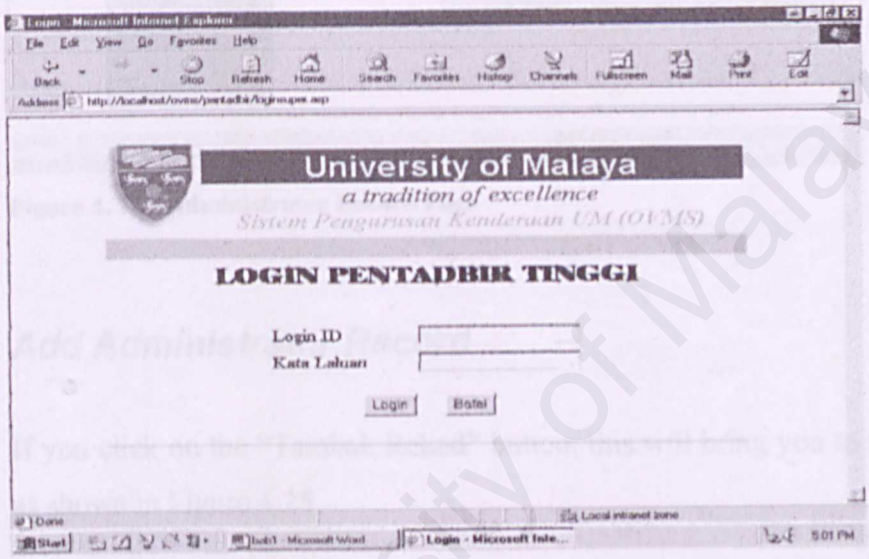


Figure 4. 23 : High-level Administrator Login Page

If you enter the user login ID and password correctly, this will brings you to the following page. This page will allows you to change the password, add, delete, or search an administrator record.

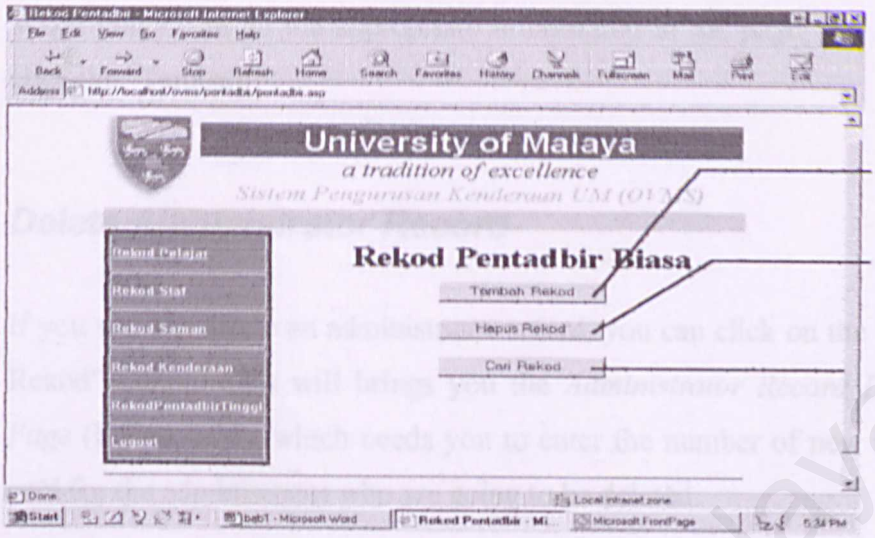


Figure 4. 24 : Administrator Record Page

4.5.1 Add Administrator Record

If you click on the "Tambah Rekod" button, this will bring you to the page as shown in Figure 4.25.

