

DWS

Daily/Weekly Scheduler For Staff

Perpustakaan SKTM

Prepared By
Cheah Li Wei
WET 000071

Under Supervision of
Ms. Azwina Mohd. Yusof

Moderate by
Assoc. Prof Madya Dr Lee Sai Peck

Faculty of Computer Science & Information Technology
University of Malaya
Session 2002/2003

Abstract

Daily/Weekly Scheduler for Staff (DWS) is a web-based system that will be implemented in intranet environment. It is developed using open source concept according to World Wide Web standard, which is cross-platform and database independent.

The objectives of DWS are to implement a computerized and efficient Scheduling System in a company. The system will help to manage the scheduler information more systematically and effectively. The information includes staffs' and supervisors' profile and staffs' scheduler.

DWS system is divided into four modules: Administrator Module, Supervisor Module, Staff Module and General Module. Basically, Administrator Module is about database admin. Besides, the administrators also assign staff and supervisor according to the department.

While is Supervisor module, supervisor can view staffs' scheduler by daily/weekly/monthly. Besides, supervisor can also writes comments against the scheduler. For the staff module, staffs' can write schedule(planning) in their work. This will make sure staffs' can finish their work within the scheduler time.

The features and benefits of this system are to manage staffs' works systematically, more efficient and secure in web-based system.

Acknowledgement

In the process of complementing the documentation for thesis paper (WXES 3181 and WXES 3182), many people have been very kind in lending helping hands, giving invaluable advices and encouragement that contributed to success it.

First of all, I would like to express my greatest acknowledgement to my supervisor, Ms. Azwina Yusof, for being so dedicated and patient in giving me advices and consultation at anytime and providing me with the detail of existing system in FSKTM. Her encouragement and kindness in helping me throughout the project is deeply appreciated.

I wish to express my gratitude to my moderator, Prof. Dr. Lee Sai Peck, for giving me invaluable suggestions and ideas to further enhance the value of DWS project. Thank you for her suggestions and ideas to improve the functionality of the current system.

I also would like to take this opportunity to thank the staffs from UM for providing me advices and some important information in developing DWS. Especially to those lecturers, who have provided me with useful knowledge, advices and suggestions.

Last but not least, not forgotten also to thank helpful seniors and friends.

Table of Content

Abstract	ii
Acknowledgement	iii
List of Tables	xii
List of Figures	xiii
Chapter 1 Introduction	1-8
1.1 Project Definition	1
1.2 Project Objective	1
1.3 Project Scope	2
1.4 Significance of Project	2
1.5 Expected Outcome	3
1.6 Project Limitation	4
1.7 Project Planning	5
1.8 Chapter Summary	7
Chapter 2 Literature Review	9-64
2.1 What is Literature Review?	9
2.2 Review of Existing System	9
2.2.1 Current System In Kean Hup Machinery	9
2.2.2 Current System in FSKTM	10
2.2.3 Current System in http://perdana.fsktm.um.edu.my/~tehyw	12
2.2.4 Current System in http://www.galactix.com	14
2.2.5 Critical Review of Current System	15

2.3	Project Background Study	16
2.3.1	What is Computer-Based Information System (CBIS)?	16
2.3.2	Web-based Application	17
2.3.3	Database Management System(DBMS)	18
2.4	Introduction Of Internet And Intranet	19
2.4.1	Internet	19
2.4.2	Intranet	21
2.5	Software Architecture	22
2.5.1	Client / Server Architecture	22
2.5.1.1	Two-tier Architecture	23
2.5.1.2	Three-tier Architecture	25
2.6	Operating System	28
2.6.1	Microsoft Windows NT Server 4.0	28
2.6.2	Microsoft Windows XP Professional	30
2.6.3	Microsoft Windows 2000 Server	31
2.6.4	Microsoft Windows 2000 Professional	33
2.7	Web Server	35
2.7.1	Apache Jakarta Tomcat 4.0	35
2.7.2	Netscape Enterprise Server (NES)	36
2.7.3	Microsoft Personal Web Server (PWS)	37
2.8	Database Consideration (relational databases)	38
2.8.1	MySQL Database	38
2.8.2	Microsoft Access	39
2.8.3	MS SQL Server 2000	41
2.8.4	Oracle	43

2.9	Web Browser	45
2.9.1	Internet Explorer 6.0	45
2.9.2	Netscape Navigator	46
2.10	Web Application Programming Technology (Server Side)	47
2.10.1	Hypertext Transfer Protocol(HTTP)	47
2.10.2	JavaServer Pages (JSP)	48
2.10.3	ActiveServer Pages (ASP)	50
2.10.4	Common Gateway Interface (CGI)	51
2.11	Web Application Programming Technique (Client-side)	54
2.11.1	Hypertext Markup Language (HTML)	54
2.11.2	VBScript	54
2.11.3	JavaScript	55
2.12	Web Application Development Tools	56
2.12.1	Microsoft FrontPage 2000	56
2.12.2	Notepad	58
2.13	Interface Design	60
2.14	Database Connectivity	62
2.14.1	Open Database Connectivity (ODBC)	62
2.14.2	Java Database Connectivity (JDBC)	63
2.15	Other Technology	64
2.15.1	Java Bean	64

Chapter 3	Methodology	65-78
3.1	Project Methodology	65
3.1.1	Research and Analysis	65
3.1.2	Historical Background of Waterfall	66
3.1.3	Waterfall Model With Prototyping	66
3.1.4	Strength of the Waterfall Model	70
3.1.5	V Model	71
3.2	Technology Consideration	73
3.2.1	Operating System Consideration	73
3.2.2	Database Consideration	73
3.2.3	Web browser	74
3.2.4	Web application Programming Language	74
3.2.5	HTML (Hypertext Markup Language)	75
3.2.6	JavaScript	76
3.2.7	Database Connectivity Consideration	76
3.2.8	Web Server Configuration	77
3.2.9	Methodology Configuration	77
Chapter 4	System Analysis	79-83
4.1	Requirement Analysis	79
4.1.1	Functional Requirements	79
4.1.2	Non-functional Requirement	81
4.2	Run-time Requirement	83
4.2.1	Server-side Requirement	83
4.2.2	Client-side Requirement	83

Chapter 5	System Design	84-97
5.0	System Design	84
5.1	Characteristic of Good Design	84
5.1.1	Component Independence	84
5.1.2	Exception Identification and Handling	85
5.1.3	Fault Prevention and Fault Tolerance	85
5.2	Architectural Design	86
5.2.1	Context Diagram	86
5.2.2	Structure Chart	87
5.3	Data Flow Diagram	88
5.4	Database Design	92
5.4.1	Logical Database Design	92
5.4.2	Physical Database Design	93
5.5	Entity Relational Diagram (ERD)	95
5.6	User Interface Design	96
Chapter 6	System Implementation	99-117
6.0	Introduction	99
6.1	System Development	99
6.1.1	Software Configuration	99
6.2	Create Database	100
6.3	Accessing Databases Programmatically	101
6.3.1	Accessing Database For Application System	101
6.3.2	Create Data Source Name (DSN)	102
6.3.3	Accessing Database For Website	104

6.4	Programming Language Used	106
6.4.1	HTML	106
6.4.2	JavaScript	107
6.4.3	SQL	109
6.4.4	JavaServer Pages (JSP)	109
6.4.4.1	JSP constructs	110
6.4.5	Servlets	113
6.4.6	Beans	114
6.4.7	Deploying A Web Application	116
Chapter 7	System Testing	118-131
7.0	Introduction	118
7.1	Testing Techniques	118
7.1.1	Ad Hoc Testing	118
7.1.2	White Box Testing	118
7.1.3	Black Box Testing	119
7.2	Testing Strategies	119
7.2.1	Unit Testing	119
7.2.1.1	Unit Testing For General Module	120
7.2.1.2	Unit Testing For Administrator Module	120
7.2.1.3	Unit Testing For Supervisor Module	123
7.2.1.4	Unit Testing For Staff Module	124
7.2.2	Integration Testing	125
7.2.2.1	Integration Test	126
7.2.3	System Testing	129

7.2.3.1	Function Testing	129
7.2.3.2	Security Testing	129
7.2.3.3	Performance Test	130
7.2.4	User Acceptance Test	130
7.3	Analysis Of Test Result	131
7.3.1	Achieving The Main Objective Of The Project	131
7.3.2	Enhancement on the user interfaces	131
Chapter 8	System Evaluation	132-137
8.0	Introduction	132
8.1	Problems Encountered And Recommended Solutions	132
8.1.1	Determine Scope Of The System	132
8.1.2	Time Constraint	132
8.1.3	Problems on Installation	132
8.1.4	Not Fully Supported by Different Browser	133
8.1.5	Not Prior Experience In The Chosen Programming Languages	133
8.2	System Strength	134
8.2.1	User Friendly	134
8.2.3	Reliable System With Effective Errors Handling	134
8.2.4	Auto Generated ID	134
8.2.5	Transparent	134
8.3	System Limitations	135
8.4	Future Enhancement	136
8.5	Project Conclusion	137

Appendix A - Interview Questions

Appendix B - User Acceptance Test (Questionnaire)

Appendix C - User Manual

Reference

Bibliography

List Of Tables

Table 2.1: comparison between ASP, JSP and CGI vs Perl	53
Table 3.1: comparison between ASP, JSP and CGI vs Perl	75
Table 5.1: Description of symbols in Data Flow Diagram	89
Table 5.2 : Datatype for personal_info	93
Table 5.3 : Datatype for comp_dept	94
Table 5.4 : Datatype for Admin_profile	94
Table 5.5 : Datatype for Supervisor_profile	94
Table 5.6 : Datatype for Staff_profile	95
Table 5.7 : Datatype for Staff_schedule	95
Table 6.1 : Summary of Software/ Software Tools Used	100
Table 7.1 : Unit Testing For General Module	120
Table 7.2 : Unit Testing For Administrator Module	123
Table 7.3 : Unit Testing For Supervisor Module	124
Table 7.4 : Unit Testing For Staff Module	125
Table 7.5 : Integration Test For Administrator Module	127
Table 7.6 : Integration Test For Supervisor Module	128
Table 7.7 : Integration Test For Staff Module	128
Table 7.8 : Test Cases For Session	130

List Of Figures

Figure 1.1 : Project Planning	6
Figure 2.1 : Current system in Mr. Teh homepage for submitting tutorial	12
Figure 2.2 : Current system in Mr. Teh homepage in reviewing results	13
Figure 2.3 : Current system in http://www.galactix.com/images/dayview.jpg	14
Figure 2.4 : Current system in http://www.galactix.com/images/synchronizeview.jpg	15
Figure 2.5 : Two-tier Architecture	23
Figure 2.6: Three-tier or Multi-tier Architecture	25
Figure 3.1 : Waterfall with Prototyping	67
Figure 3.2 : The V model	72
Figure 5.1: System Context Diagram	87
Figure 5.2 : Structure chart for DWS	88
Figure 5.3 : Diagram 0 for DWS	90
Figure 5.4 : Diagram 1 for administrator module	90
Figure 5.5 : Diagram 1 for Supervisor Module	91
Figure 5.6 : Diagram 1 for Staff Module	91
Figure 5.7 : Diagram 1 for General Module	91
Figure 5.8 : ER Diagram for DWS	96
Figure 5.9 : Sample Interface for Login page	97
Figure 5.10 : Sample interface for administrator module	97
Figure 6.1 : The Code Of Connection To Database	103
Figure 6.2 : The Code Of Accessing Database For Website	106
Figure 6.3 : Sample Code of JavaScript To Verify Data	107
Figure 6.4 : Sample Code Of JavaScript To Validate Date	108

Figure 6.5 : SQL statement for retrieving data from database	109
Figure 6.6 : SQL statement for updating data	109
Figure 6.7 : SQL statement for deleting data	109
Figure 6.8 : Chart of all JSP constructs	110
Figure 6.9 : Page Directive	111
Figure 6.10: Session in JSP	111
Figure 6.11: Checkbox controlling in JSP	112
Figure 6.12: Sample of servlet	114
Figure 6.13: Sample of beans	116
Figure 6.14: Part of web.xml	117

Chapter 1 : Introduction

1.1 Project Definition

As a student in FSKTM everyone need to complete a thesis in order to graduate. The title for this system is Daily/Weekly Scheduler for Staff. This system is very useful for a company to improve their working efficiency.

Many companies don't have a system to ask staff to write scheduler with computerize, problems of arranging the scheduler will be showed. This system will keep all the resources in the database with more systematically and efficiently. By having this system, we don't need to get the paper and fill up. Besides, supervisor and staff can do their work according to their time.

This project is the project that aims to solve all the problems mention above.

1.2 Project Objective

Daily/Weekly Scheduler is a complex task. The development of computerized Daily/Weekly Scheduler is to overcome all the constraint in staff schedule and help the company in achieving high quality of work. As a result, the Daily/Weekly Scheduler has the objective as follow:

1. Reducing the time
2. Friendly user interface to interact with the user.
3. Standard and easy enough for the user to be trained to handle the system in short period.

While the administrator module which is developed in this project paper is having the objectives as below:

1. Allow to generate the report/schedule every month.
2. The system should be user-friendly: easy to learn, easy to use and helpful.
3. The system produced should be feasible and of sufficient quality to be used.

1.3 Project Scope

This Daily/Weekly Scheduler is especially for a small company. This system is suitable for a company which has a few manager and about four or five staff under supervise by manager/supervisor. Administrator will key in all employees' data into database.

This system will only be used in a company, which means this system is an intranet system.

1.4 Significance of Project

Daily/Weekly Scheduler for Staff is developed to manage the scheduler information accuracy, efficiently, and systematically. This is essential because as supervisor or administrator they need to handle many works in a company. By implementing Daily/Weekly Scheduler for Staff, all the records can be stored easily, systematically and efficiently. The database management system will speed up the process of searching or retrieving information from the database.

The information is an important asset to any organization especially the privacy and secrecy information; the database or system must provide

with the security features to reduce any information threats. Therefore, this system will require login name and password before any user enter the system. As security concern Daily/Weekly Scheduler for Staff allows users to change the password from time to time. This can protect against unauthorized data disclosure and prevent unauthorized data modification.

As a conclusion, Daily/Weekly Scheduler for Staff is really an efficient and systematic system that is required in managing the scheduler information. Thus, this is why Daily/Weekly Scheduler for Staff is so important to be developed and implemented.

1.5 Expected outcome

This system is divided into four modules; there are administrator, supervisor, staff and general. Every user must login before getting to the main page, interface for each module will be different.

i) Administrator

Administrator can add new staff profile according to the position which administrator, supervisor or staff. (name, staff ID, department and supervisor's name).

ii) Supervisor

Supervisor can assign the staff who is under the same department. Supervisor can view staff scheduler and add comments against the schedule. Besides, supervisor can generate the schedule.

iii) Staff

Staff will key in schedule into this system. Before supervisor add or edit the comments, staff still can edit the schedule that had written.

iv) General

This module will include change password for all users. Beside, it contains the function of help for helping user to use this system.

1.6 Project Limitation

1. Not secure enough

All the information in Daily/Weekly Scheduler for Staff is not secures enough although login is required before users can entry the system. This because it is not being encrypted. The entire data or information are only stored in plain text format. Therefore, the secrecy or integrity threats still exist.

2. Not support multiple languages.

The current developing system is only limited to one language only. This is due to the time limitation. But it still can be enhance to support more languages to adapt to different environment will use different languages.

3. Not fully supported by different browser

Daily/Weekly Scheduler for Staff is being developed using the Internet Explorer 6.0. Therefore, this has make some of the features or function may not being support, look differently or performed well by using lower version of using Internet Explorer or using other browser.

1.7 Project Planning

Project planning and scheduling is concerned with identifying the activities, milestones and deliverables produced by a project. A plan schedule then be drawn up to guide the development towards the project goals “ Good management cannot guarantee project success. However, had management usually results in project failure.” (Sommerville, 1998)

ID	Task Name	Start	Finish	Jun 2002			Jul 2002				Aug 2002				Sep 2002				Oct 2002				Nov 2002				Dec 2002				Jan 2003									
				4/6	16/6	23/6	30/6	7/7	14/7	21/7	28/7	4/8	11/8	18/8	25/8	1/9	8/9	15/9	22/9	29/9	6/10	13/10	20/10	27/10	3/11	10/11	17/11	24/11	1/12	8/12	15/12	22/12	29/12	5/1	12/1	19/1	26/1			
1	Project Definition	11/06/2002	8/28/2002																																					
2	Literature Review	6/20/2002	7/25/2002																																					
3	System Study and Analysis	7/10/2002	8/6/2002																																					
4	System Design	7/25/2002	8/12/2002																																					
5	System Development	8/19/2002	12/6/2002																																					
6	Testing	10/10/2002	1/7/2003																																					
7	Documentation	8/27/2002	1/22/2003																																					

Figure 1.1 : Project Planning

1.8 Chapter Summary

This first phase of Daily/Weekly Scheduler System project documentation is divided into 5 parts.

Chapter 1 : introduction

This chapter includes all the aims and scopes of this project is being described and listed properly. It also explains about the problems in the current system, the significant of doing this project and what is the expected outcome of this project. The project schedule also is shown in Gantt Chart.

Chapter 2 : Literature Review

This chapter describes the process of gathering and research for relevant information. In this section includes what is literature review and type of literature reviewed. Information about databases and technology in client and server side technology such as programming language and tools that are needed to develop this system also will be discussed here.

Chapter 3 : Methodology and System Consideration

This part will clearly discuss the methodology. Besides, method of research also described here. All the tools software, operating system and strategy to tackle this project are analyzed and described in this chapter.

Chapter 2 : Literature Review

2.1 What is Literature Review?

The literature review is a critical look at the existing research that is significant to the work that is carrying out. Literature Review is an important process in system development. In this stage finding, summarize, analysis and synthesis of the system will be done. This is to ensure the understanding of the system that will be developed and to choose the best way to achieve objective of this system.

For the case of Daily/Weekly Scheduler for Staff have been carried out to understand the current workflow a managing resources. This includes researches various fields including Introduction of Intranet/Internet, Web Based Architecture, Client-server Computing, Database servers, generation of Web application, Server Side Language, Client Side Language and System Security.

2.2 Review of existing system

2.2.1 Current system in Kean Hup Machinery

During this literature review, I had interview Mr. Hung against the scheduler system in his company.

Scheduler system is still the same to schedule every project and manage the company's information well. Before computer developed in Malaysia, most companies used traditional system in scheduling, includes this company-Kean Hup Machinery which needed project scheduler to make sure every task are well done. Manual system manages the scheduler by writing

all project and works which should be done on the white board. The white board is placed in a corner of office.

Staffs' profile are recorded and filed. Company's staff can review existing file from the company. The information are kept arranged well. Even though scheduler system and management system using paper-based is more flexible in order to record data and well prepared if compared to the possibility of facing 'downtime', there are a few weakness using this system which are not standardized as this system is paper-based system and not well-prepared.

2.2.2 Current system in FSKTM

This existing system is FSKTM, which can be found at <http://www.fsktm.um.edu.my>. This website has divided into three columns; the first column contains a lot of sections such as introduction, departments, programmes, research, E-journal, Facilities and Faculty Members. Each section covers different part of information into its subsections, for example under the Mission, Objective and Logo. The middle column displays an overview about the FSKTM whereas the third column provides latest news to the visitors and also links to other different part of functions and areas of information.

The main page of the existing web site is information but densely packed with too many information. Even there is information redundancy happen where the Department section also display staff list, same as Faculty

member section. The interface of the main page is simple with some animation effect.

The drawback of this web site is lack of true interactivity and real time dynamic. Most of information provided is hard to maintain since it is hard coded. This is caused by the designation of this web site, which is no database for storing the data and therefore administrator need to update the information manually.

As my part is Daily/Weekly Scheduler for Staff which consist staff profile, administrator profile, supervisor profile and staff scheduler, so this survey will be emphasis in designation, structure and presentation of this section. Under faculty member section in the main page of current FSKTM web site, the section is divided into another 3 subsection, which are Academic Staff, Administrator Staff and Technical Staff. When the users click either one, it will access to same web page but to the different part of the web page. A list displaying staff name and email address is provided. Most of the staff in the list in not accessible at the time this survey is conducted. So it is not comprehensively provide information of all the FSKTM staff.

When the name of a staff is clicked, a personal page of that staff is displayed. The web page is simply and tidy. Some of staff information is not totally complete. Besides that, there is no linkage to go to back to previous page.

Moreover, there is no information about staffs' activities announcement in the main page of FSKTM web page.

