Agent Technology
In Web Based Time Scheduling

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February 2001

Acknowledgements

First and foremost, my gratitude to the Almighty God for His Blessings and for bestowing me good health to complete this research.

I am also indebted to the following people who have given me their undivided support and generous guidance to see me through in making this project a success.

I am grateful to my supervisor, Dr. Selvanathan Narainasamy for his invaluable notes/comments and guidance in helping me shaped and planned this project.

My thanks are also due to my moderator, Dr. Rodziati for her constructive comments on the project.

I am deeply indebted to Puan Sharifah Fazliyaton of UUM for the "intellectual banter" we shared over the Internet and for the invaluable comments made on my draft.

Finally, my gratitude to the pillar of my strength - my family, Azrul Nizam and friends for their understanding and constant support. Thank you.

Abstract

The technology age has, in many ways, makes life easier for human beings. Gone are the days when it takes few days up to few weeks to get letters from one place to another. The emergence of Internet, with its e-business, e-commerce and the like, has left the running of the human life to a click of the mouse with a tool that fits into our palm.

Similarly, student's enrolment and registration at the university can be done easily and effectively via the Net. The idea of Virtual University, which was once seen as an impossible venture, a foolish dream has finally been materialized. In fact, every day more and more information technology systems and programs have been churned out to facilitate the education field, in particular.

This research paper seeks out to come out with a program to help facilitate the Time Table through the Internet. As nowadays the Internet can be access anywhere. People may check the timetable in Web pages. This project will only focusing in FSCIT, UM environment.

This document is documentation for the Agent Technology in Web Based Time Scheduling. This paper consists of seven chapters, which covers all the research carried out on this new technology.

Chapter 1 is an introduction about the project WXET 3181 Latihan Ilmiah I. Chapter 2 presents the Literature Review on Agent Technology in Web Based Time Scheduling and the analysis that has been done to identify the usage of this technology to our world.

Chapter 3 discusses the Methodology used and the justification for it. It also covers the tools used and also reviews similar software that has been implemented in the Internet.

Chapter 4 discusses the System Design and the User Interface. It will elaborate the methods used and demonstrates the related diagram used for the System Model.

Chapter 5 presents the Implementation and Testing phase. This chapter will discuss on development of ATWBTS – the web pages, creating images and also the testing phase of the system.

Chapter 6 will discuss about the overall evaluation. Problems occurred and how the developer solves the problems. This chapter also will list out the strengths and limitation of the system. And finally, Chapter 7 is the conclusion.

Appendixes contain the project time line, references used in developing the system, terminology & acronyms and also the user's guide.

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Chapter 1:

Introduction

1.0 Introduction

Nowadays, in the borderless world, computers are becoming more prominent in the comfort of human homes and workplaces. Computers are seen as not only being part and parcel of our present life but they also serve as an important vehicle and tool that is able to carry out a wide range of daily activities. The Agent Technology in Web Based Time Scheduling (ATWBTS), hence, proposes to provide an active assistance to user with computer –based task.

The Agent is expected to play a major role for the Internet navigators and the users of the 'information superhighway'. In our daily life, we often find ourselves seeking for help or assistance in our quest to get our work done and in this superhighway world; the agent can help solve human problem by customizing information to user's preferences.

Currently, in University of Malaya's Science Computer and Information Technology faculty, there are two lecture's halls, one auditorium, eleven laboratories, five lecture's rooms and six tutorial rooms. Very often, both students and lecturers face difficulties in securing a venue to be used at a certain time with the right capacity to accommodate a certain number of users.

Why ATWBTS?

Bearing this problem in mind, this application sets out to help people, at large and students and lecturers, specifically, to find vacancy of those venues at the required time and date. This agent will search according to the data given available in the

schedules written in the web pages. The administrators will monitor and control these web pages.

1.1 Objectives

- To create a program that can accomplish a complex, task and narrow defined task.
- To allow user to access directly to the information they want from the Internet.
- To help users find suitable time and the most appropriate venue to accommodate the number of users at the required time at the FSCIT.

1.2 Project Scope

- To employ the use of intelligent agent in our environment.
- Implement an interactive program based on the web.
- Implement a secured system – password protected for the administrator's access
- Investigation of the techniques and knowledge acquisition for the agent technology.
- Implement interactive web pages to deploy information to students and lecturers.

1.3 Significance

The emergence of the Internet has changed numerous things. It helps users to find information about almost everything worldwide. And because of the thousands of information available in the Internet, we need to specify accurately our needs and wants in the web. This is how the Agent Technology can be put to use.

In this case, the lecturer, students and administrators will no longer required to go through the mundane manual procedures in obtaining information regarding to the vacancies and availability of the lecture's venues and laboratories. Instead, the ATWBTS is proposed to focus on simplifying the procedures with the intention of implementing the system on web.

The challenge here is to conduct research and to work on the analyses before the application can be implemented in the web. Understanding the system and developing a powerful system that can fulfill the user's expectation would be the biggest challenge. This will require some intelligence to create such software.

1.4 Project Management

Project management is to ensure that the development of the project is carried out consistently. Good management cannot guarantee project success. However, bad management usually results in project failure. (Ian Sommerville, 1995).

During the development of this project, there are several activities to be considered:

- Proposal writing

  In the first week, the proposal was given to the supervisor. The proposal describes the objectives and the scope of the project.

- Project planning & scheduling

  This is where we identify the activities and determine how each task fits into the process. In addition, it also defines the sequence in which task is carried out.

- Project monitoring & reviews

  Monitoring keeps track of project progress. Informal monitoring will predict project problems as it may reveal difficulties as they occur. Project management reviews will see whether the best technical approach has been adopted. They are also necessary to decide what is to be done in further project phases.

- Evaluation & report writing

  The project will then be evaluated and the results will be presented in a report.

Chapter 2:

Literature Review

2.0 Literature Review

2.1 Purpose

In the process of developing the ATWBTS, many researches have been carried out to understand the intelligent agent technology. It is best first, to examine what are Intelligent Agent and Agent Technology. The research on this project also covers the field of the Internet development, the evolution and various new concepts in conjunction with the Intelligent Agent. A review on the software and the programming tool used to develop the system is also included.

2.2 Approach

There are few sources in searching and gathering for the information:

- Internet
- Library resources

2.2.1 Internet

The Internet is teeming with a variety of information. Therefore, I've used a few search engines in order to obtain related information. The search engines used are:

- www.altavista.com
- www.yahoo.com
- www.google.com
- www.catcha.com.my
- www.cari.com

- www.geocities.com
- www.tripod.com
- www.member.xoom.com

The search engines were mainly used:

1. **To locate documentation or discussion on this topic.**

   The purpose is to find out if there is any documentation on this topic. The keywords used are:

   - Agent Technology
   - Intelligent Agent

2. **To identify similar software available on the net.**
3. **To search for information on how to build a similar system.**
4. **To obtain some points available in constructing an efficient website and search engine.**

2.2.2 Library resources

Some books on designing the system and software used are obtained from the main library of University of Malaya, National Library and the MPPJ Library, PJ. The readings made are essential to get a better comprehension on constructing a good system.

2.3 Analysis

This section will explain the Intelligent Agent and Agent Technology and will summarize the findings from various resources stated in the previous section.

2.3.1 What is Intelligent Agent and Agent Technology?

The Intelligent agent is software that assists people and acts on their behalf. It will execute special tasks that require some intelligence. The Agent Technology, on the other hand, is similar to the metaphor. The metaphor is that a personal assistant who is collaborating with the users in fulfilling their needs, interest and preferences.

The IBM Agent Strategy defines Intelligent Agents as software entities that carry out some set of operations on behalf of a user or another program with some degree of independence or autonomy, and in so doing, employ some knowledge or representation of the user's goal or desires". This explains that the Agent is acting for another, with authority granted by another.

The Agents assist users in a range of different ways (Pattie Maes, 1997) :

- They perform tasks on the user's behalf
- They can train or teach the user
- They help different users collaborate
- They monitor events and procedures

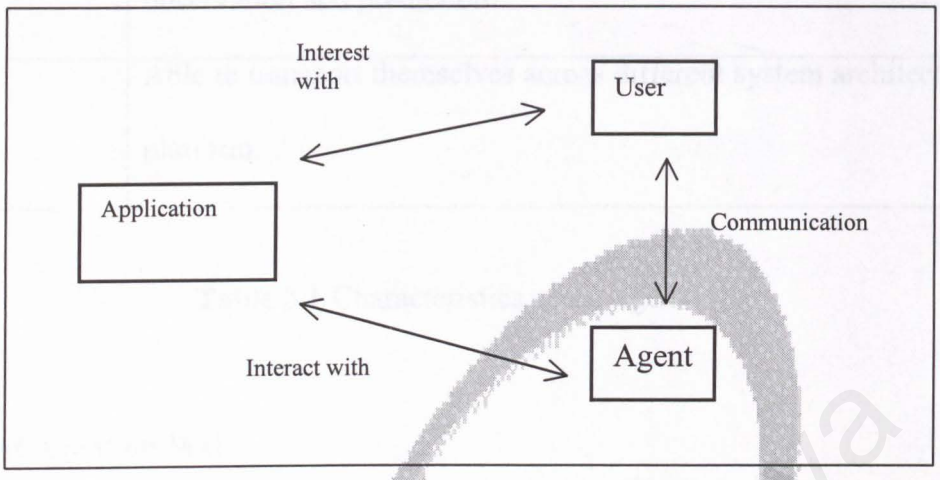


Figure 2.1: The interface agent does not act as an interface or layer between the user and the application. Rather, it behaves as a personal assistant that cooperates with the user on the task. The user is able to bypass the agent.

In order for this agent to be useful and acceptable, it must first satisfy the following characteristics:

Property	Meaning
Reactive	It can perceive changes in its environment and responds in a timely fashion to these changes.
Autonomous	Has control over its own actions in following ways : a) Goal-oriented b) Collaborative
Communicative	Able to interact or communicate with other agents, software program or perhaps human. It can be created to handle undedicated task.
Learning	Ability to change its behavior based on previous experiences –

	observation and prediction.
Mobility	Able to transport themselves across different system architecture and platform.

Table 2.1 Characteristics of an Agent

Intelligent Agent on Web

On the Internet, an Agent is a program that gathers information or performs some other services without the user's presence and follows some regular schedule. It will search all or some part of the Internet using the parameters given and will gather the information. The practice or technology of having the information brought to the user by an agent is sometimes referred to as *push technology*. Good agents will allow people to spend less time searching for the information.

Type of Agent on the Web

There are five main areas on the web where the agents can be utilized:

- Research and analysis
- Building 'communities'
- Selling products, services and content (electronic commerce)
- Providing entertainment
- Assistance in the realm of network management, adaptive user interfaces, document workflow, customer service and other areas.

2.3.2 Software

Software Evaluation

The software evaluation is made based on these factors (Kendall & Kendall, 1999):

- Performance effectiveness
  - Able to perform all required task
  - Able to perform all tasks desired at some point in the future
  - Has well designed display screens
  - Has adequate capacity
- Performance efficiency
  - Fast response time
  - Efficient input
  - Efficient output
  - Efficient storage of data
- Ease of use
  - Satisfactory user interface
  - Help menus available
  - ReadMe files for last minute changes
  - Flexible interface
  - Adequate feedback
  - Good error recovery

- Flexibility
  - Option for input
  - Option for output
  - Useable with other software
- Quality of documentation
  - Good organization
  - Adequate online tutorial
  - Web site with FAQ
- Manufacturer Support
  - Teach support hotline
  - Newsletter / email
  - Website with downloadable product updates

Macromedia Dreamweaver

Dreamweaver is a professional visual editor used to create and manage Web sites and pages. Dreamweaver makes it easier to create and edit cross- platform, cross-browser pages. Even a beginner is able to create a web page without facing any difficulties.

Dreamweaver provides advanced design and layout tools, as well as making it easier to use Dynamic HTML features such as animated layers and behaviors without having to write a line of code. The browser checks the work for potential problems on all popular platforms and browsers.

Dreamweaver is fully customizable. We can create our own objects and commands, modify menus and keyboard shortcuts and even write JavaScript code to extend Dreamweaver with new behavior and property inspectors.

Features:

- Easier Installation
- WYSIWYG table support
- Auto correct backlinks
- Hit counters
- Hover Buttons
- Tutorial
- Enhanced integration with Flash and Shockwave

Benefits:

- Intuitive leading- edge features help users crate professional Web Sites, without any programming.
- Intelligent design assistance and innovative imaging tools make it easier than ever to build great – looking Web sites.
- Flexible, open support for the latest technology on the web gives user the power to create the most compelling, original sites on the World Wide Web.
- Manage Web content and site structure effectively.

