DIGITAL DICTIONARY SYSTEM

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ABTRACT

Digital Dictionary conception of an electronic dictionary is quite distinct from the conventional online dictionaries that are now common. Digital dictionary is a global system and it is suitable for public usage. It is so simple system that takes only a few minutes to learn. This idea is a great time saver for user and it is trickling down to everyday usage can serving a useful purpose for humanity.

There are four main functions such as elaborate difficult words that involve a Malay language and English. The second function is digital dictionary also can suggest a similar word for incorrect input from user the third function is this system developed with audio pronunciation and the last function a the system is provided with example of elaboration and picture .

A non functional requirement such as reliability, serviceability, portability, user-friendly and accuracy describes a restriction on the system that limits our choices for constructing a solution to the problem arises. Considering dictionary is always needed by each user in the specific fields especially such as Education, Business, research and etc, so I hope that this system can give satisfaction to user from all aspect.

(193 words)

ACKNOWLEDMENT

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1.0 INTRODUCTION

The digital dictionary is increasingly challenged to meet the growing demand for improved our language. While manual dictionary involve waste time to get some knowledge, these days user are starting to look their digital dictionary function in different light. Digital dictionary system is able to save time can ensure that information is accurately and promptly access.

Digital dictionary developed with audio pronunciation, this is an added benefit for user to improved their communication and easier to understand. It is flexible system which administrator can upgrade the data automatically. This system has built abreast of information system environment.

Digital dictionary is built up follow the waterfall and prototyping model. The system will develop using Active Server Page (ASP) and published with internet information server (IIS).This system is using Microsoft SQL server as its back-end database.

1.1 OBJECTIVES

i. **Give facilities to user to understand a difficult word**

Considering the user is consisted from various age levels and background, so is hoped digital dictionary can facilitate for user to understand information and aim for one difficult word.

ii. **Economize user's time to find information**

Digital dictionary emphasizes user's time in finding information for one word. Time is important asset especially for professional user or expert user. I hope so that this system can give satisfaction from the viewpoint of time speed to all users' types

iii. **Grade Malay Language at international level**

Considering digital dictionary that I will built involves Malay language, so I hope Digital dictionary can introduce our national language uniqueness to foreigner. This also is one of the efforts to centralize Malay Language at global level.

iv. **Can contain many data and more flexibility**

This is a step to overcome that problem to there be the text of dictionary or manual dictionary. Often there is some the word there is not in text dictionary, and when there being the new word then the dictionary text must be republished to fulfill the user's demand. This will involve the cost to user. With being created by digital dictionary that has flexibility database, hoped can reduce user's cost because the word must only recently are just contained.

1.2 PROJECT SCOPE

This project is aimed to develop a web application for public user. The scope of system basically covered the following function:

i. **Translation and Elaboration Word**

User will insert the input and give matching explanation that is word in Malay Language then this system will translate the word. The output that is disclosed is the translation result and information about the word and explanation will be explained in English.

ii. **Incorrect word from user**

To overcome the mistake spelling user's input problem then this system will give several input proposals that is similar with the word

iii. **Audio pronunciation**

This system is provided with pronunciation's audio where this will assist the user to call a word with correct expression. This is easier for user to understand.

1.3 TARGET USER

The target users for my system are public user. I had divided public user into three levels. There is explanation of each level of user:

i. Lower level – this level convergent for a primary student and secondary student.

ii. High level – this level involve high level of student such as graduate, college student and etc.

iii. Professional level – this level consist of worker that involve in professional arena such as teachers, businessman/women, engineer, accountancy and etc.

1.4 REPORT LAYOUT

This is the proposal on the Digital dictionary System that I plan to develop. I have divided my proposal into 7 chapters and every chapter contains information as below:

Chapter 1: Introduction

This chapter contains the explanation on proposal digital dictionary system that I plan to develop. In this chapter, I will list down the introduction, project background, project objectives, project scope, and project development strategy and project schedule. This chapter also gives the brief concepts about the proposal system.

Chapter 2: Literature Review

This chapter contains the research I did on the existing current system and also some development software and platform. The research has been done to compare and find out system requirement and also the software that suitable to use in develop the proposed system.

Chapter 3: System Requirement and Analysis

This chapter shows the methodology used in developing the proposed system. It also gives the explanation about the development software and platform chosen to develop this system. System requirement also listed in this chapter.

Chapter 4: System design

This chapter gives some detail about the design of the proposed system. In this chapter, there will be the functionality design, graphical user interface design and database design of the proposed system.

Chapter 5: System Implementation

This chapter describes the coding approach, coding style and also steps taken to set up the environment in developing the system.

Chapter 6: System Testing

This chapter describes the tests that have been taken in developing the whole system to make sure that the system is running smoothly. There is unit test, module test, integration test and also system test that have been taken.

Chapter 7: System Evaluation

This chapter describes about the strength and the limitation of whole system. It also list down the problem encountered in developing the system.Future enhancement also include in this chapter.

1.5 PROJECT SCHEDULE

Project management is very important for the success of a project. A successful project can be develop only if the developer understand the scope of the project, objectives of the project, task to be accomplished and the schedule of the project to be followed.

A project schedule describes the software development cycle for a particular project by enumerating the phases on stages of a project and breaking each discrete task or activities to be done. In developing this project, a sequence of steps will be followed to accomplish the success of the project. These steps can be divided into 7 sequential phases, although in reality the phases are in interrelated and often are accomplished simultaneously.

(a) System planning

- Understands the topic of digital dictionary
- Identify problems and opportunity.
- Determining information requirements.

(b) System analysis

- Analyzing system needs.

(c) System design

- Designing the recommended system

(d) Program design and coding

- Developing and documenting software

(e) System implementation

- Implementing and evaluating the system

(f) System testing

- Testing and maintenance the system
- Ensure that the entire application is tested and can work properly.

(g) System documentation

- The activity of recording facts and specifications for a current system and for future reference.

1.6 DELIVERABLES AND MILESTONE OF DEVELOPMENT STAGE

Table 1.1 Deliverables and milestone of Development Stage

Stage of Development	Deliverable complete date	Deliverables/milestone	Start date
Feasibility Study	08/07/2003	Project proposal	01/01/2003
Literature study	21/07/2003	Scope of literature study Method of literature study Material collection ended Material read and process	09/07/2003 10/07/2003 17/07/2003 21/07/2003
Requirement Analysis	01/08/2003	Requirement analyses plan Requirement report System specification	22/07/2003 29/07/2003 01/08/2003
System Design	10/08/2003	System architecture design System abstract view	02/08/2003 09/08/2003
Program Design	31/10/2003	Logical functional design State / activity / data flow diagram	11/08/2003 31/10/2003
Development and Design	20/12/2003	Logical design learning Coding Internal / external documentation	03/11/2003 17/11/2003 20/12/2003
Functional and Testing	01/12/2003	Unit testing plan Unit acceptance Document verification	22/11/2003 23/11/2003 30/11/2003
System Testing	24/12/2003	System testing plan System acceptance	02/12/2003 24/12/2003
Maintenance	27/01/2004	Maintenance plan / enhance	23/01/2004

Task Name	Duration	Start	Finish
Feasibility Study	6 days	Tue 7/1/03	Tue 7/8/03
Literature study	9 days	Wed 7/9/03	Mon 7/21/03
Requirement Analysis	9 days	Tue 7/22/03	Fri 8/1/03
System Design	10 days	Mon 8/4/03	Fri 8/15/03
Program Design	17 days	Thu 8/7/03	Fri 8/29/03
Development and Design	60 days	Mon 8/11/03	Fri 10/31/03
Functional and Testing	21 days	Mon 11/3/03	Mon 12/1/03
System Testing	15 days	Tue 12/2/03	Mon 12/22/03
Maintenance	26 days	Tue 12/23/03	Tue 1/27/04

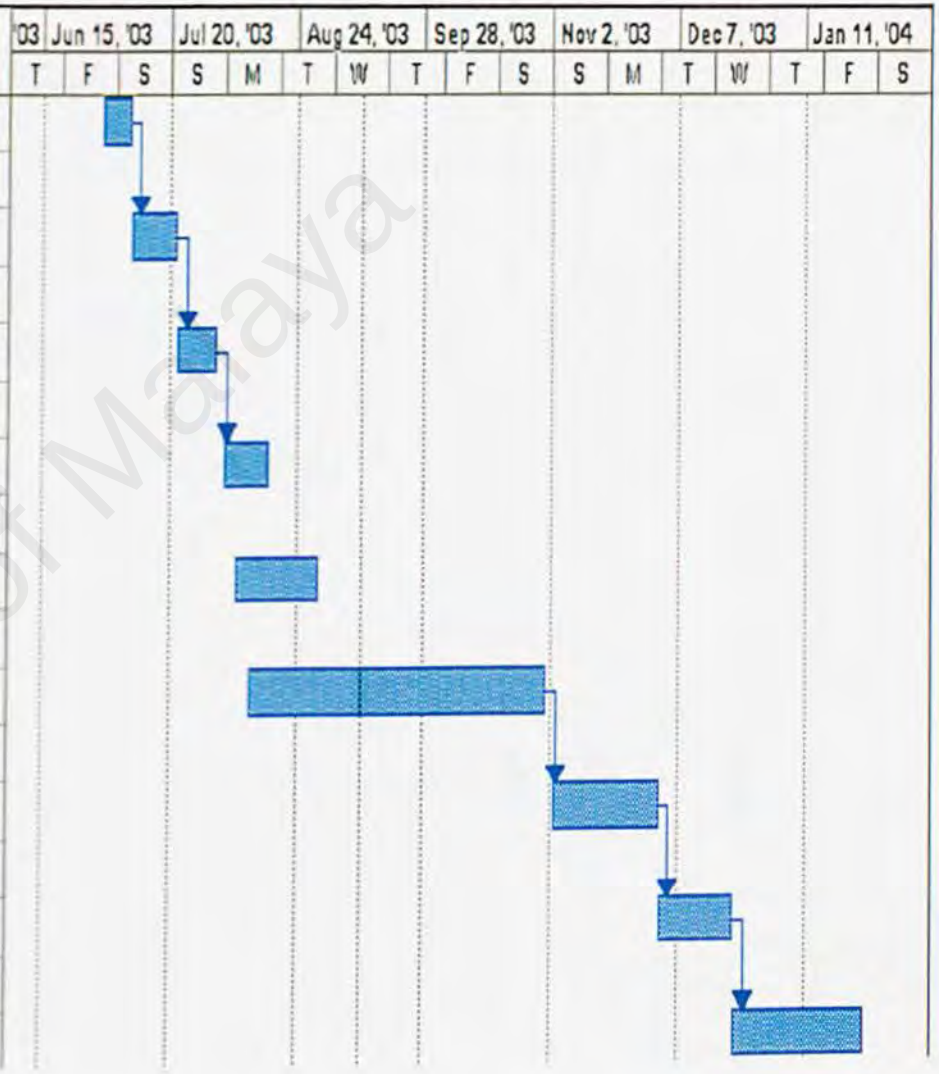


Figure 1.2 Gantt chart

1.7 Conclusion

Digital Dictionary is the solution systems that can help user to know a lot of information about new words. It can improve user satisfaction and can reduce the cost and provide an audio pronunciation as the way to improve their communication.

This chapter has been clearly clarified the objectives, scope, system requirement, schedule of this project as well as the importance of this project.

2.0 LITERATURE REVIEW

Literature review is a background studies about the knowledge and information gains to develop this project. This chapter indicates findings, summarization, analysis and synthesis of what have been read and explored. The purpose of this review of literature is to get better understanding in the development tools that can be used to develop a project and get a better knowledge on the development methodology used while developing project.

2.1 Analysis Review of Existing Digital Dictionary (Online Dictionary)

In this section, several of existing Online Dictionary that implemented in Information Technology environment. The existing systems are being research and analysis to explore the system advantage and drawback of the system been delivered to user.

http://www.m-w.com/

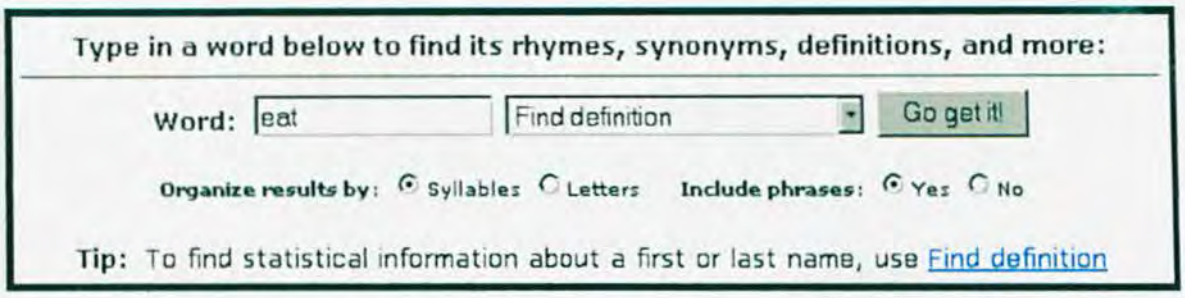
Advantages

1. Have audio pronoun's that is able to assist the user in calling a word.
2. Give information about the application of the word, and how to use it in communication.

Drawback

1. Information that is quite given is difficult understood by user that is consisted from various ranks of age
2. Information that given is not detail, and doesn't emphasize about aspects of application the sentence.

http://www.rhymezone.com/



Definitions of *eat*:

- ***verb***: eat a meal; take a meal

  Example: *"We did not eat until 10 P.M. because there were so many phone calls"*

- ***verb***: take in solid food

  Example: *"She was eating a banana"*

- ***verb***: worry or cause anxiety in a persistent way

  Example: *"What's eating you?"*

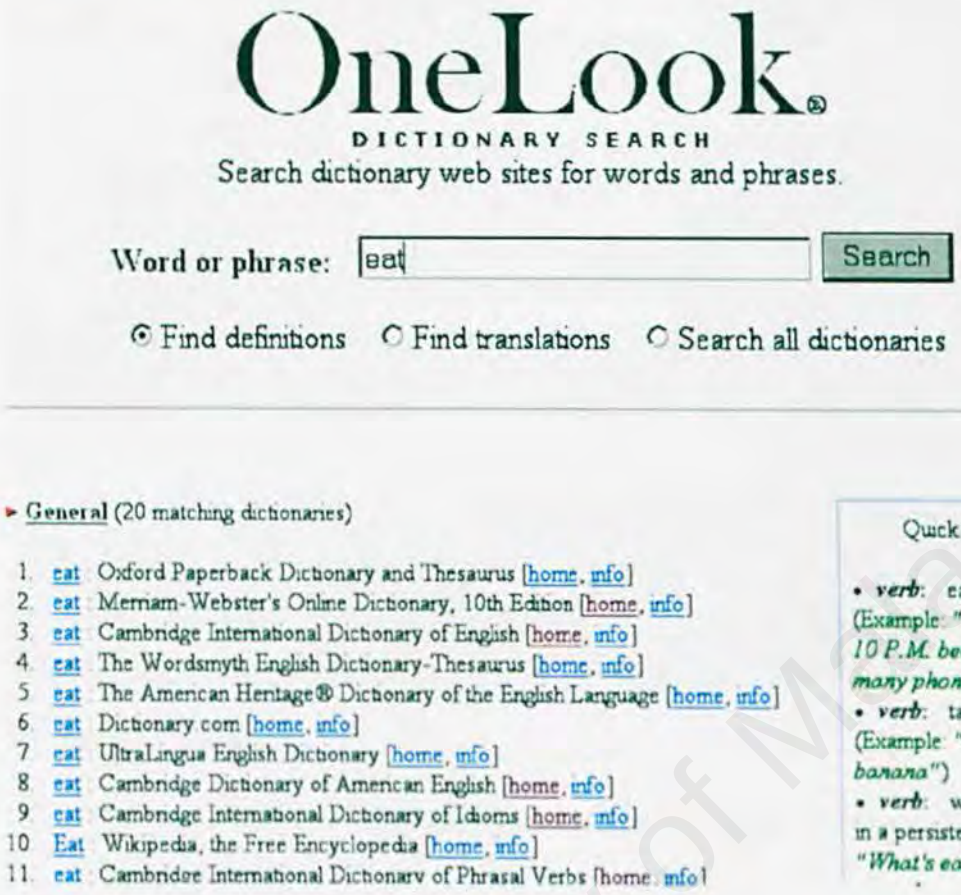
Advantages

1. give example word application in the comprehensible sentence by user while can use it is deepen by daily communication

Drawback

1. Doesn't give detailed information about the word. This will cause the user to be forced to found back information concerning the word.
2. Raise user's time to find information that is required

http://www.onelook.com/



Advantages

1. Give example word application in the comprehensible sentence by user while can Use it is deepen by daily communication
2. Give webpage that is able to assist the user to find the additional information.