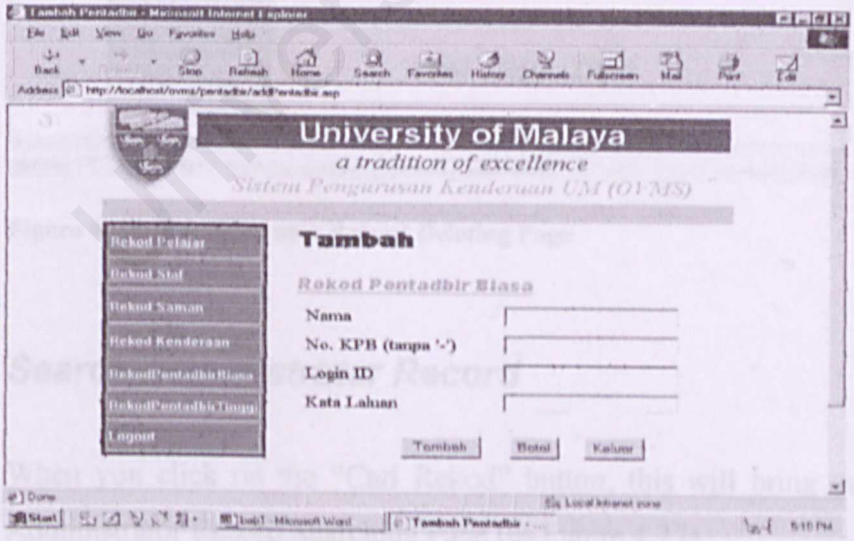


Figure 4. 25: Administrator Record Adding Page

When you fill in all the appropriate information in the page, you have to click the "Tambah".

4.5.2 Delete Administrator Record

If you want to delete an administrator record, you can click on the "Hapus Rekod" button. This will brings you the *Administrator Record Deleting Page* (Figure 4.26), which needs you to enter the number of new identity card for the administrator who are going to be deleted.

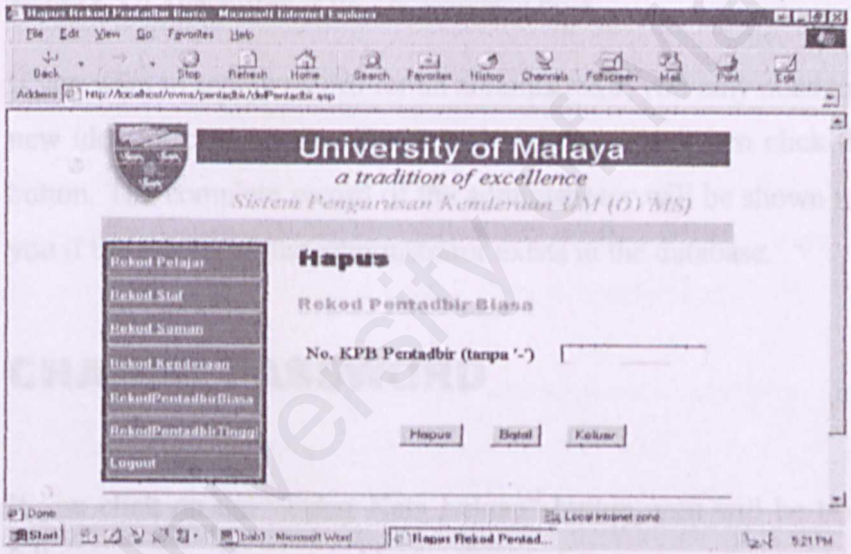


Figure 4. 26: Administrator Record Deleting Page

4.5.3 Search Administrator Record

When you click on the "Cari Rekod" button, this will bring you to the Administrator Record Searching Page (as Figure 4.27).

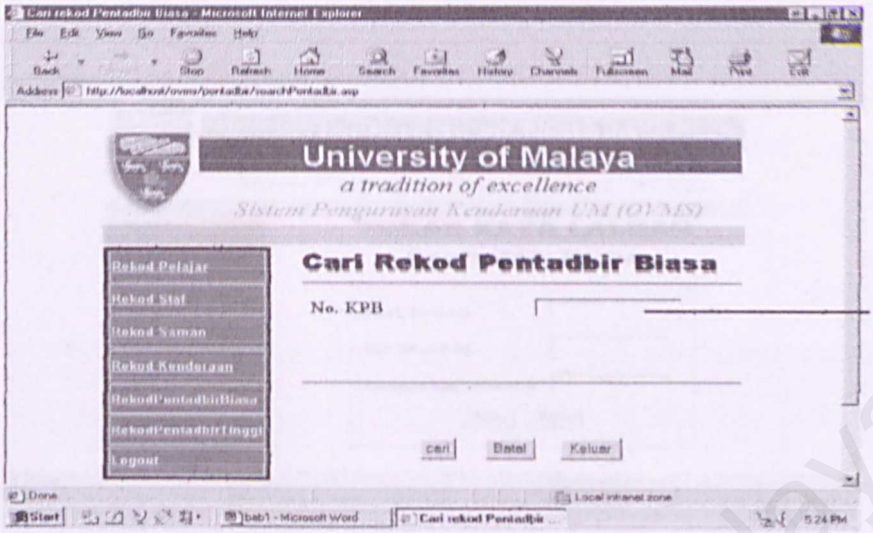


Figure 4. 27: Administrator Record Searching Page

If you want to search record for an administrator, you only need to enter the new identity card number for the administrator and then click the "Cari" button. The complete record of the administrator will be shown to show to you if the record of that administrator exists in the database.