- Flexible collaboration features let users work with others to create and manage their site.
- Compatibility with the most popular Web browser makes it easier to design and to develop Web sites for any audience

2.3.3 Programming tools

This is where we identify a suitable programming technology and programming language to build the system. The vast array of web development does show that there are many approaches to building a successful web application for deployment on the net. In the ATWBTS, an analysis of the best programming language and technologies for the development was made. There are few factors to be considered when building such system – flexibility, scalability and extensibility. The chosen programming technology and language have met the above-mentioned requirements.

Personal Web Server

A Web server is a program that, using the client/server model and the World Wide Web's Hypertext Transfer Protocol (Hypertext Transfer Protocol), serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that has a Web site must have a Web server program.

The most popular Web servers are Microsoft's Internet Information Server (Internet Information Server), which comes with the Windows NT server; Netscape FastTrack and Enterprise servers; and Apache, a Web server for UNIX-based operating systems. Other Web servers include Novell's Web Server for users of its NetWare operating system and IBM's family of Lotus Domino servers, primarily for IBM's OS/390 and AS/400 customers.

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

2.3.4 Scripting Language

JavaScript

Java script is a language written by Netscape that preceded the European Computer Manufacturer Association (ECMA) standard and is the first Web scripting language to hit the market. It is syntactically identical to Java, which is based on C++, but it is an interpreted language ad compared to Java, which is a compiled language.

It is also a powerful scripting language, which facilitates a disciplined approach to designing a computer program that enhances the web pages. It is also easy to use.

PERL version 5

PERL is a language optimized for scanning arbitrary text files, extracting those text files, and is able to produce report based on that information. It is also practical, easy to use, efficient and complete. PERL uses sophisticated pattern matching techniques to scan large amounts of data very quickly.

Benefits:

- Possible to write much more readable PERL code.
- Error messages are more informative and optional warnings will identify many of the mistakes a novice might make.
- Simplified grammar. Many of the arbitrary grammar rules have been regularized.
- Modularity and reusability. The library is defined in terms of modules, which can be easily shared among various packages.

Common Gateway Interface (CGI)

CGI handles the formatting and the handling of data. The user-written program that processes the user data and sends the results back to the user is called *script*.

There are three ways to obtain the *CGI Script*:

- The user can write his/her on own, usually either in PERL or C programming languages or as a *shell script* on Unix machine.
- Get a programmer to write the script for user.
- Search across the Net, find a script that will work for you, download it to the server and use it.

2.3.5 Similar existing Agent Technology

To get an overview of the system to be built, an analysis of current available Agent technology is done. Unfortunately there was no exact match for the system suggested but there are few examples of agent technology which is similar to the one designed.

Copernic 2000 – by Copernic Technologies Inc.

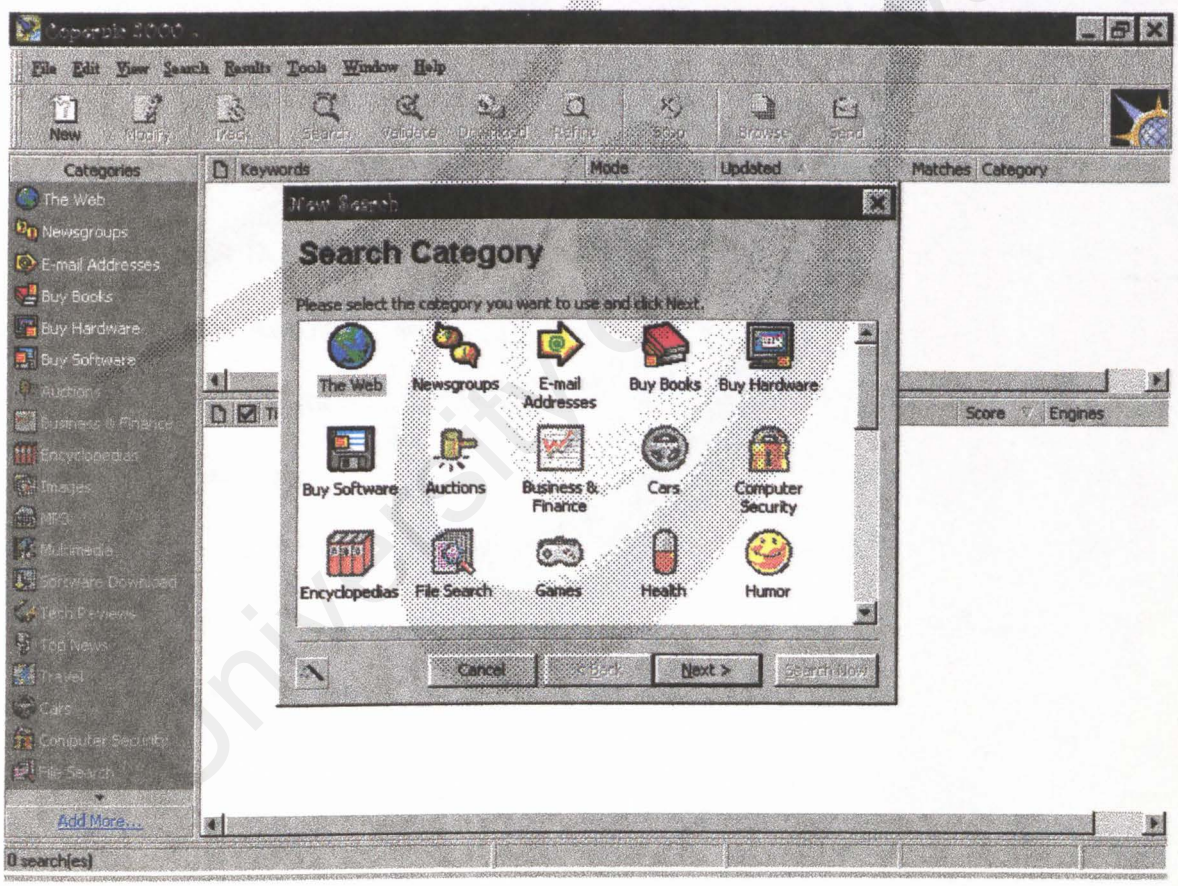


Figure 2.2 : The Copernic 2000

This software is a good example. It is an agent for search engine. The system will search according to the user's preference by combining few search engines. This software is a freeware by Copernic Technologies Inc.

As demonstrated by the figure above, the search options are divided into few categories. They are:

- The Web
- Newsgroup
- Email Addresses
- Buy Books
- Buy Hardware
- Buy Software
- Auctions
- Business and Finance
- Cars
- Computer Security
- Encyclopedias
- File Search
- Games
- Health
- Humor

Once the category has been chosen, the program will ask the user what are the query. The agent will then search according to the user's preference.

Firefly – by AgentsInc.

This agent helps users to find music or film of interest. The users send reviews of movie(s) and music to the Firefly website. When they wish to select a new movie to be viewed or a CD to be bought, they supply data on their personal favorites, and Firefly will produce a list of similar items based on the reviews. The service is being standard to books, restaurants and mutual funds.

Features:

- Firefly identifies product of interest to consumers, but instead of filtering products based on the features, this agent recommends product by using an automated "word of mouth" recommendation mechanism called "collaborative filtering".
- Firefly first comprises a shopper's product rating with those of other shoppers. It identifies users with similar taste. It then recommends products based on recommendation like-minded people. Buyers can use Firefly to find music, restaurant, website and mutual funds.
- Electronic form for purchasing (order form)
- A review

AuctionBot – by Unversity of Michigan

This software allows seller to set up their own auction where buyers and sellers can place bids according to protocol and parameters established by the auctioneers. AuctionBot functions by helping buyers and sellers to come to an agreement with the

quoted prices or other forms of transactions. Using this software, the sellers actually run auctions by selecting the type of auctions and parameter such as clearing time, number of sellers (they wish to use). Then the software will determine the buyer's bidders according to specified parameters.

Features:

- Negotiate multiple terms of transaction, including warranties, delivery time, loan auctions as well as prices.

Chapter 3:

Methodology

3.0 Methodology

3.1 Choosing a problem – solving cycle

It is important to choose the right method in order to solve a problem. The choice is influenced by the nature of the problem in particular (Igor Hawryszkiewycz, 1998):

- The degree of the system architecture
- Familiarity with the technology
- Project Size

3.2 Justification on System Development Life Cycle (SDLC)

SDLC refers to a methodology for developing a system. It is widely used for practical system development and also suitable for a small system. SDLC is also an organized, structured, methodology for developing, implementing and installing a new or revised system. There are few factors underlying the decision to use SDLC to build the system.

The first reason is because SDLC has a good visibility. Each activity or phase produces some deliverables. Good visibility means that every stage will have documents produced which will validate activities. For example in the first stage: Requirement analysis; the output documents will be the feasibility study and the outline requirements. Hence, this will help developers to ensure that every activity work out.

SDLC is a straightforward process. Each stage logically is related to the next stage. The methodology tracks a project from an idea developed by the user, through a feasibility study, system analysis and design, programming, pilot testing, implementation and post-implementation analysis. And thus, any documentation pertaining to each stage will be used in the future when the system is reassessed for its continuation, modification or deletion.

And lastly, SDLC allocate time for each stage. There are time constraints for each stage. This is good because the project will definitely have a budget - cost estimation can be predicted.

3.2.1 Failure of System Development Project

The system development projects failed as a result of the SDLC not being properly followed. It will be a large waste of money, time and resources. The failure of the development is due to:

- Lack of user involvement

  As the users are often not consulted, this lead to the failure of the project. Since the users dislike or are not satisfied with the system, they choose not to use the system.

- Continuation of a flawed design

  This happens when there is a continuation-using fix up to a flawed design. This will create an unstable, unfriendly system.

- Failure of system integration

  Happens when two or more portions of a system do not fit together properly which will also cause the system to be unstable.

3.3 Approach

There are seven step procedures in System development Life Cycle. (Kendall & Kendall, 1997)

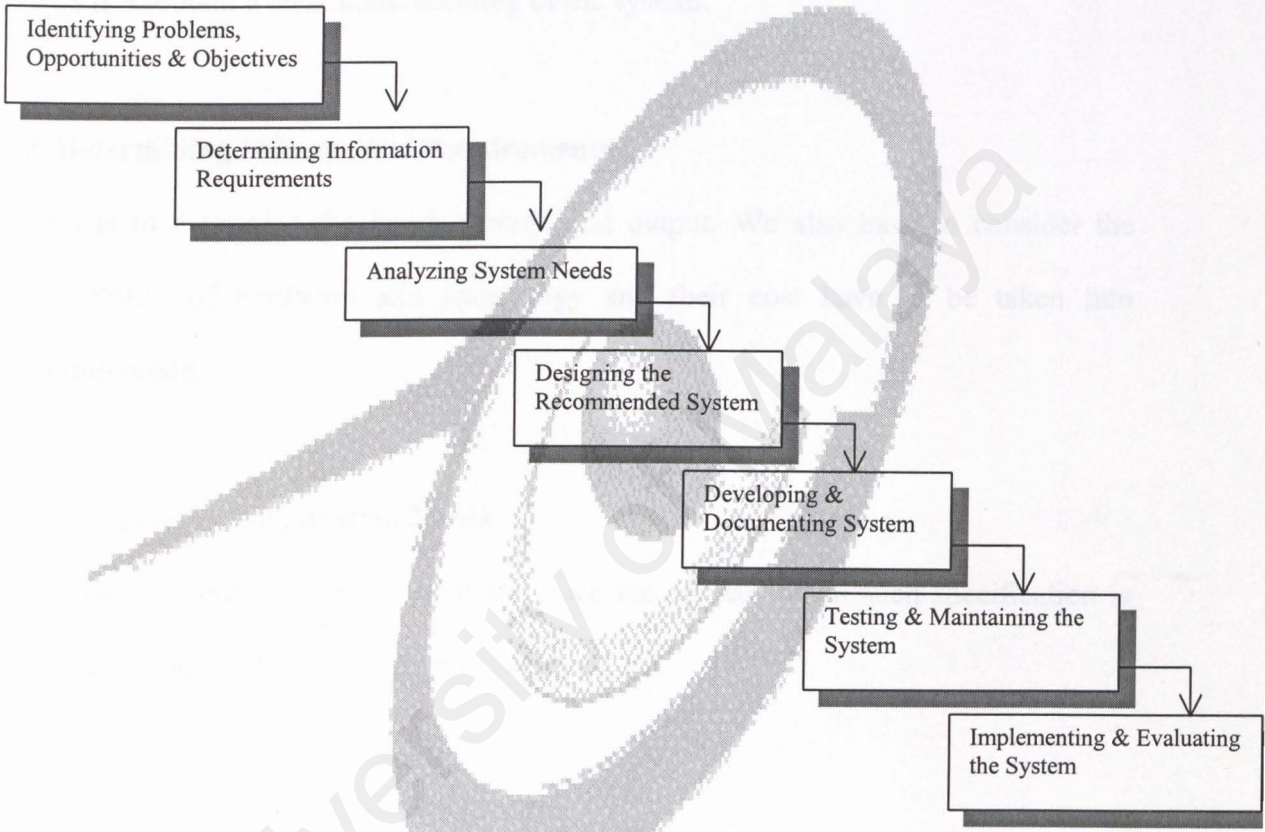


Figure 3.1: System Development Life Cycle

3.4 Development Strategy

1. Identifying Problems, Opportunities and Objectives

This is to obtain a clear understanding of the system.

