WebWordPro Version 2.0

The Web-Based Word Processing System

by

LIN KOON HOW

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under the supervision of

Encik Omar Zakaria

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ABSTRACT

Nowadays, in this era of information technology, computerized word processors have become a very common and essential need to everyone. From leisure to serious manner, it is used for typing letters, assignments, reports, paperwork and etc. It also enables people to keep data and manage it in a more secure and efficient way. With the current popularity and expansion of the Internet, Web-based applications become a new platform for the evolution of business systems. Well, from this point, come the idea of providing the word processing system through Internet or online.

WebWordPro 2.0, which is the upgraded version of WebWordPro 1.0, is a project that will further implement the idea. Basically, WebWordPro Version 2.0 is a Web-based processing system that provides users with the basic functionality of a normal word pad as in Microsoft Windows 95/98. It allows users to access it freely via Internet from a server and perform tasks like typing, saving, editing and so on. The main objective, besides enhancing the previous version, is to build a robust, effective and easy-to-use Web-based processing system available for everyone in the Internet.

WebWordPro Version 2.0 is developed using Lotus Notes and Domino R5 [1], from Lotus Development Corporation [2]. With the powerful database architecture system that comes with it, keeping data and accessing it anytime, anywhere will no longer be a problem. This is because it offers the availability, reliability and security of the data in the Internet. Hopefully, with the development of WebWordPro Version 2.0, it will help to ease the process of word processing and provide a better understanding to everyone about the benefits and importance of the Internet.

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INTRODUCTION

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

WebWordPro Version 2.0 is a Web-based word processing system that allows user to access it via Internet. It is an upgraded version of the previous WebWordPro Version 1.0. Hence, new features and functionality will be added to solve the problems found in WebWordPro Version 1.0, and further enhance its performance to fulfil the increased user requirements.

WebWordPro Version 2.0 is a system that is kept in a particular remote server to provide word processing services to users around the globe as long as they are connected to the Internet. It contains a flexible and robust database system that enable users store their data securely and making it available anywhere, around the clock as long as the system is running.

Unlike the other normal word processors software, it is absolutely free of charge, in the sense that users no longer have to pay for the expensive licensed copy of word processing software. Apart from that, installation work is not required. However, users have to pay for the Internet Service Provider (ISP) connection charge if they are home users. On the contrary, it benefits Intranet users where cost is bared by the organisation.

Its basic functionality includes typing documents, saving, reading, retrieving, deleting, printing, and etc. Last but not least, it convinces users with the scalability and reliability of the system because it is developed with an established powerful tool, called Lotus Notes and Domino R5 [1] from Lotus Development Corp [2].

1.2 PROJECT DEFINITION

WebWordPro Version 2.0, which is a word processing system, is a final year project conducted at Faculty of Science Computer and Information Technology, Universiti Malaya, Kuala Lumpur. Final year project is one of the requirements for those undergraduates who are taking Degree in Bachelor of Science Computer in the faculty. This project was offered in 2nd semester of 1999/2000 session by En. Omar Zakaria from Department of Computer System and Technology. It is divided into two main parts:

1. WXES3181 (*Projek Ilmiah Tahap I)* is the first part, which takes up four credits hours. It involves the preparation of project proposal and a viva session by the project moderator.
2. WXES3182 (*Projek Ilmiah Tahap 2*) is the second and final part, which takes up five credits hours. It consists of technical evaluation of the system, quality of project report plus a viva session.

This project is about the development of a Web-based word processing system. It begins with an early research that covers the finding and gathering of information about the system. Then, scheduling the development processes, and followed by doing analysis on the system's requirements and design. Coding, implementing, testing and maintaining it come after that. Finally, discussion about the problems faced and possible bugs found would be conducted, plus preparing a complete documentation of project. Overall, the whole project requires one to understand the concept that lies behind a system development. Self-discipline, determination, literal thinking, decision-making, and time management would be the elements to ensure its success.

1.3 PROJECT OBJECTIVES

The development of WebWordPro Version 2.0 is focus on enhancing and upgrading the existing WebWordPro Version 1.0 [3]. The objectives of the previous version were to:

1. Develop a word processing system stored in an Intranet of an organisation to facilitate the staff in typing, saving, editing, retrieving, and printing documents.
2. Allow users to access WebWordPro from any place at any time via Internet, providing reliability and availability to them.
3. Allow registered users to store their documents or files in a reserved database system and regain it at any time for editing or printing purposes, without the hassle of carrying and using normal removable devices such as floppy diskette and zip drive.
4. Provide users with free storage of space in the database where they can save and keep their files in it, thus saving cost.
5. Provide a secure storage of users' data in the database system where only authorised member are allowed to access it with the registered user password.
6. Allow users to organise and manage their files accordingly and effectively.

The new WebWordPro Version 2.0 will include more features apart from those objectives mentioned above. The additional objectives are to:

1. Provide the WebWordPro totally free to all users not only limited to the staffs of the organisation. Meaning, this service is opened to public who wishes to use it.
2. Create a more interesting and friendly user interface, compare to the previous version, WebWordPro Version 1.0.

3. Add more menus with extra functions such as text pattern utility, fonts type selection, and allow users to open multiple documents concurrently.
4. Upgrade the security platform by providing user password encryption facility for securing the password from being read by unwanted person.
5. Upgrade the database and server management for better maintenance and administration.
6. Educate users by providing online tutorial or help files on how to use the word processing system.
7. Help to overcome users confusion and problem by providing technical support section that allows users to summit their problems, suggestions or feedback about the system.
8. Create an expandable system where the new version of WebWordPro can be easily upgraded or changed to boost up the performance in order to fulfil the demanding user requirements in the future.

1.4 PROJECT SCOPES

The scopes of this project generally consist of four main modules, which are the user administrator, system access and the database as follow:

1.4.1 User

Users may be range from a student to a lecturer, a clerk to a high rank officer and so on. However, all these users should be at least computer literate or have the bit knowledge of using computer and the Internet. Users are also divided into members or non-members.

Therefore, this user module will include a welcome page with member login area and option to enrol for membership. The page will also contain links to the below pages:

1. The information section about WebWordPro Version 2.0 word processor.
2. A membership enrolment page with a registration form provided to accept user's details. It also contains the membership term of service.

1.4.2 Administrator

System administrator will be the one managing and maintaining WebWordPro system. Administrator will monitor the system database and assign a specific storage to the members. Administrator also responsible for updating the system and debug any error occur during the run time to provide a reliable environment. Administrator will also define the user's status and keep them updated with any new events happen in the site.

1.4.3 System access

WebWordPro Version 2.0 can be access from anywhere around the globe as long as they are connected to Internet and have the ability to browse the World Wide Web. Users without the membership are not allowed to access certain features like accessing the application database to perform any storage or retrieval of data. Only users who registered with the system administrator will be given a login name and a password.

1.4.4 Database

A database will be designed to store necessary information in document form. The database is managed using database software client, installed in a robust server. It is a crucial

integrated part of the overall system. Failure of database will cause the system stop running until it has been repaired.

1.5 PROJECT SIGNIFICANCE

Internet has become an important platform in this era of information technology. People begin to aware of the benefits and importance that they can gain from it. Learning how to use computer and Internet has become an interest to everyone from young to old. By developing this system, it is hoped to boost up the number of computer literate and help them cope with this issue. Other significance of WebWordPro Version 2.0 include:

1.5.1 Cost

The significance of cost saving in the system are explained as follows:

1. Help users to solve the problems in getting and paying a licence copy of the word processor software, distributed by certain manufacturers in the market. With WebWordPro, users only have to pay for the Internet charges, which is much cheaper.
2. WebWordPro Version 2.0 is highly recommended for an Intranet in an organisation with unlimited access to the Internet since fixed amount is paid for the connection.
3. High expensive word processors in the market often make users to opt for pirated software. With the existence of WebWordPro, it is likely that this unhealthy activity will decrease in number.
4. The advantage of keeping data in a database helps users to save money in buying extra data storage disk, such as floppy or hard disk.

1.5.2 Availability

Since WebWordPro is a Web-based application, users can access it anytime, anywhere as long as they are connected to the Internet. Users can also access to their files kept in the database whenever they wish.

1.5.3 Security

The system consists of three security levels, namely the server level, the database level and the document level. All these levels are configured and programmed accordingly to provide a safe and secured data system for the users.

1.6 PROJECT LIMITATION

For every system, there will be a least one limitation or more and so is the WebWordPro Version 2.0 system. As an immature Web-based application, it is lack of certain factors and criteria. Few are described briefly here:

1.6.1 Number of Functions

Compare to a powerful established word processor system like Microsoft Word, the limitation of WebWordPro lies in its number of functionality and capabilities. This is because an immature project like WebWordPro Version 2.0 needs a slow progress in analysis before improving the system. There will be some function limitation like:

1. Advance clipart utilities
2. Word counts
3. Charts

4. Templates
5. Advance text format
6. Symbols insertion
7. Grammar and spelling checker
8. Style gallery
9. Changes tracker
10. Customised function

1.6.2 Connection Speed

For those users with low modem speed like 28.8kbps, 36.36kbps or 56.6kbps, they will face a lagging situation when accessing WebWordPro Version 2.0. It may takes some times before the application is finished loaded in their browser.

1.6.3 Member Replication

Tracking and stopping a same user from trying to have several membership accounts will be near to impossible if they fake their personal particulars during registration. These users may have the intention of owning extra storage, but their action will cause congestion to the database system. A solution to this is to implement the user aging system that will terminate user's status as member if he/she never logs into the system in one-month duration.

1.7 System Development Strategies

The system development strategies determine the relative importance of the different activities in the systems development process. It is also common for strategies to specify the deliverables, like the concrete results, for each activity. Among the famous and appropriate strategies around, (such as Prototype, Spiral and 'V' model [4]) the Waterfall model [5] has been chosen as the system development strategy.

The Waterfall model is a simple but systematic step-by-step approach to a system development process. Its advantages includes the followings:

1. Convey major software engineering activities to the uninitiated.
2. Provide high-level view of the process.
3. Can be used to provide crude milestones.
4. Reduce the development and maintenance cost.
5. Suitable for short-term program or short-life span system.

The Waterfall model is divided into four main phases, as shown in Figure 1.1 below. Each phase consists of specific objectives that are to be met.

1.7.1 Requirements Analysis

Requirements analysis is the process of analysing the information needs of the end users, the organisational environment, and any system presently being used, developing the functional requirements of a system that can meet the needs of the users. The requirement documentation should be referred to throughout the rest of the system development process to ensure the developing project aligns with user needs and requirements.

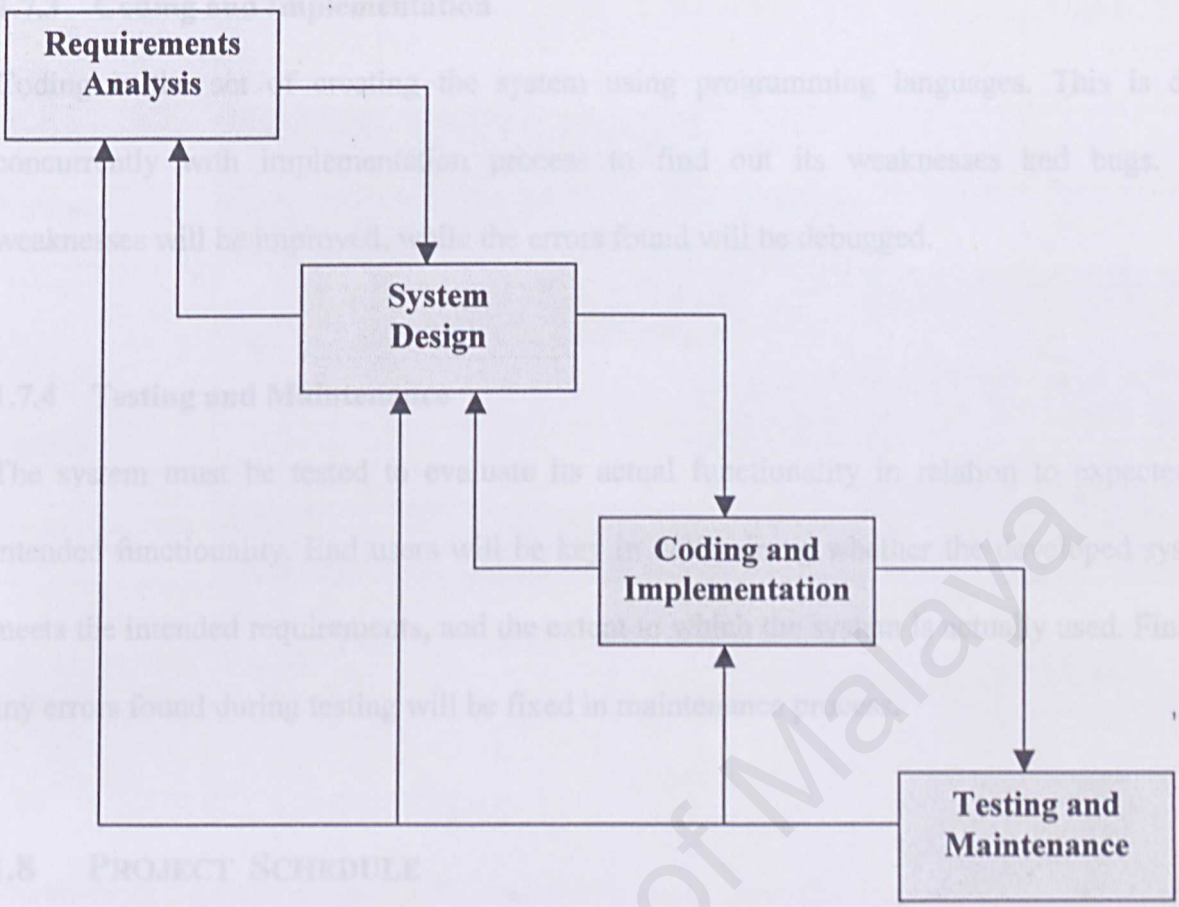

Figure 1.1: *System Development Strategies: Waterfall Model*

1.7.2 System Design

After the requirements have been determined, the necessary specifications for the hardware, software, people, data resources, and the information products that will satisfy the functional requirements of the proposed system can be determined. The design will serve as a blueprint for the system and helps detect problems before these errors or problems are built into the final system.

1.7.3 Coding and Implementation

Coding is the act of creating the system using programming languages. This is done concurrently with implementation process to find out its weaknesses and bugs. The weaknesses will be improved, while the errors found will be debugged.

1.7.4 Testing and Maintenance

The system must be tested to evaluate its actual functionality in relation to expected or intended functionality. End users will be key in determining whether the developed system meets the intended requirements, and the extent to which the system is actually used. Finally, any errors found during testing will be fixed in maintenance process.

1.8 Project Schedule

Project planning and scheduling is an important factor to determine the success of any development projects, including this WebWordPro Version 2.0 project. During the development, many unwanted or unforeseen problems would occur and taking an early precaution to handle it would be a wise decision. Therefore, planing the project schedule accurately and giving each process a precise timing are always a crucial matter. This is to ensure that the whole project is developed smoothly and finishes on time, despite any obstacles faced. Below is the project schedule, a Gantt Chart [6], which is divided into several important stages.

Month / Stages	Dec 1999	Nov 1999	Jan 2000	June 2000	July 2000	August 2000
Early research						
Analysis						
Design						
Coding						
Testing						
Documentation						

Table 1.1: *Gantt Chart: Project Schedule*

1.9 CHAPTERS ORGANISATION

The chapters organisation in this documentation is as followed:

1.9.1 CHAPTER 1: INTRODUCTION

Chapter 1 gives an overview of the project, providing sub-topics, such as project introduction, definition, objectives, scopes, significance, limitation, system development strategies, and project schedule. All these discussions are based on the information gathered during the early research.

1.9.2 CHAPTER 2: LITERATURE SURVEY

In the early stage of project development, planning and understanding the system and its requirements is essential. A literature survey is conducted to find and collect all the related

aspect about the system. This chapter will talk about the purpose, approach, and its findings such as definitions, history, term, and development tools.

1.9.3 CHAPTER 3: SYSTEM ANALYSIS

The aim in this chapter is to cover the following in system requirements:

1. Understand
2. Analyse
3. Documentation
4. Make the right decision

All these factors provide a better understanding towards the next stage of the project development.

1.9.4 CHAPTER 4: SYSTEM DESIGN

System design is one of the core stages in the project. Chapter 4 will involve the planning for future system design. System design should cover the database, user interface, output and the overall process.

1.9.5 CHAPTER 5: SYSTEM CODING AND IMPLEMENTATION

In this chapter, the system coding procedures, like coding approach and coding style are explained. This is followed by development environment requirements involving hardware configurations and software installation.

1.9.6 CHAPTER 6: SYSTEM TESTING AND MAINTENANCE

The necessary testing processes are carried out to evaluate the system's functional and non-functional requirements. This is to assure that the developed system meets the system objectives and requirements mentioned earlier. Once completed, some precautious steps in the maintenance section are figured out to ensure a stable and reliable system.

1.9.7 CHAPTER 7: SYSTEM EVALUATION AND CONCLUSION

This chapter will touch some of the problems encountered during the development phases and the solutions to it. Then, there is discussion about the system's strength, limitation and future enhancement. Finally, few word about the overall system development to conclude this documentation.

CHAPTER 2

LITERATURE SURVEY

CHAPTER 2: LITERATURE SURVEY

2.1 INTRODUCTION

The emerging and dynamic growth of the Internet has become a distributed resource, development and business platform. It is capable of delivering countless information to millions of people around the globe everyday. Organisations that realise the benefits in it have started to build their own private Web and Web-based applications to facilitate communication and resource sharing among the employees. A literature survey is done during the early research stage to determine and understand the field and concept related to this widely dispersed networking.

2.2 PURPOSE

The purpose of conducting a literature survey in the early research is to find out and collecting all the needed information related to WebWordPro system It also a first step to overview the project in many aspects and prepare for it before proceeding further. The ways it is done:

1. Find the definition for word processor and its characteristics.
2. Look into the history of word processing.
3. Get to know better some related topics like Internet and World Wide Web.
4. Comparison with the market word processors software.
5. Analyse and choose the most suitable development tools.

The information gathered is use to:

1. Analyse the processes in developing a system to see its feasibility.
2. Study and understand the system requirements.
3. Make sure that the system is developed according to the scope of its objectives.
4. Figure out the weaknesses in the project and try to improve it.
5. Fit in all the characteristics in a word processing system.
6. Understand the type of programming concepts and its benefits.
7. Understand the current and future international market of Web-based applications.
8. Estimate the expected results of the built system in the future.

2.3 APPROACH

There are many resources available to provide the information needed for the project. Examples of these resources are books, documents, journal, report, software, World Wide Web and users. Several approaches have been done in finding and collecting information from these resources. These approaches are highly useful to fulfil the purposes in literature survey. The findings from the below approaches will be discussed in details in the next section.

2.3.1 Reading Printed Materials

During the process of finding and collecting information, several books related to the system has been referred. Some title of these books are:

1. Microsoft Word 97 Quick Reference, by Patty Winte, Que Corp
2. Intranets Unleashed, by David Garrert Sams, Macmillan Computer Publishing

3. JavaScript Unleashed, by Richard Wagner et al, Macmillan Computer Publishing.
4. Sams Teach Yourself Lotus Notes and Domino 5 Development in 21 Days, by Dorothy Burke, Jane Calabria, Macmillan Computer Publishing.
5. Database Systems, by Peter Rob and Carlos Coronel, International Thomson Publishing.
6. System Analysis and Design, by Kenneth E. Kendall and Julie E. Kendall, Prentice-Hall.

All these books are obtained from bookstores, friends or relatives. Beside books, other printed references are journals and previous project reports from the Document Room at faculty. Only related topics to the system, in the "Contents" page of these books are gone through.

2.3.2 Browsing the World Wide Web

Internet itself is one huge cyber library that is so easy to use and convenient in the finding process. Useful articles, journals, and electrical books can be found easily. Surfing into IT related Web pages given a lot of ideas and information to this project. Some of the useful Web sites visited are:

1. www.lotus.com
2. www.mcp.com
3. www.itlibrary.com
4. www.whatis.com
5. www.britannica.com
6. www.pcworld.com

7. http://www.gooddocuments.com/olddesign/philosophy/wphistory_m.htm
8. http://www.cs.iupui.edu/~aharris/mmcc/mod3/abwp1.html

These sites are either recommended by friends or found through search engines available in the Internet like *AltaVista, Yahoo!* and *Hotbots*. Certain keywords, such as "definitions of word processing", "history of word processing", "online tutorial" and "Lotus +Notes +R5 +tutorial" are entered into these search engines.

2.3.3 Interviewing People

Getting opinions and guidelines from the people around you always improve your understanding in things in many ways. The people whom have become the interviewee in this project are the project supervisor Encik Omar Zakaria, seniors in faculty and friends with some good knowledge in computer field. Discussions have been done in order to determine the necessities to develop a system, solution to the problems and also ideas to create a professional system. Besides that, user requirements to the system were also determined through friends and course mates.

2.3.4 Testing Word Processors

Currently, there are several numbers of word processing systems available in the market. Most of them are well known and established. As an immature system, referring to these word processors as much as possible is likely to beneficial. Therefore, some of this software have been tested and used to understand their specialities, functionality, features, and

requirements for a word processing to be developed. The applications, which involved in the research, are:

1. Microsoft WordPad
2. Microsoft Word 97 [7]
3. Sun Star Office 5.1 [8]
4. Corel WordPerfect 8 [9]

Besides testing them, reading articles about them in the Internet were also done, to get more understanding. Comparison among them and WebWordPro were done from time to time to get some ideas on what to be included in the project and what should be omitted.

2.4 FINDINGS

The findings and outcome of the four approaches above consists of information about the definition of a word processor, the history of word processing, Internet, Intranet, World Wide Web, Web-based application, client-server architecture, Web-based architecture, and the types of development tools.

2.5 DEFINITIONS OF WORD PROCESSING SYSTEM

There are many definitions given to a word processing system. Some say it is a process of transferring an idea to a printed form. Others say it is a fast, effective and economic way for an author to flow his or her work into a printable form. According to *whatis.com Inc.*, "*A word processor* [10] *is a computer program that provides special capabilities beyond that of a text editor and usually provides a graphical user interface. The term originated to*

distinguish editors that were "easy to use" from conventional text editors and to suggest that the program was more than just an "editor".".

The definition of a Web-based application is divided into "Web-based" and "application". "Web-based" means something that is found only in the Internet or something using Internet as platform to function. Where else, the definition of "application" from the *whatis.com Inc.* defines application [11], as "*In information technology, an application is the use of a technology, system, or product. The term application is a shorter form of application program. An application program is a program designed to perform a specific function directly for the user or, in some cases, for another application program.*"

After a long research and analysis, a conclusion were made for this project that word processors can range from anything as simple as a text editor (like Microsoft Edit which comes with MS DOS) to high quality programs like Microsoft Word, Word Perfect and general-purpose program like Microsoft Works to publishing programs. For WebWordPro Version 2.0, the two words "*Web*" and "*Pro*" clearly imply that it is different from the conventional word processors because it is Web-based. Meaning, the system is only accessible through Internet. Other than that, it is just another type of software that specialises in handling text.

2.6 History Of Modern Word Processing System

The first evolution into the modern word processing system was developed in 1936 [12]. This device consisted of a kind of automatic typewriter, called an auto-typist that could store and reproduce simple form letters and certain paragraphs of longer documents. The auto-typist used punched paper tape for its storage medium. In 1964 researchers at International

Business Machines (IBM) produced the Magnetic Tape Typewriter, a relatively high-speed, automatic typewriter that had a magnetic tape data storage unit and retrieval device. This machine constituted the first true modern word processor.

A typical advanced word-processing system consists of an automatic typewriter or high-speed printer that is linked to a computer that has an auxiliary storage unit. In many such systems, the input terminal consists of an alphanumerical keyboard and a visual display composed of a cathode-ray tube (CRT).

The CRT display enables the keyboard operator to input and also check, edit, or revise the information to be entered. The text of the document, including all corrections, additions, and deletions made by the keyboard operator, is recorded by the computer. When the final draft is ready to be prepared, the computer activates and operates the typewriter or printer, which produces as many copies of the document as required. The information can be stored for reuse in the auxiliary memory of the computer or on storage devices such as a magnetic disk.

The development of electronic digital minicomputers and microcomputers during the late 1960s and 1970s gave rise to faster word-processing systems with greater capabilities. It was then that each computer was built specially to do word processing. With the advent of inexpensive video computer screens, the connection to the typewriter as input device was broken. Some early devices tried to avoid this break, and simulated the look and feel of a typewriter by making the screen act as much like a piece of paper as possible. These devices kept the page orientation.

Some of the early screen-based word processors dealt with the entire document as one long string of text, with the pagination done at print time. Explicit pagination was left to extra

commands, such as explicit page breaks. These machines were WYSIWYG editor or programs on large timesharing computers. A WYSIWYG [13] (pronounced "wiz-ee-wig") is one that allows an interface or content developer to create a graphical user interface (GUI) or page of text that will look like the end result while the interface or document is being created.

Features we take for granted today, such as having margins and other paragraph settings spanning a certain amount of text, had to be invented. Much debate went on between the page and document oriented camps, continuing to this day. In all cases, the design goal of the word processor was to produce a final paper output. The initial uses were not even the authors, they were the typists and typesetters.

2.7 Introduction To Internet

By short and brief definition, the Internet is a global-linked network of computers [14][15]. It provides people, business & corporations, educational institutions, governmental agencies and even countries with the ability to electronically communicate over long distances. It came into existence during the Cold War Era when the U.S. Department of Defence became concerned with the question of how different governmental services would be able to communicate in the event of nuclear war.

The Rand Corporation, under research sponsored by the United States Air Force and known as Project RAND, responded to this problem and eventually conceived of a network of computers designed to function despite the loss of a substantial part of the system. In short, each computer or node would be capable of sending, routing and receiving information by taking messages and breaking them into different parts (packet switching) and sending them along separate routes to their eventual destination.

Each node was treated equally without a single computer being the hub. If large parts of the system were destroyed, its self-sufficient nature allowed information to get through. In 1969, this concept was tested and funded by the Advanced Research Projects Agency (ARPANET), primarily so that researchers and scientists could communicate and transfer data.

Initially, UCLA, Stanford Research Institute, University of California, Santa Barbara, and the University of Utah were the first to be connected to this network. MIT, Harvard, Bolt Beranek & Newman, and Systems Development Corporation were connected in 1970, Stanford, MIT's Lincoln Labs, Carnegie-Mellon & Case-Western Reserve University connected in 1971, and NASA/Ames, Mitre, Burroughs, Rand & the University of Illinois added in the months that followed.

Within two years, however, a strange twist was developed. Instead of long-distance research and development, the Internet was being used for personal communication. Eventually, ARPANET gave way to what we today know as the Internet. This was brought on by TCP/IP, a standard of communication, which replaced ARPA's original "Network Control Protocol" or NCP.

"Transmission Control Protocol" or TCP breaks information into different packets at its source and then puts them together at its final destination. "Internet Protocol" or IP does the addressing of the information ensuring that the packets are sent across multiple nodes and networks using different standards. Whole networks began using TCP/IP to communicate with ARPANET and TCP/IP became more commonly used.

2.8 Introduction To Intranet

An Intranet is a smaller version of Internet [16][17]. It exists as a small private network within a company or organisation. Initially, these Intranets have been established as an internal communication tool. There are surely some advantages for these organisations to create their own Intranets. Employees can send e-mail to other employees within the company. That is, Intranets enable private and sensitive corporate information to be distributed and shared within the organisation.

This new medium of communication has become a very cost-effective solution, especially for geographically dispersed businesses that have employees all over the world. The time to communicate new policies, procedures, and information is immediately reduced along with postage and paper costs.

An Intranet also can be used for software distribution and for providing access to vital applications. Companies are now starting to put applications like survey forms and employee benefit registration forms on their Intranets to simplify basic processes. Businesses also are starting to consider replacing or enhancing their applications, such as accounting, sales order entry, and so on, with applications that are secured within an Intranet. This is because of the installation of firewall, a program that prevents outside intruders from accessing the internal network. However, to the user, there is no difference between accessing the Internet and the company's Intranet.

Private Intranets offer the same reliability, security, and guaranteed response time that a company's internal Intranet provides. The difference between them is that a company's reach extends beyond the internal organisation to external entities. The use of private Intranets will continue to rise as application requirements exceed the current capabilities of

the Internet infrastructure. The WebWordPro Version 2.0 is likely going to be a suitable application recommended for an Intranet. Figure 2.1 depicts a typical configuration for an Intranet.