4.6 CHANGE PASSWORD

If you click on the "Tukar Kata Laluan" button, you will be bring to the following page. You may able to change your current password to another password in security wise.

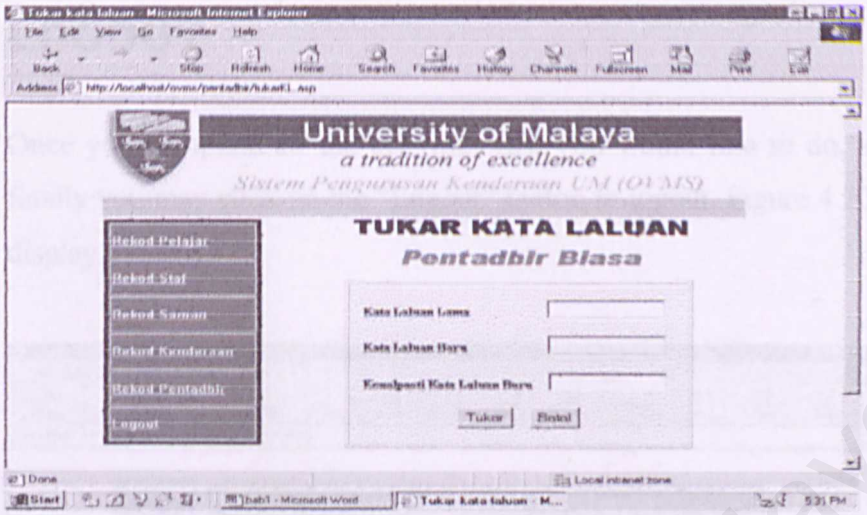


Figure 4. 28 : Change Password – Administrator

4.7 UPATE PERSONAL DETAIL

By clicking the "Kemaskini Rekod" button, you may see the screen which shown as Figure 4.29. In this page, you can update your record by change the necessary fields and then click on the "Kemaskini" button.

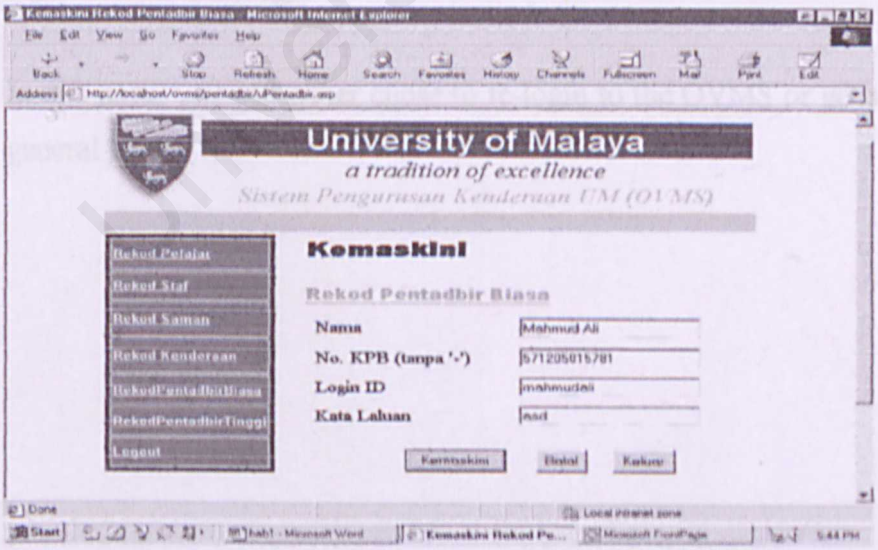


Figure 4. 29 Administrator Record Updating Page

4.8 LOGOUT

Once you complete all the activities that you would like to do, and then finally you may click on the "Logout" button to logout. Figure 4.30 will be display.