Drawback

1. Doesn't give detailed information about the word. This will cause the user to be forced to found back information concerning the word.
2. Doesn't have audio pronunciation's

http://www.epedoman.com

Advantages

1. Involve more than a language such as Malay and English.
2. Can translate more than one word.
3. Have more function such as URL translate and Dwilanguage search.

Drawback

1. Not consist in example for each elaboration word.
2. Doesn't have audio pronunciation.
3. The system translates word by word for long sentences, so it may cause a grammer mistake.

2.2 How the World Wide Web Works

The World Wide Web is the most popular part of the internet by far. Once you spend time on the web you will begin to feel like there is no limit to what users can discover. The Web allows rich and diverse communication by displaying text, graphics, animation, photos, sound and video.

The Web physically consists of personal computer, web browser software, a connection to an Internet service provider; computer called serves that host digital data, and routers and switches to direct the flow of information.

The Web is known as a client-server system. Computer users are the clients; the remote computers that store electronic files are the servers. Here's how it work:

First users enter the address or URL of the website in web browser. Then user browser requests the web page from the web server that hosts the site. The server sends the data over the Internet to computer. User's web browser interprets the data, displaying it on computer screen.

The "glue" that holds the web together is called hypertext and hyperlinks. This feature allows electronic files on the web to be linked so users can jump easily between them. On the web, Navigate through pages of information based on what interests you at that particular moment, commonly known as browsing or surfing the Net.

To access the Web you need a web browser, such as Netscape Navigator or Microsoft Internet Explorer. Web pages are written in a computer language called Hypertext Markup Language or HTML.

2.3 WEB BASED LANGUAGES

2.3.1 Hypertext Markup Language (HTML 4.0)

HTML (Hypertext Markup Language) is the set of markup symbols or codes inserted in a file intended for display on a World Wide Web browser page. The markup tells the Web browser how to display a Web page's words and images for the user. Each individual markup code is referred to as an element (but many people also refer to it as a tag). Some elements come in pairs that indicate when some display effect is to begin and when it is to end.

HTML is a formal Recommendation by the World Wide Web Consortium (W3C) and is generally adhered to by major browser, Microsoft's Internet Explorer and Netscape's Navigator, which also provide some additional non-standard codes. The current version of HTML is HTML 4.0. However, both Internet Explorer and Netscape implement some features differently and provide non-standard extensions. Web developers using more advanced using the more advanced features of HTML 4 may have to design pages for both browsers and send out the appropriate version to a user. Significant features in HTML 4 are sometimes described in general as dynamic HTML.

2.3.2 DHTML (Dynamic Hypertext Markup Language)

Dynamic HTML is collective term for a combination of new Hypertext Markup Language (HTML) tags and options, which will let you create Web pages more animated and more responsive to user interaction than previous versions of HTML. Much of dynamic HTML is specified in HTML 4.0.

Simple example of dynamic HTML pages would include:

i. Having a color of the a text heading change when a user passes a mouse over it

ii. Allowing a user to "drag and drop" an image to another place on Web page. Dynamic HTML can allow Web documents to look and act like desktop applications or multimedia productions.

The biggest obstacle to the use of dynamic HTML is that, since many users are still using older browsers, a Web site must create two versions of each site and serve the pages appropriate to each user's browser version.

The concept and features in Dynamic HTML, both Netscape and Microsoft support:

i. An object-oriented view of page and its element

ii. Cascading style sheets and the layering of content

iii. Programming that can address all or most page element

iv. Dynamic fonts

2.3.3 XML (Extensible Markup Language)

XML (Extensible Markup Language) is a flexible way to create common information formats and share both the format and the data on the World Wide Web, intranet and elsewhere.

Such a standard way of describing data would enable a user to send an intelligent agent or program to each computer maker's Web site, gather data, and then make a valid

comparison. XML can be used by any individual or group of individuals or companies that wants to share information in s consistent way.

XML, a formal recommendation from the World Wide Web Consortium (W3C), is similar to the language today's Web pages, the Hypertext Markup Language (HTML). Both XML and HTML contains markup symbols to describe the contents of page or file. HTML, however describe the content of a web page such as mainly text and graphic images only in terms of how it is to be displayed and interacted with.

XML is "extensible" because unlike HTML, the markup symbols are limited and self-defining. XML is actually a simpler and easier-to-use subset of the Standard Generalized Markup Language (SGML), the standard for how to create a document structure. It is expected that HTML and XML will be used together in many Web applications.

2.4 WEB SCRIPTING LANGUAGE

2.4.1 JavaScript

JavaScript is an interpreted programming or script language from Netscape. It is somewhat similar in capability to Microsoft's Visual Basic, Sun's Tcl, the UNIX-derived Perl, and IBM's REX. In general, script language is easier and faster to code in than the more structured and compiled language such as C and C++. Script language generally takes a longer to process than compiled, but are very useful for shorter programs.

JavaScript is used in Web site development to do such things as:

- Automatically change a formatted date on a Web page

- Cause a linked-to page to appear in popup windows
- Cause text or graphic image to change during a mouse rollover.

JavaScript uses some of the same ideas founds in java, the compiler object-oriented programming derived from C++. JavaScript code can be embedded in HTML pages and interpreted by the Web browser (or client). JavaScript can also be run at the server as in Microsoft's Active Server Pages before the page is sent to the requestor. Both Microsoft and Netscape browser support JavaScript, but sometimes in slightly different ways.

2.4.2 VBScript (Visual Basic Scripting)

VBScript is an interpreted script language from Microsoft that is subset of its Visual Basic programming language designed for interpretation by Web browsers. VBScript can be compared to other script language that can be used on the Web.

Both a designed to work with a interpreter that comes with Web browser that is, at the user or client end of the Web client/server session. VBScript is designed for use with Microsoft's Internet Explorer browsed together with other programming that can be run at the client, including ActiveX controls, automation servers, and Java applets. Although Microsoft does support Netscape's JavaScript (it converts it into its own Jscript), Netscape does not support VBScript is best used for intranet Web sites that use the Internet Explorer browser only.

2.5 WEB APPLICATION DEVELOPMENT

2.5.1 Active Server Pages (ASP)

An Active server page (ASP) is an HTML page that includes one or more script (small embedded programs) that a processed on a Microsoft Web server before the page is sent to the user. An ASP is somewhat similar to a server-side include or a common gateway interface (CGI) application in that all involve program that run on the server, usually tailoring a page for the user. Typically, the script in the Web page at the server uses input received as the result of the user's request for the page to access data from database and then builds or customizes the page on the fly before sending it to the requestor.

ASP is a feature of the Microsoft Internet Information Server (IIS), but since the server-side script is just building regular HTML page, it can be delivered to almost any browser. You can create an ASP file by including a script written in VBScript or Jscript in and the HTML file or by using ActiveX Data Object (ADOs) program statements in the HTML file. You name the HTML file with the ".asp" file suffix. Microsoft recommends the use of the server-side ASP rather than a client-side script, where there is actually a choice, because the server-side script will result in an easily displayable HTML page. Client-side script (for example, with JavaScript may not work as intended on older browser.

2.5.2 JSP (Java Server Page)

Java Server Page (JSP) is a technology for controlling the content or appearance of Web pages through the use of servlets, small program that are specified in the Web pages and run on the Web server to modify the Web page before it is sent to the user who requested it. Sun Microsystems, the developer of Java, also refers to JSP technology as the servlet application program interface (API). JSP is comparable to Microsoft's Active Server page (ASP) technology. Whereas a Java Server page calls Java Program that executed by the Web server, an Active Server Page contains a script that is interpreted by script interpreter (such as VBScript or Jscript) before the page is sent to the user.

2.5.3 PHP (Personal Home Page)

PHP is a script language and interpreter that is freely available and used primarily on Linux Web severs. PHP originally derived from *Personal Home Page* Tools, now stand for PHP: *Hypertext Preprocessor*, which the PHP FAQ describes as a "recursive acronym".

PHP is an alternative to Microsoft's Active Server Page (ASP) technology. As with ASP, the PHP script is embedded within a Web page along with its HTML. Before the page is sent to a user that has requested it, the Web server calls PHP to interpret and perform the operations called for in the PHP script.

An HTML page that includes a PHP script is typically given a file name suffix of ".php", ".php3", or."phtml". Like ASP, PHP can be thought of as "dynamic HTML pages", since content will vary based on the results of interpreting the script. PHP is free and offered under an open source license.

2.6 WEB ARCHITECTURE

2.6.1 Client/Server Computing

Client/server describe the relationship between two computers in which one program, the client makes a service request from another program, the server, which fulfills the request. Although programs within a single computer can use the client/server idea, it is a more important idea in a network. In a network, the client/server model provides a convenient way to interconnect programs that a distributed efficiency across different locations. Computer transactions using the client/server model are very common.

In the usual client/server model, one server, sometimes called a daemon, is activated and awaits client requests. Typically, multiple client programs share the services of the common server program. Both client programs and server programs are often part of larger program or application. Relative to the Internet, your Web browser is a client program that requests services (the sending of Web pages or files from a Web server (which technically called a Hypertext Transport Protocol or HTTP server) in another computer somewhere on the Internet. Similarly, your computer with TCP/IP installed allows you to make client requests for files from File Transfer Protocol (FTP) servers in other computers on the Internet. Other program relationship models included *Master/slave*, with one program being in charge of all other program, and peer-to peer, with either of two programs able to initiate a transaction.

Client /server involve breaking up system functionality into layers so that it can be independently developed. It is then deploy across multiple machines and uses a communication mechanisms to allow different layers to cooperate. Client/server involves

the following independent layers. Presentation Logics: This layer will handle how users interact with the application. It is implemented by providing graphical user interface (GUI).

2.6.2 two-tier client/server

In a two-tier system, you have a *client* program and *server* program. The main different between the two is that server responds to request from many different clients, while the clients usually initiate the requests for information from a single server.

Advantages of two-tier system

i. Application development in a two-tier environment is much quicker than in older legacy environment, but not necessarily quicker than the new three-tier environment.
ii. Tools for two-tier development are tested and robust. Prototyping and Rapid development techniques are easily employed.
iii. Two-tier solution work well in stable non-dynamic environments but do not perform well in rapidly changing organizations.

Disadvantages of A two-tier System

i. Two-tier environment require extensive version control and application distribution efforts when changes are made. This is due to the fact that most of the application logic exists on the client workstation.

ii. System security in two-tier design is complex and often requires extensive database account management due to the number of device with direct access to database environment.

iii. Client and Database tools used in two-tier designs are constantly changing and very proprietary. Long –term commitments to any one tool can complicate future scaling or implementations.

2.6.3 three-tier client/server

A special type of client/server architecture consist of three well-defined and separate processes, which each of them running on a different platform.

This middle tier runs on a server and is often called the application server. A database management system (DBMS) that is stores the data required by the middle tier. This tier runs on second server called database server.

Advantages of three-tier Architecture:

i. Calls from the user interface on the client workstation to the middle tier server are more flexible than two-tier design since the client only needs to pass parameters to the middle tier.

ii. With three-tier architecture, the client interface is not required to understand or communicate with the back-end data layer. Therefore, back-end data structure can be modified without changing the user interface on the client PC.

iii. Middle tier code can be reused by multiple applications if designed in a modular format. This can reduce development effort, maintenance, and migration costs.

iv. The separation of roles into the three-tier makes it easier to replace or modify one tier without affecting the remaining modules.

v. Separating the application from the database makes it easier to use new clustering and load balancing technologies.

vi. Separating the user interface from the application offloads a majority of the processing from the workstation and allows application updates to be centralized on the application server.

Disadvantages of three-tier and Web-Based Architectures

i. Three-tier environment can increase network traffic and require more load balancing and fault tolerance

ii. Current Browsers are not all the same. Standardization among different vendors has been slow to develop. Many organizations are forced to choose one over the other while each offers its own distinct advantages.

2.7 WEB BROWSER

A browser is an application program that provides a way to look at and interact with all the information on the World Wide Web. The word "browser" seems to have originated prior to the web as a generic term for user interfaces that let you browse (navigate through and read) text files online. By the time the first Web browser with a graphical user interface was generally available. The term seemed to apply to Web content.

Technically, a Web browser is a client program that uses the Hypertext Transfer Protocol (HTTP) to make request of Web servers throughout the Internet on behalf of the

browser user. A commercial version of the original browser, Mosaic, is in use. Many of the user interface features in Mosaic however went into the first widely used browser, Netscape Navigator.

2.7.1 Microsoft Internet Explorer

Microsoft Internet Explorer (MSIE) is the most widely used World Wide Web browser. It comes with the Microsoft Windows Operating system and can also be downloaded from Microsoft's Web site. The MSIE browser competes with an earlier browser, Netscape Navigator.

2.7.2 Netscape Navigator

Netscape is one of the most popular Web browsers and also the name of a company, Netscape Communication, now owned by America Online (AOL). First Web browser that had a graphical user interface is at University of Illinois' National Center for Supercomputing Application (NCSA) in 1993.

2.7.3 Opera

Opera is a Web browser that provides some advantages over the two most popular browsers from Netscape and Microsoft. Much smaller in size, Opera is known for being fast and stable. Opera, which is available for BeOS, EPOC, Linux, Mac, OS/2 and Windows, offer the same capabilities of more popular browsers including integrated searches and Instant Messaging, support for JavaScript, cascading style sheets, and mail.

Because Opera is so compact, it is being promoted as the browser of choice for hand-held Internet devices.

Opera for Windows is now free; there is still a purchase fee for other platforms. The fee version of Opera contains ads, which are cached weekly to insure Opera's fast speed is maintained. The other versions of Opera do not have ads, which is why Opera charges a modest one-time license fee.

2.8 WEB SERVER

A Web server is a program that, using the client/server model and the World Wide Web's Hypertext Transfer Protocol (HTTP), serves the files that form Web pages to Web users (whose computers contains HTTP client that forward their request). Every computer on the Internet that contains a Web site must have a Web server program. Two leading Web Servers are Apache, the most widely installed Web server, and Microsoft's Internet Information Server. Other Web servers include Novell's Web Server for users of its Netware operating system and IBM's Family of Lotus Domino servers, primarily for IBM's OS/390 and AS/400 customers.

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

2.8.1 Internet Information Server (IIS)

IIS (Internet Information Server is a group of internet server (including a Web or Hypertext transfer Protocol server and a File Transfer Protocol server) with additional capabilities for Microsoft's Windows NT and Windows 2000 server operating systems. IIS is Microsoft's entry to compete in the Internet server market that is also addressed by Apache, Sun Microsystems and O'Reilly. With IIS, Microsoft includes a set of programs for building and administering Web sites, a search engine, and support for writing Web-based applications that access databases. Microsoft points out that IIS is tightly integrated with the Window NT and 2000 Servers in a number of ways, resulting in faster Web page serving.

A typical company that buys IIS can create pages for Web sites using Microsoft's Front Page product (with its WYSIWYG user interface). Web developers can use Microsoft's Active Server Page (ASP) technology, which means that applications (including ActiveX control) can be imbedded in Web pages that modify the content sent back to users. Developers can also write programs that filter requests and get the correct Web pages for different users by using Microsoft's Internet Server Application Program Interface (ISAPI). ASP and ISAPI programs run more efficiently than common gateway interface (CGI) and server-side include (SSI) programs, two current technologies. However there are comparable interfaces on other platforms.