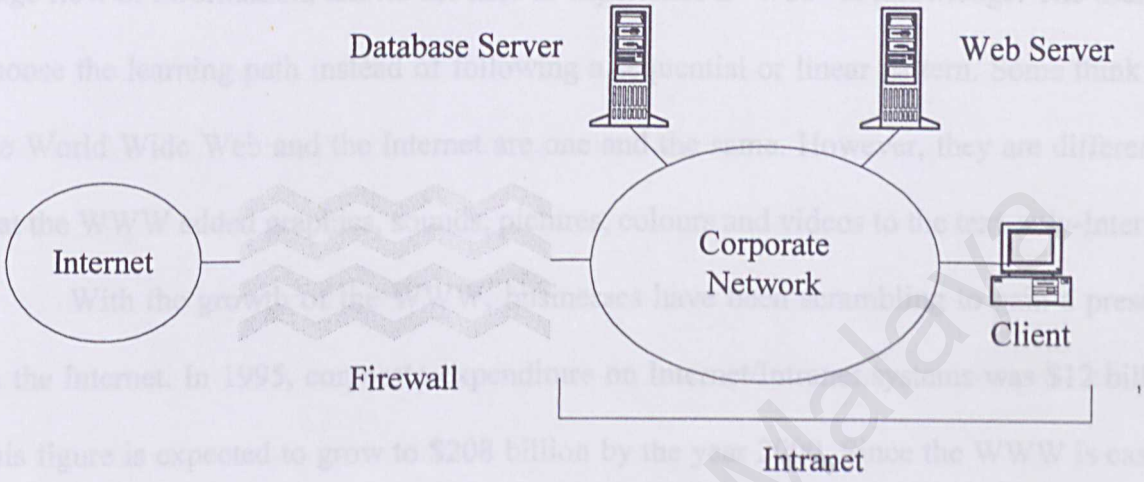

Figure 2.1: *Intranet's Typical Configuration*

2.9 World Wide Web

The World Wide Web [18][19] or WWW has many origins, but most people point to the time period between 1989-1991 when the Conseil European pour la Recherche Nucleaire (CERN) European Laboratory for Particle Physics in Geneva, Switzerland, developed its first specifications. Tim Berners-Lee, a researcher for CERN, developed the basic concepts of sharing information through the use of a consistent, universal interface.

Mark Andreessen is credited with developing the first browser (Mosaic) for the Web in 1993. The use of a browser to view the Internet turned attention away from the information stored on the server, focusing more on the user experience through the client

machine. The browser provided a graphical, point-and-click interface for viewing Web content that made the Internet easier to access.

The Web is the primary service responsible for bringing the Internet into the homes of millions. The WWW is the most popular and useable service. The hypertext, which links to a huge flow of information, allows the user to experience a "Web" of knowledge. The user can choose the learning path instead of following a sequential or linear pattern. Some think that the World Wide Web and the Internet are one and the same. However, they are different in that the WWW added graphics, sounds, pictures, colours and videos to the text-only-Internet.

With the growth of the WWW, businesses have been scrambling to gain a presence on the Internet. In 1995, corporate expenditure on Internet/Intranet systems was $12 billion. This figure is expected to grow to $208 billion by the year 2000. Since the WWW is easy to use and user-friendly, between 27 million to 50 million people browse the Web daily, despite the fact that in 1993, there were only a little over 100 sites on the World Wide Web. One of the objectives in developing the WebWordPro Version to is to boost up this number.

2.10 WEB-BASED APPLICATION

The first wave of Web development involved information publishing. Rudimentary tools were provided to convert documents created with common word processors to the HTML format of the Web. Then it has extended the notion of textual documentation to provide graphical information. Graphics, 3D images, audio, and video are put into the HTML to enhance the user's experience on the Web.

The second wave of Web development has been the creation of functional applications. These applications extend the simple registration forms commonly seen on Web

sites to become true interactive applications that include database accessibility. These applications can be classified as just another phase of client-server. Then the Web-based application architecture [20] came in to bring more advantages and new features compare to the client-server architectures.

2.10.1 Typical Client-server Architecture

Client-server [20] is a style of computing where the client machine makes a request of a server machine and the server machine fulfils it. The request is usually a request for information, as in a database request, or for processing. The benefit of client-server systems is that they take advantage of the strengths of each machine or platform. In a typical scenario, the client handles some application logic and the presentation to the user while the server provides the processing and databases functions. Figure 2.2 illustrates typical client-server architecture.

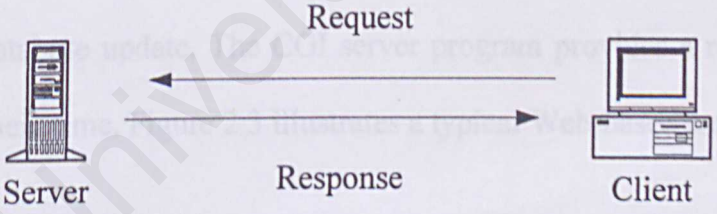

Figure 2.2: *Typical Client-server Architecture*

2.10.2 Typical Web-based Architecture

In a typical Web application, the browser serves as the universal client that sends a request for a Web page, interprets the HTML document, and displays it to the user. The Web server

receives the request through the HyperText Transport Protocol (HTTP) and returns the required information in HTML format that the client can understand. Similar to client-server, you can distribute the application processing and database management portions to varying degrees between the client and the server machine.

The main benefit to Web-based applications over client-server is found in the deployment. In a Web-based scenario, the browser serves as the universal client, providing access to the most current information on the server. Version control, software distribution, and systems management costs are significantly reduced for Web-based applications.

Historically, Web applications have been based on HTML and common gateway interface (CGI) programs on the server. CGI programs have typically been used for processing requests on the server and distributing information to the client machine. CGI programs, or scripts, are executable files that can be built using languages such as UNIX shell script, Perl, C, and so on. As information is updated on your database, the CGI script can handle accessing the data and passing the information back down to the client browser.

The advantage is that you don't have to write new HTML code for every new document or database update. The CGI server program provides a reusable component that saves development time. Figure 2.3 illustrates a typical Web-based architecture.

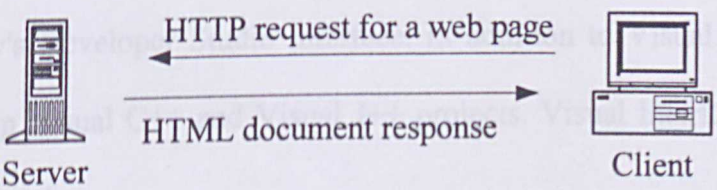

Figure 2.3: *Typical Web-based Architecture*

2.11 Types Of System Developing Software

With all of the excitement surrounding the Web, its development tools are growing at an ever-increasing pace. There are many extensive and powerful technologies for creating Web applications, but most tools only focus on a single, specific need. Developers are now seeking for better and comprehensive, integrated development environment to build their applications. It is definitely an exciting time for developers who can capitalise on the new technologies to deliver Web-based solutions. Below is some of the software, which is related to the case study of this project.

2.11.1 Microsoft Visual Interdev 6.0

Microsoft Visual InterDev 6.0 [20] is a comprehensive, Web-based application development tool that integrates many of the popular components and technology. It provides developers with the ease of use of Visual Basic, the extensibility of Visual C++, and the database functionality of Microsoft Access, while using a common development environment.

The capabilities of the integrated development environment allow user to integrate various technologies, like ActiveX controls and Active Server Components, to create a powerful application. Besides that, it also enables user to use scripting languages like VBScript and JavaScript to create dynamic applications and Web pages.

Simultaneous projects of different types can also be worked out all from within Visual InterDev's Developer Studio interface. In addition to Visual InterDev projects, you also can develop Visual C++ and Visual J++ projects. Visual InterDev provides some very robust database tools.

For HTML writing and editing purposes, Microsoft FrontPage editor is included. Lastly, the advantages of integrated database tools significantly reduce the time and effort for adding database capability into the application. These include the support for major ODBC compliant databases.

2.11.2 Sybase Enterprise Application Studio

Another company that offers a great deal in choosing a Web application development tool is Sybase, Inc. [21]. The product, Sybase Enterprise Application Studio or EA Studio [22] provides a comprehensive tool set that embraces Web, distributed, and client/server architectures. The package, EAStudio, includes Enterprise Application Server 3.0 and other development tools like PowerBuilder 7.0 and PowerJ 3.0.

1. Enterprise Application Server
   - Enterprise Application Server or EAServer [23] provides an industrial strength set of services for deploying Web and distributed applications using core Java 2, Enterprise Edition (J2EE) standards, including Enterprise Java Beans (EJB). EAServer also offers cross-client and cross-component support for almost any type of application those based on CORBA, XML, HTML, DHTML, any ActiveX client, PowerBuilder, COM, C and C++.
2. PowerBuilder 7.0
   - The PowerBuilder 7.0 [24] development environment offers broad support for Web-based components' standards. Tight integration in both development and deployment with EAServer offers highly competitive reliability, availability, and scalability for PowerBuilder applications developed for the Web.

3. PowerJ 3.0

   - PowerJ 3.0 [25] provides a true end-to-end solution for building sophisticated Internet applications, exploiting the benefits of HTML, Java clients, and delivering powerful Java server-side components.

This sophisticated, but highly scalable and powerful tool is certainly the best solution for any professional developer.

2.11.3 ColdFusion Studio 4.0

ColdFusion, distributed by Allaire Corp. [26] is a tool that enables programmers to develop Web-based applications that access databases. ColdFusion includes an integrated suite of visual tools, powerful server technology, and an open language environment. There are:

1. ColdFusion Studio

   - Tightly integrated with ColdFusion Server, ColdFusion Studio [27] provides visual programming, database, and debugging tools for building sophisticated Web applications. Its features include visual programming and database tools, extensive wizards, and an intuitive editor work. Together, they offer a highly productive integrated development environment (IDE). ColdFusion Studio also features powerful interactive debugging technology that enables developers to go through the pages in an application to quickly find and fix bugs.

2. ColdFusion Server

   - ColdFusion Server [28] offers all the runtime services for delivering e-business applications built on a highly scalable and open architecture. The server supports

a broad range of services from database connectivity to full text searching to load balancing and fail over. When a page in a ColdFusion application is requested by a browser, ColdFusion Server processes the scripting in the page, interacts with any components, connects with backend systems, and dynamically generates the page that is returned to the browser.

3. Language Environment
   - ColdFusion uses a tag-based, server scripting language that is ideal for programming Web applications. Processed entirely on the server, the ColdFusion Markup Language (CFML) cleanly integrates with HTML for user interface and XML for data exchange. Both open and extendible, CFML supports more than 70 server-side tags, 200 functions, and 800 third-party components. In addition, ColdFusion supports Java and C++, and fully integrates with object transaction middleware through COM, CORBA, or EJB.

2.11.4 Lotus Note and Domino R5

Lotus Notes and Domino R5 [1] is the next step in the ongoing evolution of Internet products from Lotus Development Corp. [2]. Its extensibility and capabilities as one of the best and recommended Web application development tools available today, has been a very encouraging development tool for WebWordPro using it. The R5 product family of Lotus comes with Lotus Notes, Lotus Domino and Lotus Domino Designer. Below is some brief introduction to the software. The reason why it is chosen as the project development tool will be discussed in detail in the next chapter.

1. Lotus Notes R5

   - The Lotus Notes R5 [29] is an integrated Internet client that provides easy access to all the information that is important to user, such as e-mail, calendar, favourite Web sites and Internet newsgroups. The client includes a new browser-like user interface with a customisable "welcome page" for tracking important daily information. It also includes improvements to the applications use in your daily work, such as mail, calendar and scheduling, Web browsing, and discussions.

     The Notes R5 client is server independent, that is, you can use it with Domino R5 as well as other Internet-standard servers, such as the ones your Internet Service Provider (ISP) may use. For example, user can read and send messages to any Internet mail server, read and post topics to any Internet newsgroup, search any Internet directory, view HTML from any Web server, and use X.509 certificates for security. The best part is that it enables user to do all these things from within one, consistent interface, without needing to know about the Internet standards involved.

2. Lotus Domino R5

   - Lotus Domino R5 [30] is an enterprise server platform for messaging, collaboration, and Internet and Intranet applications. The new Domino server includes the latest innovations in Internet messaging, with native support for all the major Internet standards, and industry-leading support for Web applications, including CORBA support and integration with Microsoft Internet Information Server (IIS). The new release R5 includes increased server reliability and scalability, including improvements in performance, capacity, availability, and

maximum database size. In addition, the server has a new administration interface, with a task-oriented approach that makes Domino easier to deploy, use, and manage.

Domino R5 continues to support a wide variety of clients, in addition to the traditional Notes client. Messaging features are available to Web browsers and Internet mail clients such as POP3 and IMAPv4 clients and directory features are available to browsers and LDAP clients. Where else, the discussion features are available to browsers and NNTP newsreader clients and the administration features are available to browsers as well as the Notes client. Plus, Domino continues to be the best platform for designing dynamic Web applications, and with the new Domino Designer R5, developers can easily build a single application that looks and runs the same for both the Web and Notes clients.

3. Lotus Domino Designer R5

- Lotus Domino Designer R5 [31] is an integrated Web and Intranet application development tool. It is regarded as the next step towards a Web-friendly development environment. It is easy and convenient to use HTML and JavaScript in the designs because Designer supports them natively, meaning that a conversion process is no longer required. Frames and Java applets, both supported by the Domino server, are also available in Designer. The strengths of the Domino infrastructure also allow more appealing and interesting applications to be designed.

CHAPTER 3

SYSTEM ANALYSIS

CHAPTER 3: SYSTEM ANALYSIS

3.1 INTRODUCTION

The system analysis phase is conducted before the system design. It is to determine the system functional and non-functional requirements as well as the hardware and software requirements that are required to support the defined function. Information gathered during literature survey will be used for these purposes.

After the requirements have been determined, the necessary specifications for the hardware, software, people, data resources, and the information products that will satisfy the functional requirements of the proposed system can be determined. The design will serve as a blueprint for the system and helps detect problems before these errors or problems are built into the final system.

3.2 FUNCTIONAL REQUIREMENTS

Functional requirements are functions or subsystems that are crucial to the system. Any left out in these components will become the barrier to the success of the project. The following describe the modules in functional requirements for WebWordPro Version 2.0. It falls into 3 main categories as follow:

1. Unregistered user
2. Registered user
3. Administrator

3.2.1 Unregistered User

The WebWordPro site is divided into 2 sections, the member area and non-member area. Anonymous users or unregistered users can only access the non-member area. They are prevented from entering the member area, which is password-protected. The member area offers the word processing, data storing and other facilities to the registered users. In order to access this restricted section, they have to register as a site member. The non-member area comprise of some important modules as follow:

1. Welcome page
   - This module displays the first Web page of the site as the user enters the site. It is linked to the members' login page.
2. Site information
   - This module provides some hyperlinks, which bring anonymous users to some useful informative pages about the application such as company details, applications descriptions, and benefits of WebWordPro. No username and password are required in this section.
3. Registration
   - This module provides a member registration form, enabling new users to sign up to become registered member with their own unique username and password. These so called user identification will be required when accessing the WebWordPro application.

3.2.2 Registered User

The registered user category covers most of the main modules of the system. It also shows the behaviour of the system when the user makes certain actions in the site. Unlike anonymous users, the registered members can access the password-protected section of the site and enjoy the WebWordPro services. This category has the following modules:

1. Login
   - This module prompts user with username and password when they try to log into the member area.
2. Authentication and authorisation
   - This module responsible of verifying the correct user's login name (username) and password during login. Anonymous or unregistered users will be restricted from entering the password-protected databases.
3. Database security
   - This module forces the user's login when accessing the restricted area of the databases. It should control the databases accessibility when necessary to avoid any anonymous users from tampering into the users' data.
4. User support
   - This module will help registered users whom forgot their username or password. It has a form that processes the user's input and a reply to their problems will be sent to his/her mailbox.
8. The WebWordPro word processor
   - This module consists of a Web-based word processor with its own customised functionality and features. It focuses on the functional of the application when

users use it. All functions or actions (example: save, compose, delete, edit, search and print documents) must work perfectly according to its original objectives.

9. Data storage
   - This module lists the member's documents or files from WebWordPro that are kept in an online database. The security measures taken in this module is only the rightful author of the document could view their own files and not others. The author can read, edit, delete and print the files belong to he/she.
10. User profile
    - This module provides the facilities of changing password by the user if he/she suspects that some unwanted person has discovered his/her password.
11. Help manual
    - This module guides users with online tutorial on how to use the application.
12. Feedbacks
    - This module gives users the opportunity to send their comment, enquiry, suggestion and problem directly to the system manager. This is also an alternative if user cannot get help from the tutorial mentioned above.

3.2.3 Administrator

The administrator category allows the system administrator or manager to manipulate the data, records and configurations in the WebWordPro's databases. The modules in this category includes the below:

1. User registration module
   - This module is important to manage the registration of new members as they visit the Web page. Users, who enrol, will be recorded.
2. Recording members status
   - This module is meant for updating users' information if there are any changes. Users who wish to withdraw from the membership will be processed.
3. Member aging
   - This module will terminate those users who never log into the system after one-month duration. Warning or reminder will be sent to user's e-mail prior to the termination.
4. Maintaining database
   - This module allow administrator to manipulate the records in the system database like creating, deleting, updating and retrieving any related data from the database. Plus, to ensure users' limitation of storage space.
5. Web page information
   - This module will update any informative news about the application and the site for users' knowledge.
6. User support
   - This module will handle any enquiry or feedback from the users and provide it with the best solution.

3.3 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements are essential properties for a system. Below state the non-functional requirements for WebWordPro Version 2.0:

1. User friendliness
   - The design of the system user interface should be user-friendly and easy to understand, without causing any confusion to the users.
2. Error-free
   - The system should provide an error-free environment, by means of the log in process, functionality of the application, registration activities, and hyperlinks.
3. Reliable and robust
   - System should be able to produce accurate data or information to the users to maintain their trust toward the system's capabilities and reliabilities.
4. Security
   - System should includes all the necessary security measures like server and database access to avoid unwanted retrieval from malicious users that could cause vital loss of data or system malfunction.
5. Modularity
   - The scopes of the system should be divided into separated modules to differentiate their distinct functions and objectives to ease the development processes. It will provide an easy modification to the system, if any, in the future.
6. Maintainability
   - Maintainability can be described, as problems that occur in the system should be easily detected, understood, debugged and improved.

7. Response time
   - Time is an important attribute in terms of retrieving data from the server by the users and updating the site by the site manager. It should be practically short to provide a consistent flow of data.
8. Availability
   - The access to the system should be available anytime and anywhere. Therefore, server maintenance must be done from time to time to prevent any breakdowns.
9. Expandability
   - The degree of it expandability should be high so that it can be enhanced into a better version in the future to fulfil higher user and system requirements.

3.4 Comparison With The Existing Word Processors

Comparisons with the existing word processing systems are carried out to determine their characteristics and feature. These existing systems will be referred thoroughly to improve the features and performance in WebWordPro Version 2.0. There are varieties of non-Web-based word processing software available in the market for comparison. Few have been chosen based on the features suitable for the development of the system.

Besides that, criteria in the previous version, WebWordPro Version 1.0 was analysed. Surveys are conducted on any private organisations in the market that offer Web-based application to the public through their web site. Test and evaluation have been done, to study its capabilities, in order figure out the weaknesses in the project and try to improve it. Plus fitting in all the necessary characteristics in the WebWordPro Version 2.0 and adding in extra features.

3.4.1 Non-Web-based Word Processing System

In this research, Microsoft Word 97 has been chosen for comparison. The reasons is because it is:

1. Well developed, looking at its existing period in the market.
2. Easily available in the market.
3. User-friendly and easy to use.
4. A word processor that includes the basic requirements for a word processing system plus other great features.

3.4.1.1 Basic Functionality in MS Word 97

The functions in Microsoft Word 97 that is included in the WebWordPro system:

1. Typing
2. Saving
3. Retrieving
4. Deleting
5. Printing
6. Fonts and text pattern selection
7. Online tutorial and help files

3.4.1.2 Extra Features Available in WebWordPro

The extra functionality that of the WebWordPro system are:

1. Online data storage

- Users (members) can keep their files in the database storage allocated for them. The document can be retrieved anytime, anywhere according to their needs.

2. Database security

   - Users will have their own private view of their personal data. The data or document can only be access if the login username and password is verified.

3. Web characteristics

   - Joining membership page, introduction about the system, and giving feedback. Also the different user interface view by users.

3.4.1.3 Advantages and Disadvantages

Table 3.1 shows the advantages and disadvantages between Microsoft Word 97 and WebWordPro Version 2.0, by comparison.

Microsoft Word 97	WebWordPro Version 2.0
More functions and better capabilities.	Lesser because it is still an immature system, as a Web-based word processor.
Faster performance because it runs straight from the host machine.	Slower performance depending of the bandwidth and speed of the Internet connection.
License copy is expensive, but cost saving in the long run. Recommended for home users.	Cheaper. Users only have to pay for the Internet charges but not practical in the long term. Recommended for organisations that own the Intranet.
Convenient in the sense of accessing the application because it is installed in the owner's computer.	Convenient is the sense of accessing data in the database from anywhere, in term of availability.
Time saving because users are not requires to log onto the Internet.	Require more time in order to log onto the Internet and the database.

Table 3.1: ***Comparison between Microsoft Word 97 and WebWordPro Version 2.0***

3.4.2 Web-based Word Processing System

There are two Web-based word processors used for the comparison. One is the previous version, WebWordPro Version 1.0 [3] and the other is a Web-based notepad by Yahoo! Inc.[32].

3.4.2.1 WebWordPro Version 1.0

The previous version has some limitations and these will be overcome in the newer version WebWordPro 2.0. In WebWordPro Version 1.0, the characteristics are:

1. User must register as a member before accessing it. Unregistered users are unable to login into the restricted database section.
2. System is installed in the Intranet of the organisation and only available within the Intranet and not for public access.
3. Basic functions like *Save*, *Print*, *Delete*, *Edit, and Compose Document.*
4. Features like registration form, user login, and view documents in database.

WebWordPro 2.0 includes the entire above, plus the some extra features as below:

1. Intranet and Intranet
   - The system will be installed in Intranet as well as in Internet for public access.
2. Fonts pattern selection
   - Users can choose the font type, colour scheme, text bolding, underlining, indentation and so on.

3. Online tutorial and help files
   - Users can get online tutorial or read help files provided to get them understand the WebWordPro better.
4. File manager
   - Users can manage their files kept it the database, like renaming and editing the files. Multiple deletions of files at a time are also available to save time.
5. Security measures
   - Users can now rely on the improved security measures taken. It involves 3 levels of securities that are server level, database level and view level.
6. Friendlier user interface
   - Users can now view a more interesting web page with better graphics design plus improved user-friendly interface.
7. Concurrent task
   - Users can open, view and edit few documents at the same time.
8. Extra web characteristics
   - Users can get more technical support by e-mailing the administrators, giving feedback and suggestion, plus commenting about the application.

3.4.2.2 Notepad by Yahoo! Inc.

Yahoo! Inc. [32] is an established information technology company among others in the similar business. It provides services such as search engine, free Web-based electronic mail and many more. It also offers a simple free Web-based word processor, called Yahoo! Notepad, to people around the world. However, users have to register for the free Web-based

electronic mail in order to use the notepad. This is because the notepad is included in the electronic mail area. The features provided in this Yahoo! Notepad include the below:

1. A rich text area for typing.
2. Functions like save, editing, viewing, and delete files are included, plus creating folders for managing the files.
3. Free data storage is provided to store the saved files.

These characteristics are taken into consideration in the WebWordPro Version 2.0 system.

3.5 Application Development Tool Used

Studying all the functional and non-functional requirements for the system will lead to a better understanding in choosing the most suitable system development tool. The programming language of the tool should have the following criteria:

1. It must be a Web-based programming language.
2. It must be able to support database communications.
3. It should be able to support the building of graphical user interface (GUI).

After a long study and consideration, Lotus Notes and Domino R5 has been chosen as the development tool for the project WebWordPro Version 2.0.

3.5.1 Why Lotus Notes and Domino R5?

As described in previous chapter, Lotus family products offer many features and benefits in developing a Web-based application. It is chosen because of the flexible programming language (example: LotusScript, @Formula languange, Javascript, Java, HTML and etc.), plus other advantages like integrated client-server, integrated database, and also integrated

platform for developing web and Intranet applications. These gives convenience because the system can be developed in just one environment or platform without having hassle of using other tools.

Domino Designer and Server R5 in Lotus provide an integrated platform and high-level visual development to create web application quickly and easily. Other advantages by Domino R5 are such as server-side scripting, dynamic content creation, data driven Web pages, content separated from business logic, high level application construct and integrated application services.

Lotus allows one to organise the workspace such as documents, records, and etc. effectively and efficiently. The supports for developing graphical user interface , like embedding or importing graphics, images and video from the database to create a more interesting web page. The database capabilities allow users to access the same database at the same time and use the information to suit their individual needs. Data from a Lotus's server can also be copy easily to another server. It also allows integration with external database system like Microsoft Excess and etc.

Lotus also provides facilities like online help and technical support to the users if they face any difficulties when using the product. Besides that, the online education provides the knowledge needed to develop WebWordPro Version 2.0. These tutorial can either be downloaded or view online in Adobe Acrobat Reader (.pdf) format. Other information and documentation about the product can also be found in document library.

The cost for supporting the Lotus products in a server is reasonable and considerable cheap. This is because we do not need to run an expensive powerful machine in order to fulfil the clients' requirements. Moreover, server or database maintenance is easy, time saving and

low overhead. Lastly, Lotus provides a high level of security infrastructure in managing the system. Other features included are:

1. E-mail client and server facility
2. Group discussion among the users
3. Easy navigated scheduling and workflow
4. Web publishing and browsing
5. Distributed document replication
6. Address book

3.5.2 Programming Techniques in Notes and Domino.

Notes and Domino have many programmability tools that are very useful and flexible in developing a Web-based application. These tools consist of several levels:

1. Pages, forms, buttons, and other user interface elements can be programmed to handle User events. These events can be handled with the Lotus formula language, LotusScript, JavaScript, or Java.
2 Web pages can use JavaScript and Java for Applets.
3. Agent, which are small programs, can be written in formula language, LotusScript, or Java. They can be triggered automatically when certain events occur or they can be run under user control.
4. Scripts libraries, which are libraries of program code written in either LotusScript or Java, can be use.

5. LotusScript can be enhanced by using LotusScript Extension (LSXs). Lotus and other third parties have written LSXs and they typically provide specialised functions such as database access.
6. There are APIs in C, C++, and Java to write customised code to access Domino databases. Applications can run within the Notes environment or as standalone application. APIs can also be use to write LSXs.

The above techniques can be used, if fit, to program the WebWordPro application. The tools range in complexity and power so that simple tasks can be performed by non-programmers, while complex data access programs can be written by programming experts.

3.6 RUNTIME REQUIREMENTS

Run-time requirements involve the necessary hardware and software required to run the application, for both the client and server machine. Hardware requirements cover the minimum physical devices of a computer to run the application. Where else for software requirements are the necessary software to be installed. These client/server hardware and software requirements will be brief in the following section.

3.6.1 Client Hardware Requirement

Client computer should have a "minimum" specifications, or higher, of:

1. 166 MHz processor chip
2. 16 MB RAM
3. Network Interface Card or modem
4. Other standard computer peripherals

3.6.2 Server Hardware Requirement

The specifications for server computer must be higher than those mentioned above to provide a more powerful capability. It must have all the characteristics of a normal server machine. The "minimum" server hardware requirements are:

1. Processor chip with the performance equivalent to Pentium II 233 MHz
2. 64 MB RAM
3. Network Interface Card
4. Other standard parts for running a server.

3.6.3 Client Software Requirement

The essential software for a client machine is:

1. Windows 95/98 as the operating system.
2. Microsoft Internet Explorer 4.0, Netscape Communicator 4.5 or any other compatible browsers for surfing purposes.

3.6.4 Server Software Requirement

The supporting software below is installed to enable the server machine run and host the system:

1. Windows 98 or Windows NT as the network operating system.
2. Lotus Domino Server R5 as the database and Web server.
3. Lotus Administrator R5 to maintain and configure the Domino Server.
4. Lotus Designer R5 to maintain the application from time to time.
5. Lotus Notes R5 as the browser and for easier maintenance.