2. Determining Information Requirements

This is to determine the input, storage and output. We also have to consider the availability of hardware and technology and their cost have to be taken into consideration.

3. Analyzing System Needs

The requirements will be analyze and once the agreement on such specification is reached, then the design can commence.

4. Designing the Recommended System

There are many things to be done here. How the system is to be constructed is determine. System design usually proceeds in two steps: **Broad design** and **detailed design**.

i. Broad design – identifies the main architecture of the proposed system. The architecture is verified against the proposed system model and validated against user requirements.

ii. Detailed design – It starts when the broad design is chosen. This is where the database and program modules are designed and detailed user procedures are documented. The interaction between user and computers are also defined.

5. Developing & Documenting System

After the design has been approved, then it must be developed. This is when the hardware and software is actually required.

6. Testing & Maintaining the System

It is important part of quality assurance. Testing proceeds in parallel with system development.

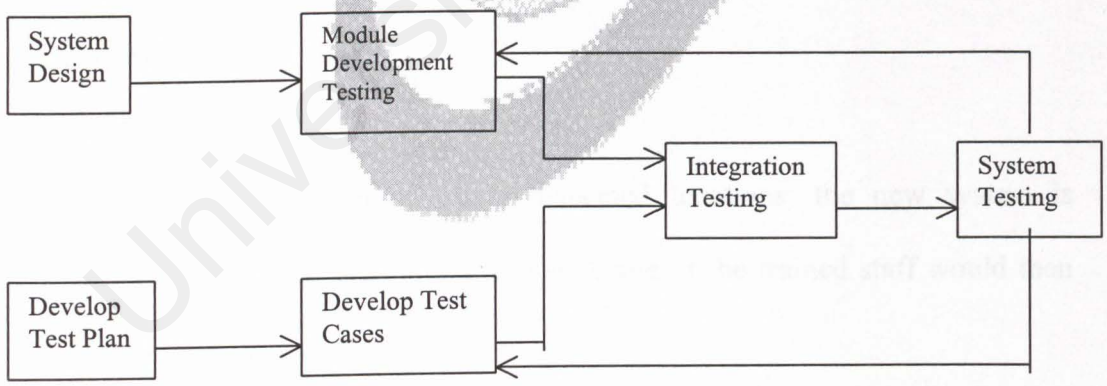


Figure 3.2: Testing Concept

7. Implementing & Evaluating the System

After the system has been developed and testing, it must be implemented. There are four main implementation methods:

- Direct Implementation

  The change to the new system is made all at once. This method is used in a small business or in a larger one where a model was previously developed and thoroughly tested.

- Parallel Implementation

  Both the old and the new systems are up and running at the same time. When the operation of the new system is satisfactory, the old system is shut down.

- Phase Implementation

  Implementation of a part of the system and when it is running satisfactorily, another part follows. This is used for extremely large and complicated systems.

- Pilot Implementation

  If a company has many widely dispersed locations, the new system is implemented in one location at a time. Some of the trained staff would then be moved to the new location

3.5 Proposed Tools

3.5.1 Hardware

A computer with a minimum requirement of hardware as below will be needed to develop ATWBTS.

1. 8 - 16 MB RAM
2. 35 – 40 MB Hard disk space
3. 32 MB for Personal Web Server
4. Network Card

3.5.2 Software

1. Macromedia Dreamweaver 3.0 – for Web development
2. Microsoft Internet Explorer version 4.0 – as a browser to run the system
3. Note Pad – For HTML and PERL coding
4. Microsoft Windows 98 – Operating System
5. Personal Web Server – Web server
6. Microsoft Word 97 – For documentation

3.5.3 Programming tools

1. Active PERL version 5.0
2. HTML
3. Java Scripts
4. CGI

3.6 Justification of the proposed tools

Given the vast choices of technology, it is decided that ATWBTS to be built using Macromedia Dreamweaver as the software is compatible with other programming tools. Java Scripts will be the main scripting language as well as PERL. The approach is chosen because of its simplicity and no additional software requirement needed apart from Windows 98. In addition, Active PERL and Personal Web Server is freeware and downloadable from the Internet.

3.7 Requirement Analysis

It covers the area of functional requirements, non- functional requirements.

3.7.1 Functional Requirement

These are the statement of services the system should provide. It summarizes how the system should react to particular inputs, how the system should behave in some particular situations. It should be complete and consistent.

1. **Time Management Module**

   This module has to do with maintaining the update time-table information. It consists of the date and time for each venue. There will be a password to ensure that all the entered is done by the administrator.

2. **Capacity Management Module**

   This module allows administrator to make changes to the information pertains to the capacity of student s for each venue. This is also a password- protected site to ensure the integrity of the data.

3.7.2 Non- Functional Requirement

Defines the system properties and constraints on the services or function offered by the system. They include timing constraints, constraints on development process, standard and so on. The non-functional requirements can be derived into three types:

a) Product Requirements

Resulted from the need for the delivered product to behave in a particular way.

b) Organizational Requirements

It is a consequence of organizational policies and procedures. Specify where the product and its documentation are to be delivered.

c) External Requirements

Arise from external factors- including interoperability, legislative and ethical.

1. User Friendliness

The system is required to have a very user-friendly interface. GUI is the best approach to the user.

2. Speed

The time required for the system to get the information should be less than 10 seconds.

3. Error Detection

The system should display error message for any errors: wrong password, invalid data input and unsuccessful process.

Chapter 4:

System Design & User Interface

4.0 System design

After evaluation of user's requirement and system needs, the system is design to fulfill the requirements.

4.1 Architectural Design

The objective here is to develop a modular project structure that represents the control relationship between modules. Diagram below represents the architectural design for ATWBTS:

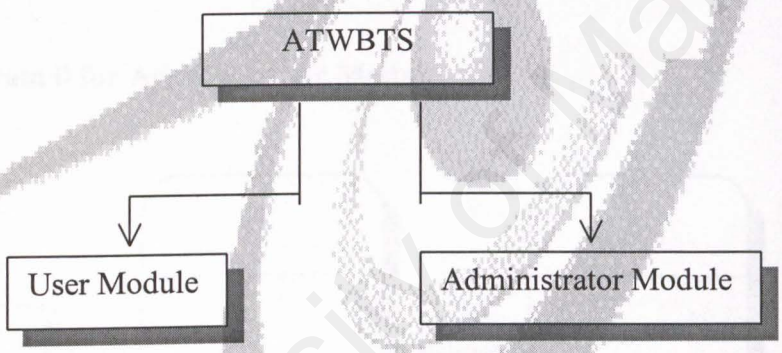


Figure 4.1: Architectural design for ATWBTS

4.2 Context Level Diagram of ATWBTS

4.2.1 Context Diagram for Administrator Module

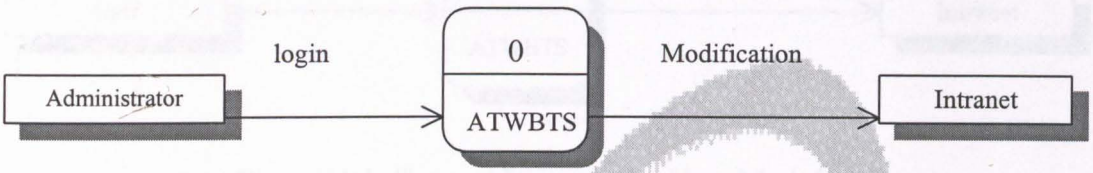


Figure 4.2: Context Diagram for administrator module

4.2.2 Diagram 0 for Administrator Module

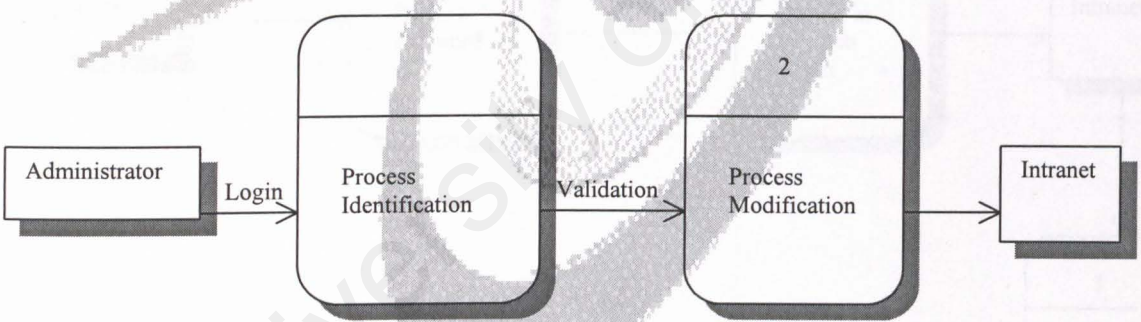


Figure 4.3: Diagram O for Administrator Module

4.2.3 Description for Administrator Module

Administrator will key in the login information: Username and Password. Then Process 1, will verify and validate the user. After validation, the administrator will able to modify or update the information in the intranet.

4.2.4 Context Diagram for User Module

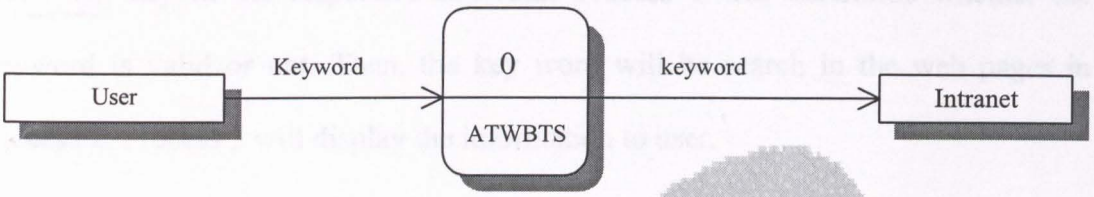


Figure 4.4: Context Diagram for User Module

4.2.5 Diagram 0 for User Module

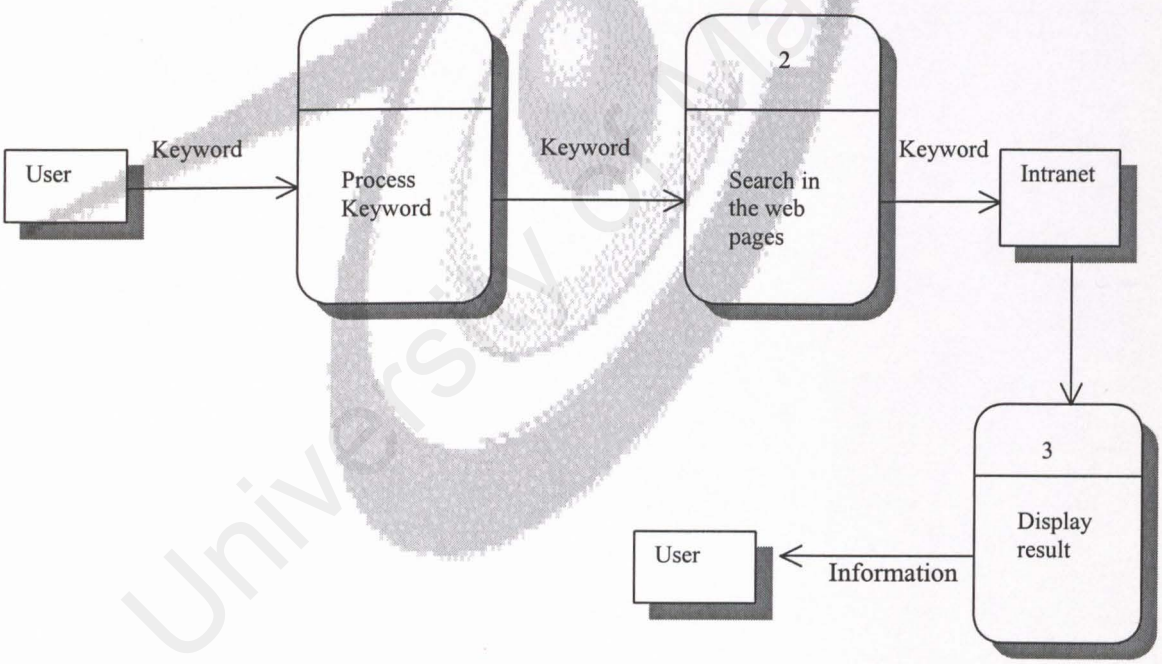


Figure 4.5: Diagram 0 for User Module

4.2.6 Description for User Module

User will key in the respective keyword. Process 1 will determine whether the keyword is valid or not. Then, the key word will be search in the web pages in Process 2. Process 3 will display the information to user.