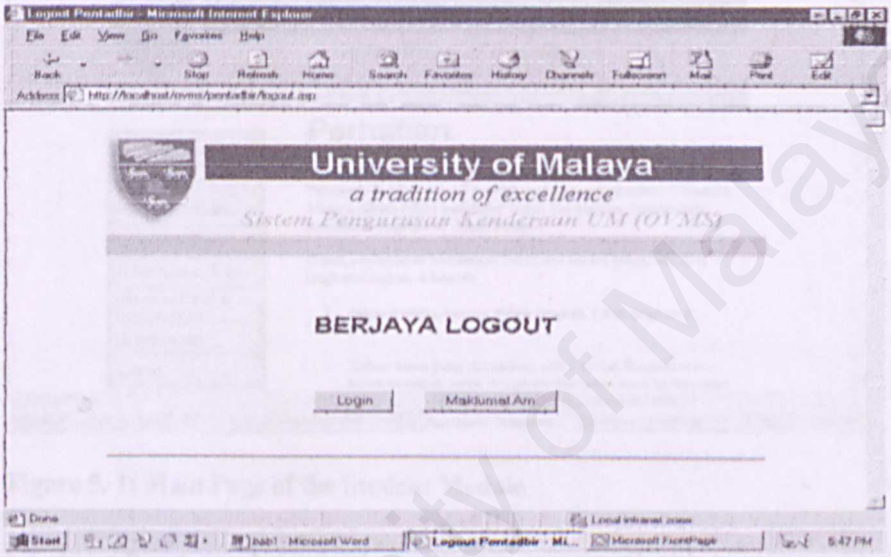


Figure 4. 30: Logout Page

In this page, you can either chose to re-login to the OVMS or go back the general page.

Chapter 5 : STUDENT MODULE

After keying the login ID and password correctly, you are going to bring by the system to the student module main page (Figure 5.1).

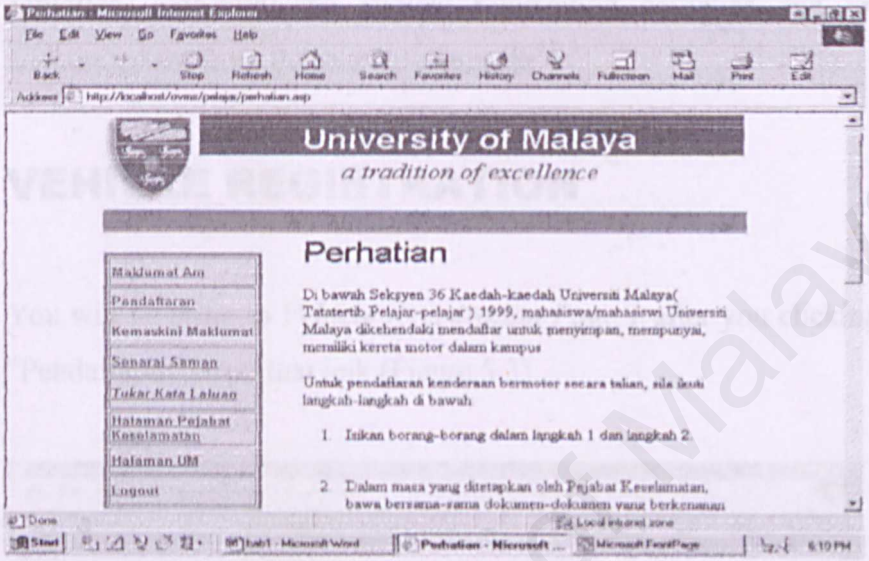


Figure 5. 1: Main Page of the Student Module

There are about 8 sub modules with the different activities that are provided to all the students. The activities are listed in the left hand side of every page (Figure 5.2).

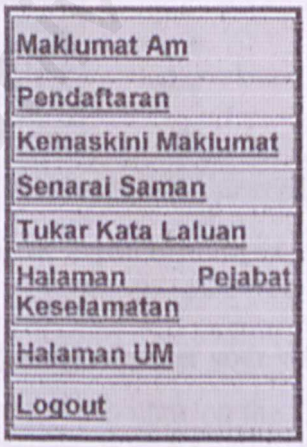


Figure 5. 2 : List of Activities for Student

5.1 GENERAL PAGE

If you clicked on the "Maklumat Am" hypertext link, then you will see the General Page as shown in Figure 3.1. This page is use to display all of the activities, especially the vehicle registration activities and important announcement from Pejabat Keselamatan.

