# Web-based Laundry Management System

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# ABSTRACT

Nowadays, information technology has pervaded into almost every industry in the country. Business organization today are moving to computerized their current systems to ensure smoother operations in the daily running of the business. Web-based Laundry Management System is introduced as to give a new impulse for the organization to gain more competitive advantages.

The Waterfall with Prototyping Model has been chose as the methodology of system development to develop the proposed system. Beside the waterfall with prototyping model, a survey have had carried out to gather more information. This system was used JSP as web programming language, MySQL as the database and Apache and Tomcat as the web server.

This system consists of two section and several modules. The two sections are member section and administrator sections. The member section will enable the member to register to join as member and place the order. The administrator section enables the administrator to view the order, change order status and generate the report.

Web-based Laundry Management system is an online ordering system for the laundry business, which is developed with the purpose to gain more competitive advantages and reduce the problems such as losing receipt and unclaimed clothed (storage spaces) that currently facing by using manual system.

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# Chapter I

# INTRODUCTION

## 1.1 Introduction to the Project

Nowadays, most of the businesses organization especially small businesses in Malaysia are still using the traditional way (i.e. filing system) to conduct their daily business operations, this maybe insufficient in terms of space, quality, cost and internal management. Therefore, the purpose of this project is to eliminate the drawbacks in the traditional method beside increase customer satisfaction using the Internet.

This project/system will assist those people who are very busy with their daily working schedule and have no time to washes or sending their clothes to the laundry and dry clean shop. By implementing the web-based laundry ordering system in an organization, the system can totally reduce the time spend for sending the clothes to the shop. Although sending clothes to the laundry and dry clean shop still not very popular in Malaysia although in the city but the trend will change due to the busy daily life in the city on the current days. Thus, this project is a conceptual solution for them.

The project is called Web-Based laundry management system. The concept of this system is that the customer can make order/send their clothes to the laundry and dry shop without going to the laundry and dry shop. The customer can make order by phone call or make order by using Internet. The website will display all kinds of services provided by the organization and the price list for all kind of services item and some other descriptions such as organization profile and etc.

## 1.2 Aims, Relevance and Significance of the Project

### 1.2.1 Aims

In the competitive market today, the management for the organization needs to have its promotions widely spread among the customers in order to gain the competitive advantages. However, in today information technology (IT) century, there have others alternatives such as computerized the current manual system and make it available on the Internet in order to compete with other competitors. Through computerization, all the customers, suppliers, employees and services information can be easily tracked and maintained.

It is hope that this system will be able to handle all services, which include recognizing the need of services, placing an order for goods with a supplier and receiving the goods, receiving orders from the customer. Beside that, in the customer side, proper records of customer information, ordering, payment, pickup and deliveries to the customer are needed in order to fulfill the customer needs.

This project is aimed to provide or to generate various types of reports for the management for evaluation purposes. It is important to make sure the organization is growing through periodic evaluation so that actions can be taken to increase the performance from time to time.

It is also important to provide adequate safeguards to protect the system from unauthorized users. The level of access by the top management of the organization is different from the normal users. This is to protect unauthorized users from modifying the contents of the database. Because this is a web-based system, so authentication for register user must also be done to protect unauthorized users from enter to the system.

The main objectives of the system can be summarized as follow:

- To provide a complete web-based management laundry system.
- Handle and maintain the customers, employees and services databases.

- Handle all transactions.
- Generate various types of report for the management.
- Provide safeguards to protect the unauthorized users.
- To encourage the participation of electronic commerce by small business.
- To create a user-friendly system for users.

### 1.2.2 Relevance

This project is relevant because in the century of information technology (IT) today, everything gets changing and speed with which today's information becomes yesterday's news is increasing at a staggering rate. Organization needs different software applications or manpower to support their heavy transactions everyday. Implementing one complete web-based system in the organization can be more efficient way to carry out this duty.

Through web-based system, the cost will be definitely reduced. There is not necessary for one organization to hire another party to do their promotion by handout postal or handbill, what they need to do is through the Internet. This will definitely widely spreads and the entire user who surfer the website will sure get the notice and this will not only limit for the local people. There is also no need to have a large store to keep all the ready clothes. What they need is sending back to the customers when the clothes are ready or just put a notice at the website so that the customer will know that their clothes are ready when the customer check about the status of their clothes. The manual management system will sure increase by using database to store all the important information including all the transactions, customers' information, suppliers' information, stocks' information and etc. So, it is beneficial for the organizations to implement the system.

### 1.2.3 Significance

If the web-based system can be successfully implemented, it would provide the organization with an added advantage to its competitors. It will provide customers with a user-friendly system (GUI) that allows the customers to communicate their requests efficiently, effectively and correctly. Without a need of others promotion method, the organization can widely spread to the customers, the organization not only can improve

the business but also can reschedule the plan within an organization to refocus on expanding their business.

## 1.3 Project Scope, Limitations and Assumptions

### 1.3.1 Scope

This project has its own scope of target users. It mainly covers all people who wish to get a laundry and dry clean service but have no time to do so because of the busy working life or no suitable time, and owner of the laundry and dry clean shop. Basically they can divide into four categories, which are the management, operator/employee, register member and all person who wish to get the laundry and dry clean service.

**Target Users**

*Management*, the one who concern the most about the system is included in the list of users as they too can login to the system to manage the system. Besides that, the system enables them to view the statistics of the system like the number of order, daily transaction and etc.

*Operator or employee*, the other group of user, can also login to system to conduct daily business transaction such as enter the order request by the customer who order through a phone call or come to the shop.

Since this system is a web-based system, it can have its own member/customer. They are like any other customers except that they can also make order through the system. Besides that, they can also enjoy other promotion provided by the system.

Finally, it is the Internet user who the system would like to target its users to. They will be provided with all the information about the organization so that they can choose for service and after join in as a member to get the promotion provided by the organization.

### 1.3.2 Limitations

There are some limitation in this project due to the limited companies that provide the complete computerized web-based Laundry and Dry Clean system in the country. This has given me some difficulties in identifying the actual problems faced by these companies. However, currently this situation has been change dramatically because of the realizations and the importance of Information Technology in the global community especially in new and big companies. They have started to emphasis on computerization on their current systems. So, it has given me new impulses in doing this project.

### 1.3.3 Assumptions

There are two assumptions that relate to characteristics of this project:

a) The employee or shop assistant of this system should have basic computer knowledge. This means that they should know how to start computer, enter login ID, password and etc.
b) The word ***organization*** used in the context of the proposal report is referring to the Laundry and Dry Clean shop.

## 1.4 Research Plans and Methods

Research will begin with an analysis of the current manual systems and some of the web-based systems implemented in the local Laundry and Dry Clean shop. This will provide a good understanding of how the current system works, comparisons between the manual and computerized systems and also provide the groundwork for the system designs.

Besides that, Internet surfing relating to the organizations provides web-based system must be in ongoing process. This because, it will give me more new idea about the business process and the actual facts or situation that I need to know about the internal process of the organization and how to develop a good user interface (GUI) to attract more customers.

Lastly, interviews will also be conduct among the local Laundry and Dry Clean shop and also the people in our society for personal opinions concerning the Web-based system for Laundry and Dry Clean shop and issue related to current operations in the business organization. In order to gain more information, the document room in the faculty is a

necessity place for reviewing the structure of the report and also for finding the actual information for writing this report

**Summary of Research Plans and Methods**

- Analyzing of the current systems in the business organizations.
- Interviews the owner of the laundry and dry clean shop and also people around.
- Browsing through Internet and document room to find more information.

## 1.5 Expected Outcome

This project is expected to come out with one web-based laundry management system that can enhance/ replace the current manual system in the laundry business. This system must allow users to sign-in and access, edit, place order, and etc. Most importantly, it should be able to fulfill all users and laundry businesses requirements and provide and ease-to-use to both party.

It also expected that the system could achieve the objectives as proposed in this proposal report. Each module in the system must be clearly identified and has a specific direction that can provide a good user interface and clear functions to the users. The system also must be easy to maintain for the management.

It is also hope that the system can convince the laundry business organization to upgrade their current manual system to the web-based system.

## 1.6 Project Schedule

A Gantt chart is an easy way to schedule tasks. It is essentially a chart on which bars represent each tack or activity. The length of each bar represents the relative length of the task. Figure 1.1 below is an example of Gantt chart where time is indicated on the horizontal dimension and description of activities makes up the vertical dimension. This is the project planning for the system.

| Task Name | Duratic | Start | Finish |
|---|---|---|---|
| Feasibility study | 2 wks | Sun 6/10/0' | Thu 6/21/01 |
| Literature review | 3 wks | Fri 6/22/01 | Thu 7/12/01 |
| Requirement analysi | 3 wks | Fri 7/13/01 | Wed 8/1/01 |
| System design | 3 wks | Sat 7/28/01 | Thu 8/16/01 |
| System prototyping | 4 wks | Sun 9/30/0' | Thu 10/25/01 |
| Development | 8 wks | Fri 10/26/0' | Thu 12/20/01 |
| Testing and mainten | 4 wks | Fri 12/21/0' | Thu 1/17/02 |
| Documentation | 36 wks | Sun 6/10/0' | Tue 2/12/02 |
| Implementation | 3 wks | Fri 1/18/02 | Thu 2/7/02 |

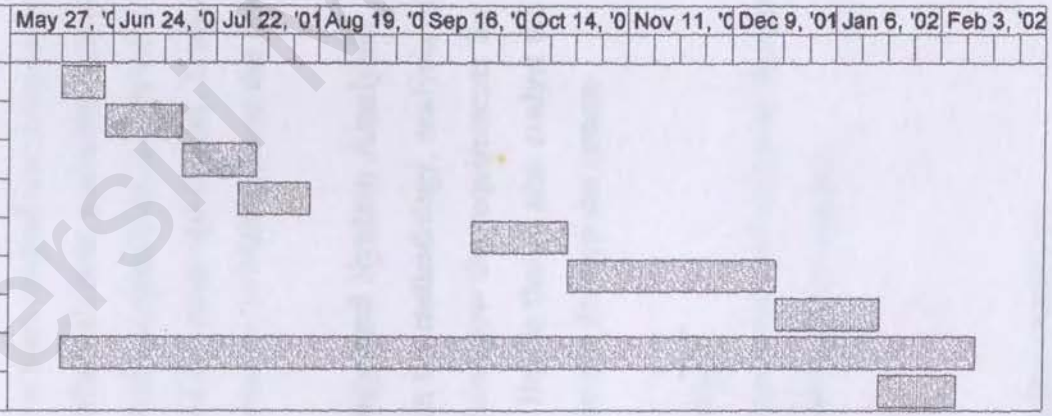



Figure 1.1: Project Schedule

## 1.7 Report Layout

The purpose of this project layout is to give an overall overview of the major contents, which will include and involved during the development of this project. Below is the report layout:

### Chapter 1: Introduction

This chapter gives an overview of the project, which includes the aims, relevance, significance, limitations, project scope and some assumptions. In addition, this chapter also covers the project plan and methods.

### Chapter 2: Literature Review

The current laundry shops is been studied and compare to get more idea about the ways the laundry shops was conduct. Current available local and foreign web sites about the laundry system was discussed and details of comparisons between the currently available systems on the Internet and the proposed system. It also explains the current problems faced by the business organization in Malaysia and the solutions for the problems.

### Chapter 3: Methodology and System Analysis

This chapter emphasized on the methodology, analysis of the project's requirements and development tools. It explains how the requirements for this project were acquired and the analysis of the results. Beside that, it also analyst the development tools available to choose the best tools/software to develop the system

### Chapter 4: System Design

This chapter explains the conceptual and technical design processes of the system. It will include the database and user interface designs.

### Chapter 5 System implementation

This chapter gives documentation about the developmental process of the system, which include both hardware and software.

## Chapter 6 System Testing

This chapter gives a description of testing processes, which involve both planning and implementation. It also includes the verifications and validation of the system to make sure the error is in the minimum level.

## Chapter 7 System Evaluation

This chapter will evaluate the system in terms of strengths and limitations together with suggestion for further enhancements for the system. The problems encountered during the development of the system will also be illustrated here. Finally, it ends with a conclusion of the whole project.

# CHAPTER II

# LITERATURE REVIEW

Recent advances in information technology have made the various industries in Malaysia to realize the need to upgrade or develop a new information technology system, including business organizations. A lot of companies in western country have implemented the online laundry and dry clean web site to offer the more convenient way for customers to make order.

In Malaysia, only one companies that fully using web-based laundry management system approach to do businesses and advertising is the Smart laundry and dry cleaning services which own by the Teknik Segala Sdn. Bhd.

## 2.1 System Comparison

Research and analysis had been conducted through some of the current available laundry and dry clean web based management system in the Internet. Both the local and foreign countries' laundry and dry clean web based system have been visited and analyzed to obtain a better view and understanding of how a laundry an dry clean web based systems are currently implemented.

In addition, the study and analysis of current manual system also had been conducted through interviewed with the person in charge of the local laundry shops to gains some knowledge about the ways they conducted the daily business and the problems they are facing.

Besides that, the advantages and disadvantages of these current manual systems and the web-based systems are been compared as well. Listed below are some of the current manual laundry shop and also some web-based system that had been chosen for discuss:

***Current Manual laundry shops:***

- ❖ August Cherry laundry shop.
- ❖ Dobi Sincere.
- ❖ Advanced Laundry and Dry Cleaning Center.
- ❖ Rex Laundry and dry cleaning.
- ❖ Kedai Pencucian Layan Diri Electro-Clean.

***Local Web based laundry system:***

- ❖ Speedwash Laundry Sdn. Bhd.
- ❖ Public Drycleaners Sdn. Bhd.
- ❖ Teknik Segala Sdn. Bhd.

***Foreign Web based laundry system:***

- ❖ 9-laundry.com
- ❖ LondonLaundry.com
- ❖ White-knight.co.uk
- ❖ Dryclean Express Pte. Ltd.

## 2.1.1 Current Manual Laundry shop

### 2.1.1.1 August Cherry Laundry

August Cherry Laundry is located at the section 17, Petaling Jaya. This laundry shop just operates about one month. The person in charge of the shop is Mr. Thomas.

The ways this laundry shop operate their daily business by manual system, which mean that the shop assistant will give a receipt to the customer when the customer send their cloths to laundry shop. The customer has to show the receipt when he or she comes to collect his or her cloths and then make a payment.

August Cherry shop assistant, Mr. Din said only the collected cloths will records in a daily transaction book and after finishing one receipt book then it will give to the person in charge.

The main customers of the August Cherry are mostly working people and some students. They also provide pick-up and delivery service by phone call. Others services such dry clean, ironing and laundry also provided.

Since this laundry shop is a new operates business, there are still not facing any problem regarding the uncollected cloths or losing receipt cases.

**2.1.1.2 Dobi Sincere**

Dobi Sincere is in charge by the Ms. Cecilia. This laundry shop is located at the SS2, Petaling Jaya. According to Ms. Cecilia, this Dobi Sincere is her family business and she is managing the business almost three years.

Its own family members conduct this laundry shop without hiring out side people. The way they running their business are in manually method that means they provide a receipt to the customers and the customers will show back the receipt when the customers come for collect their cloths. The shop assistant will give the cloths to the customers according to the receipt number and then will record this transaction into a book after the customer have make the payment.

This shop provide dry clean, hand wash, ironing and laundry services but they do not offer the pick-up and delivery service. The major customers of Dobi Sincere are students, working people and some families.

One of the problems that Ms. Cecilia facing is the uncollected clothe. Some of the cloths have already kept for two years. Others problem such as losing the receipt but are just very small number.

### 2.1.1.3 Advanced Laundry and Dry Cleaning Center (AL)

Advanced Laundry and Dry Cleaning Center (AL) is owner by Ms. Helen. This laundry business is also a family business and located at section 11, Petaling Jaya.

AL has three assistants to helping Ms. Helen to manage the business. As mentioned early, AL is also operating the daily business by the manual style.

Working peoples, hotels and restaurants are the core customers of the AL. Families and students are also the customers for AL but the number is very few. The services that AL provides are dry clean, ironing and laundry. AL also provide the pick-up and delivery service but only for the hotel or the restaurant.

The problems currently faces by AL are also the uncollected clothe and normally they will continue to keep the cloths although the expired date for collect was over. According to the shop assistant, the losing receipt cases are seldom happen.

### 2.1.1.4 Kedai Pencucian Layan Diri Electro-Clean

Kedai Pencucian Layan Diri Electro-Clean is a self-service laundry shop, which located at the Section 17. The owner of this shop is Ms. Lim. This laundry shop has operated about 20 years and currently employs a worker to helping her to conduct the daily business.

This laundry shop is a self-services laundry shop. What mean by self-service? Self-service is a system of service in a restaurant, shop, etc in which customers take what they want and then pay for it. Therefore, at Kedai Pencucian Layan Diri Electro-Clean, the customers have to put the cloths to the machine for wash and after that move to another machine to make it dry by them.

Unfortunately, those scenarios were not happen at Kedai Pencucian Layan Diri Electro-Clean although it is a self-service shop. Why this can happened? According to Ms. Lim, this is because the related to the Malaysia culture. Normally, the customer will just give

the cloths to the shop assistant and let the shop assistant to do for them. Some will wait there, but normally they will come back later to collect their cloths. So, is no much different from the full-services laundry shops.

The problems that Ms. Lim facing also is the missing receipt problem and the uncollected cloths. One approach to overcome the losing receipt cases, Madam Lim will also request a private number such as motorcycle number and house number from the customer to write in down at the plastic bag that use to place the cloths. So, when the customer loses their receipt, they still can claim the cloths by giving the private number. For the uncollected cloths, there is still no idea to overcome this problem.

#### 2.1.1.5 REX Laundry and Dry Cleaning

REX Laundry and Dry Cleaning is a laundry shop that located at SEA Park, Petaling Jaya. According to Ms. Liew, person in charge of REX said that REX has been operating over 32 years under her control and REX also is a family type business.

Since REX is a family type business system and operate over 32 years without much change, so the way REX conducted the business is in the manually way.

Types of services that REX provides are such as dry clean, ironing and others. The additional service that REX provides is the self-service system, which the customer will wash and dry their cloths themselves after insert coins into the machine or pay the charge to the shop assistant. According to Ms. Liew, this self-service system is seldom use by the customers. If the customer uses the self-service system, they will normally ask the help of the shop assistant to do it for them.

The major customers of REX are the family and working people. Almost of them are the residents near SEA Park.

Family members are usually helping Ms. Liew to operate REX business. The problems that primarily face by REX are the losing of the receipt among the customer. According

to Ms. Liew, the numbers of customer who lose their receipt is about 3-4 cases within a month. This creates a big problem to REX, their have to record down the customer's name, contact information and also the identity number before give them collect the cloths. Those process is procure to make sure that they can claim back the cloths or report to police if the customer refuse to return back the cloths if the customer was accidentally taken the cloths.

## 2.1.2 Local Malaysian Web-based Laundry system

### 2.1.2.1 Speedwash Laundry Sdn. Bhd. (http://www.speedwashlaundry.com)

Speedwash Laundry Sdn. Bhd. was incorporated on the 20th of May 1991, to provide professional and specialized laundry services to business organization such as hotels, restaurants, and recreational clubs [1].

Basically, this web site is more like the home page for its company therefore it just only provides the information about the company profile, service provided, customer, financial status, manpower, equipments, etc.

There are also no have any animations designed in this web site that are able to attract users' attention to certain information like upcoming events, latest added promotions and others. One good point of the design of this site is that interface is made simple by adding just a few nice images and pictures, which are of ideal sizes and this make the download speed of its web pages looks nice and appealing.

In general, this site has a main page and also a good combination of background colors. Instead of using pictures and images to design its web page interface, attractive text styles, logos and combinations of colors are also being used to make the web pages attractive. But this web site was not similar with the system that proposed system because it just contain a static page and all the information are written into one pages.

### 2.1.2.2 PUBLIC DRYCLEANERS SDN. BHD. (http://www.publicdrycleaners.com/)

Public Dry Cleaners Sdn. Bhd. is the professional dry cleaner and carpet cleaner established since 1968. The addition services provided are collection and delivery in this company but there was no way the user can make order through the web site because its no provide the online order services and others information are almost the same such as kind of services provided, company profile and contact information [2].

This site no has a main page and it straight away get into the information page. But the good combination of background colors and some animation at the top of the page has an attractive look. Instead of using pictures and images to design its web page interface, attractive text styles, logos and combinations of colors are also being used to make the web pages attractive.

Basically, this site also likes a home page for its company. All the information was written in the same page but it provide a link button which locate at the left hand site of the page to link with other information in the same page without need to scroll down the page. This is a good point about the design of this site.

**2.1.2.3 Teknik Segala Sdn. Bhd.**

The Smart Laundry and Dry Cleaning Service is owned and operated owned and operated by Teknik Segala Sdn Bhd, No 34 Jalan TPP 5/2 Puchong Industrial Park, 47100 Puchong, Selangor, Malaysia [3].

This web site was the best laundry and dry service web-based system that have been founded and visited among the three local web sites. This web site can be divided into three main modules, which are information module, e-mail module and ordering form module. At the information module, it provided all the suitable information that the users always needs such as company profile, type of service provided, price lists, area served and contact number.

In the ordering form module, the user had to full in a form and summit the order form in order to complete the online ordering process. Besides that, there are also no have a

cancellation module is provided for the user to cancel their order. The drawback about the ordering form is themselves do not provide this features, they just use other free provided form features which own by http://forms.flashbase.com/. The form is too simple as u can see at the print screen below. After user had submitted the form, it will link the user to other web site, which is http://sweepstakes.doubleclick.net/.