Microsoft includes special capabilities for server administrators designed to appeal to Internet service providers (ISPs). It includes a single Window or "console" from which all services and users can be administered to be easy to add components as

snap-ins that you didn't initially install. The administrative Windows can be customized for access by individual customers.

2.8.2 APACHE

Apache is a freely available Web server that is distributed under an "open source" license. Version 2.0 runs on most UNIX-based operating system (such as Linux, Solaris, Digital UNIX, and AIX), on other UNIX/POSIS-derived systems (such as Rhapsody, BeOS, and BS2000/OSD), on AmigaOS, and on Windows 2000.

Apache complies with the newest level of the Hypertext Transport Protocol, HTTP 1.1. Free support is provided through a bug reporting system and several Usenet newsgroups. Several companies offer priced support.

From the above point of view, each Web server can be concluding as:

	Apache	**Internet Information Server**
Strengths	Freeware, good performance, reliability, support for HTTP 1.1 Protocol, quick technical support via Usenet Newsgroup.	Free download, superior administration control, HTTP 1.1 support, Virtual server support, excellent combination with Windows 20000.
Weakness	NT version is in its infancy, lack of graphical administration tools for configuration and administration task.	NNTP does not support USENET feeds; SMTP does not support POP 3 mailboxes.

Table 2.1: Compare Apache and Internet Information Server

2.9 WEB SECURITY

2.9.1 Secure Sockets Layer (SSL)

The Secure Sockets Layer (SSL) is commonly used protocol for managing the security of message transmission on the Internet.

SSL has recently been succeeded by Transport Layer Security (TLS), which is based on SSL. SSL uses a program layer located between the Internet's Hypertext Transfer Protocol (HTTP) and Transport Control Protocol (TCP) layers.

SSL is included as part of both the Microsoft and Netscape browsers and most Web server products. Developed by Netscape, SSL also gained the support of Microsoft and other Internet client/server developers as well and became the de facto (effectively) standard until evolving into Transport layer Security.

The "sockets" part of the team refers to the sockets method of passing data back and forth between a client and a server program in a network or between program layers in the same computer. SSL uses the public and private key encryption system from RSA, which also includes the use of digital certificate.

2.9.2 Transport Layer Security (TLS)

Transport Layer Security (TLS) is a protocol that ensures privacy between communicating applications and their users on the Internet. When a server and client communicate, TLS ensure that no third party may eavesdrop or tamper with any message. TLS is the successor to the Secure Sockets Layer (SSL).

TLS is composed of two layers: the TLS Record Protocol and the TLS Handshake Protocol. The TLS Record Protocol provides connection security with some encryption

method such as the Data Encryption Standard (DES). The TLS Record Protocol can also be used without encryption. The TLS Handshake Protocol allows the server and client to authenticate each other and to negotiate an encryption algorithm and cryptographic keys before data is exchanged.

The TLS protocol is based on Netscape's SSL 3.0 protocol. However, TLS and SSL are not interoperable. The TLS protocol does contain a mechanism that allows TLS implementation to back down to SSL 3.0. The most recent browser versions support TLS. The TLS Working Group established in 1996, continues to work on the TLS protocol and related applications.

2.10 APPLICATION PLATFORM CONSIDERATION

Currently, UNIX, Windows 2000 Family and Linux are most famous platform for developing web client/server application. Each of these operating systems has its strengths and weaknesses. As different kinds of application will run in different platform here, in this part of literature review, studies on these operating systems are made.

2.10.1 Windows 2000 Advance Server

The server operating system designed for highly scalable and available line-of business and e-commerce applications. It is enhanced version of Windows 2000 server.

Windows 2000 Advance Server contains all of the features and functionality of the standard version of version of Windows 2000 Server, plus features designed for larger, more mission-critical servers and server farms. Features in Windows 2000 Server Family include:

i. Internet Information Services 5.0 (IIS) – Integrated Web services enable users to easily host and manage Web sites to share information, create Web-based business application, and extend file, print, media and communication service to the Web.

ii. Support for the Latest Security Standards – Build secure intranet, extranet and Internet sites using the latest standards, including: 56-bit and 128-bit SSL/TLS, IPSec, Server Gated Cryptography; Digest Authentication, Kerberos v5 authentication and Fortezza.

iii. Windows DNA 2000 – With the Windows Distributed interNet Application Architecture (Windows DNA 2000) – the Microsoft platform for developing Web application – you can build secure, reliable, highly scalable solutions that ease the integration of heterogeneous systems and applications.

iv. Backup and Recovery – Backup and Recovery features make it easier to backup data and recover data in the event of a hard disk failure. Windows 2000 allows back up to a single file on a hard disk and tape media.

v. Distributed File System (DFS) – Build a single, hierarchical view of multiple file servers and file server shares on a network. DFS makes files easier for users to locate, and increases availability by maintaining multiple file copies across distributed servers.

2.10.2 UNIX

UNIX operating systems are used in widely-sold workstation products from Sun Microsystems, Silicon Graphics, IBM and a number of other companies. The UNIX environment and the client/server program model were important elements in the development of the Internet and the reshaping of computing as centered in networks rather than in individual computers. Linux, a UNIX derivative available in both "free software" and commercial versions, is increasing in popularity as an alternative to proprietary operating systems.

UNIX can be used for:

- Sending and receiving e-mail, forwarding mail, redirecting mail, mapping a particular mail group to list of specific users.
- Storing files, including user's personal files as well as publicly accessible software archives.
- Managing centralized database and serving information to users remotely.
- Running a Web server and storing Web page. The UNIX machines are normally left on 24 hours a day.
- Implementing shared network file systems.
- Remote services computers running UNIX normally support certain remote services, allowing users to request information from the computer without actually logging in.

The benefits and weakness of UNIX can be concluded as the following:-

Benefits

- UNIX is consistent in treating files. It is very easy for the users to work with files because users do not need to learn special command for every new task.
- UNIX is not known only for its longevity and versatility as an operating systems, but also for the variety and number of utility programs that called tool.

Weakness

- UNIX needs very powerful workstations. Therefore it is not cost effective to use.
- UNIX is very expensive

2.10.3 LINUX

The following are the important features of Linux

- Linux is real multitasking system that allows multiple users to run programs on the same system at once.
- The X windows system is a very powerful graphics interface, supporting many applications.
- Linux is built in networking support. It uses standard TCP/IP protocols, including Network File System (NFS) and Network Information Service (NIS) – formally known as YP.
- Linux is fault tolerant; it is used to more than 31 % of the World Wide Web servers. With Apache as the primary application for those servers, they have proven to be practically immune to the recent explosion of viruses that have plagued e-mail and the Internet.
- Because the available source code and the ability for users to modify, Linux is not as secure as other system if an ever-expending group of hackers who want to get their hand dirty with other's Linux based system.
- Lower cost than must over Window NT system and Unix clones systems, as Linux is freely available on the Internet.

The benefits and weakness of Linux can be concluding as:-

Benefits:

- Linux is as stable as Unix
- Highly cost,– effective ability to scale the size of the site as traffic grows.
- Is it developed under the GNU General Public License and its source code is freely available to everyone.

Weakness

- It is developed World Wide, therefore lack of proper organized support.
- Linux is inherently unsafe because every malicious cracker in the universe has the source code to the site.
- Linux is missing many required to build a real application. Those pieces are problematic.

	Linux-Red Hat	UNIX	Windows 2000 Server
Installation Issues	Need concept on disk portioning and mounting file system.	Need concept on disk portioning and mounting file system	Easy to install using interface wizard
User-friendly	Not user-friendly because user interfaces is too cryptic.	Not user-friendly because user interfaces is too cryptic	User-friendly with Windows based interfaces.
Security	Vulnerability is high because distribution of source code is widely available.	Vulnerability is high because distribution of source code is widely available.	Vulnerability is low because of the applications are not truly available in the Internet.
Cost Effective	Cost effective because it is freeware	No cost effective because with certain modification, the whole operating system need to be recompiled.	Cost effective operating system. Budget is between RM2500. A fully function internet server is running in matter of days.
Scalability	Support multitasking.	Support multitasking.	Support multiprocessing (SMP).
Stability	Stable	Stable	Sometimes unstable due to system and registry problem.
Compatibility with Web Development Tools	Less compatible with development tools.	Incompatible with web development tools.	Compatible with development tools.

Table 2.2: Server Platform Comparison

2.11 NETWORK ARCHITECTURE

2.11.1 TCP/IP (Transmission Control Architecture)

TCP/IP (Transmission Control Architecture) is the basic communication language of the Internet. It can be also be used as a communications protocol in a private network (either an intranet or extranet).

TCP/IP is a two layer program. The higher layer, Transmission Control Protocol manages the assembling of message or file into smaller packets that are transmitted over the internet and received by TCP layer that reassembles the packets into the original message. The lower layer, Internet Protocol handles the address part of each packet so that it gets to the right destination. Each gateway computer in the network checks this address to see where to forward the message. Even though some packets from the same message are routed differently than others, they reassembled at the destination.

TCP/IP uses the client /server model of communication in which a computer user (a client) requests and it provided a service (such as sending a Web page) by another computer (a server) in the network. TCP/IP communication is primarily point-to-point, meaning each communication is from one point (or host computer) in the network to another point or host computer. TCP/IP and the higher level applications that use it are collectively said to be "stateless" because each client request is considered a new request unrelated to any previous one (unlike ordinary phone conversations that required dedicated connection for all duration). Being stateless frees network paths so that everyone can use them continuously. (Notes that TCP layer itself is not stateless as far as

any one message is concerned. Its connection remains in place until all packets in a message have been received).

2.11.2 HTTP (Hypertext Transfer Protocol)

Hypertext Transfer Protocol (HTTP) is the set of rules for exchanging files (text, graphic images, sound, video and other multimedia files) on the World Wide Web. Relative to the TCP/IP suite of protocols (which are the basis for information exchange on the internet), HTTP is an application protocol.

Essential concepts that are part of HTTP include (as its name implies) the idea that files can contain reference to other fails whose selection will elicit additional transfer requests. Any web server machine contains, in addition to the HTML and other files it can serve, an HTTP daemon, a program that is designed to wait for HTTP request and handle them when they arrive. Your Web Browser is an HTTP client, sending requests to server machines.

When the browser user enters file requests by either "opening" a Web file (typing in a Uniform Resource Locater) or clicking on a hypertext link, the browser builds an HTTP request and sends it to the Internet Protocol address indicated by the URL. The HTTP daemon in the destination server machine receives the request and after any necessary processing, the requested file is returned.

2.11.3 FTP (File Transfer Protocol)

File Transfer Protocol (FTP), a standard Internet Protocol, is the simplest way to exchange files between computers on the Internet. Like the Hypertext Transfer Protocol (HTTP), which transfer displayable Web pages and related files, and the Simple Mail Transfer Protocol (SMTP), which transfer e-mail, FTP is an application protocol that uses the Internet's TCP/IP protocols. FTP is commonly used to transfer Web page files from their creator to the computer that acts as their server for everyone on the Internet. It's also commonly used to download programs and other files to your computer from other servers.

As a user, you can use FTP with a simple command line interface (for example, from the Windows MS-DOS Prompt window) or with a commercial program that offers a graphical user interface. Your Web browser can also make FTP request to download programs you select from a Web page. Using FTP, you can also update (delete, rename, move and copy) files at a server. You need to logon to an FTP server. However, publicly available files are easily accessed using anonymous FTP.

Basic FTP support is usually provided as part of suite of programs that come with TCP/IP. However, any FTP client program with a graphical user interface usually must be downloaded from the company that makes it.

2.12 DEVELOPMENT TOOLS

2.12.1 Microsoft Visual InterDev 6.0 Professional Edition

Microsoft Visual InterDev 6.0 is the latest version of the award-winning integrated web application development system for professional programmers. The new version enables Web teams to design, build, debug and deploy cross-platform Web applications faster than ever before.

Visual InterDev 6.0 also features a new integrated WYSIWYG editor for ASP & Dynamic HTML pages, enhanced database programming tools, and end-to-end debugging facilities for multi-tier applications built with HTML and Script. Benefit using Microsoft Visual InterDev 6.0:

i. Rapid end-to-end Web application development. Allows professional developers to design, build, debug and deploy cross platform HTML and Script based Web applications faster than ever before.

ii. Full featured standards-based team development. Specifically designed to meet the unique challenges of team based Web development.

iii. Data environment – Add database connection to a Web site without any programming, including visually setting connection properties such as cursor derivers, query time-outs, etc. Drag and drop from the data environments to quickly create sophisticated data driven HTML form.

iv. Query builder – Query allows developers to visually construct complex SQL statements against any ODBC database. Test any query in the live test pane before using within a Web page.

v. Database tools – Enhanced support for oracle database, as well as Microsoft SQL server. Powerful, integrated database tools. Includes a complete set of database programming and design tools, allowing developers to build enterprise-class, data driven Web applications within a single, integrated IDE.

2.12.2 Microsoft Visual Basic 6.0

Visual Basic 6.0 is the most productive tool for creating high performance enterprise and Web base applications. Integrated Visual Database Tools and a RAD environment promote productivity while native code compilation provides fast applications. Features using Microsoft Visual Basic 6.0:

i. ADO (ActiveX Data Objects) – Visual Basic 6.0 introduces ADO as the powerful new standard for data access. Included OLE DB drivers include SQL server, oracle, Microsoft access, ODBC, and SNA server.

ii. Native Code Compiler – Create applications, and both client and server side components that are optimized for throughput by the world class visual C++ 6.0 optimized native-code compiler.

iii. Creation of custom data consumers and providers – Create custom data aware COM controls for the client or middle-tier and custom OLE DB providers.

iv. Data Report Designer – Developers can quickly drag-and-drop custom data bound controls to create forms or reports. Creation of custom data hierarchies is as easy as filling out a dialog box and dragging the command to the form.

Use the Visual Basic 6.0 integrated Visual Database Tools and new Data Environment Designer to visually design Oracle and Microsoft SQL server database and create reusable data access queries all without leaving the Visual Basic environment.

Build server side Web applications that are easily accessible from any browser on any platform with Visual Basic 6.0 Web Classes. Program highly interactive Web pages as easily as a Visual Basic form with the new Dynamic HTML Page Designer.

Quickly develop rich data forms, or use the new integrated Report Writer to develop sophisticated, hierarchical reports all with drag and drop ease.

2.12.3 Microsoft FrontPage 2002

Microsoft FrontPage 2002 is sophisticated technology to your Web site without having to program. Microsoft FrontPage version 2002 provides the best value category. It has integrated features for Web site creation, Web site management, instant team Web sites with the Share Point Team Services, team Web Solution, e-commerce and graphics editing built right in.

FrontPage is easy to get started with. Built-in templates and wizards allows you to create a Web site in only a matter of minutes, and then customize it to make your own graphics, photo gallery, backgrounds, image maps, themes, fonts and formatting. Features Microsoft FrontPage 2002:

i. Photo Gallery – Quickly and easily create a Photo Gallery to display personal or business photos or images. Select from several professional looking layouts. Add captions and descriptions reorder images, change image sizes and switch layouts when you want.

ii. Usage Analysis Report – Usage Analysis Report help you find out what pages getting the most hits in daily, weekly, or monthly reports and how visitors find your site. You can save reports in HTML or Excel for later analysis.

iii. Database Interface Wizard – Generates the forms and pages you need to display the contents of database on the page. Allows specific users to edit or delete records through a Web page, while allowing everyone who can browse to your site to add new records and view existing ones.

iv. SharePoint Team Services – SharePoint Team Services allows you to quickly set up a team web site for intranet or internet users to store, find and share information, documents and web pages. Use FrontPage to customize the site.

v. Central Commerce Manager Add-in FrontPage – Easily sell products on your web site Central Commerce Manager Service. FrontPage helps step you through creating products pages, categories pages and list of all the categories of products you offer.