CHAPTER 4

SYSTEM DESIGN

CHAPTER 4: SYSTEM DESIGN

4.1 INTRODUCTION

Once the data and process requirements have been identified, detailed design specifications are developed for the components of the proposed solutions. Detailed design specifies the hardware and software for automated procedures. All the design involved should be easy to be maintained and upgraded in the future. They also should be user-friendly, simple yet interesting, in systematic format, error-free, reliable, secure from any threat, and other good characteristics that a good Web-based application should has.

In this phase, all the requirements of the system are converted into the system model. Designs developed in WebWordPro system are categorised into:

1. System functional design
2. Database design
3. User interface design

4.2 SYSTEM FUNCTIONAL DESIGN

System functional design is developed based on the information gathered from the previous functional requirement analysis process. These functional requirements are illustrated in the following structure chart.

4.2.1 Structure Chart

Structure Chart is one of the most commonly used methods for system design. In structure chart, a rectangular box represents each program module. Module at the top level of the

structure chart calls the modules at the lower level. Communications between systems are identified here. Decomposing a system into sets of interacting sub-system is an important phase. Structure chart id used to depict the high level extraction of a specified system. The usage of structure chart is to describe the interaction between independent sub-systems, with lines between the rectangular boxes to represent the connection between modules. Three main structure charts of the system are shown as below:

4.2.1.1 Non-member or New User Section

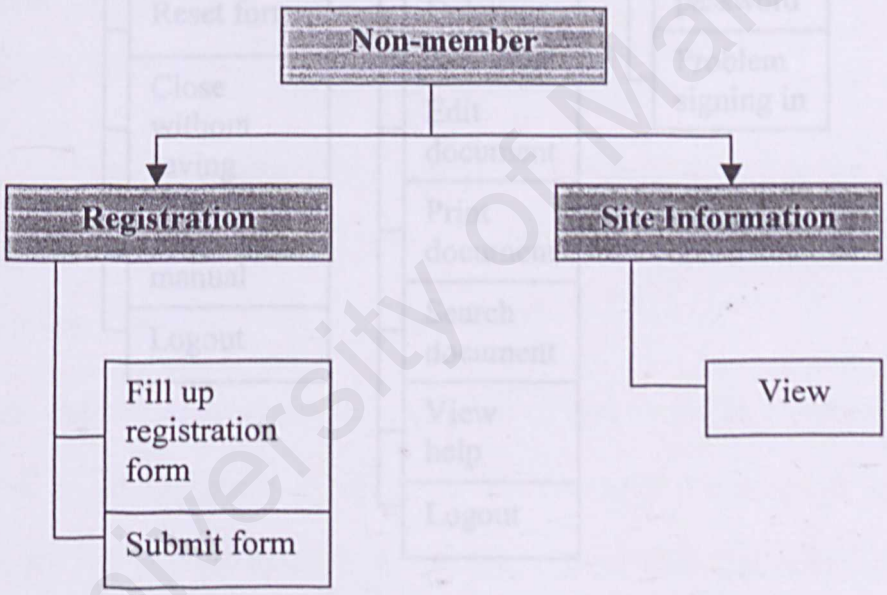

Figure 4.1: ***Structure Chart of the Non-Member Section***

4.2.1.2 Member Section

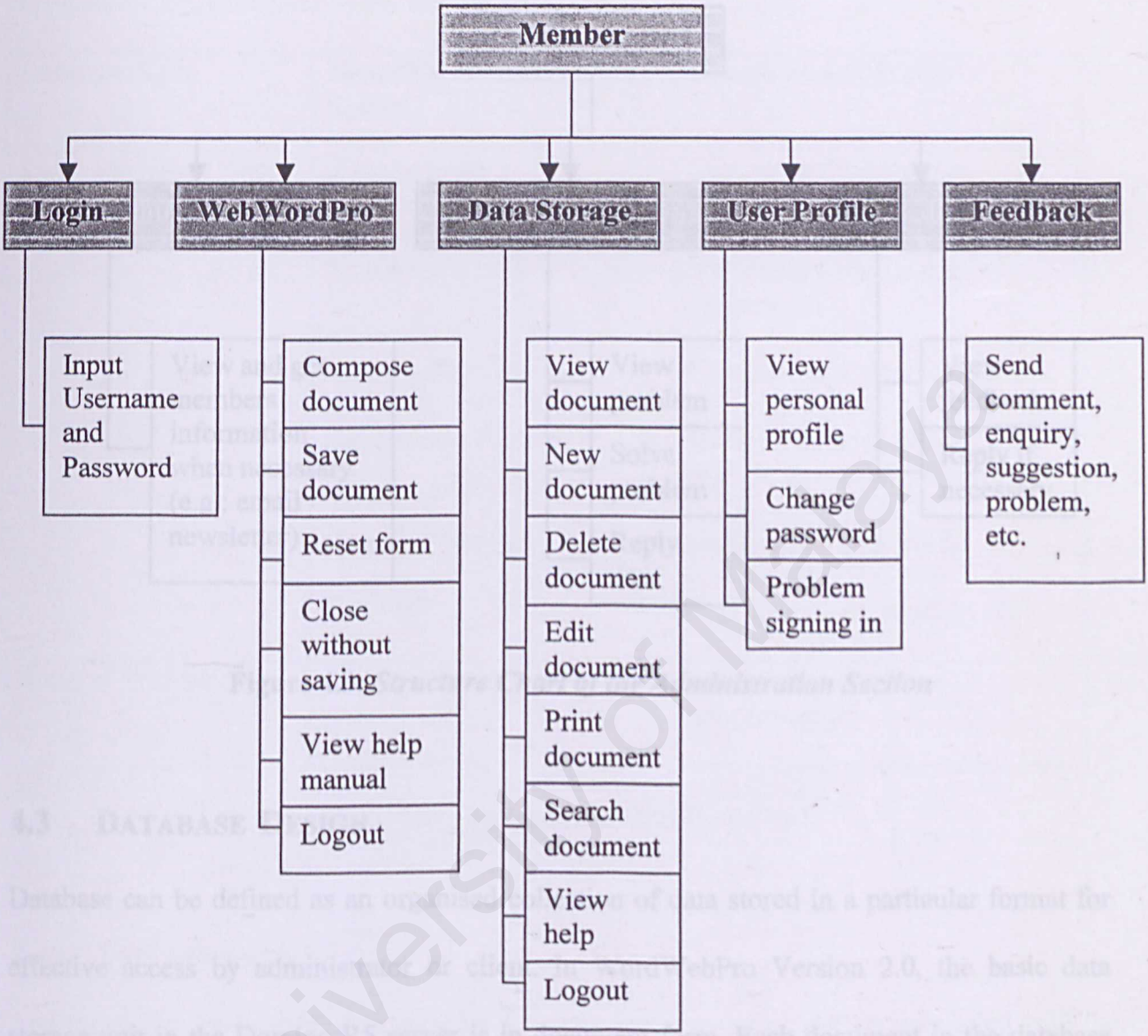

Figure 4.2: ***Structure Chart of the Member Section***

4.2.1.3 Administration Section

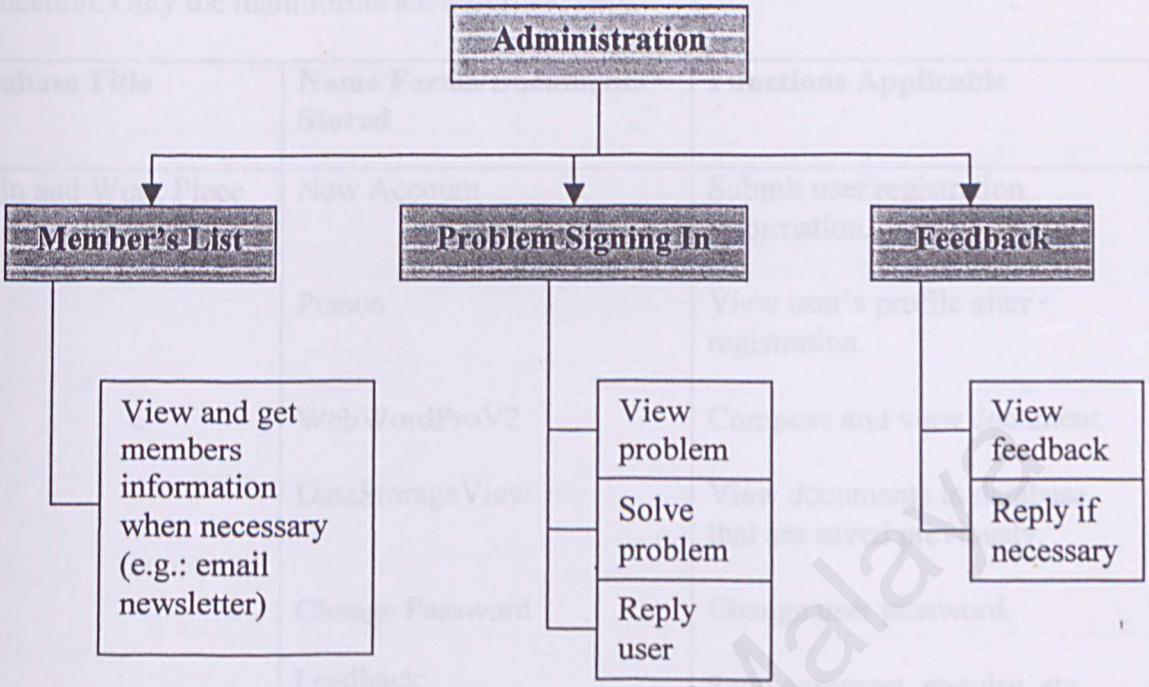

Figure 4.3: ***Structure Chart of the Administration Section***

4.3 DATABASE DESIGN

Database can be defined as an organised collection of data stored in a particular format for effective access by administrator or client. In WordWebPro Version 2.0, the basic data storage unit in the Domino R5 server is in document form. Each document in the database holds one or more item that stores a variety of data types like text, numbers, images and many more.

The Lotus database has its own design elements such as form, view, agent and etc. In Lotus, a data entry screen is called the form. Form contains fields for data entry tasks. Data input by users are then recorded in documents and can be retrieved for viewing using the

same form or different form. Table 4.1 shows the databases created for the WebWordPro application. Only the main forms are described here.

Database Title	Name Forms/Documents Stored	Functions Applicable
Login and Work Place	New Account	Submit user registration information.
	Person	View user's profile after registration.
	WebWordProV2	Compose and view document.
	DataStorageView	View documents in database that are saved previously.
	Change Password	Change user password.
	Feedback	Send comment, enquiry, etc.
Home of WebWordPro	ProblemSignIn	Submit login problem to administrator.

Table 4.1: ***Databases in WebWordPro***

4.3.1 Data Dictionary

The following shows data dictionary for the main forms and their details associated with the WebWordPro system:

4.3.1.1 New Account

Member registration form used to create an account with the system.

Field Name	Data Type	Description
Username	Text	Member's login name or identification that will be used to during login.
NewPassword	Password	Password for verifying the Username during login process.
RetypePwd	Password	Password confirmation for the NewPassword field.
Email	Text	Member's Internet mail address.
FirstName	Text	Member's first name.
MiddleName	Text	Member's middle name.
LastName	Text	Member's last name.
Gender	Radio button	Member's gender.
Month	Combobox	Member's month of birth.
Day	Combobox	Member's day of birth.
Year	Text	Member's year of birth.
JobTitle	Combobox	Member's occupation.
Company	Text	Member's company name.
HomeAddress	Text	Member's house address.
Zip	Text	Zip or postal code for the HomeAddress.
Country	Combobox	Member's country.
PhoneNumber	Text	Member's contact number.

Table 4.2: ***Data Dictionary for New Account Form***

4.3.1.2 Person

Form used to display member's registration information (User Profile).

Field Name	Data Type	Description
DisplayName	Names	Display member's Username.
FullName	Names	Member's Username.
HTTPPassword	Text	Member's password in encrypted manner.
Email	Text	Member's Internet mail address.
FirstName	Text	Member's first name.
MiddleName	Text	Member's middle name.
LastName	Text	Member's last name.
Gender	Combobox	Member's gender.
Month	Combobox	Member's month of birth.
Day	Combobox	Member's day of birth.
Year	Text	Member's year of birth.
JobTitle	Combobox	Member's occupation.
Company	Text	Member's company name.
HomeAddress	Text	Member's house address.
Zip	Text	Zip or postal code for HomeAddress.
Country	Text	Member's country.
PhoneNumber	Text	Member's contact number.

Table 4.3: ***Data Dictionary for Person Form***

4.3.1.3 WebWordProV2

This form is used for word processing. It contains actions that represent some basic functionality in the word processor.

Field Name	Data Type	Description
FileName	Text	Allows users to input the name of the document.
FileContent	Rich text	The place for users to type the document.

Table 4.4: ***Data Dictionary For WebWordProV2 Form***

4.3.1.4 Change Password

The Change Password form allows members to change password when desired, either for security measures or pleasure.

Field Name	Data Type	Description
FullName	Text	Display member's Username.
OldPassword	Text	Requires member to input current password.
NewPassword	Password	New password to replace the old password.
ConfirmPwd	Password	Confirm the new password.

Table 4.5: ***Data Dictionary for Change Password Form***

4.3.1.5 Feedback

Members can use this form to send any enquiry, comment or suggestion to the system administrator.

Field Name	Data Type	Description
FeedbackColumn	Rich text	The text area for users to type the feedback.

Table 4.6: ***Data Dictionary for Feedback Form***

4.3.1.6 ProblemSignIn

Members who face the problem of signing in the database can send their problem directly to the system administrator using this form.

Field Name	Data Type	Description
ProbUsername	Text	Member's login Username.
ProbFirstName	Text	Member's first name.
ProbLastName	Text	Member's last name.
ProbEmail	Text	Member's Internet mail address.

Table 4.7: ***Data Dictionary for ProblemSignIn Form***

4.4 User Interface Design

The user interface design is based on the graphical user interface (GUI) approach. The goal of user interface design is to provide the best way for end-users to interact with computers, or what is commonly known as Human Computer Interaction (HCI). In WordWebPro, it is important to create an interesting yet user-friendly user interface design to attract more users. The considerations taken are:

1. Application layout
2. Registration form layout

3. Information display
4. Understandable hyperlinks
5. Navigation between Web pages
6. Standardised error message display
7. The connection speed when downloading pages

4.4.1 Screen Design

WebWordPro is a Web-based application and its screen design is presented in form of Web pages. To generate a better user-friendly interface, the screen design is formatted in a standard layout so that the various types of information, messages functions always appear in the same general display area. The WebWordPro site is divided into 2 main parts with the major screen design that follow the criteria to meet the objectives of self-explanatory, easy-to-use and attractive in designing user interface:

4.4.1.1 The Site Information Area

This area is the non-member area. No login is required to access this section. It describes everything about the site to anonymous surfers who enter the site. Figure depicts the screen design for displaying this information.

The page is divided into 3 frames where the middle frame holds the content of the information and links to other information pages. The top frame is decorated with WebWordPro banner while the bottom frame consists of some copyright message and the current date.

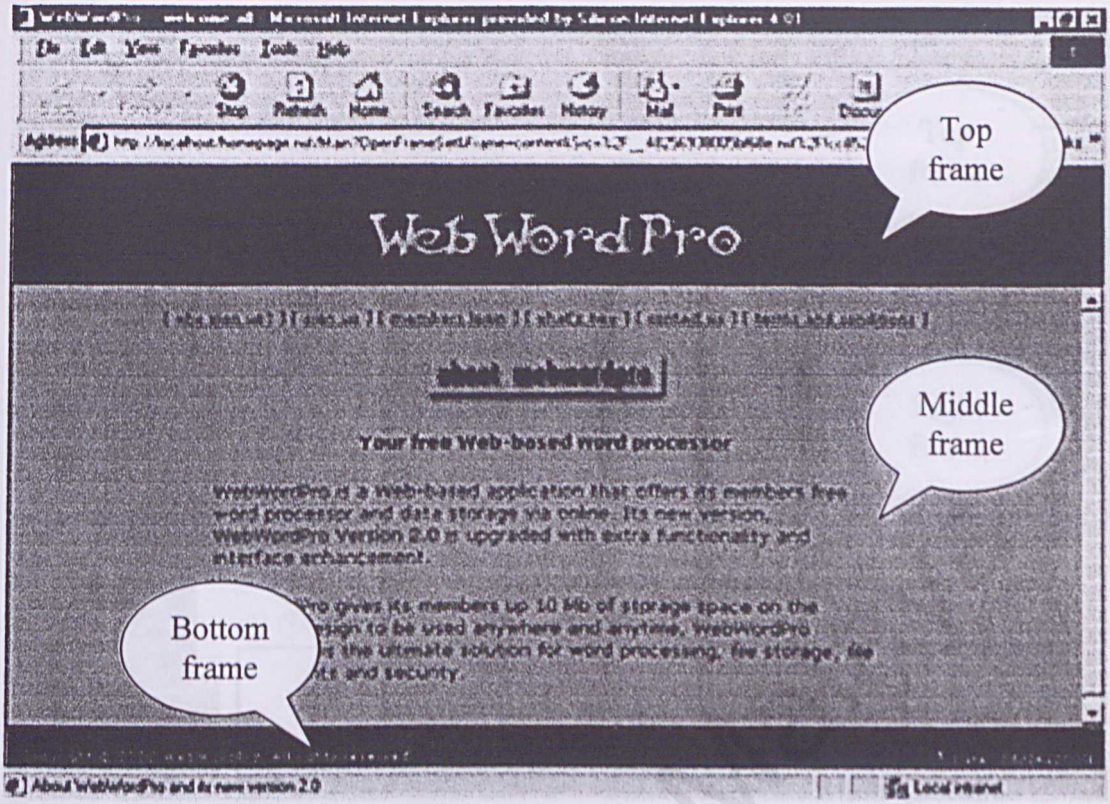

Figure 4.4: ***Screen Design - Site Information Area***

4.4.1.2 The WebWordPro Application Area

This area is the member area where login is required to access it. It is the workspace for doing word processing and viewing the saved document in the database. Figure illustrates the screen design for this section.

The page consists of 3 frames, the top frame, the left frame and the right frame. Again, the top frame is decorated with WebWordPro banner to add some attractiveness to the page. The left frame provides an easy-to-understand navigation that guides users to the pages of their interest, on the right frame.

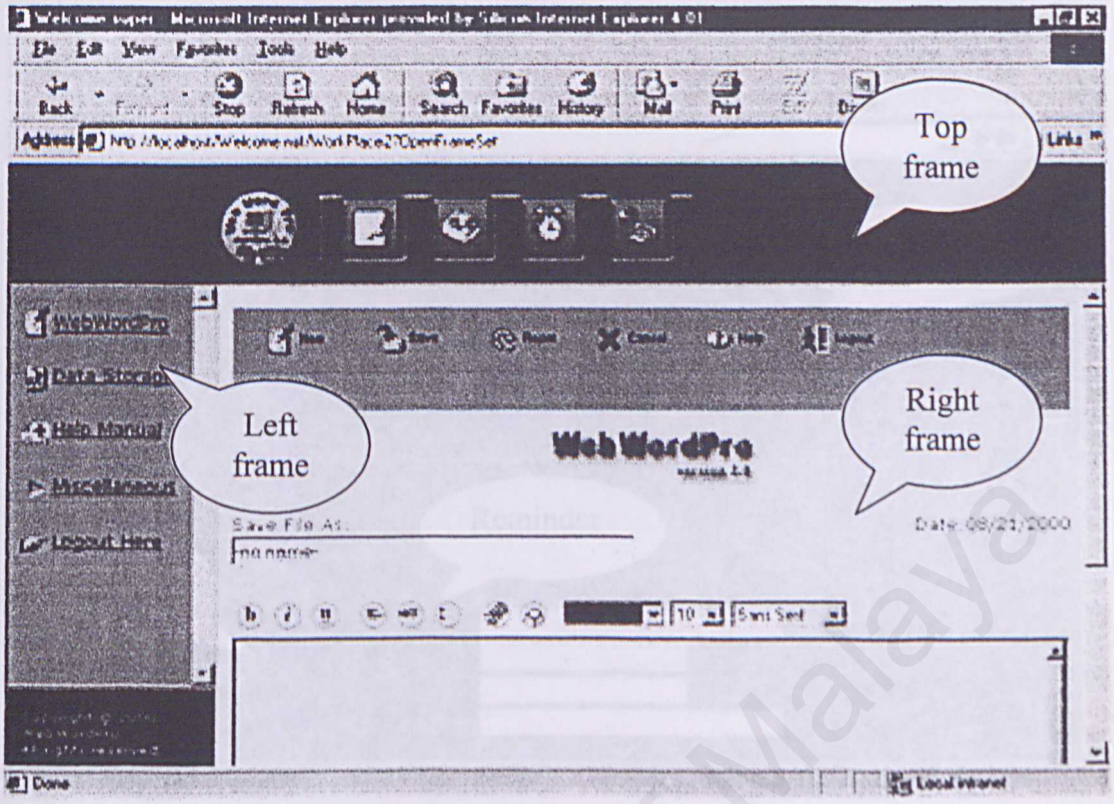

Figure 4.5: ***Screen Design-WebWordPro Application Area***

4.4.2 Input Design

Input design is concerned with the design of any elements that involve data input by the users. These elements can be a text field, rich text field, action button, and so on. Good input design should have the following characteristics:

1. Fields that needs data input should have an easy-to-understand label, which define them.
2. Instructions or guidelines would be a help to make better understanding in users.
3. The data entry form should be including some error check, which will popup message dialog box or just a simple message error page if user makes error.

Figure 4.6, Figure 4.7 and Figure 4.8 shows a better picture about the above:

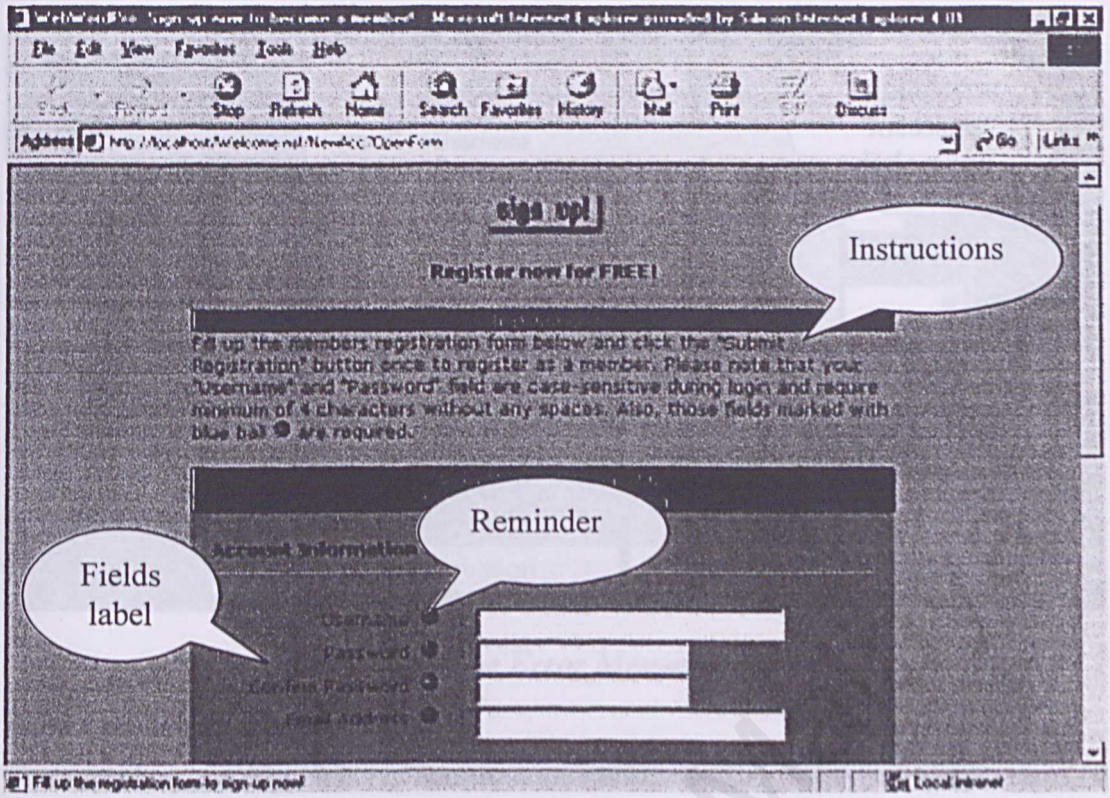

Figure 4.6: ***The Registration Data Entry Form***

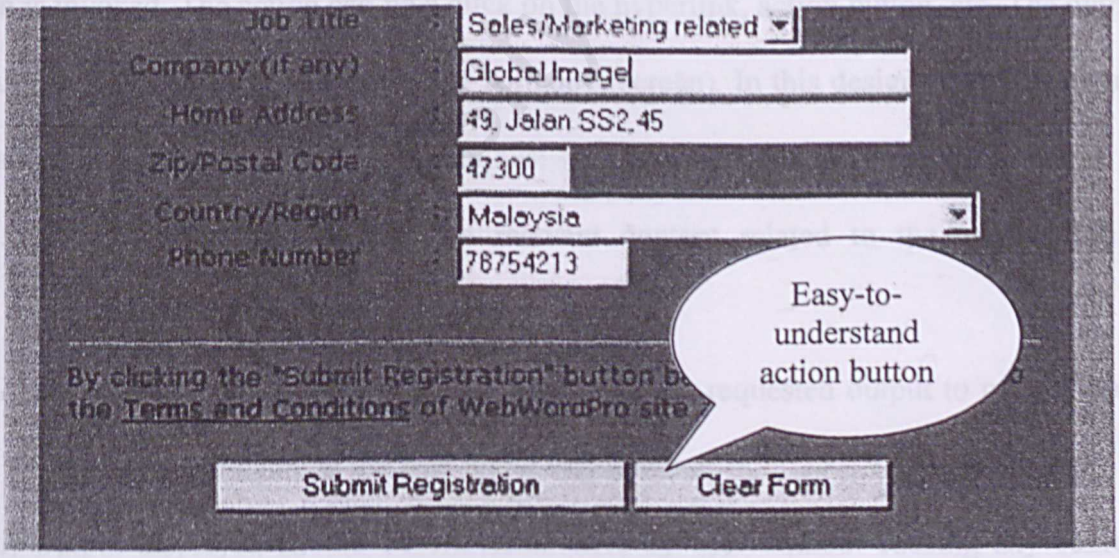

Figure 4.7: ***The Action Button***

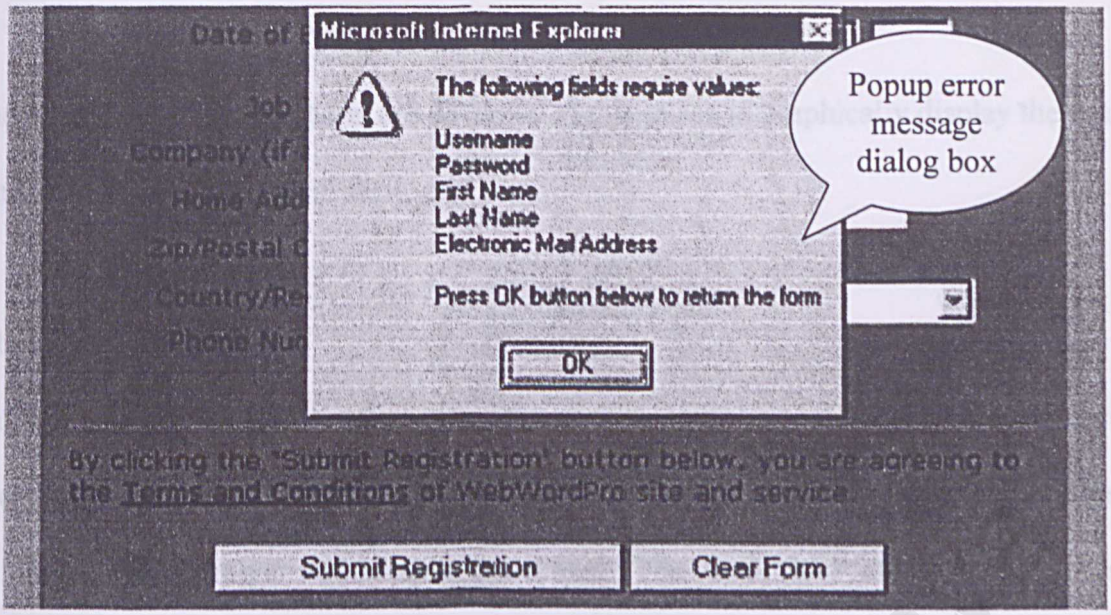

Figure 4.8: ***The Error Message Display***

4.4.3 Output Design

Output is the information or result that will be presented to the users when a decision or an action is invoked. The action can be a click on the hyperlink, action button, etc. The output is produced either as hardcopy (printer) or softcopy (screen). In this design module, the output is designed based on the following guidelines:

1. The output should display the relevant content related to the system and any information when requested by user.
2. Extra links should be included together with the requested output to provide further information and clue to the user about call function.
3. Output displayed should be understandable by user without causing any confusion because of data inaccuracy.