4.3 User Interface Design

User Interface design must take into accounts the needs, experience and capabilities. There are few principles to be considered when designing a user interface. (Ian Sommerville, 1995)

Principle	Description
User familiarity	The interface should use terms and concept, which are drawn from the experience of the anticipated class of user.
Consistency	The interface should be consistent in that comparable operations should be activated in the same way.
Minimal Surprise	User should never surprised by the behavior of a system.
Recoverability	The interface should include mechanism to allow user to recover from their errors.
User Guidance	The interface should incorporate some form of context-sensitive user guidance and assistance

Table 4.1: Principles of User Interface Design

4.3.1 User Interface for ATWBTS

This is the homepage for the system. This page is accessible by public. In this page, the administrators have to access their modules by clicking on the "Administrator" button. The public will have to key in the required information. Below is the example of the user interface:

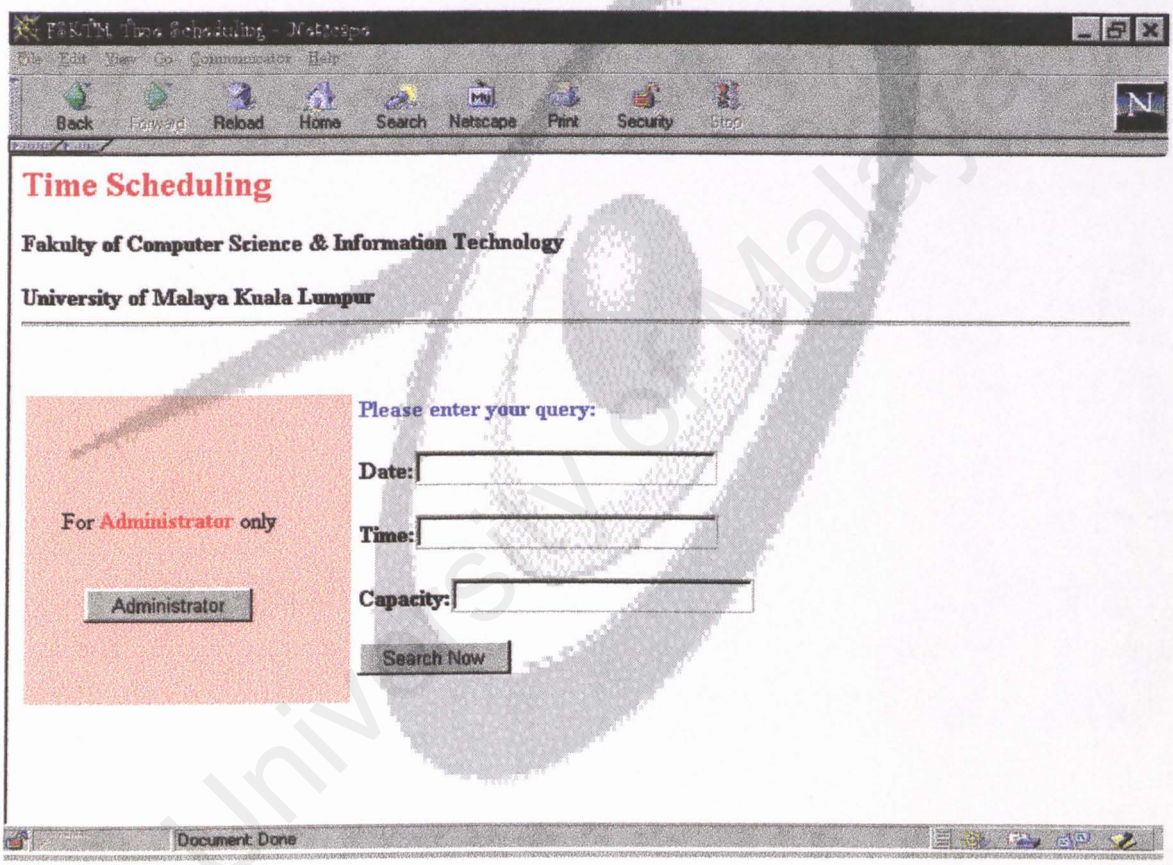


Figure 4.6: User Interface of ATWBTS

4.3.2 User Interface – User Module

Search

This will be the information retrieving part. It is a dialog box and drop down menu selection for the user to key in the information.

4.3.3 User Interface for the Administrator

Administrator will have to login in the login page. This is to ensure the data integrity of the web page. Example of the login page is as below:

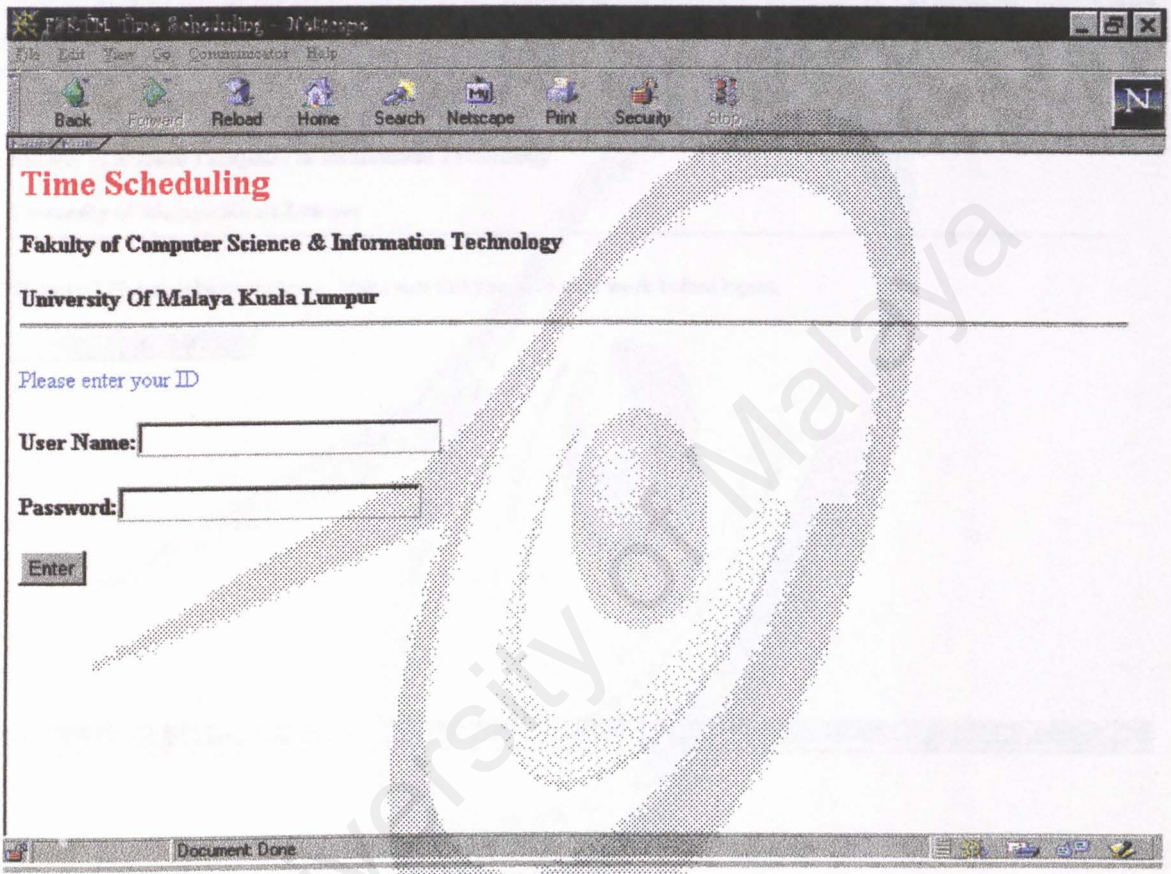


Figure 4.7: User Interface for Login Page

4.3.4 User Interface – Administrator Module

Below is the user interface for the administrator module:

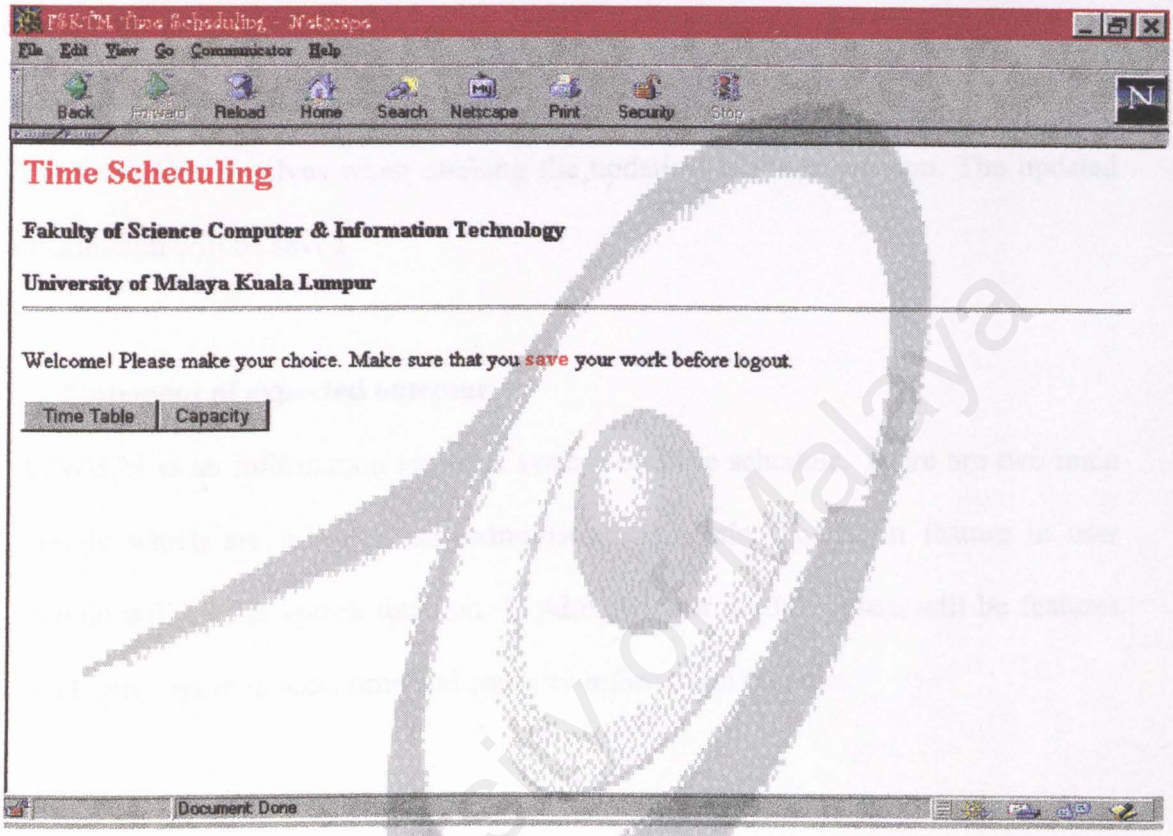


Figure 4.8: User Interface for the Administrator

Time Table Information

The login page (Figure 4.7) will occur as the administrator click on the option. The type of information will be time and date for each venue. Administrator will key in the updated information.

Capacity of the Venue Information

Similar to the module above.

Updating Data Entry

The procedure involves when clicking the updating information icon. The updated information will be saved.

4.4 Statement of expected outcome

ATWBTS is an information retrieval system on time schedule. There are two main module which are the user and administrator module. The main feature in user module will be the search function. In administrator module, there will be features like login, logout update, time and capacity information module.