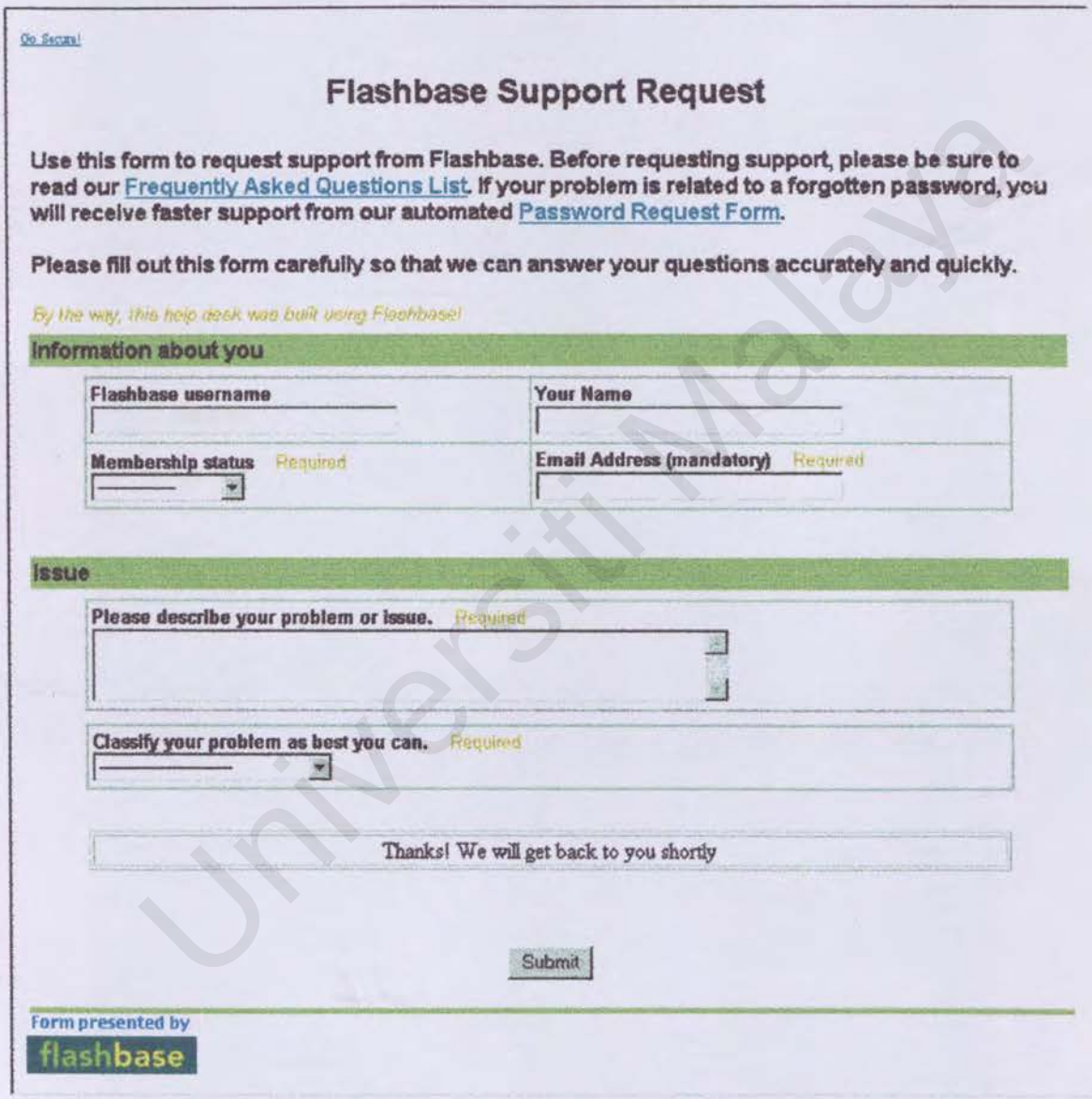



Figure 2.1 Request form use by Teknik Segala Sdn. Bhd.

This web site also uses some animations at each page to make it look appealing but it seem not has the good effect as u can see at the print screen below. There are also some drawbacks in its design. One of them is, there are too many unrelated links to other web

sites like providing property to sale, Anti-Corruption Agency, Malaysia Customs, etc. Although this may look convenient to users, but too many unrelated link can result in losing focus of its main purpose, which is to relate to the laundry and dry clean services.

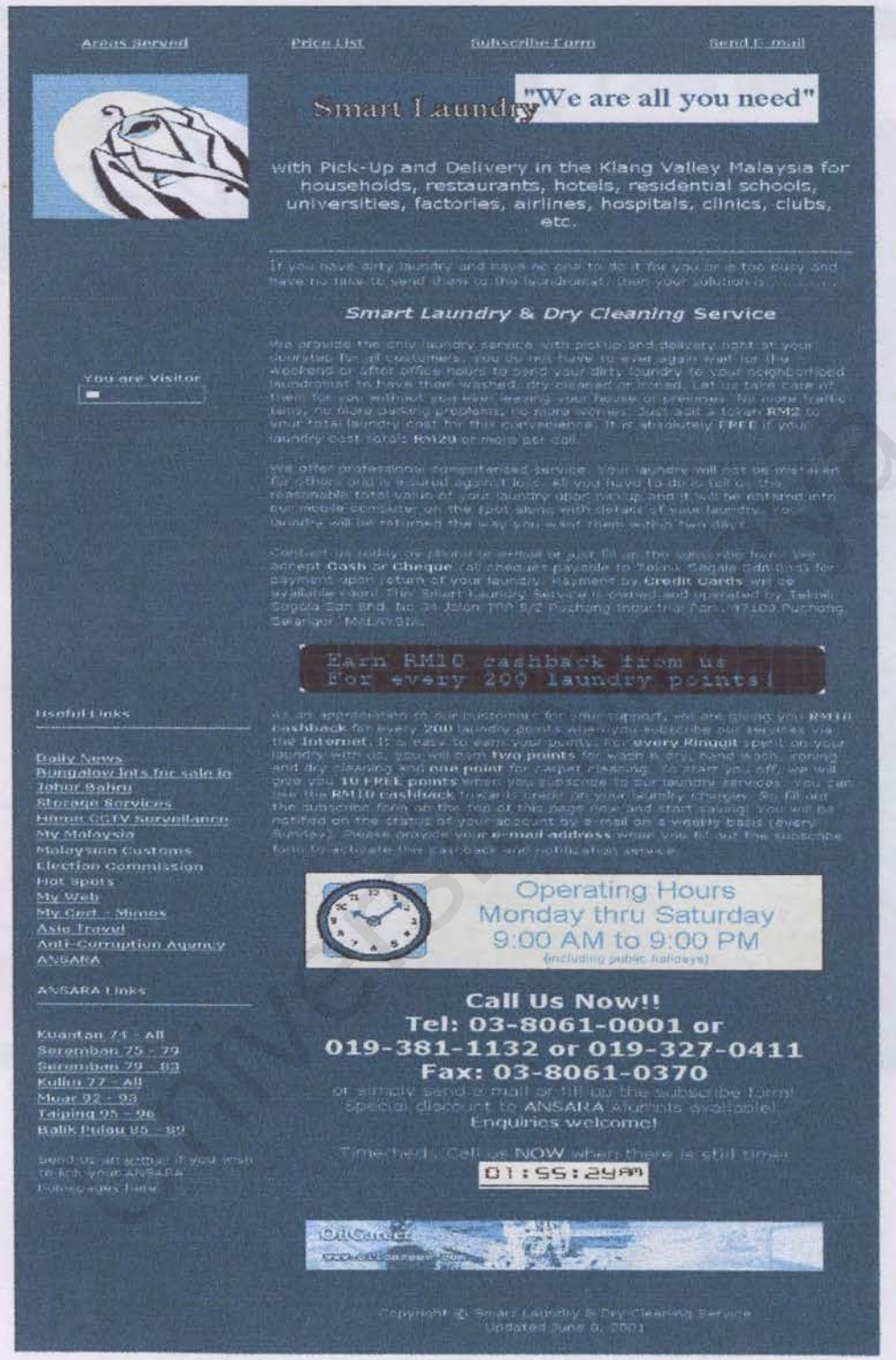



Figure 2.2 Teknik Segala Sdn. Bhd. Home Page


Figure 2.3: Teknik Segala Sdn. Bhd. Area Served page


Figure 2.4: Teknik Segala Sdn. Bhd. Price List page

As what you can see from this web site, the interface of this web site is quite poor and not very user friendly. The vertical size of each web page is too long and the users have to drag the scrollbar down and up to view the web page. Besides that, the price list for all the

services are being displayed in a bordered table form with bad combination of color, which does not look attractive. (Please refer print screen above)

### 2.1.3 Foreign Web-based Laundry system

#### 2.1.3.1 http://www.9-laundry.com/

9-laundry.com is also one of the high quality online laundry and dry-clean web-based system that should be visited and study. 9-laundry is a Singapore-based laundry and dry clean web site [4]. This site provides a very good interface design with simple and user-friendly features.

This site is divided into 3 main modules, which are information module, e-mail module, and request for collection module. Those entire 3 modules are simple, short and complete with the information that user usually request.

In the information module, User easily can view the information about the company profile, price list, types services provide and FAQs. What the user need to do is just clicking the icon at the main page and also at the left hand site of very pages. In addition, the information in these pages is arranged in very tidy and the entire page in this web site is also short. This is a good point of this site where user no needs to scroll down the screen for view the information.

In the e-mail module, user can email the administrator of the 9-laundry to require anything about the 9-laundry services. There also provide the phone number of the 9-laundry for user to contact other than email.

The user can order the place an order and also join as a member to enjoy the promotions at the request for collection module. But the weakness of this module is the user need to enter all the information although the user has joined as member already. There also do not have the cancellation or reset button in this module.

Basically, this site is good and have nice interface but it no has login function for the customers who have signed in as a member. It also no have features for the customer to check the status of its orders, what having there is just a request form to collection only. The cancellation module also not provided in the web site.

**2.1.3.2 LondonLaundry.com**

LondonLaundry.com is a United Kingdom-based laundry web-based system that provides online laundry services that included pick-up and delivery services across the London city [5].

This web site can generally be category to 4, which are information module, register module, booking module, email and contact info module. Information module contains services available information, price list for each laundry charge, Area that are covered for the pick-up and delivery services and etc.

In register module, user is requiring entering all the fields listed there and some of the fields are already listed such as city. This is because the London laundries only provide the services in London. The user can book the services by fill up the booking form. In the booking form, there are fields likes member number, type of service require, time require, etc.

The last module is the email and contact info module. In this module, there are listed all the contacts number and also the email address for different problem such as further info, general contact, site related contact, quick comment, etc. This is good for the purpose of management because they can easily differentiate the problem and diagnosis the problem faster.

Besides that, from the view of the interface, this web site provides a good user-friendly interface and some animations that make it more attractive. Other than that, all the page are well organize and the information have break up to more page if it too long. This is a good point of the web site, which the users no need to scroll down the vertical bar instead

of view the information. Its also provide a link button a the left hand side of each page to easy the user to view the information.

**2.3.1.3 http://www.white-knight.co.uk/**

Established in 1904, **White Knight** is a successful privately owned company providing linen rental and laundry services to hotels, restaurants, catering, leisure, industrial businesses and consumers throughout the South East of England [6].

The white-knight also provide the basic laundry services; they also provide additional services such as leather, sheepskins and suede, rugs, fine shoes repair, bridal wear and etc.

This web site has a very good combination of text color, background and some picture make it look very nice and the icons are arranged neatly and in order. One important point about this web site is it not use any animations but its can make user feel comfortable. From my opinion, this web site is no bad than other web site that use animations.

Besides the interface, this web site can divided to four module, which are profile, customer services, business services and contact module. In the business and customer services module, there provide the information such as type of services, location served, contact and the price list.

In the customer services module, the price list is divided into two types, which are dry cleaning and laundry in a drop down list box. The user can choose which types of price list the user wish to view and this make it look tidy and not like others web site where its usually list all the price list in long page.

**2.1.3.4 http://www.drycleanexpress.com.sg/dryclean (Dryclean Express Pte Ltd)**

Dryclean Express Pte. Ltd is also a Singapore company [7]. This web-based laundry system is also a good example.

In general, this web site can be categorizes into five modules, which are login module, register module, place order module, information module and contact module. In login module, user who had already registered as a member has to enter the ID and the password to login to the system and use the system features such as place an order. The unregistered user can access the information but they cannot place an order without register as a member. The user can register as a member in the register module.

After the user had already registered as a member, he or she can place an order through the web site. There is an addition module for the registered members that are managing their own personal profile. In this module, user can view their information and also change their information as well.

In the information module, the user can view all the information such as price list, product, location served, FAQs, etc. The place order module is provides to the user to order online. But this feature is only for the registered user.

This web site uses many applets to display their promotions package. This is another good way to display the page other than just link to other page. The login user also can manage their profile and this feature is not provided by other web sites that have been visited before.

In general, this web site's interface is good and attractive because it use some animations which suitable with its background. One disadvantage and also the advantage of the web site is that the user have to join as member before can make an orders and this will cause the user who do not which to join as member find another web site. But this feature also can tie closer the user and the web site all the time and this is good from the view of the business strategic.

## 2.2 Summary of the research

As what can be seen from the research, laundry shops in Malaysia can generally categorizes into two types, which are full-services system and the self-services system.

According to the OXFORD Advanced Learner's Dictionary, Self-service is a system of service in a restaurant, shop, etc in which customers take what they want and then pay for it [8]. So, the self-service system, as mention before, this types of service is just a name in our country but not really a self-service system, the operate style is also same as the full-services system.

Besides that, most of the laundry shops in our country still using manual system, which the run their daily business by give receipt and match the receipt if the customer come to collect the clothe.

For the web-based system, Malaysia local online laundry web-based system are very limited, only three web sites about the laundry web-based systems were founds although many foreign and local search engines have been used to search for it. From the three of these web sites, only one of these web sites is provide the online order feature and the other two are mostly like a home page for its company.

The good points of the local web-based laundry system are:

| | Speedwash | Public Drycleaner | Teknik Segala |
|---|---|---|---|
| Combination of Color | Normal | Good | Poor |
| Animation | No have animation. | Only have a little animation but is look nice because it can match with the background color. | Have many animations but is not match with the background color. |

Table 2.1: Comparison of the local websites

On the other hands, the foreign laundry web sites all provide the basic information about the company profile, price list, contact features, promotions and others. Some have added more features such as login and almost have the online ordering feature to enhance the functionality of the site and some still lack of certain features that are worth to be added in.

The below table show the comparison among the foreign websites:

| | 9-Laundry | Londonlaundry | White-Knight | Dryclean Express Pte. Ltd |
|---|---|---|---|---|
| Combination of color | Good | Normal | Attractive | Normal |
| Animation | Only have animation at the main pages. Simple and nice. | Too many animations. Look to complexes. | No animation at all. But still attractive because of the good combination of color | Only have the animation at the main page, look nice and match the background. |

Table 2.2: Comparison of the foreign websites

After looking at many different web-based laundry and dry clean web-based system that are currently available, lots of information and knowledge can be gained from this research. All the advantages and good points of these web sites will be incorporated into the development of this proposed web site if possible and on the other hand, the disadvantages will be avoided as much as possible too. Besides the web-based system, the manual system as well have been studied to obtain more understand about the way conduct the daily business and also the problem faces by the manual system.

## 2.3 Proposed Web-based Laundry System

From the research have been carry out, there are too little online laundry services in Malaysia compare to the foreign country especially the western country.

The proposed laundry and dry clean web-based system are basically divided into 2 sections: user section and administration section. In the user section, it will contain authentication and authorization module, information module, place order module, registration module, email module and cancellation module. The authentication and authorization module is use to identity the registered member and authorizes them to access into the system. For the unregistered member, this module will block them from entering the system.

Information module will provides all the information such as price list, type of services provided, area served and etc. At the contact module, the user can email/send feedbacks to the administrator for inquire any problem or doubt.

The user can register as a member at the register module. In this module, user will be requiring to fill-in some detail such as name, password, e-mail, contact number, etc. After the user had completed the registration, the user will be given a member number for the use of management as the identity of the user. In the place order module, user do no need to enter their personal detail because the system will get these information from the database when the user login. What the user needs to do is just enter the suitable time and the place for pick-up and delivery services.

In the administration section, it will contain the authentication and authorization module, staffs profile module, place order module, view order and change order status module, report module and cancellation module. The authentication and authorization module in the administration section is to differentiate between the normal staff and the management.

Staffs profile module is use by the management to keep the record of the staffs more efficiency. The place order module in the administrator side is use by the administrator to place order for the user who have come to the shop by its own.

The purpose of the view order and change order status module is to view all the order and reply to the customer to let them know that the cloths are under services. Administrator can change the status of the item to ready when the cloths are ready and change the status to collect when the order is collected.

## 2.4 Why a web-based laundry and dry clean system had been proposed?

After completed the research about the laundry shop, there are too little web based small business system for the laundry shop in Malaysia. Another thing that had been founded was the laundry shops in Malaysia are mostly is family business and conducted by the family members.

A web-based small business system for the laundry shop had been proposed because at the present time all laundry and dry clean business in Malaysia still using the traditional commerce style even we are already in the information and technology era. So, the web-based laundry system will have high market values.

Besides that, the idea of putting the laundry and dry clean service on the Internet is still new and fresh in our community. Therefore, it will attract more people to try and use the system.

The third points are the Internet usage is getting more common in our society and addition support of government policy to make one house at least own one computer will encourage the number of people using computer and also the Internet. So, this idea is feasible in our community nowadays and perhaps this system will get popular in the future.

Since the laundry business is getting a good respond from the community, the amount of laundry and dry clean shop have increase hugely. So, by moving the business into the Internet will gain more competitive advantages than others traditional laundry and dry clean shops.

By using the web-based system, the problems such as losing receipt and unclaimed cloths cases will reduce. This because all the record is store in the database and no receipt is needed anymore. Therefore, the business operations will more efficiency to carrying out without these problems.

Below are the comparisons between the proposed system and the currently available web-based system:

| | **Online Order** | **Login** | **Pick-up and delivery service** | **Email** | **Online check item.** | **Registration** |
|---|---|---|---|---|---|---|
| Speedywashlaundry.com | X | X | X | X | X | X |
| Smart laundry and dry cleaning service | ✓ | X | ✓ | ✓ | X | ✓ |
| Publicdrycleaners.com | X | X | ✓ | ✓ | X | X |
| 9-laundry.com | ✓ | X | ✓ | ✓ | X | ✓ |
| LondonLaundry.com | ✓ | X | ✓ | ✓ | X | ✓ |
| White-knight.co.uk | ✓ | X | ✓ | ✓ | X | X |
| Dryclean Express Pte Ltd | ✓ | ✓ | ✓ | ✓ | X | ✓ |
| **Propose Web site** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Table 2.3 Comparison between propose web site and current available web site.

## 2.5 Business organizations in Malaysia – Problem and Solutions

Currently, most of the small and medium size organizations in Malaysia still using manual filing systems to record all the business transactions / processes. This means that they needs a lot of files to keep track and maintain all the records such as invoices, delivery orders, payment requisitions, payment vouchers, purchase orders and etc. This is not a sufficient way as it is a very tedious work and needs a lot of manpower to handle them. The records also difficult to update and some of the data may be duplicated or lost.

In the case of doing promotion, they are using local newspapers, radios, televisions, poster, hire third party and handout to make advertising. Although these traditional ways of advertising are acceptable, but it is costly and small companies may not be able to spend a large amount of money for advertising. As a result, they lose the power to compete with their competitors in the market.

The problem will exist if an individual organization keeps growing and the amount of stocks increase dramatically and may have thousand of records. That is a lot of information. As in any area of society, information's equal power, in this case the power to prescribe, prevent and remedy. But information also equals to problems specifically problems in gathering, storing and accessing. So, they need a proper computer system to enhance the accuracy of information contained in each record.

The next problem is storage and access. Paper files required large amount of storage space, but more importantly, they are easily misplaced or lost, required excessive time for retrieval. Beside that, its only can be examined by a person at a time (and not even that if the records are in transit or waiting to be refilled). Database can eliminate these difficulties. They are more convenient and can be accessed instantly.

The third problem is inventory control. Currently most of the business organizations in Malaysia do not have a proper inventory control over their stocks. Usually what they did is the staff will physically examine the amount available of certain stocks, how much left

and how much they need. All this stock examination is through observation only. The exact amount of stock available in the organization might not be accurate. A proper inventory system is needed to help the staff and management of the organization to have a better control on the stock keeping record.

## 2.6 The Internet and the World Wide Web

The name "Internet" is derived from the concept of "internetworking"; that is, connecting host computers and their networks to form an even larger, global network. [9] And that is essentially what the Internet is: a large worldwide network of networks that sue a common protocol to communicate with each other. By using the Internet, user can communicate with other people throughout the world via electronic mail; read online versions of newspapers, magazines, academic journals, and books; join discussion groups on almost any conceivable topic, and obtain free computer software. In the recent year, the Internet has allowed commercial enterprises to connect. Today, all kinds of businesses provide information about their products and services on the Internet. Many of these businesses use the Internet to market and sell their products and services.

The part of the Internet known as World Wide Web, or simply, the web, is a subset of the computers on the Internet that are connected to each other in a specific way that makes those computers and their contents easily accessible to each other. The most important thing about he web is that it includes an easy-to-use standard interface. This interface makes it possible for people who are not computer experts to use the Web to access a variety of Internet resources.

## 2.7 Definition of Web Site

A Web site is a related collection of World Wide Web (WWW) files that includes a beginning file called a home page. A company or an individual tells you how to get to their Web site by giving you the address of their home page. From the home page, you can get to all the other pages on their site. For example, the Web site for IBM has the home page address of http://www.ibm.com. (The home page address actually includes a

specific file name like *index.html* but, as in IBM's case, when a standard default name is set up, users don't have to enter the file name.) IBM's home page address leads to thousands of pages. (But a Web site can also be just a few pages.) [10]

Since *site* implies a geographic place, a Web site can be confused with a Web server. A server is a computer that holds the files for one or more sites. A very large Web site may be spread over a number of servers in different geographic locations. IBM is a good example; its Web site consists of thousands of files spread out over many servers in world-wide locations. But a more typical example is probably the site you are looking at, whatis.com. We reside on a commercial space provider's server with a number of other sites that have nothing to do with Internet glossaries.

A synonym and less frequently used term for Web site is "Web presence." That term seems to better express the idea that a site is not tied to specific geographic location, but is "somewhere in cyberspace." However, "Web site" seems to be used much more frequently.

You can have multiple Web sites that cross-link to files on each other's sites or even share the same files.

## 2.8 System Classification

Systems can be classified along numerous spectrums. They can be simple or complex, open or closed, stable or dynamic, adaptive or non-adaptive, and permanent or temporary.

### 2.8.1 Simple vs. Complex

A simple system is one in which there are few elements and the relationships between the elements are uncomplicated and straightforward. A complex system, on the other hand has many elements that are highly related and interconnected. In reality, most systems fall on a continuum between simple and complex.

### 2.8.2 Open vs. Closed

An open system interacts with its environment. In other words, there is a flow of inputs and outputs across system boundary. A closed system is the opposite of an open one. There is no interaction with the environment within a closed system. In reality, there are very few closed system.

### 2.8.3 Stable vs. Dynamic

A stable system is one in which changes in the environment result in little or no change in the system. For example, materials to support the system is fairly constant, the system would probably stable. However, the dynamic system is one that undergoes rapid and constant change due to changes in its environment. Most computer manufacturers are dynamic because of the fast changing in computer technology.

### 2.8.4 Adaptive vs. Non-adaptive

The concepts of adaptive and non-adaptive are related to stable and dynamic. An adaptive system is one that responds to a changing environment. In other words, an adaptive system is one that monitors the environment and undergoes change in response to changes in the environment. A non-adaptive system does not change with a changing environment.

### 2.8.5 Permanent vs. temporary

A permanent system is one that is or will be in existence for a long period of time, usually 10 years or more. A temporary system is one that will not be in existence for a long period time. Most corporations are permanent system because of the cost for developing a suitable system is high. [11]

In terms of developing the database system, the outcome must be stable and simple system but can fulfill all the customers' needs as well as organization goals. Beside that,

it is also important to make sure that system can perform efficiently and effectively as the way to convince the user requirements.