4.5 PROCESS DESIGN

Some simple system flow charts are designed in this phase to graphically display the function modules, data process, system flow, etc.

4.5.1 Data Flow Chart

Data Flow Chart provides an overview or the system input, process and output of the system. Basically, data flow charts describe the inter-relationships among systems and subsystems plus the system's input and output processes. The data flow chart of the overview WebWordPro Version 2.0 system, the Registration module, and Login module are shown below as examples.

4.5.1.1 WebWordPro Version 2.0 System

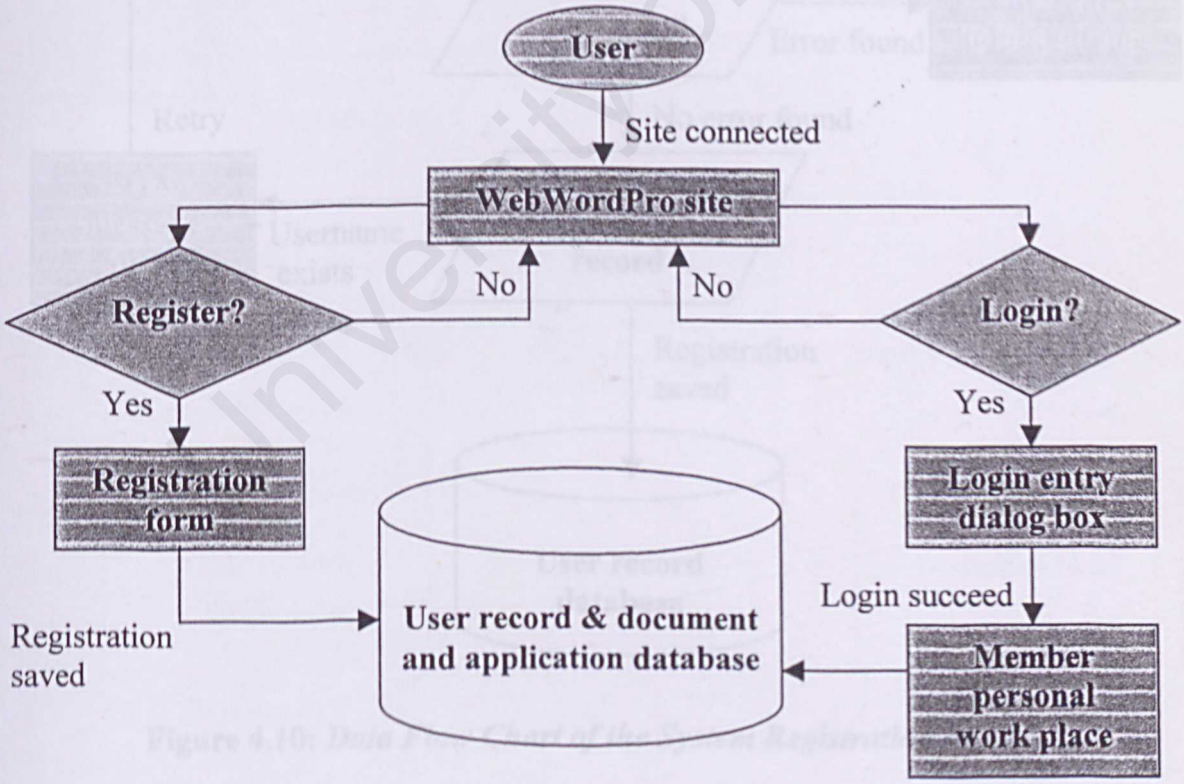

Figure 4.9: ***Data Flow Chart - Overview WebWordPro Version 2.0 System***

4.5.1.2 Registration Module

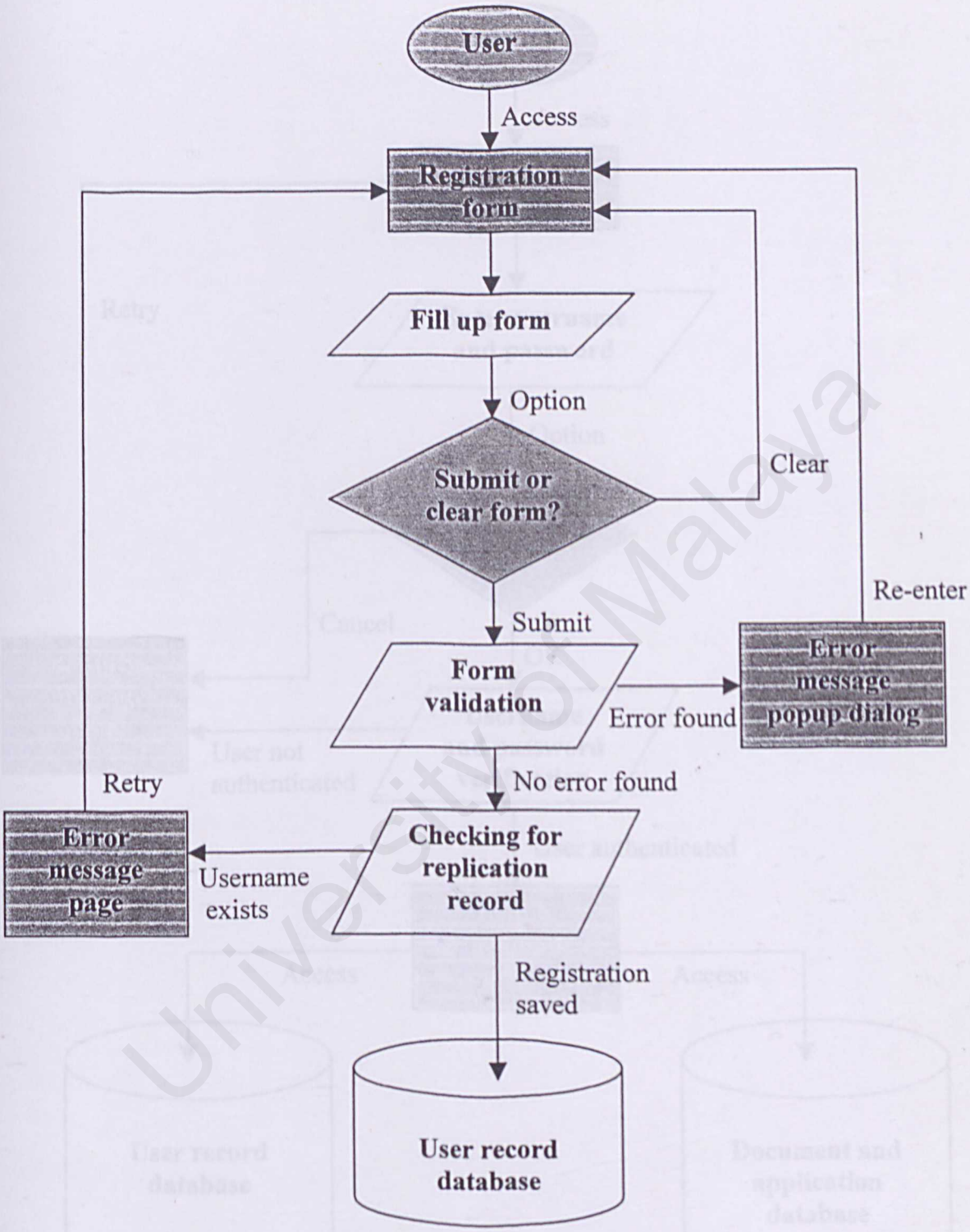

Figure 4.10: ***Data Flow Chart of the System Registration Module***

4.5.1.3 Login Module

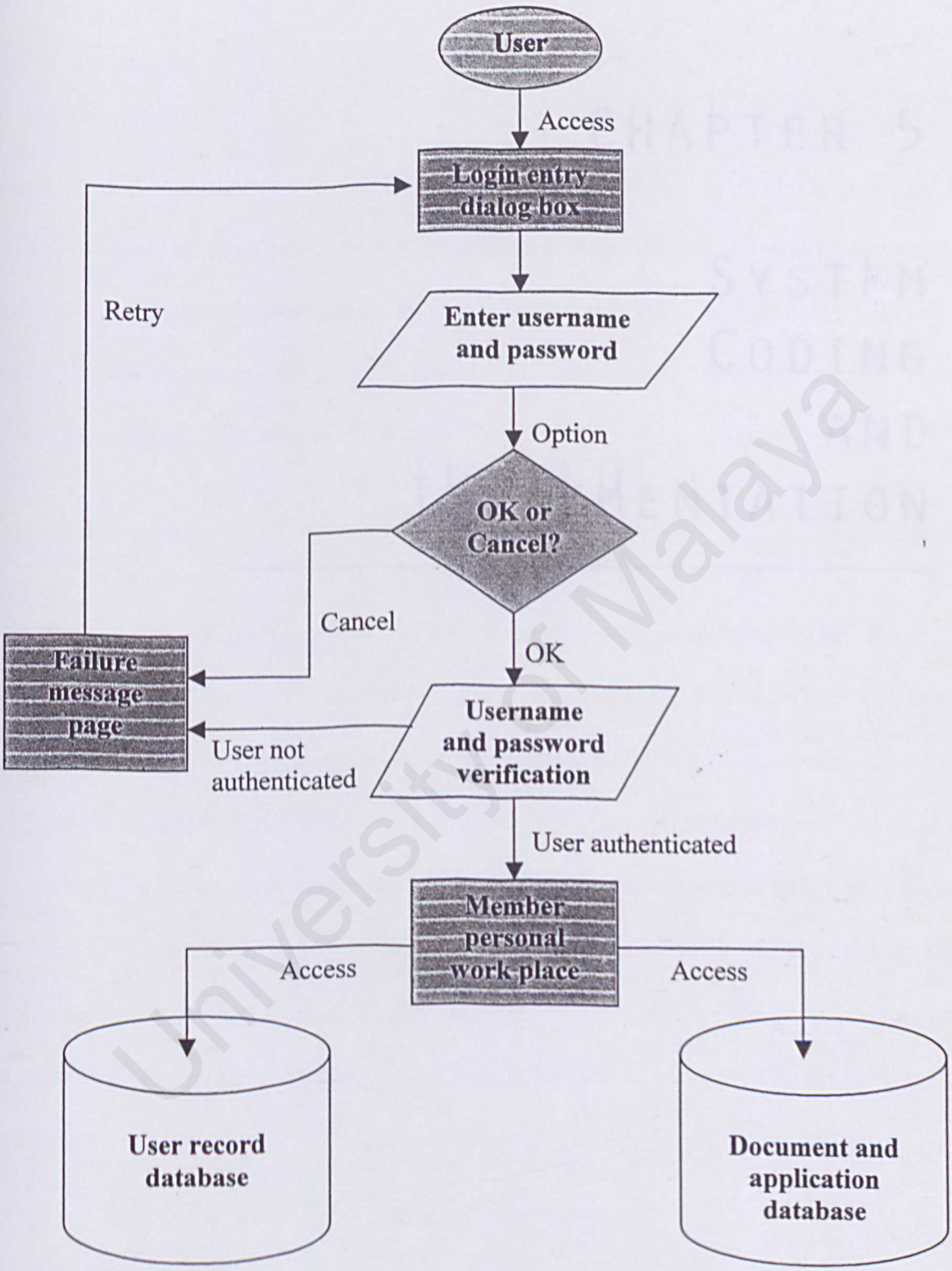

Figure 4.11: *Data Flow Chart of the System Login Module*

CHAPTER 5

SYSTEM CODING AND IMPLEMENTATION

CHAPTER 5: SYSTEM CODING AND IMPLEMENTATION

5.1 INTRODUCTION

Coding is done concurrently with the implementation process to ensure the system runs as desired. Coding the system is the process of writing technical instructions that implement the system design. During implementation, all functionality planned in design phase is checked. It should be able to process the correct data and produce accurate information to end-user. Any problems or malfunction occur is revised carefully and fixed accordingly.

5.2 CODING

During coding, the design specifications are translated into machine-readable format. If design is performed in detailed manner, coding can be accomplished mechanically [4]. It also meant to transform the design specifications into sets of structural program, which are developed later into modules and functions to form a fully functional system.

It started with database development where it is initialised with relevant data. Then it is followed by the creation of user interface that lead to these data. It is a crucial step for a system programmer or developer to decide carefully the best system design before proceeds to the coding process. Otherwise, it will be a difficult task to translate the design elements into structural program.

5.2.1 Coding Approach

Coding is a continuous process that requires a programmer to keep on trying until the correct result is achieved. In this WebWordPro system, an essential coding technique for most of the

system developments, called "top-down approach" was used to get a well-structured program. This approach enables the program terminated the top-down, stepwise refinement process when the pseudo-code algorithm is specified. Basically, it was adapted because of the dependency of the function to login in each module [33].

5.2.2 Coding Styles

Coding styles and its convention rules is an important attribute to the source code and determines the intelligibility of a program. It should follow the convention rules of a good programming style that involve the followings:

1. Proper variables or field naming that does not against reserve names.
2. Meaningful and understandable function and method declarations.
3. Standard paragraph indentation for a neater look.
4. Keep all complex or compound statement as simple as possible to avoid confusion.
5. Important documentations whenever necessary.

All these and other relevant stuff are always remembered when writing codes to build up a professional looking, yet practically work and robust program. Plus, making the system easier to maintain or enhance in the future by either the original programmer himself/herself or any other people.

5.2.3 Coding Documentation

Code documentation begin with the selection of identifier (variable) names, continues with the composition of connectivity and end with the organization of the program. Blank line or

indentation is used so that comment can be readily distinguished from code. Some important rules such as followings are adapted during the coding process:

1. Internal documentation
   - Internal comment provides a clear guide during the system maintenance phase. It is written within the body of the source to describe processing function, stating the purposes of the functional module. However, computer will ignore these comments during code compilation. In short, internal documentation provides the development with means of communicating with readers of the source code.
2. Naming convention
   - Naming convention provides easy identification for the programmer. The naming convention is created with coding consistency and standardization.
3. Modularity
   - In order to reduce complexity, programs are divided into subprograms of in small modules form encouraging parallel development of different part of a system. This forms a uniform, consistent and easier way to develop and debug the overall coding process.

5.3 System Development Environment

During the development, coding is done concurrently with implementation process to find out the weaknesses and the possible run-time errors. The weaknesses will be improved, while the errors found will be debugged. System implementation can also be defined as part of system testing phase, which will be discussed in next chapter.

The necessary requirements for development environment include the hardware configuration and software installation. Both aspects are carefully analysed and carried out to create a good development environment. It is important to have a development environment that could support the coding and implementation process smoothly without any problems occur in between.

5.3.1 Hardware Configuration

The hardware used for the WebWordPro system development involves a personal computer with the below specifications. All parts were made sure to be fully functional and run at the top performance. This is required because the system development process cannot afford any breakdown of the computer components, which will lead to a time delay or possible data loss.

1. AMD K6 II 450 Mhz processor chip
2. 64 Mb RAM
3. 10.2 Gb Harddisk storage
4. 4 Mb PCI display card
5. Other standard computer peripherals like monitor, mouse, etc.

Apart from this personal computer, another computer with an Internet connection is configured to act as the server. This server machine must have a fixed Internet Protocol (IP) address because it is required by the Domino Server's configuration. A normal personal computer with the modem Internet connection is impossible to be set up as a Domino Server because it uses different IP addresses every time a new Internet connection is made.

The specifications for the server machine can be equivalent with the above described during coding, implementation or testing phase. However, these specifications are not so practical in real world because a standard server capability should be higher than that to perform a robust and reliable hosting.

5.3.2 Software Installation

The server machine is pre-installed with the Windows 98 operating system (Windows 2000 or Windows NT is recommended) and Lotus Domino Server software to host the system. Also, a Lotus Administrator is installed to configure and manage this server. The good characteristics about the Domino Server software is that it could be configured or managed from a Lotus Administrator which is installed at a remote computer. This can be done as long as the Lotus Administrator has a verified ID to take control of the server. Hence, time saving and convenience is an advantageous factor here.

For the normal development personal computer mentioned previous, it is pre-installed with the Windows 98 operating system, plus Lotus Notes and Designer software to conduct the development, in terms of coding, implementation and testing of the WebWordPro system. Other necessary and related software installed are described below:

1. Microsoft FrontPage 2000
   - FrontPage [34] is use to understand some Hyper Text Markup Language (HTML) syntax. This WYSIWYG HTML editor has a tab function that easily reveals the HTML coding during the element design. Understanding the basic concepts of HTML is important, as the system is a Web-based application. Therefore, HTML is used whenever necessary during the development process.

2. Adobe Photoshop 5.5

   - Photoshop [35] is used mainly to create graphical elements to be included in the system. Photoshop is well known as one of the best graphic editor around. The features functions in Photoshop include layering, filtering, masking and many more to create attractive images. Besides beautifying the application, a well-designed graphic also defines the system functions to be user-friendly or self-explanatory.

3. GIF Movie Gear 2.6

   - Movie Gear [36] is a simple, yet a very useful GIF animator software. Pictures and images created in Adobe Photoshop are imported into Movie Gear to create animated images. Animated images will make the Web pages less static and a key factor to attract more users to the site. This software is a shareware and can be downloaded from the Internet.

4. Internet Explorer 5.0 [37] and Netscape Communication 4.74 [38]

   - These two browsers are among the most popular browsers nowadays and easily available in the market. These features are used to get a better idea on the how the application is actually previewed in an end-user's environment. All user interface designs will follow the browsing capabilities of these two main browsers.

5. Microsoft Word 2000

   - Microsoft Word [39] is the word processing software used for project documentation purposes. It is picked because of the high level of availability in the market and also the easy-to-use functions in it.

CHAPTER 6

SYSTEM TESTING AND MAINTENANCE

CHAPTER 6: SYSTEM TESTING AND MAINTENANCE

6.1 INTRODUCTION

Testing is carried out once the program components are coded. Testing process is not the first place where fault finding occurs, as requirements and design reviews have earlier ferret out some of the problems. In this phase, tests are conducted to check the system modules for their consistency and error, plus ensuring that the system fulfil all the requirements and objectives. Here, all the system specifications, designs and coding are to be revised again, in more systematic and careful manner. A good type of test will determine errors and faults that were unable to be discovered during system analysis, design and coding phases.

6.2 TYPES OF ERRORS AND FAULTS

After coding the programs components, the code is examined to spot it faults and if found, these faults will be eliminated right away. Therefore, it is important to know what kind of faults or errors that might exist in a program. Two major types of errors and faults commonly found when developing the WebWordPro system are discussed below:

6.2.1 Algorithmic Fault

Algorithmic fault occurs when a component's algorithms or logic does not produce the proper output for given input because something is wrong with the processing steps. These faults is sometimes easy to spot by reading through the program (called desk checking) or by submitting input data from each of the different classes of data that the program expected to

receive during its regular working. Typical algorithmic fault that occurs during development are:

1. Forget to initialise variables or set loop invariants
2. Testing for the wrong condition
3. Comparing variables of inappropriate data types (example: text and number)

6.2.2 Syntax Fault

Syntax error happens when the constructs of the programming languages are not properly used or written. Sometimes, the presence of a seemingly trivial fault can lead to disastrous results. Fortunately, in the Domino Designer R5, most of the syntax errors are captured by the compiler and displayed.

6.3 Types Of Testing

The testing phase of the WebWordPro Version 2.0 system involves 3 main steps, the unit testing, the integration testing and lastly the system testing. The purpose of unit and integration testing is to ensure that the code implements the designs properly. These two tests cover the testing of system components individually and then integrating them to check the interfaces. Where else, system testing is performed in the final step of testing to ensure that system comprises of all the system requirements and objectives.

In Figure 6.1, the arrow from the top boxes indicates the normal sequence of testing. The arrows returning to the previous box indicates that previous testing stages may have to be repeated because of some problems.

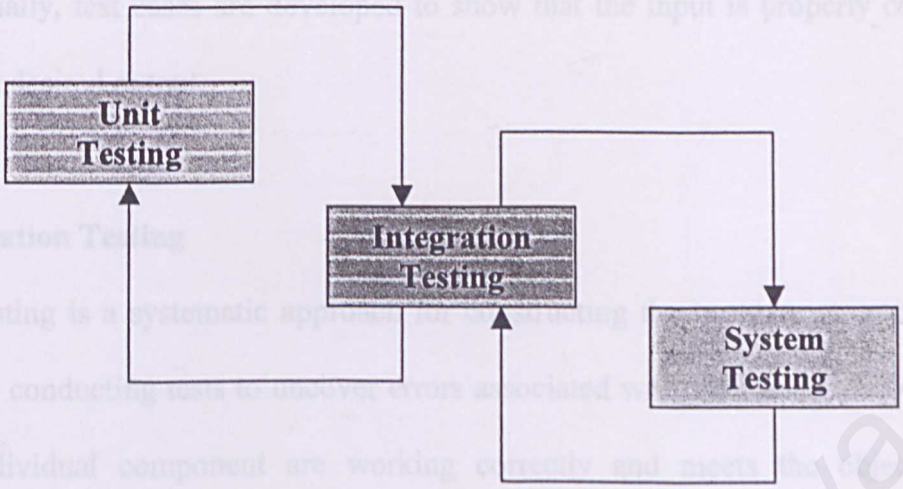

Figure 6.1: *Testing Stages*

6.3.1 Unit Testing

Unit testing focuses on verification effort on the smallest unit of application design in the module. This process enables errors detection in coding and logical mistake. For this system, unit testing is done during the coding phase. Basically it involves three major steps:

1. Examine the code
   - This first step is to examine the program code by reading through it, trying to spot the algorithm, data and syntax fault. When necessary, the code is compared with the system specifications and designs to make sure that all relevant cases have been considered.
2. Compile the code
   - In this step, the code is compiled and any remaining syntax faults found will be eliminated.

3. Develop test cases
   - Finally, test cases are developed to show that the input is properly converted to the desired output.

6.3.2 Integration Testing

Integration testing is a systematic approach for constructing the program structure while at the same time conducting tests to uncover errors associated with interfacing. In other words, when the individual component are working correctly and meets the objective, these components are combined into a working system. If integration is planned and coordinated correctly, the causes for any failures occur can be determined easily. In this integration testing, there are several approaches [4] that can be considered, the Bottom-up Integration, Top-down Integration, the Big-bang Integration and the Sandwich Integration. Among these approaches, Top-down Integration is used in the WebWordPro integration testing.

6.3.2.1 Top-down Integration

In this approach, the system is again viewed as a hierarchy of components, where each component belongs to a layer of design (see Figure 6.2). The top level, usually one controlling component, is tested by itself. Then all, components called by the tested components are combined and tested as a larger unit. This approach is reapplied until all the components are incorporated. Figure 6.3 illustrates an example on how top-down testing works.

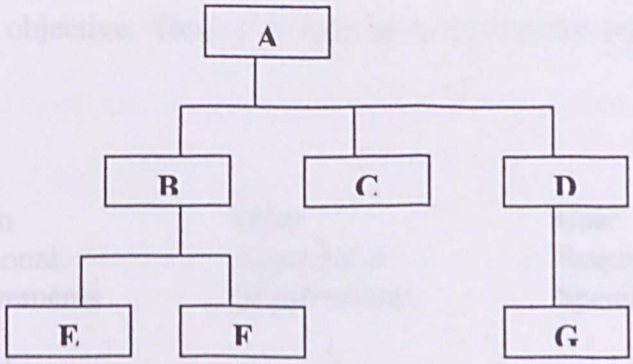

Figure 6.2: *Example of Component Hierarchy*

Figure 6.3: *Top-down Testing*

6.3.3 System Testing

System testing is performed is the final phase of testing whereby it is performed after completion of coding for each module. This process ensures that all units in the module will function accordingly when integrated and have fully satisfied its system requirements. System testing is designed to reveal bugs that cannot be attributed to individual components or to the interaction among component or to the interaction among components and other objects. There are 3 main steps taken in the WebWordPro Version 2.0 system testing process:

1. Function testing
2. Performance testing
3. Acceptance testing

These steps are shown in Figure 6.4. Each step has a different focus and a step's success depends on its goal or objective. Thus, it is helpful to review the purpose of each step of system testing.

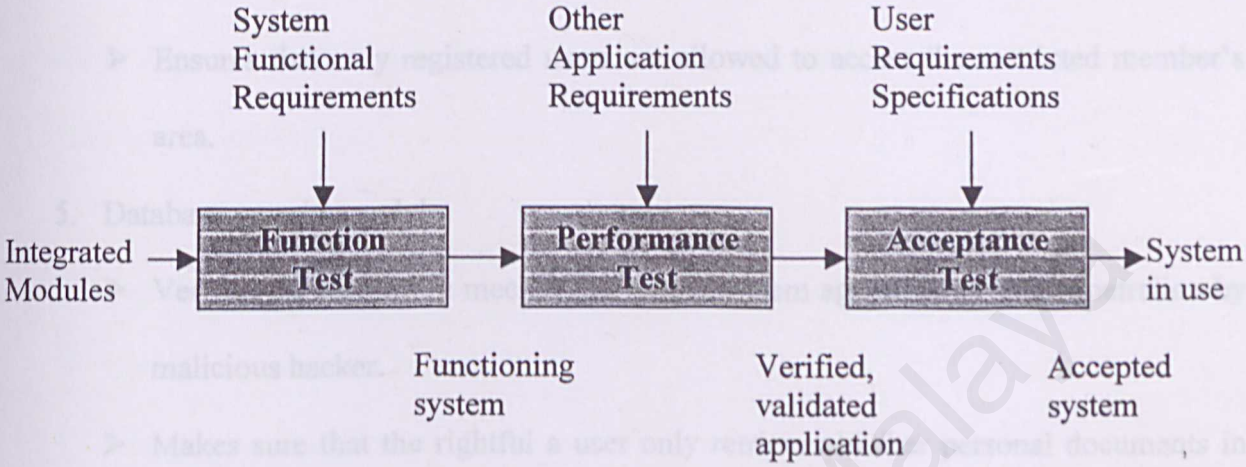

Figure 6.4: *Steps in the Testing Process*

6.3.3.1 Function Testing

A function test checks that the integrated system performs its function as specified in the requirements. In the WebWordPro Version 2.0 system, function test is implemented on the following modules:

1. Site information module
   - ➢ Verifies the correct display of pages when users click on the links.
   - ➢ Links are tested to work correctly, avoiding dead links.
2. Registration module
   - ➢ Registration is ensured to process correctly and automatically when submitted by users.
   - ➢ Verifies that the error checking even handling occurs when needed.

3. Login module
   - Allows the specific authenticated user to login into her personal work place.
   - Prompts user with error messages if username or password is invalid.
4. Authentication and authorisation module
   - Ensures that only registered users are allowed to access the restricted member's area.
5. Database security module
   - Verifies the protection mechanism on the system against improper penetration by malicious hacker.
   - Makes sure that the rightful a user only retrieves his/her personal documents in data storage.
6. User support module
   - Ensures that the problems or feedbacks sent by users are processed or received.
7. WebWordPro word processor module
   - Checks that all functions in the application, such as save, edit, print, delete and open, work as programmed.
8. User profile module
   - Verifies that the user gets the correct information display and password-changing procedures work accordingly.
9. Administration module
   - Verifies the all the functions in this module, such as viewing, updating, deleting, maintaining and configuring process, can correctly be done.

6.3.3.2 Performance Testing

Once the system functions are convinced to work as specified, the performance test is conducted. It compares the integrated components with the non-functional system requirements. These requirements, including security, accuracy, speed and reliability, constrain the way in which the system functions are performed. Performance tests taken are to evaluates the followings:

1. Speed of data retrieval.
2. Security precautions required.
3. Consistency in data's availability.
4. Precision accuracy in data, function and process.
5. Response time to user inquiry and errors detection.
6. System's reliability and robustness.

At this point, after the performance tests, the system is considered to have operated the way it is intended to be. This verified system is then compared with the end-users expectations by reviewing the requirements definition in the documentation. Upon satisfaction of the comparison, the system is called a validated system, which means that the requirements have been met.