Due to the designation of this web site that is hard coded rather than retrievable from the database, the information of this section is difficult to be update. Thus, it will effects the efficiency and informative of the sites.

2.2.3 Current system in <http://perdana.fsktm.um.edu.my/~tehyw>

This system is mainly for student in FSKTM submit the tutorial. This system will ask user to register, the way of registering is quite confusing. Besides, it did not show the correct to register. On the page to submit the tutorial, user needs to fill in the subject code, date and so on. As this system is form-based where there are no drop down list for user to choose, user may key in the wrong data. For example, in the column of subject code, the correct code is WMES3314 but may be user will fill in as E-Commerce.

Moreover, when user checked on the list of submitting tutorial, the system shows the duplicate data.

Overall, this system is quite useful where user can submit the tutorial anytime and save a lot of paper because it is not paper-based.

Teh - Microsoft Internet Explorer provided by FSKM Universiti Malaysia

File Edit View Favorites Tools Help

Address http://perdana.fskm.unim.my/~teh/

WELCOME TO Teh'S HOME PAGE

Research

Publication

Teaching

Contact

Main

Tutorial On-line Submission

Tutorial No. Subject Code Date of submission

Student Name 1 E-Mail address

Student Name 2 E-Mail address

Student Name 3 E-Mail address

Student Name 4 E-Mail address

Student Name 5 E-Mail address

Student Name 6 E-Mail address

Answers

<pre width = "90">

Done Start http://www.fskm.unim.my/ Documents - Microsoft W... Teh - Microsoft Intern... 12:25 PM

Figure 2.1: Current system in Mr. Teh homepage for submitting tutorial

Teh - Microsoft Internet Explorer provided by FSKM Universiti Malaysia

File Edit View Favorites Tools Help

Address http://perdana.fskm.unim.my/~teh/

WELCOME TO Teh'S HOME PAGE

Research

Publication

Teaching

Contact

Main

Search Results

| | | | | |
|----|-----------|------------|--------------------------|-------------------------|
| 7 | WMES 3314 | 12/8/2002 | Go Wee Leng | goweeleng@hotmail.com |
| 7 | WMES 3314 | 12/8/2002 | Go Wee Leng | goweeleng@hotmail.com |
| 7 | WMES 3314 | 14/8/2002 | Shalini Bhaskaran | sha12@tm.net.my |
| 7 | WMES3314 | 14/08/2002 | Carolina Yusof | cj_mel@yahoo.com |
| 7 | WMES3314 | 14/08/2002 | Carolina Yusof | cj_mel@yahoo.com |
| 7 | WMES3314 | 14/08/2002 | Wong Yaw Ming (WET00048) | johnwong30@yahoo.com |
| 7 | WMES3314 | 15/8/2002 | Amin Farita bt Mohd Wasi | pikaboo_16@hotmail.com |
| 8 | WMES3314 | 15/8/2002 | Shalini Bhaskaran | sha12@tm.net.my |
| 13 | WMES3317 | 14.08.2002 | Masina Singkul | masinasingkul@yahoo.com |

Done Start http://www.fskm.unim.my/ Documents - Microsoft W... Teh - Microsoft Intern... 12:26 PM

Figure 2.2 : Current system in Mr. Teh homepage in reviewing results

2.2.4 Current system in <http://www.galactix.com>

This system has divided into two main frames. The frames on the left hand side shows variety of sub modules: which are master module, tournaments, fields, leagues, official, contacts and sponsors.

While the frames on the right hand side shows the interface after user select on the sub modules. This system is quite complex and tidy. This system is too complicatedly. User may confuse against the function shows in this system.

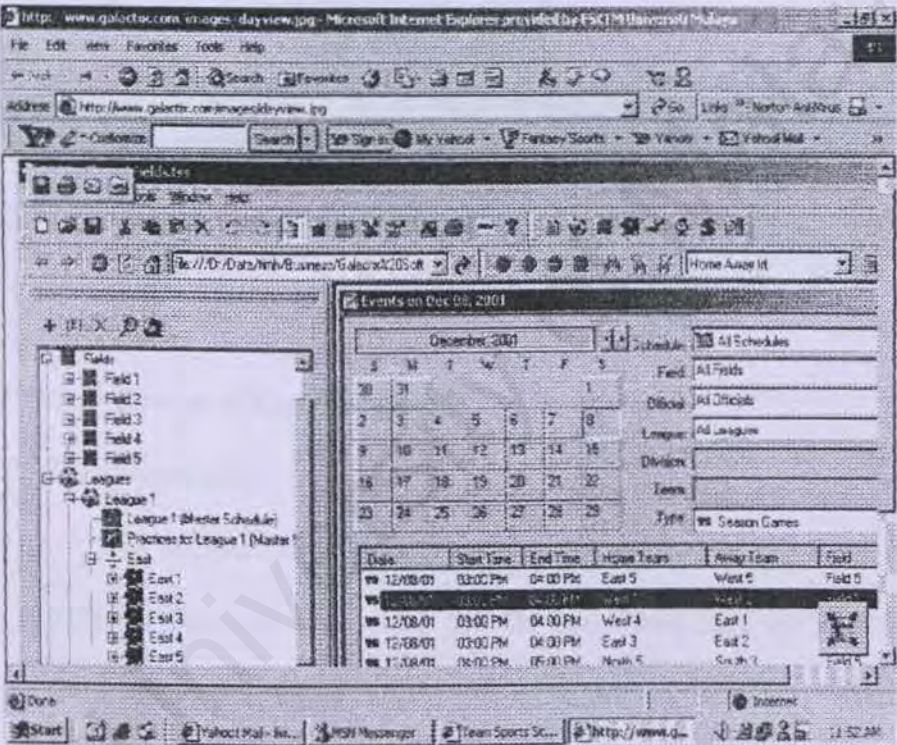


Figure 2.3 : Current system in <http://www.galactix.com/images/dayview.jpg>

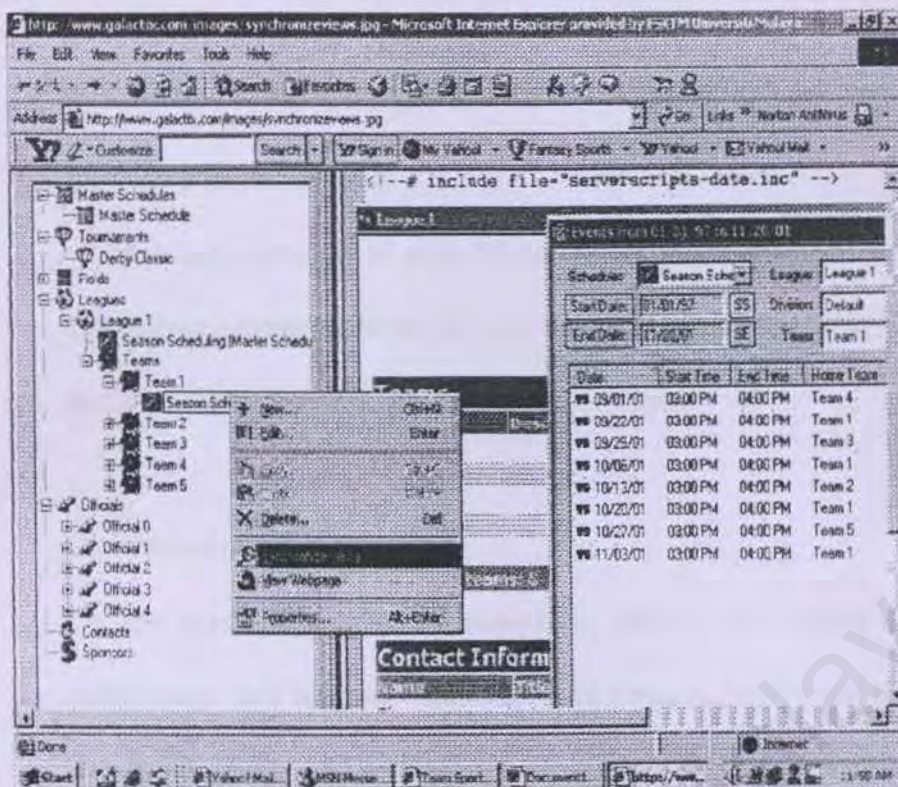


Figure 2.4 : Current system in <http://www.galactix.com/images/synchronizeview.jpg>

2.2.5 Critical Review of Current System

1. Data Duplication

The duplication of data happen when we stored the same data into different files. It will waste the file space and data integrity problem. Data integrity problem is cause by inconsistency of data. Where happen if one of the data in file is been modify but the other file that have same data are not be updated. Thus the differ data item will produce inconsistent result.

2. Cost for paper document

The large amount of cost is needed for generating many paper base documents especially forms in long term. Besides, they also need a free space or storeroom to keep all the files or forms.

3. Slow data retrieved process

The users have to go to cabinets to find out the related files for the information they wanted. This may take times in finding out the file from the stacks of files. Sometimes, the file might mix with other files or lost.

4. Not user friendly

The system is command line based system that means technicians have to remember all the command to operate the system.

5. Too complicated

The system has too much button and hyperlink. These makes user confused.

2.3 Project Background Study

2.3.1 What is Computer-Based Information System (CBIS)?

A CBIS is any information system that uses computer, computer systems and technology. A typical CBIS employs hardware, software, databases, people,

telecommunications and procedure to collect, manipulate, store and process data into information.

People

People are the most important element in CBIS. Information system personnel include all the people who manage, run, program and maintain the system. Users are staffs, supervisor/manager and administrator that use the system for their benefit.

Hardware

It consists of computer equipment used to perform input, processing and output activities.

Software

It consists of programs and instructions given to the computer and to the user.

Database

Database is an organized collection of facts and information such as facts and information's on employee, comments of first and second supervisor.

Telecommunications

It allows organizations to link computer stem together into effective networks.

Procedures

Procedures include the strategies, policies and methods and rule that human use to operate the Daily/Weekly Scheduler.

2.3.2 Web-based Application

It is computer programs that execute in a web browser environment. For examples is online store accessed via Netscape Navigator or Internet Explorer. Built on the foundations of the World Wide Web, such applications can run anywhere on the world at any time and are completely cross platform. Web applications provide a rich interactive environment through which the user can further define their unique online experience.

2.3.3 Database Management System(DBMS)

A DBMS is usually a very large software package that carries out many different tasks including the provision of facilities to enable the user to access and modify information in the database. The database is an intermediate link between the physical database, the computer and the operating system, and on the other hand, the users. To provide the various facilities to different types of users, a DBMS normally provides one or more specialized programming languages often called Database Languages. Different DBMS provide different database languages although a language called SQL has recently taken on the role of a de facto standard.

The advantages of DBMS are:

- Redundancies and inconsistencies can be reduced centralized. Combining all the data in a database would involve reduction in redundancy as well as inconsistency. It also is likely to reduce the costs for collection, storage and updating of data.
- Better service to the Users. Since the data can be shared and the DBMS makes it easy to respond

to unforeseen information requests, the ability to quickly obtain new and combined information is becoming increasingly.

- Cost of developing and maintaining systems is lower can be large, but the cost for maintaining application programs to be lower than for similar service using conventional systems.
- Standards can be enforced

Since all access to the database must be through the DBMS, standards are easier to enforce. Standards may relate to the naming of the data, the format of the data, the structure of the data etc.

- Security can be improved.

Since the data is now centralized. It is easier to control that who has access to what parts of the database and make it easier for determined person to breach security.

- Integrity can be improved

Because all data is stored only once, it is often easier to maintain integrity than in conventional systems.

2.4 Introduction Of Internet And Intranet

2.4.1 Internet

“Internet (noun)-A sprawling collection of computer networks that spans the globe, connecting government, military, educational and commercial institutions, as well as private citizen to a wide range of computer services, resources, and information. A set of network conventions and common tools are employed to give the appearance of a single large network,

even though the computers that are linked together use many different hardware and software platform” (Dr.Bob, 2/7/2002)

The internet, sometimes called “ the Bet is a world wide system of computer networks, that is, a network of networks in which users at any one computer can, if they have permission, get information from any other computers(and sometimes talk directly talk directly to users on the other computers)

Today the Internet is a public, co-operation, and self-sustaining facility accessible to hundreds of millions of people worldwide. Physically, the internet uses a portion of the total resources of the currently existing public telecommunication network. Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP(Transmission Control Protocol/ Internet Protocol. Two recent adoptions of Internet technology, the Intranet and the Extranet, also make use of the TCP/IP protocol.

The most widely used part of the internet is the world wide web(“WWW” or called “ the Web”). It is a distributed hypertext-based information system developed at CERN, is a globally interconnected network of hypermedia information based on

- The Internet
- A Uniform addressing scheme for locating resources over the Web (e.g. HTTP).
- Hypertext, for easy navigation among resources(e.g. HyperText Markup Language or HTML, a standard format for describing the structure of documents for transmission of hypermedia documents).

HTML documents are ASCII files with embedded codes for logical markup, format(text styles, document titles, paragraphs, tables) and hyperlinks.

- A set of servers that respond to requests from
- Browser(or clients)for those documents.

WWW also interfaces with other standard protocols(FTP, telnet, NNTP, WAIS, gopher) and their data formats. Using the web, million of pages of information can be accessed. Web “surf” is done with a web browser, the most popular of which are Netscape Navigator and Microsoft Internet Explorer.

2.4.2 Intranet

“Intranet(noun) - A contained collection of computers and networks within an organization(It may span the globe), connection the organization’s members and/or employees to a range of computer services, resources and information. A set of network conventions and common tools are employed to give the appearance of a single large network, even though the computers that are linked together use many different hardware and software platform. It’s more than a fancy name for the corporate LAN/WAN (Mr. Geoff, 2/7/2002)

An intranet is a private network that is contained within an enterprise. It may consist of many interlinks. The internet may also use leased lines in the wide are network(WAN). Typically, an Intranet includes connections

through one or more gateway computers to the outside Internet. The main purpose of an intranet is to share company information and computing resources among employees. An Intranet can also be used to facilitate working in groups and for teleconferencing.

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

2.5 Software architecture

The term client/server was first used in the 1980s in reference to personal computers(PCs)on a network. The actual client/server model started gaining acceptance in the late 1980s. The client/server software architecture is versatile, message-based and modular infrastructure that is intended to improved usability, flexibility, interoperability and scalability as compared to centralized mainframe, time sharing computing.

2.5.1 Client/server Architecture

The client/server architecture (sometimes call two-tiered architecture) emerged because of the limitations of file sharing architectures. This approach introduced and database server to replace the file server using a

relational database management system (DBMS), user queries could be answered directly.

A network architecture in which each computer or process on the network is either a client or a server. Servers are powerful computers or processes dedicated to managing disk drives(file servers), printers(print servers) or network traffic(network servers). Clients are PCs or workstation on which users run applications. Clients rely on servers for resources, such as files, devices, and even processing power.

The client/server architecture reduced network traffic by providing a query response rather than total file transfer. It improves multi-user updating through a GUI front end to a shared database. In client/server architecture, Remote Procedure Calls (RPCs) or standard query language(SQL) statements are typically used to communicate between the client and server (Schussel , 5/7/2002). They are two- and three-tiered architecture.

2.5.1.1 Two-Tier Architecture

The two-tiered architecture contains two computers – a clients, and server-with areas of logic combined on the client. The three components of an application-presentation, processing and data are divided among two software entities or tiers:

- Client application code(client)
- Database server(server)



Figure 2.5 : Two-tier Architecture

The user system interface is usually located in the user's desktop environment and the database management services are essential for a two-tier implementation. Presentation is handled exclusively by the client, processing is split between client and server, and data is stored on and accessed through the server. The PC client assumes the bulk of responsibility for application(functionality)logic with respect to the processing component, while the database engine-with its attendant integrity check is, query capabilities, and central repository functions-handles data intensive tasks. In a data access topology, a data engine would process request sent from the clients.

Advantages of Two-tier System

1. Work well in relatively homogeneous environments with fairly static business rules. They are less suitable for dispersed, heterogeneous environments with rapidly changing rules.
2. Application development speed is the most compelling advantage of a two-tier environment.
3. Most tools for two-tier are very robust and lend themselves well to iterative prototyping and rapid applications development (RAD) techniques, which can be used to ensure that the requirements of the users are accurately and completely met.

Disadvantages of a Two-tier System

1. It faces several potential version control and application redistribution problems because the bulk of application logic exists on the PC client. A change in business rules would require a change to the client logic in each application in a corporation's portfolio affected by the change.
2. System security in the two-tier environment can be complicated because a user may require a separate password for each SQL server accessed.
3. Client tools and the SQL middleware are also highly proprietary, and the PC tools market is extremely volatile.

2.5.1.2 Three-tier Architecture

Sometimes it also referred to as the multi-tier architecture. The components of three-tiered architecture are divided into three layers:

- Presentation layer
- Functionality layer
- Data layer

Each of these layers must be logically separate.

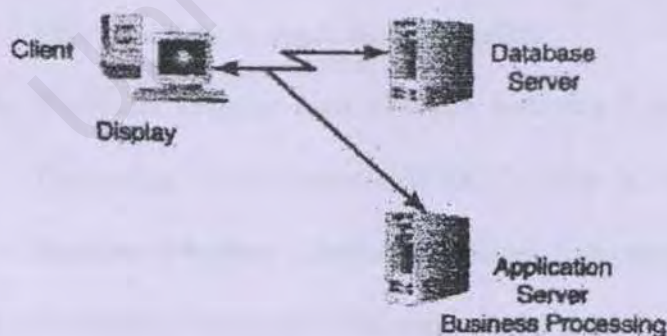


Figure 2.6 : Three-tier or Multi-tier Architecture

The three-tier architecture attempts to overcome some of the limitations of the two-tier scheme by separating presentation, processing, and data into separate distinct entities. A middle tier was added between the user system interface client environment and the database management server environment. This tier performs calculations or makes requests as a client to additional servers. The middle tier servers are typically coded in a highly portable, nonproprietary language such as C. Middle-tier functionality servers may be multithreaded and can be accessed applications.

Advantages Of A Three-tier Architecture

- Provides for more flexible resource allocation. Middle-tier functionality servers are highly portable and can be dynamically allocated, shifted as the needs of the organization change and network traffic may be reduced.
- The three-tier presentation client is not required; data can be organized hierarchically, relationally or in object format. Having separate software entities allow for the parallel development of individual tiers by application specialists.
- Three-tier systems such as Open Software Foundation's Distributed Computing Environment(OSF/DCE) offer a variety of additional features to support distributed application development.
- Modularly designed middle-tier code modules can be reused by several applications

Disadvantages of three-tier Architectures

- Three-tier brings with it an increased need for network traffic management, server load balancing and fault tolerance.
- Current tools are relatively immature and require more complex 3GLs for middle-tier server generation. Maintenance tools have underdeveloped facilities for maintaining server libraries a potential obstacle for simplifying maintenance and promoting code reuse throughout an IS organization.

2.6 Operating System

2.6.1 Microsoft Windows NT Server 4.0

Microsoft Windows was designed from the group up to be the most integrated, comprehensive and easy server operating system and to provide several premises such as scalability, reliability, and manageability necessary for mission-critical applications. And it provides total solutions in Intranet and Internet services and to mission-critical applications support and all these services are built into the operating system.

Besides, it has fault tolerant feature by supporting Redundant Array of Inexpensive Disks (RAID) technology that provides data protection. Furthermore, tight integration of Internet Information Server(IIS) with Windows NT Server 4.0 provides a fast and secure platform for HTTP, FTP, WWW and Gopher services. Windows NT Server also provides an outstanding platform for a wide range of services and applications and to be a superb, high-performance, high availability network operating system. It also includes features designed to make it easier to install, use and manage than ever before.

Windows NT Server 4.0 also includes a Web-based administration tool that makes the features of the NT administrative tool suite available through any web browser. For security, a web browser that supports either direct NT log-in (such as Internet Explorer) or one that supports secure socket layers(SSL) communications is used.

The advantages of Windows NT are:

- Interoperability

Windows NT Server interoperates with a broad range of server operating system including: NetWare, UNIX, Banyan, Microsoft LAN manager, Path works, SNA and Macintosh.

- Protocols

Windows NT Server includes support for protocols than any other network operating system.

- File sharing

Windows NT Server is the only network operating system that supports file sharing via NCP, X-Open SMB, and HTTP. Windows NT Server supports POSIX application interfaces, conforming to the open systems guidelines of the U.S government.

2.6.2 Microsoft Windows XP Professional

Microsoft Windows XP Professional is a powerful server operating system. Microsoft Windows XP Professional makes our computer significantly easier and faster to use than earlier versions of Windows. Windows XP Professional makes it easier to find information, files, and programs, and more quickly accomplish tasks, such as customizing computer settings, using, storing, and printing files and documents.