## 2.9 Database

### 2.9.1 What is Database?

A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated. The most prevalent type of database is the relational database, a tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. A distributed database is one that can be dispersed or replicated among different points in a network. An object-oriented programming database is one that is congruent with the data defined in object classes and subclasses [12].

Databases contain aggregations of data records or files, such as sales transactions, product catalogs and inventories, and customer profiles. Typically, a database manager provides users the capabilities of controlling read/write access, specifying report generation, and analyzing usage. Databases and database managers are prevalent in large mainframe systems, but are also present in smaller distributed workstation and mid-range systems such as the AS/400 and on personal computers. Structured Query Language is a standard language for making interactive queries from and updating a database such as IBM's DB2, Microsoft's Access, and database products from Oracle, Sybase, and Computer Associates.

#### 2.9.1.1 Why Use Database?

Web-based Laundry system is a system, which needs to handle and process data. So, an application such as database management system (DBMS) that can manage and access the data and maintaining its integrity. Database provides numerous advantages over the file-based system management by making it easier to eliminate most of the system's data consistency, data anomalies and data structural dependency problems.

In case of knowledge information processing, data are more complex. There are following good points from the viewpoint of using integrated data communally as databases.

- Redundancy of data decreases due to integration and multi-purpose use of data.
- Easy to protect data from attacks of users without access capabilities.
- Unnecessary to create the same data for each program.
- Unnecessary to keep redundant data consistent.

Subsequently, what functions of databases are required? Let's start with the universal and basic functions:

1. Data Definition Language (DDL) to represent integrated information of the real world.
2. Data Manipulation Language or DML to manipulate information in databases.
3. Data independence to reduce influence on programs when data changes not only in contents but also in structures.
4. Integrity constraints to justify the contents of databases, which are not given to each user but to databases in order to prevent redundancy and omissions.
5. Concurrency control to keep consistency of data when updated by plural users or user programs at the same time.
6. Recovery from database destruction on account of hardware, software and human errors or accidents.

### 2.9.1.2 Database Organizing

In general terms, we can distinguish three ways of organizing data for use by an organization: centralized, replication and partitioning. Centralized database is housed in a central computer facility. If the computing function is distributed, users and application programs at remote locations may have access to centralized database. It is desirable when the security and integrity of the data are paramount, because the central facility is more easily controlled than a dispersed collection of data.

In the replicated database, all or part of the database is a copy at two or more computer. In a partitioning database, the database exists as distinct and non-overlapping segments that

are dispersed among multiple computer systems. In general, there is no duplication of data among the segments of the partitioned database.

Simplified comparison of these three approaches of database organization is shows in table 2.4. [13]

| Type of Distributions | Advantages | Disadvantages |
|---|---|---|
| Common database accessed by all processors (centralized) | No duplication of data; little reorganization required | Contention among multiple processors attempting to access data simultaneously; Data is large, so response time is slow; during disk failure, all processors lose access to data |
| Copy of the common central database stored at each processor (replicated) | Each processor has access to database without contention; fast response time; during failure, new copy can be obtained | High storage cost due to extensive duplication of data; updates of one copy must subsequently be made on all other copies; high database reorganization costs. |
| Individual database for each processor (partitioned) | No duplication of data minimizes storage cost; size of database determined by application of node, not total corporate requirement; fast response time. | Ad hoc or management reports must be obtained from different databases. |

Table 2.4 Advantages and Disadvantages of Database Distribution Methods

### 2.9.2 What is Relation Database?

A relational database is a collection of data items organized as a set of formally-described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables. E. F. Codd at IBM invented the relational database in 1970. [14]

The standard user and application program interface to a relational database is the *structured query language* (SQL). SQL statements are used both for interactive queries for information from a relational database and for gathering data for reports.

In addition to being relatively easy to create and access, a relational database has the important advantage of being easy to extend. After the original database creation, a new data category can be added without requiring that all existing applications be modified.

A relational database is a set of tables containing data fitted into predefined categories. Each table (which is sometimes called a *relation*) contains one or more data categories in columns. Each row contains a unique instance of data for the categories defined by the columns. For example, a typical business order entry database would include a table that described a customer with columns for name, address, phone number, and so forth. Another table would describe an order: product, customer, date, sales price, and so forth. A user of the database could obtain a *view* of the database that fitted the user's needs. For example, a branch office manager might like a view or report on all customers that had bought products after a certain date. A financial services manager in the same company could, from the same tables, obtain a report on accounts that needed to be paid.

When creating a relational database, you can define the *domain* of possible values in a data column and further *constraints* that may apply to that data value. For example, a domain of possible customers could allow up to ten possible customer names but be constrained in one table to allowing only three of these customer names to be specifiable.

The definition of a relational database results in a table of metadata or formal descriptions of the tables, columns, domains, and constraints.

#### 2.9.2.1 Why use RDBMS?

RDMS or Relational Database Management System performs the same basic functions provided by the hierarchical and network DBMS system plus a host of other functions that make the relational database model easier to understand and implement.

RDBMS have the ability to let the user or designer operate in a human logical environment. The RDBMS manages all of the complex physical details and most important of all is that RDBMS model achieves the structural independence not found in other database models. Furthermore, in the RDBMS model has a very powerful query language called Structured Query Language (SQL), which makes ad hoc queries possible. [13]

# CHAPTER III

## Methodology and System Analysis

After analyzing the survey and findings from the literature review in the previous chapter, this chapter will specify the description about the technique and procedures that are used to gather the system requirements and will specify the justification for the chosen methodology for the project. It also discuss about the modules of the proposed system.

## 3.1 Requirements Gathering

There are varieties of technique can be used to determine the requirements of the system / user. This includes sampling and investigating hard data, interviewing, using questionnaires, prototyping and observing decision-maker behavior and the office environment. However, not all the technique can be used at the same time, it depend on situation. Among the information-gathering techniques that been used are questionnaires and interviewing.

### 3.1.1 Questionnaires

The questionnaires had been distributed randomly nearby the garden house and the shops (section 17 and SS2) and learning institution (University Malaya), which are the potential users of the system. The personal opinions from various peoples, no matter what is the gender, race, level of education, religion will be gathered to compile the final results. Beside that, personal opinions from my friends through their working experience also helpful to capture the requirements of the system.

#### 3.1.1.1 Reason to use a Questionnaires

There are several reasons stated below why questionnaires had been use as information gathering technique:

- The people need to be questioned are widely dispersed.

- A quick way to gather massive amount of data
- An exploratory study and overall opinion to be gauged before the project can be design properly.

### 3.1.1.2 Questionnaire Design

Closed questionnaire was chosen to limit the response options available to the respondent and eventually ease the analysis and interpretation of their responses without using a computerized content analysis program. The design of the questionnaire is attached in the Appendix.

### 3.1.1.3 The Respondents

The respondents cover a wide range, actually is every level of people in the society. They range from the executives of the organizations to professionals, low-level workers, students and etc. This system is meant to ease the life of busy people who has limited time to go to laundry shop. As such, the responses must come from each level of people in the society, without counting the sex, age, race and etc.

### 3.1.1.4 Questionnaire Results

From the 50 questionnaires that have been distributed, most of the respondents have different view about the questions. Responses through this closed questionnaire are quantified and tabulated.

#### 3.1.1.4.1 How Frequent People send the cloths to the laundry shop?

| Sending cloths to the laundry shop among the respondents | Total (X/50) | Percentage (%) |
|---|---|---|
| Never | 4 | 8 |
| Seldom | 16 | 32 |
| Sometimes | 11 | 22 |
| Usually | 12 | 24 |
| Always | 7 | 14 |

Table 3.1:Statistical Result on How Frequent People sending cloths to laundry shop.

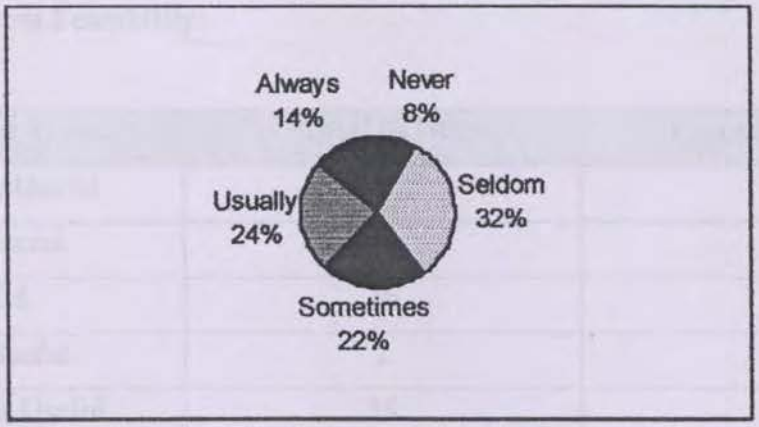



Figure 3.1: Percentage of respondents sending cloths to the laundry shop.

The statistics reveal that on average, majorities' respondents request for the laundry services. Figure 3.1 show that 14% of the respondents always send the cloths to the laundry shop, usually send to the laundry shop is 24% and 22% are sometimes request for the laundry services. There are also 32% of respondents seldom send the cloths to the laundry shop and 8% of the respondents never send the cloths to the laundry shop before. Because of the fact that most respondents sending their cloths to the laundry shop for several reasons, it is necessary to have one web-based laundry system to fulfill the customers need.

#### 3.1.1.4.2 Realization of Web-based laundry system

| Realization of Web-based laundry system | Total (X/50) | Percentage (%) |
|---|---|---|
| Yes | 10 | 20 |
| No | 40 | 80 |

Table 3.2: Respondents realization of the Web-based laundry system

The statistics shown that only 10 respondents (20%) knew about the web-based laundry system and there are 80% of the respondents do not know about the web-based laundry system. This situation happens because the web-based laundry system is so new in Malaysia so no much people realize about it.

### 3.1.1.4.3 System Feasibility

| Useful of the system | Total (X/50) | Percentage (%) |
|---|---|---|
| Extremely Useful | 4 | 8 |
| Very Useful | 6 | 12 |
| Useful | 16 | 32 |
| Often Useful | 2 | 4 |
| Sometimes Useful | 19 | 38 |
| Rarely Useful | 3 | 6 |

Table 3.3: Statistical Result on the usefulness of the system

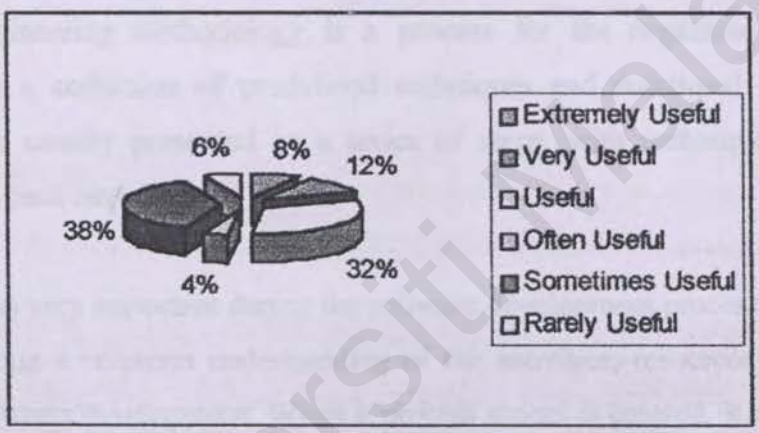



Figure 3.2: Percentage showing the usefulness of a Web-based laundry system.

The result of the figure 3.2 may affect the usefulness of the Web-based laundry system. But a total of 52% of the respondents still support the presence of the system in an organization. They find the system in a business organization as useful, very and extremely useful. This statistics reveal that the system is feasible to be implement.

### 3.1.1.4.4 Ordering laundry services through the Web-based laundry System.

| Ordering Services | Total (X/50) | Percentage (%) |
|---|---|---|
| Yes | 33 | 66 |
| No | 17 | 34 |

Table 3.4:Respondents willingness to use the web-based laundry service.

The percentage of users willing to use the web-based laundry system is high (66%). This will encourage the development of the web-based laundry system. However, there are still 34% of the respondents refuse to use the web-based laundry system and some of the reasons given are:

- No internet facilities
- Laundry is nearby.

## 3.2 Methodology

According to FOLDOC, Free On-Line Dictionary of Computing, methodology is an organized, documented set of procedures and guidelines for one or more phases of the software life cycle, such as analysis or design [14]. Whereas, Rumbaugh et al defined that a software engineering methodology is a process for the organized production of software, using a collection of predefined techniques and notational conventions. A methodology is usually presented as a series of steps, with techniques and notation associated with each step. [15]

Process model is very important during the software development process or software life cycle. It can form a common understanding of the activities, resources and constraints involved in software development. When a process model is created, it helps to find the inconsistencies, redundancies and omissions in the process. As the problems are noted and corrected, the process becomes more effective and focused on building the final system. [16]

People have developed software systems for decades. In the development process several different models for system development have been used. For instance, Waterfall Model, V Model, Prototyping Model, Spiral Model and Transformation Model. These models provide guidance on the order in which a project should carry out its major tasks.

The process model for this Web-based Laundry System is 'Waterfall model with prototyping'. It is actually using waterfall model concept but the prototyping concept is added during the modules development.

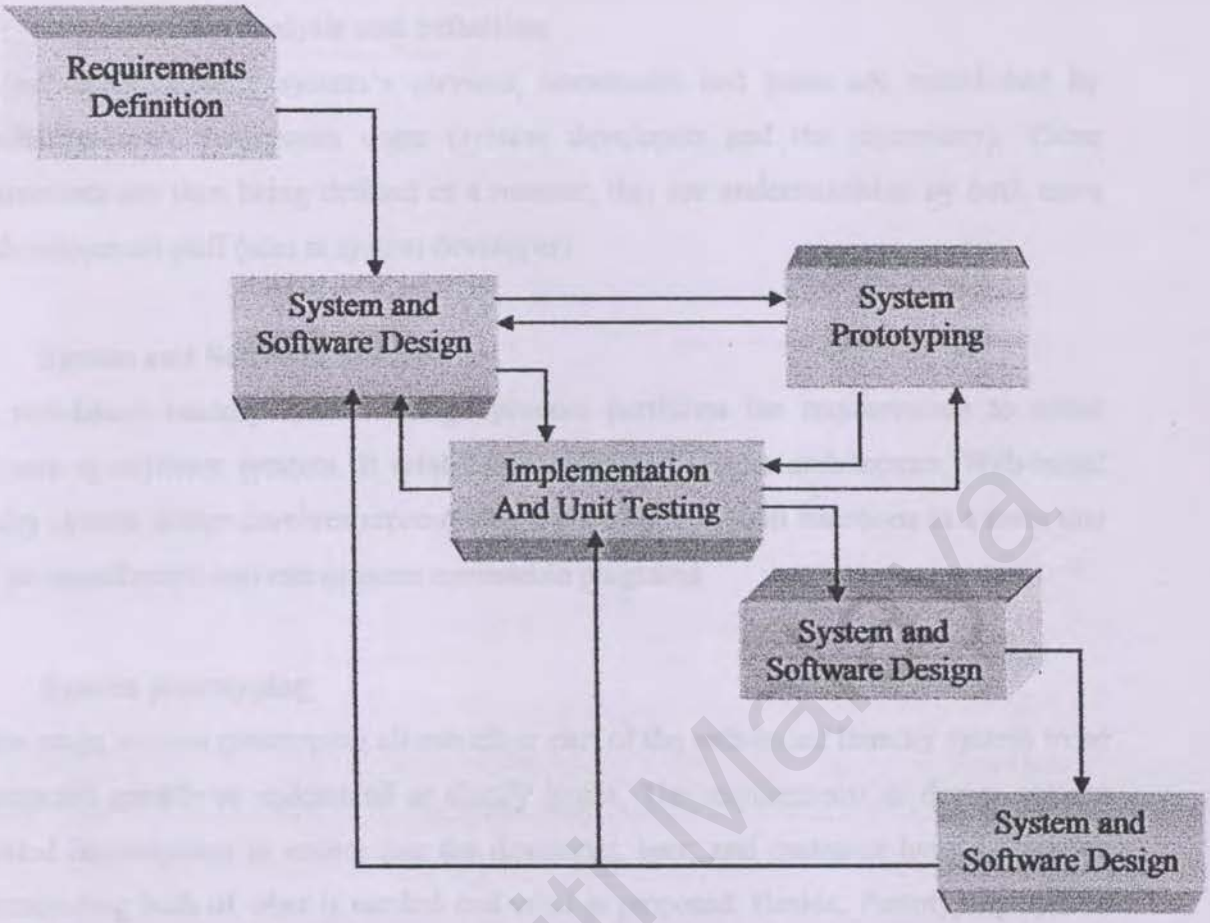



Figure 3.1 Waterfall model with prototyping

The above figure is waterfall model with prototyping [17], which represent the laundry system processes. The waterfall with prototyping approach was used because the system consists of separate process phases, which cascade from one phase to another, except the system prototyping state. The system consists several phases such as requirement analysis and definition, system and software design, system prototyping, implementation and unit testing, integration and system testing, and operation and maintenance. Each stage is 'signed-off' when it is defined and development goes on to the following stage. There is a cycle among the stages of system and software design, system prototyping and implementation and unit testing. These three stages are keeping looping if the system prototype is to be changed, as it is not as ideal as what had been expected. Another reason why the waterfall with prototyping approaches was used is it offered a means of making the development process more visible compare to other models. In this waterfall model with prototyping, the fundamental development activities are [18]:

❖ **Requirements analysis and definition**

The web-based laundry system's services, constraints and goals are established by consultation with the system users (system developers and the supervisor). Those requirements are then being defined in a manner, that are understandable by both users and development staff (also is system developer)

❖ **System and Software design**

The web-based laundry system design process partitions the requirements to either hardware or software systems. It establishes an overall system architecture. Web-based laundry system design involves representing the software system functions in a form that may be transformed into one or more executable programs.

❖ **System prototyping**

In this stage, system prototyping allows all or part of the web-based laundry 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. Beside, Prototyping system information is a worthwhile for gathering specific information about users' information requirements. The initial reactions from users to the prototype were sought. Then, the user suggestion about changing or 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 [19].

❖ **Implementation and unit testing**

During this stage, the web-based system prototype is realized as a set of program units. Unit testing involves verifying that each unit meets its specification. If the unit testing was fail, the system prototype is redefined again or the system and software design stage is reprocessed again.

❖ **Integration and system testing**

If unit testing is success, the individual program units or program, which had been developed, are integrated and tested as a complete system to ensure that the web-based

laundry system's software requirements have been met. After testing, the software is available for the use.

❖ **Operation and maintenance**

Normal (although not necessarily) this is the longest life cycle phase. The web-based laundry 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 units and enhancing the system's services as new requirement a re discovered.

## 3.3 Requirements Analysis

Requirements analysis covers the area of functional and non-functional requirements of the web-based small business system for the laundry shop. The functional requirement probably can divided into two categories namely, customer section and administrator section. The customer's section is where the clients can access the web site through Internet to make order and others transactions as needed. While, the administrator section is basically to responsibility of the system administrator to manage and maintain the database.

### 3.3.1 Functional Requirements-Customer's Section

#### 3.3.1.1 Main page

This is the front door to the system. It provides links to modules in the system and also the login page for users to sign in. It is also the gateway for users to use the system. This main page should be able to provide a clear picture on the flows of system so that those users can use the system with minimal ambiguity. Several features are included in the main page are such as user signup, system login, contact us, price list, place order and FAQs.

### 3.3.1.2 Information Module

This module will contains several parts such as company profile, price list, area served and services provided. At the company profile, it will display some company profile for user to view. While the price list part will list all the price charge for the services. Area served part will let users know which area are currently be served and services provided part will let users know what services is been served.

### 3.3.1.3 Registered Users (External Users)

Visitors to the system can register with the system to enable themselves to use the facilities and promotions provided. Once registered, the user will be able to access to their account to enjoy the features provided by the system. The features that will be provided are such as secure login, managing personal information, modification of password, check the status for the cloths that have been send to the shop.

### 3.3.1.4 Checking Order Status

The users can check their order status by click on the order status icon. Then, the status will display on the screen and if the user wishes to view the order detail, they can do so by click at the order ID.

### 3.3.1.5 E-mail

There are three types of emails in this system. The first one is for user to send the FAQs or any problems regarding the services to the administrator. The second type is the register forms that user use to register with the system. Third type is the ordering form; this will send the order to the administrator.

### 3.3.1.6 Registered Members Account Manage Module

This is the module that able the registered members to manage their own profile. They can change their information such as contact number, address, e-mail, etc. They also can change their password in this module. The users also can check or know their cloths status in this module.

### 3.3.2 Non-functional Requirements

Non-functional requirement are as important as functional requirement. A non-functional requirement describes the features will be included in the system to provides a feasibility and ease of use to the users. It also can be defined as constraints under which the system must operate and standards, which must be met by the delivery system soon. There are few issues in this area in respect to development of the system.

#### 3.3.2.1 Reliability

A system is said to have reliability if it does not produce dangerous or costly failure when it is used in a reasonable manner that a typical user expected is normal. The system to be developed must be reliable because reliability is one of the essential software qualities. It is crucial in maintenance and operational, as frequent breakdown of the system will increase the cost of maintenance and development for enhancing and debugging the system. Therefore, it should process the input data and produce the expected output without any errors.

#### 3.3.2.2 User Friendly and Usability

The system can be considered as attractive or as an easy-to-use application because the users only have to click on the task or image by using the mouse. The usage of suitable and meaningful icons or buttons will help the user to use the system with more confidence. The use of menu should give the user sufficient information to use the system. Confirmation message and error messages for any non-trivial process such as updating or deleting any records should be displayed to make sure that the user could do final decision before certain action is taken.

#### 3.3.2.3 Maintainability and Expandability

The system must also design to be understood, corrected, adapted, and able to be enhanced without much difficulty so as to posses a high degree of maintainability and expandability. Architecture components, algorithm, data structure and procedures design should be able to extend and modify with ease. This is important so that any future enhancements and expansion can be done easily.

#### 3.3.2.4 Modularity

Software architecture of the system should embodies modularity, that is, software is divided into separately named and addressable components, called module, which is integrated to satisfy problem requirements. This is done to isolate function codes from one another. This quality is essential so that testing; debugging and maintenance can be done easily.

#### 3.3.2.5 Legislation

All software, including platform used will be assured a lessened copy. None of any pirated software will be to use.

#### 3.3.2.6 Robustness

The system consists of five modules which will be completely tested to ensure each module achieve its expectation. The modules will be integrated into system and system testing will be started after process integration. Any errant that will be discovered during system testing will be solved immediately. This is to make sure the system is as robust as what had been expected before.

#### 3.3.2.7 Response Time

The response time to retrieve the information can be considered within a reasonable interval time. It means that all desirable information should be available to users at any point in time.

## 3.4 Analyst and Consideration on the Development Tools.

### 3.4.1 Web Architecture Review

#### 3.4.1.1 Java Database Connectivity

##### 3.4.1.1.1 What is JDBC?

JDBC (Java Database Connectivity) is an application program interface (API) specification for connecting programs written in Java to the data in popular database [20]. The JDBC specification is similar to Microsoft's Open Database Connectivity (ODBC)

driver in terms of its structure and concept, where they both used for clients' access to databases.