6.3.3.3 Acceptance Testing

Function and performance testing is done by the system developer. Before the system is fully ready to roll out, it is a best thing if the system is also tested by the end-user. This test, called an acceptance test, assures the end-users that the system they requested is built for them. The end-user testers are selected specially to test out the application. For the WebWordPro

Version 2.0 system, friends, college students and office staffs are invited for the testing. The test is held at a test facilitated laboratory and not the actual environment. Feedbacks from the user-tester or the testing result is documented and analysis accordingly.

6.4 Analysis Of The Test Result

From the testing process that has been carried out, the following test result can be summarized:

1. The achievement of the main objectives
   - Generally, the main objectives of the system development, described earlier, is achieved. System could handle member's registration process, enforce the necessary security measures and provide a work place for user to do word processing and keep document virtually via Internet. These few features are the most important part of the application.
2. Enhancement requirements
   - Several aspects of the word processor need to be enhanced to provide more functionality and features, like saving documents in local harddisk or floppy disk.
3. System demonstration
   - The user-testers have requested for a section that provides the word processor application demonstration for anonymous users, without registration needed. This could give them a better idea of the system and the opportunity to try it first.

6.5 MAINTENANCE

In the previous sections and chapters, the way a system is developed is discussed from the scratch till the moment where it is delivered for end-users. However, a system's life does not end with delivery because it will continue to evolve to fulfil user's requirements from time to time. Thus, maintenance is required in the future to support all changes in the system's modules. Basically, there are few types of maintenance that might be implemented on the system, which are explained in the following section, depending on the situation.

6.5.1 Corrective Maintenance

Corrective maintenance focuses on maintaining control over the system's day-to-day functions. Any function failures occur will be brought to the maintenance team's attention. In the WebWordPro system, a feedback column is prepared, so that users can inform the respond team for this particular problem. The maintenance personnel will then respond to the problems resulting from faults by finding the failure's cause. This is solved by making corrections and changes to requirements, design, code, test suites, and documentation, as necessary.

6.5.2 Adaptive Maintenance

Sometimes, a change introduced in one part of the system requires changes to other parts. Adaptive maintenance is the implementation of these secondary changes. For example, if a newer version of Domino Server software is installed in the future, then it requires appropriate configuration on the server and databases.

6.5.3 Perfective Maintenance

Perfective maintenance involves making changes to improve some aspect of the system, even when the changes are not caused by faults. As WebWordPro system might be upgraded to a newer version in the future, a redesign to the rule-based approach may make it easier for the developer to upgrade any features in the future. Thus, few maintenance steps such as below will be taken as guidelines if perfective maintenance has to be carried out.

1. Documentation changes to clarify items.
2. Test suite changes to improve test coverage.
3. Code and design modifications to enhance readability.

6.5.4 Preventive Maintenance

Similar to perfective maintenance, preventive maintenance involves changing some aspect of the system to prevent failures. It may include the addition of type checking, the enhancement of fault handling and so on. These activities will be taken into consideration in the future to create a more reliable and robust WebWordPro system.

Chapter 7

System Evaluation and Conclusion

CHAPTER 7: SYSTEM EVALUATION AND CONCLUSION

7.1 INTRODUCTION

In this final stage of system development, the WebWordPro Version 2.0 system is evaluated to list out all the problems encountered during the development processes and then the necessary solutions to it. Also, in this chapter, the system strength, limitation, and enhancement will be discussed.

7.2 PROBLEM ENCOUNTERED AND SOLUTION

Throughout the development phases of the WebWordPro system, several problems have been encountered and defined. However, most of these problems were resolved eventually, either fully or partly. Some of the problems encountered were:

7.2.1 Development Time Constraint

The limited period of time allocated for this system development is rather limited. Lots of time has been used to do research, finding, analysis and discussion before moving into the system design, coding, implementation and testing. Also, lack of knowledge in programming language had slower down the developing process.

In order to deliver the WebWordPro Version 2.0 in time, tedious and careful time management planning had be done. All the important modules of the development were given the time priority compared to those less important to the system's milestone. Then, learning the programming languages of Lotus Notes and Domino R5 is done parallel with all the development phases.

7.2.2 Problems in Tools Selection

Since Web-based programming only started and was popular late 1990's, the exposure of knowledge in Web-based programming language is limited. Therefore, it was difficult to choose the most appropriate programming language and tools for the system development.

To gain more insight of Web-based programming and identify the most appropriate approach to develop the system, an in depth studies and research was carried out in earlier stage of development. The studies and research activities including Internet surfing, reading topic related magazine, reference books and discussing with experienced person regarding Web-based application development.

7.2.3 Lack of Knowledge in Lotus Notes and Domino R5

Lack of knowledge in Lotus Notes and Domino R5 had slower down of the system development process. Lots of time was spent in looking for solution to solve the problems associated with the programming languages in Lotus Notes and Domino R5.

The solution taken to overcome this problem was joining the Notes Discussion Forum [40] via Internet. Questions and problems were posted in the forum to get the answers. Apart from joining forum, surfing the Notes related sites to find some useful programming tips and trick was also done. Lastly, friends and those with good knowledge in Notes were referred for discussion.

7.2.4 Setting Up Domino Server

Setting and configuring the server was a difficult and heavy task. The Domino Directory of the Domino Server R5 need to be configured correctly to assures that the hosting process

goes well. Things like server and document connection, domain naming, Web port setting, security access and other important stuff must be configured properly. Any mistakes could lead to the system malfunction.

While setting up the server and managing it are not an easy task, it had been resolved eventually by reading the server manual book and also referring to the Lotus Domino technical support team in the Internet.

7.2.5 Developing Web-based Application

Web-based application is totally different from a conventional stand-alone software or application. Web-based application is slight tougher because Internet connectivity is required. Understanding the concept thoroughly behind it is required before the development can take place.

Time and effort had been invested to study the implementation on Web-based application. As time goes by, understanding the development of Web-based application with Lotus Notes and Domino R5 had become more competent and clearer.

7.2.6 Unsupported Features in Web Browsers

In Lotus Notes and Domino R5 tool, there are some features that are not supported on the Web. These features include Domino objects, function and properties. It is important for the application developer to review all these weakness to avoid any faulty result later in the developing process. For example, a normal Web client cannot see private view and folder features in Lotus. Then, there are some programming command and formula, which are not supported on the Web.

All these were carefully studies to avoid using them in this WebWordPro system. Any alternative, if any, is used to replace the unsupported features. For instance, to call an action (example: popup dialog box) written in LotusScript directly from the Web browsers is impossible. Instead, other alternative programming languages, such as JavaScript is used to replace LotusScript.

7.2.7 Slow Response Time

The development of the WebWordPro word processor involved embedded Java applets. These Java applets need to be downloaded into the client's machine before the application can be use. The downloading process will slow down the overall data transfer speed performance. Images and graphics used to in the interface design also add to situation.

Therefore, images and animation with big file size was avoided in the system interface design. Only small file size pictures were use. Also, applets are embedded when required.

7.3 SYSTEM STRENGTH

The WebWordPro Version 2.0 system strength is discussed below:

7.3.1 User-Friendly

Overall, the WebWordPro system could be evaluated as an easy-to-use application. Unlike command-based environment, such as MSDOS, WebWordPro provides simple, user-friendly and graphical user interface. Standard user interface control objects, such as icons, buttons,

scroll bar, radio button, combobox, plus Window-oriented point and click interface, WIMP (Window, Icon, Menu and Pointing Devices) has been applied.

Besides, sufficient instruction and guidance are provided to guide and assist user. For example, error messages will be displayed to guide user whenever invalid user input are encountered by the system. Then, there is online help manual for users to get necessary help.

7.3.2 Security

All necessary security features are implemented in the system. There are three types of security level that are the server level, database level, and document level. These levels are set accordingly to prevent any unauthorised access. Only registered users are able to access the restricted application section. Here, user's status such as registered or unregistered, is determined so that they have the necessary access right to access the application database and also view their personal documents.

7.3.3 Accessibility and Ease-of-use

WebWordPro Version 2.0 system can be access with Netscape or Microsoft's Internet Explorer browsers. These browsers are available easily in the market. Also, the system Web pages are designed without object control like an Active Server Page (ASP). There is no need to download controls to client machine that depend on the Internet transmission line and the file size of the controls. This allows the Web pages to be downloaded with minimal of download time, anytime and anywhere, as long as there is an Internet connection.

7.3.4 Transparency

System is transparent to user, as they do not need to know where the database resides, how the system is structured, etc. For example, users do not need to know how retrieve and insert record into the database. All they need to do is submit data and then click the specific function to view the result.

7.3.5 Data Entry Validation

The system includes some error-checking step that displays error messages if user makes a data entry error. This allows user to identify the mistake effectively and correction can be made. Data entry validation enhances the reliability and robustness of the system.

7.3.6 Feedback Facility

There is a feedback form prepared for user to interact directly with the system management. Users can send any enquiry, comment, problem or suggestion to the system support team. A reply to the feedback will then be sent to the sender's mailbox. This feature allows an easier and effective way of communication between the end-user and the system administrator.

7.3.7 Email Notification

Electronic mail address provided by members during registration will be recorded and used to send any news and update about the site to the members. This will attract users to visit the site more frequently.

7.4 System Limitation

There are some limitations in WebWordPro Version 2.0 system due to time constraints, facilities constraints and limitation of the program language itself. These limitations include the followings:

7.4.1 Number of Functions

As an immature Web-based word processor, WebWordPro Version 2.0 is still lack of number of functions if compare to established word processor like Microsoft Word 2000. Advance functions such as inserting picture, paragraph formatting, spelling checker, word count, and etc. is yet to be included in the system. Therefore, users would not be able to enjoy all these facilities at the time being.

7.4.2 Capabilities of Web Browsers

The WebWordPro system is designed for Web browsers, which are able to support Java applet and frameset. User with old browsers or unsupported browsers would unable to try the application. This is because some section of the application is embedded with Java applets and the screen design includes frameset.

7.4.3 Saving Ability

At the moment, users only able to save the documents in the data storage provided online. Saving the documents into local harddisk or floppy disk function is not available yet. However, users can download the whole Web page displaying the content of the document, by using the "Save As..." command in the "File" menu of the browser.

7.4.4 Printing Function

Printing function is integrated with the Web browser print facility. This is because Lotus Notes does not provide customised printing method for normal Web browsers. This forces the printing to be done in Web page form. User who wishes to print document can do so by clicking the "Print" icon on the browser or the "Print Now" button provided within the page. The button is coded to invoke the Web browser print facility.

7.4.5 Data Transmission Speed

The system design includes images and Java applets that might need some time for loading them into browser. Users with low speed Internet connection (using modem) would have the problem of lagging when accessing the WebWordPro application. However, the system is best use if it is installed in a small Intranet or private network, where the connection speed is fast.

7.4.6 Member Replication

The system administration section is unable to track a same user with multiple membership accounts. Users can own several account if they forge their personal information during registration. These users might have the intention of having more data storage, but eventually they will cause the network congestion and also add to the database load.

7.4.7 Updating User Information

At the moment, users are only allowed to change their login password and not other details in the User Profile page. This is due to the time constrains during the system development.

7.5 FUTURE ENHANCEMENT

Some of the future enhancement that should be considered to be included in this project in the future is described below:

7.5.1 Customised Login Page

The WebWordPro Web user login mechanism uses the basic HTTP authentication scheme. Upon request of login, the browser will popup the standard authentication login dialog box that prompts user with his/her unique username and password. In order to request the login box, user has to click on the login link provided and this is so unclear. It would be better if the login page were ready with two input field, the username and password field. This would picture a better standard login procedure like most of the Web application available in the Internet nowadays. For instance, the "Microsoft Hotmail" and "Yahoo! Mail" login page.

7.5.2 More Functions and Features

If possible, the WebWordPro word processor should include more functions and features like those found in Microsoft Word 2000. This would meet more user requirements regarding the functionality available in a word processing system. The functions need to be added are creating table, drawing tools, undo typing, spelling checker, and etc.

7.5.3 Improve Saving Ability

In the future, the system should be improved to provide users with the capability to save their documents into the local harddisk storage or the floppy disk. If this could be done, it would

be better if users are able to save the documents in variable types of file extension, such as ".txt", ".doc" and ".rtf".

7.5.4 Improving the User Profile Section

The User Profile section will be enhanced later during the maintenance process to allow user to change or update their registration information.

7.5.5 Uploading File Service

Maybe in the future, WebWordPro will allocate some special data storage in the database to allow user to upload and keep their files. The files format could be in executable form (.exe), image form (.gif, .jpg) and so on.

7.5.6 Free Web-based Electronic Mail

WebWordPro should provide free e-mail service to attract more users to the site. The e-mail service can be use to send the typed document in attachment form. This feature might help to ease users who need to send files over Internet.

7.5.7 Chat Room

An online chat room will be installed in the site, so that users around the globe can have a real time chat among themselves or with the system manager regarding the application or any other issues. This will encourage users to exchange and share information, plus creating a harmony and informative society.

7.6 CONCLUSION

Internet, commonly known as the virtual information highway, is getting everyone's attention nowadays, from young to old. WebWordPro Version 2.0 is a prototype example of providing more useful or daily use application to users through Internet. While developing the whole system is not very easy task because various objective has been targeted, but it can still be considered as a contemporary effort to achieve the goal. Overall, this project has achieved and fulfilled the objective and requirement as determined during the analysis phase.

Building a Web-based application is a challenging task. Although it requires a lot of time, effort, self-discipline and patience, the knowledge acquired is surely a priceless one. In the process of developing the system, useful experience was gain from the complexities of programming and the software engineering concept. Also, it is an opportunity to learn about the system developing approaches, development tools, project management, time scheduling, and communication skills.

The successful development of the system at the present is the first step towards the future expansion of system. The problem encountered and experience gained during the development phases should be helpful in future endeavours. In the coming future, it is hope that WebWordPro Version 2.0 could overcome all its limitation and further enhance the system to fulfil the various user and environment requirements that continue to evolve with time. With the existence of system, doing word processing task via Internet would be more interesting and enjoyable.

APPENDIX A

USER MANUAL

USER MANUAL

This user manual is prepared to provide user with the necessary guidelines on how to use the WebWordPro Version 2.0 Web-based application. The manual is consist of the following sections:

1. Webmaster
2. Normal Web User

1 WEBMASTER

1.1 Uploading the System to the Domino Web Server R5

The whole system comprises of two Notes databases with the "nsf" file name extension (nsf stands for Notes Storage Facility)

1. homepages.nsf
2. Welcome.nsf

In order to upload these two database files and get them work, copy or move them to the data directory of the Domino Server R5, that is "C:\Lotus\Domino\Data\". Data directory is the default Web server directory of the Domino Server R5.

1.2 Testing the Web Server

To test the Web server, first run the Domino Server R5 from the Start Menu. Then determine the IP (Internet Protocol) number of the server machine. Finally, open the Web browser

client and enter the whole IP number (example: 10.100.2.238) in the location bar column to test it. If running, the browser should load the first page of the site (refer Figure A-4).

1.3 Viewing Records

To view records, open Lotus Notes R5. Make sure it is connected to the Domino Server. Under the "Folder Bar" on the left screen, click the "paper and pen" icon (see Figure A-1). This icon is the folder containing bookmarks of the Member's Record, Feedback and Problem Signing In (see Figure A-2). Then, click on the necessary bookmark to view the related information, such as members' record, their feedback and their problem signing in, if any. Figure A-3 illustrates the members' registration records.

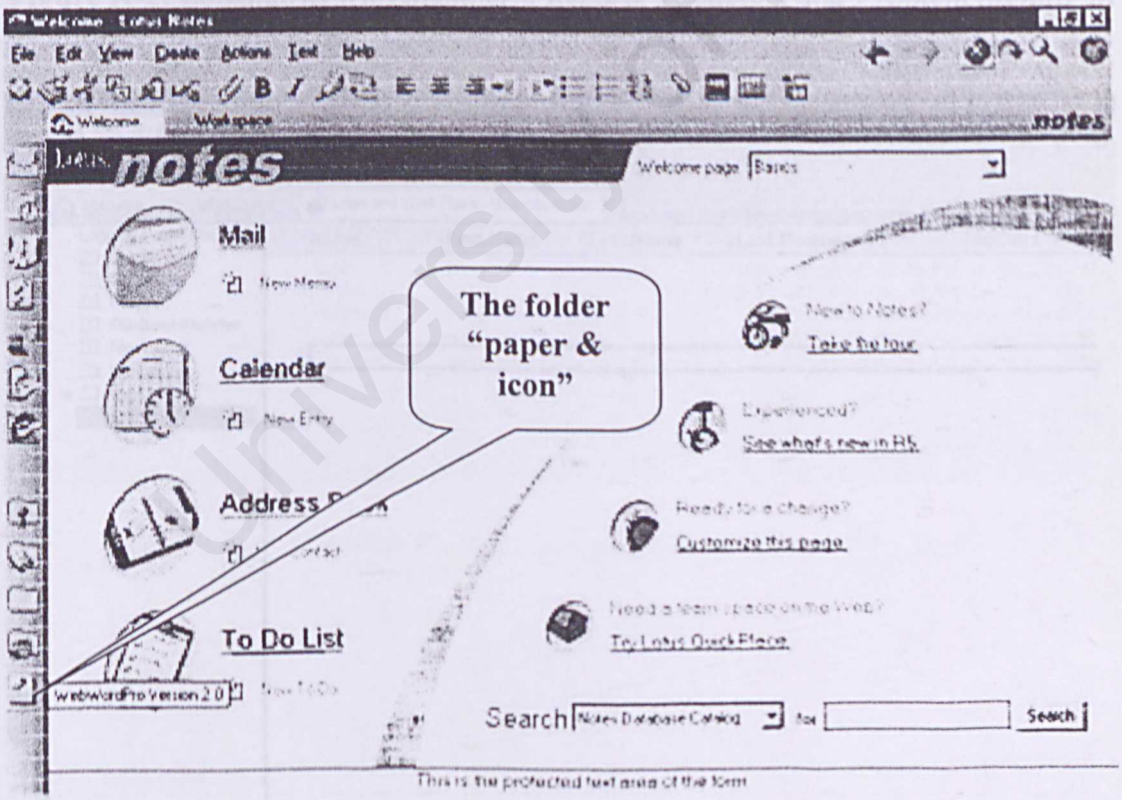

Figure A-1: *The Folder Containing Bookmarks*

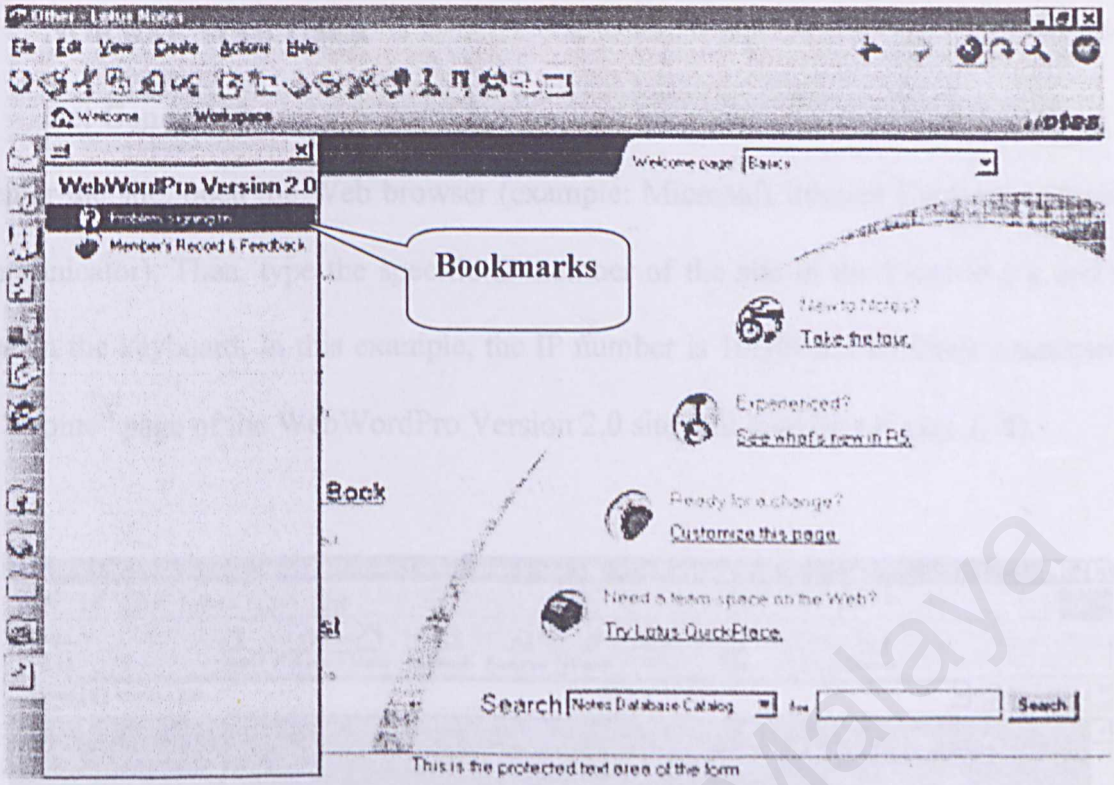

Figure A-2: *Bookmarks with Member's Record, Feedback and Problem Signing In*

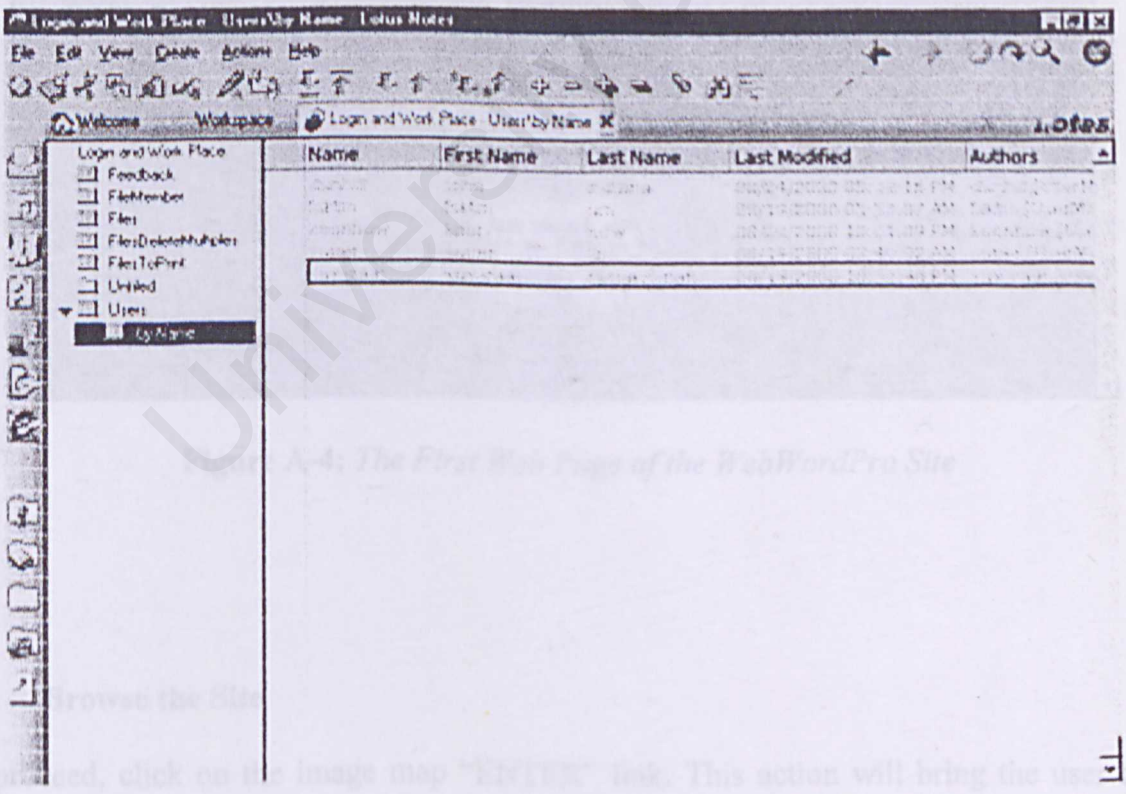

Figure A-3: *Members' Registration Record*

2 NORMAL WEB USER

2.1 Get Connected

To enter the site, open the Web browser (example: Microsoft Internet Explorer or Netscape Communicator). Then, type the specific IP number of the site in the location bar and press Enter on the keyboard. In this example, the IP number is 10.100.2.238. Once connected, the first "Home" page of the WebWordPro Version 2.0 site will load (see Figure A-4).

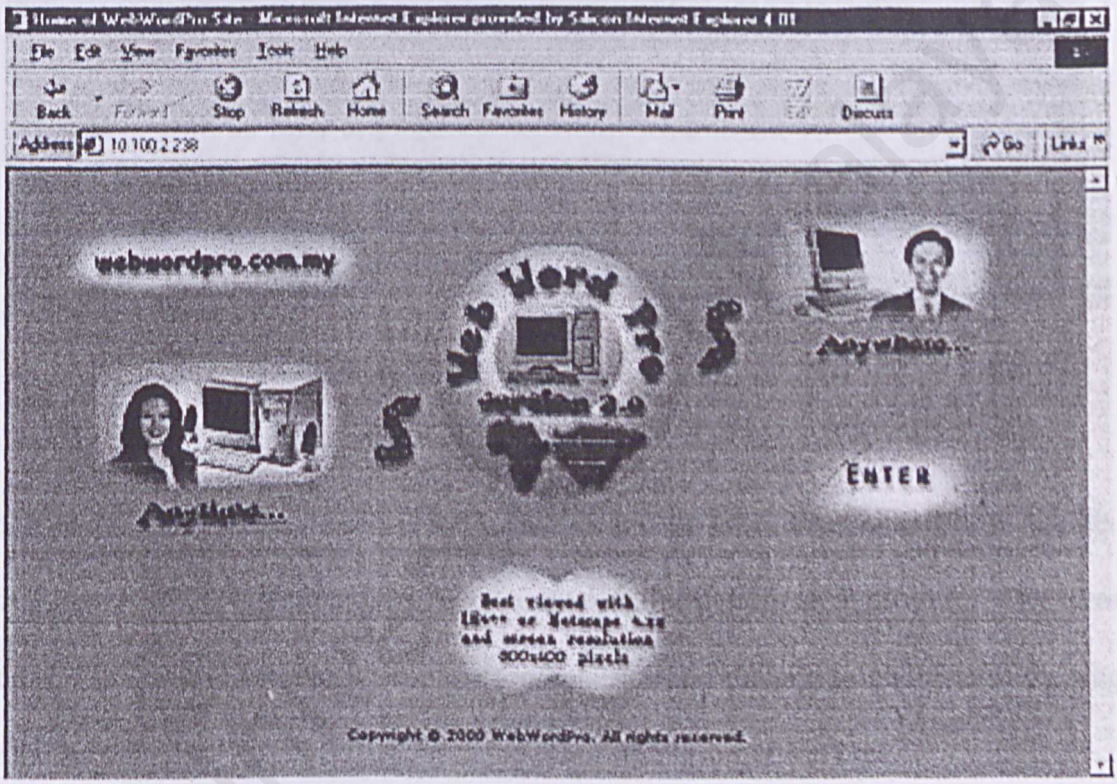

Figure A-4: *The First Web Page of the WebWordPro Site*

2.2 Browse the Site

To proceed, click on the image map "ENTER" link. This action will bring the user to the next "Welcome" page of the site (see Figure A-5)

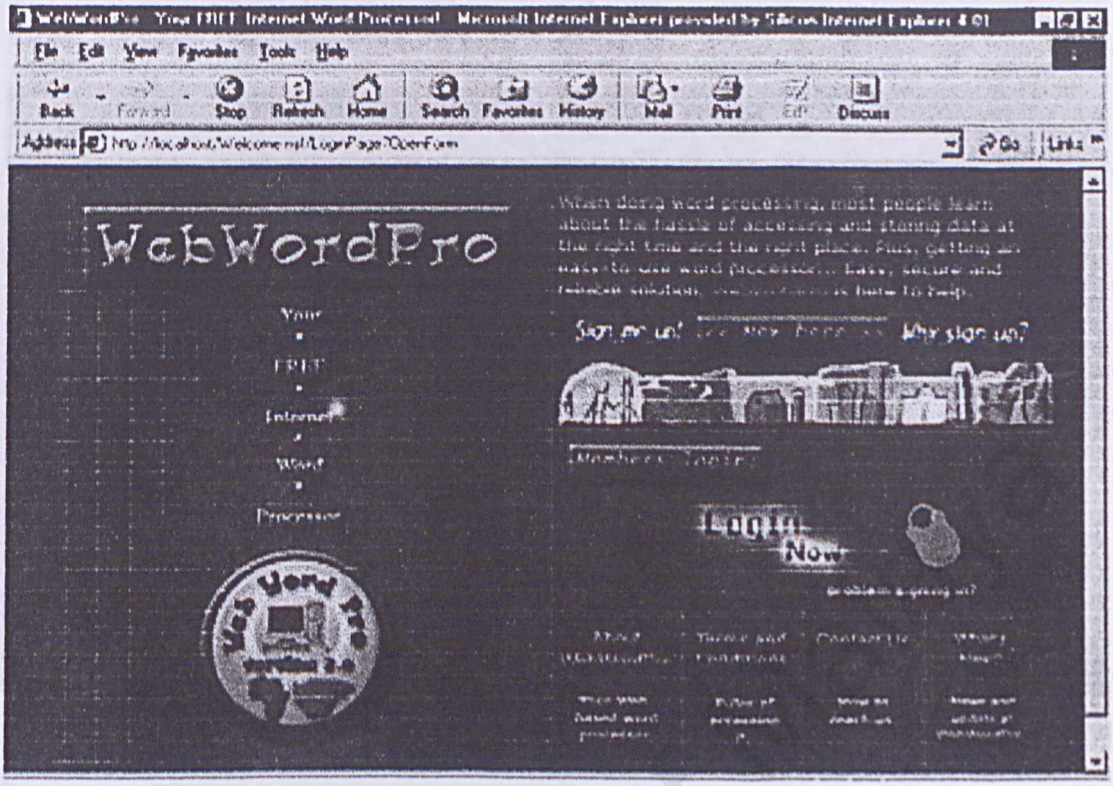

Figure A-5: *The Welcome Page of the Site*

From here, user can follow the links available to the information area of the site. The information area provides user with the description about the application. User can get around the site to understand the application better. Below is example of one of the pages in the information area.