Windows XP Professional was designed to help users complete tasks more quickly and with greater success. These design improvements include:

- A redesigned Start Menu, offering a single source for launching applications, finding documents, and changing settings.
- Taskbar grouping organizes open windows, making it easier to work with many items at the same time.
- Less clutter and more meaningful notifications in the taskbar notification area.
- A new navigation pane that displays tasks and details, making it easier to work with files and folders.
- A new Icons view in Control Panel called Category view, making it easier to navigate to common settings and control panel tools.
- Integrated CD-burning features that make it easier to work with your CD-R/CD-RW recorder in very simple steps.

2.6.3 Microsoft Windows 2000 Server

Microsoft Windows 2000 Server operating system are the net generation in the Windows NT Server series of operating system. In addition to providing a comprehensive Internet and application platform, Windows 2000 Server builds on the strengths of Windows NT Server 4.0 by delivering increased reliability, availability and scalability with end-to-end management features that reduce operating costs.

The most critical new features and enhancements offer by Windows 2000 Server are those that relate to Internet capabilities. The Windows 2000 Server operating system builds on the solid Internet technologies delivered in Windows NT Server 4.0 to provide an agile, powerful Internet platform.

The advantages for Windows 2000 Server is the ideal platform for building and running rich web-based applications and services:

- Scalability and flexibility

Host lots of web sites and more terminal services users while getting better use of bandwidth and high performance even on the fastest networks.

- Security

With flexible authentication and authorization options, strong encryption services and flexible and secure network access, rest assured that only the right people have access.

- More system uptime and less unplanned downtime

Reboot up to 90% less often! Increased server and network availability. It is resilient to application failures and allocates resources to preserve availability Easy to deploy, configure and use.

- Centralized management

A lower cost of ownership to play well with existing infrastructure:

Other operating system, servers, mainframes, applications, directories, network devices and peripherals supports the newest networking devices and technologies.

Windows 2000 Server supports upgrades of NT 4.0 Server meaning all applications and settings will be saved. In the other work it replaces NT 4.0 Server and having mostly probably all the features of it.

Provides safe guards to assure that device drivers have not been tampered with and reducing the risk of installing non-certified drivers.

- Full 32-bit operating system

Minimizes the chance of application failures and unplanned reboots.

- Microsoft Installer

Works with the Windows Installer Service, helping users install, configure, track, upgrade, and remove software programs correctly, minimizing the risk of use error and possible loss of productivity.

- Windows Logo Program

Provides assurance that applications have met a comprehensive set of standards developed by Microsoft in cooperation with customers and third-party developers.

- Dramatically Reduced Reboot Scenarios

Eliminates most scenarios that forced you to reboot in Windows NT 4.0 and Windows 9x. Many software installations also will not require reboots.

2.7 Web Server

2.7.1 Apache Jakarta Tomcat 4.0

Apache is UNIX web server and available free of charge. It also can run in Windows NT. Apache can obtain from the Internet and all the core and module source code can be get and modified to suit developers' needs. Hosting multiple IP addresses on an Apache server is done with little configuration. There are many good features in Apache. Apache supports:

- Dynamic Shared object(DSO)support Apache modules may now be loaded at runtime; this means that modules can be loaded into the server process space only when necessary, thus overall memory usage by Apache will be significantly reduced.

- Support for Windows NT/95

Apache supports the Windows 95, 98, Me, Windows NT , Windows 2000 Operating Systems and Windows XP Professional.

- Support for NetWare 5.x

Apache now experimentally supports the NetWare 5.x operating systems.

- Re-organized Sources

The sources files for Apache have been re-organized. The main difference for Apache users is that the "Module" lines in configuration have been replaced with "Add Module" with a slightly different syntax.

For module authors there are some changes designed to make it easier for users to add their module.

- Reliable Piped Logs

2.7.2 Netscape Enterprise Server(NES)

Netscape Web Server produces it. It supports Oracle, Informix, java, LDAP and use to convert .pdf file to TOML. NES can run either in UNIX or Windows NOT server. It has a direct link to a DBMS and automatic directory tree.

This server allows users to serve several different Web sites using the same server on the same machine. It uses the Standard NCSA log format and has built-in image maps(NCSA) and supports the Windows CGI interface.

This web server has full-text search features, such as automatic index updates, allowing immediate search access to newly changed data, and searched by content or by document attributes, such as author, title and modification date.

Besides, Enterprise server also supports stored procedures multiple database connection and persistent transactions. This commercial server is one of the most expensive available today.

2.7.3 Microsoft Personal Web Server (PWS)

Microsoft's Personal Web Server (PWS) is a scaled-down version of the commercial Information Internet Server (IIS) included with the Server edition of Microsoft Windows NT and Windows 2000. It does include support for ASP, script debugging, and many other important features found in IIS. PWS is a great entry-level Web server that makes it easy to publish personal home pages, serve small Web sites, and share documents via a local intranet.

2.8 Database Consideration(relational databases)

A database is like a file cabinet that can stores information. A database is a set of information related specific application.

Relational database management system is a type of database management system is a type of database management system(DBMS) that stores data in the form of related tables. Relational databases are powerful because they require few assumptions about how data is related or how it will be extracted from the database. As a result, the same database can be viewed in many different ways.

An important feature of relational systems is that a single database can be spread across several tables. This differs from flat-file databases, in which each database is self-contained in a single table. Almost all full-scale database systems are RDBMS's. Small database systems, however, use other designs that provide less flexibility in posing queries.

2.8.1 MySQL Database

MySQL is also called as My Ess Que Ell. It is the most popular Open Source SQL Database. It is provided by MySQL AB. MySQL AB is a commercial company that builds its business providing services around the MySQL database.

MySQL is a database management system(DBMS) can be vast amounts of information in a corporate network. The DBMS such as MySQL is needed to add, access, and process data stored in a computer database. It is

Relational Database Management System(RDBMS) that can stores data in separate tables rather than putting all the data in one big store room. This increases speed and flexibility. It is Open Source software that there is possible for anyone to use, modify and download from the internet and use it without paying anything. (WJ Gilmore, 10/7/2002)

The advantages of MySQL are:

- Very fast, reliable, and easy to use

MySQL was originally developed to handle very large databases much faster than existing solutions and has been successfully used in highly demanding production environments for several years.

- Client/Server system

It consists of a multi-thread SQL server that supports different backend, several different backend, several different client programs and libraries, administrative tools and several programming interfaces.

- Has a lot of contributed software available

User will find that many favorite or famous application of language already supports MySQL.

2.8.2 Microsoft Access

The Microsoft access is one of the easiest ways to create a database.

Access provides two different modes. The first is an easy to use menu driven interface that let user issue commends without an in depth understanding of Access. Program mode lets the user to stored instruction in a file such as Visual Basic file and executes them with one command.

Access allow user to indicate how tables should be related to each other. A table that has referential integrity allows only one parent record for each record. User can add, delete, and rearrange fields in the table structure. User can also control how the data will be entered in a table using the properties sheet of a field. (Sellapan, P., 1999)

The advantages and many disadvantages of Access are Access is a desktop database package. It is not design to compete with system such as Oracle or SQL server – full database servers whose engines are superior in terms for speed and multi-user capabilities. It does not provide a good performance when run across the network and more than a handful person using it at once. But it performance capability is good with limited multi-user capabilities. In addition, it can and does make a good front-end package larger engine such as Oracle and SQL server. Access integrated will data transfer between Access and the other office components that is relatively easy.

2.8.3 MS SQL Server 2000

SQL Server 2000 opens the door to the rapid development of a new generation of enterprise-class business applications that can give company a critical competitive advantage. SQL Server 2000 provides agility to data management and analysis, allowing organization to adapt quickly and gracefully to derive competitive advantage in a fast-changing environment.

SQL Server 2000 is the record-holder of important benchmark awards for scalability and speed, SQL Server 2000 is a fully web-enabled database product, providing core support for Extensible Markup Language(XML) and the ability to query across the Internet and beyond the firewall.

The advantages of SQL Server 2000 are:

i) Fully Web-Enabled

SQL Server 2000 provides extensive database programming capabilities built on web standards. Rich XML and Internet standard support provide the ability to store and retrieve data in XML format easily with built-in stored procedures. Besides user can also use XML update programs to insert, update and delete data easily.

- **Easy access to data through the web.** With SQL Server 2000, HTTP can be used to send queries to the database, perform full-text search on documents stored in database and run queries over the web with natural language.

- **Powerful, flexible web-based analysis.** SQL Server 2000 Analysis services capabilities are extended to the Internet. User can access and manipulate cube data by means of a web browser.

ii) **Highly Scalability and Reliable**

With scale up and scale out capabilities, SQL Server meets the needs of demanding e-commerce and enterprise applications.

- **Scale up.** SQL Server 2000 takes advantage of symmetrical multiprocessor(SMP) systems. SQL Server Enterprise Edition can use up to 32 processors and 64 GB of RAM.
- **Scale out.** Scale out distributes the database and data load across servers.
- **Availability.** SQL Server 2000 achieves maximum availability through enhanced fail over clustering, log shipping, and new backup strategies.

iii) **Fastest Time-to-Market**

SQL Server 2000 is the data management and analysis backbone of the Microsoft.Net Enterprise Servers. SQL Server 2000 includes tools to speed development from concept to final delivery.

- **Integrated and extensible analysis services.** With SQL Server 2000, you can build end-to-end analysis solutions with integrated tools to create value from

data. Additionally, you can automatically drive business processes based on analysis results and flexibly retrieve custom result sets from the most complex calculations.

- **Quick development, debugging and data transformation.** SQL Server 2000 features the ability to interactively tune and debug queries, quickly move and transform data from any source, and define and use functions as if they were built in to Transact-SQL.
- **Simplified management and tuning.** With SQL Server 2000, it is easy to manage databases centrally alongside all enterprise resources. Stay online while easily moving and copying databases across computers or between instances.

MS SQL Server is outperformed than MS Access and Informix SQL. This is because it includes a superset the ANSI standard SQL language elements that couldn't be find in MS Access and Informix.

2.8.4 Oracle

Oracle is the most popular database management system or rather relational database management system. A few advantages of Oracle's architecture are:

- **Large Databases** – oracle supports the largest of databases, potentially terabytes in size.

- **Many Concurrent Users** – oracle supports large number of concurrent users executing variety of database applications operating on same data. It minimizes data contention and guarantees data concurrency.
- **High Transaction Rates** - Database user does not suffer from slow processing performance
- **High Availability** – At some sites such as most production site, Oracle works 24 hours per day with no down time.
- **Controlled Availability** – An administrator can disallow use of a specific application so that the application's data can be reloaded, without affecting other applications.
- **Industry Standards** – Adheres to industry accepted standards for data access language, operating system, user interfaces, and network communication protocols.
- **Manageable Security** – Provides fail-safe security features to limit and monitor data access.
- **Database Integrity** – Enforces data integrity. "Business rules" that dictate the standards for accepting data.
- **Distributed Systems** – Combines the data physically located on different computers into one logical database that can be accessed by all network users.
- **Portability** – Ported to work under different operating system with little or no modifications.

- **Connectability** – allows different types of computers and operating system to share information across networks
- **No delay in read and writes** – Readers of the database data do not wait for readers of the same data. This means two users can read and write the same set of data, without waiting on each other but only wait for if they attempt to update identical works in concurrent transactions.

2.9 Web browser

There are a large number of browsers available to the general public, some are free and some are not. Most, however, can be downloaded for free from dozens of sites on the web. The most common browsers used by the general public are Netscape Navigator and Internet Explorer.

The similarities are both of them are flexible toolbars, has complete history list and management. Furthermore they have control over security, HTML – aware e-mail clients, web page editors, supports Dynamic HTML (DHTML), automatic URL completion and software updates. Besides they also support the Cascading Style Sheets (CSS) specification and the latest Java standard from Sun.

The following are the comparison between Internet Explorer 6.0 and Netscape Navigator/Communicator.

2.9.1 Internet Explorer 6.0

- Completely integrated into desktop.
- Desktop wallpaper has turned into “active desktop that can host miniature web pages.

- Internet related tasks are meshed into the start menu and Microsoft applications.
- HTML authoring is done via separate software package(FrontPage) no necessary to buy and learn another interface.
- Ability to choose which e-mail and news editor/reader to use.
- Preferences are plenty, but not as customizable as Navigator.
- Only supports a handful of platforms(Windows 95 and NT, Macintosh and UNIX)
- Uninstall feature is extremely difficult for the novice user to find and use adequately.
- Relatively Stable (many reports scattered throughout the Internet say that it has caused hard drive failures)

2.9.2 Netscape Navigator

- Transformed from a simple viewing tool to the client side of an enterprise-wide, cross-platform architecture for exchanging information both within a company and outside.
- Communicator Pro includes a group-calendar application.
- Java Based terminal emulator
- HTML authoring is done via an integrated tool in Communicator(composer) so no need to buy and learn another interface.
- Default e-mail and news editor is Messenger and cannot be changed.

- Preferences for customization are much more advanced from choosing font size and type to cache size.
- Support for over 15 platforms
- Uninstall feature is simple and thorough
- Very stable

They are both very good browser. Their major differences are Explorer has many compatibility issues with Java, JavaScript and HTML, while Navigator tries to stay current with the industry standards in most cases.

2.10 Web Application Programming Technology(Server Side)

2.10.1 HyperText Transfer Protocol(HTTP)

HTTP is a set of rules for exchanging files(text, graphics images, sound, video an other multimedia files) on the WWW. Relative to TCP/IP protocols that are basis for information exchange on the Internet, HTTP is an application protocol.

According to the HTTP 1.0 specification, the HyperText Transfer Protocol(HTTP) is an application-level protocol with the lightness and speed necessary for distributed, collaborative, hypermedia information systems. It is a generic, stateless, object-oriented protocol, which can be used for many tasks, such as name servers and distributed object management systems, through extension of its requests methods(commands). A feature of HTTP is the typing and negotiation of data representation, allowing systems to be built independently of the data being transferred.

Web browser is an HTTP client sending requests to server machines. When the browser user enters the files requests by either "opening" a web file

typing in URL or click on hypertext links, the browser build the HTTP request and send it to the Internet Protocol address indicated by the URL. The HTTP daemon in the destination server machines receives the request and after processing, the requested file is returned.

2.10.2 JavaServer Pages(JSP)

JavaServer Pages is a web-scripting technology that means for creating dynamic web-based content using server-side(middle-tier) processing. JSP simplifies the process of creating these dynamic pages by separating the application logic from the page design and encapsulating logic in portable, reusable Java components. Besides it also simplifies the task of building web applications that work with a wide variety of web servers, application servers, browsers and development tools.

JSP technology has evolved from the powerful servlet technology(servlets are Java technology-based, server-side applications)(Hall Marty, 2000). JSP extends the servlet technology in many ways, making it easier and faster to build, deploy, and maintain server-side applications that communicate with web-based clients.

JSP technology builds on the strength of the Java family and the multivendor Java community, extending the core capabilities of the Java platform to create powerful, flexible, and easy-to-maintain dynamic web pages. JSP technology inherits all of the benefits of the Java language, including platform- and server-independence, a modular and reusable component architecture, and across to the rich family of a Java

APIs(including JDBC, JavaMail and Java Transaction service).(Damon *et al*, 2001)

JSP technology can meet the needs for up-to-date, high-performance, and reliable web-based applications, while addressing the overall organizational or developer's needs for long-term architectural decisions:

Vendor independence

As part of the Java technology family, JSP enable rapid development of web-based applications that are platform-independent. It built with the input and support of the major vendors in the market that does not lock companies into any one vendor's solutions.

- Portability

JSP technology is portable across platforms and servers alike, building on the Write Once, Run Anywhere philosophy of the Java language. Users can access Java technology-based components (beans, customized JSP tags) that are also reusable and portable across platforms.

- Flexibility

The multi tier architecture using JSP technology is inherently flexible and adaptable. Developers can change data sources, access external data, and implement new security or authorization methodology -all without affecting "customer-facing" applications.

- Low cost of ownership

JSP technology lets page authors handle the ongoing maintenance of dynamic pages without requiring developers to be involved in changes that do not involve application logic.

- Scalability

JSP pages are compiled one when first invoked and remain in memory; this provides better scalability for high-volume sites than the others approach.

Therefore JSP is a better technology provides an easy way to create dynamic web pages and simplify the task of building web applications that work with a wide variety of web servers, application servers, browsers and development tools.(Karl A, 2000)

2.10.3 ActiveServer Pages (ASP)

Active Server Pages is a Microsoft-developed technology for generating dynamic Web content – which includes HTML, Dynamic HTML, ActiveX controls, client-side scripts and Java applets(i.e.,client-side java programs that are embedded in a Web page)

Active Server Pages(ASP) demonstrate between clients and servers via the HTTP protocol of the World Wide Web. When a client sends an HTTP request to the server, the server receives the request and directs it to be processed by the appropriate Active Server Page. The ASP does its processing(which often includes interacting with a database), then returns its result to the client – normally in the form of a HTML document to display in a browser, but other data formats, such as images and binary data, can be return.(Deitel *et al*, 1999)

ASP can use to create and run dynamic, interactive, high performance web server applications. ASP is server-generated page that can call other programs to do things like access databases, serve different pages to different browsers-basically, anything we used to do with CGI. ASP is almost as efficient as writing code directly to the server's application program interface, and it's a lot more efficient than CGI because it runs as a service and can take advantage of multithreaded architectures.

ASP is an open, compile free application environment in which can combine HTML, scripts and reusable ActiveX server components to create dynamic and powerful web-based business solutions. ASP enables server-side scripting for IIS with native support for both VBScript and Jscript.

However, ASP is not a cure for cancer. ASP was introduced so that all the Visual Basic programmers in the world would feel needed again, now that the web had shoved Unix geeks back into the limelight(they tried and failed with VBScript, which pretty much died for a whole host of reasons)

Nowadays, ASP pages can be created using whatever language you want, but VBScript is still the most common choice. ASP can also take advantage of COM and DCOM (Component Object Model and Distributed Component Object Model) objects with minimum effort.

2.10.4 Common Gateway Interface(CGI)

The Common Gateway Interface(CGI) is a mechanism for creating scripts on the server, which can then be used to create dynamic applications. It has been around for quite a bit longer than ASP, and right now the majority

of dynamically created pages on the web are created using CGI and a scripting language.

It is incorrect to assume that CGI does the same job as ASP. Rather, CGI allows the user to invoke another program (such as Perl Script) on the web server to create the dynamic web page, and the role of CGI is to pass the user-supplied data to this program for processing. However, it does provide the same end-results-a dynamic web applications.

However, CGI has some shortcomings. The major one is that it adds extra level to the browser-server model of interaction: namely, it is necessary to run a CGI program to create the dynamic page, before the page is processed on the server. Also, the format in which CGI receives and transmits data means that this data is not easily manipulated by many programming language so a programming language that has good facilities for manipulating text and communicating with other software have to be used. Besides, CGI programs take more time to write and debug; thus frequent 'down' time for the web sites. CGI also uses a greater amount of server resources degrading performance of servers and sites.

The most able programming languages that can work on any operating system for doing this are C, C++ and Perl. While these languages can adequately do the job, they are some of the more complex languages to learn. Visual Basic does not offer sufficiently adequate text-handily facilities, and is therefore rarely used in CGI.

The following are the comparison between ASP, JSP and CGI vs Perl

| Features | ASP | JSP | CGI vs Perl |
|---|----------------------|---|---|
| Duration since first introduce | 4 -5 years | Fairly new, 2-3 years | has been around far longer than ASP and JSP. |
| Web server | Microsoft IIS or PWS | Any web server (Apache, Netscape, IIS) | Any web server (Apache, Netscape, IIS) |
| Platform | Microsoft Windows | Most popular platforms, including the Solaris Operating environment, Microsoft Windows, Mac, Linux, other UNIX platform implementation. | Most popular platforms windows NT included. |
| Database Connectivity | via ODBC | via ODBC and JDBC | via DBI libraries
Perl is able to make connection to most database server. |
| Portable across platforms/servers | No | Yes | No |
| Reusable, modular code | No | Yes | No |
| Scripting language | VBScript, Jscript | Java | C, Perl |
| Memory leak protection | No | Yes | Yes |
| Supports concurrent access without separate processes | Yes | Yes | No |

Table 2.1 : comparison between ASP, JSP and CGI vs Perl

2.11 Web Application Programming Technique(Client-side)

2.11.1 Hypertext Markup Language(HTML)

It is the fundamental building stuff of the web. It is the lingua franca for publishing hypertext on the World Wide Web. HTML is the set of “mark up” symbols or codes inserted in a file intended for display on a World Wide Web browser. The markup tells the Web browser how to display a web page’s words and images for the user. The individual markup codes are referred to as elements (but many people also refer to them as tag).