#### 3.4.1.1.2 Advantages of JDBC

Since many PC-based networks are already using the ODBC in their applications before the introduction of JDBC, the JDBC-ODBC Bridge can also be implemented, as there are advantages in using a JDBC implementation that relies on the ODBC. This happen when an application will need to access databases that mot be widely supported by other more vendor –specific JDBC drivers. This bridge is a layer that allows JDBC clients to connect through an ODBC client library to access databases. The reason why JDBC is being implemented is when the back-end programs are written using Java programming language for accessing databases. As the Java programming language has gained popularity as the language of choice for Internet application and for its platform independence, the number of choices for JDBC drivers has grown. This means that web developers can now write database access client applications with JDBC and not JDBC-ODBC for varieties of networks like being able to write one application that will run any platform. Another benefit is it helps shorten the development process schedule and makes application maintenance much easier than any other traditional programming languages like C or C++.

#### 3.4.1.1.3 Why use only JDBC instead of JDBC-ODBC Bridge?

Sometimes ODBC may provide the right kind of services for applications because for some databases like MS SQL Server, ODBC may be a necessary means of access to JDBC, as most of Microsoft's database does not provide any JDBC drivers for databases connection. However, ODBC can add unnecessary layers of complexity to applications. It could also slow down the performance (i.e. time) of application while users perform activities like requesting and retrieving data from a database. This is because the connection is now going through two layers of database connectivity instead only the JDBC layer.

### 3.4.1.2 Client-Server Architecture

Many definition of the client-server architecture already exist, ranging from an Access app'ication with a shore database to an all-encompassing transaction processing system across multiple platforms and databases. Anyway, throughout all of the permutations and combinations, some major themes still remain consistent, such as [21]:

1. **The Requestor / Provider Relationship**

   The client and the server have well-defined roles, with the client requesting services and the server fulfilling the service requests.

2. **Message-based**

   The communication between the client and server (or the client middle-ware server) is a well-defined set of rules (messages) that govern all communications, which is a set of transactions that the client sends to be processed.

3. **Platform Independence**

   The server or the service provider is responsible for fulfilling the request and returning the requested information (or completion code) to the client, due to the clearly defined roles and message-based communication. The incoming transaction can be from a Window client, and OS/2 machine or a normal web browser.

4. **Dynamic Routing**

   The Client can send a transaction to a service provider and have the request fulfilled without having to be aware of the server that ultimately fulfills the request. A database server, a mid-range data update, or a mainframe transaction might satisfy the data or transaction.

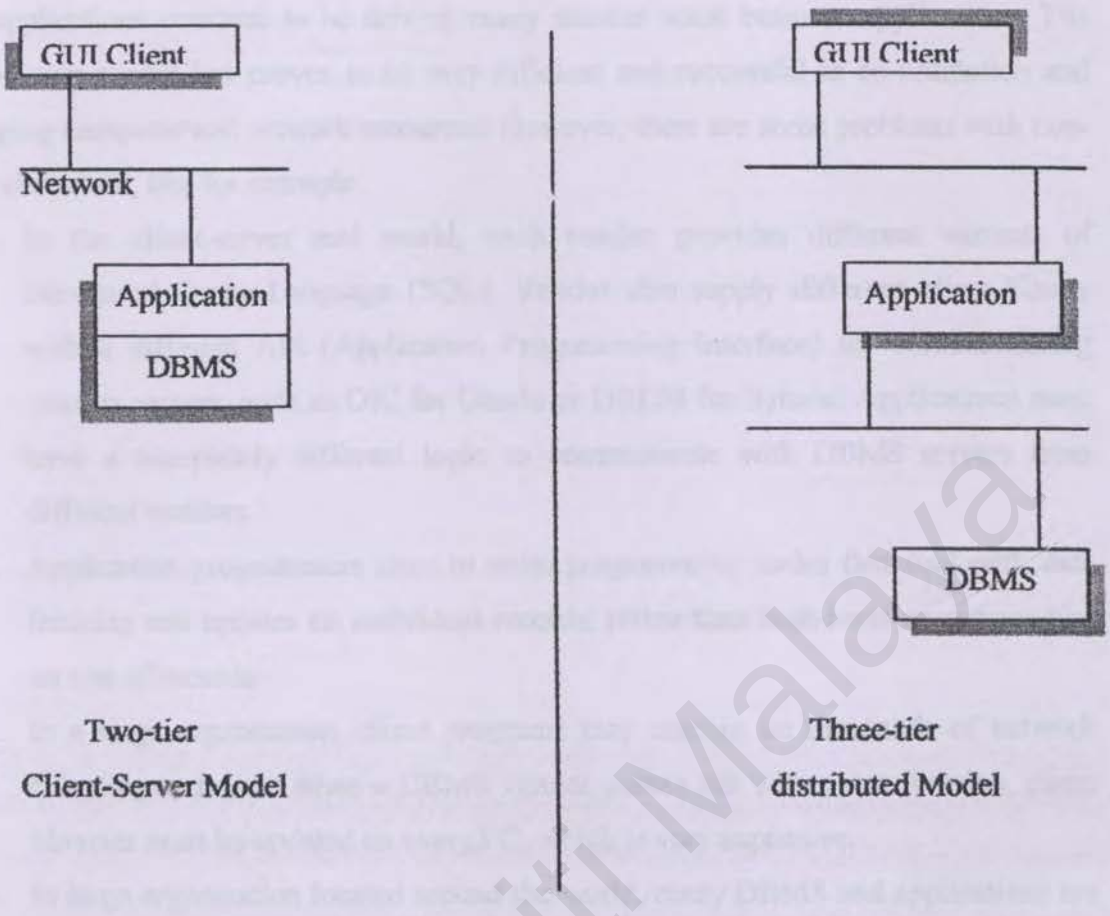



Figure 3.4 Web Architecture Models

#### 3.4.1.2.1 Two-tier Client-Server Model

In the two-tier (client-server) model, a single multithreaded DBMS server starts up before any client program. Clients' requests, which are in the forms of SQL queries or updates, are received over the local area network (LAN) by the DBMS (Database Management) server, which then sends back SQL rows or status information in response to each request [12]. Much of the processing is actually performed on the client workstation, using the memory space and processing power of the client to provide most of the functionality of the system. In this two-tier architecture also the client has to be aware of the data resides and what the physical data looks like. The data may reside on one or more database servers, on a mid-range machine, or on a mainframe. The formatting and displaying of the information is provided by the client application as well. The sever will only routinely provide access to the data. The ease and flexibility of there two-tier products to create

new applications continue to be driving many smaller scale business applications. The client-server model has proven to be very efficient and successful in co-ordination and managing computer and network resources. However, there are some problems with two-tier architecture, like for example:

1. In the client-server real world, each vendor provides different variants of Structured Query Language (SQL). Vendor also supply different client library with a different API (Application Programming Interface) for communicating whit its servers, such as OIC for Oracle or DBLIB for Sybase. Applications must have a completely different logic to communicate with DBMS servers from different vendors.
2. Application programmers have to write programming codes that deal with data fetching and updates on individual records, rather than high-level operations like on sets of records.
3. In a large organization, client programs may contain on thousands of network PCs. So, each time when a DBMS vendor comes out with a new version, client libraries must be updated on every PC, which is very expensive.
4. In large organization located around the world, many DBMS and applications are distributed across machines all over the world on a relatively slow wide area network (WAN). Within this kind of environment, each round trip between SQL request and rows returned can be significantly slow.
5. Client applications are usually deployed on desktop PCs with limited memory and disk space. So, as client-server applications and the PC operating systems become larger and more complex, the cost for equipping every client Pc becomes very expensive.

#### 3.4.1.2.2 Three-Tier Distributed Model

The three-tier architecture, also called the multi-tier model, extends the standard of the client-server architecture by placing a multithreaded application between the client and the DBMS. A three-tier application is also an application program that is divided into three major parts, with each of it distributed to different places in a network [21].

Those three major parts are as the following:

1. *Workstation*

   Contain programs that provide the graphical user interface (GUI), application-specific entry forms or interactive windows.

2. *Business logic*

   Located on a LAN server or other shared computers. It acts as a server for client requests that comes from workstations. It also determines what data is needed, where the data is located and also acts as a client in relation to the third tier of programming (DBMS) that is located on a server computer.

3. *Database Management System*

   This third tier of the multi-tier model included the DBMS and programs to manage read and write access to it.

The clients will now be able to communicate with the DBMS through the web server (which stores the business logic), using high-level, vendor-independent requests and replies. This application server is fully responsible for executing those requests, and makes calls when needed into the DBMS. As describe earlier in the multi-tier architecture, each of the major pieces of functionality is isolated. So the presentation layer is independent of the business logic, which in turn is separated from the data access layer. The multi-tier architecture would be able to solve most of the problems in the traditional two-tier client-server model if properly implemented.

#### 3.4.1.2.3 Advantages of using the Three-tier Architecture

Different programmers can develop each layer in the three-tier model concurrently.
Each layer of programs can also be coded in different languages from the other tiers.
As the programs for one of the tiers can be changed or relocated without affecting the other tiers, the three-tier architecture provides an easier way for an enterprise or software packager to continually evolve an application as new needs or opportunities arise [21].

## 3.4.2 Operating System Comparison

### 3.4.2.1 Linux

Linux, a clone of the UNIX operating system that written from scratch to avoid license fees entirely, although the operation of the Linux operating system is based entirely on UNIX. It shares UNIX's command set and look-and-feel, so if anyone knows either UNIX or Linux, they know the other.

Here are some of the important features of Linux [22]

1. **Full Multitasking and 32-bit support**

   Linux is a real multitasking system that allows multiple users to run many programs on the same system at once. Linux is also a full 32-bit operating system that utilizes the special protected-mode features of Intel 80386 and later processors and their work-alike.

2. **The X Window System**

   The X Window system is a very powerful graphics interface, supporting many applications. A complete version of the X Window system, know as XFREE86, is available for Linux. This means Linux is moving into the GUI world in the future.

3. **Built-in networking support**

   Linux uses standard TCP/IP protocols, including Network file System (NFS) and Network Information Service (NIS, formerly known as YP). By connecting the system with an Ethernet card or over a modem to another system, anyone can access the Internet.

4. **Shared libraries and Virtual memory**

   Linux implements shared libraries that allowing program use standard subroutines to find the code for these subroutines in the libraries at runtime. This saves a large amount of space on the system where each application doesn't store its own copy of these common routines.

5. **GNU software support**

   Linux supports a wide range of free software written by the GNU Project, including utilities such as the GNU C and C++ compiler, gawk, gruff, and so on. Many of the essential system utilities used by Linux are GNU software.

6. **Portability**

   Linux is compatible with the IEEE POSIX.1 standard. Linux has been developed with software portability in mind, thus supporting many important features of other UNIX standards.

7. **Linux is fault-tolerant**

   It is used to more that 31% of the world's web servers. With Apache as the primary application for these servers, they have proven to be practically immune to recent explosion of viruses that have plagued e-mail and the Internet.

8. **Nonproprietary source code**

   The Linux kernel uses no code from AT&T, nor any other proprietary source. Other organizations, such as commercial companies, the GNU project, hackers, and programmers from all over the world have developed software for Linux.

9. **Security**

   Because of the available source code and the ability for users to modify, Linux is not as secure as other system if an ever-expanding group of hackers who want to get their hands dirty with others' Linux-based system.

10. **Lower than most other Windows NT systems and UNIX clones systems.**

    Anyone who has the patience to access to the Internet, the only price that needs to pay for Linux is the time. Linux is freely available on the Internet. For a nominal fee of anywhere from US $30 to US $90, anyone who wish to use Linux can save their time by getting CR-ROM or floppy-dick distributions form several commercial vendors.

### 3.4.2.2 Window NT

The two letters tacked onto the end of the name stand for New Technology. The most obvious part of Windows is the graphical user interface—the colorful screen and those small, sometimes puzzling pictures referred to as icons.

Below are some of the features of the Window NT [23]:

1. **Pre-emptive multitasking and scalability**

   The internals of Windows NT were written from scratch and centered on microkernel-style architecture similar to UNIX. This microkernel gave Windows NT preemptive multitasking. Additionally, Windows NT made sue of process threads —an idea popularized by Carnagie Mellon's MACH operating system—to support symmetric multiprocessing (SMP). The internal operations of Windows NT are designed to take full advantage of SMP systems (scalability).

2. **Flat, 32-bit Memory Model**

   Windows NT is a 32-bit operating system that uses 32-bit addresses to access objects. This result in many advantages such as it enables NT to address 4,194,304KB (four gigabytes) of memory.

3. **No more DOS**

   Although there is no DOS, Windows NT is still able to run the vast majority of DOS program as long as they don't try to directly access the hardware or require special device drivers. It does this by creating a virtual DOS environment called the NT virtual DOS machine (NTVDM). The DOS program runs in this emulated DOS environment. NT traps the DOS calls and converts them to standard Win32 API calls.

4. **Network Operating Systems**

   Windows NT is both an operating system and a network operating system. With LAN Manager, OS/2 was the operating system and LAN Manager was the network operating system. This integration of the OS and the NOS has proved to be a formidable combination in Windows NT.

5. **Reliability through Protected Memory Model**

   In Windows NT's memory model all processes get their own 32-bit address space. This 4GB space is divided in half, and the application can only really use the lower 2GB of space. The upper 2GB is for interfacing with other parts of the system. Every process effectively thinks it is the only thing running. There is no way for a process to read or write outside of its own memory space, either accidentally, or intentionally. This can prevents the system crashes and it provides security for each process.

6. **Portability**

   It is this portability that enables Window NT to run not only on Intel x86 microprocessors but also on RISC chips, such as the DEC Alpha AXP, the MIPS R4400, and Motorola PowerPC. Part of the key to Windows NT's portability is the hardware abstraction layer (HAL), which hides the difference in actual hardware from the higher-level operating system software. The HAL makes all hardware look essentially identical to the rest of Windows NT.

7. **Personality/Compatibility**

   Windows NT was designed to support multiple simultaneous personalities. Its interface became the primary personality. It also supports a POSIX personality, an OS/2 personality, and a DOS/Windows personality. Additional personalities, such as a full personality can easily be added.

8. **Security**

   Windows NT was created to meet the United States National Security Agency's C2 level evaluation criteria. By creating Windows NT based on a defined security model, Microsoft was able to guarantee that Windows NT would meet the most demanding corporate security needs.

9. **Fault-Tolerance**

   Windows NT has many features that provide varying levels of fault-tolerance for the system. Included in NT's list of fault-tolerant features are NT's journal-based, recoverable file system (NTFS), disk mirroring and disk stripping with parity (RAID

1 and RAID 5), disk sector sparing, and support for an uninterruptible power supply (UPS).

**10. Localization**

Windows NT is available in localized versions for Brazilian, Chinese, Danish, Dutch, Finnish, French, Italian, Japanese, Korean, Norwegian, Portuguese, Russian, Spanish, and Swedish. In each of these versions, it was ensured that NT not only communicates in the particular language, but also employs standard idiom, uses correct punctuation in lists dates, time, and numerical and currency output.

**11. License fees**

However, Windows NT is a copyrighted piece of software that demands license fees when any part of its source code is used. Therefore, it required a sum of monetary outlay to obtain it.

| Premise | Linux | Windows NT |
|---|---|---|
| *1. Portability* | Developed with software portability in mind, thus supporting many international standards features | The system would run on different hardware platforms with minimal changes |
| *2. Security* | Source code availability and open for users to modify decreases the security. | Can be locked down through software, meeting NSA's C2-level criteria. |
| *3. Compliance and compatibility* | Compatibility with the IEEE POSIX.1 standard and supports many standard features of UNIX. | POSIX-compliant, runs existing Windows applications, and supports open international Standards. |
| *4. Scalability* | Supports full multitasking and 32-bit support | Supports Symmetric Multi-Processing (SMP). |
| *5. Extensibility* | Virtual memory support. Linux utilizes all of the system's memory, without | Could be easily expanded by writing to a well-defined Application Programming |

| | | |
|---|---|---|
| | memory limits or segmentation through the use of a virtual memory manager. | Interface (API). |
| *6. Ease of internationalization* | Easy as to be ported to run in different languages and writing system. | Could easily be ported to run in numerous different languages and writing systems, with minimal modification to the software. |
| *7. License Fee* | No license fee required | License fee required. |

Table 3.5 Comparisons between Linux and Windows NT

## 3.5 Database Comparison

### 3.5.1 Oracle8i

Oracle8i is one of the most stable databases available in the market. It can run on almost on every platform. Oracle8i supports Java natively inside the database (the developer can write in PL/SQL or Java) [25]. It also supplies a lot of built-ins. No other databases have this level of integration with Java.

Besides that, it is also designed as an Internet development and deployment platform. Oracle® interMedia enable Oracle8i to manage text, documents, image, audio, video, and locator data in an integrated fashion with other enterprise information. It includes Internet services supporting popular web client interfaces, web development tools, web servers, and streaming media servers.

Oracle® WebDB allows non-programmers to easily develop web database application and still have time to concentrate on other jobs. Oracle8i's Java offering Oracle Jserver Option, that is the Java Machine (Java VM), it can runs within the Oracle8i database server address space.

Oracle8i also supports data partitioning with hash and composite partitioning. It has features such as enhanced ANALYZE, statistic management capabilities, indexes based on functions and transportable table spaces, which are useful in Very Large Database Support (VLDB) and can handle much larger databases—multi-terabytes of data. Oracle8i also includes some features that maintain high availability such as automate standby database (improved standby features from Oracle 7 and 7.3), fast-start fault recovery feature (a new data recovery feature) and online index builds or rebuilds (allowing users to update and query the base table while creating the index). Oracle8i provides Oracle Parallel Server and database resource manger, which is for better scalability. For the cost, Oracle is quite expensive; it cost around US $40,000 for the software and US $100,000 for professional setup.

### 3.5.2 IBM DB2 Universal Database Version 7.2

DB2 is a product of IBM. It is a relational database management system (RDBMS) for large business computers that, according to IBM, leads in terms of database market share and performance. DB2 trails Oracle's database products in UNIX-based systems and Microsoft's Access in Windows systems [26]

DB2 can also support multi-platform. It runs on the most popular UNIX and Intel server platforms including AIX, HP-UX, Solaris, Linux, NUMA-Q, OS/2 and Windows NT/2000. DB2 also provide capabilities to allow the user to reduce the cost by improving the cycle-times by leveraging the current investment in data, hardware, software and skills. It allows the user to access the existing tools and applications and managed within networks computing environment.

Besides that, DB2 also have the ability to support more advanced application involving multimedia data such as document, images, audio and video. This will save the costs by just extending DB2 to support this new application.

Other then that, DB2 also provide a performance monitor that allow the administrator monitoring the performance of DB2 objects such as instances, databases, tables, table spaces, and connections. The Performance Monitor alerts the administrator if

performance falls outside your defined thresholds. They can use the Performance Monitor to observe the performance of the system at a point in time or capture performance data over a period of time. The administrator then can tune up the performance of the database.

DB2 also introduce a feature call Index Advisor Utility that helps the developer to improve the performance of the database by suggesting and creating on optimal set of indexes. The developer can use the Index Advisor Utility to find the best indexes for a problem query, determine the best indexes for a set of queries (a workload), subject to resource limits, which they can optionally apply and test an index on a workload without having to create the index.

To ease the administration workload, DB2 also support Lightweight Directory Access Protocol (LDAP) directory services. LDAP directory services both store, and provide an access method for, detailed information about the resources such as users, printers, computers, file servers and application servers. The database, server location and configuration can be published in the LDAP directory, then the administrator don't needs to manually catalogue database and node entries on client machines.

And finally, DB2 Universal Database includes a complete suite of GUI administration tools that allow the user to easy installation, administration and remote operations. This feature is called the Control Center, which includes programmer-friendly tools to get an application up-and-running quickly, and user-friendly tools to make end-users immediately productive.

For the aspect of cost, DB2 Universal Database Enterprise Edition V7.2 is more cheaper that Oracle According to IBM, DB2 Universal Database Enterprise Edition (EE) is a multi-user object-relational database for complex configurations and large database needs for Intel to UNIX platform and from uniprocessors to the largest SMP's (Symmetric Multi-Processing). It is Ideal for midsize to large business particularly where Internet connectivity is important.

### 3.5.3 MySQL

MySQL is a very fast, multithreaded, multi-user and cross platform database. It is available as a open source software. This means that anyone can study the source code and modify it (in certain conditions) to fit their needs. It can download for free with non-commercial purpose only. In order to embed MySQL into a commercial application, users must buy a commercially licensed version with a very cheap price.

The MySQL relational database system was first released in January 1998. It is fully multi-threaded using kernel threads, provides application program interfaces (APIs) for C, C++, Eiffel, Java, Perl, PHP, Python, and Tcl, allows for many column types, and offers full operator and function support in the SELECT and WHERE parts of queries. [27]

For the graphics aspect, MySQL does not allow the storage of graphical data. MySQL is also not able to store very large databases (VLDB) such as up to multi-terabytes. It only supports up to 50,000,000 records. Besides that, MySQL does not support database partitioning and LDAP. Anyway, the advantages of MySQL is it is very fast, reliable and easy to use [28]

In the aspect of implementation of ANSI standard, MySQL does neither transaction nor preserve referential integrity which means tables can be explicitly locked and unlocked for transactional access. And there are a lot of supports from websites for MySQL such as "Basic Email Support", "Extended Email Support", "Login Support" and "Extended Login Support". MySQL is also available inn both Windows and Linux platform. And now, there are also Graphical User Interface add-ons for MySQL to make life easier for the administration to control the database.

### 3.5.4 Why is MySQL the chosen database?

In choosing the database in this project (Oracle8i, IBM DB2, and MySQL), here are few criteria that have to be considered:

1. **Portability (OS)**

   The entire database that I mention above can support for both windows and Linux platform. Oracle supported almost every platform.

7. **Cost**

   In terms of cost, Oracle8i is the most expensive one. It cost about US$40,000 of software fees and additional US$100,000 for professional setup fees. IBM DB2 Universal Database Enterprise Edition cheaper than Oracle whereas MySQL charge only a few hundreds for commercial purpose.

### 3.5.5 Databases—Summary

Since this is a small size business and it has the extendibility to become medium company, so, MySQL had chosen as the back end database. The Oracle8i was not choose because the cost is too high a. Although the criterion for IBM DB2 is much suitable but the price also too costly compare to MySQL. So, the MySQL has chosen.

## 3.6 Web Server Comparison

A web server is a program that, using the client/server model and World Wide Web's Hypertext Transfer Protocol (Hyper Text Transfer Protocol), serves the files that form web pages to web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that contains a Web site must have a Web server program. The most popular Web servers are iPlanet Fast Track and Enterprise servers, and Apache, a Web server for UNIX-based operating systems.