2.12.4 Adobe Photoshop 7.0

Adobe Photoshop 7.0 software, the professional image editing standard, helps you work efficiently, explore new creative options and produce the highest quality images for print the web and anywhere else. Create exceptional imagery with easier access to file data, streamlined Web design, faster, professional quality photo retouching and more. Features Adobe Photoshop:

i. Enjoy unlimited creative options – Sophisticated painting tools including brushes that simulate natural media, pattern maker to generate background textures automatically, layer styles to apply multiple effects instantly.

ii. Enhanced Photography – Powerful color correction tools, healing brush to remove flaws while preserving tonality and texture, layer for editable compositing, watermarking to protect artwork posted on the web, sophisticated crop tool the corrects perspective as it crops.

iii. Create compelling web graphics – tools to define and edit slices directly in Photoshop, transparency controls including dithered transparency for edges that blend into any background, instant GIF animations from layered Photoshop and adobe illustrator.

iv. Work more efficiency – File browser to inspect images before open, history palette to undo or redo multiple steps with ease, customizable workspace controls to save palette arrangement.

v. Maintain color precisely – color management controls for soft-proofing and consistent color across every device, spot color and duotone support, precise controls for dot gain, black plate generation and more.

2.14.5 Dreamweaver MX

Macromedia Dreamweaver MX builds on the foundation of these combined market-leading tools to again pioneer a new course for professional web development. Dreamweaver MX is an easy, powerful and open authoring tool that every member of the development team can use to quickly build robust web sites and Internet applications. For

the first time, designers, developers and programmers can work within one environment to easily create and manage any professional web site, whether it's built using HTML, XHTML, XML, web services, ColdFusion, ASP.NET, ASP, JSP or PHP.

Dreamweaver MX offers a solid foundation for Internet application development. It gives developers the familiar tools they need to do their jobs today, while providing access to new tools for next-generation development-all within one environment. With Dreamweaver MX, developers can grow with the product, not outgrow it.

Features Dreamweaver MX:

a. Easy - Achieve complete control over code and design. Build the site you want, the way you want it, using the combined visual layout tools of Dreamweaver with the code editing tools of Home Site.
b. Powerful - Rapidly develop Internet applications for the latest server technologies. Robust support enables effortless development for any popular server technology using drag-and-drop visual tools or extensive code editing support.
c. Open - Unlock the benefits of emerging standards and new web technologies. Leverage support for XML, web services, XHTML and accessibility compliance to retrofit existing sites or build next-generation applications.
d. Quickly - Quickly develop common Internet applications using libraries of code to create database insertion and update forms, record set navigation pages, and user authentication pages. Test layouts using live data to populate the design view.

2.13 DATABASE

2.13.1 Microsoft SQL Server 2000

Microsoft SQL Server 2000 includes the complete set of SQL Server database and analysis features and is uniquely characterized by several features that make it most scalable and available edition of SQL Server 2000. It scales to the performance levels required to support the largest Web site and enterprise Online Transaction Processing (OLTP) and data warehousing system. Its support for failover clustering also makes it ideal for any mission critical line-of-business applications. Additional features of SQL Server 2000 Enterprise Edition are most evident:

i. Scalability – Whether for data warehousing or for a transactional system, Enterprise Edition scales best. It supports more memory (up to 64 gigabytes [GB]) and processors (up to 32) than Standard Edition.

ii. Availability/uptime – Ensure the highest levels of availability for mission critical applications. It improved availability/uptime are installing a system that will use failover clustering to ensure that your applications stay up and running even disaster strikes.

iii. Performance – Need to improve performance of applications that frequently use queries that perform particular types of joins or aggregations, as in reporting applications, need to speed up transactional applications that do many database reads and full table scans.

iv. Advanced analysis – Offers a variety of unique features including allowing OLAP cubes with very large dimensions to be created, stored and analyzed. Creating and updating large dimensions. Have extremely large dimensions that require

relational OLAP (ROLAP) storage, need to update cubes quickly in real time, need to link cube access over the Web.

2.13.2 Oracle 9i

Oracle 9i is a platform and not only a database as was the case with Oracle 8i. Oracle 9i consist of the 9iDB (Database), 9iAS (Application Server), 9iDS (Developer Suite). New features in 9iDB:

i. Traditional rollback segment (RBS) are still available, but can be replaced with automated System Managed Undo (SMU). Using SMU, Oracle will create its "Rollback Segments" and size them automatically without any DBA involvement.

ii. Use Oracle Ultra Search for searching database, file systems etc. the Ultra Search crawler fetch data and hand to Oracle Text to be indexed.

iii. Scrolling cursor support. Oracle 9i allows fetching backwards in a result set.

2.13.3 Microsoft Access 2002

Microsoft Access version 2002 helps novice users and experienced programmers like build powerful, customizable solutions that integrate easily with the Web and Enterprise data sources. Capture sales records. Track inventory. Whatever your needs, Access 2002 helps users work smarter. Access 2002 makes it easier than ever to build powerful database solutions and access and analyze important information.

i. Easily fix your work – Now you can undo and redo multiple actions for maximum productivity when creating forms, report, data access pages, macros and modules.

ii. Turn form and report into Web pages – share your data on Web using the tools you already know. Save your form or report as a Data Access Page, which allows users to view and edit live data within their browser.

iii. Get valuable tools on the Web visit the Office Tools on the Web site to download templates, tools, tips and updates that help you work faster.

2.13.4 MY SQL 4.0

My SQL database server is the world's most widely used open source database. Its ingenious software architecture makes it extremely fast and easy to customize.. Features My SQL 4.0:

i. Database Administrators is My SQL parameters (startup option) can soon be set without taking down servers.

ii. Many read heavy applications will benefit from further increased speed through the rewritten key cache.

iii. Many developers will also be happy to see the My SQL command help in the client.

2.14 CONCLUSION

In this chapter, I do some research on the Online Dictionary concept and also do review on the currently existing Online Dictionary System in order to develop my own proposed system. Besides that, I also do some research on the web server, web architecture, graphical design, web database management system, development software. After doing those researches, I will choose the most suitable one in developing my proposed system. I will further explain about the software chosen and also the system requirement in Chapter 3.

3.0 METHODOLOGY & SYSTEM ANALYSIS

Developing a computer system is never a simple matter. There are many facets involved in the system development process starting from information search to implementation and maintenance. Usually, the risk of failure is very high. Therefore, proper planning of project and appropriate methodology must be adopted to produce a good outcome. This chapter will draw out the suitable methodology for the proposed system, the stages involved and appropriate software tools.

3.1 System Methodology

To produce the project system, a methodology is selected based on the congruence of the method and the system. The phases, advantages and disadvantages of the methodology are discussed in this section.

3.1.1 Methodology – Waterfall with Prototyping

The development methodology for this project based on the System Development Life Cycle (SDLC). The model chosen is the "Waterfall model" with prototyping approach. As we know, system development generally passes through a series of phases or stages.

Each phase in "Waterfall model" is presented discretely and never accomplished as a separate step. Several activities can occur simultaneously and activities may be repeated. It suggests to the developers the sequence of events they should expect to encounter. It can also very useful in helping "new" developers to layout what they need

to do and what are the tasks that must be focus on. Besides that, the developers could use the model, to gauge how close the project was to completion at given point in time.

Phases or activities were planned and divided according to planning, requirement and analysis, system design, coding, implementation and testing, operation and maintenance.

Prototyping is such a sub process. A prototype is partially developed product that enables customers and developers to examine some aspect of the proposed system and decide if it is suitable or appropriate for the finished product.

Prototyping is actually an external process and it has its own development cycle, which will be developed earlier in the actual development process. Prototyping is usually an iterative process. A prototype is a small portion of the system build to examine some aspect of the proposed system. For example, the developer may build a prototype model and evaluates it from user's feedback. The process iterates in the same phase until both parties are satisfied. Then the developer will move to the following phase and repeat the prototyping process.

Validate ensures that the system has implemented all of the requirements, so that each system function can be traced back to particular requirements in the specification.

Implementation and testing also verifies the requirements: verification ensures that each function works correctly. That is, validation makes sure that the developer is building the right product (according to the specification), and verification checks the quality of the implementation.

Prototyping is useful for verification and validation. But these activities can occur during other parts of the development process. There are several advantages in using the Waterfall model with prototyping:

- Allows all part of the system to be constructed quickly to understand or clarify the requirement.
- Understands feasibility of a design or approach.
- Reduces risk and uncertainty in the development process.
- The resulting system is easier to use.
- User needs are better accommodated.
- The resulting system has fewer features.
- The design is of higher quality.
- The resulting system is easier to maintain.

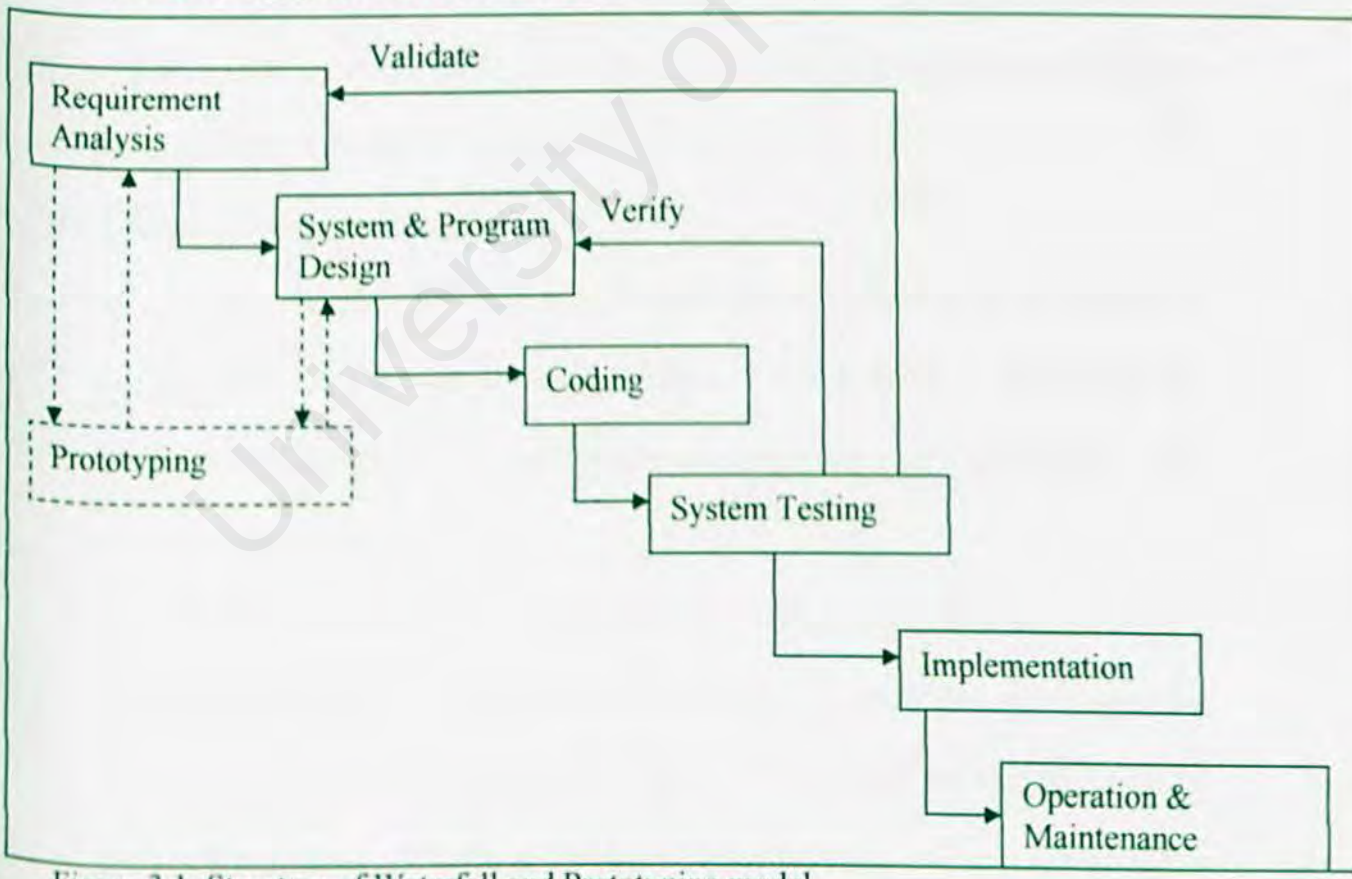


Figure 3.1: Structure of Waterfall and Prototyping model

3.1.2 Justification

The Waterfall model with prototyping approach that will be adapted in the proposed project encompasses the activities at system requirement and analysis, system design, coding, testing and implementation, operation and maintenance. Each of stage is discussed below.

a) Requirement Analysis

The main activity at this stage is to understand the proposed system and determine the system requirement. This will involve data gathering and system analysis. Other task is observing other intelligent agent software (especially some intelligent agent which has the similarity behavior or function like the proposed system) with the intension to mimic or enhance the current system. Thus, the accuracy of the proposed system is specified correctly. Furthermore, many AI reasoning and inference technique have been studied to determine the finest and most suitable technique to apply into this project.

b) System & program design

Once the requirements are defined, a system design has to be created. It establishes overall system architecture. System design involves describing the software system appearance and functionality from the user's perspective. The user then reviews it.

When users approve the system design, the overall system design is used to generate the designs of the individual program involved. This stage concerns about the front-end design, database design, interface design and system design of the intelligent agent. Data Flow Diagram (DFD) modeling will be involved in the

system design while the logical design of the Microsoft SQL Server 2000 Enterprise database will be depicted in a proposed database structure design.

c) System prototyping

In this stage, system prototyping allows all or part of real system to be contracted quickly to understand or clarify issues. The requirement or design require repeated investigation to ensure that the developer, user and customer have a common understanding both of what is needed and what is proposed.

Besides, prototyping system information is about user's information requirements. The initial reactions from the users to the prototyping were sought. Then, the user suggestion about changing or cleaning up the prototyped system possible innovations for it, and revision plans detailing which parts of the system needs to be done first or to prototype next were searched too.

d) Coding

This stage translates and implements the detail design representation of the system into programming realization. Scripting languages such as VBScript and HTML are used in coding together with ASP during handling requests from the users via Internet. Microsoft FrontPage is the proposed Web-authoring tool that will be used to create Web pages while Microsoft SQL Server 2000 Enterprise will be used to develop the database of the system.

e) System testing

Testing is a critical step in assuring the quality of the developed intelligent agent and will represent the ultimate review of specification, design and coding.

First, unit testing will be particularly difficult because there will be a lot of unexpected result produced.

Next, integration testing is performed. It is to integrate unit-tested program modules and conduct tests that uncover errors or bugs associated with the interfacing of those modules. Validation test succeeds when the system functions in the manner that is reasonably expected.

f) Implementation

Implementation is done during the end of the system development life cycle. The system will deploy into the target environment. In this case, Web server.

g) Operation and maintenance

Normally (thought not necessarily) this is the longest life cycle phase. The real estate system is installed and put into practical use. Maintenance involucels correcting errors which were not discovered in earlier stage of the life cycle, improving the implementations of system unit and enhancing the system's services as requirements are discovered.

It is an ongoing process throughout the system's lifetime. Necessary adjustments such as new rules or better inference technique might be carried out. All these will ensure a good system during its operation on the Web server.

3.2 Information Gathering Method

For information-gathering phase, there is no underlying standard or procedure to be followed strictly as each single project is unique and data gathering may be vary suit the needs of each particular project. However, there are a certain number of methods that are commonly used in gathering information such as collecting hard data like written documents or reports, interviewing using questionnaire, observation and sampling.

As for this project, due to cost and tight schedule constraints as well as difficulties in finding and getting domains experts whom are willing to help, method such as interviewing becomes the intermediary who obtained the user's requirement from the real estate company. The main data sources for system analysis were written documents, reference books, observation and other source from Internet.

3.2.1 Written Document and Reference Books

I have done some through printed documents such as books, magazine and journal to gather information about user's need, system requirement and also technical requirement for the proposed system. I have to go the library to find some books, magazine and journals that related to digital dictionary or online dictionary to learn about the background and function that can help me to understand more about the system proposed.

Besides that, I also get more information about today computer technology and update computing knowledge from Pc magazine and also from the newspapers such as In-Tech from Star.