HTML is a standard recommended by the World Wide Web Consortium (W3C) and adhered to by the major browsers, such as Microsoft’s Internet Explorer and Netscape’s Navigator, which also provide some additional non-standard codes. However, both Internet Explorer and Netscape implement some features differently and provide non-standard extensions.

Web developers using the more advanced features of current version of HTML may have to design pages for both browsers and send out the appropriate version to a user. Significant features in HTML are sometimes described in general as dynamic HTML.

2.11.2 VBScript

VBScript is the newest member of the Visual Basic family (a slimmed-down version) of programming languages that brings active scripting to a wide variety of environments, including web client scripting in Microsoft Internet Explorer and we server scripting in Microsoft Internet Information Server(ASP Roadmap, 12/7/2002). The syntax is very much the

same with Visual Basic. Visual Basic Scripting Edition (VBScript) was introduced by Microsoft to allow web page developers to leverage their existing Visual Basic skills then creating client-side script. It inherits its syntax and structure from Visual Basic programming language.

VBScript is an alternative to JavaScript in the client-side scripting language. However only Microsoft Internet Explorer supports this language. Netscape Navigator users require a Netscape Plug.in called ScriptActive, developed by third party developer Ncompass in order to enable VBScript. VBScript provides the ability similar to Java Script. It can be used to validate form data, displaying status bar messages, working with cookies and ActiveX control.

2.11.3 JavaScript

JavaScript was the first general purpose, "dynamic" client-side scripting language for browsers. Netscape first delivered JavaScript in 1995 but called it LiveScript.

Netscape quickly renamed LiveScript to JavaScript, thereby confusing many people who had just started to hear about Java. The confusion was somewhat lessened by Sun, the developer of Java, when it issued a joint press release with Netscape that same year. The press release proclaimed Java and JavaScript to be complementary but very different technologies.

JavaScript provides a scripting language for creating user interface controls. In effect, JavaScript inserts code logic into the browser. It supports

such effects as validation of user input and image swapping as the mouse cursor rolls over a spot on a web page.

JavaScript is a scripting language that allows the application run over the internet. JavaScript is used in order to support a wider range of type of web browsers. It allows cross-platform scripting of events, objects, and options.

2.12 Web Application Development Tools

2.12.1 Microsoft FrontPage 2000

Microsoft FrontPage 2000 is a Microsoft's tool for creating and designing web pages. It allows users to create web pages without actually having to program and in the same way the user would create documents in word or spreadsheets in Excel. It is an HTML editor aimed at letting non-programmers build the pages for a web site.

FrontPage 2000 offers:

- **Flexibility and control.** FrontPage 2000 offers features that are designed to help in creating web pages such as pixel-precise positioning and layering, custom themes, DHTML animation and many more.
- **HTML Editing.** FrontPage 2000 makes it easier to work with HTML by introducing HTML preservation, insert code in HTML view and see HTML tags in WYSIWYG view.
- **Database Integration.** Allow us to put data in web pages using Microsoft Office 2000 and FrontPage 2000 features.

- Web-technology Support. FrontPage 2000 supports the latest web technology such as editing HTML, DHTML, script, ASP and XML.
- Extensibility and Programming. For example, Microsoft Visual Basic can be used to build powerful FrontPage-based solutions, and extend them across Microsoft Office applications.

The benefit of Microsoft FrontPage 2000 can be concluded as the following : -

- FrontPage 2000 gives users everything they need to create exactly the site they want.
- They can use Dynamic HTML to animate, use Cascading Style Sheets 2.0 to wrap or layer text and images, and get just the colors they want with enhanced color tools.
- FrontPage 2000 makes site management easy. FrontPage automatically fixes hyperlinks when files are renamed or moved, and its new management reports summarize the status of a site at a glance.
- FrontPage 2000 makes creating a web site easier than ever. FrontPage shares toolbars, menus, themes, background spell checking, and Format Painter with Microsoft Office.
- FrontPage 2000 also makes adding forms and databases into sites easier than ever.
- FrontPage 2000 web developers ease and power. FrontPage won't reformat imported HTML code, and users can even

specify how they want new code formatted. Users can quickly author in HTML view by using buttons and menu items.

- FrontPage 2000 allows to work together easier than ever. Microsoft Office users can save documents directly to FrontPage-based Webs, and FrontPage provides check-in/check-out and workflow reports to help teams collaborate on web content.
- FrontPage 2000 is easy to own and maintain. FrontPage 2000 uses the same installer as Microsoft Office, which provides installation on demand, run from server and the ability to self-repair. FrontPage 2000 is also available in 15 language.

2.12.2 Notepad

Notepad is a time-honored text editor. It is so simple and does not generate any extra code that it is still a very popular choice among developers no matter how much Microsoft promote Visual Interdev.

Notepad has one of the simplest user interfaces of any internet web authoring tools. Other web tools have overly complex interfaces that hamper the uses of the software. The menus are logically laid out, conforming to all standards in design, so anyone can understand them before ever uses it. The four menus of Notepad provide us with more than all versions of windows, so moving over to the latest version of Windows should not hamper the HTML code creation. The editing window of Notepad is designed to provide users with the maximum view of the HTML of JavaScript code, consisting of just two simple to use scroll bars and a menu line. Notepad also has the facility to

wrap HTML text over the next line, making it easy to read and edit. This wrapping facility is available through the easy to use menus built right in to the application. The Notepad web-authoring tool is compatible with every single standard of Internet presentation medium yet devised. As a bonus, Notepad is also compatible with all future developments in HTML and any other web based presentation medium. This functionality is included as standard, and at no extra cost.

Notepad was designed to have a very small application footprint, taking up as little space as possible in computers' memory and a minimum of disk space. Unlike other web authoring tools and HTML editors, large chunks of memory and system resources are consumed, and sometimes not even returned when closing the applications down. Notepad can be run in the background, no matter how little memory available. Notepad gives a clear, easy to read and full HTML. JavaScript is also fully available through Notepad, without the need of complex tools.

The pros and cons of using Notepad can be simplified as below:

Pros

- Notepad is an excellent tool for creating any text document, including HTML files, Pen files, and normal text files.
- Users have complete control over layout and the HTML code that goes into the documents they are working with.

Cons

- One has to be experienced in the field in which he or she is creating a document for. If not, Notepad is not recommended to be used as a development tool.
- Notepad, unlike other types of HTML editor does not include HTML tags or syntax help so users need to know what they are doing in order to make a pleasing site.

2.13 Interface Design

Background

White background goes best with all text or graphic colors and is considered the best choice for a background color. Users need not strain their eyes. Besides, developers need not spend additional time to match the right font and graphic with the background (Karp, 1999)

For the dark background, among the considerations is what font colors matches the background and the period user can stay at the page until their eyes feel tired and strained.

Page size

Good web page design emphasizes speed as well as appearance (taken from KT consultants). The main concern in designing a web page is its speed to load because most users are impatient to wait for a web page to load. The only way to decrease loading time is to keep the page size to a minimal.

(Olsen, 1999) advises web page designers to keep page size under 50kb and not above 100kb. However, the max file size of a web page should be kept as 40kb. The reason is that the people will go elsewhere if a page takes longer than 20 seconds to load.

The good use of bandwidth is what web page design is all about getting the most information into the smallest possible size. According to (Karp, 1999), a loading time less than 15 seconds is a goal worth aiming for because web surfers have short attention spans.

Colors

Colors are wrongly perceived as the main attraction of the main focal point of a site, Karp(1999) noted that colors should be used to convey information or to draw attention of where it is really needed. Good color combination gives a good impression to users and projects a sense of considerations on users' eyes.

Text

Text on a web page must be easy to read because the viewing area of the web browser is much smaller than a normal printed page. Today, most of the web sites users Arial or Helvetica Verdana as main font in site because of their neatness and clarity. Web site developers are advised not to use long

paragraph of text as well as keeping paragraphs to four sentences or less because it is hard to read on a computer screen (Karp,1999)

Width of Browser's Window

From most of the articles, it is advisable to set the width of the browser's window to 640 x 480 pixels. Karp(1999) stated that the practical width of computer screens varies from about 640 pixels to 1280 pixels. The entire target "window" size should be designed for is 640 x 480 pixels .

Testing and Debugging

For every trivial change made to the web site, testing needs to be conducted on different browsers and different platforms to ensure it displays correctly. Web site should be also proof read by other person apart from those who help in developing the site. "Other person" refers to the general view of the audience.

2.14 Database Connectivity

2.14.1 Open Database Connectivity (ODBC)

ODBC is a functional library designed to provide a common Application Programming Interface (API) to underlying client/server database systems. It is a component of Windows Open System Architecture (WOSA) and it communicates with the database through a library driver that makes it easier to connect to a wide range of database formats. It ODBC is based on the open call-level interface and uses SQL. During the run time, ODBC driver will communicate with other drivers and through a standard

interface called service provider interface (SPI). It is a network independent technology because it employs replaceable network libraries.

2.14.2 Java Database Connectivity (JDBC)

Java Database Connectivity (JDBC) provides Java developers with a standard API that is used to access the database, regardless of the driver and database product. Using the JDBC API, a user can access virtually any data source, from the relational databases to spreadsheets and flat files.

The JDBC API comprises two packages:

- i The `java.sql` package, which include in the Java 2 SDK, Standard Edition.
- ii The `javax.sql` package, which include in the Java 2 SDK Enterprise Edition or available as a separate download.

To use the JDBC API with a particular database management system, a JDBC technology based driver is needed to mediate between JDBC technology and the database. Besides that, JDBC also offers a wide range of functionality, such as prepared statements for greater performance, stored procedures, scrollable result sets, batch updates and new data types.

2.15 Other Technology

2.15.1 Java Bean

JavaBean are Java-based software components that are designed for maximum reuse. They are intended for use in visual software development environments. User uses visual development tools to construct JavaBeans. Once a bean has been developed, user uses the drag-and-drop capabilities of visual tools to add beans to applets and application and tailor them to particular needs.

Beans are often visible GUI components, but they also be invisible algorithmic components. User can uses beans for developing user programs such as applets and applications. User can also use beans in server programs in distributed applications. Javasoft provides a bean bridge so that beans can even be used in Legacy COM-based applications, such as Microsoft Word and Excel.

Beans are self-contained software components that easily can be tailored and added to a wide range of software applications. Since the introduction of JavaBeans, thousands of JavaBeans have been developed, hundreds of available as off-the-shelf software components.

Chapter 3 : Methodology

3.1 Project Methodology

3.1.1 Research and Analysis

Technique use during research

To define the system requirements, the following techniques are used:

i internet

The internet is the largest information warehouse in the world. Research is also done on available on-line promotion/demo human resource management system on the www. Although some of these systems are inaccessible due to security or others reasons, sufficient documentation is found on some of the system. In addition, the Internet is used to get information on latest technology to implement the web application, security, client/server architecture, etc.

ii Library resource and document room

Research is also done by reference books regarding security. Studies are done on various issues especially the current latest technology uses in developing the web application.

iii Interview

Interviews are scheduled with Mr. Hung for knowledge acquisition and requirement analysis. Research and analysis are also done on current available system in University Malaya. The current available system used for human resource department in the university is

actually a series for files processing system. Besides that, I also interview my thesis's supervisor Ms. Azwina against the current system in this faculty.

3.1.2 Historical Background of Waterfall Model

At first, programming software was simple and often done by one person and for engineer or scientific purposes. However, as the use of computers got more widespread, software had to be written for other people than the writers themselves, people with little or no understanding in programming. The old idea of writing a program and then fixing the bugs was no longer sufficient. In 1970 Royce proposed a model for the development of software, derived from a similar model from engineering activities. The notion at the time was that software development was an engineering discipline and that; therefore it would follow a model. This model was warmly greeted and became known as the Waterfall Model. Later it was found that it only worked well for certain classes of software. Thus new and more complex models were developed. The original model by Royce was also slightly improved and adjusted overtime.

3.1.3 Waterfall Model With Prototyping

The waterfall model is an engineering model designing to be applied to the development of software. The idea is the following : there are different stages to the development and the outputs of the first stage "flow" into the second stage and these outputs "flow" into the third stage and so on.

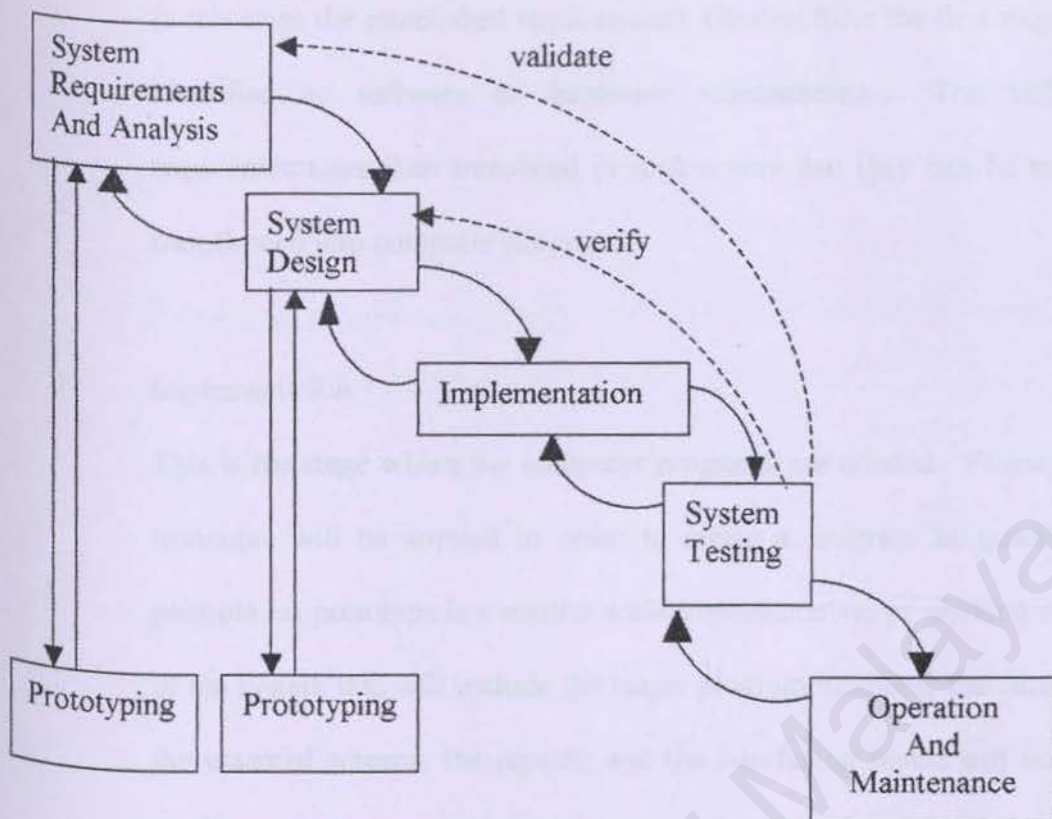


Figure 3.1 : Waterfall with Prototyping

There are usually 5 stages in this model of software development:

1. System Requirements and Analysis

In this stage the requirements of the “to be developed software” are established. These are usually the services it will provide, its constraints and the goals of the software/system. Once these are established they have to be defined in such a way that they are usable in the next stage. This stage is often prelude by a feasibility study is included in this stage. The feasibility study includes questions like: should we develop the software, what are the alternatives? It could be called the conception of a software product and might be seen as the very beginning of the life cycle.

2. System design

In this stage the established requirements, flowing from the first stage, are identified as software or hardware requirements. The software requirements are then translated in such a way that they can be readily transformed into computer programs.

3. Implementation

This is the stage where the computer programs are created. Prototyping technique will be applied in order to create a program as quickly as possible. A prototype is a smaller-scale, representative, or working model of the system that will include the major program modules, the database, the essential screens, the reports, and the interfacing inputs and outputs used to communicate with other system. It will be a skeletal version of the system and will not contain all the processing and validation rules that the system will finally have. Prototype is created, tested and upgraded in an iteration loop. Finally, this stage will produce a system that satisfied all the users' requirements and constraints.

4. System testing

The entire system is tested. Information needed is entered into the system for the testing purpose. When the combined programs are successfully tested the software product is finished.

5. Operation and Maintenance

Most software products include this stage of the development. It involves correcting errors that have gone undetected before, improvement and

other forms of support. The stage is part of the life cycle of a software product, and not of the strict development, although improvements and fixes can still be considered as “development”.

These steps are the main stages. There are also sub-stages within each stage, but they differ from project to project. For example for management purposes the requirements stage is divided in a feasibility study, an outline requirements definition, a design study and a requirements specification stage.

It is also possible that certain software projects require the adding of and extra stages all together, or the splitting of one in two stages. However all the different waterfall models have the same underlying idea; the idea that one stage provides outputs which can be used as the input for the next stage. There thus is a linear flow amongst the stages. The progress of the software development using the waterfall model, is thus easy to find out. A common way to look at the outputs of a certain stage and see whether or not they are finished in time, thus seeing how far the overall progress is. There are also activities that are performed at every stage of the software development. These are documentation, verification and management. Documentation is intrinsic to the Waterfall Model for it is document driven, as most of the outputs are documents. Verification, not only is a part of implementation and unit testing and system testing, but it is also part of all the other stages in the form of walk through, reviews and the like. Management involves the tailoring of the Waterfall Model to fit

individual processes, managing the human resources (i.e. the people) and managing the rules and the protocol on how the output is formalized, who accesses what and other managing tasks.

Finally it has to be noted that the software development process is not a linear as it seems. When errors in later stages are found, they are often fed back to a previous stage and the development is set back to that stage again. Since this is a managing nightmare, it often occurs that problems are ignored, left for later or programmed around. This feedback makes for a Waterfall with information flowing both ways down through the stages when something is made and up through the stages when something goes wrong, or feedback is given. Also many processes are frozen when it is not yet the time to deal with them.

3.1.4 Strength of the Waterfall Model

The divide and conquer approach of the waterfall process has several advantages like other top-down approaches. It enables organization to track project progress more accurately and discover possible problems at early stages of the product life cycle, especially for large or huge projects. It demands that the process generate a series of documents that can later be used to test and maintain the system. The bottom line of this approach is to make large software projects more manageable and delivered on time without cost overrun.

In addition, the Waterfall Model is an important model as it is the basis for many other software development models. The Waterfall Model itself can be used for single projects that are cost or time restricted because of the easy way to manage it and cost and time restrictions are often an important issue. Furthermore, this model has a clear define objective to reduce the development and maintenance cost. It is suitable for short-term program or short-life span system.

3.1.5 V Model

The V model is a variation of the waterfall model that demonstrates how the testing activities are related to analysis and design. As shown in Figure 3.2, coding forms the point of the V, with analysis and design on the left, testing and maintenance on the right. Unit and integration testing addresses the correctness of programs. The V model suggests that unit and integration testing also be used to verify the program design. That is, during unit and integration testing, the programmers should ensure that all aspects of the program design have been implemented correctly in the code. Similarly, system testing should verify the system design, making sure that all system design aspects are correctly implemented.

The model's linkage of the left side with the right side of the V implies that if problems are found during verification and validation, then the left side of the V can be executed to fix and improve the requirements, design and code before the testing steps on the right side are reenacted. In other words, the V model makes more explicit some of the iteration and rework

that are hidden in the waterfall depiction. Whereas the focus of the waterfall is often documents and artifacts, the focus of the v model is activity and correctness.