Web servers often come as part of a larger package of Internet and intranet-related programs for serving e-mail, downloading requests for File Transfer Protocol files, and building and publishing Web pages. Consideration in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, and publishing, search engine, and site building tools that may come with it.

### 3.6.1 iPlanet Web Server Fast Track Edition 4.1

iPlanet Web Server, Fast Track Edition 4.1 is a web server that originates from the Netscape Corporation. It enables developers or programmers to quickly test Java applications and deploy a web site with the same reliability, manageability, and flexibility

as the award winning iPlanet Web Server, Enterprise Edition 4.1. One of the more important thing is it is free.[29]

This web server is quite powerful in the sense of its supportability of Java Servlet 2.2 and JavaServer Pages 1.1, which is considered the latest technology available in the market. Besides that, it also has a complete Graphical User Interface (GUI) that makes the administration of the web server easier to be implemented by users who are new to Linux or shell. In terms of security, there is a 56-bit SSL (Secure Socket Layer) encryption support and LDAP (Light Weight Directory Access Protocol) technology with license to use iPlanet Directory Server for user authentication.

### 3.6.2 Tomcat

Tomcat is a servlet container and Java Server Pages(tm) implementation. It may be used stand alone, or in conjunction with several popular web servers such as Apache version 1.3 or later, Microsoft Internet Information Server version 4.0 or later, Microsoft Personal Web Server version 4.0 or later, Netscape Enterprise Server version 3.0 or later and the others.

Tomcat is a servlet container with a JSP environment. A servlet container is a runtime shell that manages and invokes servlets on behalf of users. In a nutshell, it is the component that allows websites to utilize java applets as part of their content. The three main modes of Tomcat implementation are as:

**i. Stand-alone servlet containers**

These are an integral part of the web server. This is the case when using a Java-based web server, for example the servlet container that is part of the Java Web Server. Stand-alone is the default mode used by Tomcat. Most web servers, however, are not Java-based, which leads us to the next two container types.

**ii. In-process servlet containers**

The servlet container is a combination of a web server plug in and a Java container implementation. The web server plug in opens a JVM inside the web server's address

space and lets the Java container run in it. If a certain request should execute a Servlet, the plug in takes control over the request and passes it (using JNI) to the Java container. An in-process container is suitable for multi-threaded single-process servers and provides good performance but is limited in scalability.

**iii. Out-of-process servlet containers**

The servlet container is a combination of a web server plug in and a Java container implementation that runs in a JVM outside the web server. The web server plug in and the Java container JVM communicate using some IPC mechanism (usually TCP/IP sockets). If a certain request should execute a Servlet the plug in takes control over the request and passes it (using the IPCs) to the Java container. The response time of an out-of-process engine is not as good as in the in-process one but the out-of-process engine performs better in many measurable ways (scalability, stability, etc.).

Tomcat can be used as either a stand-alone container (mainly for development and debugging) or as an add-on to an existing web server (currently Apache, IIS and Netscape servers are supported). This means that whenever user is deploying Tomcat you will have to decide how to use it and, if user selects options (ii) or (iii), user will also need to install a web server adapter.

### 3.6.3 Apache Web Server

Apache is currently the most popular web server in the market according to statistics at the NetCraft [30]. This particular web server is quick at handling request and responses. It is available as Open Source and is definitely free of charge.

If Apache were to support Servlets and Java Server Pages (JSP), an additional patch would have to be added to link with the original Apache web server. This particular patch is called Apache Jakarta Tomcat. The main problem here is that these servers are quite difficult to be configured for use. There are a lot of configuration needs to be done. Besides that, Jakarta Tomcat does not fully support Servlet and Java Server Pages [31].

### 3.6.4 Why Apache+Jakarta-Tomcat Web Server the chosen Web Server?

1. It is possible to have Tomcat serve both static and dynamic document provision needs, But is more slow on serve the static page. So, Apache is best suit with Tomcat for cooperate to serve the following purposes.

2. Tomcat is not as robust as Apache.

3. Tomcat may not address many sites' need for functionality found only in Apache modules (e.g. Perl, PHP, etc.).

4. Tomcat is not as configurable as Apache.

5. Free of charge either commercially or non-commercially.

## 3.7 Web Programming Languages Comparison.

### 3.7.1 PHP

In Web programming, PHP is a script language and interpreter that is freely available and used primarily on Linux Web servers. PHP (the initials come from the earliest version of the program, which was called "Personal Home Page Tools") is an alternative to Microsoft's Active Server Page (ASP) technology. As with ASP, the PHP script is embedded within a Web page along with its HTML. Before the page is sent to a user that has requested it, the Web server calls PHP to interpret and perform the operations called for in the PHP script. An HTML page that includes a PHP script is typically given a file name suffix of ".php" ".php3," or ".phtml". Like ASP, PHP can be thought of as "dynamic HTML pages," since content will vary based on the results of interpreting the script [32].

The knowledge of C programming language (with the complexity such as memory management, pointers, and strong typing taken out) is essential for the coding of PHP.

Besides that, PHP is now available as an Open Source in the current market. Open Source software in general means a number of significant advantage for the corporate IT infrastructure because the full source code is available with them. The source codes now can be inspected in thorough security audits. If third parties find security issues, they are usually fixed immediately. If no one is going to do it, the manager can assign their own personnel to do it, with the full code in hands and they are no longer dependent on external software manufacturers. In the aspect of performance, a dynamic web page written using PHP could only execute in an intermediate speed as all the logic the application are integrated into the HTML. This makes web pages quit large in its size and takes some time to load and needs optimizers to enhance the speed. PHP developed application are portable in the condition of using PHP4.0 and above. The previous versions of PHP could only be integrated into the Apache web server or runs as separated CGI program.

### 3.7.2 ASP (Active Server Pages)

The Microsoft for purpose of building web applications developed ASP. Its concept and structure are similar to PHP where ASP scripts are also embedded in the HTML code of page, and then get parsed on the server-side. The strength of ASP is the ability to dynamically build a pure HTML web page based on a user's input and profile, the time and location the user accesses the page or the type of browser and operating system that is running on the user's computer. However, ASP applications are no portable. Active Server Pages are tightly integrated with Microsoft BackOffice suite of products must be running Internet Information Server (IIS) on a Windows NT server machine [33] or running a Personal Web Server (PWS) on either Windows 98 or 95.

ASP uses VBScript as a language in its coding. This will definitely benefit those who are with knowledge of Visual Basic programming, as VBScript is a sub component of it. ASP is not available as Open Source in the current market. In the aspect of performance, the speed of executing an ASP web page is just intermediate as in the same case as ASP where all its programming logic are embedded in the HTML. It needs a task of performance tuning on the database (optimize the SQL statements for better efficiency in handling queries) and code modification in order to load faster. ASP is quite competitive

in the market, as it is easy to be developed and cater for fast changing needs of most of businesses and organizations.

### 3.7.3 CGI (Common Gateway Interface)

CGI or Common Gateway Interface is a standard for the communication between web documents and the CGI scripts programmers have to write. CGI scripting or programming, is a method of creating a program that follows this standard of communication. A CGI script is just simply a program that communicates with the web document [34]. Web document are any kind of files used on the web. They could be HTML documents, text files, image, or any other file formats. The existence of this gateway between the programs programmers have to write and the web documents, allows them to create much more dynamic and interactive web pages than with HTML alone.

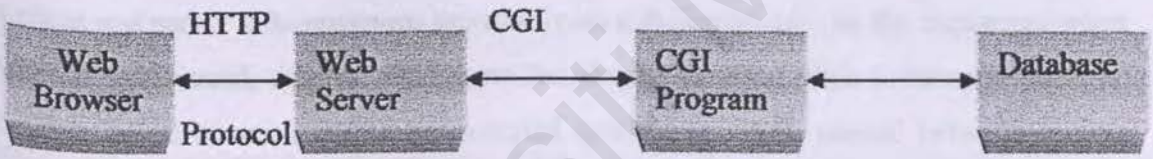



Figure 3.5 Example of data requesting and retrieving using CGI

In the beginning, CGI was good, because it was universal. But it was also slow, and being a universal standard, it didn't provide much competitive differentiation [35]. The most common language used to develop CGI programs is Perl but CGI could be written in any other languages like C, C++ and much more. As reference from the example diagram above, it shows that CGI programs are server side programs that do not integrate with the client side programs like in ASP or PHP. CGI is also not an Open Source to the public. It is portable and platform independent. That means a CGI program can be written once and run on any platforms. 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 request is time consuming and requires large amount of server's memory. Therefore, this can restrict the resources available for sharing from the server application itself, slowing down the

performance and increasing the wait times on the web. To avoid the performance problems of CGI programs, some sites use ISAPI or NSAPI modules, but these modules are not portable across web servers and the complexity involved in programming them can be the source of stability problems.

### 3.7.4 Java Servlets

Servlets are Java technology's answer to Common Gateway Interface (CGI) programming. They are programs that run on a Web server, acting as a middle layer between a requests coming from a Web browser or other HTTP client and databases or application on the HTTP server [36].

They run completely on the server and a good thing is, nothing is ever downloaded the browser, which indeed saves loading time [37]. Servlets are also a replacement to the old fashion CGI. This explains why servlets are also not embedded in the HTML like CGI. The client and server side programs are totally on a different side. In the beginning when servlets were invented, and the world saw that they were good. This is because dynamic web pages based on servlets can be executed quickly, could be moved between servers easily, and integrated well with back-end data sources. Therefore, servlets became widely accepted as a premiere platform for server-side web development [38].

This means that Servlets are now quite competitive in the market but it is not available as an Open Source to everyone. However, the commonly used simple approach to generating HTML content, having the programmer write an "out.println()" call per HTML line, became a serious problem for real servlet use [38] HTML content had to be created within code, which is a time consuming task for long HTML pages. Servlets scale with multiprocessors and heterogeneous systems [37].

### 3.7.5 JavaServer Pages (JSP)

JSP is a technology that allows web developers to quickly develop and easily maintain, information-rich, dynamic web pages that leverage the existing business systems. As a part of the Java™ family, the JSP technology enables fast development of web-based applications that are platform independent [39]. JSP technology separates the user

interface from the content generation to enable developers to change the overall page layout without modifying the underlying dynamic content.

JavaServer Pages technology actually uses the XML-like tags and scriptlets written in the Java programming language to embed the logic that generates the content for the page. Besides that, the application logic can reside in server-based resources like JavaBeans, that the page accesses with these tags and scriptlets. Any or all formatting of HTML/XML [40] tags are being passed directly back to response page. By separating the page logic from its design and display, plus supporting a reusable component-based design, JSP technology makes it faster and easier that ever to build web-based application.

JavaServer Pages technology is also actually an extension of the Java Servlet technology. Together, JSP technology and servlets provide an attractive alternative to other types of dynamic web scripting/programming that offers platform independence, enhanced performance, and separation of logic from display, ease of administration, extensibility into the enterprise and most importantly, ease of use.

JSP file share the "Write Once, Run Anywhere™" characteristics of Java technology. JSP technology is key component in the Java 2 Platform, Enterprise Edition, Sun's highly scalable architecture for enterprise application [41].

### 3.7.6 JavaBeans

JavaBeans component architecture is the platform-independent architecture for the Java application environment. It is the ideal choice for developing or assembling network-aware solutions for heterogeneous hardware and operating system environment – within the enterprise or across the Internet.

JavaBeans component architecture also extends the "Write Once, Run Anywhere™" capability to reusable component development. In fact, the JavaBeans architecture takes interoperability a major step forward – the code runs on every OS and also within any application environment. A beans developer secures a future in the emerging network

software market without losing customers that use proprietary platforms, because JavaBeans components interoperate with ActiveX. JavaBeans architecture connects via bridges into other component models such as ActiveX. Software components that use JavaBeans APIs are thus portable to containers including Internet Explorer, Visual Basic, Lotus Note, Microsoft Word, and others [42].

| Premise | JavaServer Pages (JSP) | Active Server Pages (ASP) | PHP | CGI |
|---|---|---|---|---|
| **Web page execution speed** | Slow during first time due to the compilation of JSP file to servlet. Fast on subsequent requests | Intermediate. Requires a lot of performance tuning and code modification to execute fast. | Intermediate. Needs optimizer to enhance running speed. | Slow to intermediate. |
| **Portability (Platform Independent)** | Yes | Integrated tightly with Microsoft products. Not recommended changing server platform. | Only portable if using PHP 4.0 and above. Previous versions could only integrate PHP as a module into the Apache web server or runs as a separated CGI program. | Yes |
| **Open Source software availability.** | No | No | Yes | No |
| **Knowledge of programming** | Java. Uses the J2EE standard | VBScript | C | Mostly Perl |

| language. | | | | |
|---|---|---|---|---|
| **Integration of client and server side programs** | Client and server side programs are combined | Client and server side programs are combined | Sama as ASP | Sama as Servlets. |
| **Market competitiveness** | High | High | Low | Low. Getting less popular |

Table 3.6 Comparison Between Four Different Types of Web Programming Languages

### 3.7.7 Why JavaServer Pages is the chosen Web Development language?

1. **Ease of development**

   JSP provides a way to generate dynamic web pages that are both easier to write and faster to run. There is also no need to code client and server side programs separately, which made up of two files instead of only one JSP file.

2. **Allowing collaboration between people**

   A JSP can handle multiple requests concurrently, and can synchronize each of the requests. Synchronizing means multi-tasking where different users' requests are being handled in a different way.

3. **Forwarding requests**

   JSP can forward requests to other servers and servlets. So, JSP can be used to balance load among several servers that mirror the same content and to partition a single logical service over several servers, according to task type or organizational boundaries.

4. **Portability and flexibility**

   JSP have a rich set of platform-neutral Java APIs to connect to most back-end components and it is platform independence through "write once, run anywhere".

5. **Performance advantages**

- Can be preloaded or loaded on demand
- Execute and remain in memory.
- It is multithreaded
- Maintain sessions across HTTP requests (Reducing activities to back-end systems)

## 3.8 Hardware Requirements

i) **Server site**

- Processor : Pentium® Processor or compatible processor
- Memory : 64.0 MB of RAM or above
- Hard disk :space at least 70 MB
- VGA : 640X480 (256 color)
- Modem : Baud
- Other standard peripherals that includes monitor, printer, mouse and keyboard.

ii) **Client side**

- Average PC running on Windows 95/98/2000
- Memory at least 64 MB

## 3.9 Software Requirement

i) **Server site**

- Operating System : Microsoft Windows 2000
- Web Server : Tomcat and Apache
- Database Server : MySQL Server
- Programming Language : Java Server Page (JSP)
- Browser : Microsoft Internet Explorer / Netscape Navigator

ii) **Client site**

- Browser: Internet Explorer 4.0 or above

# CHAPTER IV

# SYSTEM DESIGN

System design is an important part for the whole project. So, good design is the key to successful software project. This is the stage in the system development process where the requirements for the system are translated into the system characteristics. There are many stages in the design process such as architecture design, database design, user interface design, and security and report design.

## 4.1 Architecture Design

A large system can be decomposed into sub-system that provides some related set of services. Thus, architecture design is the initial design process of identifying these sub-systems and establishing a framework for sub-system control and communications. As part of the architecture design process, the below activities are usually essential:

### 4.1.1 Modular Decomposition

This construction is based on assigning functions to components. A high-level description of the functions that are to be implemented and build lower-level explanations of how each component will be organized and related to other components. Each identified component is decomposed into modules/functions. [17]

A modular design reduces complexity, facilitates changes (a critical aspect of system maintainability) and also results in easier implementation of the system because parallel development can be carried out. To achieve a modular design, the following characteristics have to be followed:

#### 4.1.1.1 High cohesion and Low Coupling

A system can consist of many modules. Two modules are highly coupled when there is a great deal dependent between them. On the other hand, loosely coupled modules have some dependence but the interconnections among them are weak [17]. The goal of this system is to keep the degree of coupling as low as possible. If coupling is loose, then only a few other components will be affected by the change and might be candidates for modification or replacement. But if coupling is high, then large parts of the system may be perturbed by the change. For the purpose of this system, it is a complicated system, so it is hard to reduce the degree of coupling.

Cohesion refers to the internal "glue" with which a module is constructed. The more cohesive a module, the more related is the internal parts of the module to each other's and to its overall purpose. A common design goal is to make each module as cohesive as possible so that every part of a module's processing is related to the singular function.

## 4.2 Data Flow Diagram

Data flow diagram (DFD) characterizes data processes and flows in a system graphically. DFD depicts the broadest possible overview of system inputs, processes, and outputs. A series of layered DFDs are used to represent and analyzed procedures within the proposed system.

For this project, DFD has been used to graphically characterize data processes and flows. The flow of the proposed Web-Based Laundry Systems is shown below:

### 4.2.1 Context Diagram

Context diagram is an overview, which includes basic inputs, the general system, and the outputs. This diagram helps the systems analyst grasp basic data movement.

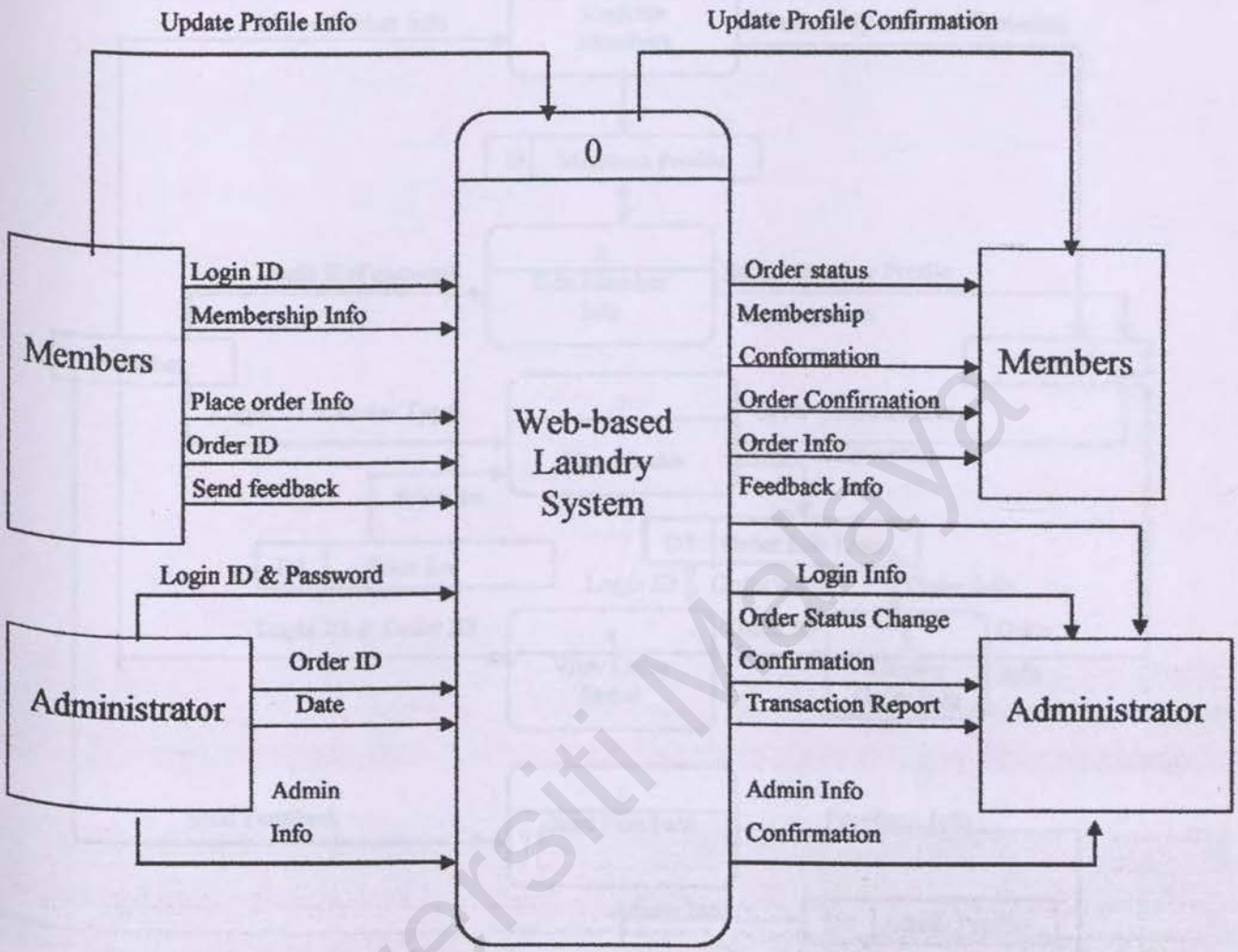



Figure 4.1: Context Diagram



### 4.2.2 0 Diagram

Diagram 0 is the explosion of the context diagram. It shows all the major processes, data movement and data stores at the highest level of detail. Figure 4.2 illustrates the diagram 0 for the proposed system.

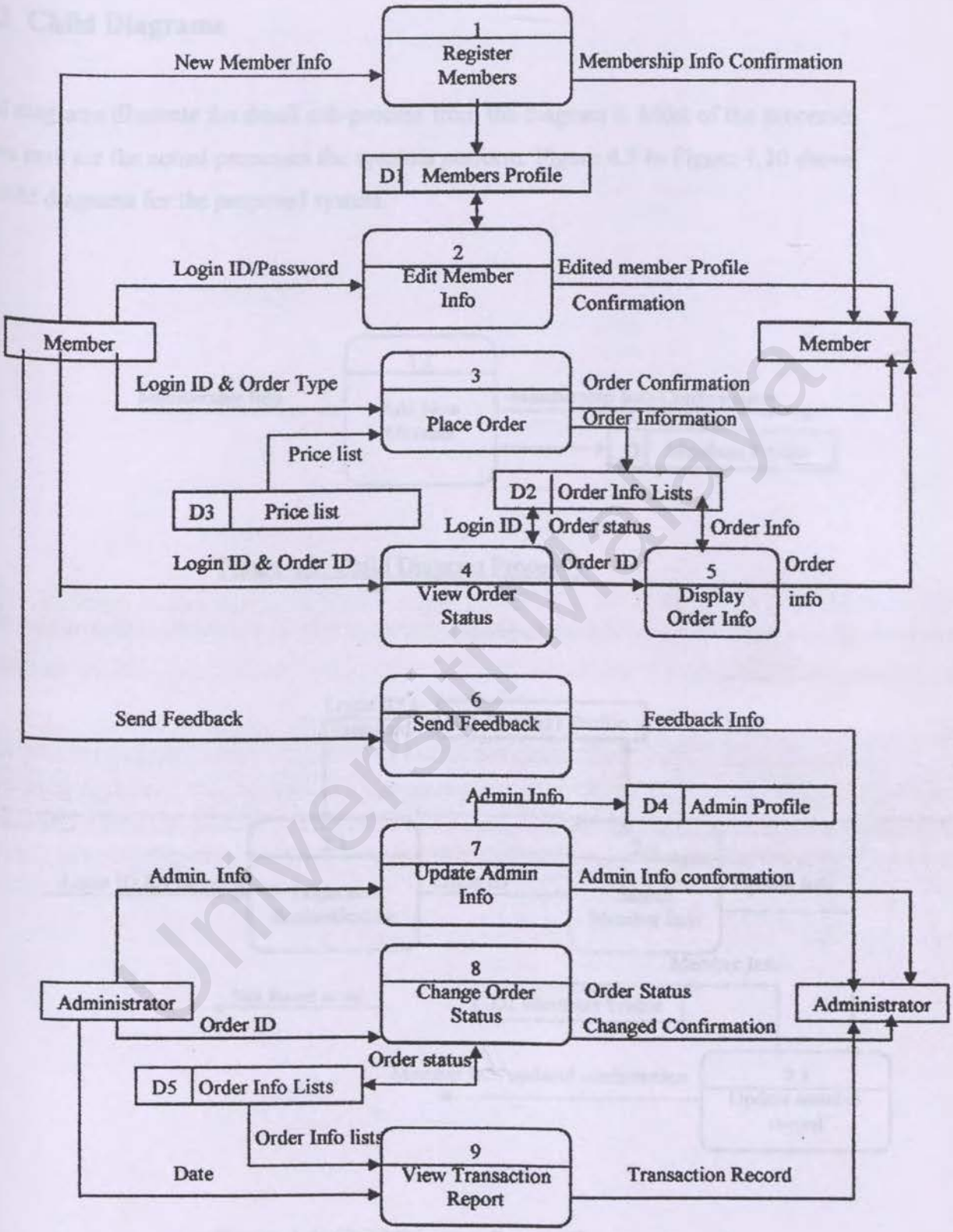



Figure 4.2: 0 Diagram

### 4.2.3 Child Diagrams

Child diagrams illustrate the detail sub-process from the diagram 0. Most of the processes shown here are the actual processes the systems perform. Figure 4.3 to Figure 4.10 shows the child diagrams for the proposed system.