Chapter 5:

System Implementation & Testing

5.0 System Implementation & Testing

5.1 Development Environment

There are few things needed in order to develop this system. Listed below are the minimum requirements.

- Software Tools

There have been some changes in the software tools used. Please refer to 5.2.1 Web Pages Development and 6.1.2 Problems & Solution during Project Implementation & Testing

Software	Module	Description
Windows 95/98	System Requirement	Operating System
Personal Web Server	System Requirement	Web Server Hosting
Visual Interdev 6	System Development	Loading the web pages and Coding the language
Macromedia Dreamweaver	Interface Design	Image Designing and Manipulation
Adobe Photoshop	Graphic Design	Image Designing and Manipulation

5.2 Development of ATWBTS

5.2.1 Web Pages Development

The process of developing the web pages not only required the developer's creativity but also patience. It involved endless testing and debugging the coding. In this system, the programming language involved were ASP, HTML, JavaScript and VB Scripts.

Active Server Pages

Active Server Page is a very powerful Server-side scripting environment. This environment enables the user to create a web site that is dynamic, fast and interactive. User does not have to worry about the capabilities of clients' browsers. The ASP statements will control the appearance of text and HTML tags outside the script blocks; which are just performed in the program flow of the server-side script. It also controls the appearance of the web page with every call of the ASP file.

HTML

HyperText Markup Language (HTML) is used for creating the web pages. It is **not** a language used to write Web Program. It is used primarily to define a particular content of a document and is secondary to describe the page layout. This language then, will be used to describe a presentation of the browser.

JavaScript

It is recognized as a powerful programming tool that can enhance the web pages. Compared to Java, this language is a scripting language, a simplified programming language that provides only some Java features. There are some disadvantages using this language:

1. It doesn't have graphical abilities.
2. It can't read or write files on the client machine.
3. Java supports networking only as it is involved in downloading the contents of specified HTML pages from URLs.
4. No multithreading capabilities are built into JavaScript, meaning that CPU cannot be shared among multiple tasks or threads.

VBScript

This is a subset of Microsoft Visual Basic used in World Wide Web HTML documents to enhance the functionality of a web page. This language is valuable especially since this system uses ASP.

VBScript is a powerful and robust scripting language and does have many advantages over other scripting languages:

- It's simple and easy to learn

- It's based on Visual Basic

Internet Explorer contains a built-in VBScript engine, therefore users don't need to locate and install add-in to the browser in order to code in VBScript.

5.2.2 Creating Image of the Web Pages

This involved endless cycle of testing and modifying the ASP source codes and loading the file in the browser for viewing. Those files then will be validated changes will only be made where necessary. For this purpose, Visual Interdev offers a platform to maintain and update the changes. Graphics and the layout of the pages are done in Adobe Photoshop and Macromedia Dreamweaver. Both software is easy to use and understand.

5.3 System Testing

This is to ensure that the system is executed correctly and conform to the requirement specified. There are three types of testing done throughout this phase.

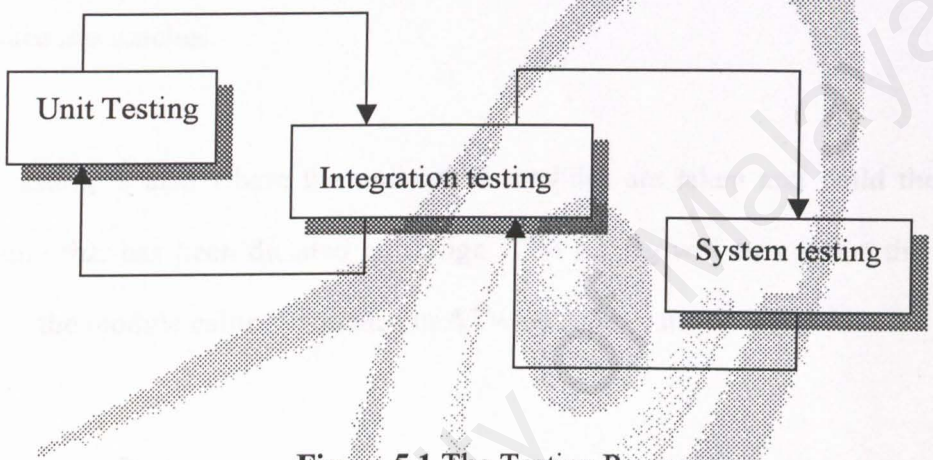


Figure 5.1 The Testing Process

5.3.1 Unit Testing

This is where the program tested. Normally the testing focuses on a small unit of codes, for example a subroutine or function's which are independent of one another to locate error. The unit testing process will enables the tester to detect errors in coding and logical mistakes that are contained within that module itself. The interactions between the modules are initially avoided during this testing, as each module is tested separately.

5.3.2 Integration Testing

The integration testing is usually made when the individual functions in that module are integrated. This is done once the integration takes place as to ensure that all units in the module functions well and accordingly. The most common problems will be the interface mismatches.

This testing is also where the unit-tested modules are taken and build the program structure that has been dictated by design. This testing will ensure that the interfaces such as the module calling sequence in ATWBTS are systemized.

5.3.3 System Testing

This takes place when modules or sub system are integrated so that testing is done on a created larger system. This type of testing is important to see if the end- product is working perfectly once all the modules and functions are integrated. This is where the user tests the complete system.

Chapter 6:

System Evaluation

6.0 System Evaluation

Several problems were encounter in hardware, software interfaces and logic errors in programming the required functions of the system.

6.1 Project Problems & Solutions

6.1.1 Problems & Solution during Project Studies & Analysis

- Research

This system is a new technology at the moment and hence, it is difficult for the researcher to obtain the right information for this project. The Internet is the main source used to obtain the information needed. The help and feedback given by other users all over the world via the chat room, mainly, have assisted greatly in realizing this project.

6.1.2 Problems & Solution during Project Implementation & Testing

- PWS Installation

There are few problems occurred. The Web server usually hanged during the development and loading the application. The only solution to it was to reinstall the Web server.

- Programming language

In the proposal, this system is supposed to use PERL as the programming language. But after consulting with few programmers, they recommended that the UNIX would be the best platform for PERL. Since part research has been conducted earlier, it impossible to change to Unix and due to time constraint the researcher had opted for a change of software used. Therefore the software suitable and has been used for this project Visual Studio Interdev. This software offers better flexibility and easier to use.

6.2 System Strengths

6.2.1 User Friendly

The interfaces of this system are designed to help users to search for the exact information and the interfaces can also be understood easily. The interfaces are developed after researches had been carried out over the Internet to find out what does it take to create an interface that fulfills the users' needs.

6.2.2 Security

Security plays a vital role in this project to prevent must be provided to prevent information being lost or destroyed. Therefore, a login page was created for the administrator to make any changes necessary to the information.

6.3 System Limitation

6.3.1 Search limitation

The system is unable to search for several functions. It is supposed to be able to search for variables. This is due to the coding.

6.3.2 Administrator's module

In the administrator's module, the administrator has to make changes to the data by using the source code. And thus, the administrator has to have basic knowledge in HTML.

6.3.3 User's right

Users are only able to read the information. This means that the booking system has to be done manually.

6.4 Future Enhancement

6.4.1 Windows NT Server

In Windows NT Server, multiple servers can be used in a platform. Therefore, by using NT server, user will be able to search in different server. It means that one will able to search in a bigger environment.

6.4.2 Search

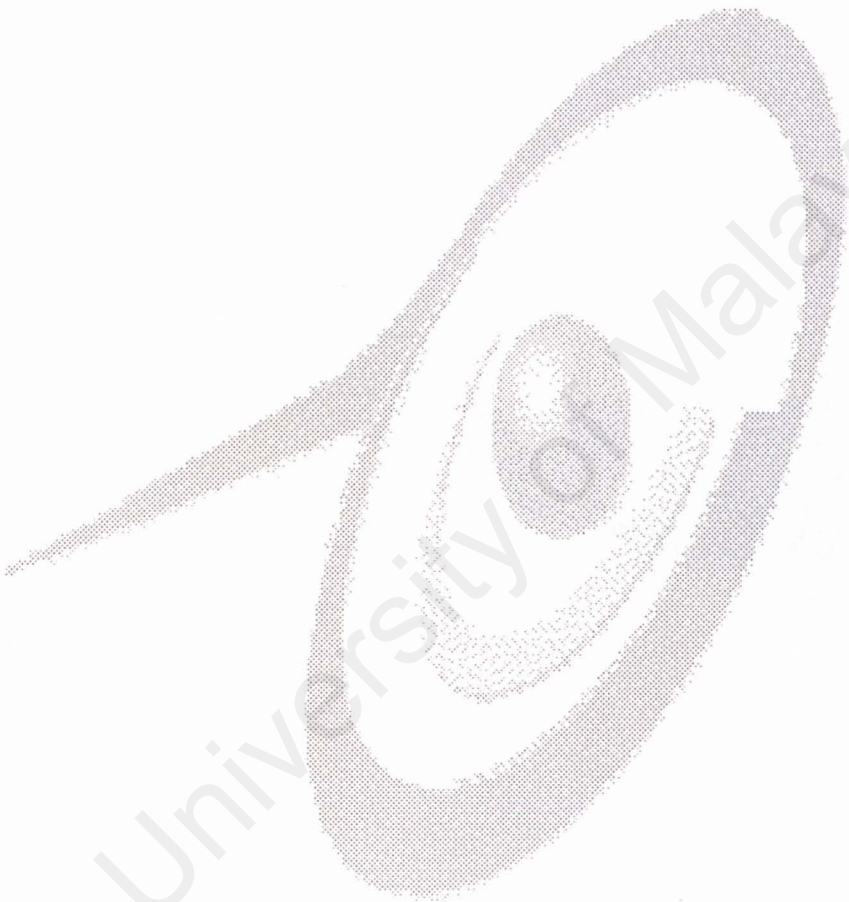
Perhaps, in the future, the system can be improved so that user can search for the exact information by using a variety of keywords.

6.4.3 Administrator's module

In the administrator's module, one can create a form-based web page for the administrator to insert the changes and save it online. Previously, the only system available is by using the database.

6.4.4 User's right

Perhaps also, users can also make reservation for vacant venues online and this enables other users to see the availability or vacancies of the venue for a particular time on a particular day.



Chapter 7:

Conclusion

7.0 Conclusion

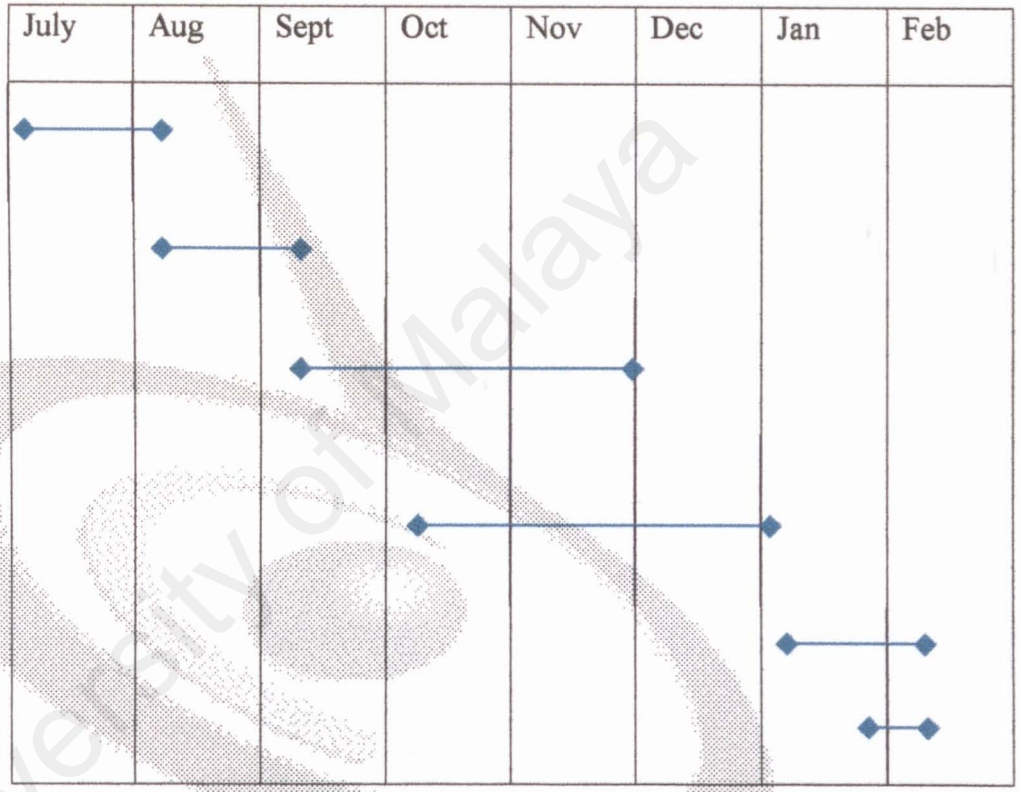
Yahoo!, Altavista, Goolges, Excite and many more are the examples of search engine. But the way the information was laid down is too general and this makes it difficult for the user to get the exact information. Therefore ATWBTS is designed to eliminate junk information. This means that the agent able to search for the exact information without having to face any hassle. This is why it is called the Agent Technology.