3.2.2 Internet Research

Research for this project was also done via the Internet. The result from the research has been elaborated in more detail in chapter 2. From this research, Internet is used as main resource for referring to any ambiguities that might arise during the entire development period.

From these researches, I get a lot of software, tools, programming languages and computing knowledge. From the help file that can be found prepared, I can learn more about those software and programming tools and this help me to apply it in the proposed system.

3.2.3 Brainstorm

During the requirement elicitation, I try to generate as many ideas as possible without any analysis until all the idea have been exhausted. Besides, I study the feasibility of the requirement identified in this stage.

After complete the above technique, I had separated the requirement into two categories:

a) ***Requirement that absolutely must be met***

- ✓ The system should able to suggest a similar word for incorrect input from the user.
- ✓ System must able elaborate the word in two languages according input from the user.

- ✓ The system should provide the functionality for the administrator to access database system.

b) Requirement that are highly desirable but not necessary

- ✓ Error messages with some guidelines should be provided to the users when illegal operations happen.

3.3 System Analysis Requirement

A system analysis requirement is thorough related to the analysis of the user's need and system's need at whole. With this requirements analysis, result from it can be very useful in the sense of getting an extract system requirement and the accurate functions of the system.

3.3.1 Functional Requirement

A functional requirement describes an interaction between the system and its environment. The system module is the part where the user can see and interact with the system and request for specific information. It is not the user interfaces but a series of interfaces with functional icons for user to select and perform certain function.

The Digital Dictionary is divided into 4 main modules. They are elaboration of word module; suggest similar word module, audio pronunciation module and picture/example modules.

3.3.1.1 Elaboration of word module

- It enables administrator to add, view, edit/update and delete data in database system.
- User can get result for the word that they have entered. The system should enables to give some of example how to use the word in communication

3.3.1.2 Suggest a similar word

- User able to get a suggestion of similar word for incorrect input (word). If the Word has incorrect spelling so the system should be able to suggest a matching word that similar with the word has entered from user.

3.3.1.3 Audio pronunciation

- The system has provided with audio pronunciation to help user how to mention the Word.

3.3.1.4 Pictures/example

- This system has existed with a picture for certain word and example for every word in elaboration. This function will help user to easier understand the word based on the picture.

3.3.2 Non-Functional Requirement

The requirements are constraint on the services or functions offered by the system. They include timing constraints, constraints in the development process, standard and so on.

a) Reliability

- The application system, software and hardware shall be reliable and shall not cause unnecessary and unplanned downtime of the overall environment.

b) Serviceability

- The application system should highly available at all time.

c) Portability/flexibility

- It must be able to incorporate new technologies in the future and fast changing Environment. These technologies includes object oriented technology and advance security technology.

d) User friendly

- As the system is built in windows environment, the interface should be friendly and easy to understand. It also shall be intuitive and consistent within themselves in purpose and use.

e) Accuracy

- The final Digital Dictionary must meet the objective, specification and requirement of the user started earlier. The system will be build according to the user requirement and specification.

3.4 Software Requirement

From the literature study on several development tools, I have list out the software requirement tools for the development of the system:

Operating System	**Windows 2000 Pro Operating System**
Development Tools	Microsoft Visual InterDev 6.0, Adobe Photoshop 7.0, Macromedia Dreamweaver MX.
Database Management System	Microsoft SQL Server 2000
Programming Language	Active Server Pages (ASP) – VbScript, JavaScript.
Web Server	Microsoft Internet Information Server 5.0 (IIS)
Web Browser	Internet Explorer 5.0 or above

Table 3.2: Software Requirement

3.4.1 Why using Microsoft windows 2000 pro operating system?

Microsoft Windows 2000 was chosen over others such as UNIX, LINUX and Pearl. This is because it doesn't have complicated installation procedures. For example, UMIX, LINUX, Pearl is more difficult to install and configure. Unlike Windows 2000, UNIX and LINUX is not an end-user-oriented operating system known for its user friendliness. In production environment, this is not very desirable because valuable time will be wasted on learning intricate details of various applications. Windows 2000 built to Window NT technology and it is easy to use.

Among the entire platform, the pricing of Windows 2000 is not so expensive. Besides the cost for setting up this server are also not expensive as UNIX, which have cryptic user interfaces are hard to manage and give way to high administration costs. Therefore it is the best choices of Operating System in this project.

3.4.2 Why using Visual InterDev?

It is development tool for building a dynamic and data driven web site. Visual InterDev offer a user interface similar to those for visual basic, visual j++. This interface is important since that every aspect of client server application development can now be accomplished visually rather than through hand coding projects in a simple text editor.

Visual InterDev also support major object oriented technology such as Microsoft ActiveX control and Java Applet. It also supports third party ActiveX control where users are allowed to integrate custom ActiveX control.

It is support for visual design time controls that allow developers to create data driven web pages in simple drag and drop Manner. Visual InterDev includes data access

support for large client server database system, including Microsoft SQL Server and Oracle. Website is accessed to almost any database using Microsoft's Universal Data Access, including ActiveX Data Objects, Open Database Connectivity (ODBC) and OLEDB.

3.4.3 Why using Microsoft SQL Server 2000 Enterprise?

Easy access to data through the Web- with SQL Server 2000, users can use HTTP to send queries to the database, perform full-text search on documents stored in database and run queries over the Web with natural language.

SQL Server 2000 features the ability to interactively tune and debug queries, quickly move and transform data from any source and define and use functions as if they were built in Transact-SQL. You can visually design and code database applications from any Visual Studio tool.

With SQL Server 2000, you can build end-to-end analysis solutions with integrated tools to create value from data. Additionally you can automatically drive business processes based on analysis results and flexibly retrieve custom result sets from the most complex calculations.

SQL Server 2000 features the ability to interactively tune and debug queries, quickly move and transform data from any source, and define and use functions as if they were built in to Interact-SQL.

3.4.4 Why using IIS (Internet Information Server)?

Based on the data gathered, Internet Information Server is the natural choice to function as the web server to run the web application that is being proposed. This is because of its tight integration with Windows 2000 and its graphical management facilities. Also IIS comes free with Windows 2000 without the need to purchase additional licenses. Other web servers would require additional cost with exception of Apache Web Server. Due to the nature of the software industry, licensing is perhaps the most expensive cost that has to be incurred by users. So an integrated solution like IIS is welcome change because it is an added value application that comes standard with Windows 2000.

3.4.5 Why using ASP (Active Server Pages)?

ASP is technology form Microsoft provides the capability for the web server to process application logic and then delivers standard HTML to the client browser.

ASP and Internet Information Server (IIS) act as a medium for porting existing applications to built new application for web. ASP is a faster execution and it will save user a lot of time because it is more convenient to the users that they can get some information quickly. When come to the time frame consideration, ASP properly is the appropriate technology used to develop OCMS since ASP is fast execution, time saving, easy to learn and use Web language.

3.4.6 Why using Adobe Photoshop?

Adobe Photoshop 7.0 software, the professional image editing standard, helps work more efficiently, explore new creative options and produce the higher quality images for print, the web and anywhere else. Create exceptional imagery with easier access to file data, streamlined Web design, faster, professional quality photo retouching and more. Enhanced picture packages to allow you to print multiple images on one page, choose different page sizes and add custom labels, such as copyright notices or captions.

3.4.7 Why using macromedia Dreamweaver?

Macromedia Dreamweaver MX has familiar tools that user interface demand, brought together in a single, web-centered environment. Quickly create original web graphics and interactivity from simple graphical buttons to complex rollover effects and pop-up menus.

Features Macromedia Dreamweaver MX

a) Easy- Quickly create buttons web interfaces and complex interactivity. Dreamweaver MX offers the most streamlined environment for getting sophisticated result.

b) Powerful – Dreamweaver MX has all the familiar tools you need, robust bitmap, editing, precise text control and complete professional tool set for rapid production and easy updates.

c) Quickly create sophisticated web navigation – Easily use and edit the resulting files in Dreamweaver MX.

3.5 Hardware Requirement

Requirement	Server	Client
Processor	Pentium compatible 233 MHz processor or higher	Pentium compatible 133 MHz processor.
RAM (Random Access Memory)	256 MB RAM or above	64 MB RAM
Hard Disk	Minimum of 4 GB hard disk space	Minimum of 800 hard disk space
Other	Other computer peripherals being used are such as keyboard, mouse, VGA monitor, Modem, etc. Network Interface card (NIC) which bandwidth 10/100 Mbps.	Other computer peripherals being used are such as keyboard, mouse, VGA monitor, Modem, etc. Network Interface card (NIC) which bandwidth 10/100 Mbps, sound card.

Table 3.3: Hardware Requirement

3.6 Conclusion

As we know that analysis is a compulsory phase of development system. The analysis includes the analysis of the fact, the problem and the constraints of the system and the reviewing of the methodology being used. Procedures that specify the system requirement in detail, analysis of development tools will help in gaining the advantages and knowledge about the implementation of proposed system.

Besides that, software analysis in this page is the selection of the suitable software of developing system. The selection is based on the characteristic of the software and the easier of use. Hardware analysis is also almost the same as software analysis. However this analysis is for hardware that is compatible to the software used and compatibility with other hardware platforms.

Finally preparing a full report on the analysis done concludes the analysis phase. This report is necessary for the system analyst to go on the next phase that is design phase.

4.0 System Design

System design is a creative process of transforming the problem into solution and the description of the solution. System design involves designing of program, form of input, user interface and database. User requirement and request will be transforming into a working model that can be used as guidance in system design. System design has to go through a modification and testing before coming to complete system. Amendment has to be done on every occurrence of mistake especially in coding, user interface and database design.

4.1 System Architecture Design

Digital Dictionary architecture has built after feasibility study and also relationship between services and system. It is designed based on client-server architecture and extends it to the web. This architecture is divided into 3 distinct tiers included server user, business services and data services.

4.1.1 Third Tier Data Server

At the data services level, a repository of relevant data stored is Microsoft SQL Server 2000. Database is available to support the work performed by the analysis engine. It is an online intranet based application that provides into and implements the task of info management in network. It is a user-friendly system and designed to appeal and generate strong levels of interaction. Advantages of three-tier architecture:

- Isolation of concern

  The major advantage is that the front-end clients are clearly separated from the back end data manipulation facilities. This allows details of the data storage mechanisms such as which database is used, record structure and field names to be abstracted away from the client process. All the front-end sees is an abstract operation request which takes input and output parameters.

- Data from multiple source

  A client may require data from a number of servers. This can be handled easily because a Control Agent automatically splits the data operation is then performed by the appropriate agent and the combined results forwarded to the calling client.

- Reduces database loading

  In three-tier architecture, not only does the database machine benefit from fewer connections but also any data caching operations result in fewer data operations and therefore fewer throughputs. In addition, this saving is concentrated on those very queries that are most commonly performed, thus reducing the potential for conflict on any hot sport in the data.

- A three-tier application adds a third program to the mix.

  The three-tier application is an incremental improvement to the two-tier architecture, the flow of information is still essentially linear: a request comes from the client to the server, the server requests stores data in the database, the database returns information to the server, the server returns information back to the client.

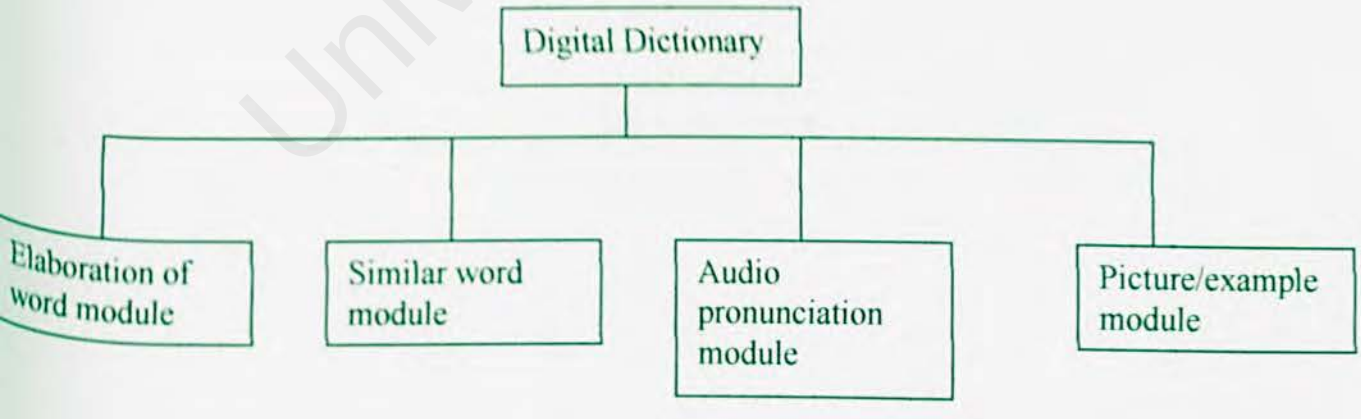
4.2 System Module

The system structure is based on the functionality modules. System modules design will explain the entire modules in this system. This system is divided into 4 main modules such as elaboration of word modules, similar word module, audio pronunciation and picture/example module.

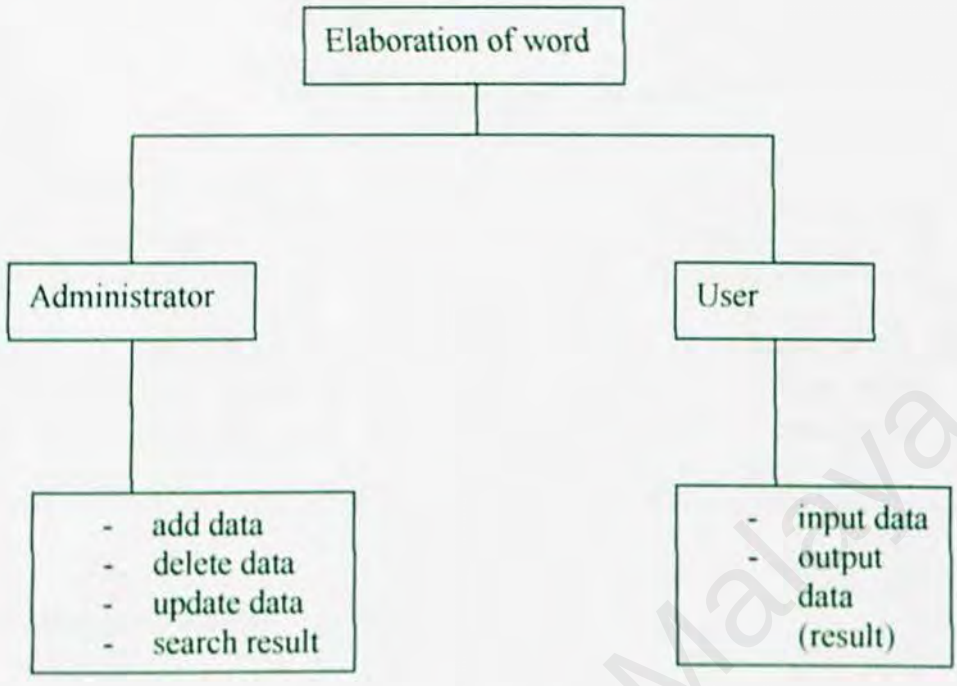
4.2.1 System Structure Chart

The system is dividing into a number of principle subsystems where a subsystem is an independent unit. Communications among subsystems are identification. Decomposing a system a set of interacting subsystem is an important phase. A structure chart is used to depict the high level extraction of a specified system. The system structure is based on the functionality modules and it is broken into manageable levels and components.