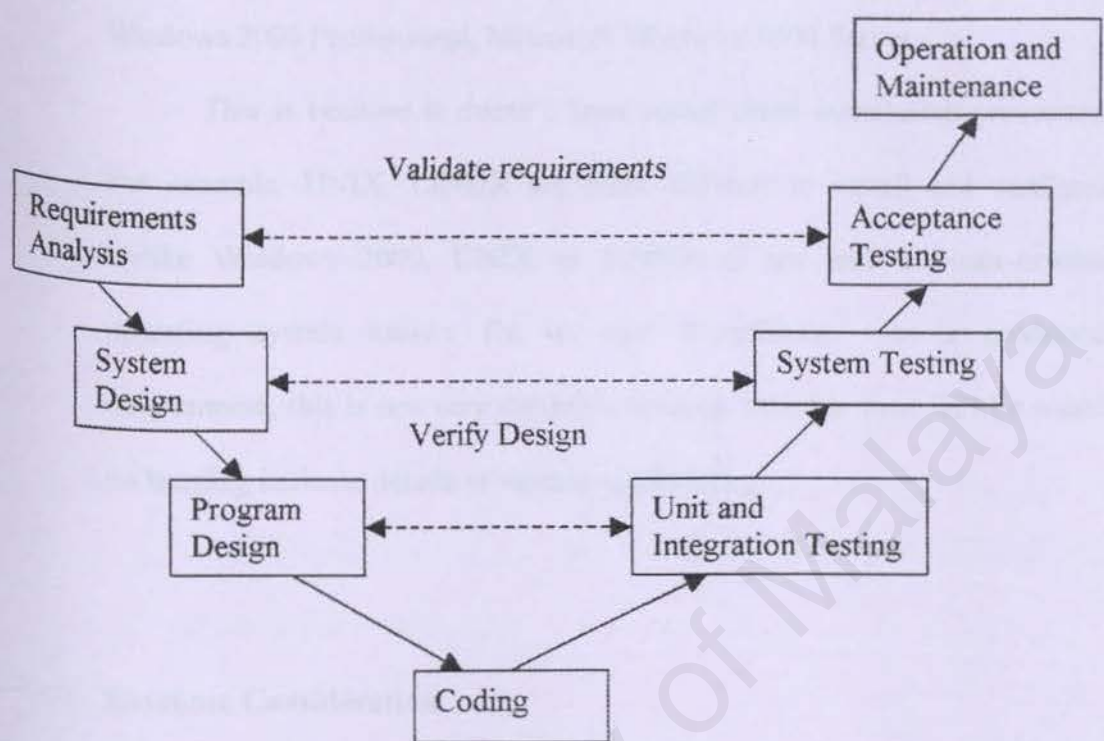


Figure 3.2 : The V model

3.2 Technology Consideration

3.2.1 Operating System Consideration

Microsoft Windows NT server 4.0 was chosen over others such as Microsoft Windows 2000 Professional, Microsoft Windows 2000 Server.

This is because it doesn't have complicated installation procedures. For example, UNIX, LINUX are more difficult to install and configure. Unlike Windows 2000, UNIX or LINUX is not an end-user-oriented operating system known for its user friendliness. In a production environment, this is not very desirable because valuable time will be wasted on learning intricate details of various applications.

3.2.2 Database Consideration

A database is needed to store the relevant of thesis data and information. The database selected is SQL Server 2000 is chosen as the database management system for this project.

SQL Server 2000 has been chosen because it has the largest number of third-party, front-end support products world wide, from those designed strictly for application development to add-in SQL Server access modules for standard PC-based DBMSs such as Paradox and dBase. There are even access modules that let users query the database from the leading spread sheet programs.

In addition, SQL Server well integrated with other Microsoft products and providing universal data access. Plus, it has good recovery and distributed transaction support. And it support up to 50 concurrent users. It

is also the record-holder of important benchmark awards for scalability and speed, fully web-enabled database product, providing core support for Extensible Markup Language(XML) and the ability to query across the Internet and beyond the firewall.

The most advantages of it are having an ease-of-use through SQL Server's graphical management tools. This user-friendly interface can help user easier to learn on it if compare with other database such as MySQL database. However, this database is also not too small size like Microsoft Access and too large such as Oracle. From aspect of cost, it is cheaper than Oracle.

Therefore it is really a complete database and data analysis package that suitable to use in this project.

3.2.3 Web browser

Internet Explorer 6.0 and Netscape Navigator/Communicator are both very good browsers and the speed at which they upload and download pages is almost the same. Explorer has many compatibility issues with Java, JavaScript and HTML, while Navigator tries to stay current with the industry standards in most cases. Since JSP is my web programming language, which is inherit from Java family, Internet Explorer 6.0 has been selected as my web browser.

3.2.4 Web application Programming Language

JavaServer Pages is chosen as the web programming language for the whole development of this project because it is platform- and server-independence,

a modular and reusable component architecture, and access to the rich family of Java APIs (including JDBC, JavaMail, and Java Transaction Service).

JSP technology is vendor independence. It does not lock companies into any one vendor's solutions. It is also portable across platforms and servers alike, building on the Write Once, Run Anywhere philosophy of the Java language. The multi-tier architecture using JSP technology is inherently flexible and adaptable. Developers can make changes without affecting "customer-facing" application. Besides it is low cost of ownership. JSP technology lets page authors handle the ongoing maintenance of dynamic pages without requiring developers to be involved in changes that do not involve application logic.

Below is the comparison between ASP, JSP and Perl vs CGI

| | | | |
|---|-------------------|------|---------|
| Portable across platforms/servers | No | Yes | No |
| Reusable, modular code | No | Yes | No |
| Scripting language | VBScript, Jscript | Java | C, Perl |
| Memory leak protection | No | Yes | Yes |
| Supports concurrent access without separate processes | Yes | Yes | No |

Table 3.1: comparison between ASP, JSP and CGI vs Perl

Since JSP has so many advantages, it is my web programming language consideration result among other technologies.

3.2.5 HTML(Hypertext Markup Language)

It is a compulsory language that is needed in order for user to view any output on Internet. HTML is the set of "markup" symbols or codes inserted in a file

intended for display on a World Wide browser. The markup tells the Web browser how to display a web page's words and images for the user. HTML is also a standard recommended by the World Wide Web Consortium (W3C) and adhered to by the major browsers, such as Microsoft Internet Explorer and Netscape Navigator.

As a conclusion, it is the most important language that must include in every web page.

3.2.6 JavaScript

JavaScript is a scripting language that allow the application run over on the Internet. However it also can work together with JSP. After consideration from Chapter 2, it can be found that on client-side scripting, only JavaScript is used in order to support a wider range of type of web browsers. It allows cross-platform scripting of events, objects, and options. Besides add simple interactive behaviours to an HTML page, it also can create dynamic HTML pages.

JavaScript is lightweight interpreter as VBScript, and it is easier to learn. It also can help productive with less time or faster. Therefore, JavaScript is selected as one of the scripting language besides HTML.

3.2.7 Database Connectivity Consideration

JDBC is chosen as the data access technology because of the features below:

- i) JNDI support
 - Ease of deployment (gives JDBC driver independence, makes JDBC applications easier to manage).

ii) Connection pooling

- Performance improvement (a connection pool is a cache of database connections that is maintained in memory, so that the connections may be reused).
- Important for implementing a distributed transaction processing system.

iii) JavaBeansTM (RowSet objects)

- Send data across a network to clients, such as web browsers, laptops, PDAs and so on.
- Access any tabular data source, even spreadsheets or flat files.
- Make results sets scrollable or updateable when the JDBC driver does not support scroll ability and updatability.
- Encapsulate a driver as a JavaBeans component for use in a GUI.

3.2.8 Web Server Configuration

JSP is a web server-independent, which means it can be develop in IIS, Apache Web Server or any other web server. In this proposed system, Apache Tomcat 4.0 has been chosen as the development web sever under Jakarta project carried out by Apache. With simple configuration, it is able to run the application smoothly as expected.

3.2.9 Methodology Configuration

Waterfall with prototyping is chosen in the project because it is appropriate to this project based on the reasons listed below:

- The project is relatively short (less than one year)
- The scope and objectives of the project are well understood.
- User requirements of the system at one time.
- With prototyping in the implementation stage, the complexity of an error is low because the prototype enables the developers to detect any deficiency early at the process.

Chapter 4
System Analysis
University of Malaya

Chapter 4 : System Analysis

4.1 Requirement Analysis

Requirement analysis covers the area of functional requirements and non-functional requirement of Daily/Weekly Scheduler.

The system is mainly target for administrator, manager/supervisor and staff in a certain company. This system is divided into four main modules:

- i administrator module
- ii manager/supervisor module
- iii staff module
- iv general module

4.1.1 Functional Requirements

Functional requirement are set of functions that are required to be included into the system, how the system should react to particular inputs and how the system should behave in particular situation. In some cases, it also stated what the system should not do. Furthermore, it is independent from the implementation of the solution.

There are four components recognized as the most important functional requirements for this project: Administrator Module, Supervisor Module, Staff Module and General Module.

1. Administrator module

This component consist of several sub-module that provide the security functions to enable the authorized users to login either as supervisor or staff to this system.

Administrator Module is one of the sub-modules for DWS. This module has several sub-modules, which are:

i) Manage Administrator Profile

Administrator will add new user as administrator for this system. The purpose of adding new administrator is to help the first administrator to manage the supervisor and staff profile.

ii) Manage Supervisor Profile

Administrator will add / edit / delete supervisor profile. Administrator will key supervisor personal detail into the system, such as name, staff_ID, department, date joined the company and so on. Administrator will create a new username and password for the new user. The user will change password in this DWS system.

iii) Manage Staff Profile

Similar to Supervisor Profile.

2.

Supervisor module

For supervisor module, there are several submodules too.

i) View staff list

Supervisor can view the list of staff which are under the same department.

ii) View staff scheduler

Supervisor can view staff scheduler by selecting the certain staff under the same department.

iii) Manage comments

Supervisor can add / edit comments against the scheduler submit by staff, so that staff can improve their working performance.

iv) Generate reports

Supervisor can generate staff scheduler by weekly or monthly.

3. Staff module

i) Manage scheduler

Staff can add / edit / delete the scheduler.

4. General module

i) Manage general information

All users(administrator, supervisor and staff) can update their password in this module.

ii) Manage help function

This will guide user to learn how to use this system

4.1.2 Non-functional Requirement

Non-functional requirements are defined as constraints under which the system must operate and the standard, which must be met by the system.

There are a few issues in this area in the respect to Daily/Weekly Scheduler development.

1. Browser

Browser which supports to JavaScript and CSS is needed in order to access to Daily/Weekly Scheduler. Internet Explorer 4.0 and above are recommended if the user want to have the full functionality of Daily/Weekly Scheduler.

2. User Friendliness

Daily/Weekly Scheduler have a very user-friendly interface so that the users can interact with the system comfortable and easily. Visual effects and meaningful images and icons are used to provide Daily/Weekly Scheduler with a sophisticated and yet simple to use interface. Meaningful captions and menu options will simplify user interaction with the system. Confirmation message for any non-trivial process such as updating a record should be displayed. Effective error handling and validation procedures will also help the user to use the system. The system should display an error message if an error occurs, such as an invalid data input and invalid password.

3. Reliable

Daily/Weekly Scheduler for Staff should be reliable, which means minimum system should perform normally when the problem occurs such as the user enters the wrong data type. The system should also check for the input, which does not make sense for example the starting data of scheduling more then the end date.

4.2 Run-time Requirement

4.2.1 Server-side Requirement

Hardware Requirement

- A server with not less than 266MHz processor
- At least 128MB memory
- 4 GB of free hard disk space.
- Other standard computer peripheral.

Software Requirement

- Microsoft Windows NT Server 4.0 : Network Operating System
- Jakarta-Tomcat 4.0 : JSP engine and web server service.
- JDBC : Access medium to MS SQL server
- Microsoft SQL server 2000 : Database Server
- Microsoft Internet Explorer : Browser to surf the site.

4.2.2 Client-side Requirement

Hardware Requirement

- Any computers
- At least 64MB memory
- Pentium II 266 MHz processor or higher connected to LAN

Software Requirement

- Any operating system
- Microsoft Internet Explorer 5.0 or above
- Pentium II 266 MHz processor or higher connected to LAN

Chapter 5 : System Design

5.0 System Design

Introduction

Design is a meaningful engineering representation of something that must be built. The system design phase is the phase in which requirements produced in the system analysis phase are translated into a representation of the system. This phase will be focused on architectural design, database design, process design and user interface design.

5.1 Characteristic of Good Design

High quality designs should have characteristics that lead to quality products: ease of understanding, ease of implementation, ease of testing, ease of modification, and correct translation from the requirements specifications. Modifiability is especially important, since changes to requirements or changes needed for fault correction sometimes result in a design change.

5.1.1 Component Independence

Abstraction and information hiding allow us to examine the ways in which components are related to one another in the overall design. To recognize and measure the degree of component independence in a design, we use two concepts that are adapted: coupling and cohesion (Pfleeger, S.L, 2001)

Coupling

We say that two components are highly coupled when there is a great deal of dependence between them. Loosely coupled components have some

dependence, but the interconnections among components are weak. Uncoupled components have no interconnections at all; they are completely independent. Thus, we can measure coupling along a range of dependence.

ii Cohesion

Cohesion refers to the internal “glue” with which a component is constructed. The more cohesive a component, the more related are the internal parts of the component to each other and to its overall purpose. The worst degree of cohesion, coincidental, is found in a component whose parts are unrelated to one another.

5.1.2 Exception Identification and Handling

Exception is the situations that we know is to be countered to what is really wanted the systems to do. Exception handling is included in the design, so that the system addresses each exception in a satisfactory way that does not degrade system functions. Typical exceptions include failure to provide a service, providing the wrong service or data and corrupting data. For each exception identified, there are three ways to handle it. They are retrying, correct and report. Thus, for each service we want our system to perform, ways it may fail must be identified, as well as ways to rescue it from failure.

5.1.3 Fault Prevention and Fault Tolerance

Designs should try to anticipate faults and handle them in ways that minimize disruption and maximize safety. The goal is to make the code as

fault-free as possible by building fault prevention and fault handling into the design.

5.2 Architectural Design

In architectural design, large systems are decomposed into sub-systems that provide some related set of services. This is the initial design process of identifying sub-systems and stabling a framework for sub-system control and communication. Besides, the sub-systems that make up the whole system and their relationships are identified and documented.

The system is structured into a number of principal sub-system is an independent software unit. Communications between sub-systems are identified. Decomposing a system into a set of interacting sub-systems is an important phase. It is a top-down approach that based on assigning function to components.

The project design is based on data flow oriented design. It is also called structured design. This type of design stresses on modularity, top-down design and structured programming.

5.2.1 Context Diagram

The context diagram for the system is shown at figure 5.1. This context diagram gives an overview of the system, including basic inputs, general system and outputs.

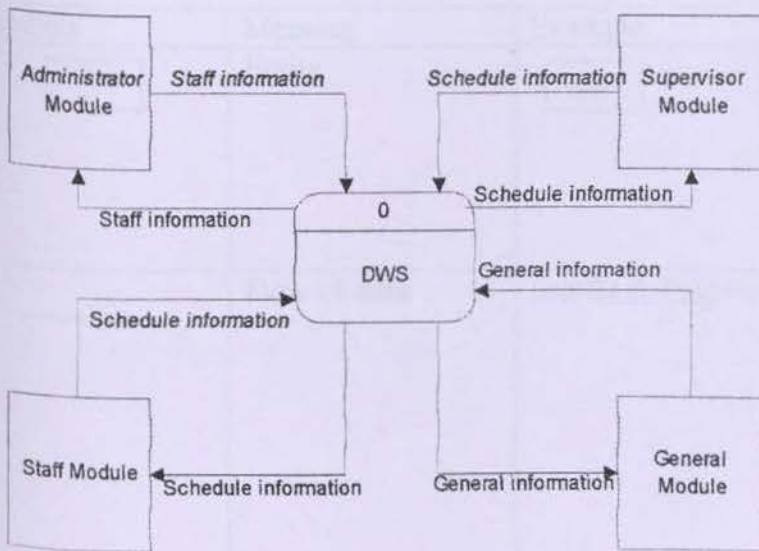


Figure 5.1: System Context Diagram

5.2.2 Structure Chart

The structure chart shows all the relation between modules in DWS and is used to identify the activities that make up the system. It is used to model the program structure. Structure chart is used to depict high-level abstraction of specified system. The use of structure chart is to describe the interaction between independent modules. Major functions form the initial component part of the structure chart, which can be broken into detailed sub-components.

The main system is divided into four major components.

- Administrator module
- Supervisor module
- Staff module
- General module

Each of four major components is further divided into sub-modules.

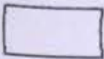
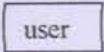
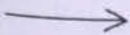
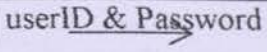


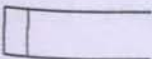
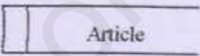
| Symbols | Meaning | Example | Description |
|---|--------------|--|---|
|  | Entity |  | Depict an external entity that can send data or receive data from the system. |
|  | Flow of data |  | Shows movement of data from one point to another, with the head of the arrow pointing toward the data's definition. |
|  | Process |  | Shows the occurrence of a transforming process. |
|  | Data store |  | Shows depository for data that allows addition and retrieval of data. |