5.2 VEHICLE REGISTRATION

You will be bring to *Vehicle Registration Page 1* after you clicking on the "Pendaftaran" hypertext link (Figure 5.3).

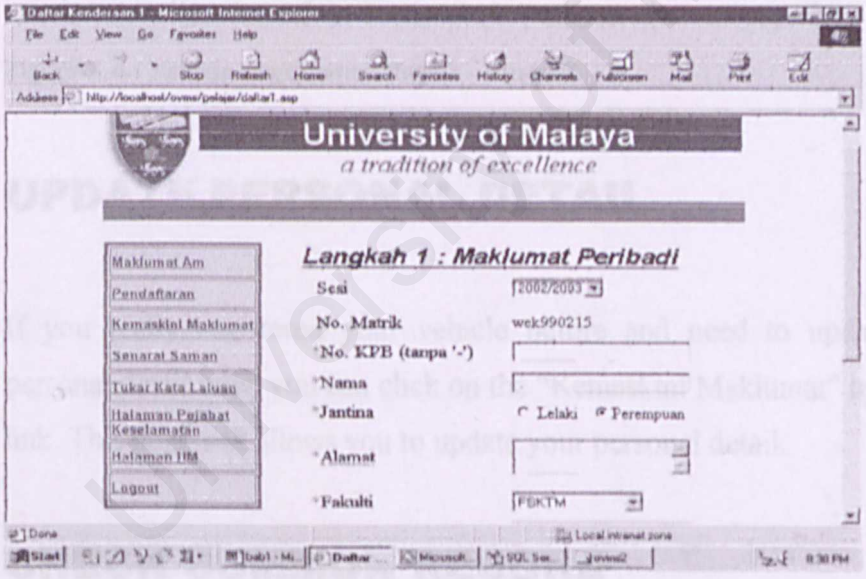


Figure 5. 3 : Vehicle Registration Page 1 - Student

In this page, you can register your vehicle by insert all the necessary fields. After this, you have to click on the "Langkah 1" button and this will bring you to the *Vehicle Registration Page 2* as shown in Figure 5.4 . You are

required to insert all the necessary fields in this page and then click the "Daftar" button.

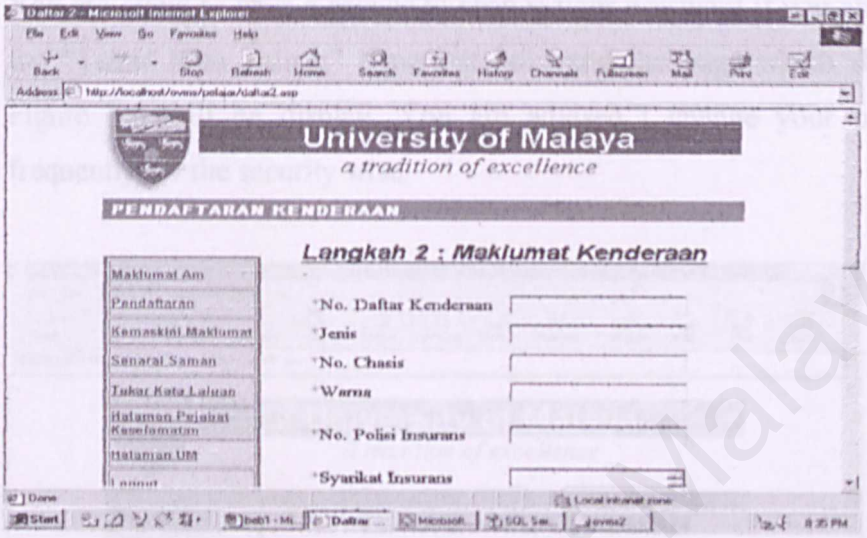


Figure 5. 4 : Vehicle Registration Page 2 – Student

5.3 UPDATE PERSONAL DETAIL

If you really registered your vehicle before and need to update your personal detail now, you can click on the "Kemaskini Maklumat" hypertext link. This page will allows you to update your personal detail.

5.4 CHECK SUMMON RECORD

By clicking on the "Seranai Saman" hypertext link, the system will display all of your summon record.