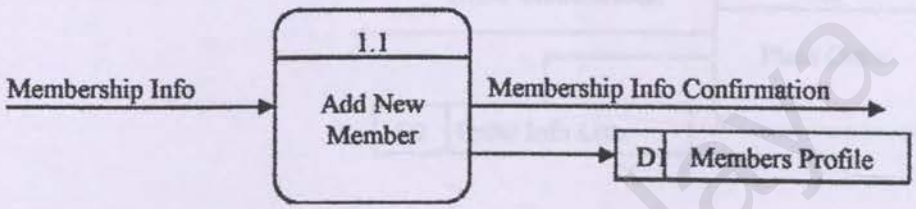



Figure 4.3: Child Diagram Process 1

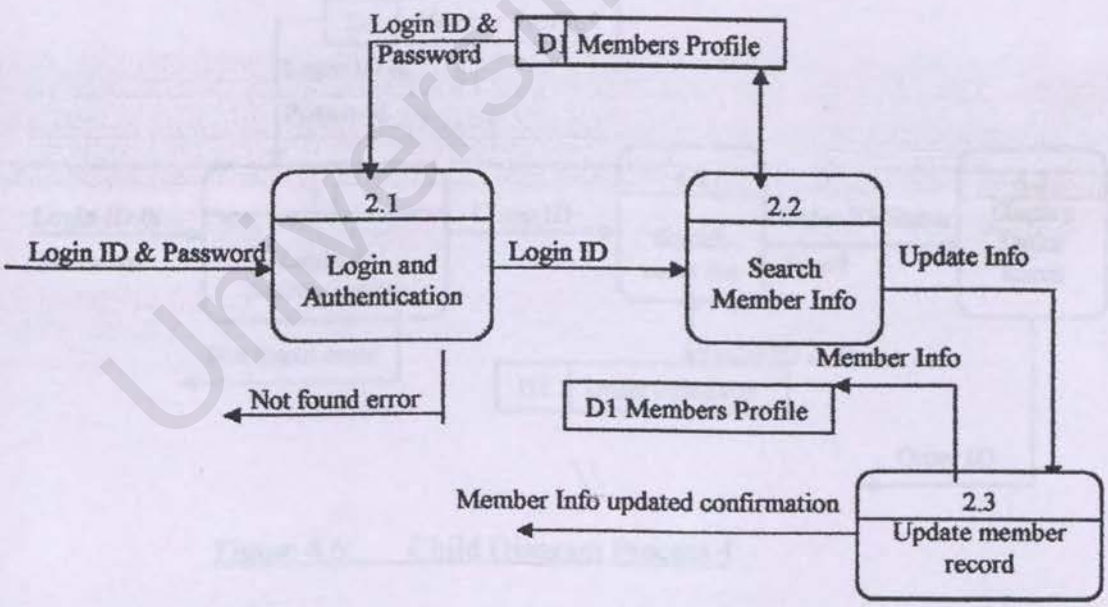



Figure 4.4: Child Diagram Process 2

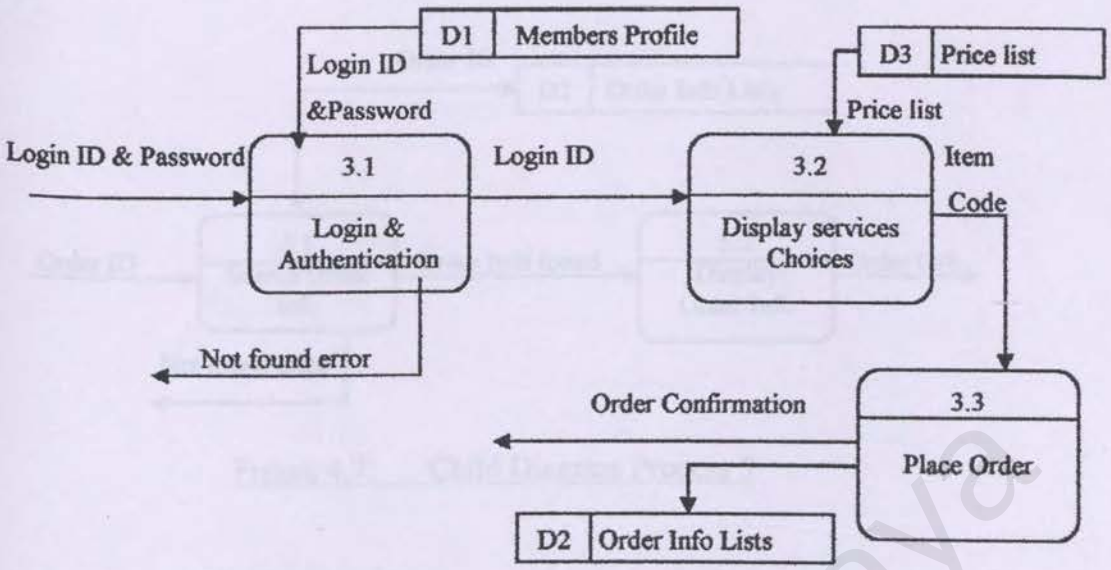



Figure 4.5: Child Diagram Process 3

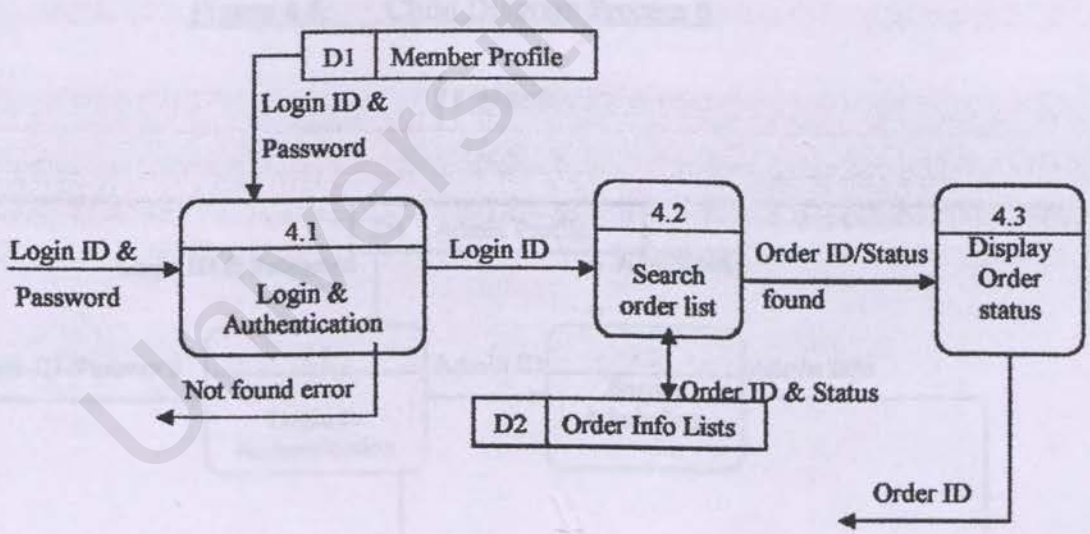



Figure 4.6: Child Diagram Process 4

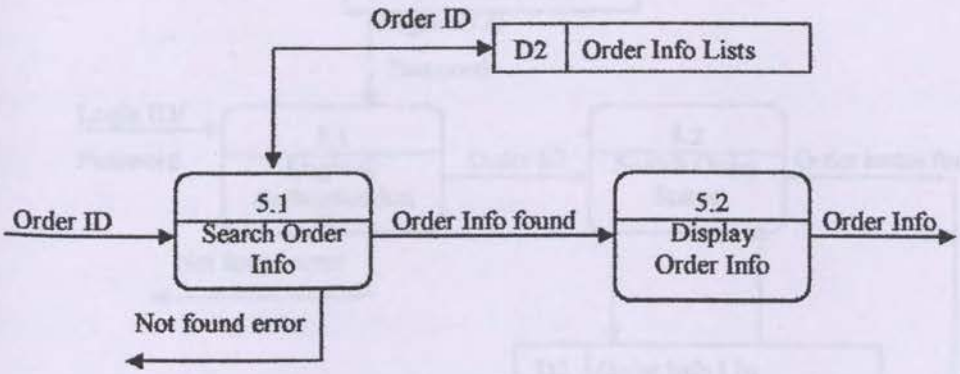



Figure 4.7: Child Diagram Process 5

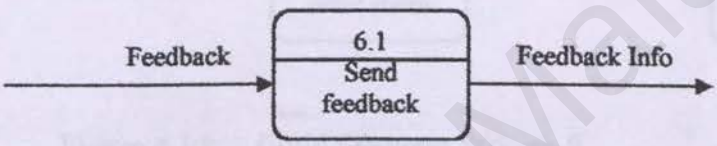



Figure 4.8: Child Diagram Process 6

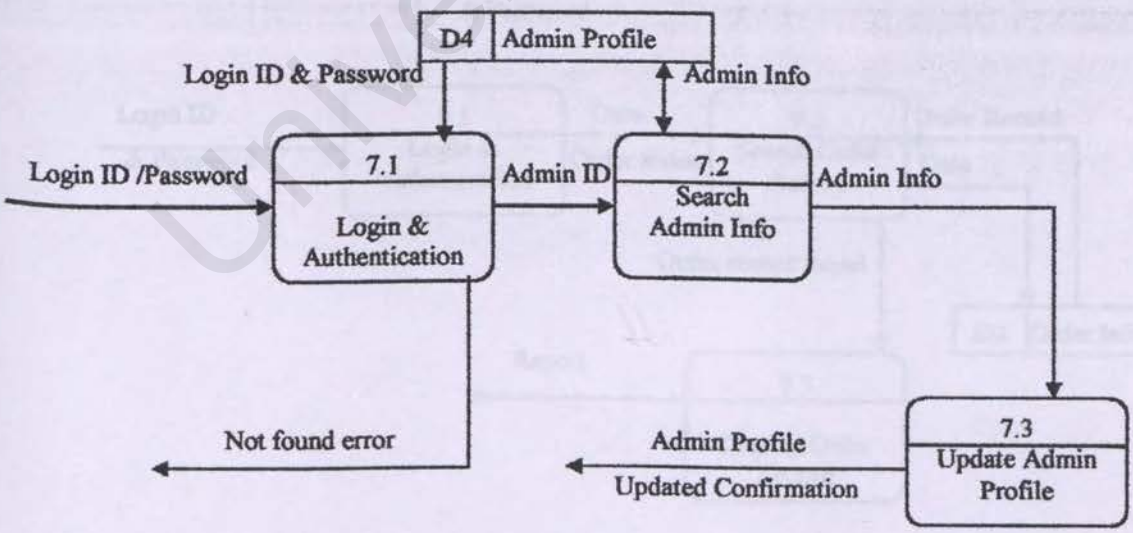



Figure 4.9: Child Diagram Process 7

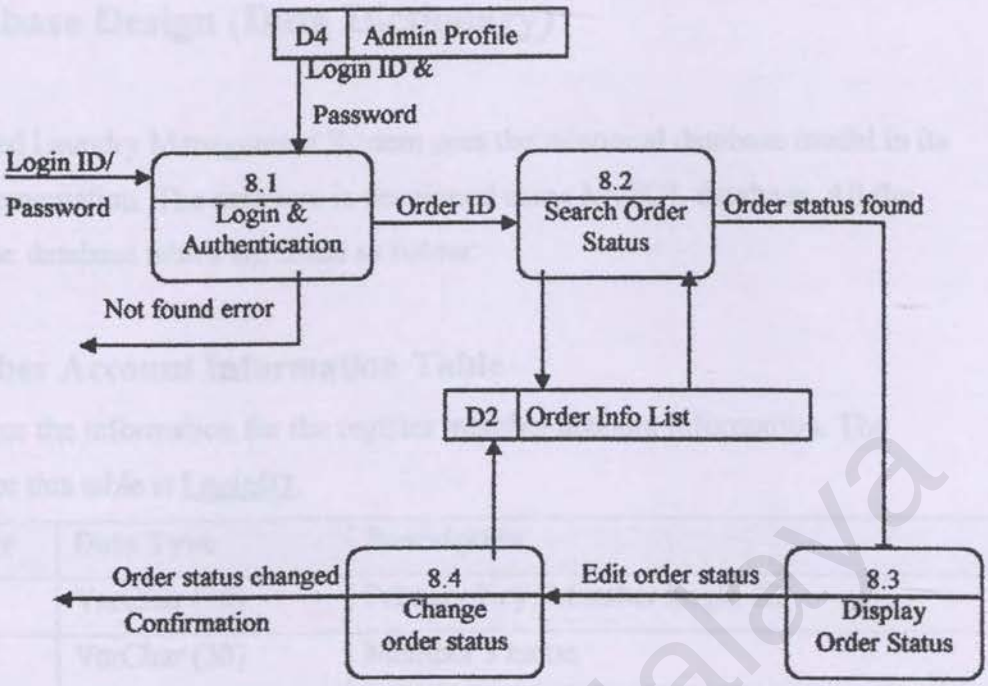



Figure 4.10: Child Diagram Process 8

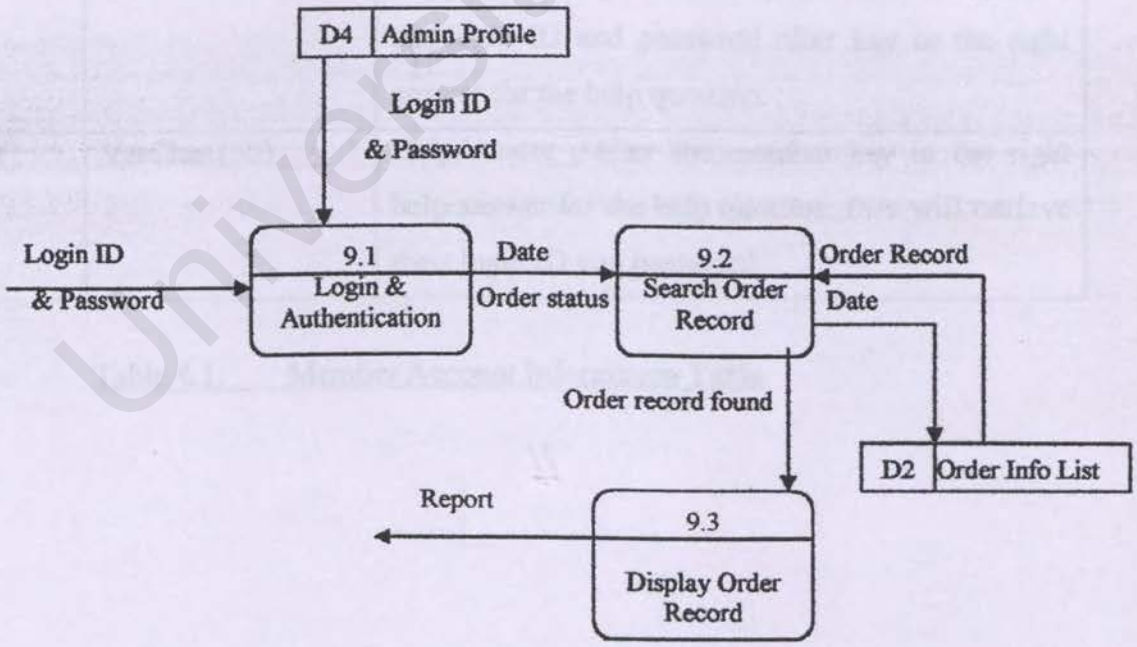



Figure 4.11: Child Diagram Process 9

## 4.3 Database Design (Data Dictionary)

The Web-Based Laundry Management System uses the relational database model in its database implementation. The database is developed using MySQL database. All the attributes of the database tables are listed as below:

### 4.3.1 Member Account Information Table

This table stores the information for the register member account information. The primary key for this table is LoginID.

| Column Name | Data Type | Description |
|---|---|---|
| LoginID | VarChar (30) | Primary Key. Member Login ID |
| Name | VarChar (30) | Member's name |
| Email | VarChar (30) | Member's email. |
| Password | VarChar (8) | Member's Password |
| HelpQuestion | VarChar (50) | HelpQuestion when member forgot password, the member can key in the help question for retrieve the login ID and password after key in the right answer for the help question. |
| HelpAnswer | VarChar (50) | HelpAnswer , after the member key in the right help answer for the help question, they will retrieve their login ID and password. |

Table 4.1: Member Account Information Table

### 4.3.2 Member Address Table

The tables 4.2 used for stores the registered member address and display the address when the member needs to update the information or place orders.

| Column Name | Data Type | Description |
|---|---|---|
| LoginID | VarChar (30) | Primary Key. Member login ID. |
| Address1 | VarChar (30) | Member address |
| Address2 | VarChar (30) | Member address |
| PostCode | VarChar (5) | PostCode Number |
| City | VarChar (30) | City name |
| State | VarChar (15) | State Name |
| Country | VarChar (10) | Country Name |

Table 4.2: Member Address Table

### 4.3.3 Member Contact Table

The tables 4.2 used for stores the registered member address and display the address when the member needs to update the information or place orders.

| Column Name | Data Type | Description |
|---|---|---|
| LoginID | VarChar (30) | Primary Key. Member login ID. |
| Home_Phone | VarChar (10) | Member 's house phone number |
| Office_Phone | VarChar (10) | Member's office phone number |
| Mobile_Phone | VarChar (10) | Member's mobile phone number |

Table 4.3 Member Contact Table

### 4.3.4 Order information Table

Table 4.4 used to stores all the information about the order information that has been made by the members.

| Column Name | Data Type | Description |
|---|---|---|
| OrderID | Int (6) | Primary Key. ID for the order. |
| Name | VarChar (30) | Member's Name |
| LoginID | VarChar (30) | Member Login ID |
| AddForCol | VarChar (100) | Collection address |
| Contact_No | VarChar (15) | Member contact number |
| DateForCol | Date | Date require for collection . |
| TimeOfCol | Time | Time require for collection. |
| SpecIntruct | VarChar (100) | Special instruction that member want highlight. |
| Remark | VarChar (50) | Remark |
| GrandTotal | Decimal (5,2) | The total of payment that member have to pay. |
| Period | Char (2) | Session for time (am/pm) |
| OrderedDate | Date | Date member place order. |
| OrderedTime | Time | Time member place order. |
| OrderStatus | VarChar (15) | Status for the order. |
| ExChargeType | VarChar (15) | Extra service type. |
| ExChargeAmount | Decimal (5,2) | Charge for extra service. |
| Total | Decimal (5,2) | Charge for the service. |

Table 4.4: Order Information Table

### 4.3.5 Ordered list Table

Table 4.5 used to store the ordered item/services that the member has been ordered.

| Column Name | Data Type | Description |
|---|---|---|
| OrderID | Char (5) | Primary Key.ID for the order |
| Item_Name | VarChar (30) | Item/clothes' name that member have ordered. |
| QtyL | Int (3) | Quantity for the laundry services. |
| QtyD | Int (3) | Quantity for the dry cleaning services. |
| PriceL | Decimal (4,2) | Price for laundry services. |
| PriceD | Decimal (4,2) | Price for drycleaning services |
| Sub_Total | Decimal (5,2) | Total charge for the order/services. |

Table 4.5: Ordered list Table

### 4.3.6 Garment Price List Table

Table 4.6 used to store price for the garment category item/clothes.

| Column Name | Data Type | Description |
|---|---|---|
| Item_Name | Char (30) | Primary Key. Name for the item/clothes |
| Price_l | Decimal (4,2) | Charge/Price for the laundry services |
| Price_d | Decimal (4,2) | Charge/Price for the drycleaning services |
| Category | Char (2) | Category for the item/clothes. |

Table 4.6 Garment Price List Table

### 4.3.7 Household Linen Price List Table

Table 4.7 used to store price for the house linen category item/clothes.

| Column Name | Data Type | Description |
|---|---|---|
| Item_Name | Char (30) | Primary Key. Name for the item /clothes. |
| Price_l | Decimal (4,2) | Charge/Price for the laundry services |
| Price_d | Decimal (4,2) | Charge/Price for the drycleaning services |
| Category | Char (2) | Category for the item/clothes. |

Table 4.7 Household Linen Price List Table

### 4.3.8 Curtain & Carpet Price List Table

Table 4.8 used to store price for the house linen category item/clothes.

| Column Name | Data Type | Description |
|---|---|---|
| Item_Name | Char (30) | Primary Key. Name for the item /clothes. |
| Price_l | Decimal (4,2) | Charge/Price for the laundry services |
| Price_d | Decimal (4,2) | Charge/Price for the drycleaning services |
| Category | Char (2) | Category for the item/clothes. |

Table 4.8 Curtain & Carpet Price List Table

### 4.3.9 Leather Garment Price List Table

Table 4.9 used to store price for the house linen category item/clothes.

| Column Name | Data Type | Description |
|---|---|---|
| Item_Name | Char (30) | Primary Key. Name for the item /clothes. |
| Price_l | Decimal (4,2) | Charge/Price for the laundry services |
| Price_d | Decimal (4,2) | Charge/Price for the drycleaning services |
| Category | Char (2) | Category for the item/clothes. |

Table 4.9 Leather Garment Price List Table

### 4.3.10 Administrator Account Information Table

Table 4.10 used to store account information for the administrator.