Table 5.1: Description of symbols in Data Flow Diagram

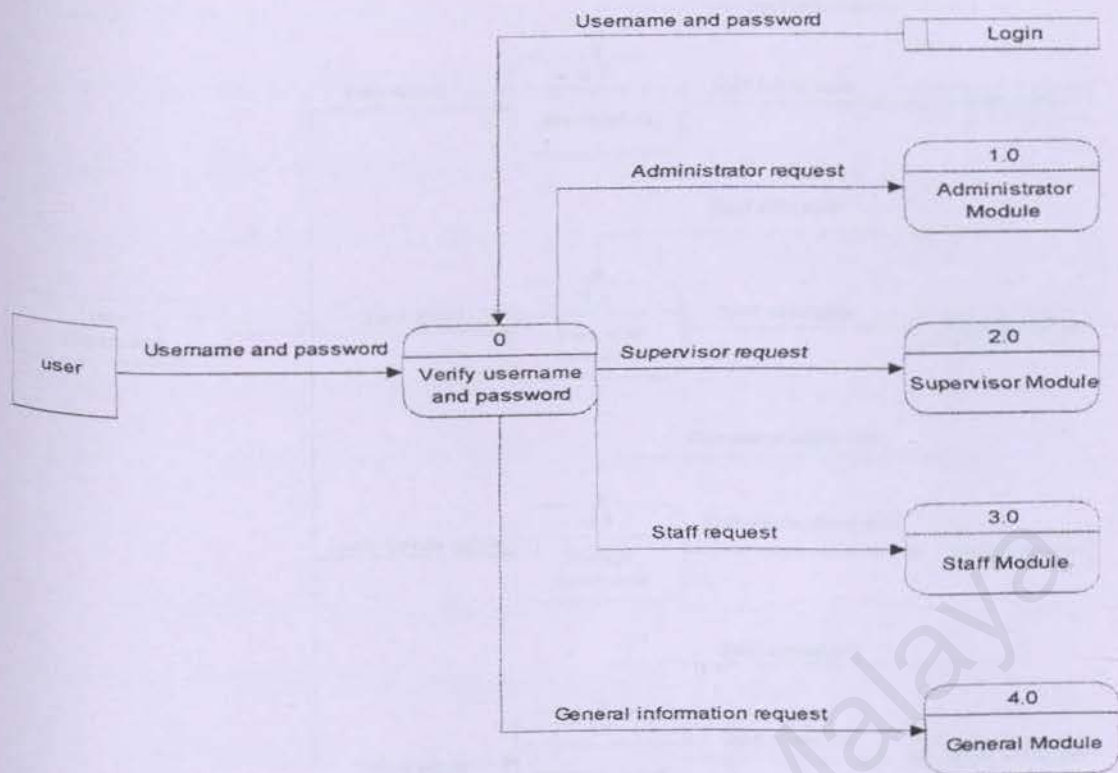


Figure 5.3 : Diagram 0 for DWS

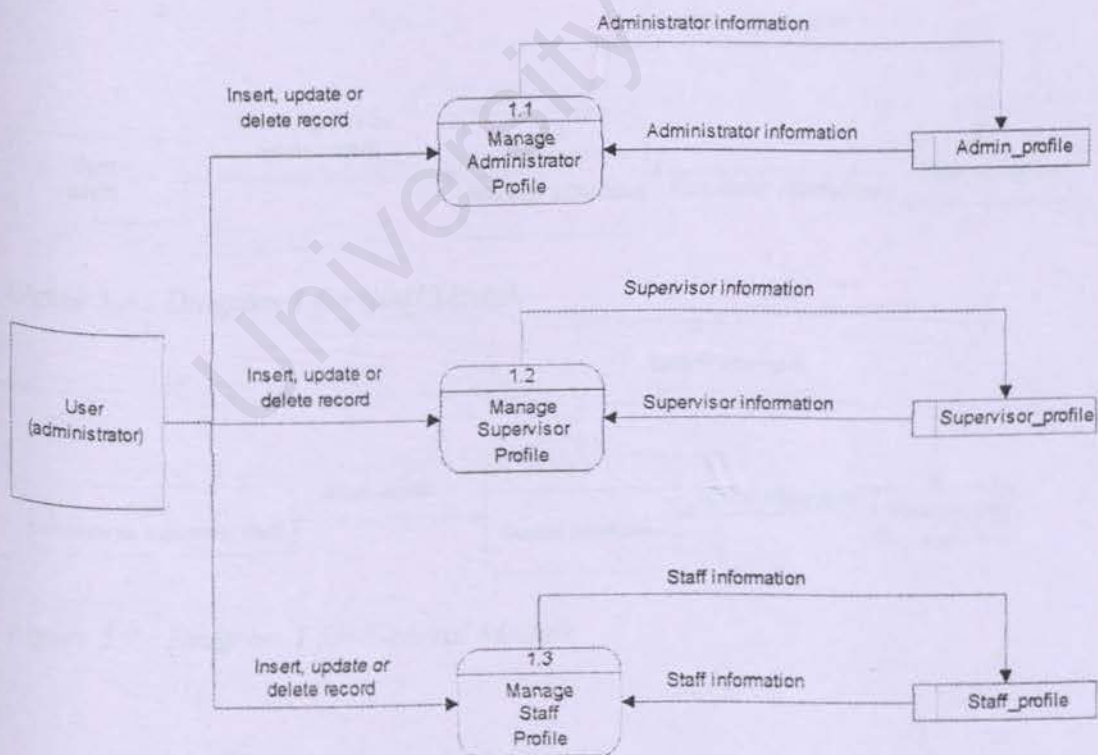


Figure 5.4 : Diagram 1 for administrator module

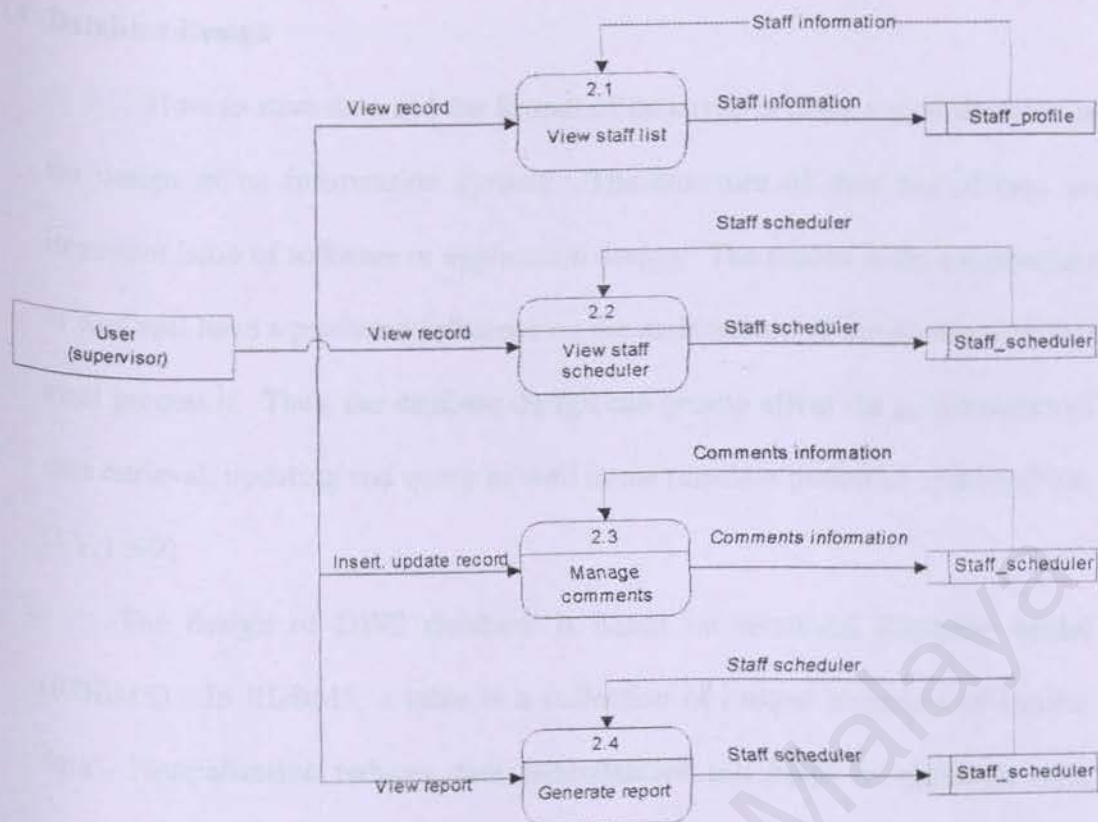


Figure 5.5 : Diagram 1 for Supervisor Module

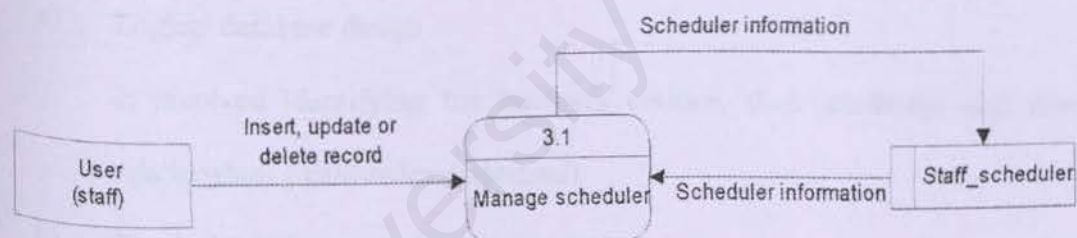


Figure 5.6 : Diagram 1 for Staff Module

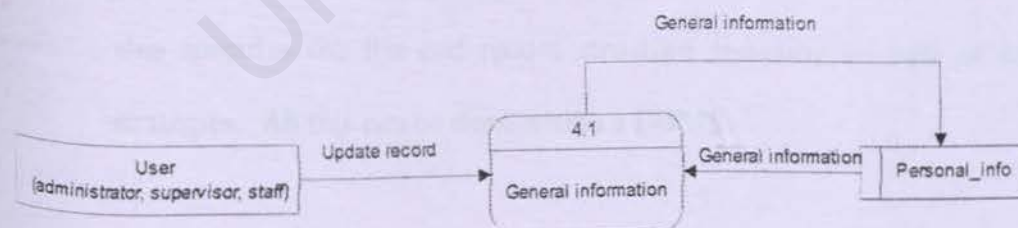


Figure 5.7 : Diagram 1 for General Module

5.4 Database Design

How to store data and the format of data type is often a vital decision in the design of an information system. The structure of data has always an important issue of software or application design. The reason is the architecture of data will have a profound influence on the architecture of the application that must process it. Thus, the database design can greatly affect the performance of data retrieval, updating and query as well in the run-time period of system. (Post, G.V, 1999)

The design of DWS database is based on relational database model (RDBMS). In RDBMS, a table is a collection of unique instances of similar data. Normalization reduces data redundancies and helps to eliminate data anomalies that result from those redundancies.

This section is divided into 2 sections:

a) Logical database design

It involved identifying the business entities, their attributes and their relationships (cardinality / optional)

b) Physical database design

This involves in identifying the storage medias to be used. Besides, it also specifies the file and record structure, indexing as well as access strategies. All this can be done within a DBMS.

5.4.1 Logical Database Design

The logical design phase begins with the creation of a conceptual data model of the company, which is totally independent of implementation details

such as programming languages, DBMS, hardware platform and other physical consideration.

Below are steps involved in creating a logical database design for relational database.

- Build local conceptual data model from user's view.
- Build and validate local data model.
- Build and validate global data model.

5.4.2 Physical Database Design

Physical database design involves the design of the tables or database. This

DWS database has 5 tables. The description of the tables will be mention in following section. Those 5 tables involves are :

- i) Personal_info
- ii) Comp_dept
- iii) Admin_profile
- iv) Supervisor_profile
- v) Staff_profile
- vi) Staff_schedule

Table name: personal_info

| Column Name | Datatype | Length | Description |
|-------------|----------|--------|---|
| ID | Varchar | 10 | Primary key |
| Username | Varchar | 20 | Username for user to login |
| Pwd | Varchar | 20 | This column name is stand for password |
| Category | Char | 1 | This column is about user position whether is administrator, supervisor or staff. |

Table 5.2 : Datatype for personal_info

Table name : comp_dept

| Column Name | Datatype | Length | Description |
|-------------|----------|--------|-------------------------|
| Dept | Varchar | 50 | Primary key |
| Dept_desc | Varchar | 300 | Department description. |

Table 5.3 : Datatype for comp_dept

Table name: Admin_profile

| Column Name | Datatype | Length | Description |
|---------------|---------------|--------|------------------------------------|
| Admin_ID | Varchar | 10 | Primary key |
| Admin_name | Varchar | 50 | Administrator name |
| Date_join | Smalldatetime | 4 | The start working day. |
| Dept | Varchar | 50 | Company department |
| Address | Varchar | 50 | Staff's address |
| City | Varchar | 50 | City |
| State | Varchar | 50 | State |
| Postcode | Varchar | 10 | - |
| Tel | Varchar | 20 | This column is stand for telephone |
| Date of birth | Smalldatetime | 4 | The date of birth |

Table 5.4 : Datatype for Admin_profile

Table name : Supervisor_profile

| Column Name | Datatype | Length | Description |
|---------------|---------------|--------|------------------------------------|
| spvs_ID | Varchar | 10 | Primary key |
| spvs_name | Varchar | 50 | Supervisor name |
| Date_join | Smalldatetime | 4 | The start working day. |
| Dept | Varchar | 50 | Company department |
| Address | Varchar | 50 | Staff's address |
| City | Varchar | 50 | City |
| State | Varchar | 50 | State |
| Postcode | Varchar | 10 | - |
| Tel | Varchar | 20 | This column is stand for telephone |
| Date of birth | Smalldatetime | 4 | The date of birth |

Table 5.5 : Datatype for Supervisor_profile

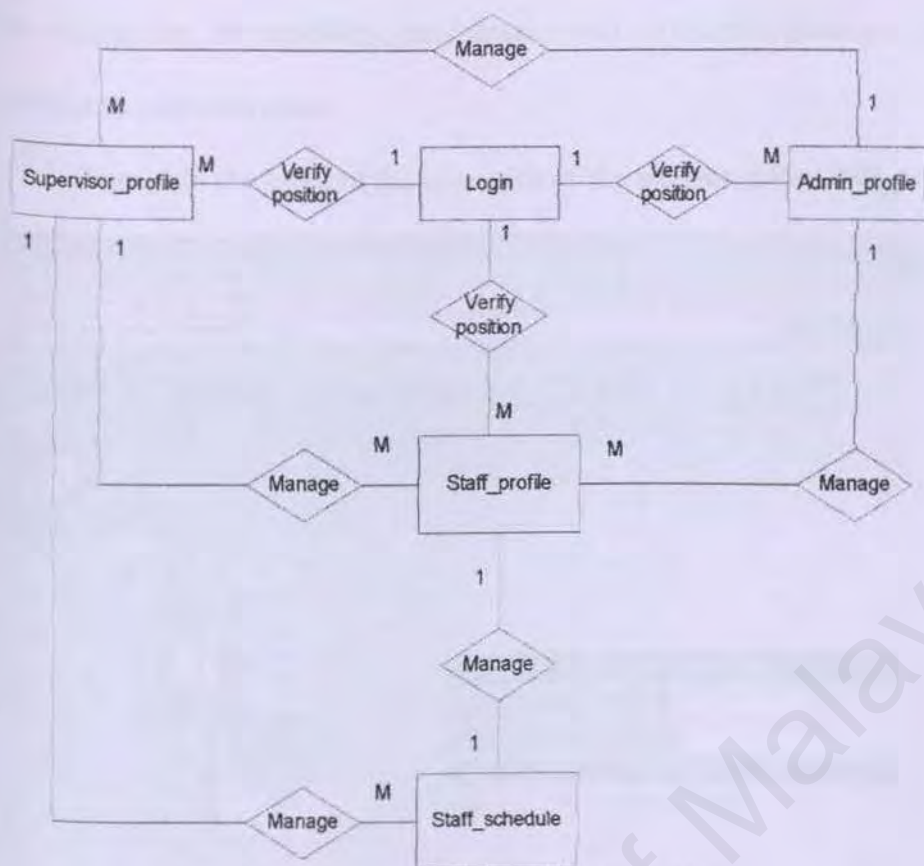


Figure 5.8 : ER Diagram for DWS

5.6 User Interface Design

The user interface design of a system is always a yardstick by which that system is judged. The goal of interface design is to provide the best way for the users to interact the system, which is to get the information they needed in and out of the system.

However, an interface which is difficult to use, will result in high level of user errors and cause some software system to be discard, irrespective of its functionality. Thus, for interface design, it is important to take into consideration the user's needs and preferences.

In DWS project, the user interface design is based on the Graphic User Interface approach. The goal of it are to provide user-friendly, easy and faster way for the user to interact with the computer, or what is commonly known as Human-Computer Interface(HCI). These HCI general principles among others

are consistency, recoverability, confirmation and verification message, reserve action and responsiveness.

Below are the some of the examples of the interfaces for DWS project.

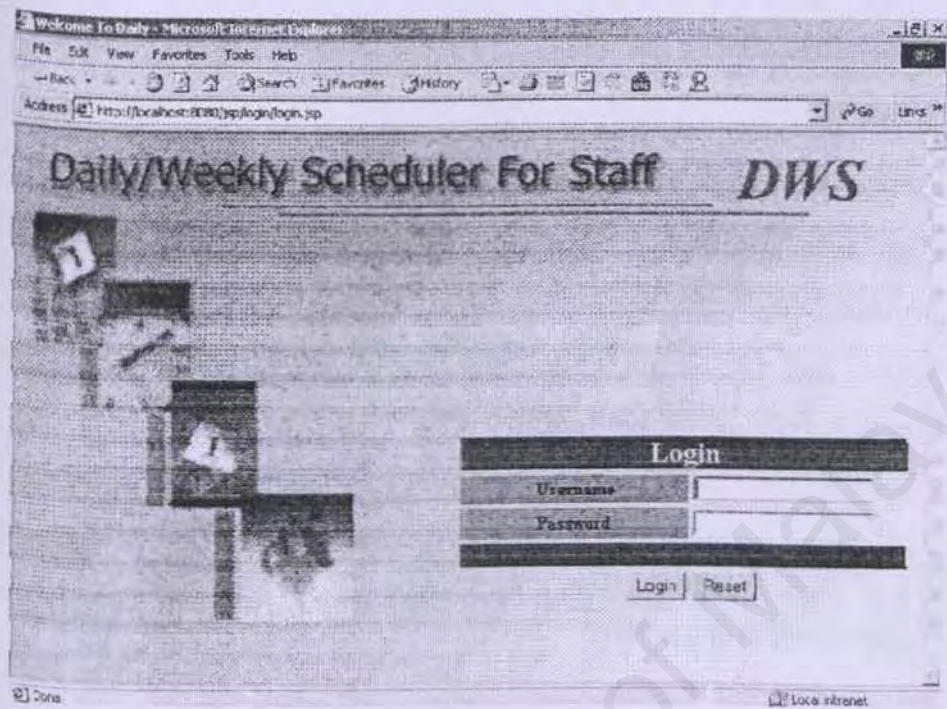


Figure 5.9 : Sample Interface for Login page

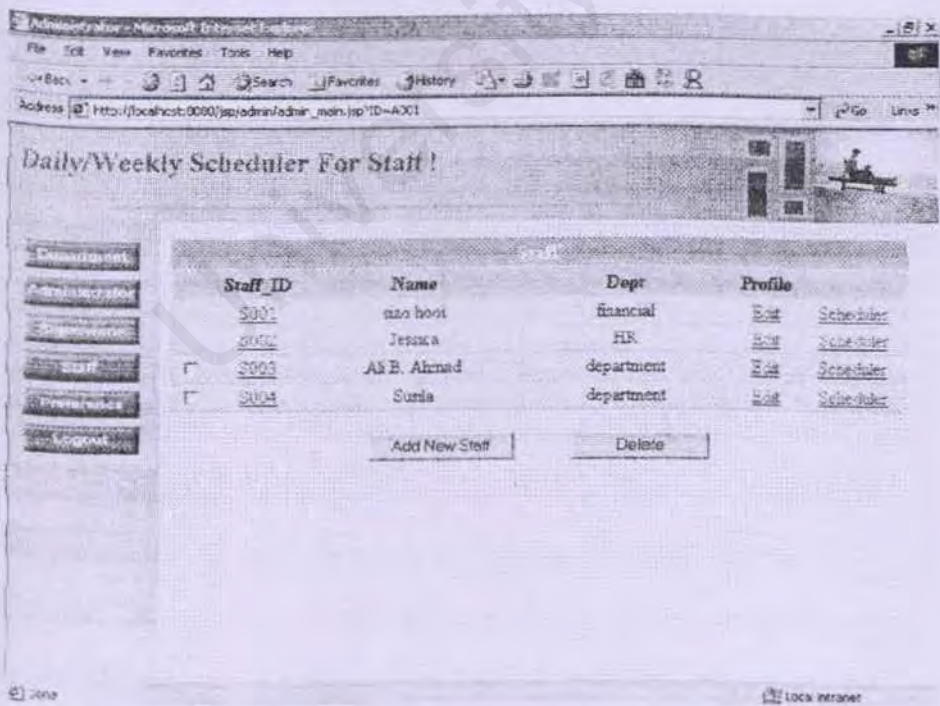


Figure 5.10 : Sample interface for administrator module

Chapter 6: System Implementation

6.0 Introduction

System implementation is a process that takes place after System Design phase. This phase will describes how the process design put into the real environment. Therefore, system development and coding methodology are included in this phase.

6.1 System Development

6.1.1 Software Configuration

First of all we need to install the development tools and servers before starting the development work.

Below shows the sequence of installation :

1. Install Windows NT server 4.0 together with IE browser.
2. Install SQL Server 2000 as database management system.
3. Install Service Pack 3.
4. Download and install the Java 2 SDK Standard Edition (J2SE) from the JavaSoft Web Site:
<http://java.sun.com/j2se>
5. Setting the path in autoexec.bat.

SET

PATH=%PATH%;C:\JDK1.3;c:\jdk1.3\bin;c:\jdk1.3\lib;c:

jdk1.3\include

set JAVA_HOME=c:\jdk1.3

6. Install Jakarta-tomcat 4.0.4 as a server
7. Install Microsoft FrontPage 2000 for design

| Software | Purpose | Description |
|---------------------------------|-----------------------|---|
| Microsoft Windows NT server 4.0 | System Requirement | Operating System |
| Internet Information Server 5 | System Requirement | Web Server Host |
| Microsoft FrontPage | System Development | Coding the Web Page |
| Internet Explorer 6.0 | System Development | View the Web Pages |
| SQL Server 2000 | Database | Build the Database to store and manipulate the data |
| Adobe Photoshop 6.0 | User Interface Design | Image Design and Creation |

Table 6.1 : Summary of Software / Software Tools Used

6.2 Create Database

MS SQL Server 2000 is used as the Database Management System(DBMS) for this system. It allows developer to create easy-to-use database solutions quickly. By using this DBMS database structure, validation rules, defaults and relationships could be done easily.

Database is developed according to the database design in Chapter 5. The data structure of each table is declared, the primary key is set, and the relationships among table are defined. So, the database is able to maintain from time to time by adding in some necessary constraints.

6.3 Accessing Databases Programmatically

6.3.1 Accessing Database for application system

Before using the data in a database, developer must be able to establish a connection. This can be accomplished with a few methods, including ODBC data source names (DSN), OLEDB data links, and connection String to connect a database. The system DWS is implemented using java, so a JDBC data source is needed. JDBC supports four categories of drivers:

- i) JDBC-to-ODBC bridge driver – this bridge driver connects Java to a Microsoft ODBC (Open Database Connectivity) data source. This driver typically requires the ODBC driver to be installed on the client computer and normally requires configuration of the ODBC data source.
- ii) Native-API, partly java drivers – this driver enable JDBC programs to use database-specific APIs that allow client programs to access databases via the Java Native Interface. This driver type translates JDBC into database-specific code.
- iii) JDBC-Net pure Java drivers – this driver take JDBC requests and translate them into a network protocol that is not database specific. These requests are sent to a server, which translates the database requests into a database-specific protocol.
- iv) Native-protocol pure Java drivers – this driver converts JDBC requests to database-specific network protocols, so that Java programs can connect directly to a database.

The type that I used for this system is type (i)

6.3.2 Create Data Source Name (DSN)

To connect to data using JDBC-to-ODBC driver, data source name(DSN) is used. DSN is a method of standardizing database connectivity. There are three types of DSN:

1. System DSN
2. User DSN
3. File DSN

A system DSN is available to all users on the current machine, including NT services. It's the fastest type of DSN because the connection information is stored in Windows Registry. A system DSN is more convenient but less secure than a User DSN.