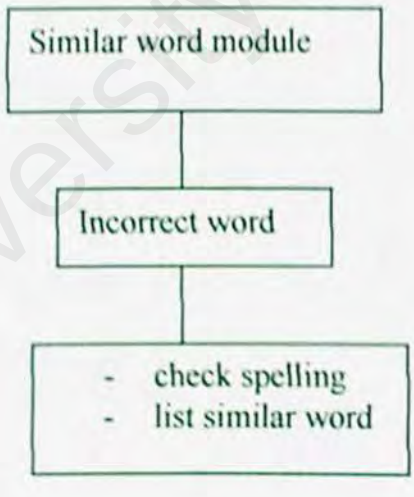
4.2.2 Digital Dictionary main modules



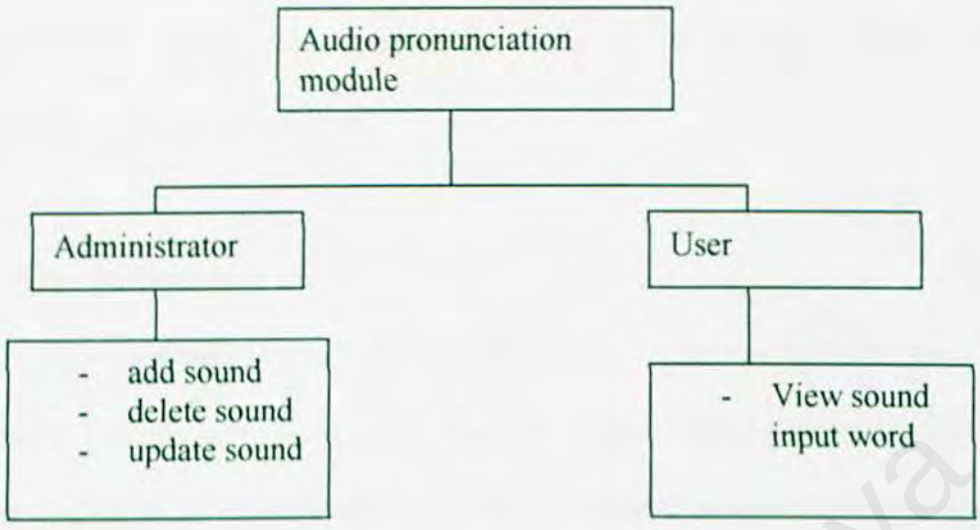
4.2.3 Elaboration of word module



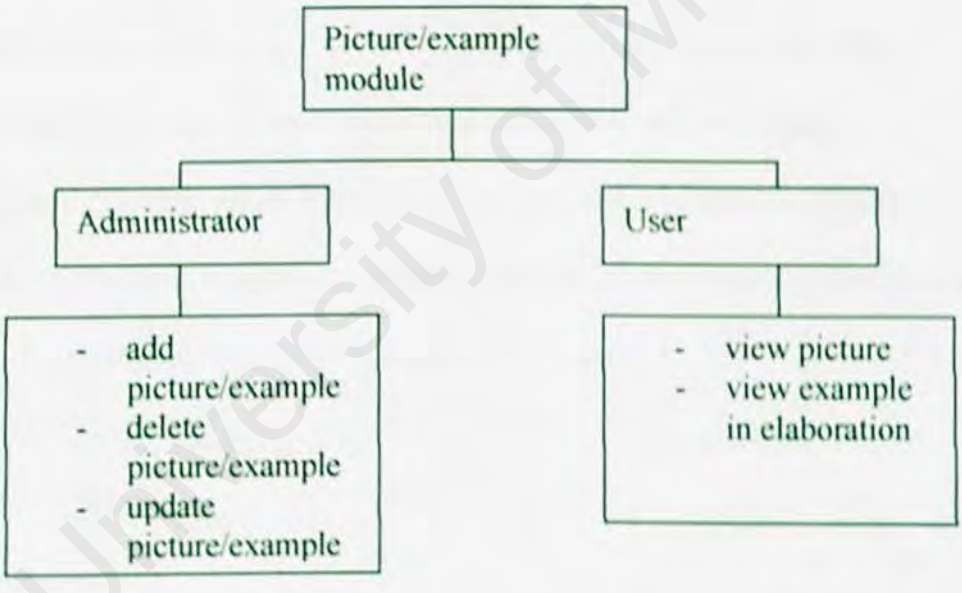
4.2.4 Similar word module



4.2.5 Audio pronunciation



4.2.6 Picture/example module



4.3 System Functionality Design

System functionality design is based on the system requirement. It translates the system requirement into system functionally. This design focuses on the system structured design and data flow design.

4.3.1 Data Flow Diagram (DFD)

Data flow diagram (DFD) is structure analysis approach that graphically represents data process and flows in a business system. DFD depict the broadest overview of system input, process and output that correspond to date movement through the system. The diagram crystallizes how data moves within organization, the processes or transformation it under goes and the outputs. The advantages using DFD are:

- ✓ Freedom from committing to the implementation of the system too early.
- ✓ Further understanding of interrelatedness of systems and subsystem.
- ✓ Committing current system knowledge to users through data flow diagram.

System is used in the DFD to represent different meanings. The table 4.1 summarizes the symbols and table 4.2 shows the DFD of Digital Dictionary:

Symbols	Meaning	Explanation
Source	Entity	- A person, group, department of other system that can send data or receive data from the system.
Process	Process	- A transform of data
Data stores	Data flows	- A reposition for data that allows addition and retrieval of data.

Data flows 	Data flows	- Movement of data from or to one process.

Figure 4.1 Symbols in Data Flow Diagram

4.3.2 Context Diagram

Top down approach is adopted in diagramming DFD. DFD drawing is started from general to specific. That is a context level diagram of the proposed. It shows the external entities inputs, the general module and possible outputs from the module. It is the highest level in DFD and constraints only one process, which is the module itself. It shows external entities inputs into and outputs from the module. We can see context diagram in figure 4.3

4.3.3 Child Diagram

Each of the major process in the diagram 0 of the Digital Dictionary module can be exploded to create detailed child diagram. We can be seen from the diagram, process 1.0, 2.0, 3.0, 4.0, 5.0 and 6.0 on detailed child diagram. The child diagram depicts new lower level data flow. It is illustrated in figure 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 and 4.8 (table number).