Appendix A:

Project Time Line

Activities:

- Literature Survey & Requirement Analysis
- System Design
- Prototyping & Coding the System
- Development of the System Enhancement & Testing
- Documentation
- Preparation for Presentation



Appendix B:

References

Appendix B - References

1. Deitel,Deitel &Neito, "Internet &World Wide Web: How To Program"; Int. Ed., Prentice- Hall Inc., 2000
2. Timothy T. Gottleber & Timothy N. Trainor, "More Excellent HTML with an Introduction on JavaScript"; Int. Ed., McGraw Hill Inc., 2000
3. Igor Hawryszkiewycz, "Introduction to System analysis & Design"; 4th Ed., Prentice- Hall Inc., 1998
4. Whitten L. Jeffrey, MS,CDP, Professor, "System Analysis & Design Methods", 3rd Ed., Richard D. Irwin Inc., 1994
5. Kendall Julie E. & Kendall Kenneth E., "System Analysis & Design"; Int. Ed., Prentice- Hall Inc., 1999
6. Ian Sommerville, "Software Engineering"; 5th Ed., Addison- Wesley Ltd.; 1995
7. Tom Archer, "SAMS Teach Yourself Visual Interdev 6 in 24 Hours";1st Ed., Sams Publishing; 2000
8. Christoph Willie & Christian Koller, "SAMS Teach Yourself Active Server Pages in 24 Hours";1st Ed., Sams Publishing; 1999
9. William Stallings & Richard Van Slyke, "Business Data Communications"; 3rd Ed., Prentice Hall, Inc.; 1998
10. William Stallings, "Operating System: Internals & Design Principles";1st ed., Prentice-Hall, Inc.; 1998

11. L. Stein, "CGI.pm- a PERL5 CGI Library"; version 2.70, 2000
12. Charles J. Petrie, "Agent-Based Engineering, the Web & Intelligence"; Stanford Centre for Design Research, http://www-cdr.stanford.edu/Nextlink/Expert.html
13. Pattie E. Maes, "Agent that Reduce Work & Information Overload"; MIT Media Lab, http://pattie.www.media.mit.edu/people/pattie/CACM-94/CACM-94.p1.html
14. Pattie E. Maes, "Software Agents and the Future of E-Commerce"; MIT Media Lab, http://pattie.www.media.mit.edu/people/pattie/ECOM/CH1977
15. Pattie E. Maes, "Intelligent Software: Programs that can act independently will ease the burdens that computer put on people"; MIT Media Lab, http://pattie.www.media.mit.edu/people/pattie/SciAm-95.html
16. Pattie E. Maes "Long Tutorial Notes on Software Agents"; http://pattie.www.media.mit.edu/people/pattie/CHI97/
17. D.A Thistle, "System Development Life Cycle"; 1997, http://cs104.cs.uwinsdor.ca/develop.htm
18. "Challenges"; http://www.anglefire.com/aI/anitaraj/challenges.html
19. "My Work!"; http://members.tripod.com/djarea51/Work.html#WDI
20. "What is an Agent?"; http://members.tripod.com/brucely/CS/Whatisagent.htm
21. "System Development Life Cycle"; http://www.integratingit.com/District/solution/itf/itf17sdk.html

22. "Software Agents: Completing Patterns and Constructing User Interfaces"; http://www.cs.washington.edu/research/jair/volume1/schlimmer93a-html/schlimmer93-0.html

23. "AgentBuilder Pro Evaluation Downloads"; http://www.agentbuilder.com/Eval/

24. "Agent Construction Tools"; http://www.agentbuilder.com/AgentTools/index.html

25. "Welcome to my Java Resources page"; http://members.tripod.com/clov3r/java_sce.html

26. "What's an Agent, Anyway? A Sociological Case Study"; http://foner.www.media.mit.edu/people/foner/Julia/Julia.html

27. "What Is...an intelligent agent (a definition)"; http://www.whatis.com/intellig.htm

28. "IEEE Expert Intelligent Agents Article"; http://www-cdr.stanford.edu/NextLink/Expert.html

29. "Agent or Program"; http://www.msci.memphis.edu/~franklin/AgentProg.html

30. "Yahoo!"; http://www.yahoo.com

31. "Googles"; http://www.googles.com

32. "AltaVista"; http://www.altavista.com

Appendix C:

Terminology & Acronyms

Appendix C - Terminology and Acronyms

Accessibility

The ability of the system being access or obtained.

Address

Unique number assigned to each memory location within a computer's processing hardware.

Applet

Small program, usually written in Java language, that runs within a window inside the browser.

Authentication

A process used to verify the integrity of transmitted data, especially a message.

Client/Server

Network design in which the client –that is, any end-user's computer- takes on processing task traditionally handled by a network server.

Common Gateway Interface (CGI)

A standard that defines how web server should access external programs that can return data in a format of a web page.

Context Diagram

A diagram that shows the inputs and output of a system.

Data Flow Diagram (DFD)

A method to illustrate how diagram flows in a system.

Domain

The computer that runs the server software.

Encryption

To convert plain text or data into unintelligible form by means of a reversible mathematical computation.

Graphical User Interface (GUI)

A graphic-based interface between user and computer. GUIs usually require a mouse- type-pointing device.

Homepage

The first web page of a web site.

Hypertext Markup Language (HTML)

The language used to create conventional web pages.

Hypertext Transfer Protocol (HTTP)

The native communication scheme of the World Wide Web, initially used to transfer hypertext documents.

Internet

A worldwide system of linked computer networks for data communication services such as World Wide Web and electronic mail. The Internet is a way of connecting existing computer networks that greatly extends the reach of each participating system. Originally designed to withstand a nuclear attack, today the Internet spans almost every nation on earth.

Intranet

A corporate internetwork that provides the key internet applications, especially the World Wide Web. An intranet operates within the organization for internal purposes and can exist as an isolated, self- contained internetwork, or may have links to the Internet.

Interpreter

Translates source code into binary code, one line at a time.

Protocol

A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication.

Transmission Control Protocol /Internet Protocol (TCP/IP)

It is a set of communications protocols the Internet users use to communicate.

Web Administrator

Person who maintains a Web server.

Web Master

Person who responsible for a collection of pages on a Web site.

Web Browser

A software to navigate or surf through World Wide Web. Popular browsers are Netscape Navigator and Microsoft Internet Explorer.

Web Server

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

Web Site

A series of related Web pages.

World Wide Web (WWW)

A popular hypertext-based system of transmitting textual and multimedia-based information through the Internet.

Appendix D:

User's Guide

Appendix D – User's Guide

D.1 Main Menu

Starting FCSIT Schedule Agent

1. You need to start your web browser – Internet Explorer. Type in the address and press enter. If access through the Intranet, please type in *http://computername/agent/index.html* (where the computer name is the web server's name. For example: comm3). If you access through the Internet, type in the IP address – 202.185.159.123
2. After this, the web browser will download the home page of ATWBTS. This application is called FCSIT Schedule Agent. The welcome page contains these features :
    - Home
    - Schedule
    - Search
    - Administrator
    - Links

3. This is the welcome page:

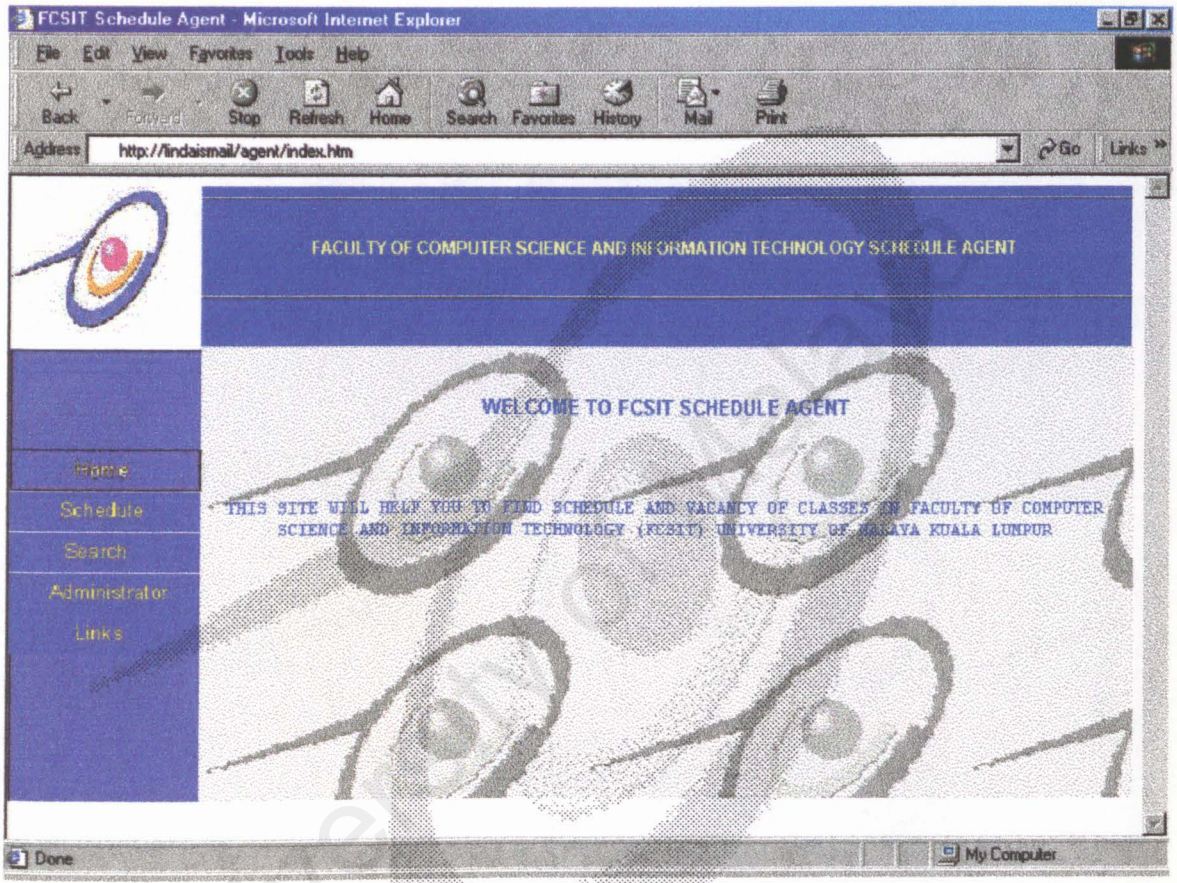


Figure D.1 : Welcome Page – FCSIT Schedule Agent

D.2 Home

This feature will direct you to the home page.