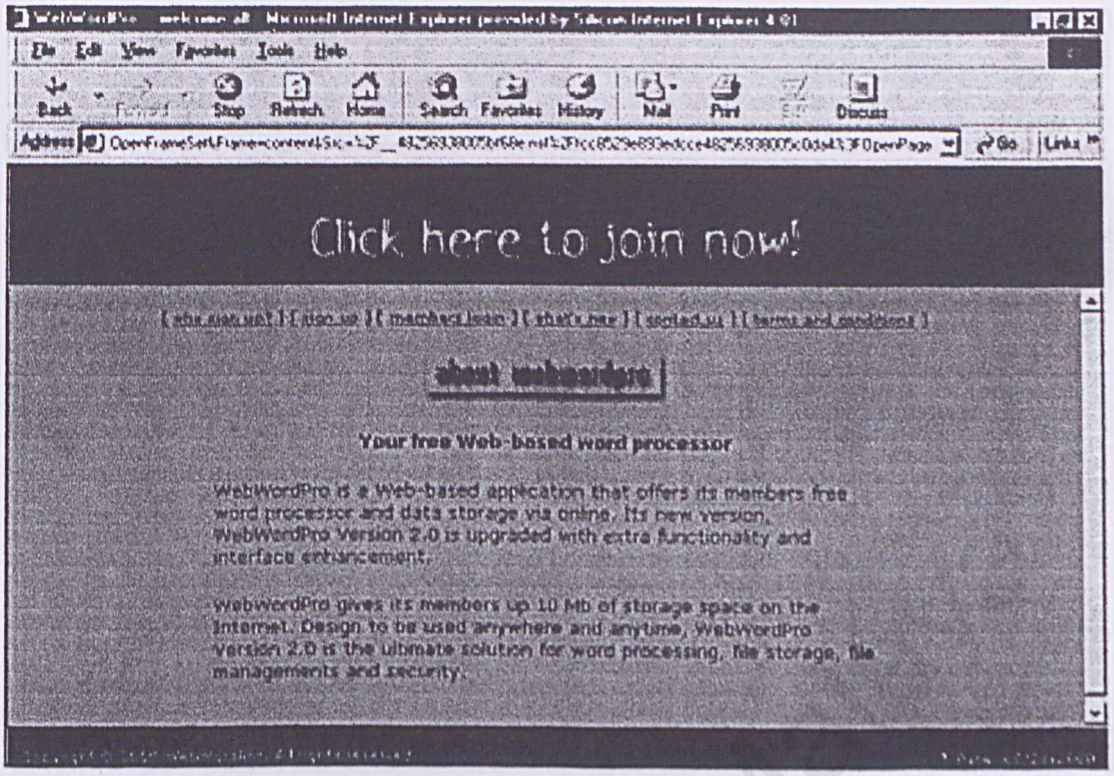

Figure A-6: *The Information Area of the Site*

2.3 Register as a Member

After reading about the application, user who wishes to register as the site member can proceed with the registration area that contains the Member Registration Form. User can get to this registration form by clicking at the banner or the link named "sign up". Here, user is required to fill up the form in order to sign up as a member (see Figure A-7).

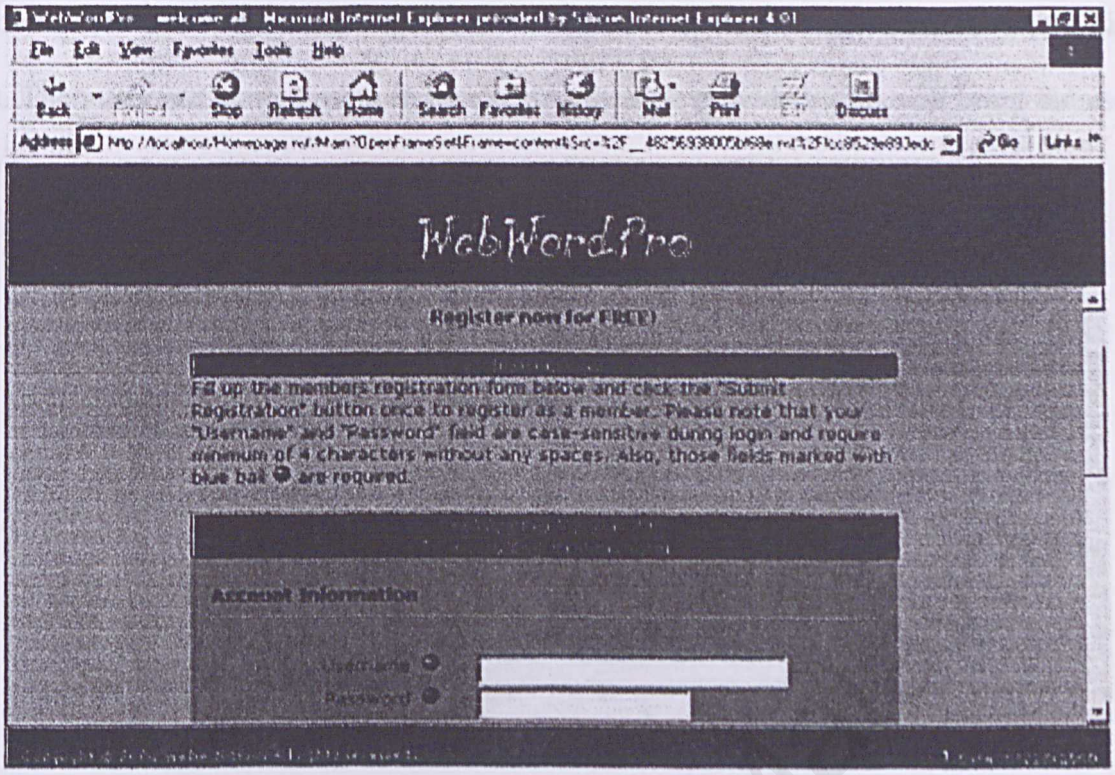

Figure A-7: *The Registration Form*

Upon completion of filling up the registration form, user can submit the registration by clicking the "Submit Registration" button below the form (see Figure A-8).

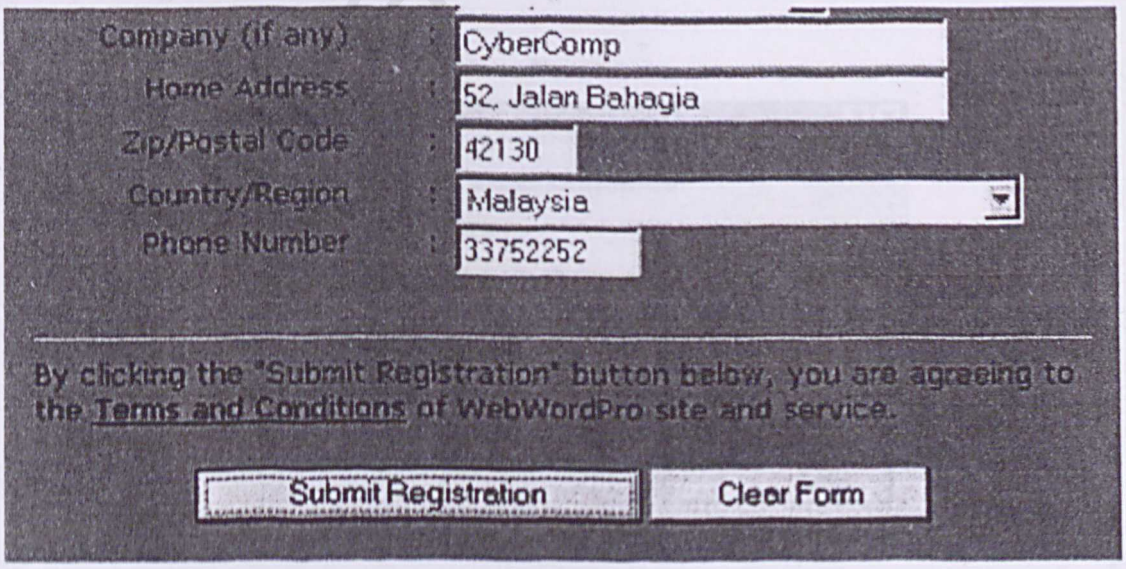

Figure A-8: *"Submit Registration" Button*

The form sent will be processed and if successful, a respond message is returned (see Figure A-9). Then user can start signing in by clicking the link provided. This will bring the user to the "Welcome" page (see Figure A-5) with the image map "Login Now" link.

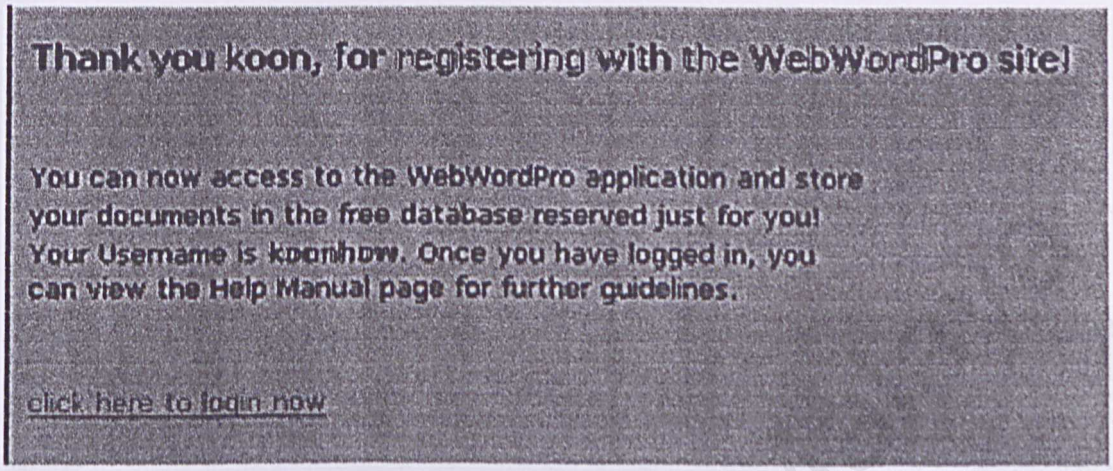

Figure A-9: *The Message of Successful Registration*

2.4 Login in as Member

To login, user has to click on the "Login Now" image link to call the login data entry dialog box (see Figure A-10). Correct registered username and password are required here.

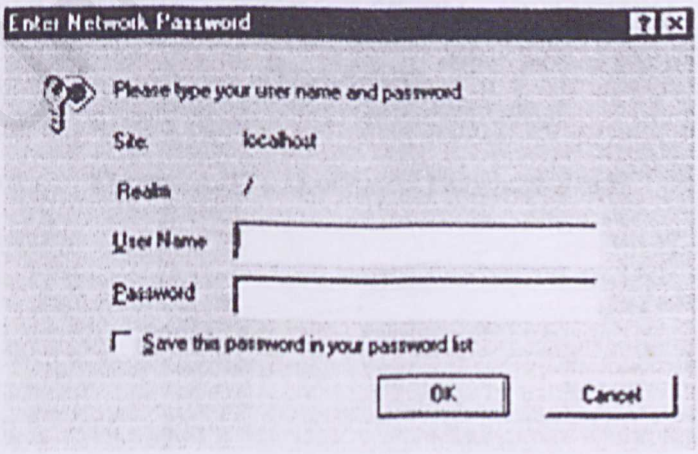

Figure A-10: *Login Data Entry Dialog Box*

2.5 Member's Area

Once the user has successfully logged in, he/she will enter his/her own personal area of the site (see Figure A-11). The page gives user the options to:

1. Compose new document (the New Document button).
2. View document in the data storage (the View Document button).
3. Exit the site (the Exit button).
4. Read details about the site (links below the buttons)

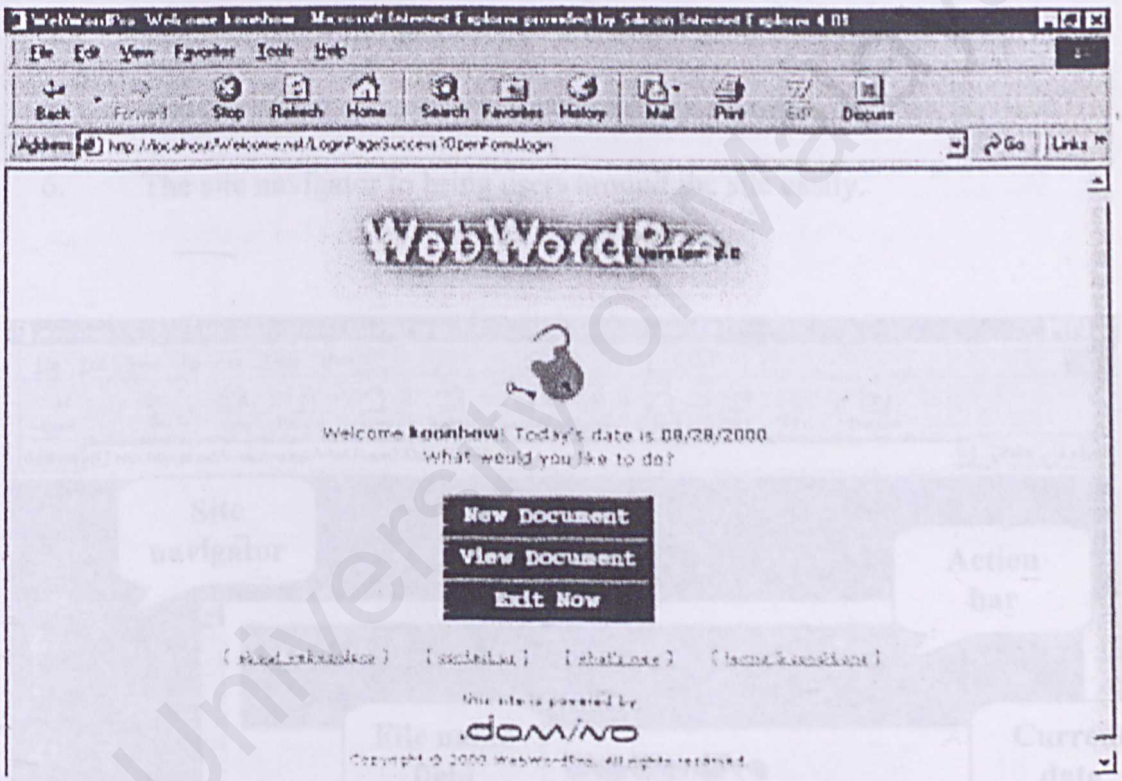

Figure A-11: *Member's Personal Area*

2.6 Compose New Document

Figure A-12 shows the work place for composing new document using the WebWordPro application. The right frame consists of the application and the left frame contains the site navigation links. The word processor application consists of 6 parts:

1. The action bar with functions like New, Save, Reset, Cancel, Help, and Logout.
2. The "Save File As:" text field for naming the document.
3. The computed current date.
4. The tool bar with function like text bolding, font sizing, and so on.
5. The document area, where user type his/her work.
6. The site navigator to bring users around the site easily.

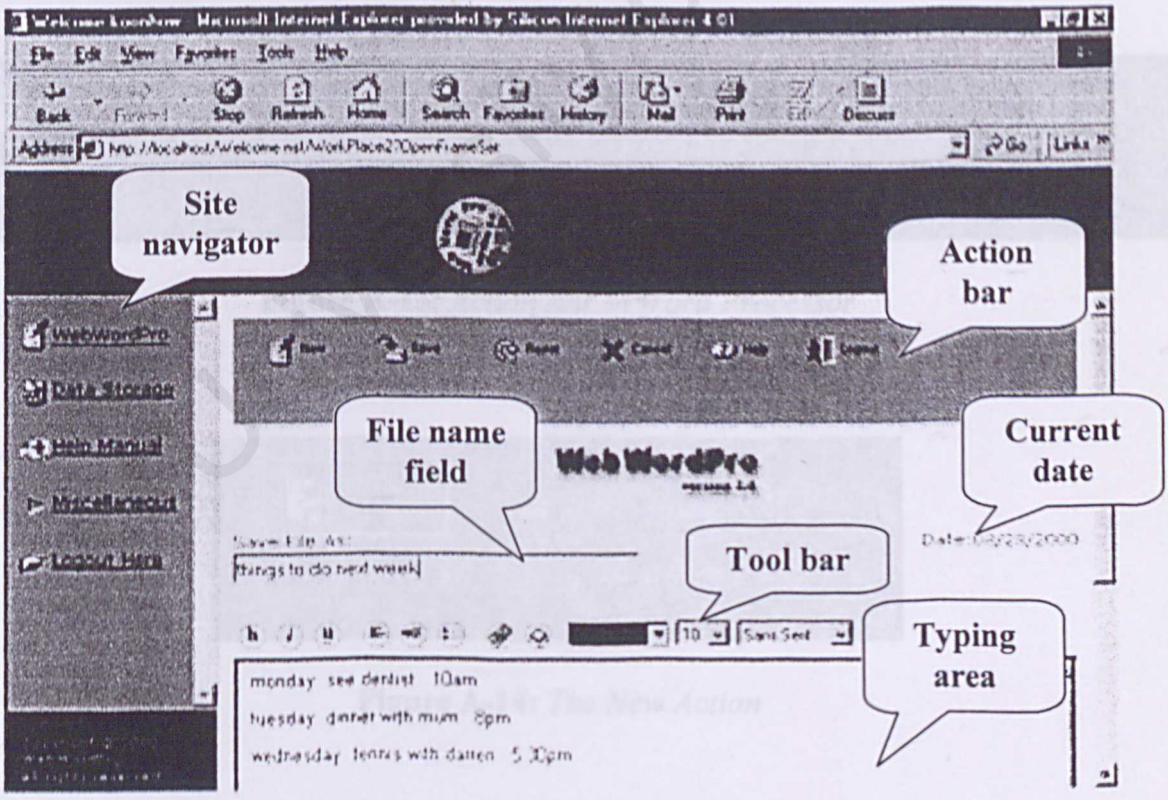

Figure A-12: *Compose New Document*

The action bar (see Figure A-13) of the WebWordPro application consists of 6 functions:

Function's Name	Description
New	User can choose to cancel the current work and compose new document in the same frame or open another word processor in a new window (see Figure A-14).
Save	User is given the option of saving the work done and closes it or composes another new document (see Figure A-15).
Reset	Clear the file name field and the typing area.
Cancel	Cancel the current work without saving and return to the Data Storage view (see Figure A-16).
Help	Open the Help Manual page, which loads in a new window, to guide user (see Figure A-17).
Logout	Exit the site to the logout page (see Figure A-18).

Table A-1: *The Action Bar's Function in Word Processor*

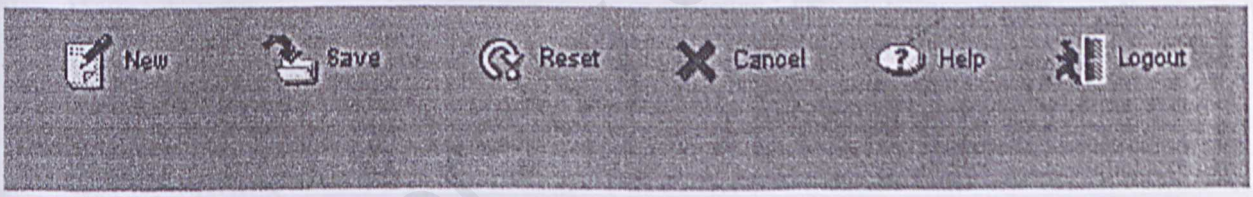

Figure A-13: *Action Bar in Word Processor*

Figure A-14: *The New Action*

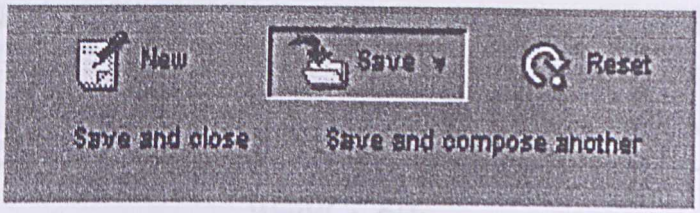

Figure A-15: *The Save Action*

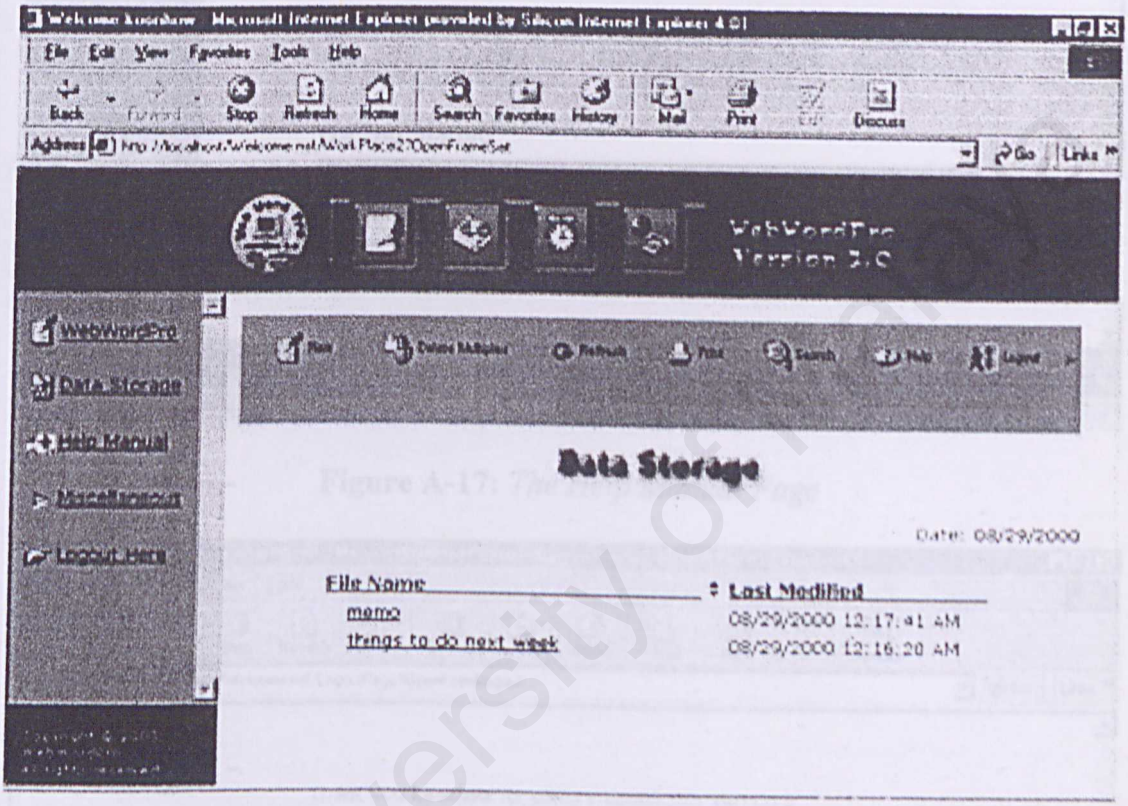

Figure A-16: *The Data Storage View*

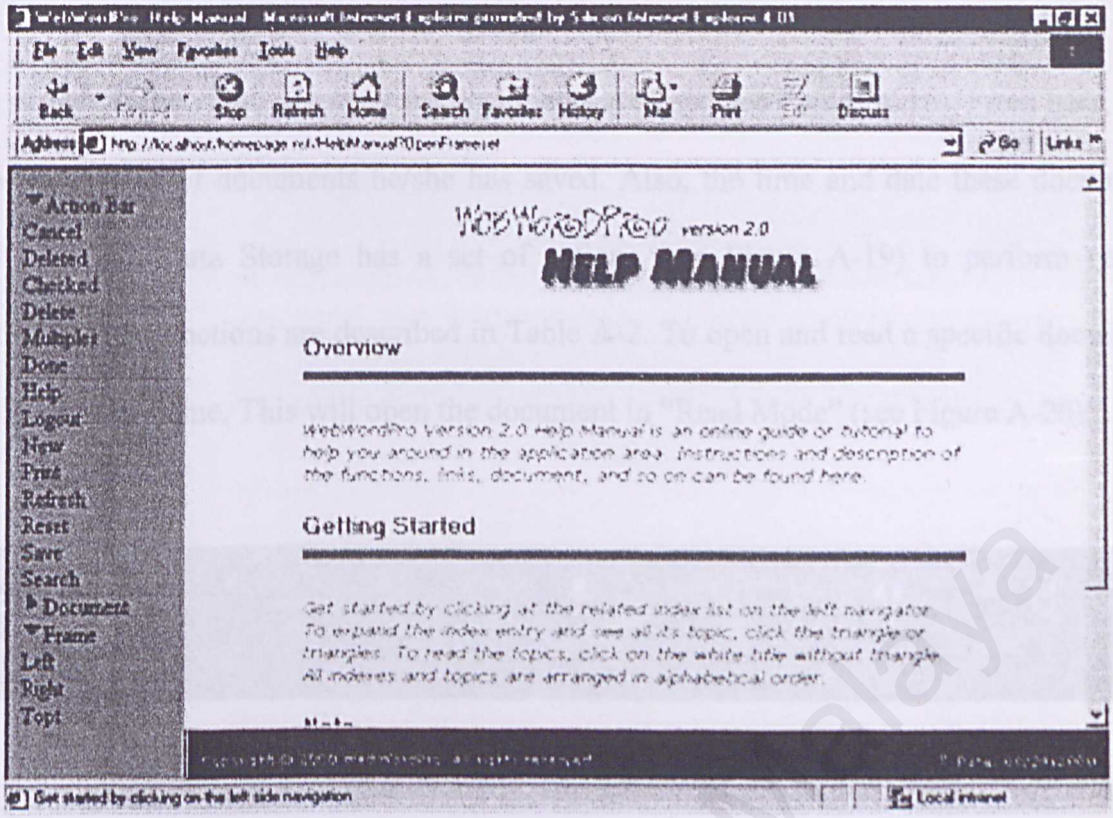

Figure A-17: *The Help Manual Page*

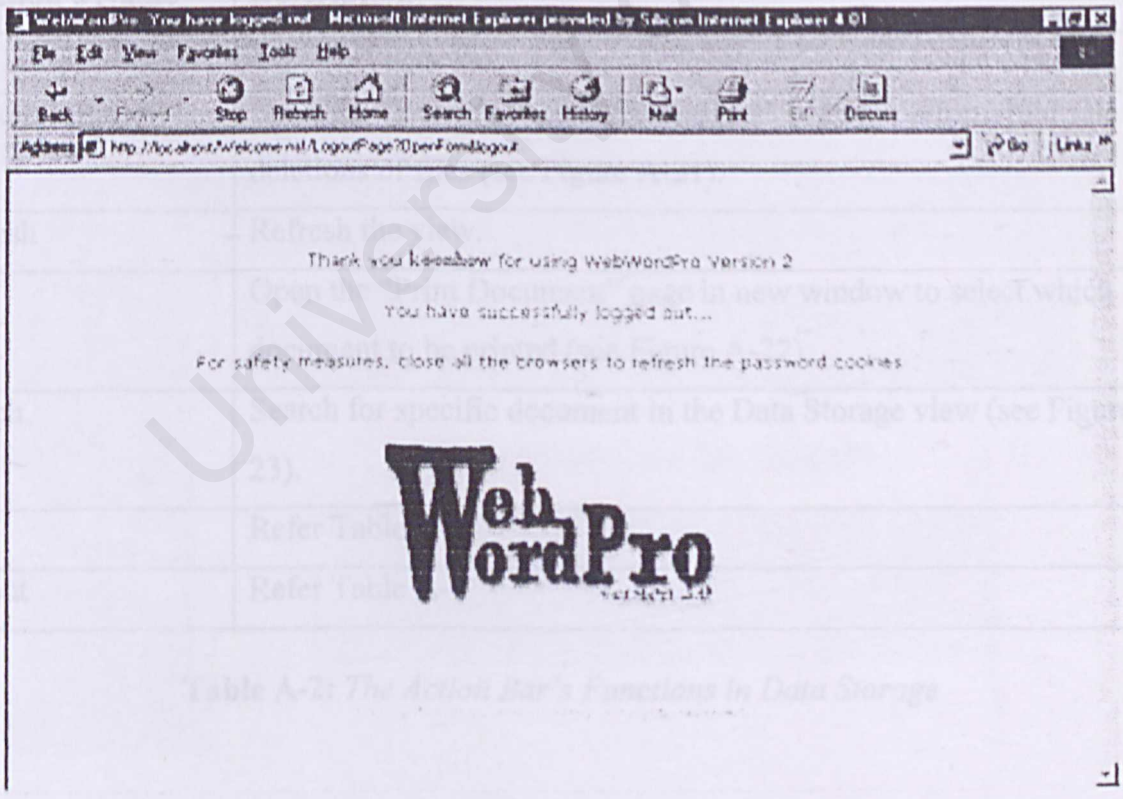

Figure A-18: *The Logout Page*

2.7 View Document List in Data Storage

Data storage is the view, where all the documents are kept (see Figure A-16). From here, user can view the list of documents he/she has saved. Also, the time and date these documents were modified. Data Storage has a set of actions (see Figure A-19) to perform certain function. These functions are described in Table A-2. To open and read a specific document, click on the file name. This will open the document in "Read Mode" (see Figure A-20).