| Column Name | Date Type | Description |
|---|---|---|
| EmployeeID | Int (4) | ID for the employee (Primary Key) |
| Name | VarChar (30) | Admin' name |
| LoginID | VarChar (30) | Admin login ID |
| Password | VarChar (8) | The Admin password |
| HelpQuestion | VarChar (30) | Help Question to help admin to retrieve password. |
| HelpAnswer | VarChar (30) | Help Answer to help admin to retrieve password. |
| Status | Char (2) | Status for the admin (super admin or ordinal admin) |

Table 4.10 Administrator Account Information Table

### 4.3.11 Feedback Table

Table 4.11 used to store the feedback detail that user have post to the administrator.

| Column Name | Date Type | Description |
|---|---|---|
| RefNo | Int (10) | Primary Key. Reference no for the detail use by the admin |
| MsgType | VarChar (15) | What the message about. |
| Subject | VarChar (30) | Subject for the message. |
| Comment | VarChar (100) | Sender's comment |
| Name | VarChar (30) | Sender' name |
| Email | VarChar (30) | Sender's email |
| ContactRequested | VarChar (5) | See sender's need response from admin or not. |

| RecDate | Date | Date that feedback is received by the admin. |
|---|---|---|

Table 4.11 Feedback Table

### 4.3.12 Administrator Profile Table

Table 4.12 used to store information about the administrator profile.

| Column Name | Date Type | Description |
|---|---|---|
| LoginID | VarChar (30) | Primary Key. The Admin ID |
| EmployDate | Date | Date that Admin has been employed |
| Salary | Decimal (6,2) | Admin salary |
| House_Phone | VarChar (10) | Admin's house phone no. |
| Mobile_Phone | VarChar (10) | Admin's mobile phone no. |
| Address1 | VarChar (30) | Admin address |
| Address2 | VarChar (30) | Admin address |
| City | VarChar (20) | Admin stay city |
| State | VarChar (15) | Admin stay state |
| Country | VarChar (15) | Admin stay country |

Table 4.12: Administrator Profile Table

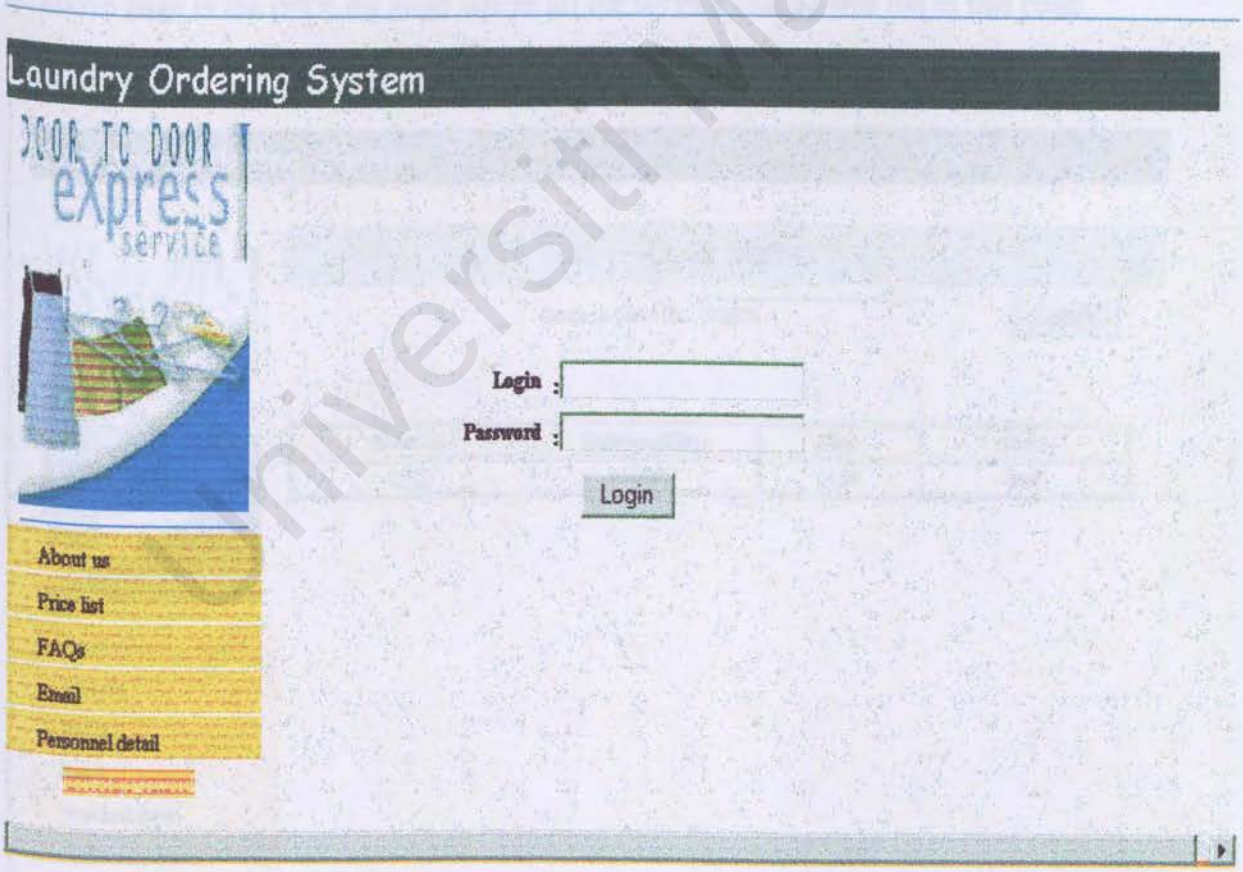
## 4.4 User Interface Design

User interface design is not an easy task. It can be a tricky thing to design, because different people have different styles of perceiving, understanding and working. Marcus (1993) points out that an interface should address several key elements:

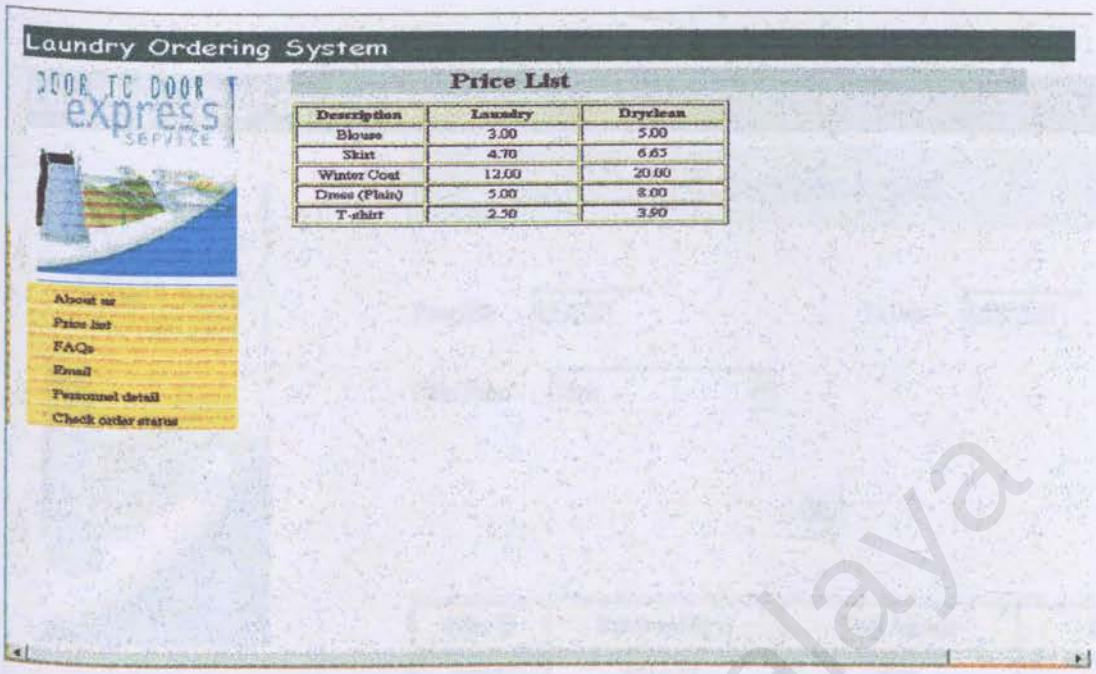
- *Metaphors*: The fundamental terms, images, and concepts that can be recognized and learned.

- *A mental model*: The organization and presentation of data, functions, tasks, and roles.
- *The navigation rules for models*: How to move among data, functions, activities and roles.
- *Look:* The characteristics of the system's appearance that convey information to the user.
- *Feel*: The interaction techniques that provide an appealing experience for the user. [13].

The goal of these elements, and of the user interface, is to help users gain rapid access to the content of complex system, without losing their comprehension as they move through information. Below are the samples interfaces for this system:

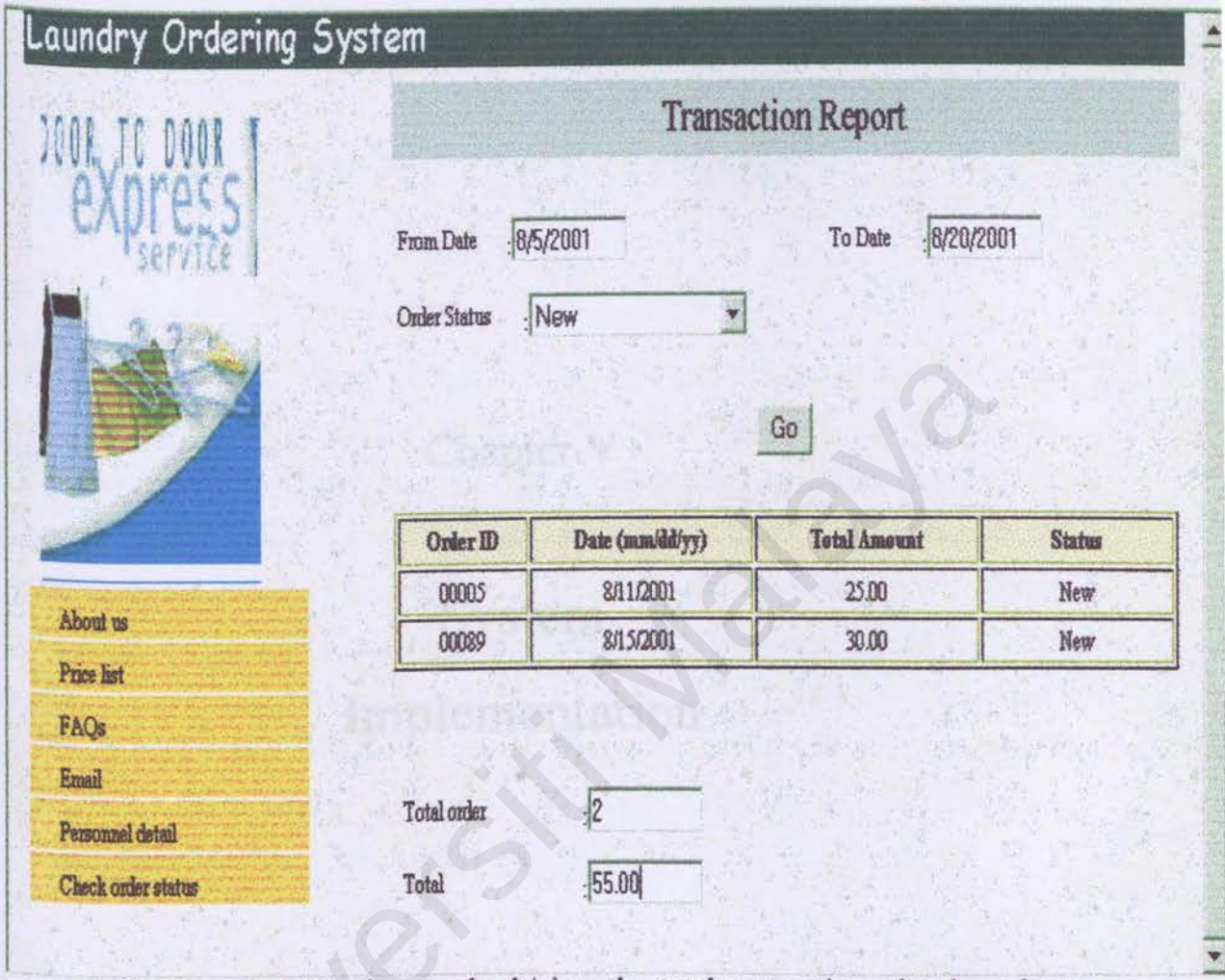



The above interface is the login page. The user has to enter the login and password for access the system. If the forgot the login and password, the can click on the forgot icon.




The above page is the price list page where all the service charge will list in this page.


The above page is for the user to check their order status and also review the order information that the user had subscribed before.




The page is for the administration to check/view the total transactions that have been made within a period time (specify by the administrator).

# CHAPTER V

# SYSTEM IMPLEMENTATION

Right after the web-based Laundry Management System application has been designed and specified its requirements, the next phase proceeding will be the system implementation phase. This is the phase that took the longest time in the development life cycle to complete. Therefore, using the right tools and the right coding methods to develop the system are crucial in determining the success of this project. Web-Based Laundry Management System is developed modularly using 'top-down' approach, which involves building the high-level software modules that are refined further into functions. Besides, this system involves code generation using different programming languages ranging from Java Server Pages (JSP), Java, JavaScripts, HyperText Markup Language (HTML) and Structured Query Language (SQL).

## 5.1 Development Environment

Development environment has certain impact on the implementation of a system. Using the suitable hardware and software will help to speed up the system development and its performance. The hardware and software tools used to develop and document the entire system are shown as below:

### 5.1.1 Hardware Requirement

The hardware that used to develop the system is listed:

- Processor : 800 MHz Pentium® Processor
- Memory : 64.0 MB of RAM or above

- Hard Disk: 10GB or above
- VGA : 640 X 480 (256 color)
- 40X CD-ROM drive
- Modem : Baud
- Other standard peripherals that includes monitor, printer, mouse and keyboard

### 5.1.2 Software Requirement

- Operating System : Microsoft Windows 2000 Professional
- Web Server : Apache httpd Server 1.3.20
- Database Server : MySQL 3.23
- MySQL JDBC Driver : mm.mysql.jdbc-1.2b
- Java Server Pages Engine : Jakarta Tomcat-3.2.3
- Browser : Microsoft Internet Explorer
- Editor : Allaire HomeSite 4.5
- Program Coding :- JavaServer Pages (JSP)
  - Java
  - JavaScript
  - HyperText Markup Language (HTML)
  - Structured Query Language (SQL)
- Java Development Kit 1.2.1 (includes Java Runtime Environment)
- Microsoft FrontPage
- Adobe Photoshop, Button Studio 1.07
- SnagIt 5.0

## 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 [17]:

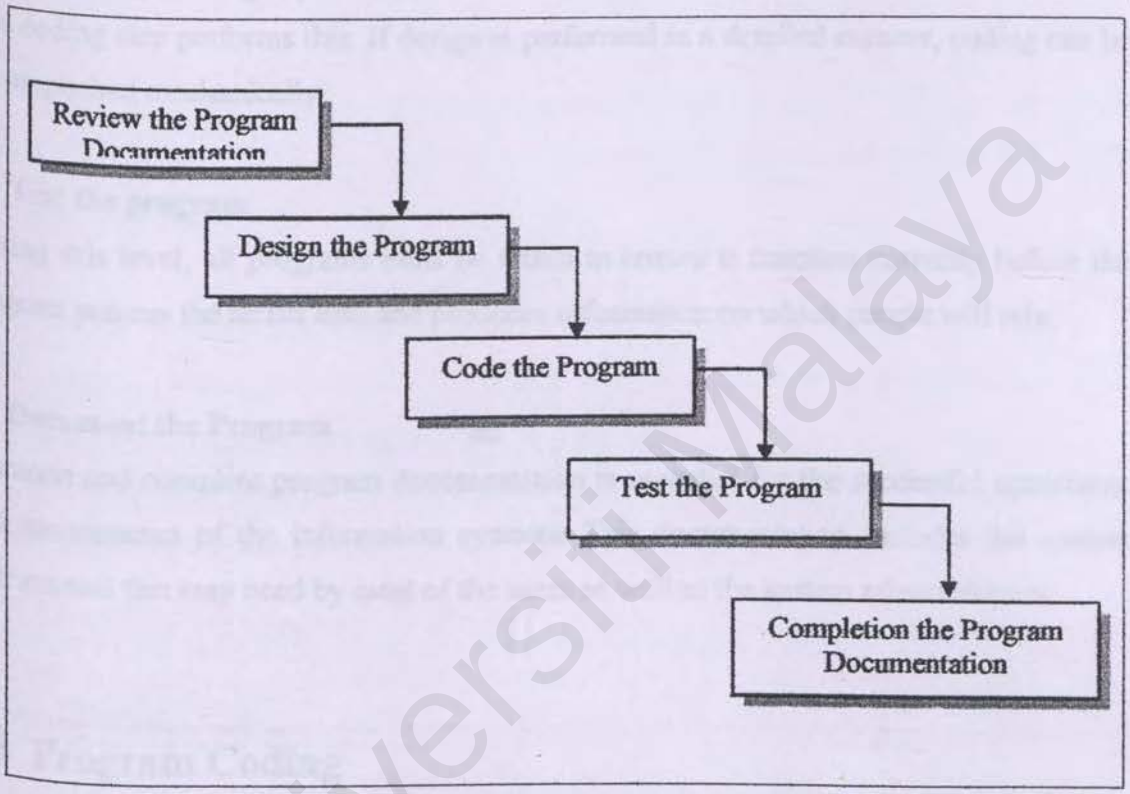



Figure 5.1: The Steps of Program Development

**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 Web-Based Laundry Management System consists of simple process descriptions, data dictionary entries and the source documents.

**2) Design the program**

For the second level of program development, decisions have to be made on how the program can accomplish its tasks by developing a logical solution to those programming

problems. The logical solution or logic for a program is a step-by-step solution to a programming problem.

**3) Code the program**

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

**4) Test the program**

During this level, all programs must be tested to ensure it function correctly before the program process the actual data and produces information on which people will rely.

**5) Document the Program**

Accurate and complete program documentation is essential for the successful operations and maintenance of the information systems. This documentation includes the system user manual that may need by most of the users as well as the system administrators.

## 5.3 Program Coding

Coding is a process of converting the logics of each program specification that had be design during the system design phase into the form of instruction codes in the programming language.

In the design phase of the system, it is clear that this system is in a structured and module design. This type of system design consists of dividing the system into subsystems or processing groups and specific functions. Each function contains one or more programming modules.

### 5.3.1 Coding Approach

On the completion of the system design stage, the implementation stage will need an approach to organize a well-structured program. Top-Down approach was used to develop the assigned project. This approach allows the higher-level modules to be coded first before the lower level modules.

It is easy to visualize what the top-down approach refers to; it means looking at the large picture of the system and then exploding it into smaller parts or subsystems [SE]. The advantage of using top-down approach includes:

- Avoiding the chaos of attempting to design a system all at once.
- Enables separate systems analysis teams to work in parallel on different but necessary subsystems. This can save a great deal of time.
- Prevent systems analysis from getting so mired in detail that they lose sight of what the system is supposed to do.

### 5.3.2 Coding Style

Coding style is an important attribute of source code and it determines the intelligibility of a program. The readability of the source code makes the system easier to be maintained and enhanced.

The main programming languages that are used to develop the web based Web-Based Laundry Management System are JavaServer Pages (JSP), JavaScript, Hypertext Markup Language (HTML) and Structured Query Language (SQL).

The JSP specification provides web developers with a framework to create dynamic content on the server using HTML and JavaScript. The basic concept is presented as Figure 5.2.

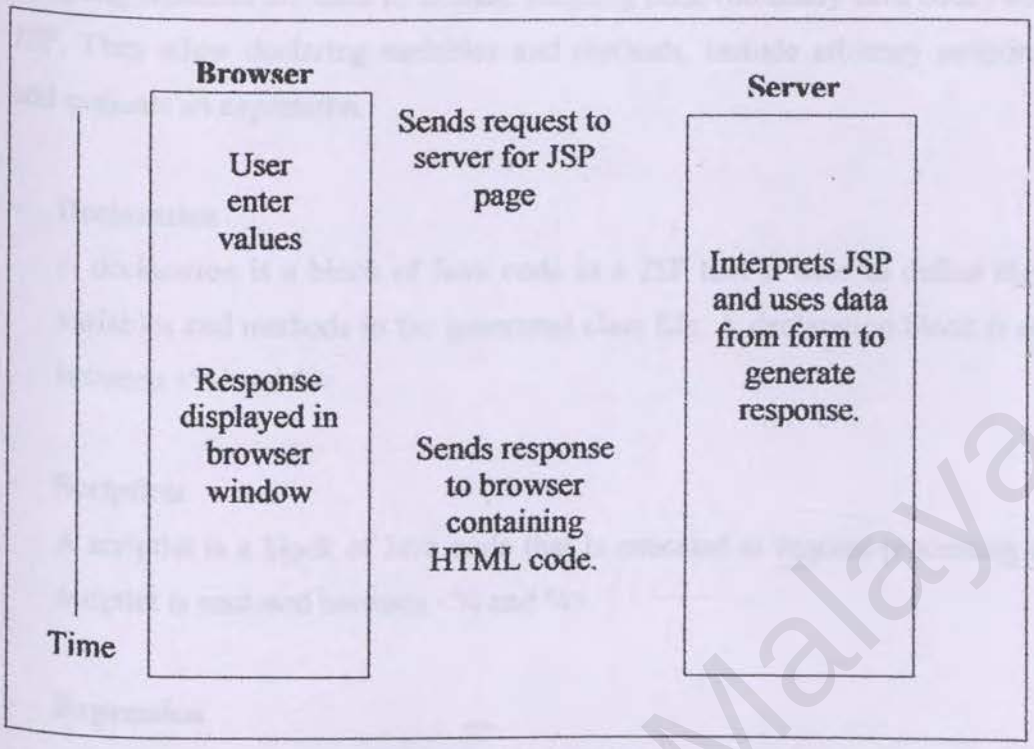



Figure 5.2: Basic Concept for Coding

Browser sends request to the web server for JSP pages, server interprets the JSP code and creates a response HTML code, which is sent back to the browser.

### 5.3.2.1 JavaServer Pages (JSP)

Element data of the JSP, which is processed on the server, can be classified into the following categories: [36]

- **Directives**

  JSP directives serve as messages to the JSP container from the JSP. They are used to set global values such as class declaration, methods to be implemented, output content type, etc. They do not produce any output to the client. All directives have scope of the entire JSP files. In other words, a directive affects the whole JSP files, and only that JSP file. Directives are characterized by the @ character within the tag, and general syntax is:

  <%@ directivesName attribute = "value" attribute = "value" %>

- Scripting elements are used to include scripting code (normally Java code) within the JSP. They allow declaring variables and methods, include arbitrary scripting code, and evaluate an expression.

  - **Declaration**

    A declaration is a block of Java code in a JSP that is used to define class-wide variables and methods in the generated class file. A declaration block is enclosed between <%! and %>

  - **Scriptlets**

    A scriptlet is a block of Java code that is executed at request-processing time. A scriptlet is enclosed between <% and %>.