D.3 Schedule

This feature will have a list of schedule available on the server. This is actually for the user to view the whole schedule. Below is the web page :

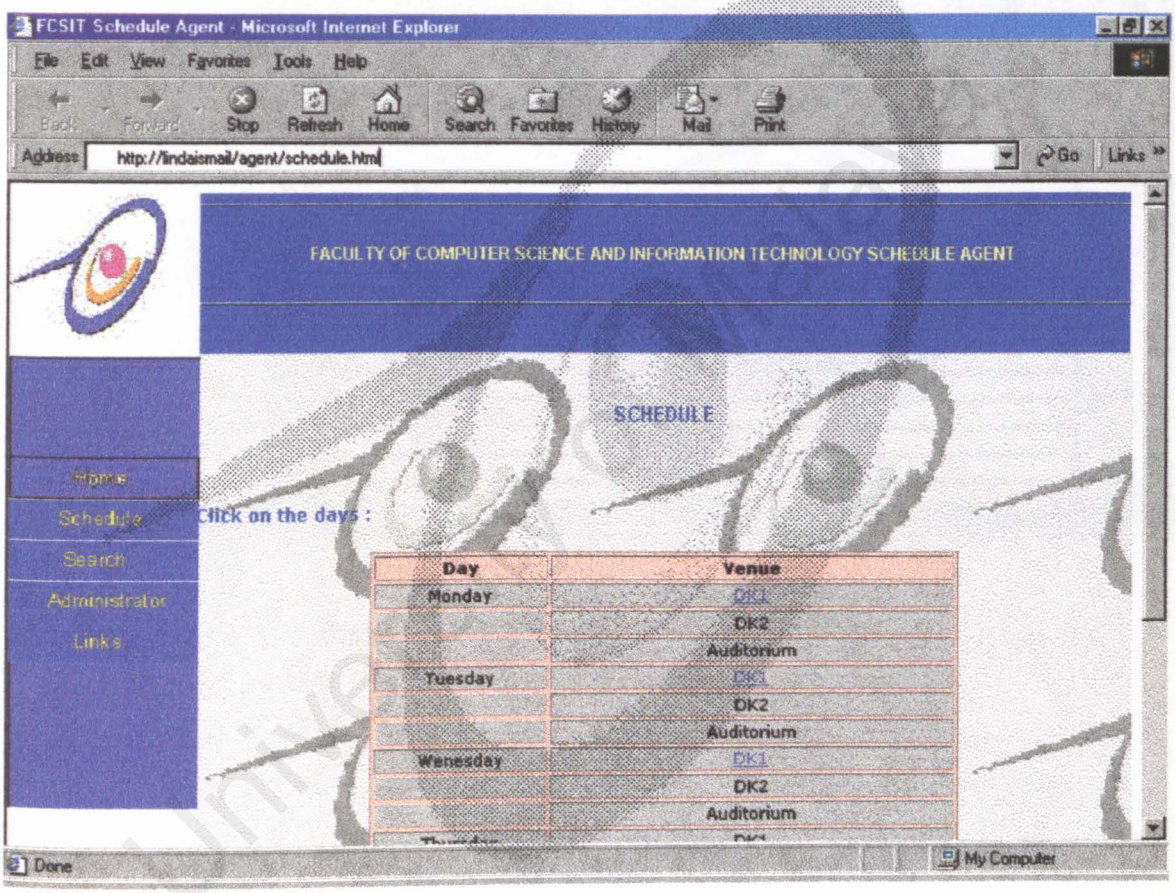


Figure D.2: Web Page of Schedule

1. Choose the venue according to the days. For example Monday – DK1.
2. The browser will download the schedule for that day and venue. For example: Monday – DK1. The web page is:

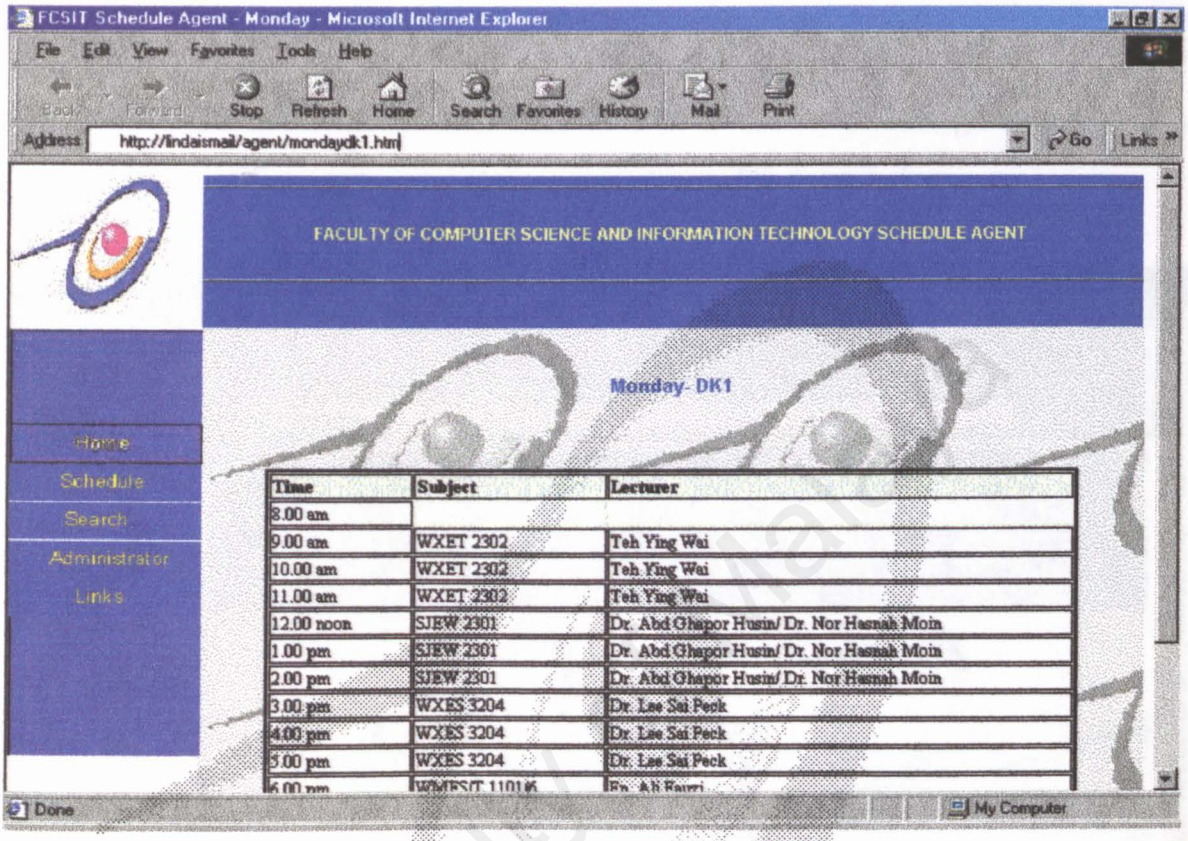


Figure D.3 : Web Page of Monday- DK1

D.4 Search

This feature allows user to search the exact venue and day.

1. First, click on the **search** option. You will be directed to the search page:

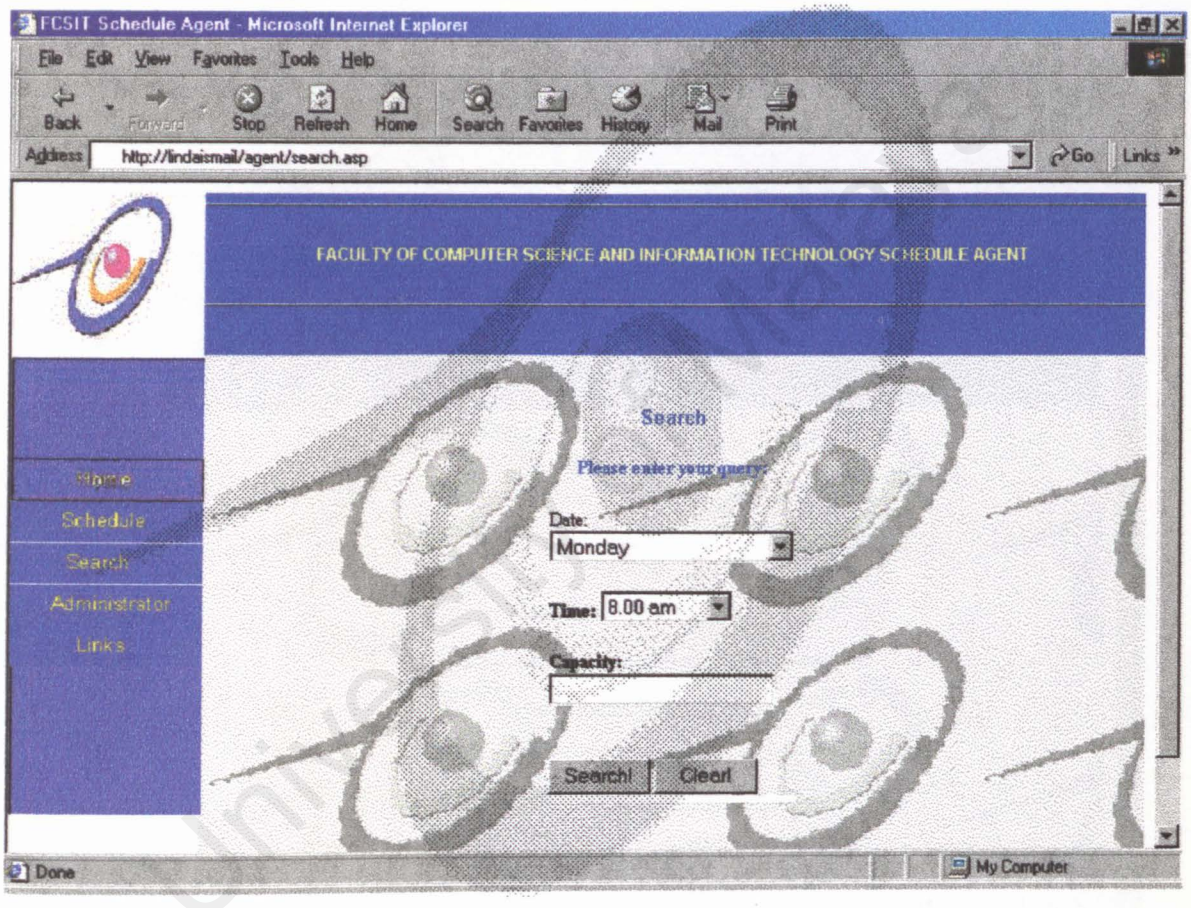


Figure D.4: Search Page

2. Then, select the day and time. Press **Search!**

D.5 Administrator

Only administrators are allowed to access this page. It is for them to make any changes to the web page.

1. Click on the option
2. Log in according to the login name and password.

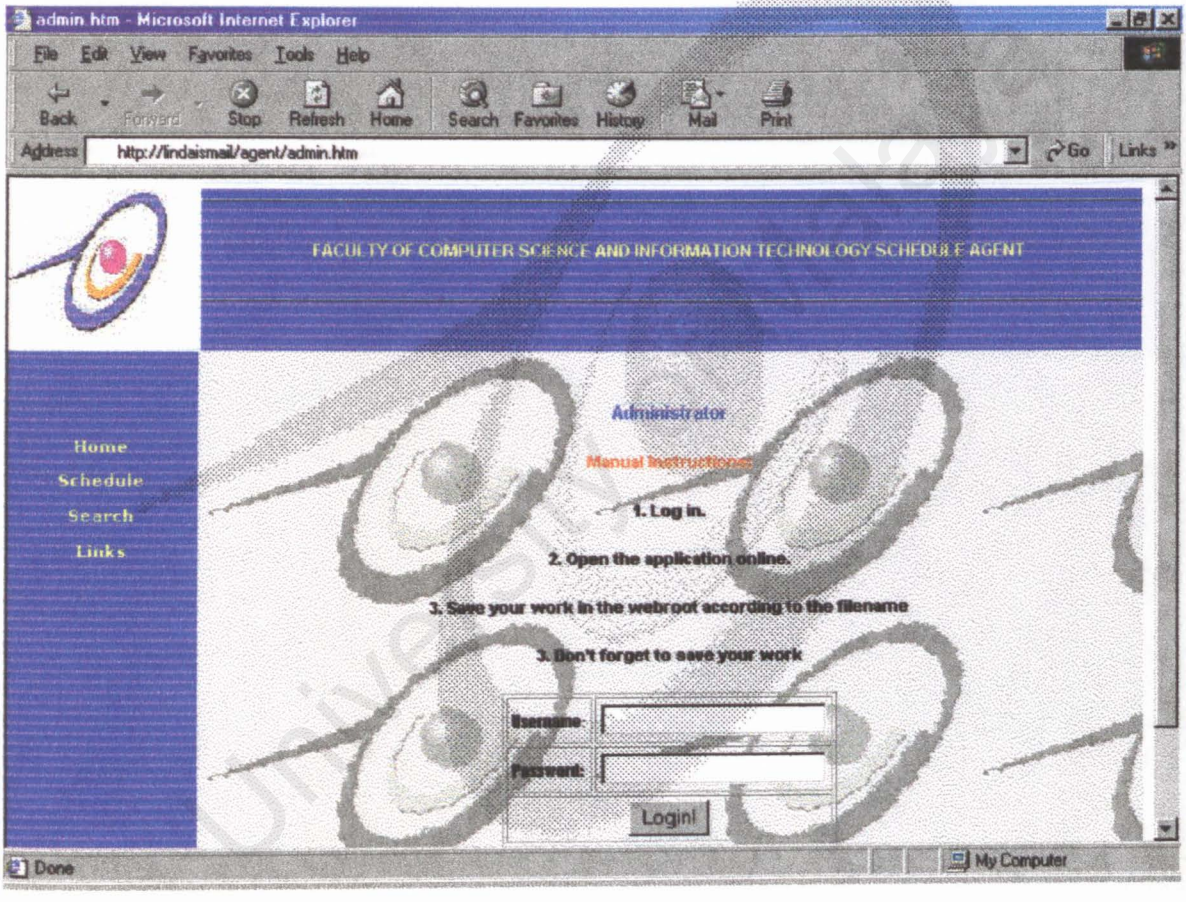


Figure D.5 : Login Page for Administrator

3. Open the application from its current location

D.5 Administrator

Only administrators are allowed to access this page. It is for them to make any changes to the web page.