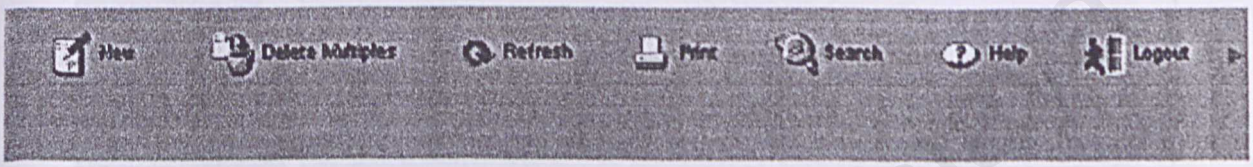

Figure A-19: *Action Bar in Data Storage*

Function's Name	Description
New	Refer Table A-1
Delete Multiples	Open the "Delete Multiple Documents" page to perform multiple deletions of files (see Figure A-21).
Refresh	Refresh the view.
Print	Open the "Print Document" page in new window to select which document to be printed (see Figure A-22).
Search	Search for specific document in the Data Storage view (see Figure A-23).
Help	Refer Table A-1
Logout	Refer Table A-1

Table A-2: *The Action Bar's Functions in Data Storage*

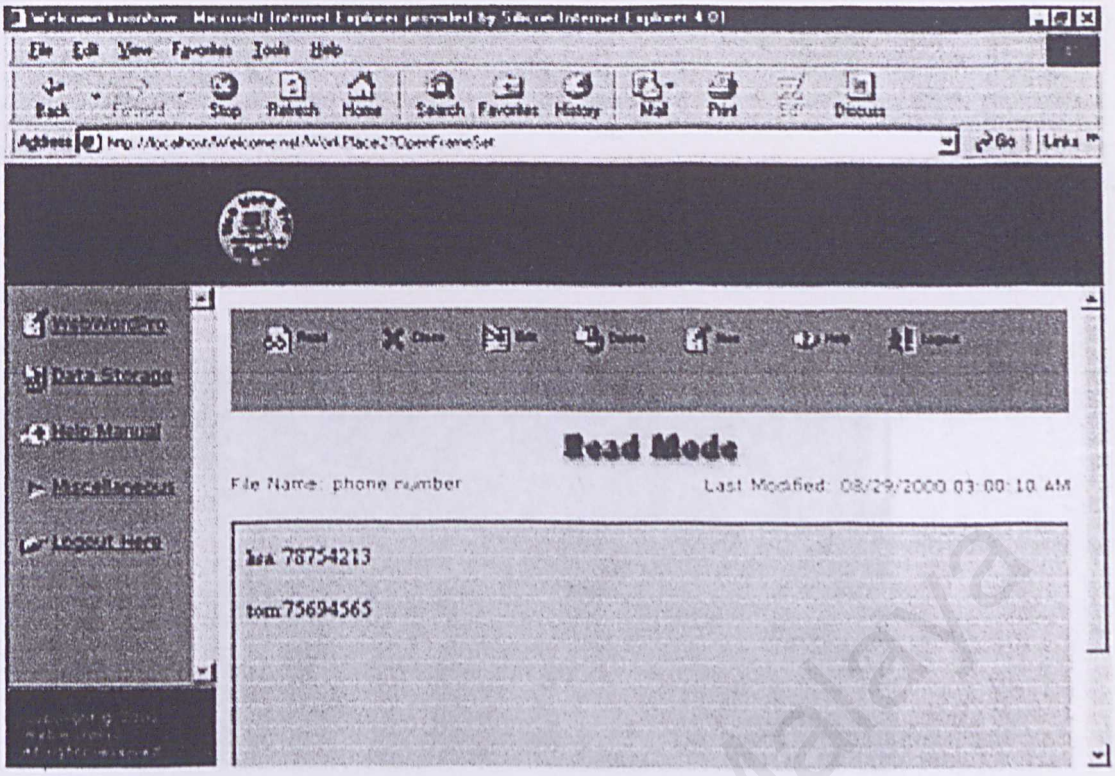

Figure A-20: *Document Open in Read Mode*

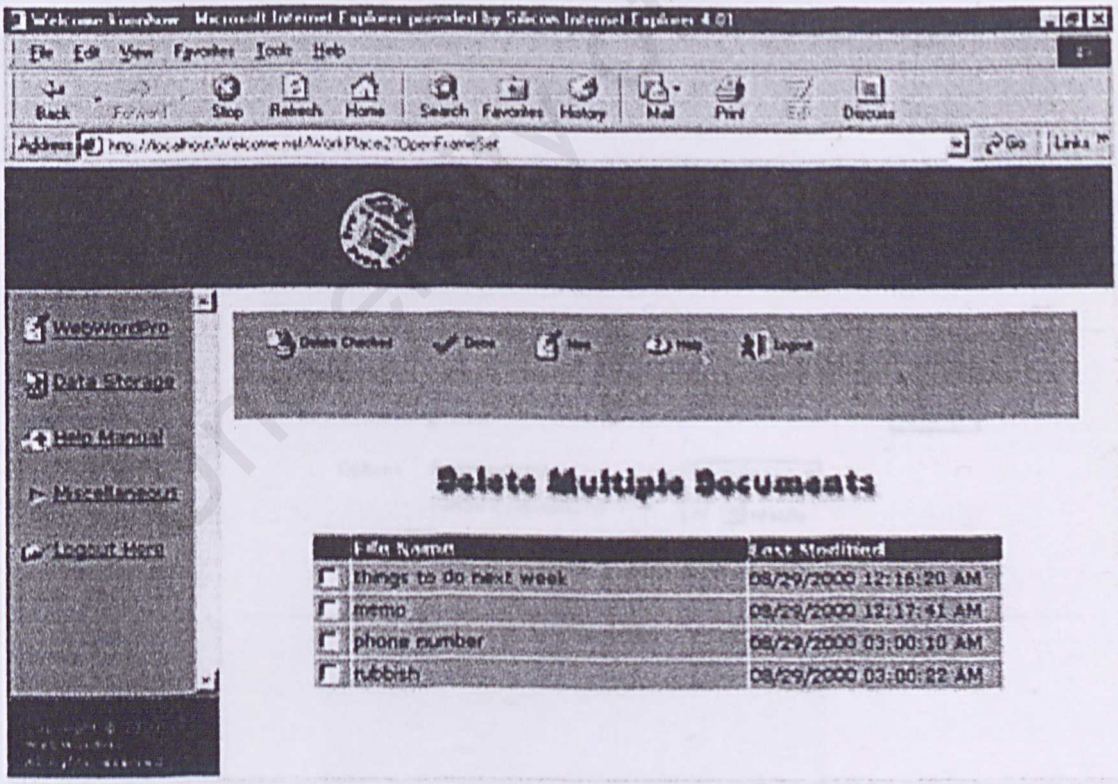

Figure A-21: *The Delete Multiple Document Page*

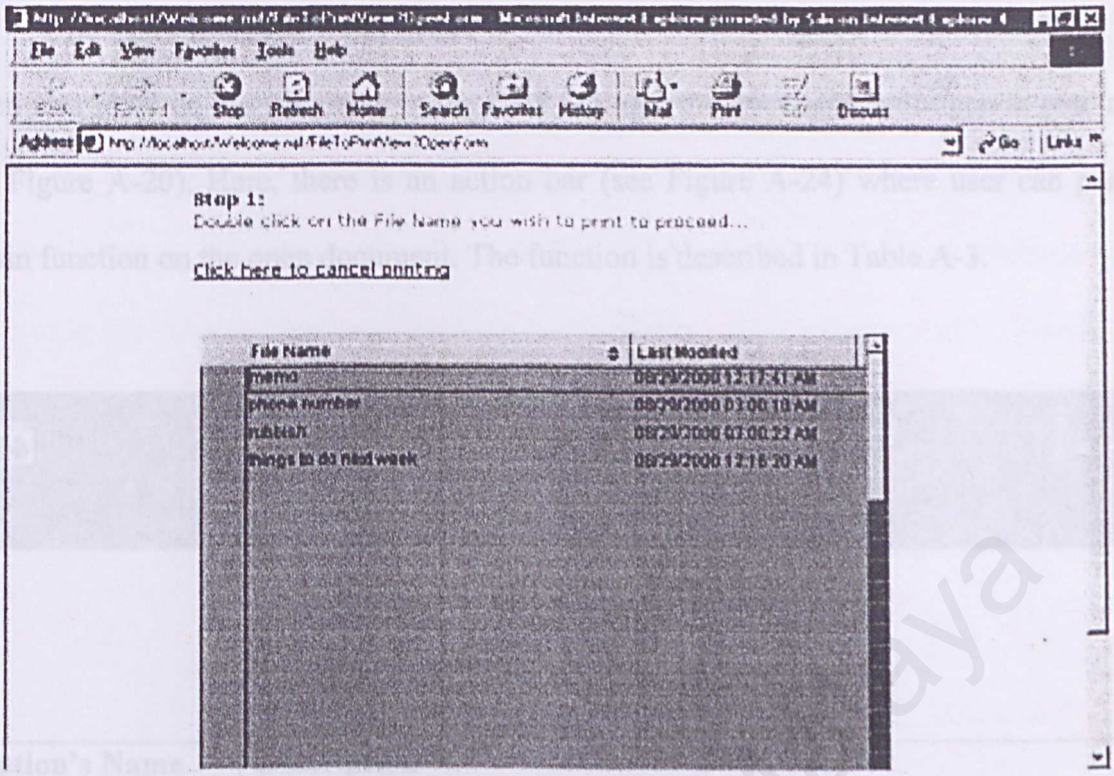

Figure A-22: *The Print Document Page*

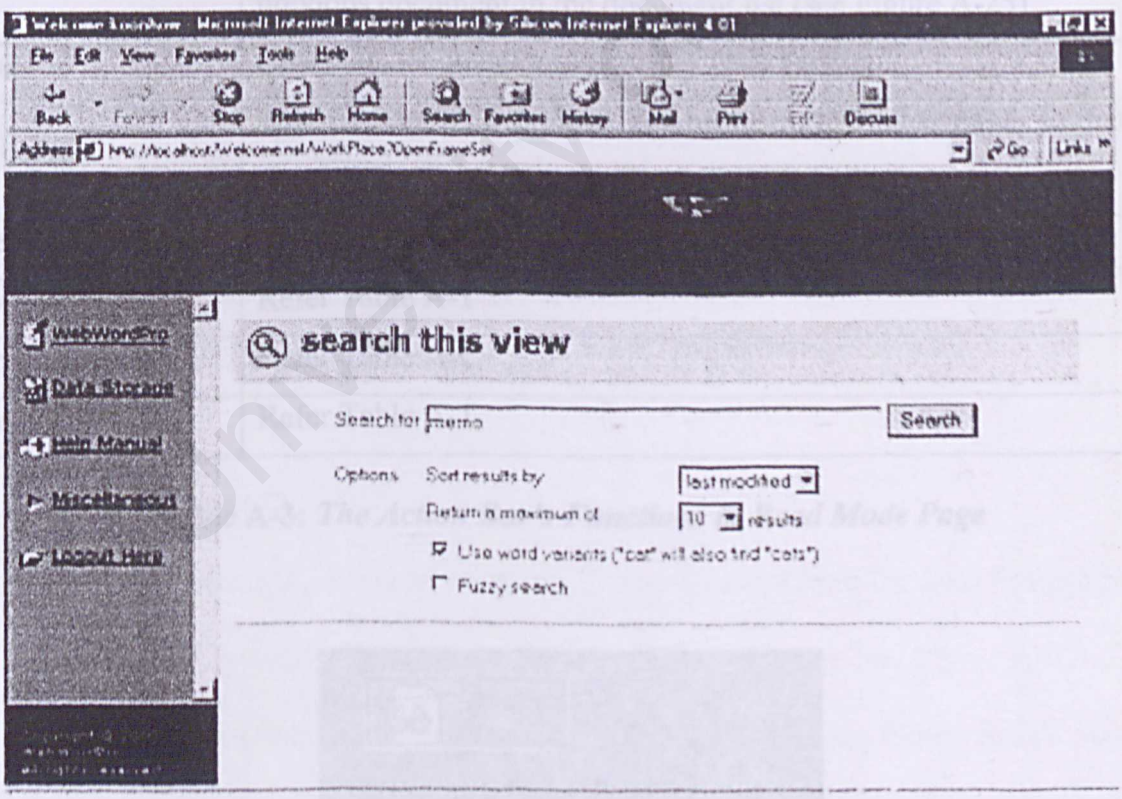

Figure A-23: *Document Search of Data Storage*

2.8 Open Document in Read Mode

When user click on the file name in the Data Storage, the document will open in read mode (see Figure A-20). Here, there is an action bar (see Figure A-24) where user can perform certain function on the open document. The function is described in Table A-3.

Figure A-24: *Action Bar in Read Mode Page*

Fucntion's Name	Description
Read	User can use this action to navigate page in read mode, either next or previous document in the document list (see Figure A-25)
Close	Close the document and return to Data Storage.
Edit	This function converts the document into editable mode so that user can edit the document.
Delete	Delete the document.
New	Refer Table A-1
Help	Refer Table A-1
Logout	Refer Table A-1

Table A-3: ***The Action Bar's Functions in Read Mode Page***

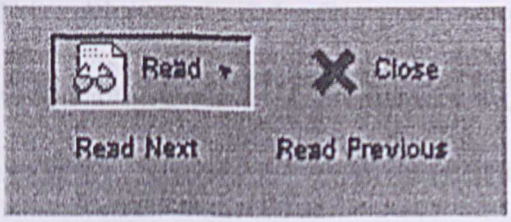

Figure A-25: *The Read Action*

2.9 Delete Multiple Documents

In the delete multiple document page (see Figure A-21), user will have a list of document like in the Data Storage. In order to delete multiple files, user has to click the related checkbox beside the file name (see Figure A-26). Those checked documents could be deleted by clicking the "Delete Checked" function in the action bar (see Figure A-27). Finally, click "Done" when finished (see Figure A-27).

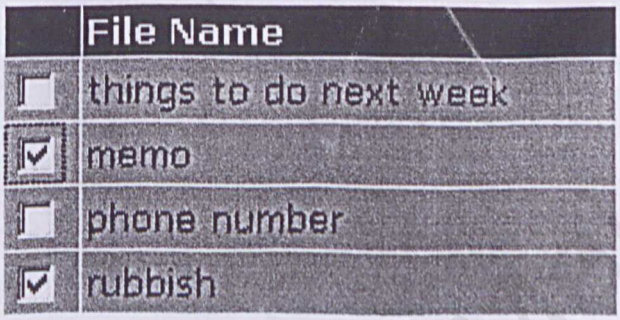

Figure A-26: *Checkboxes in Delete Multiple Document Page*

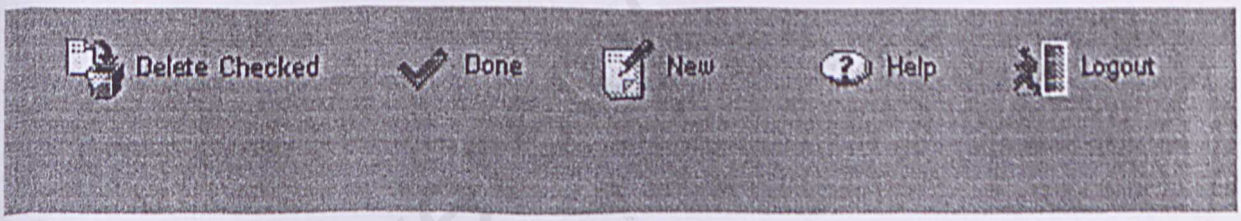

Figure A-27: *The Delete Checked and Done Functions*

2.10 Print Document

In order to print document, user must click the "Print" function from the Data Storage page (see Figure A-16 & A-19). This will open the Print Document page (see Figure A-22). From the list of documents, double click on the file name to preview it (see Figure A-28). The document previewed can be print by clicking the "Print" button (see Figure A-29). Click the "Exit" button when finish.

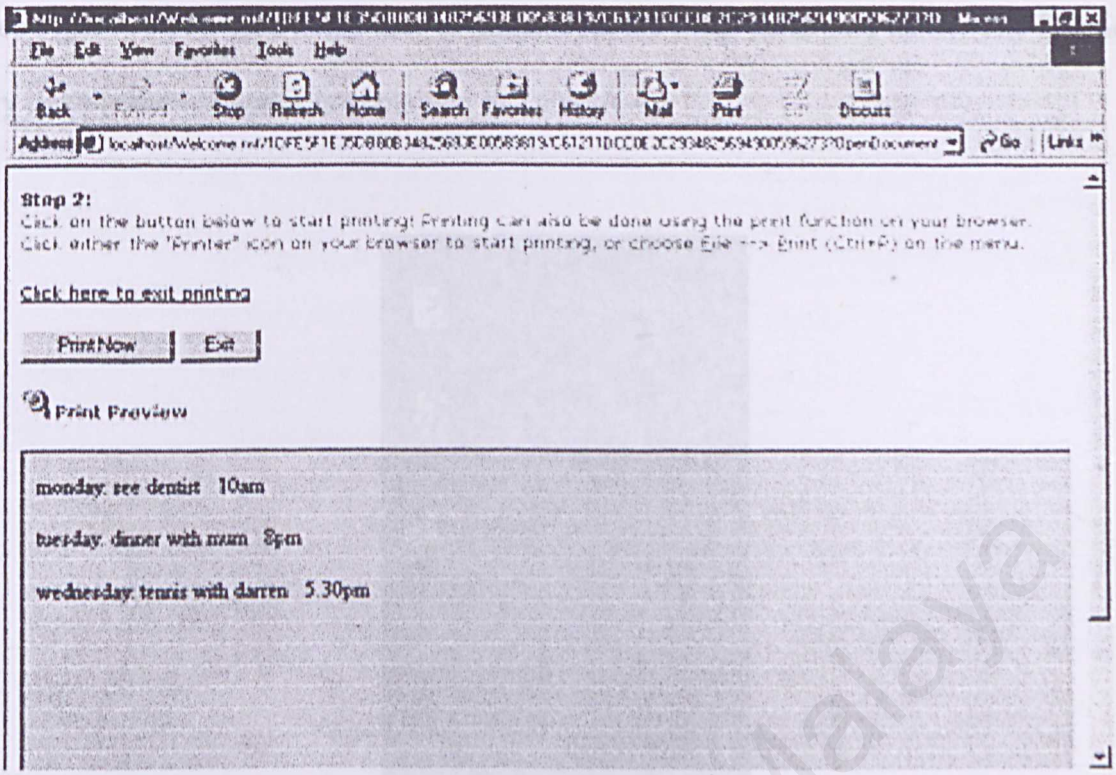

Figure A-28: *The Print Preview Page*

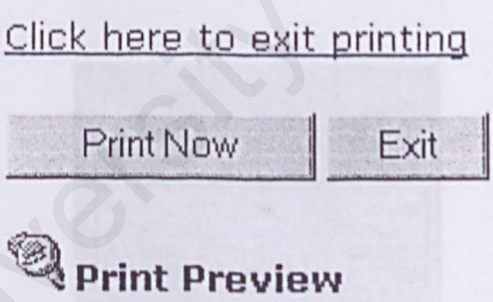

Figure A-29: *The Print and Exit Button in Print Preview Page*

2.11 The Site Navigator

The site navigator on the left frame is provided to help user to move around the pages easily and quickly (see Figure A-30). It has a friendly message popup when user move mouse over

it (see Figure A-31). This helps user to understand the links easier and faster. The function of every links in the navigator is explained in Table A-4.

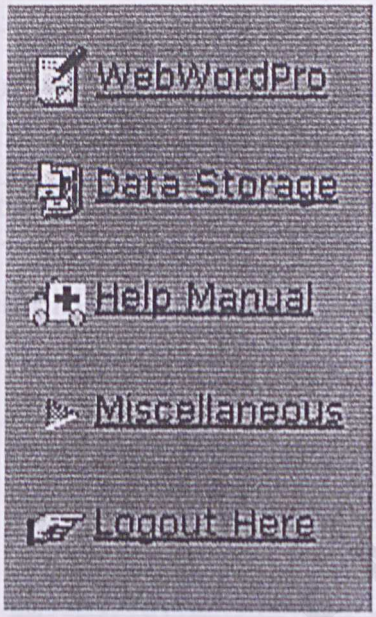

Figure A-30: *The Site Navigator on the Left Frame*

Figure A-31: *The Friendly Message of the Link*

Link's Name	Description
WebWordPro	Open the WebWordPro word processor page (see Figure A-12).
Data Storage	Open the Data Storage view (see Figure A-16).
Miscellaneous	This link will expand once clicked (see Figure A-32). It consists of five small sub-links, "user profile", "contact us", "feedback", and "links". This section will collapse when clicked again.
Help Manual	Open the Help Manual page (see Figure A-17).
Logout	Sign user out (see Figure A-18)

Table A-4: *Links in Site Navigator*

Figure A-32: *The Expandable Section of Miscellaneous*

2.12 View User Profile

To view user profile, click on the "user profile" like in the "Miscellaneous" section. The user profile page will display all the account and personal information input during registration (see Figure A-33). To change user password, click on the link below the page.

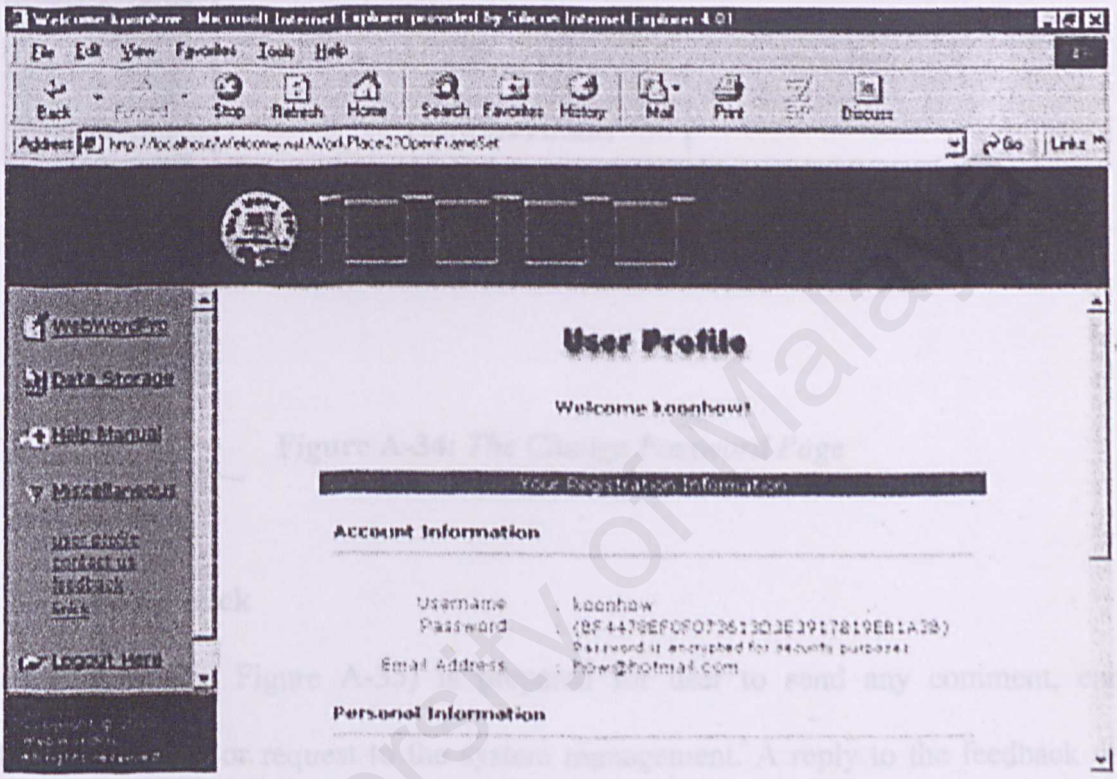

Figure A-33: *The User Profile Page*

2.13 Change New Password

From the user profile page, user can click on the "Change password here" link to change his/her new login password in the Change Password page (see Figure A-34). Here, user is required to enter the old and new password, as well as the new password confirmation. Upon completion, user can submit the change password request by clicking the "Submit Request" button.

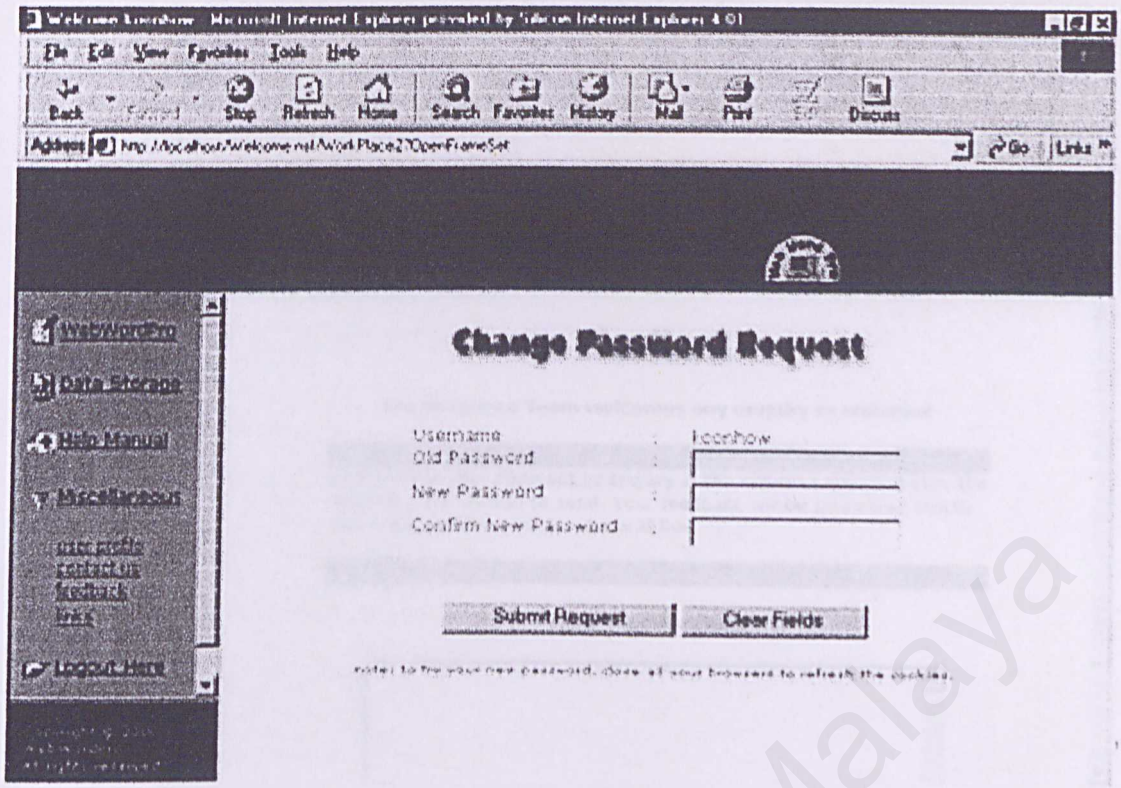

Figure A-34: *The Change Password Page*

2.14 Send Feedback

Feedback from (see Figure A-35) is prepared for user to send any comment, enquiry, problem, suggestion or request to the system management. A reply to the feedback will be sent to the user's email box.