To create a System/ User DSN:

1. On explorer click Documents and Settings, then select start menu, follow by select programs, after that choose administrative tools.
2. Double-click ODBC to open the driver manager's user interface, the ODBC Data Source Administrator.
3. Click the **System DSN/ User DSN** tab.
4. Click **Add**.
5. From the installed ODBC drivers list, select *SQL Server* and click **Finish** to bring up the **Create a New Data Source to SQL Server** dialog box.
6. Give your data source a name, such as *scheduler*.

7. Type the SQL server's name.
8. Then choose the authentication. There are two types of authentication: I) With Windows NT authentication using the network login ID. Ii) With SQL Server authentication using a login ID and password entered by the user.
9. Checked the checkbox (**the Change the default database to**) then choose the database from the drop-down list.

Finally, click the **Finish** button and then try to test DSN.

After setup the DSN, we apply the below code in bean as a connection to the database.

```
package beans;
import java.sql.*;
public class b_common extends Object{
    public static Connection getConnection()throws Exception{
        Connection conn = null;
        try{
            String dbDriver = "sun.jdbc.odbc.JdbcOdbcDriver";
            String dbUrl = "jdbc:odbc:scheduler";
            String dbUserId = "";
            String dbPassword = "";
            Class.forName(dbDriver).newInstance();
            conn = DriverManager.getConnection(dbUrl,dbUserId,dbPassword);
            conn.setAutoCommit(false);
        }
        catch(Exception Ex){ System.err.println("error"+Ex.toString());
        }
        return conn;}
}
```

Figure 6.1: the code of connection to database

Connection object that the program uses to create **Statements** and **PreparedStatement**s for executing SQL statements.

The figure 6.2 shows the code of accessing database for web site.

```
package beans;

import java.io.*;
import java.lang.*;
import java.util.*;
import java.sql.*;
import javax.naming.*;

public class b_login extends Object{
    private Connection dbConn;
    PreparedStatement pstmt=null;
    Statement stmt = null;
    ResultSet rs=null;

    public String checklogin() throws Exception{

        String userID="";
        String query = null;
        try{    //open connection
            dbConn = b_common.getConnection();//accessing database
            dbConn.setAutoCommit(false);
            //SQL STATEMENT
            query = "SELECT * FROM personal_info";
            pstmt = dbConn.prepareStatement(query);
            pstmt.clearParameters();
            rs=pstmt.executeQuery();
            while(rs.next()){
                userID=rs.getString("ID");
            }

            dbConn.commit();
            boolean result=close();
        }
        catch(SQLException se){
            System.out.println("error "+se.toString());
        }
        catch(Exception e){
            System.out.println("error from beans(Exception) "+e.toString());
        }
        return userID;
    }
}
```

```

//close connection
public boolean close() throws Exception {
    try {
        if (rs != null)
            rs.close();
        if (stmt != null)
            stmt.close();
        if (dbConn != null)
        {
            dbConn.close();
        }
    }
    catch (SQLException e)
    {
        System.out.println("error=" + e.toString());
    }

    finally {
        dbConn.close();
        rs = null;
        stmt = null;
        dbConn = null;
    }
    return true;
}

```

Figure 6.2: the code of accessing database for web site.

6.4 Programming Language Used

6.4.1 HTML

In this system, the Web-based interfaces are created using HTML. HTML is the lingua franca for publishing hypertext on the World Wide Web. It uses tags like `<A>` and `` to structure text into tables, hypertext links interactive forms, headings, paragraphs, lists, and more. HTML is useful to create form based data entry for this application.

6.4.2 JavaScript

JavaScript is used as client side programming language. It allows scripting of events, objects and actions to create Internet applications. It is used to validate data entered by the user. The figure below shows some code to verify data.

```
<SCRIPT language="JavaScript">
function VerifyData()
{
    if (document.myform.pwd.value=="")
    {
        alert ("Please insert password");
        return false;
    }
    else
        return true;
}
</SCRIPT>
```

Figure 6.3: sample code of javascript to verify data

<!-- date validation : confirm the end date is after the start date-->

```
var timeA;  
var timeB;  
var seperator = "-";  
var date_start, var date_end;
```

```
date_start = document.myform.start_date.value;  
date_end = document.myform.end_date.value;
```

```
var arrayA;  
var arrayB;  
var yearA;  
var monthA;  
var dayA;  
var yearB;  
var monthB;  
var dayB;
```

```
arrayA = date_start.split(seperator);  
monthA = arrayA[1];  
dayA = arrayA[2];  
yearA = arrayA[0].substr(2,3);
```

```
arrayB = date_end.split(seperator);  
monthB = arrayB[1];  
dayB = arrayB[2];  
yearB = arrayB[0].substr(2,3);
```

```
timeA = new Date(yearA, monthA, dayA);  
timeB = new Date(yearB, monthB, dayB);
```

```
var difference=0;  
difference = timeB - timeA;
```

```
if(difference<0)  
{alert("Invalid date"+"\\n"+"Please insert another end date");  
  document.myform.end_date.focus();  
  return(false);}
```

Figure 6.4: sample code of javascript to validate date

6.4.3 SQL

After establishing a connection with database, SQL (Structured Query Language) statements is used to insert, delete, update and retrieve information from database.

The following SQL statement is to retrieve Member's information from table "personal_info" in database.

```
query = "SELECT * FROM personal_info ORDER BY ID
```

Figure 6.5: SQL Statement for retrieving data from database

```
query="UPDATE personal_info SET pwd=? WHERE ID=?";
```

Figure 6.6: SQL Statement for updating data

```
query = "DELETE FROM staff_schedule WHERE schedule_ID="";
```

Figure 6.7: SQL Statement for deleting data

6.4.4 JavaServer Pages (JSP)

The JSP file was written in this directory C:/Tomcat/webapps/ROOT. A new folder was created in ROOT directory.

There are several useful built-in server objects provided by JSP that will help the application read requests form HTML forms, post results to the web browser, control the server, etc. It is easy to include these server-side objects within the JSP scripts. These server-side objects are *Application*, *Page*, *Request* and *Session*.

The JSP and servlet container application owns objects with application scope. Any JSP or servlet can manipulate such objects. Objects with page scope exist only in the page that defines them. Each page has its own instances of the

page-scope implicit objects. Objects with request scope exist for the duration of the request. For example, a JSP can partially process a request, then forward the request. When processing completes with a response to the client. Objects with session scope exist for the client's entire browsing session.

6.4.4.1 JSP Constructs

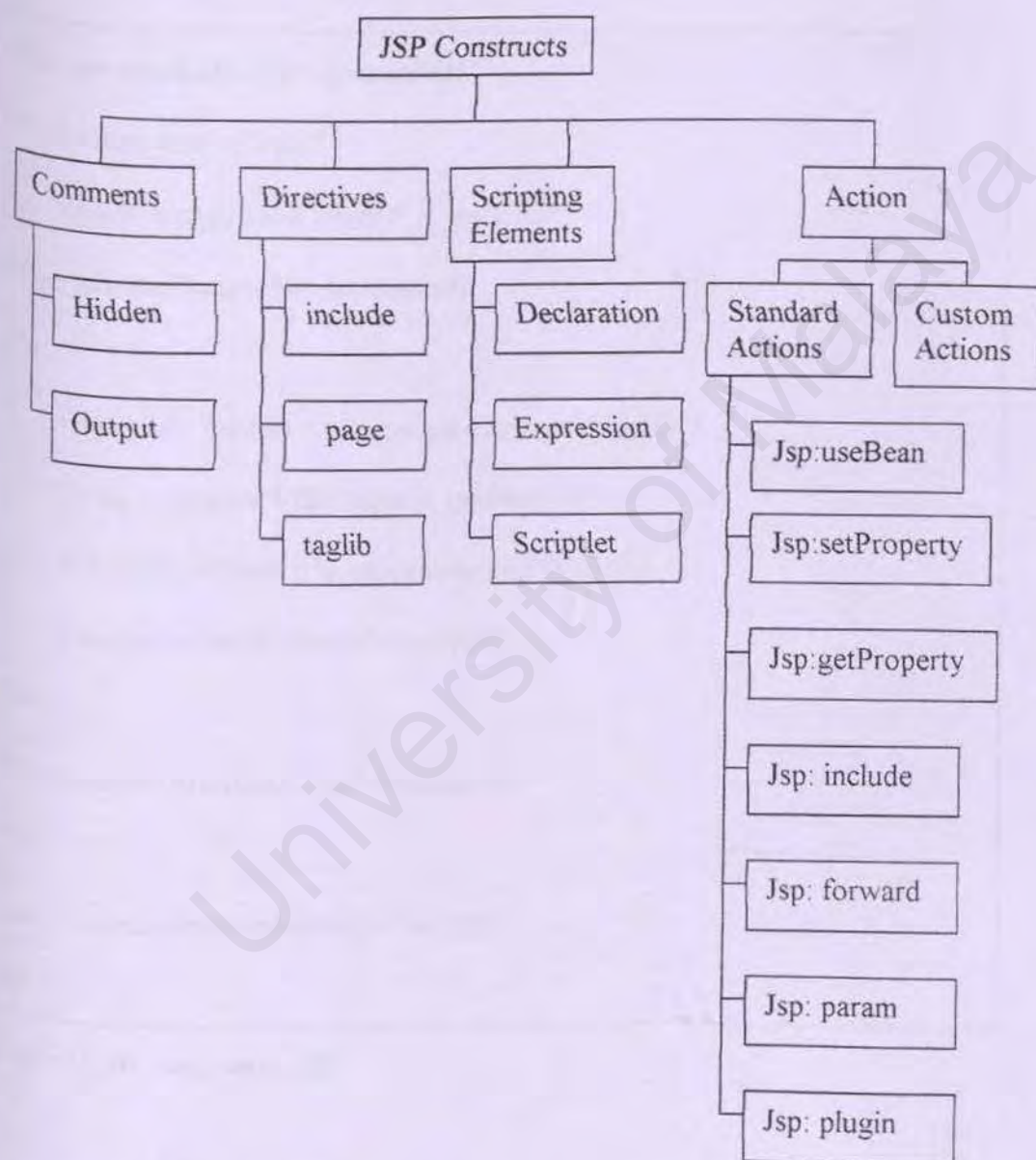


Figure 6.8 : chart of all JSP constructs

Below shows the sample code of JSP:

```
<%@ page import = "java.io.*"%>
<%@ page import = "java.util.*"%>
```

Figure 6.9: page directive

```
<%-- set attribute --%> (comment)

<% String s_test = "Valid";

    session.setAttribute("SecID",s_test); %>

<%-- get attribute --%> (comment)

<%

    Object obj_getdata = session.getAttribute("SecID");

    String s_getdata = (String)obj_getdata;

    if(s_getdata==null || !s_getdata.equals("Valid"))

    { response.sendRedirect("error.jsp"); }

%>

<%-- remove attribute --%> (comment)

<%

    session.removeAttribute("SecID");

%>
```

Figure 6.10 : session in JSP

```

<%for(int i=0;i<record;i++){
    try{
        if(admin_ID.elementAt(i).equals(userID)){%>
            <tr>
            <td>&nbsp;</td>
            <td><a
href="view_admin_profile.jsp?ID=<%=userID%>&admin_ID=<%=admin_ID.elementAt(i)%>"
font size="3"><%=admin_ID.elementAt(i)%></a></td>
            <td><%=AdminName.elementAt(i)%></td>
            <td><%=Dept.elementAt(i)%></td>
            <td><a
href="edit_admin_profile.jsp?ID=<%=userID%>&admin_ID=<%=admin_ID.elementAt(i)%>&
admin_name=<%=AdminName.elementAt(i)%>">Edit</a></td>
            </tr>
            <%>else{%>
            <tr>
            <td>
            <input type="checkbox" name="list" value="<%=admin_ID.elementAt(i)%>">
            </td>
            <td><a
href="view_admin_profile.jsp?ID=<%=userID%>&admin_ID=<%=admin_ID.elementAt(i)%>"
font size="3"><%=admin_ID.elementAt(i)%></a></td>
            <td><%=AdminName.elementAt(i)%></td>
            <td><%=Dept.elementAt(i)%></td>
            <td><a
href="edit_admin_profile.jsp?ID=<%=userID%>&admin_ID=<%=admin_ID.elementAt(i)%>&
admin_name=<%=AdminName.elementAt(i)%>">Edit</a></td>
            </tr>
            <%>
        } } catch(ArrayIndexOutOfBoundsException ae) {
            break;}
        } %>

```

Figure 6.11 : checkbox controlling in JSP

6.4.5 Servlets

Servlets are server side programs that allow for dynamic presentation of data over the Internet. A servlet can present the html page/form, process and store the data, and present a new page from the gathered data. Servlets provide a component-based, platform-independent method for building Web-based applications, without the performance limitations of CGI programs. In this system DWS, JSP implements the View while servlets are controllers. Web-based servlets typically extend class `HttpServlet`. The servlet file was written in this directory `C:/Tomcat/webapps/ROOT/WEB-INF/classes`. A new folder was created in classes directory. Below shows the sample of servlet in DWS:

```
//created by : Cheah Li Wei
package servlets.login;
import java.util.*;
import javax.servlet.*;
import javax.servlet.http.*;
import beans.*;
public class s_login extends javax.servlet.http.HttpServlet {
//manage doGet method
    public void doGet(
        javax.servlet.http.HttpServletRequest request,
        javax.servlet.http.HttpServletResponse response)
        throws javax.servlet.ServletException, java.io.IOException {
        performTask(request, response);
    }
//manage doPost method
    public void doPost(
        javax.servlet.http.HttpServletRequest request,
        javax.servlet.http.HttpServletResponse response)
        throws javax.servlet.ServletException, java.io.IOException {
        performTask(request, response);
    }
//Returns the servlet info string.
    public String getServletInfo() {
        return super.getServletInfo();
    }
/**
 * Initializes the servlet.
 */
    public void init(ServletConfig config) throws ServletException {
        // insert code to initialize the servlet here
    }
}
```

```

    super.init(config);}
    public void performTask(
        javax.servlet.http.HttpServletRequest request,
        javax.servlet.http.HttpServletResponse response) {

        b_login login;
        login=new b_login();
        //get Parameter from JSP
        String user = request.getParameter("username");
        String pwd = request.getParameter("password");
        try{
        //call bean to check the valid user
        String userID=login.checklogin(user,pwd);

        if(!userID.equals("")){
            response.sendRedirect("../jsp/login/session.jsp?user="+userID);
        }
        else {
            response.sendRedirect(
                "../jsp/login/login.jsp?error=c");
        }

        } catch (Throwable theException) {
            theException.printStackTrace(); } }
    }

```

Figure 6.12 : sample of servlet

6.4.6 Beans

The bean file was written in this directory C:/Tomcat/webapps/ROOT/WEB-INF/classes. A new folder was created in classes directory. Bean is a java file which contain SQL statement. Beans can call by JSP or servlet. Beans is reusable which means "write once, run anywhere".

Below shows the sample of beans:

```

//created by : Cheah Li Wei
package beans;
import java.util.*;
import java.sql.*;

public class b_login extends Object{
    private Vector vPassword = new Vector();
    private Connection dbConn;
    PreparedStatement pstmt=null;
    Statement stmt = null;
    ResultSet rs=null;

```

```

public b_login() {
    super();
}

//validation for login page-----
public String checklogin(String user,String pwd) throws Exception{

    String userID="";
    try{
        dbConn = b_common.getConnection();
        dbConn.setAutoCommit(false);
        StringBuffer temp=new StringBuffer();
        temp.append("SELECT  username,pwd,ID  FROM  personal_info
WHERE username=");
        temp.append(user);
        temp.append(" ");
        temp.append(" AND pwd=");
        temp.append(pwd);
        temp.append("");
        pstmt=dbConn.prepareStatement(temp.toString());
        rs=pstmt.executeQuery();

        while(rs.next()){
            userID=rs.getString("ID");
        }

        dbConn.commit();
        boolean result=close();
    }
    catch(SQLException se){
        System.out.println("error from beans (SQLException)
"+se.toString());
    }
    catch(Exception e){
        System.out.println("error from beans(Exception) "+e.toString());
    }
    return userID;
}

//close the database connection-----
public boolean close() throws Exception {
    try {
        if (rs != null)
            rs.close();
        if (stmt != null)
            stmt.close();
        if (dbConn != null)
        {
            dbConn.close();
        }
    }
}

```

```

    }
    catch (SQLException e)
    {
        System.out.println("error=" + e.toString());
    }

    finally {
        dbConn.close();
        rs = null;
        stmt = null;
        dbConn = null;
    }
    return true;
}
}

```

Figure 6.13 : sample of beans

6.4.7 Deploying A Web Application

JSPs, servlet and their supporting files are deployed as part of web applications. Web applications are deployed in the *webapps* subdirectory of Jakarta-tomcat. The Web application directory structure contains a context root – the top-level directory for an entire web application. We must configure our web application to handle the requests. This configuration occurs in a deployment descriptor, which is stored in a file called *web.xml*. The deployment descriptor specifies various configuration parameters such as the name used to invoke the servlet, a description of the servlet, the servlet's fully qualified class name and a servlet mapping (i.e., the path or paths that cause the servlet container to invoke the servlet). That is the reason we have to create *web.xml* file. Below shows the part of *web.xml* file that written in DWS:

```

<?xml version="1.0" encoding="ISO-8859-1"?>

<!DOCTYPE web-app
  PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
  "http://java.sun.com/dtd/web-app_2_3.dtd">

<web-app>

  <!--servlet definitions -->

  <servlet>
    <servlet-name>
      s_login
    </servlet-name>
    <servlet-class>
      servlets.login.s_login
    </servlet-class>
  </servlet>

  <!-- Servlet Mapping -->

  <servlet-mapping>
    <servlet-name>
      s_login
    </servlet-name>
    <url-pattern>
      /servlets/login/s_login
    </url-pattern>
  </servlet-mapping>

</web-app>

```

Figure 6.14 : part of web.xml

Chapter 7: System Testing

7.0 Introduction

Testing is focused on finding faults, and there are many ways we can make our testing effort more efficient and effective. It is a series of steps that helps assure the quality of the eventual system. Testing provides a method to uncover logical error and to test the system reliability. Once we have coded the program components, it is time to test them. Testing should involve several stages:

7.1 Testing Techniques

7.1.1 Ad Hoc Testing

Ad Hoc or ad lib testing means simply play with the functioning unit, trying whatever comes to their mind, in attempt to make it fail. This type of testing was a fast and efficient way of debugging code errors during the early development stage. The disadvantage of Ad Hoc testing is it usually finds many errors and never be sure what was or was not to be tested.

7.1.2 White Box Testing

White Box Testing basically involved analyze the structure of the code and use knowledge about the structure of a component to derive test data. The advantage of white box testing is that an analysis of the code can be used to find out how many test cases are needed to guarantee a given level of test coverage. Those code coverage that were tested under this phase including basic path testing, data flow testing, path testing and loop testing. It is focused on the idea of coverage. The main objective is to check for missing function.

For example, the loop testing was done on data retrieving function where there are extensive usages of loop like DO UNTIL ... LOOP

7.1.3 Black Box Testing

Black Box Testing is concentrate on the functionality of code. The main objective is to uncover those wrong functions programmed correctly by feeding the input to the black box and take notes on what output is produced. The test object's behavior can only be determined by studying its inputs and the related outputs.

The advantage of this kind of testing is that a black box is free of the constraints imposed by the internal structure and logic of the test object. However the disadvantage is that it is not always possible to run a complete test in this manner.

Those tests that tested during this phase including boundary value analysis, error guessing and domain testing.

7.2 Testing Strategies

7.2.1 Unit Testing

Testing is carried out during development of units in the modules and component. This type of testing is most frequently used because units are the basic of system.

In unit testing, the most basic units of the system the individual modules are tested. A module is tested independent of other modules. The sub modules and input forms are verified and the flow from form to form is tested first. It is following by the testing of the relation between pages and shared-data integrity. The main

objective of unit testing is to ensure program accuracy, data integrity, usability and efficiency at the module level.