1. Click on the option
2. Log in according to the login name and password.

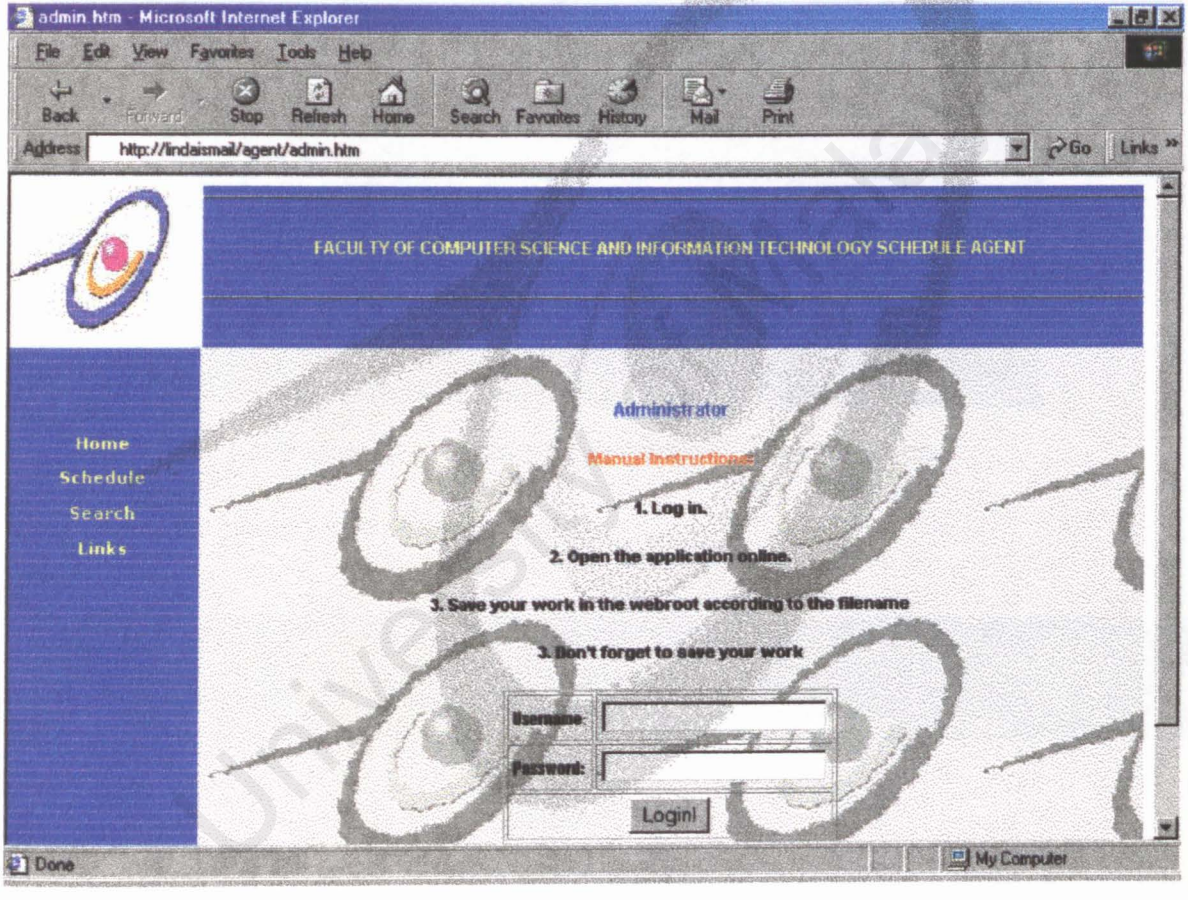


Figure D.5 : Login Page for Administrator

3. Open the application from its current location

3. Open the application from its current location

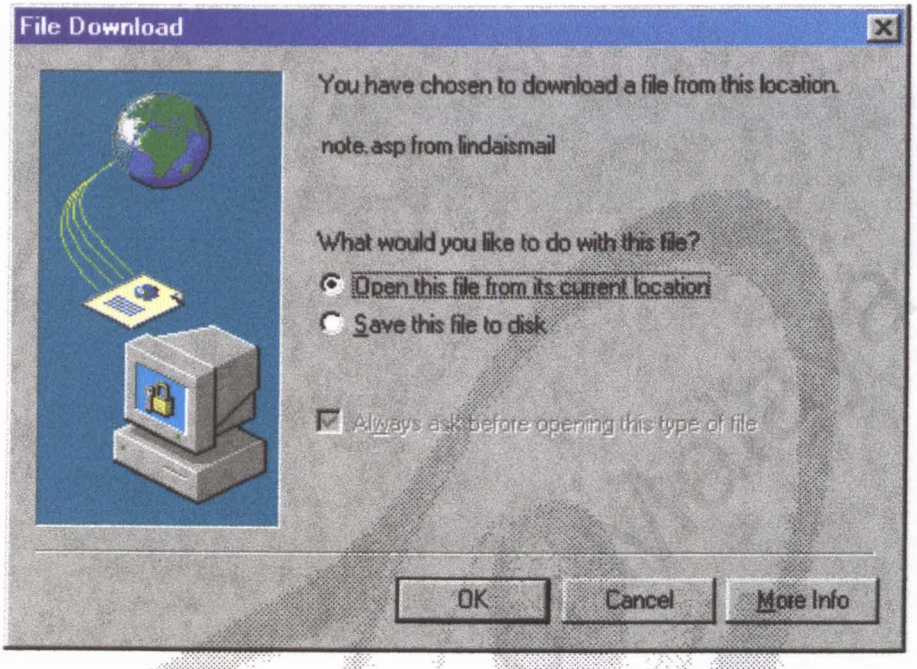


Figure D.6: Open the file from its current location

4. Write the source code on the web page.

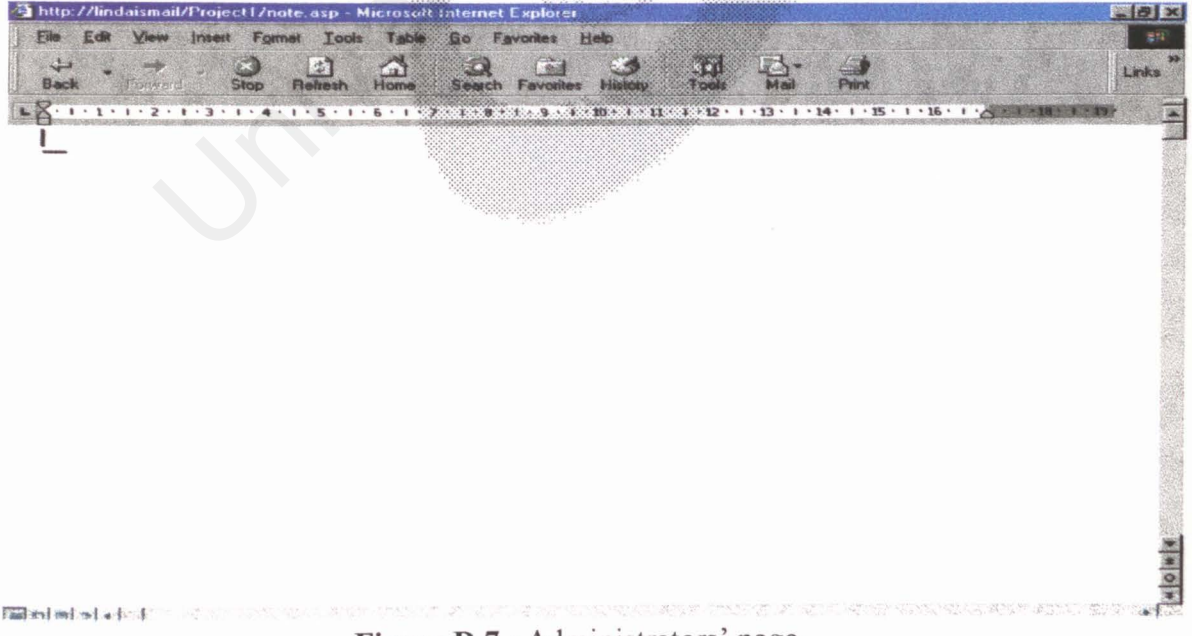


Figure D.7 : Administrators' page

5. Save the file in its folder. For example : C:/inetpub/wwwroot/agent

Figure D.8: Save as

6. Don't forget to change the '**save as type**' to **HTML Document (*htm;*.html;*.htx)**
7. And **Save** your work.

D.6 Links

This features links user to popular web site on the net. Below is the web page:

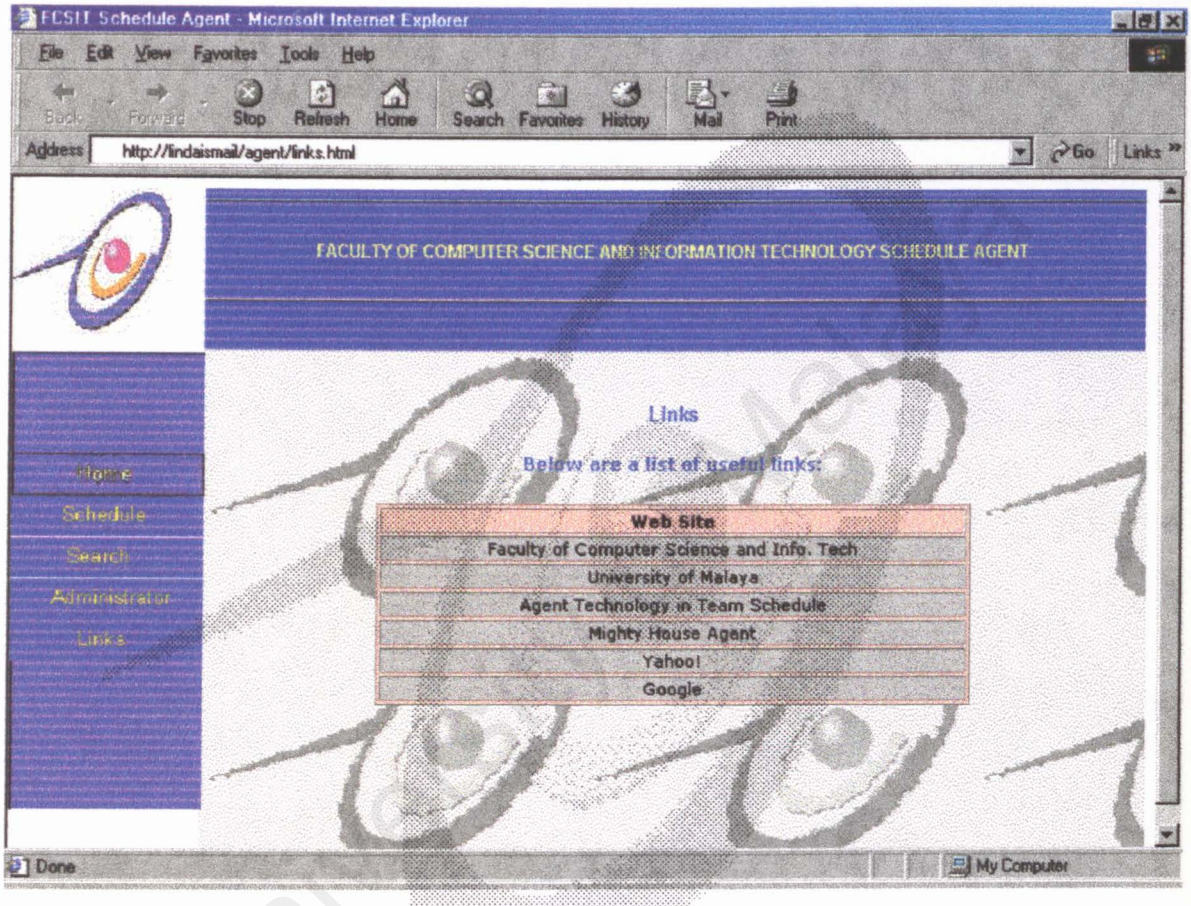


Figure D.9 : List of Links