Figure 4.2 Data Flow Diagram for Digital Dictionary

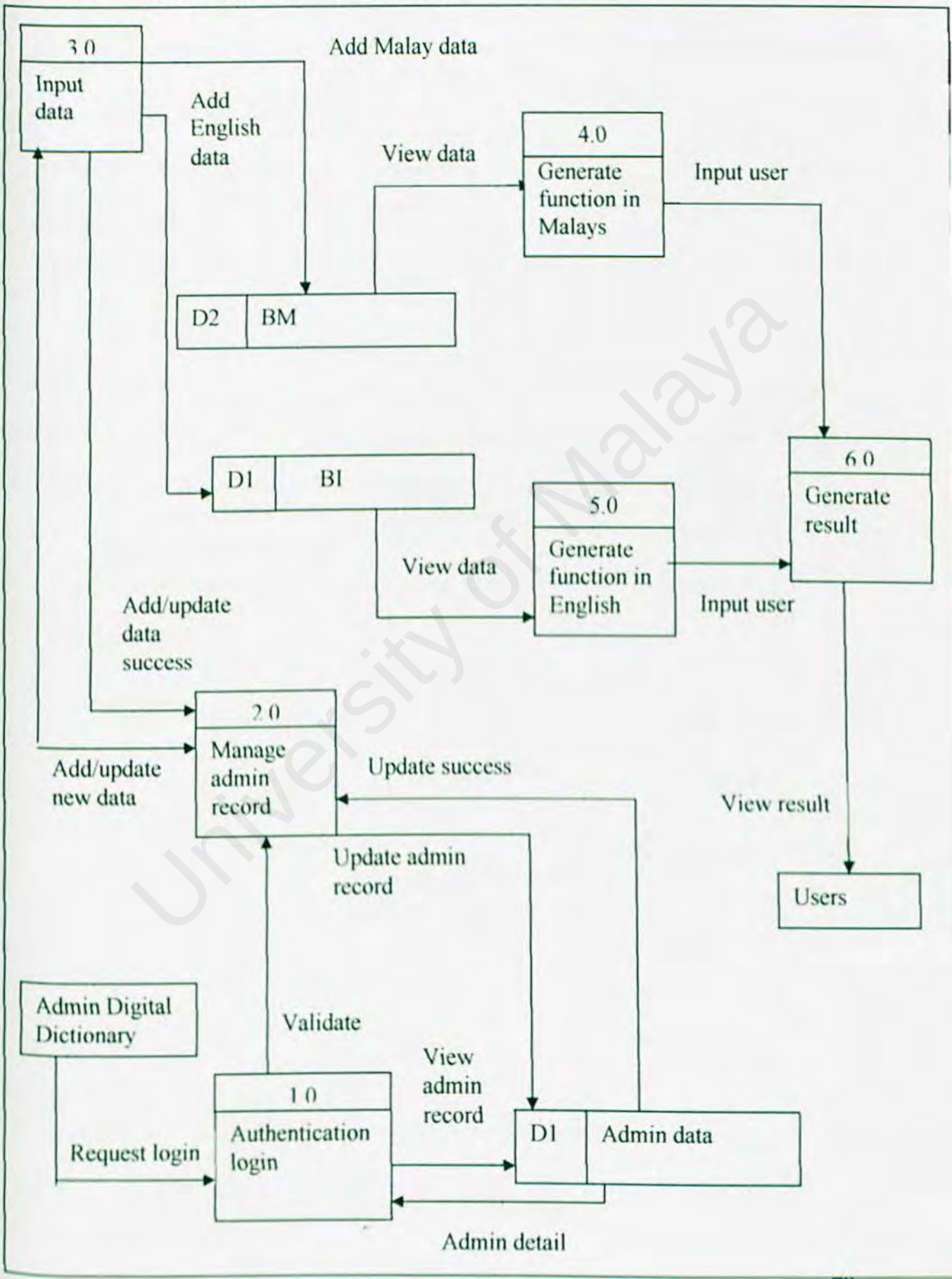


Figure 4.3 Context diagram for Digital Dictionary

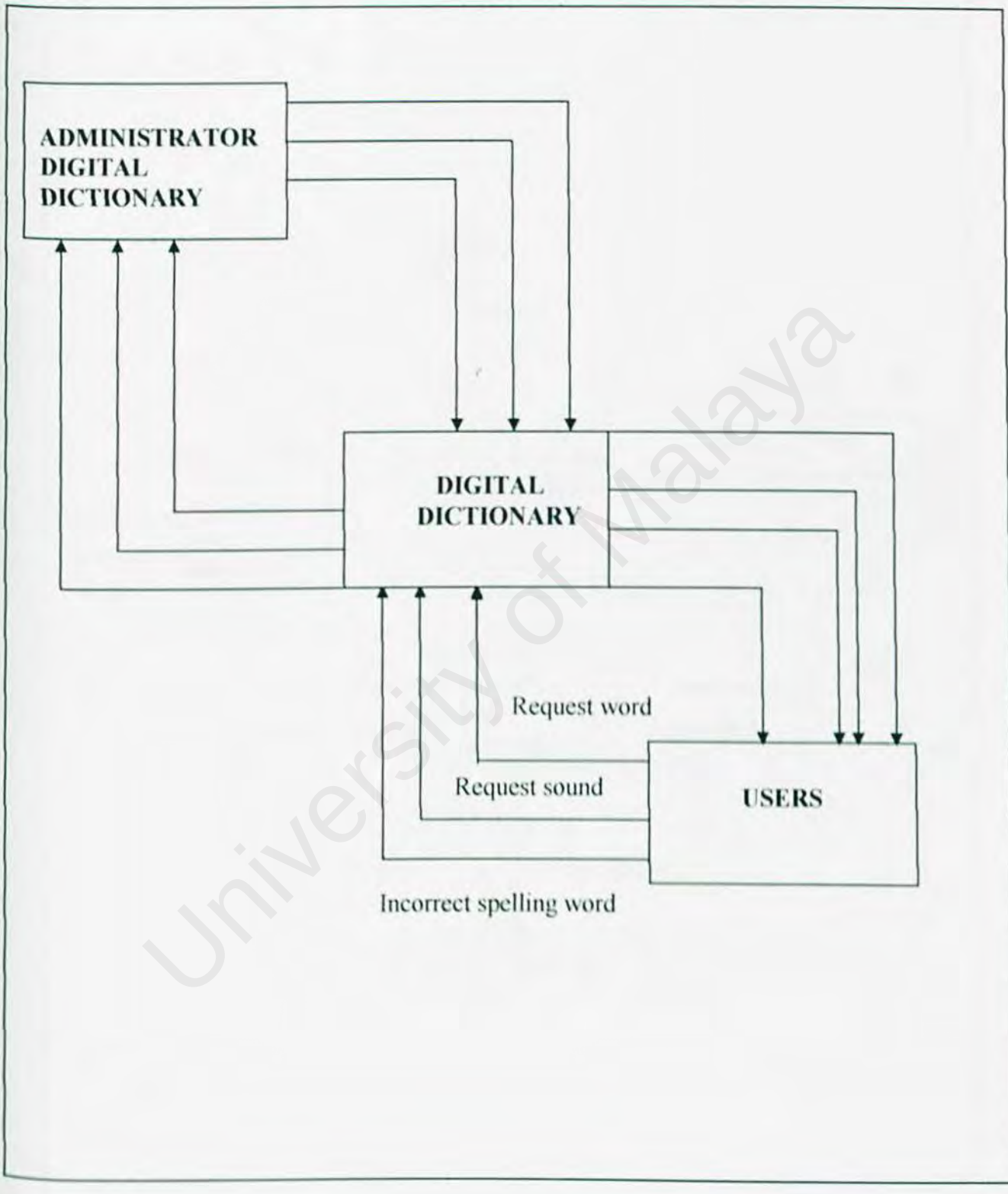


Table 4.4: Child diagram for process 1

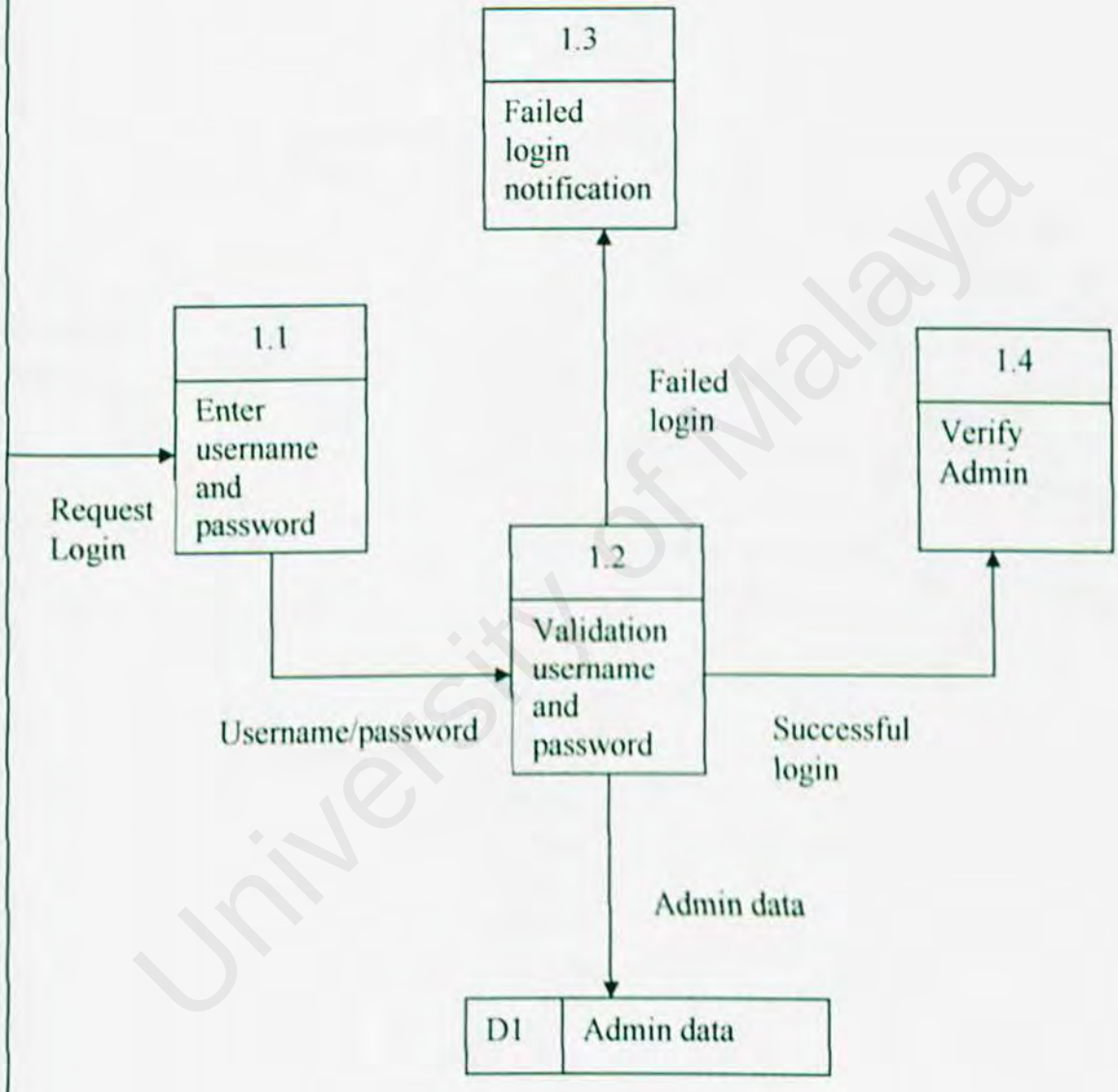


Table 4.5: Child diagram for process 2

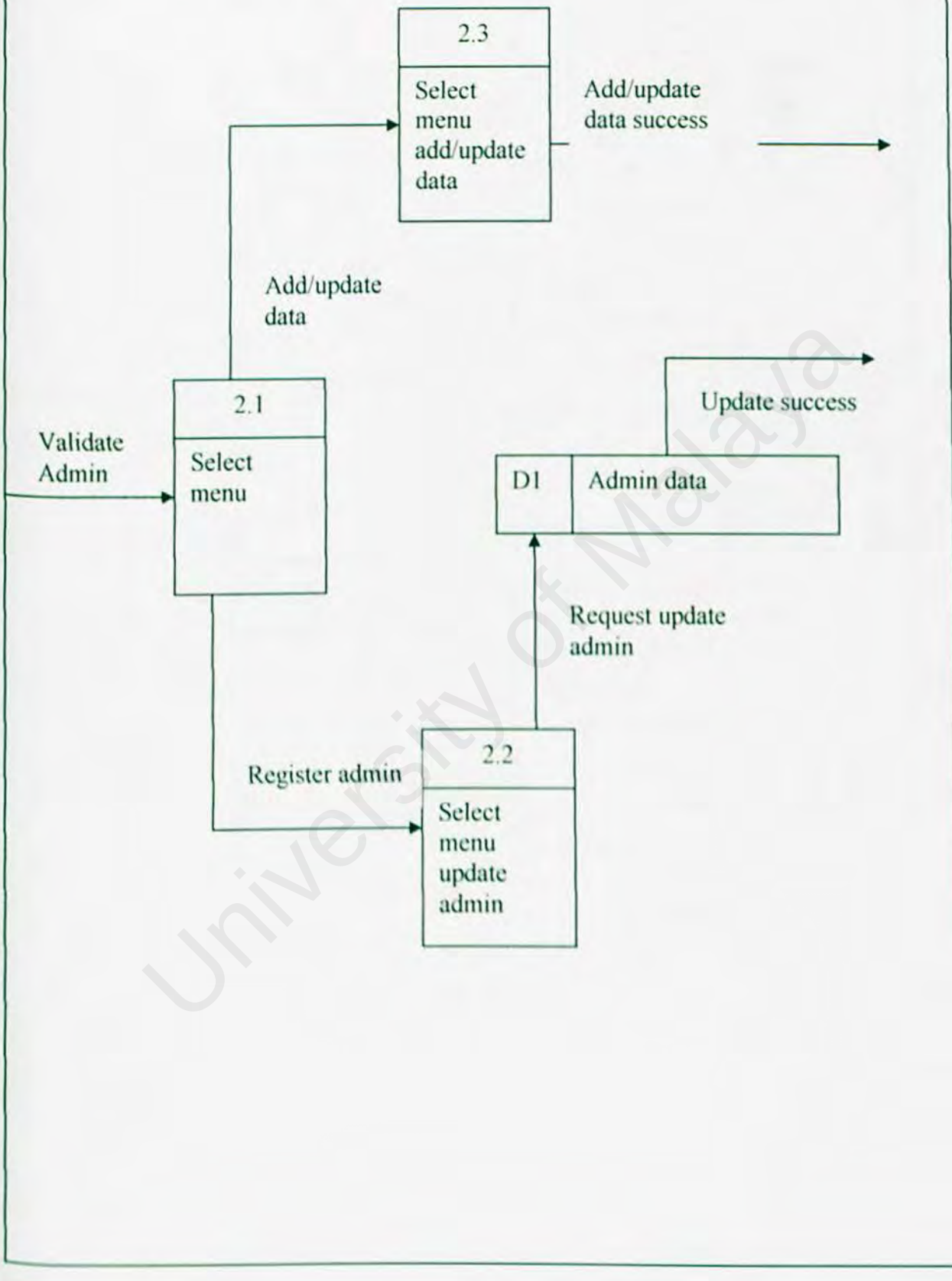


Table 4.6: Child diagram for process 3

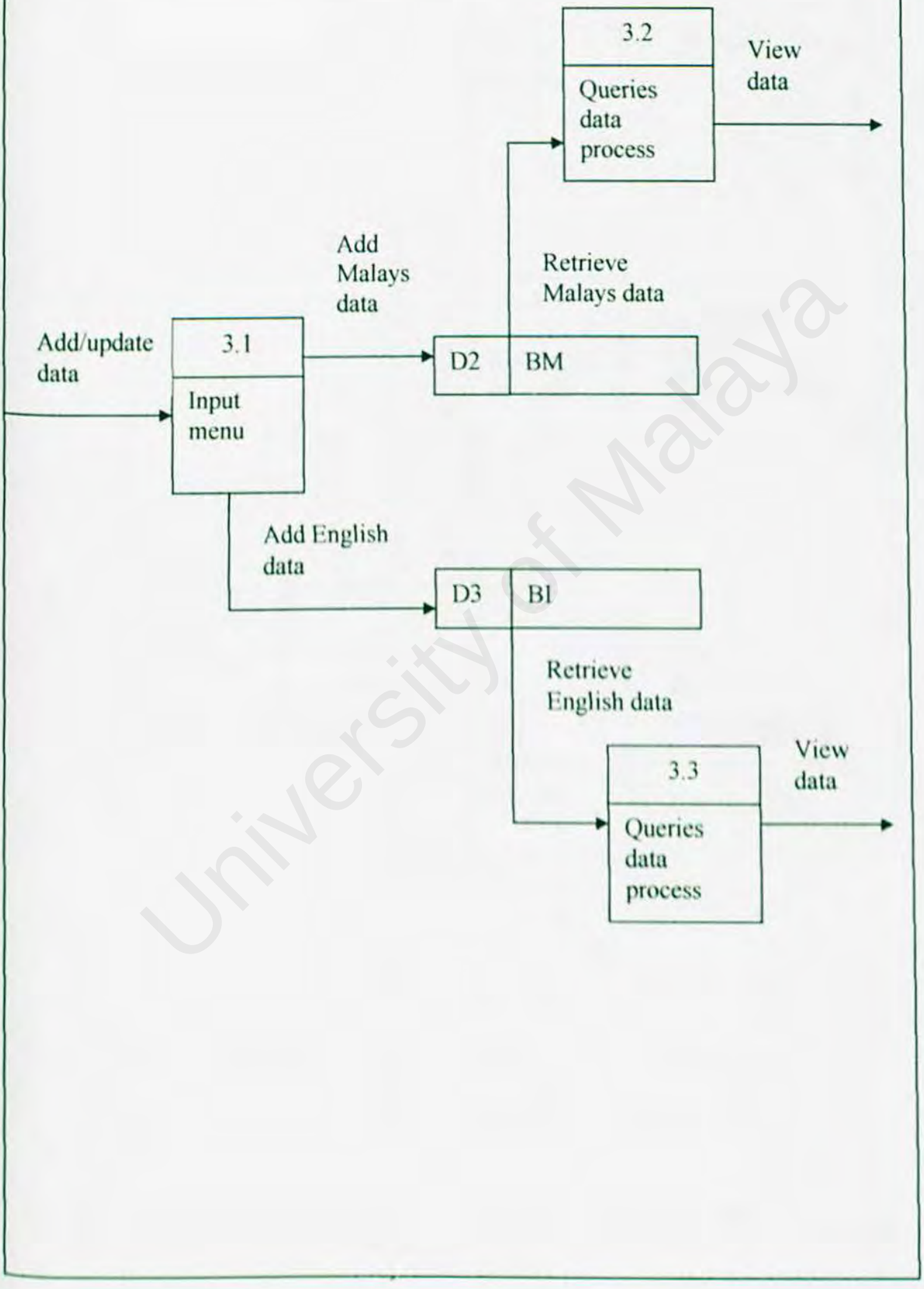
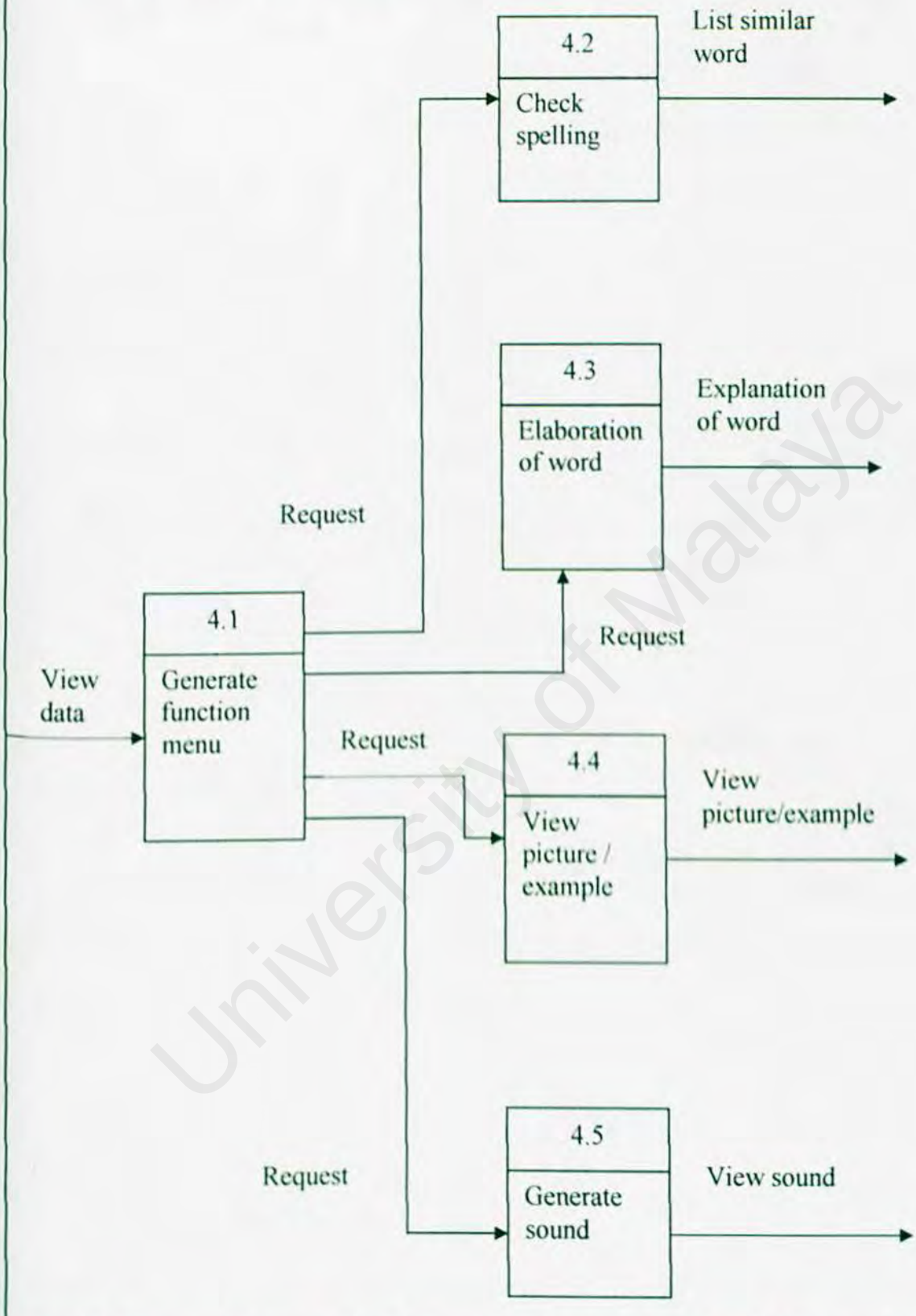
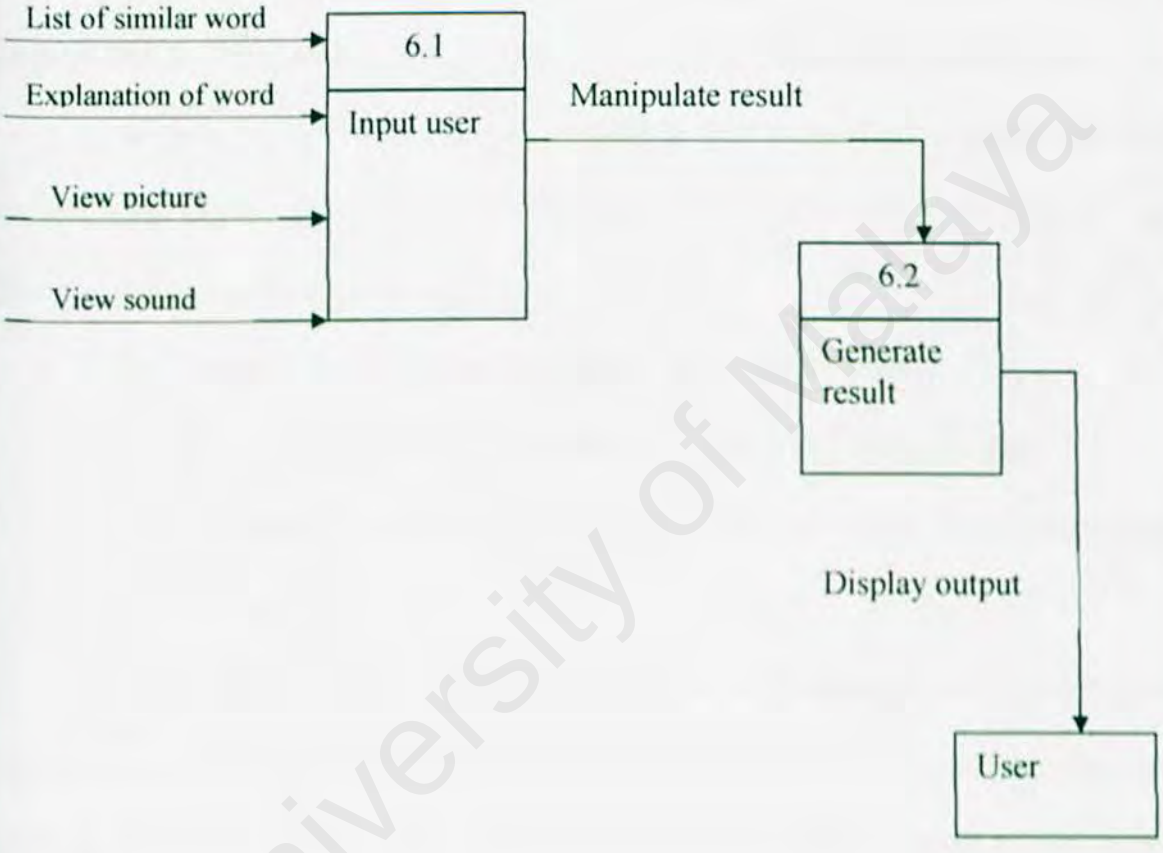


Table 4.7: Child diagram for process 4



* Child diagram for process 4 and 5 is a same function. Just has a different in language.