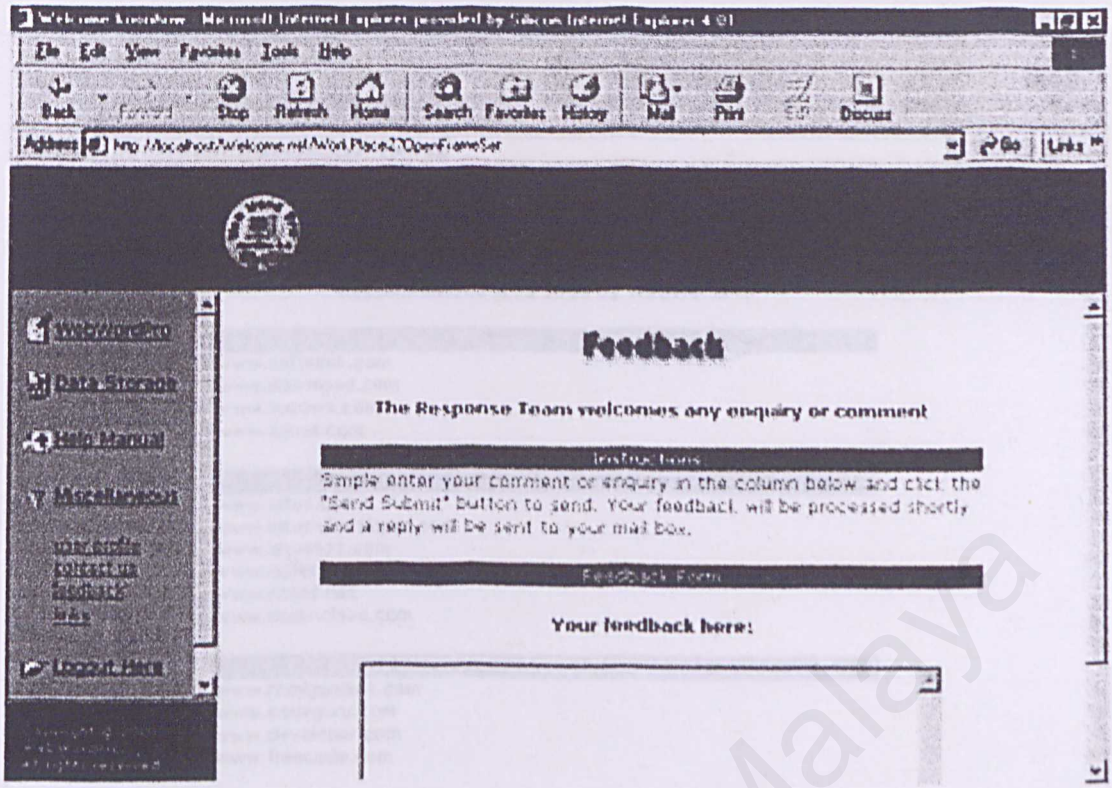

Figure A-35: *The Feedback Form*

2.15 Surf the Net

A list of recommended sites is provided in the Links page (see Figure A-36). This helps user to ease the mind after a long work with the application. The list of sites will be updated frequently for more interesting surfing.

2.16 Problem Signing In

For members who fail to sign in, they may send their problem regarding the failure, to the system administrator, using the form prepared for them (see Figure A-37). This form can be access from the Welcome page (see Figure A-5) by clicking the "problem signing in?" image map link. Possible failures would be forgotten username or password, and so.

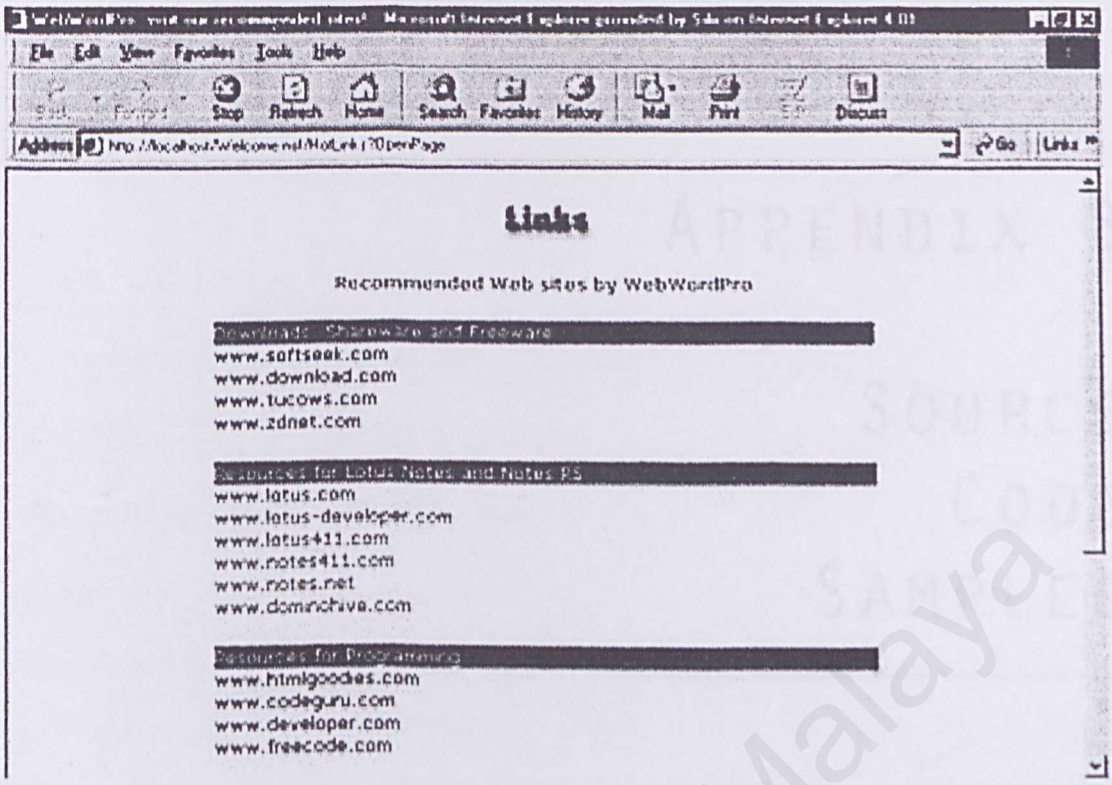

Figure A-36: *The Links Page with Recommended Sites*

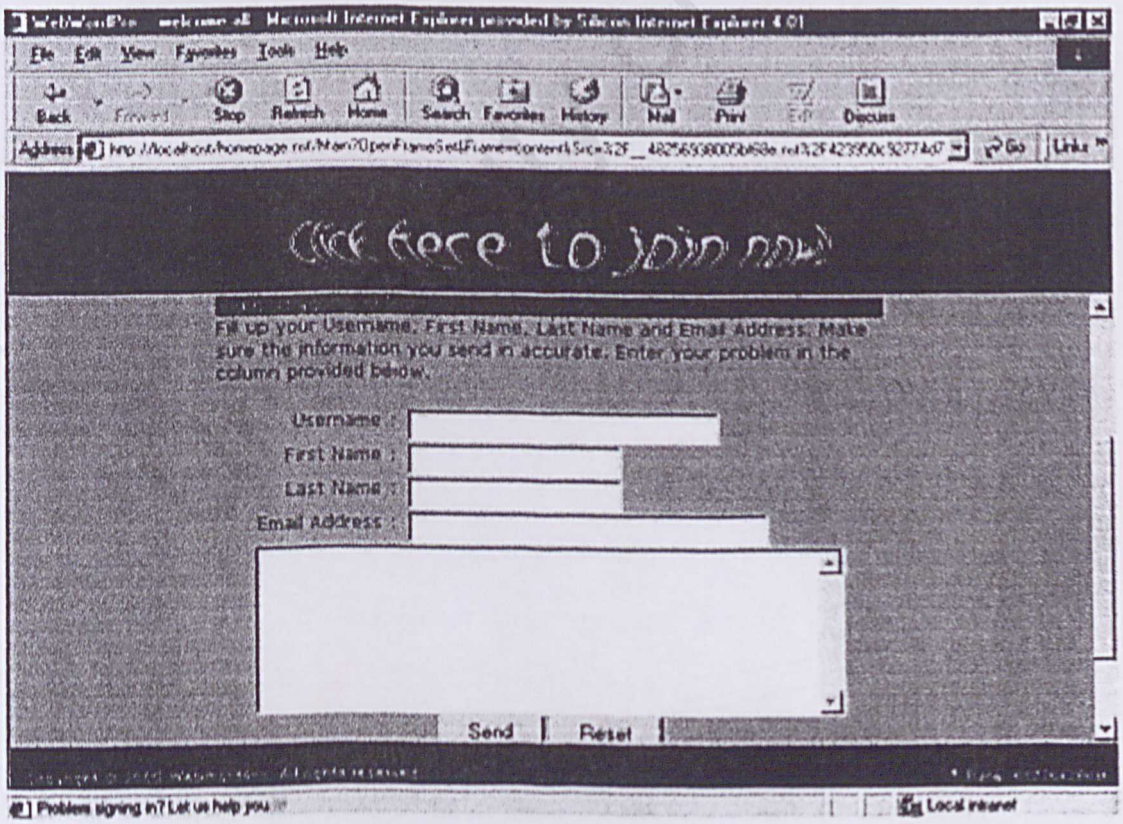

Figure A-37: *The Problem Signing In Form*

APPENDIX B

SOURCE CODE SAMPLES

SOURCE CODE SAMPLES

1. **Subfunction name** : HandleNewAccount

   Name of Agent : Handle New Account Request

   Module : User Registration

   Form name : New Account

   Language used : LotusScript

   Description : This sub handles the creation of new accounts. Person documents are created in both the NAB and in this database. The new user is also added to any groups that are needed.

'Start of code...

```
Sub HandleNewAccount ( req As NotesDocument )
    Dim status As String
    On Error Goto Oops

    Call WriteInitialAgentData( req )

  ' Password must have been hashed.

    If Not IsPasswordOK( req.NewPassword(0) ) Then
        req.AgentStatus = "Password ill-formed"
        Goto Done
    End If
```

```
' This is the NAB to use for creating people docs
    Dim nabPeople As NotesDatabase
    Set nabPeople = New NotesDatabase( "", nabPeoplePath$ )

' This is the NAB to use for creating group docs
    Dim nabGroups As NotesDatabase
    Set nabGroups = New NotesDatabase( "", nabGroupsPath$ )

'
'  Ok: Check that the user doesn't already exist in the NAB
'
    Dim docPerson As NotesDocument
    Set docPerson = GetPersonDocument( req.FullName(0), nabPeople )

    If Not (docPerson Is Nothing) Then
        req.AgentStatus = "Duplicate name"

        Print "<body bgcolor='ffbf18'><font face='verdana' size=3><b>Registration
not completed!</b></font></body><p>"
        Print "<br><font face='verdana' size=2>The Username <b>" +
req.FullName(0) + "</b> is already in use.</font>"
        Print "<br><font face='verdana' size=2>Please try registering again with a
different name.</font>"
        Print "<br><font face='verdana' size=2>To try again, click the back button on
your browser.</font><p>"

        Goto Done
    End If
```

```
' Create the person document in the NAB

    Set docPerson = New NotesDocument( nabPeople )

    docPerson.Form = "Person"
    docPerson.Type = "Person"
    docPerson.LastName = req.LastName
    docPerson.FirstName = req.FirstName
    docPerson.MiddleInitial = req.MiddleInitial
    docPerson.FullName = req.FullName
    docPerson.HTTPPassword = req.NewPassword
    docPerson.MailAddress = req.Email
    docPerson.JobTitle = req.JobTitle
    docPerson.CompanyName = req.Company
    docPerson.HomeAddress = req.HomeAddress
    docPerson.Zip = req.Zip
    docPerson.Country = req.Country
    docPerson.PhoneNumber = req.PhoneNumber
    Call docPerson.ComputeWithForm( False, False )
    Call docPerson.Save( False, True )

' Add the person to the proper groups

    Forall group In req.GroupsToJoin
        Call AddUserToGroup( req.FullName(0), group, nabGroups )
    End Forall

' Create the person document in this database

    Set docPerson = New NotesDocument( req.ParentDatabase )
```

```
docPerson.Form = "Person"
docPerson.LastName = req.LastName
docPerson.FirstName = req.FirstName
docPerson.MiddleInitial = req.MiddleInitial
docPerson.FullName = req.FullName
docPerson.HTTPPassword = req.NewPassword
docPerson.Email = req.Email
docPerson.Gender = req.Gender
docPerson.Month = req.Month
docPerson.Day = req.Gender
docPerson.Year = req.Year
docPerson.JobTitle = req.JobTitle
docPerson.Company = req.Company
docPerson.HomeAddress = req.HomeAddress
docPerson.Zip = req.Zip
docPerson.Country = req.Country
docPerson.PhoneNumber = req.PhoneNumber

Call docPerson.ComputeWithForm( False, False )
Call docPerson.Save( False, True )

Call EnsureUserInNAB( req.FullName(0) )

req.AgentStatus = "Successful"

Print "<body bgcolor='ffbf18'></body>"
Print "<font face='verdana' size=3><b>Thank you " + req.FirstName(0) + ", for registering with the WebWordPro site!</b></font>"
Print "<p><br><font face='verdana' size=2>You can now access to the WebWordPro application and store</font>"
```

```
        Print "<br><font face='verdana' size=2>your documents in the free database reserved just for you!</font>"
        Print "<br><font face='verdana' size=2>Your Username is <b>" + req.FullName(0) + "</b>. Once you have logged in, you</font>"
        Print "<br><font face='verdana' size=2>can view the Help Manual page for further guidelines.</font><p>"
        Print "<br><font face='verdana' size=2><a href='http://localhost/Welcome.nsf/LoginPage?OpenForm' target='_top'>click here to login now</a></font>"

Done:
        On Error Goto Bail

        Call WriteFinalAgentData( req )

        Exit Sub

Oops:
        status$ = "Error " & Err() & " at line " & Erl() & ": " & Error()
        req.AgentStatus = status$
        Resume Done

Bail:
        status$ = "Error " & Err() & " at line " & Erl() & ": " & Error()
        Resume BailOut
BailOut:

End Sub

'End of code...
```

2. Subfunction name : HandleChangePassword

Name of Agent : Handle Change Password Request

Module : User Profile

Form name : Change Password

Language used : LotusScript

Description : Handle any Change Password requests that come in.

'Start of code...

```
Sub HandleChangePassword ( req As NotesDocument )
    Dim status As String
    On Error Goto Oops

    Call WriteInitialAgentData( req )

  ' Certain rules:
  '  Old password must have been hashed.

    If Not IsPasswordOK( req.OldPassword(0) ) Then
        req.AgentStatus = "Old password ill-formed"
        Goto Done
    End If

  '  New password must have been hashed.

    If Not IsPasswordOK( req.NewPassword(0) )  Then
        req.AgentStatus =  "New password ill-formed"
        Goto Done
    End If
```

```
' Name in the request must match the name in the parent document

    Dim docPerson As NotesDocument

    Set docPerson = GetPersonDocument( req.FullName(0), req.ParentDatabase )

' This can only fail if something is very, very wrong -- e.g., someone's trying to break in
    If docPerson Is Nothing Then
        req.AgentStatus = "No such user"
        Goto Done
    End If

' sanity check to make sure we found the right thing
    If req.FullName(0) <> docPerson.FullName(0) Then
        req.AgentStatus = "Request name doesn't match person name"
        Goto Done
    End If

' The password must match the person's password

    If req.OldPassword(0) <> docPerson.HTTPPassword(0) Then
        req.AgentStatus = "Old password is incorrect"
        Print "<body bgcolor='ffffff'><font face='verdana' size=2><b>Your old
    password does not match your current password.</b></font></body>"
        Print "<br><font face='verdana' size=2>Please go back and correct your
    password.</font>"
        Print "<br><font face='verdana' size=2>Click on the back button on your
    browser to get back.</font>"
        Goto Done
    End If
```

```
' Ok: Find the user in the NAB.

' This is the NAB to use for people
    Dim nabPeople As NotesDatabase
    Set nabPeople = New NotesDatabase( "", nabPeoplePath$ )

    Dim nabPerson As NotesDocument
    Set nabPerson = GetPersonDocument( req.FullName(0), nabPeople )

    If nabPerson Is Nothing Then
        req.AgentStatus = "No such user"
        Goto Done
    End If

' Check that the old password matches.

    If req.OldPassword(0) <> nabPerson.HTTPPassword(0) Then
        req.AgentStatus = "Old password is incorrect"
        Print "<body bgcolor='ffffff'><font face='verdana' size=2><b>Your old
    password does not match your current password.</b></font></body>"
        Print "<br><font face='verdana' size=2>Please go back and correct your
    password.</font>"
        Print "<br><font face='verdana' size=2>Press the back button on your
    browser to get back.</font>"
        Goto Done
    End If

' OK: Set the new password in the NAB

    Call nabPerson.ReplaceItemValue( "HTTPPassword", req.NewPassword(0) )
    Call nabPerson.Save( False, True )
```

```
' Update the person document in this database.
    Call docPerson.ReplaceItemValue( "HTTPPassword", req.NewPassword(0) )
    Call docPerson.Save( False, True )

    Call EnsureUserInNAB( req.FullName(0) )

    req.AgentStatus = "Successful"
    Print "<body bgcolor='ffffff'><font face='verdana' size=2>Congratulations <b>" +
    docPerson.FirstName(0) + "</b>.</font>"
    Print "<br> <font face='verdana' size=2>Your password has been changed.</font>"

Done:
    On Error Goto Bail

    Call WriteFinalAgentData( req )

    Exit Sub

Oops:
    status$ = "Error " & Err() & " at line " & Erl() & ": " & Error()
    req.AgentStatus = status$
    Resume Done
Bail:
    status$ = "Error " & Err() & " at line " & Erl() & ": " & Error()
    Resume BailOut
BailOut:
End Sub
```

'End of code...

3. **Function name** : validate()

Module : Data Entry Validation

Form name : New Account

Language used : JavaScript

Description : This validation function is coded to validate the necessary data input in the required fields of the registration form, called New Account. The code is insert in the between JavaScript tags of the HTML header tags. To invoke this code, create a button and code it with *validate()*. The function will be called when user click the button. This will perform the necessary data entry check.

'Start of code...

```
function validate(){

var msg;
var msgflag;
var pswdflag;

msgflag = "false";
var pswdflag = "false";

msg="The following fields require values:\r";

if(document.forms[0].Username.value == ""){
        msg+="\rUsername";
        msgflag="true";
        }
```

```
if(document.forms[0].NewPassword.value == ""){
        msg+="\rPassword";
        msgflag="true";
        }
if(document.forms[0].FirstName.value == ""){
        msg+="\rFirst Name";
        msgflag="true";
        }
if(document.forms[0].LastName.value == ""){
        msg+="\rLast Name";
        msgflag="true";
        }
if(document.forms[0].Email.value  == ""){
        msg+="\rElectronic Mail Address";
        msgflag="true";
        }
if(document.forms[0].Email.value  != ""){
    var estr = new String(document.forms[0].Email.value);
   var atindex = estr.indexOf("@");
    if(atindex ==-1){
       alert("You must enter a valid Electronic Mail Address!")
       document.forms[0].Email.focus();
       return;
       }
        }

if(msgflag == "true"){
        msg+="\r\rPress OK button below to return the form";
        alert(msg);
}
```

```
if(msgflag == "false"){
 if(document.forms[0].NewPassword.value != ""){
        msgflag="true";
          passStr = new String(document.forms[0].NewPassword.value)
    if(passStr.length < 4){
        pswdflag = "true";
        alert("Password must be a minimum of 4 characters long!");
           document.forms[0].NewPassword.focus()
           Return
           }
       if(document.forms[0].RetypePwd.value == ""){
                pswdflag = "true";
                alert("Please verify you new password by re-entering it into the Confirm
Password field!");
                document.forms[0].RetypePwd.focus()        }
       if(document.forms[0].RetypePwd.value != ""){
                if(document.forms[0].RetypePwd.value !=
document.forms[0].NewPassword.value){
                        pswdflag = "true";
                        alert("The password entered in the 'Confirm Password' field does
match the 'Password' field");
                        document.forms[0].RetypePwd.focus()        }
            }
       }
       if(pswdflag == "false") {
                document.forms[0].submit()            }
        }
}
document.bgcolor="white";
'End of code...
```

4. **Module** : Password Encryption (Security)

Form name : New Account

Field name : NewPassword

Language used : Notes Formula @Function (Computed)

Description : The coding below is another type of data input validation for password field. However, it is coded with Notes Formula @Function language, and not JavaScript. Apart from the input validation, the main purpose of the code is to encrypt the password using the @Password command. The code below is to insert into the object's input translation column. Other input translation involves @Length, @Trim, and @Text.

'Start of code...

```
nchars := 4;
FIELD NPProblem := @If(
                    @Length(@Trim(NewPassword)) < nchars;
                    "Your password must be at least " + @Text(nchars) + "
    characters long. Please go back to the form and correct your password.";
                    "");

@If(NPProblem = ""; @Password(@Trim(NewPassword)); NewPassword)
```

'End of code...

5. **Hotspot name** : HotspotLogin

Module : User Login

Form name : LoginPage

Language used : Notes Formula @Function (Computed)

Description : This command will prompt user with a popup login dialog box when user click on the hyperlink containing the following formula.

'Start of code...

@URLOpen("http://10.100.2.238/Welcome.nsf/LoginPageSuccess?OpenForm&login")

'End of code...

6. **Subfunction name** : nukeDocs

Name of Agent : getUNIDS

Module : User Registration

Form name : New Account

Language used : LotusScript

Description : This agent is responsible of performing the multiple deletion action in the document view when called.

'Start of code...

```
Sub nukeDocs
    " Delete the selected documents
    Dim nukeDoc As notesDocument
    For i = 0 To Ubound(doc.docUNID)
        Set nukeDoc = db.getDocumentByUNID(doc.docUNID(i))
        Call nukeDoc.remove(True)
    Next
    " Redirect to the same URL to refresh the page
    Print "[" & doc.HTTP_Referer(0) & "]"

End Sub
```

'End of code...

7. **Action's name** : Save

Module : WebWordPro Version 2.0 word processor

Form name : WebWordProV2

Languages used : Notes Formula @Command and @Function

Description : This hotspot action is coded to perform the "Save" document function in the word processor.

'Start of code

```
@Command([FileSave]);
@Command([FileCloseWindow]);
@URLOpen("http://10.100.2.238/Welcome.nsf/DataStorageView?OpenForm");
@Command([ViewRefreshFields])
```

'End of code

APPENDIX C

BIBLIOGRAPHY

BIBLIOGRAPHY

[1] http://www.lotus.com/home.nsf/welcome/r5home

- Lotus R5; Notes, Domino and Domino Designer

[2] http://www.lotus.com

- Home of Lotus Development Corporation

[3] *Dokumen Pemprosesan Kata Berasaskan Web (WebWordPro Ver 1.0)*

- by Shuhaila bt. Jamaludin, Document Room, Faculty of Science Computer and Information Technology Universiti Malaya, 1998/1999

[4] Software Engineering, Theory and Practice

- by Shari Lawrence Pfleeger, Prentice-Hall, 1998

[5] http://nightflight.com/cgi-bin/foldoc.cgi?Waterfall+Model

- Waterfall Model, by NightFlight, Oakland, California, USA

[6] *Pengajaran Subjek Pengembalian Bencana Melalui Web (Pengembalian Bencana Online)*

- by Nizam Azwadi Ali, Document Room, Faculty of Science Computer and Information Technology Universiti Malaya, 1999/2000

[7] http://www.microsoft.com/office/word/WordTour.htm

- Word 2000 Tour; The Microsoft Office Word Processor

[8] http://www.sun.com/products/staroffice/overview.html

- StarOffice Software Overview

[9] http://www.corel.com/products/wordperfect/cwps8/cwpftrs.htm

- Corel WordPerfect 8 Intuitive Word Processing

[10] http://www.whatis.com/wordproc.htm

- word processor

[11] http://www.whatis.com/applicat.htm

- application

[12] http://www.gooddocuments.com/olddesign/philosophy/wphistory_m.htm

- Word Processing History

[13] http://www.whatis.com/wysiwyg.htm

- WYSIWYG (what you see is what you get)

[14] The Internet Connection, System Connectivity and Configuration

- by John S. Quarterman and Smoot Carl-Mitchell, Addison Wesley

[15] http://www.isoc.org/internet-history/brief.html#Origins

- A Brief History of The Internet

[16] http://home1.inet.tele.dk/llemming/WhatIntra.htm

- What is Intranet?, by Lars Lemming

[17] http://www.subexgroup.com/htm/intra.htm

- What is an IntraNet?, by Subex Group

[18] Web Publishing Unleashed

- by William Robert Stanek, Sams Publishing, 1997

[19] How to use HTML 3.2

- by Scott Arpajian and Robert Mullen, MCP Inc., 1996

[20] Teach Yourself Microsoft Visual InterDev in 21 Days

- by L. Michael Van Hoozer, Jr., MCP Inc., 1997

[21] http://www.sybase.com/index_sybase.html

- Home of Sybase Inc.

[22] http://www.sybase.com/products/eastudio/

- Sybase Enterprise Application Studio

[23] http://www.sybase.com/products/easerver/

- Sybase Enterprise Application Server

[24] http://www.sybase.com/products/powerbuilder/

- PowerBuilder

[25] http://www.sybase.com/products/powerj/

- PowerJ

[26] www3.allaire.com

- Home of Alllaire Corp.

[27] www3.allaire.com/Products/ColdFusion/productinformation/ColdFusionStudio

- ColdFusion Studio

[28] www3.allaire.com/Products/ColdFusion/productinformation/ColdFusionServer/

- ColdFusion Server

[29] http://www.lotus.com/home.nsf/welcome/lotusnotes

- Lotus Notes

[30] http://www.lotus.com/home.nsf/welcome/dominoenterpriseserver

- Lotus Domino; Family of Servers

[31] http://www.lotus.com/home.nsf/welcome/dominodesigner

- Lotus Domino Designer

[32] http://www.yahoo.com

- Home of Yahoo! Inc.

[33] *Web Based Customer Ordering System*

- by How Siow Ting, Document Room, Faculty of Science Computer and Information Technology, Universiti Malaya, Session 1999/2000

[34] http://www.microsoft.com/frontpage/

Microsoft FrontPage 2000

[35] http://www.adobe.com/products/photoshop/main.html

Adobe Photoshop 5.5

[36] http://www.gamani.com

GIF Movie Gear 2.6

[37] http://www.microsoft.com/windows/ie/default.htm

Microsoft's Internet Explorer

[38] http://www.netscape.com/computing/download/index.html?cp=hom08p1

Netscape Communicator 4.7

[39] http://www.microsoft.com/office/word/default.htm

Microsoft Word 2000

[40] http://www.notes.net/46dom.nsf

Notes Discussion Forum

Other references are:

1. http://www.informit.com
2. http://www.zdnet.com
3. http://www.britannica.com
4. Sams Teach Yourself Lotus Notes and Domino R5 Development in 21 Days, by Dorothy Burke, Jane Calabria, Macmillan Computer Publishing.
5. Special Edition Using Lotus Notes and Domino R5, by Randall A. Tamura, QUE.
6. Modern Systems Analysis and Design, by Jeffrey A. Hoffer, Joey F. George and Joseph S Valacich, Addison Wesley.