5.5 CHANGE PASSWORD

You are going to have a chance to change your password if you clicked on the "Tukar Kata Laluan" hypertext link, and the page which shown in Figure 5.5 will be display. You are advised t change your password frequently for the security wise.

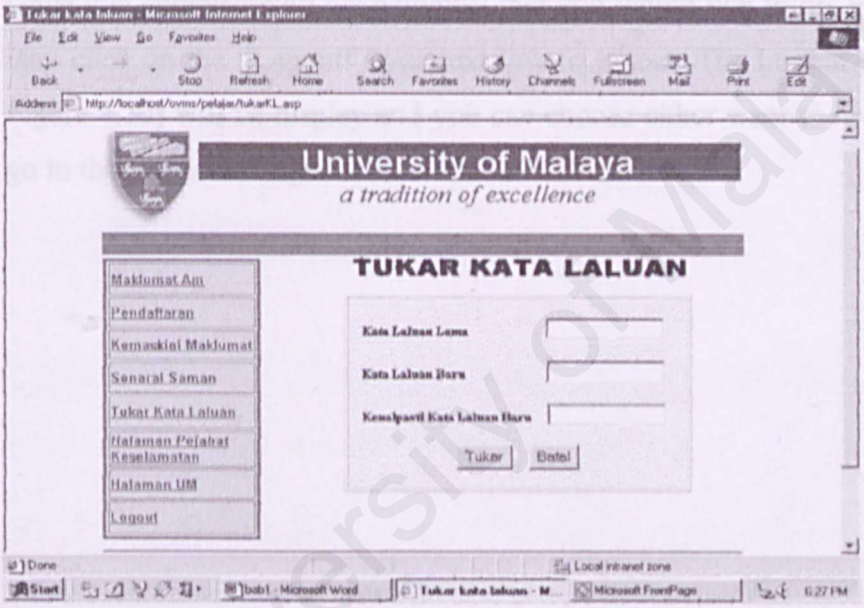


Figure 5. 5 : Change Password – Student

5.6 SECURITY OFFICE HOMEPAGE

Once you click on the "Halaman Pejabat Keselamatan" hypertext link, it will links you to the Security Office Homepage directly.

5.7 UNIVERSITY MALAYA HOMEPAGE

Once you click on the "Halaman UM" hypertext link, it will links you to the University Malaya Homepage directly.

5.8 LOGOUT

Once you completed all the activities that you would like to do, now, you may click on the "Logout" hypertext link to logout. The Logout Page (as Figure 4.30) will be display and you can choose either want to re-login or go to the Welcome Page.

Chapter 6 : STAFF MODULE

After keying the staff login ID and password correctly, you are going to bring by the system to the staff module main page (Figure 6.1).

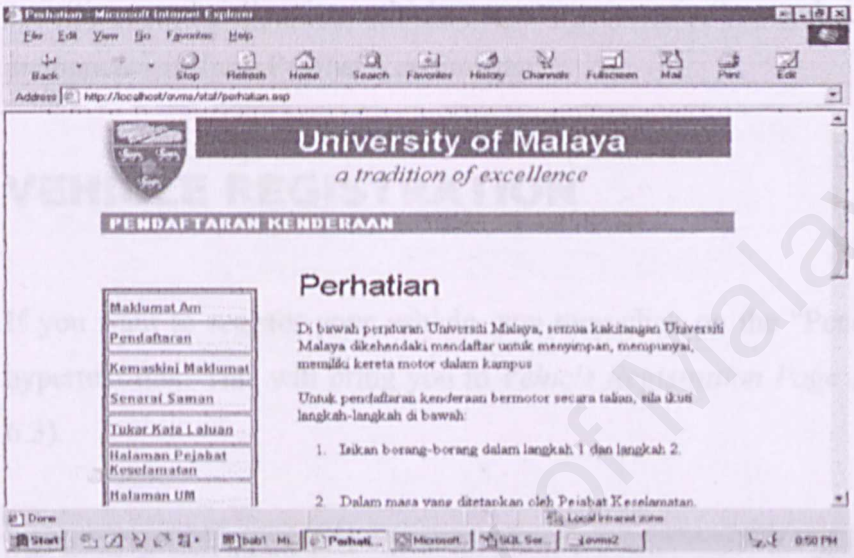


Figure 6. 1: Main Page of the Staff Module

Same with Student module, there are 8 sub modules with the different activities that are provided to all the staffs. The activities are listed in the left hand side of every page (Figure 6.2).