  - **Expression**

    An expression is a shorthand notation for a scriptlet that outputs a value in the response stream back to the client. An expression is enclosed within <%= and %>.

- **Standard Actions**

  Actions are specific tags that affect the runtime behavior of the JSP and affect the response sent back to the client. The JSP specification lists some action types that are standard, and these have to be provided by all containers, irrespective of the implementation. The standard action types are:

  - < jsp : useBean >
  - < jsp : setProperty >
  - < jsp : getProperty >
  - < jsp : param >
  - < jsp : include >
  - < jsp : forward >
  - < jsp : plugin >

### 5.3.2.2 Hypertext Markup Language (HTML)

HTML is a markup language used for electronic documents on the Internet. A markup language of describing the way a document should look using specific instructions or tags that are embedded in the document text.

The hypertext capability of HTML enables users to link to other locations of text. This could be another location within the same file, another document on the same host machine, or another document on the Internet.

Below are basic HTML tags:

```
<HTML>
<HEAD>
<TITLE> Title of page </TITLE>
</HEAD>
<BODY>
    Body contents and tags here
</BODY>
</HTML>
```

### 5.3.2.3 JavaScript

JavaScript is a compact, object-based scripting language for developing client and server Internet applications. JavaScript is designed to extend the capabilities of the web application to provide user interactivity. In a client application, JavaScript statements embedded in the HTML page can recognize and respond to user events such as mouse clicks, form input, and page navigation.

JavaScript codes are embedded in an HTML document in two ways:

- As statements and functions using the <SCRIPT> and </SCRIPT> tag
- As event handlers using HTML tags:

For examples:

```
<HTML>
<HEAD>
<SCRIPT>
    // JavaScript code here: mainly JavaScript functions
</SCRIPT>
</HEAD>
<BODY>
    // HTML code here
    // JavaScript code here: mainly JavaScript event triggers
</BODY>
</HTML>
```

#### 5.3.2.4 Structured Query Language (SQL)

SQL is a powerful tool to connect to a database regardless of the form of the database. Majority of SQL statements use 4 basic commands: SELECT, INSERT, UPDATE and DELETE.

### 5.3.3 Code Documentation

Code documentation begins with the selection of identifier (variables and labels) names, continues with the composition of connectivity and end with the organization of the program. Indentation can also be used to increase the readability of source code. The elements of code documentation include:

- **Internal documentation**

  Internal documentation contains information directed at someone who will be reading the source code [17]. Thus, 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.

- **Naming convention**

  Naming convention provides easy identification for the programmer, the naming convention have to be created with coding consistency and standardization in mind.

- **Modularity**

  In order to reduce complexity, facilitate change results in easier implementation by encouraging parallel development of different parts of a system.

# CHAPTER VI

# SYSTEM TESTING

The process of testing is done throughout the system development and not just at the end of the development. All the system's newly written or modified application programs as well as procedural manuals, hardware and system interfaces are tested thoroughly. Testing also meant to turn up heretofore-unknown problems. Testing is an essential series of steps that helps ensure the quality of the system. It is done on many different levels at various intervals as work progresses.

## 6.1 Purposes of Testing

Testing is actually a process of executing the application programs with the intention of finding errors. Before the Web-Based Laundry Management System application to go on live, this newly developed application system must to thoroughly test. This is being achieved by using carefully planned test strategies and realistic data so that the entire testing process is methodically and rigorously carried out. In fact, testing cannot show the absence of faults; it can only show that software faults are present. If the testing process is being conducted successfully, it will uncover errors with the application programs and possibly the database structure. As a secondary benefit, testing also demonstrates that the database and the application programs appear to be working according to their specification and that performance requirement appear to have been satisfied.

The following are a number of rules that can serve as testing objectives:

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

- A successful test is one that uncovers as yet undiscovered errors.

## 6.2 Testing Stages

Web-Based Laundry Management System has undergone three stages of testing, which are unit testing, integrating testing and system testing.

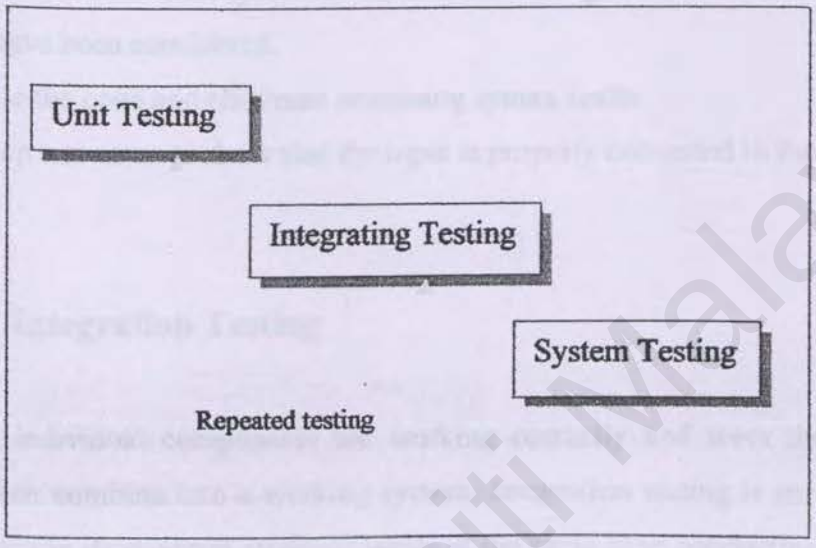



Figure 6.1: Testing Stages

Due to the fact that defects are discovered on any stages, it is required that program modifications are being done to correct them and this require other stages in the testing process to be repeated. Errors in the program components come to light at later stages of the testing process. So, testing process is therefore iterative with information being fed back from later stages to earlier parts of the process. As can be seen from the Figure 6.1, the arrows from the top of the boxes indicate the normal sequence of testing and the arrows returning to the previous box indicate that previous testing stages are repeated.

### 6.2.1 Unit Testing

Unit testing or also known as module testing/component testing. In this stage, individual program component is tested on its own, isolated from the other components in the

system to ensure that they operate correctly. For the assigned system, unit testing was done during the coding phase.

The steps for unit testing are: [17]

i) Examine the program code by reading through it, trying to spot algorithm, data and syntax faults.
ii) Compare the code with specifications and with design to make sure that all relevant cases have been considered.
iii) Compile the code and eliminate remaining syntax faults.
iv) Develop test cases to show that the input is properly converted to the desired output.

### 6.2.2 Integration Testing

When the individual components are working correctly and meet the objectives, the modules then combine into a working system. Integration testing is used on this system for constructing its program structure while at the same time conducting tests to uncover errors associated with integrating. This is a process of verifying that the system components work together as described in the system and program design specifications.

### 6.2.3 System Testing

System testing is concerned with finding errors, which result from unanticipated interactions between sub-systems and system components. It is also concerned with ensuring that the system meets its functional and non-functional requirements.

Testing the system is very different from unit and integration testing. The objective of unit and integration testing is to ensure that the code implemented the design properly; whereas the objective of system testing is to ensure that the system does what the customer wants it to do.

There are several steps in system testing, which are function testing, performance testing, acceptance testing and installation testing.

- **Function testing**
  A function test checks that the integrated system performs its functions as specified in the requirement.

- **Performance Testing**
  Performance test compares the integrated components with the nonfunctional system requirements. These requirements including, security, accuracy, speed and reliability, constrains the way in which the system functions are performed.

- **Acceptance Testing**
  Acceptance test is doing by customers or users. This is to make sure that the developed system meets their requirements.

- **Installation Testing**
  Installation test allows users to exercise system functions and document additional problems that result from being at the actual working environment.

## 6.3 Test Case

In order to perform testing on the assigned Web-Based Laundry Management System, both valid and invalid test data have been created. These data are then run to see if base routines work and also to catch errors.

### 6.3.1 Unit Test Case

There are two main modules in Web-Based Laundry Management System, namely Administrator section and user section. Each main module consists of a few

subcomponents. Individual program components are tested to determine errors occurred. Problems are solves before continuing to another subcomponents.

### 6.3.1.1 Authentication Module

- Check whether the *Login ID* and *Password* enter by user or administrator is correct or not. If wrong *Login ID* and *Password* was entered, a message will display to notice the user/administrator.

### 6.3.1.2 Administration Module

- **Admin List**
  - **Add new administrator**
    i. Insert stimulated data into Add New Administrator form
    ii. Valid data length and data type will be checked for each field
    iii. Invalid data will be warned and asked to correct before proceed
    iv. Click the *Submit* button to submit the form
    v. All data entry will be inserted into database
    vi. Confirmation alert will prompt out to notice that the new administrator have been successful added.

  - **Remove administrator**
    i. Click on the delete checkbox which beside the administrator. A confirmation alert will be prompt out to make sure that the selected administrator really need to be delete form database. When the administrator clicks on "OK", the selected administrator will be removing. After finish removed, it will return to the Administrator list to check whether the removed administrator exist in Administrator list

- **Admin Profile**
  - **Update administrator profile**
    i. Insert new data into the related fields which wish to update in Administrator Profile form
    ii. Invalid data will be warned and asked to correct before proceed
    iii. Click on Update button to submit the form
    iv. All data entry will be updated
    v. Confirmation page will be displayed if the Update Profile module function successfully. Click on "OK" at the confirmation page will return to the administrator profile page and the information displayed there will be the updated information.

- **Price List**
  - **Add new Item/Service**
    i. Insert stimulated data into Add New Entry form
    ii. Valid data length and data type will be checked for each field
    iii. Invalid data will be warned and asked to correct before proceed
    iv. Click the *OK* button to submit the form
    v. All data entry will be inserted into database
    vi. Confirmation page will be displayed if the Add New Entry module function successfully. Click on "OK" button at the confirmation page will return to the page that the item was added.

  - **Update price list**
    i. Price for each item/service can be updated by clicking on the item name (e.g.: shirt) will link to edit price list page.
    ii. Insert new price into the related fields, which wish to update.
    iii. Invalid data will be warned and asked to correct before proceed
    vi. Click on Update button to submit the form
    vii. All data entry will be updated
    iv. It will return to the page that item belong to and the information there should be updated.

- **Remove Item/services**
  i. Click on the checkbox which beside the book that will be remove from price list and then click *Delete* button
  ii. It will return to the page that item belong to and the information there should be updated.

- **Feedback**
  i. By default, this page will display 'today' feedback. If no feedback found, a message will display there.
  ii. Administrator can enter a date to search for the feedback. If no date is enter and search button is clicked, an alert message will prompt out.
  iii. All the feedback within the date that administrator will display below the search button.
  iv. Administrator can view the detail of the feedback by click on the '*click here*' and a window will prompt out to show all the detail about the feedback. The administrator can reply the feedback by click on the email address.
  v. Delete a feedback can be done by select the feedback that wish to delete at the delete check box. After that just click on the *delete* button, the entire selected message will remove.
  vi. A confirmation page will display to tell the administrator that the selected message is successful deleted.

- **View Today Order**
  i. By default, this page will display 'today' feedback. If no feedback found, a message will display there
  ii. Administrator can enter a date to search for the feedback. If no date is enter and search button is clicked, an alert message will prompt out
  iii. All the feedback within the date that administrator will display below the search button
  iv. Administrator can view the detail of the order by click on the 'Order ID' and it will link to show all the detail about the order. The administrator can delete he order by click on the *delete* button or click **back** button to go to previous page.

- **Change Order Status**
  i. Select the order status listed at the drop-down list box and then click on the search button.
  ii. The search result will display on the same page if record was found.
  iii. Order detail can be view by click on the order ID and the order status can be change by select the status listed at the drop-down list box at end of each row.
  vii. A confirmation page will display to tell the administrator that the selected message is successful deleted.

- **View Transaction Summary**
  i. By default, this page will display the current month transaction summary.
  ii. Different month transaction summary can be view by click on the month listed at the top of the page.

- **Top 5 member**
  i. By default, this page will display the current month top 5 member with the higher order.
  ii. Different month transaction summary can be view by click on the month listed at the top of the page

#### 6.3.1.3 User Module

- **Forget Password**
  i. User enters their login ID, help question and help answer into the field listed there. If all field are validated, the user login ID and password will be displayed. If either one field enters with wrong value, a message will display to tell the user what fields had entered wrongly.

- **Sign Up as new member**
  i. Click on the Sign Up will link to a register page. All fields with ( ) must be filled. If not, an alert will prompt out to alert the user.

ii. All fields will validate before successful register the user to the system. If validate fail, an alert will prompt out and the user have to correct it before can further to next step.

iii. If all the fields were correct, a confirmation page will display to tell the user that he/she had successful register and can login to the system.

- **Place Order**

i. Enter the amount for the clothes and the click on add to order form.

ii. An alert message will prompt out to notice the user that the order has been added into the order cart.

iii. If no amount has been entered but the click at add to order form, alert message also will prompt out to notice user that nothing have selected.

iv. By click on the view order detail, the user can view all the order that he/she have been added into the order cart.

v. After enter the date and time for collection, the user can check out by click on the check out button.

vi. A confirmation page will display to notice that the order have been successful sent.

#### 6.3.1.4 Sign Out

- Click on Sign Out button will link to Login page again
- Check whether if user click on Back button, the individual module still perform its function.

### 6.3.2 Integration Test case

After the unit testing, each individual component of Administrator section and User are said to be worked correctly and meet the objective of the system. The next step, integration testing is carried out to ensure that individual components had been integrated into a working system.

In Web-Based Laundry Management System, a bottom-up integration strategy approach is used. This system is constructed and tested in small segments, where errors are easier to isolate and corrected. Each module in the assigned system will be tested again to ensure that all the modules are functioning properly without errors. When this method is used, each component at the lowest level of the system hierarchy is tested individual first. Then, the next components to be tested are those that call the previously tested ones. This approach is followed repeatedly until all components are included in the testing. [17]

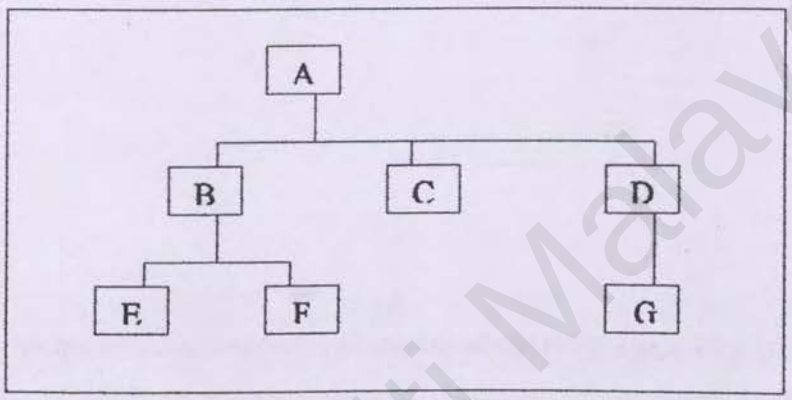



Figure 6.2: Example Component Hierarchy for the Assigned System

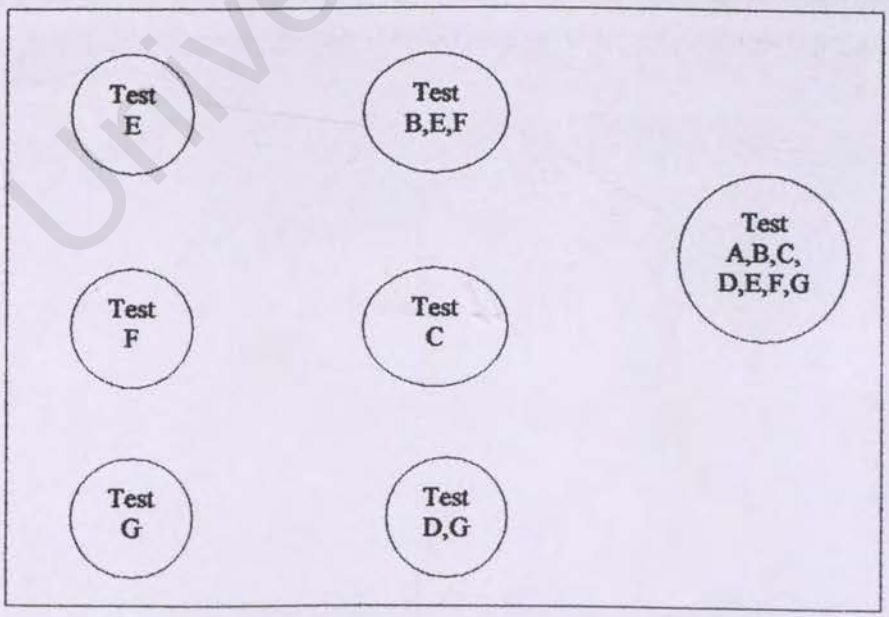



Figure 6.3: Bottom-Up Approach

### 6.3.3 System Test Case

Since the purpose of system testing was to ensure that the system does what the customer wants it to do, thus usability test has been carried out to find human factor or usability problems especially from the end users or customers.

# Chapter VII

# System Evaluation & Conclusion

The previous chapter presents the implementation of Web-Based Laundry Management as the means of deployment to users. Users will start to use and evaluate the system on whether they are able to adapt to it according to the requirements. After evaluating the system, feedbacks and comments were then being noted into several categories consisting of system strengths, limitations and constraints, problems faced and future enhancements.

## 7.1 System Strengths

Before really thinking right into the heart of development on coding, choosing the right tools and programming languages are very important factors. The following will discussed some justifications on a few points being selected as strengths:

### 1. Authorization and authentication

Every user has their login name and password. Web-based Laundry Management System only allows authorized users to access the system. A message will display if the user enter either wrong login ID or password. The user cannot redirect by click by button if the user already signed out. The users have to login again if he/she wishes to log on to the system again.

### 2. Future Extensibility

The Web-based Laundry Management System was coded using the Java's latest standard, J2EE (Java 2 Enterprise Edition) such as JSP. Thus, it guarantees future extensibility and enhancement such as Servlets and JavaBeans. Besides that, the advantage across multiple operating systems has enabled this system to reside in almost any operating systems in future.

**3. Cost saving**

Unlike any other databases server that require high cost of license fees, Web-Based Laundry Management System currently resides in the MySQL server, which require a small amount of license compare to others. Manipulation of data can be done in DOS mode and also GUI form.

**4. Validation of fields**

From the perspective of the correctness of data inputted, functions have been coded to check against input for each field. Alert message will be given by the system if user tries to input an invalid value for the particular field. This will act as the guidelines regarding how to use the system and it will help the user to use the system effectively and reduces the time for searching it through the user manual.

**5. Allowing users to keep selection item/services to the order form.**

The consideration list, which was derived using the Java's session tracking technology, was being designed to allow users to keep certain items into his/her order form for further reviewing while browsing through multiple pages for view the services.

**6. Selecting date using calendars**

In several pages, users/administrators are required to enter date. They can either enter date manually or by selecting dates from a pop-up calendar, which will automatically be populated in the format of day, month and year. In this case, calendar is powerful in the sense that the day changes according to the selected year and month. For example, if month February is selected and the year specified is a leap year, users will see 29 days in the calendar. Therefore, it ensures the users enter the valid date and users will not be confused.

## 7.2 Limitation & Constraints

Despite so many points of strengths, there will also be several limitations and constraints to the Web-Based Laundry Management System as there is no system that is perfectly well done. These limitations and constraints are normally problems that are not programmable or depend on certain operating systems and can't be solved easily. It could also be left out because of no specification in the system requirements. Therefore, it will be categorized into the future enhancement list.

**1. No SSL (Secure Socket Layer) support in terms of security**

SSL, which is an encryption method to increase the security during the transaction of data between the server and users, cannot be implemented in Web-Based Laundry Management System. This is mainly because it has to liased with a Certificate Authority (CA) to get a server digital certificate. This digital certificate then has to be bought from the CA along with other information submission like the URL for the system, and the information of the company that runs the system.

**2. JDBC API**

The version of JDBC currently implemented in this system is 1.2. This considered to be not updated compared to the release versions of JDBC 2.0 and above nowadays. Since the version of JDBC being used is only 1.2, the most recent and improved methods of current JDBC 2.0 and above could not be implemented in this system. For example, the usage of Java pointers such as beforeFirst() and afterLast() to point to some specified locations of a list cannot be implemented, which are proven to be more efficient and maintainable.

**3. Less Useful Reports**

Even the report is provided, but it can still be improved by providing more useful and meaningful reports for the management. Reports such as top 5 members, Transaction Summary are useful to the high level management in the organization to do evaluation, projection and analysis for future planning.

## 7.3 Problem faced

While developing the Web-Based Laundry Management System, there are several problems being face. Some are due to the tools' limitation and some are the result of lacking knowledge and experience. The following discussed some of these problems.

**1. Problem 1(Debugging JSP)**

JSP makes life easy when coding to create dynamic web pages, but very difficult to debug when encounter errors.

When running a JSP file, this file initially translated into a servlet source file by the JSP engine (Jakarta-Tomcat) and then compiled into a servlet class during run-time. So, whenever an error occurs, it is quite difficult to trace back the particular error. Any error messages returned from there is actually the error from the class file or the servlet source file that was created by the JSP engine.

**Solution:**

To solve this problem, an editor to write and edit JSP files has to be used. But there are not many supporting editors that exist commercially yet, because JSP is still new technology. Fortunately, an editing tool was found called the Allaire HomeSite 4 to reduce the burden of debugging a JSP file.

**2. Problem 2 (Set Up and Configuration)**

Set up the tools for the system (web server, Jakarta-Tomcat and the MySQL database) is critical for the operation of the application developed. However , the setup process take a long time because lack of experience.

**Solution:**

To solve this problem, surfing the Internet to get the relevant material is done and also asks for the some friends, which know to setup those tools.

## 7.4 Future Enhancements

Due to time constraint, some feature of the system is not including in the Web-Based Laundry Management System. So, there are still many places for future enhancement on the system.

**1. More administrative task**

Administrative task could be further enhanced to include more features to ease maintenance process. Among the features may be included are more useful report generation, database record deletion and insertion and database backup.

**2. Support More Email Services**

To benefit all the users and administrators, an email service can be integrated into the response and confirm via an automatic email reply.

**3. Include WAP module**

To make the system more effectively, the WAP function can be added for the purpose to send message to user when their order is done or their order status was changed or maybe can order by using WAP.

**4. Promotion module**

To make the services/business more attractive, a promotion function can be added to attract more users to use the system.

## 7.5 Conclusion

Web-Based Laundry Management System for Laundry business has been completed successfully, with some strengths as well as limitation as mentioned. Web-Based Laundry Management System has achieved and fulfilled the objectives and requirements, as stated in the proposal and system analysis.

However, there are still places for improvement in the system for the laundry business/market. Enhancements include the introduction of additional features in the Web-Based Laundry Management System for the future version.

Finally, this project has achieved its objective in giving the undergraduates an opportunity to undergo different challenges in different phases of the system development, which include research, system planning, system analysis, system design, system implementation and system testing.

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