7.2.1.1 Unit Testing For General Module

| No | Test Procedure | Test Result |
|----|---|--|
| 1. | Fill login page | <ul style="list-style-type: none"> • If success, there is three possibility. <ol style="list-style-type: none"> i) If the user is administrator, administrator's main page will be shown. ii) If the user is supervisor, supervisor's main page will be shown. iii) If the user is staff, staff's main page will be shown. • Error message "Invalid username or password" will be shown. |
| 2. | Fill administrator change password form | <ul style="list-style-type: none"> • Success message is shown is change password form is updated successfully. • Error message will appear. |
| 3. | Fill supervisor change password form | <ul style="list-style-type: none"> • Success message is shown is change password form is updated successfully. • Error message will appear. |
| 4. | Fill staff change password form | <ul style="list-style-type: none"> • Success message is shown is change password form is updated successfully. • Error message will appear. |

Table 7.1 : Unit Testing For General Module

7.2.1.2 Unit Testing For Administrator Module

| No | Test Procedure | Test Result |
|----|--|--|
| 1. | At department list page, after user check the checkbox then click "Delete" button. | <ul style="list-style-type: none"> • Success message is shown if selected department successfully deleted. • Error message is shown if fail to |

| | | |
|----|---|--|
| | | delete the department. |
| 2. | Fill new department form, then click "Add New Department" button. | <ul style="list-style-type: none"> • Success message is shown if the new department submitted successfully. • Error message is shown if fail to submit the new department. |
| 3. | Fill update department form, then click "Update" button. | <ul style="list-style-type: none"> • Success message is shown if the department updated successfully. • Error message is shown if fail to update the department. |
| 4. | At administrator list page, after user check the checkbox then click "Delete" button. | <ul style="list-style-type: none"> • Success message is shown if selected administrator successfully deleted. • Error message is shown if fail to delete the administrator. |
| 5. | Fill new administrator form, then click "Proceed" button. | <ul style="list-style-type: none"> • If success, it will goes to fill the administrator login form. • Error message will be shown. |
| 6. | Fill administrator login form, then click "Submit" button. | <ul style="list-style-type: none"> • Success message is shown if the new administrator submitted successfully. • Error message is shown if fail to submit the new administrator. |
| 7. | Fill update administrator profile form, then click "Update" button | <ul style="list-style-type: none"> • Success message is shown if the administrator profile submitted successfully. • Error message is shown if fail to submit the new administrator. |
| 8. | At supervisor list page, after user check the checkbox then click "Delete" button. | <ul style="list-style-type: none"> • Success message is shown if selected supervisor successfully deleted. • Error message is shown if fail to |

| | | |
|----|---|--|
| | | delete the supervisor. |
| 9 | Fill new supervisor form, then click "Proceed" button. | <ul style="list-style-type: none"> • If success, it will goes to fill the supervisor login form. • Error message will be shown. |
| 10 | Fill supervisor login form, then click "Submit" button. | <ul style="list-style-type: none"> • Success message is shown if the new supervisor submitted successfully. • Error message is shown if fail to submit the new supervisor. |
| 11 | Fill update supervisor profile form, then click "Update" button | <ul style="list-style-type: none"> • Success message is shown if the supervisor profile submitted successfully. • Error message is shown if fail to submit the new supervisor. |
| 12 | At staff list page, after user check the checkbox then click "Delete" button. | <ul style="list-style-type: none"> • Success message is shown if selected staff successfully deleted. • Error message is shown if fail to delete the staff. |
| 13 | Fill new staff form, then click "Proceed" button. | <ul style="list-style-type: none"> • If success, it will goes to fill the staff login form. • Error message will be shown. |
| 14 | Fill staff login form, then click "Submit" button. | <ul style="list-style-type: none"> • Success message is shown if the new staff submitted successfully. • Error message is shown if fail to submit the new staff. |
| 15 | Fill update staff profile form, then click "Update" button | <ul style="list-style-type: none"> • Success message is shown if the staff profile submitted successfully. • Error message is shown if fail to submit the new staff. |
| 16 | Administrator view staff's scheduler, user select month and | <ul style="list-style-type: none"> • If the selected month and year has records, the list of data will be |

| | |
|----------------------|---|
| year then click "Go" | <p>shown.</p> <ul style="list-style-type: none"> • If the selected month and year has no record, "Sorry the selected month/year has no record" will be shown. • Error message will be shown |
|----------------------|---|

Table 7.2 : Unit Testing For Administrator Module

7.2.1.3 Unit Testing For Supervisor Module

| No | Test Procedure | Test Result |
|----|--|--|
| 1 | Supervisor check the checkbox then click "Remove Staff" | <ul style="list-style-type: none"> • Success message is shown if selected staff successfully removed. • Error message is shown if fail to remove the staff. |
| 2 | Supervisor view the staff list (those who haven't selected by supervisor) by select the department then click "Go" | <ul style="list-style-type: none"> • If the selected department has staff (those who haven't selected by any supervisor), a list of staff will be shown. • If the selected department has no staff (all staff are selected by supervisor), "Sorry no record in selected department or staff are being selected by other supervisor" will be shown. • Error message will be shown. |
| 3. | Supervisor assign new staff by check the checkbox then click "Assign New Staff" | <ul style="list-style-type: none"> • Success message is shown if selected staff successfully assigned into list. • Error message is shown if fail to assign the staff. |
| 4. | Supervisor view a list of staff's scheduler, user select month and year then click "Go" | <ul style="list-style-type: none"> • If the selected month and year has records, the list of data will be shown. • If the selected month and year has no record, "Sorry the selected month/year has no record" will be shown. |

| | | |
|----|--|--|
| | | <ul style="list-style-type: none"> Error message will be shown. |
| 5. | Supervisor check the checkbox then click "Delete Task" | <ul style="list-style-type: none"> Success message is shown if selected task successfully deleted. Error message is shown if fail to delete the task. |
| 6. | Supervisor fill in the add new comment form then click "Add" | <ul style="list-style-type: none"> Success message is shown if the comment submitted successfully. <p>Error message is shown if fail to submit the comment.</p> |
| 7. | Supervisor fill in the update comment form then click "Update" | <ul style="list-style-type: none"> Success message is shown if the comment submitted successfully. Error message is shown if fail to submit the comment. |

Table 7.3 : Unit Testing For Supervisor Module

7.2.1.4 Unit Testing For Staff Module

| No | Test Procedure | Test Result |
|----|--|---|
| 1. | Staff views a list of scheduler, user select month and year then click "Go". | <ul style="list-style-type: none"> If the selected month and year has records, the list of data will be shown. If the selected month and year has no record, "Sorry the selected month/year has no record" will be shown. Error message will be shown. |
| 2. | Staff check the checkbox then click "Delete Task" | <ul style="list-style-type: none"> Success message is shown if selected task successfully deleted. Error message is shown if fail to delete the task. |
| 3. | Staff fill in the new task form then click "Submit" | <ul style="list-style-type: none"> Success message is shown if the task submitted successfully. Error message is shown if fail to |

| | | |
|----|--|--|
| | | submit the task. |
| 4. | Staff fill in the update task form then click "Update" | <ul style="list-style-type: none"> • Success message is shown if the task submitted successfully. • Error message is shown if fail to submit the task. |

Table 7.4 : Unit Testing For Staff Module

7.2.2 Integration Testing

This type of testing is a test between two or more modules. It is to make sure that each module of the system can integrate with each other. This integration is planned and coordinated so that when failure occurs, we have some idea of what caused it.

Bottom up approach is the most suitable integration testing method. It is because DWS is divided into administrator part, supervisor part and staff part and the all the modules are integrated as one main system. Each module was tested individually. Then each module was tested together. And finally the while system was tested as a whole.

After finished the integration test, errors and faults discovered were corrected in development in order to proceed to the system testing phase.

7.2.2.1 Integration test

When administrator profile, supervisor profile, staff profile are tested, these sub modules are integrated into an upper level big module called administrator module.

Administrator module

| No. | Test Procedure | Expected output | Test Result Analyzing |
|-----|--|---|--|
| 1. | Click the department button. | Department list is displayed | The department list is displayed at the window. |
| 2. | Add new department | New department is added into database. | Insertion successfully is displayed at the window. |
| 3. | Modify department. | The department's name and description are edited permanently. | Updated successfully is displayed at the window. |
| 4. | Check the checkbox at department list then click "Delete" | The selected record is deleted. | Deleted record is achieved. |
| 5. | Click the administrator button. | Administrator list is displayed. | The administrator list is displayed at the window. |
| 6. | Add new administrator | New administrator is added into database. | Insertion successfully is displayed at the window. |
| 7. | Modify administrator profile. | The profile is edited permanently. | Updated successfully is displayed at the window. |
| 8. | Check the checkbox at administrator list then click the "Delete" button. | The selected record is deleted. | Delete record is achieved. |
| 9. | Click the supervisor button. | Supervisor list is displayed. | The supervisor list is displayed at the window. |
| 10. | Add new supervisor. | New supervisor is added into database. | Insertion successfully is displayed at the window. |
| 11. | Modify supervisor profile. | The profile is edited permanently. | Updated successfully is displayed at the window. |

| | | | |
|-----|---|---|--|
| 12. | Check the checkbox at supervisor list then click the "Delete" button. | The selected record is deleted. | Delete record is achieved. |
| 13. | Click the staff button. | Staff list is displayed. | The staff list is displayed at the window. |
| 14. | Add new staff | New staff is added into database. | Insertion successfully is displayed at the window. |
| 15. | Modify staff profile. | The profile is edited permanently. | Updated successfully is displayed at the window. |
| 16. | Check the checkbox at the staff list then click the "Delete" button. | The selected record is deleted. | Delete record is achieved. |
| 17. | Select the month and year from the drop down list then click "Go" | The scheduler in selected month and year are retrieved from database. | The list of scheduler is displayed at the window. |
| 18. | Click the hyperlink of activities at the scheduler list page. | The details of selected task are displayed. | The details of the task are displayed at the window. |
| 19. | Modify the password. | The password is edited permanently. | Updated successfully is displayed at the window. |

Table 7.5 : Integration test for administrator module

Supervisor Module

| No. | Test Procedure | Expected output | Test Result Analyzing |
|-----|---|--|---|
| 1. | Click the staff list. | Staff list is displayed. | The staff list at main page is displayed at the window. |
| 2. | Assign new staff. | The record is insert under the staff list. | Insertion successfully is displayed at the window. |
| 3. | Check the checkbox at staff list then click "Remove Staff" | The staff is removed from the list but the profile still exists in database. | Removed staff is achieved. |
| 4. | Select the month and year then click "Go" at selected staff scheduler | The scheduler is displayed. | The scheduler is displayed at the window. |
| 5. | Click the hyperlink "Add" or "*" at the scheduler. | The details of the task are displayed. | The details of the task are displayed at the window. |

| | | | |
|----|--|--|--|
| 6. | Check the checkbox at the scheduler list then click "Delete" | The selected record is deleted. | Delete record is achieved. |
| 7. | Modify the comment. | The comment is edited permanently. | Updated successfully is displayed at the window. |
| 8. | Add the comment | The new comment is inserted into database. | Insertion successfully is displayed at the window. |
| 9. | Modify the password. | The password is edited permanently. | Updated successfully is displayed at the window. |

Table 7.6 : Integration test for supervisor module

Staff Module

| No. | Test Procedure | Expected output | Test Result Analyzing |
|-----|---|---|--|
| 1. | Select the month and year from drop down list then click "Go" | The scheduler is displayed. | The scheduler is displayed at the window. |
| 2. | Check the checkbox at the scheduler list then click "Delete" | The selected record is deleted. | Delete record is achieved. |
| 3. | Add new task | The new task is inserted into database. | Insertion successfully is displayed at the window. |
| 4. | Modify the task | The record is edited permanently. | Updated successfully is displayed at the window. |
| 5. | Modify the password. | The password is edited permanently. | Updated successfully is displayed at the window. |

Table 7.7 : Integration test for staff module

message ask user to login again. This protection is use to prevent another unauthorized user try to modify or delete the information by clicking the back icon in Internet Explorer.

| No. | Test Procedure | Expected output | Test Result Analyzing |
|-----|--|---|---|
| 1. | Type the username and password to login to DWS system. | Login successfully and main page is displayed. | The username and the password are checked. When the authorize user login, main page is displayed at the window. |
| 2. | Logout by clicking the logout button. | Completely logout page is displayed. | Completely logout, a session for the user is removed. |
| 3. | Click the back icon | An error page will be shown. This page ask user to login again. | After the user had logout from DWS system. The session is removed. An objective of preventing a logout user to modify or delete the record in DWS system is achieved by clicking the back icon. |

Table 7.8 : Test cases for session

7.2.3.3 Performance Testing

This testing is carrying out after the function testing process. When the system performs the function required by the requirements, the testing process then turn to test the way in which those function are performed. Thus, the performance testing addresses the non-functional requirements.

7.2.4 User Acceptance Test

Although all testing discussed earlier have been performed, another important testing will be user acceptance test. End user will be the user that will be using this system. So, user acceptance test is important to get a view of this

system and any comment from them is useful to enhance this system based on their requirement.

I had given out form for user acceptance test to 25 people. Among them some are computer literate and vice-versa. (Please refer the user acceptance form in Appendix B). Below shows the comment given by most of the user.

- i) The system is easy to understand.
- ii) The user interface is user-friendly.
- iii) Necessary and useful functions are included.
- iv) This system runs too slow.

7.3 Analysis Of Test Result

From all the testing process that has been carry out, test results can be summarized as follow:

7.3.1 Achieving the main objective of the project.

Generally, the main objectives of the project as described in Chapter 1 have been achieved.

7.3.2 Enhancement on the user interfaces

The user interface for the system should be more attractive and user-friendly in order to attract the user to use the system. As some of the user may not be computer literate, it is important to provide an easy to user interface.

Chapter 8 : System Evaluation

8.0 Introduction

Evaluation is a process that occurs continuously at all phases of the system development. It is the post-implementation review to determine strengths and limitations/ constraints of the system.

8.1 Problems Encountered And Recommended Solutions

8.1.1 Determine scope of the system

Since there was no prior experience in developing a system, it was difficult to determine to which extent to define the scope of the system so that it can be completed within the given time frame. However, this was overcome by analyzing -- and studying all of the capabilities that Java technology can do before determining the scope of the system.

8.1.2 Time Constraint

During the design phase, there was not enough time to study and produce the best solution of design in Semester 1. Two of the main programming language I have to study is Visual Basic 6.0 and ASP. Mainly, this was due to inexperience and insufficient knowledge of designing a system. The best way to learn is to read as many approaches used in previous year students' report documentation

8.1.3 Problems on Installation

There were a lot of problems on installing and configuring Windows NT server 4.0, IIS and other tools before starting coding. The needed software and tools

were successfully installed only after a few times of formatting and reinstallation.

From experience, it is essential to know the sequence of products installations. This is to ensure smooth execution without system errors. This vital information about installation sequence is not provided in a user-friendly way to guide user.

8.1.4 Not fully supported by different browser

The appearance of web pages is different on Internet Explorer 6 and Netscape Navigator and Communicator during the testing phase, such as different positioning of graphics, text, and tables on these web browsers. The main cause of these problems couldn't be detected.

8.1.5 No prior experience in the chosen programming languages

Due to prior inexperience in JavaScript, JSP scripting, servlet and bean, there was a learning curve in understanding how the JSP objects work. Scripting in a new environment such as JSP requires some knowledge of what the JSP objects do and how to use the objects to build the required functionality of the web application. The best way of learning JSP scripting during this project was going through some of the JSP examples available on the JSP reference books, Internet and also Microsoft's web site. Those examples are simple and easy to understand how JSP works.

8.2 System Strength

8.2.1 User-friendly

The system is considered as user friendly and data integrity. Its interfaces are intuitive where the users can easily get accustomed to the system's style. Normally, users will not face problems when using the system although they are computer illiterate.

8.2.2 Insert and update function

Insert new records and update function only valid for authorized users.

8.2.3 Reliable system with effective errors handling

Input of the users will be validated and verified to prevent the errors caused by invalid input. If there is any error or invalid input occurred, an error message is generated and displayed to inform the user about the error. For example, "Access was denied because username and/or password was invalid!" will prompt out when the users input invalid username or password.

8.2.4 Auto generated ID.

System will auto generate an ID for a new Account. This can avoid a repeated ID used because mistake of user.

8.2.5 Transparent

System is transparent, as users do not need to know where the database resides, how the system is structured, etc. For example, users do not need to know

how to retrieve from and insert records into the database. All they need to do are submit keywords and then view query results.

8.3 System Limitations

Despite some of the system strengths mentioned previously, there are limitations, which cannot be researched and developed due to time constraint.

Those limitations are:

- Password is not encrypted.
- Not secure enough - All the information in DWS database is not secured enough although username and password are required before the user entry the system. This because it is not being encrypted. Therefore, the secrecy or integrity threats still exist.

8.4 Future Enhancement

The DWS provides you with a functional framework from which to evolve. Here are some future enhancement's suggestions for the DWS system.

- **Encryption and decryption of password.**

Password should be encrypted before store in database and decrypted during password retrieval process.

- **Retrieve history data**

Data that had deleted by user should insert into another table so that history data can be retrieved.

- **Permission to delete data**

Any user (administrator, supervisor or staff) who wants to delete other user's data should get permission.

- **Print function**

This DWS should have a print function.

- **Generate Report**

The function of generating report should be increased. Active or inactive records, daily, monthly, weekly and yearly records, should be generated.

8.5 Project Conclusion

As a conclusion, this project has achieved to deliver the system in time and fulfilled most of the objectives and requirements as determined during system analysis phase.

This application provides new administrator, supervisor and staff functions, manage scheduler and generate report functions. Apart of that, DWS also achieves a paperless environment and saves the human resource as well.

Throughout this project, there were a lot of knowledge and experience gained. As the project progressed, so did the number of clearer views on how Internet technologies work, JSP concepts. Learning to program in HTML, JSP, servlets, beans, xml, JavaScript and so on proved to be a valuable experience and knowledge. Besides, skills in using software such as Microsoft FrontPage have been acquired.

While programming skills are essential, good practice on software engineering techniques must also be applied efficiently. This project has provided the good chance to experience using the techniques and approaches learned from System Analysis & Design and Software Engineering courses in the second year and third year study respectively.

As mentioned before, the system scope was defined through prototyping model. This makes the system most expandable in terms of functionality. Enhancement could still made to the system with more features added.

References

- Ashton H. (1997) *Teach yourself database programming with JDBC in 21 days*(1st Ed)
Sams.net
- ASP Roadmap, available <http://www.ahref.com/guides/technology/199806/0601buzprintable.html> (12/7/2002)
- Cay S.H and Gary C. (1999) *Core java 2 volume 1- fundamentals*(1st Ed). Sun Microsystems, Inc.
- Damon H. and Aaron T. (2001) *Core JSP New Jersey*: Prentice Hall.
- Deitel and Deitel (1999) *Java how to program* (3rd Ed). New Jersey: Prentice Hall.
- Dr.Bob, available http://www.nim.com.au/inet_pub/in03002.htm (2/7/2002)
- Dr. Geoff, available http://www.nim.com.au/inet_pub/in03002.htm (2/7/2002)
- Graham H. (2000) *Dynamic web programming*. Prentice Hall PTR New Jersey, 2000.
- Hall, Marty. (2000) *Core Servlets and Java Server Pages New Jersey*: Prentice Hall.
- Karl A. Danny A, Timothy B and Carl B. (2000) *Professional JSP*(1st Ed) UK:Wrox Press Ltd.
- Kendall, K.E and Kendall, J.E (1999) *System Analysis and Design*(4th Ed). United States of America: Prentice Hall.
- Olsen, Neil(1999) *IEEE Software*.
- Pfleeger, S.L (2001) *Software Engineering : Theory and Practice* (2nd Ed). New Jersey: Prentice Hall.
- Post, G.V (1999) *Database management systems: Designing and building business applications Singapore:McGraw-Hill*.
- Ralph, M.S (1996) *Principles of Information System, a managerial approach*(2nd Ed)
High Holborn, London: International Thomson Publishing Europe.

- Schneider G.P and Perry J.T (2000) *Electronic commerce Cambridge, MA: Course Technology*.
- Schussel, available
http://www.sei.cmu.edu/str/descriptions/clientserver_body.html (5/7/2002)
- Sellapan, P. (1999) *Access 2000 (1st Ed)* Selangor: Federal Publication.
- Shawn V. Hernan, available <http://www.microsoft.com/> (28/6/2002)
- Sommerville, I. (2001) *Software Engineering (6th Ed)* Addison Wesley.
- WJ Gilmore, available
http://www.mysql.com/documentation/mysql/bychapter/manual_Introduction.html
 (10/7/2002)

Bibliography

- Boehm, B.W. (1981). *Software Engineering Economics*. Englewood Cliffs, NJ: Prentice Hall.
- Card, David N.(1990). *Measuring Software Design Quality*. Englewood Cliffs, NJ: Prentice Hall.
- Sammet, Jean (1969). *Programming Languages: History and Fundamentals*. Englewood Cliffs, NJ: Prentice Hall