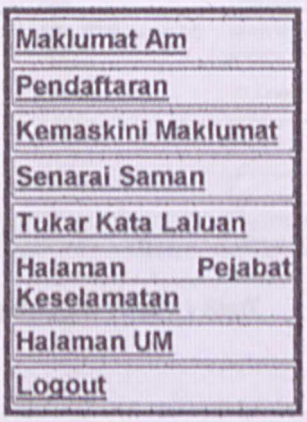


Figure 6.2 : List of Activities for Staff

6.1 GENERAL PAGE

You will be bring to the General Page as shown in Figure 3.1 if you clicked on the "Maklumat Am" hypertext link. This page is use to display all of the activities, especially the vehicle registration activities and important announcement from Pejabat Keselamatan.

6.2 VEHICLE REGISTRATION

If you want to register your vehicle, you may click on the "Pendaftaran" hypertext link. This will bring you to *Vehicle Registration Page 1* (Figure 6.3).

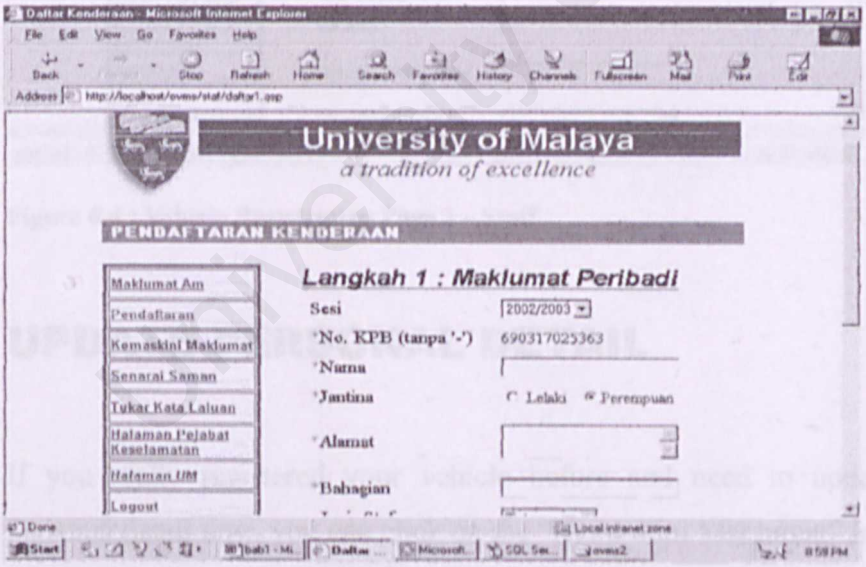


Figure 6.3 : Vehicle Registration Page 1 - Staff

There were 2 forms need to be fill in for vehicle registration. First, you have to insert all the necessary fields in the Vehicle Registration Page 1 and then click the "Langkah 2" button. This will bring you to Vehicle Registration Page 2 (Figure 6.4). Also, you need to key in all the required fields and click the "Daftar" button. If the confirmation message appears on he screen, that means your vehicle registration is successfully.

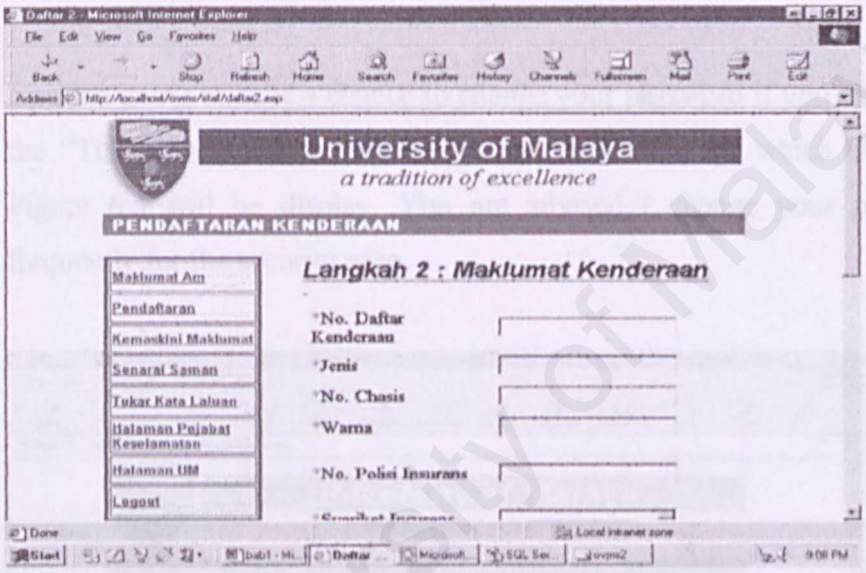


Figure 6.4 : Vehicle Registration Page 2 – Staff

6.3 UPDATE PERSONAL DETAIL

If you really registered your vehicle before and need to update your personal detail now, you can click on the "Kemaskini Maklumat" hypertext link. This page will allows you to update your personal detail.

6.4 CHECK SUMMON RECORD

By clicking on the "Seranai Saman" hypertext link, the system will display all of your summon record.

6.5 CHANGE PASSWORD

You are going to have a chance to change your password if you clicked on the "Tukar Kata Laluan" hypertext link, and the page which shown in Figure 6.5 will be display. You are advised t change your password frequently for the security wise.

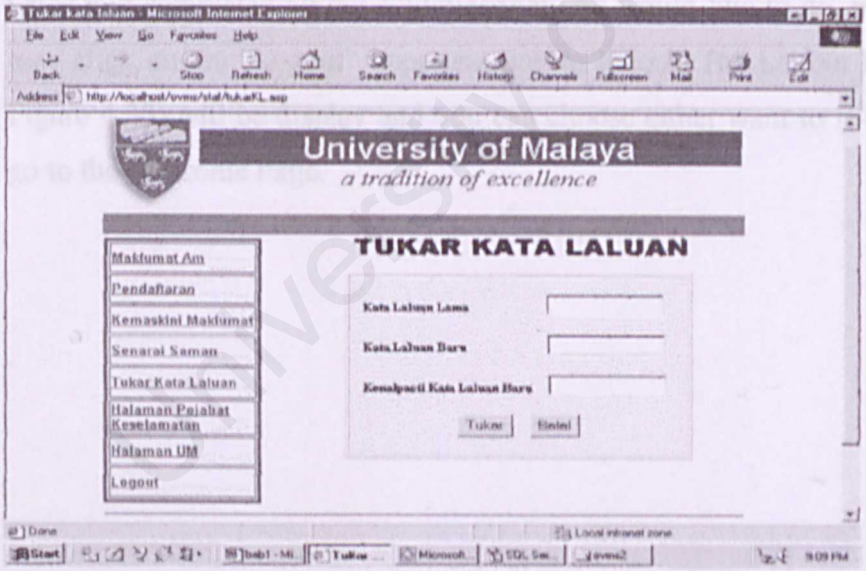


Figure 6.5: Change Password – Staff

6.6 SECURITY OFFICE HOMEPAGE

Once you click on the "Halaman Pejabat Keselamatan" hypertext link, it will links you to the Security Office Homepage directly.

6.7 UNIVERSITY MALAYA HOMEPAGE

Once you click on the "Halaman UM" hypertext link, it will links you to the University Malaya Homepage directly.

6.8 LOGOUT

Once you completed all the activities that you would like to do, now, you may click on the "Logout" hypertext link to logout. The Logout Page (as Figure 4.30) will be display and you can choose either want to re-login or go to the Welcome Page.

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GLOSSARY

GLOSSARY

Client/Server Architecture

A design model for applications running on a network in which the bulk of the back-end processing – such as performing a physical search of a database, takes place on a server computer.

Database

A collection of related information stored in a structured organized way. Users can retrieve the data from it.

GUI (Graphical User Interface)

An interface having windows, graphical symbols, pop-down menus, and other structures that are often manipulated with a mouse pointer.

HTML (Hyper Text Markup Language)

A standardized system of tagging text for formatting, locating images and other context files, and placing links or references to other documents.

HTTP (Hyper Transfers Protocols)

A references in HTML to another hypertext segment.

Web Browser

A software to navigate or surf through World Wide Web.

Web Server

A computer that provides web services and pages to Intranet and Internet users. Server-side business objects are typically instantiated here.