Table 4.8: Child diagram for process 6



4.4 Database Design

As we know, all management system should have a database of its own. It necessary to store information that can later be retrieved or can also be updated occasionally. Before creating a database, many things need to be understood first.

The basic thing that must be known is the relation between data in a database. The structure of the database is very important because a good structure can produce a good database that can be providing data retrieval service at the best possible performance.

A properly design database can provide a total control of database retrieval process. This can be done by the combination of reliability and availability of the database. Advantage database design:

- Provide for efficient storage, update and retrieval of data.
- Be reliable where the stored data should have high integrity data.
- Be adoptable and scalable to new and unforeseen requirement and applications.

However, a feared factor can affect the process of database designing that is the bad interpretation of the data itself. Wrongly defined data can result in developing a bad relational database and its integrity. There are two main database used in the Digital Dictionary system. They are BM database and BI database.

4.5 Data Dictionary

Data dictionary, as its name suggests, is a dictionary that holds the definition of all the data tables. Therefore, the data dictionary is actually a reference work if data (Meta data) that is specially compiled to guide system design. It describes the types of data that is being stored, allows DBMS to keep track of the data, and helps developers and users find the data they need.

The data dictionaries below are those used in the Digital Dictionary system.

Table Name: Table_loggin

Description: This table keeps log in Admin record

Column	Data Type	Length	Description
UserName	nvarchar	50	User name log in
Password	nvarchar	50	Password
Name	nvarchar	50	Register Name
Admin_ID	nvarchar	50	Administrator number
Admin_Email	nvarchar	50	Administrator email address.

Table 4.9: table for Admin record

Table Name: Table_BM

Description: This table keeps all data in Malay language.

Column	Data Type	Length	Description
Bm_ID	Int (Integer)	6	Refer to number ID for each word or text in Malay language. (* Primary key)
Text_Bm	nvarchar	Maximum	Refer to user input word in Malay language.
Elaborate_Bm	nvarchar	Maximum	Elaboration/ explanation of word. This column also consist in example for the word
Meaning_Bi	int	6	Refer to number ID for word in Table_BI
Picture	-	-	Refer to location that store picture such as c:\data\pic
Sound	-	-	Refer to location that store sound such as c:\data\sound

Table 4.10: table for data in Malays

Table Name: Table_BI

Description: This table keeps all data in English.

Column	Data Type	Length	Description
Bi_ID	Int (Integer)	6	Refer to number ID for each word or text in English. (* Primary key)
Text_Bi	nvarchar	Maximum	Refer to user input word in English.
Elaborate_Bi	nvarchar	Maximum	Elaboration/ explanation of word. This column also consist in example for the word
Meaning_Bm	int	6	Refer to number ID for word in Table_BM
Picture	-	-	Refer to location that store picture such as c:\data\pic
Sound	-	-	Refer to location that store sound such as c:\data\sound

Table 4.11: table for data in English

4.6 User Interface Design

The user interface is very important component of the system. As it should be, good user interface can set an overall view of the system performance. A good interface can be easier to use and provide the user-friendly environment for the user.

User-friendly interface is an interface that is easy to use and understand. If the user ever makes any mistake by entering wrong data, the system will produce a message of error and the user is required to enter the data again.

The user interface must achieve the objectives bellows:

a) Efficiency is hope to be achieved that by allowing easy and fast data entry and retrieval, simple and consistent interface.

b) Effectiveness means how well the interface is able to interact with the users. This is measured by how well users can accept and adapt to the interface perform task. Designing the user interface based on ergonomically proven methods attains productivity.

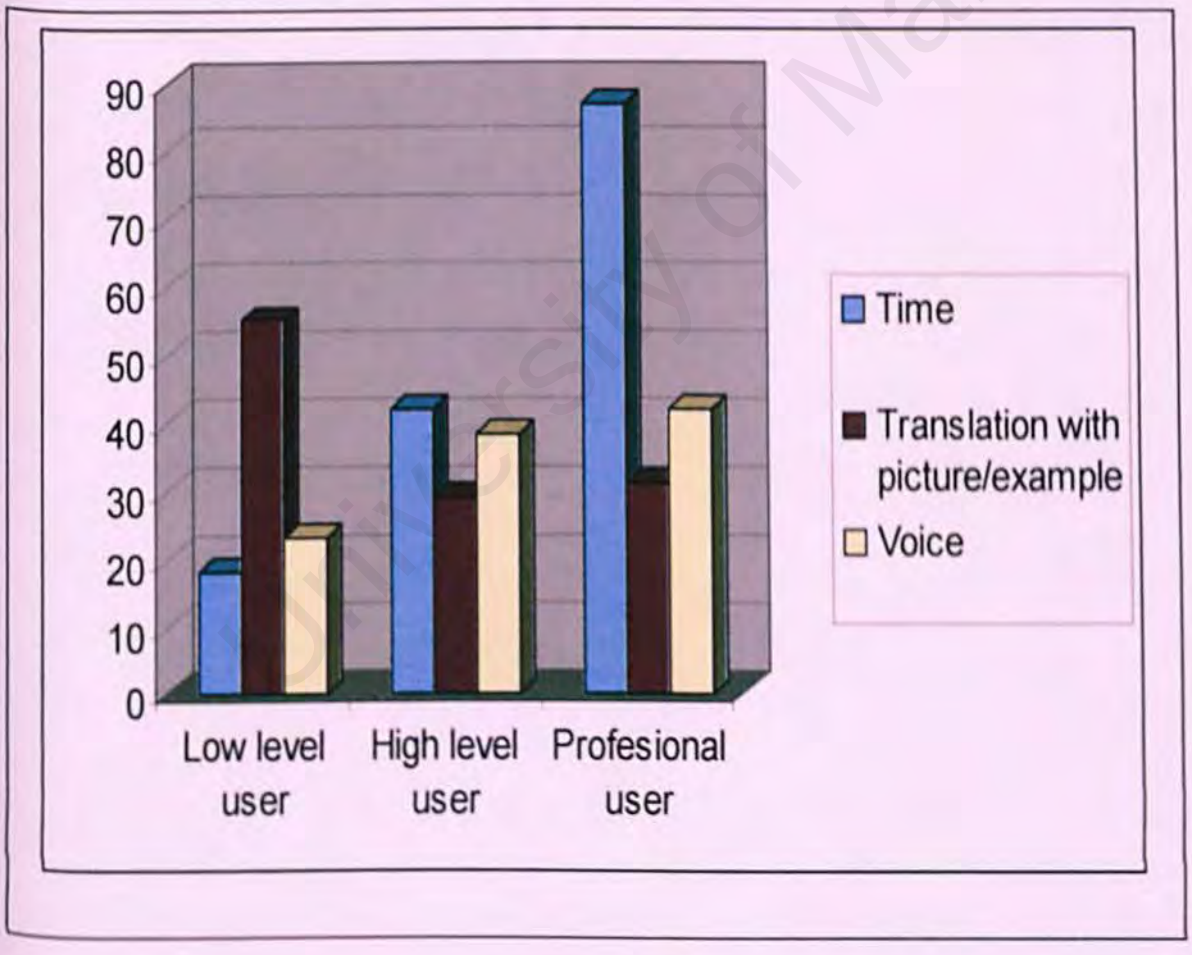
Figure 4.12 user interface design

4.7 Questionnaire

This the way that I collect a lot of information about user demands. From the information I had analyzed, the main major of user demands are speed response time, translation existed with example/picture and system with audio pronunciation.

Graf 4.13 below describes the three user demands followed by percentage of user. I had separated the user for three categories. The first category is low level that consist of student in secondary and primary school, the second user is high level, there are involved the Student College, University and etc. the last category is professional level that consists of professional worker such as teacher, businessman/women, accountant and etc.

Figure 4.13: Graf User Requirement



4.8 Conclusion

This chapter is mainly about the design of the system. They're many things to be taken for consideration. For example the data flow of the system, database design, the components of the database and others.

Besides that, the system's user interface is also very important, as it is the measurement of system effectiveness. User wants a very easy to use and attractive visualization of a user interface.

5.0 SYSTEM IMPLEMENTATION

5.1 Introduction & Purpose of System Implementation

System implementation is well defined as integration of the physical, conceptual, and constructed resources that produce a working system. Therefore, system implementation is the physical realization of the database and application designs. In system implementation, database will be created and source code will be written, which will be produce deliver a functional system.

The major work of system implementation is the construction of the system. The purpose of the system construction is to develop a functional system that fulfills the design requirements. System construction of Digital Dictionary involves database creation and also the system coding. Coding is generally recognized as a major aspect of the system construction.

Installation of the constructed system is done to integrate all the function in each module being built for the system. Therefore, the deliverable of the system is an operational system that wills functions as required by the objectives and specification of the system.

5.2 Database Creation

The first step in constructing the system is to create the system database based on the logical and data model for Digital Dictionary created during the system design in chapter 4. For Digital Dictionary system, a new database is required and it resides in the server computer or where Internet Information Services (IIS) is hosted.

I have chosen to use Microsoft SQL Server 2000 Enterprise as my database application for this system. For development purpose, I have setup 3 tables of database named as the following:

- Table_BM (Include all data in Malays)
- Table_BI (Include all data in English)
- Table_Admin (To store all data about admin)

Details about each fields, relation and definition can be found in chapter 4. The database and all table creation is done according to the design and specification stated in that chapter. During the task of creating the tables, each of the field names is specified according to the field properties it represents so that reference can be done easily. A primary key is also allocated for each tables have being created, relationship between the tables are establish to enforce referential integrity.

5.3 System Coding

After developing a functional database, I will begin with developing a fully functional or complete coding for Digital Dictionary; I have used Microsoft Visual Interdev 6.0 and Macromedia Dreamweaver MX. The software runs on both Active Server Pages (ASP) language as well as Hypertext Markup Language (HTML). It is an ideal solution for developing an intranet web base system. For Digital Dictionary, the coding is done for two different modules, which were the user module and administrator module.

5.3.1 Coding Approach

The coding approach undertaken in the development of Digital Dictionary System is the top down Approach. The top down approach can described as the development of the simple sub-module first followed by the more complex sub-module.

The purpose of using the top down approach is to enable test to be done on the simple sub-module while the complex sub-module are still in the process of coding. For example, by applying this approach the coding of the administrator login was done first followed by the sub-module that is more complex such as trace incorrect word and changes some information in the system.

Besides that, completing the simple sub-modules first enable for me to check whether the flow of the system is the same as designed and the connectivity of each of the page can be seen clearly.

5.3.2 Coding style and practice

The coding style is a very important attribute to determine the readability and maintainability of the source codes. With a clear and systematic coding style, it helps the programmer to see the codes clearer and easier. It will also help the programmer to maintaining and also debugging the system.

There are many rules in defining a good coding practice. For Digital Dictionary, a lot of precaution steps have been taken and implemented during the coding process. A good coding practice will not only enhance readability, but it is also a crucial step for future maintenance.

Several coding practices have been employed and followed in writing the program or source code in order to ensure system consistency, maintainability and readability. The followings show some of the coding practices for Digital Dictionary:

Simple Variable Names

- Choosing a simple variable name can help one to easily trace flows in programs and also enable references to be done easily. It can also help to reflect their usage as well as alphabet.
- For example, Table_BM can be chosen as simple variable name that describe all word that contain all word and description in Malays.

Formatting to enhance understanding

- The format of statements like the indentation and spacing of statements can reflect the basic control structure of the coding.

5.4 Conclusion

In chapter 5, I begin with the introduction and purpose of the system implementation. In this section I had highlighted several major work during system implementation, such as how I create a database (5.2) and style of coding (5.3).

Then, I had list one of the process of constructing the system; the database creation of Digital Dictionary (5.2). The database and all the table creation is designed based on specification of the system.

Lastly, I had touched about coding approach (5.3) which described the style of coding used during development of Digital Dictionary.

6.0 SYSTEM TESTING

6.1 Introduction & Purpose of System Testing

System testing is actually a process of verification and validation of a developed system. Therefore, system testing will ensures that the system is producing the intended output.

The main purpose of testing is to uncover different types of errors that exist while running the system. System testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. A successful testing will uncover errors in the software and demonstrates that functions of a system appear to be working according to specification. However, testing cannot show the absence of detects, it can only show that software defects are present.

Some of the purpose and objectives of system testing are listed at the following:

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

6.2 Types of testing

There are various types of testing strategies available to ensure completeness and correctness of the system. The testing process is implemented throughout the development of this system. It is implemented in stages because the system itself is consists of procedures and functions. The entire process of testing and debugging of the system are done by using the Internet Explorer Web browser.

6.2.1 Unit and Module Testing

Unit testing focuses on verification effort on the smallest unit of software design which is the software or module. Each component or module is treated as a stand alone entity and tested individually to ensure correct operation.

Using the component level design description as a guide, important control paths are tested to uncover errors within the boundary of the module. Digital Dictionary is a system that contains two modules that perform specific function and in each of the modules created; it contains some sub-functions or action command. Therefore, unit testing is conducted on each of the sub-function and finally to the module itself.

In unit testing, some of the aspects that were considered are shown below:

- Interface

  Tested to ensure all information properly flows in and out of the program unit under test.

- Local Data Structure

  Local data structure is examined to ensure all data stored temporarily maintains its integrity during all steps in an algorithm's execution and the local impact on global data should be ascertained during unit testing.

- Boundary Conditions

  Boundary conditions are tested to ensure that the module operates properly at boundaries established to limit or restrict processing.

- Independent Paths

  All the independent paths through the system structure are tested to ensure that all statement in a module have been executed at least once.

- Error Handling Paths

  All errors handling paths are checked to ensure its ability to detect and recover all fatal errors during system execution and that the routines for all the error handling work properly as directed or programmed.

6.2.2 System Testing

System testing is a very different from the unit testing. The objective of unit testing was to ensure that the codes written would run the way I had designed it to function and execute. Several steps processes taken in system testing include:

- Function testing where test focuses on the system functionality based on the functional requirements. It is performed in a carefully controlled situation and it compares the system's actual performance with its requirement.

- Performance testing where tests focuses on the non-functional requirements. One of the most critical issues in performance testing is assuring the system's reliability, availability and maintainability. Because each of these system characteristics cannot be measured directly, indirect measured needed to be used to estimate the system's likely characteristic.

6.3 Test Cases

Test cases use a set of input data to test the system and evaluate the result generated. It exercises the system to detect failure and fault so that the system will be error free when it is delivered to the user. The test case for Digital Dictionary will be divided into two modules, which are the user module and administrator module. This is because each module has its own functions.

6.3.1 Test Cases for user module

Web Site Startup

- Enter the URL at the Web browser and press enter to check whether the correct homepage is loaded.

Viewing Services Information

- Click on all the Services Information Manager (IIS) links such as about Digital Dictionary on top menu or at the Services Information Pages.
- To check whether there are any broken links and all the links direct users to the correct page according to the link clicked.

Buttons Testing

- Click on every button available to check all the buttons does not have any broken links and will bring users to the correct page.
- Besides that, also to check that all functional buttons like the "Submit", "Reset" and other buttons will function as expected.

6.3.2 Test Cases for Administrator module

Web Site Startup

- Enter the URL at the Web browser and press enter to check whether the correct homepage is loaded.

Administrator Login

- Click on the Login link to check whether there is a broken link. The correct link is direct users to the correct page.
- Fill in the Username and Password fields with normal data and submit it to check whether the database can handle the verification or not.
- Fill in the Username and Password fields with invalid, erroneous data and submit it to check whether the error handling functions is working properly.

Add/Edit and Delete Data of Database

- Tried adding, editing and also deleting records for all of the administration and data.
- Fill in the forms with normal data and submit it to check whether the database can handle the updating.

- Fill in the form with invalid, erroneous data and submit it to check whether the error handling functions is working properly.

Buttons and Links Testing

- Click on every buttons and links available to check all the buttons and links does not have any broken links and will bring users to the correct page.
- Besides that, also to check that all functional buttons like the "Submit", "Reset" and other buttons will function as expected.

Administrator Logout

- Click on the logout link to check whether the systems will logout the user and load the appropriate page.

6.4 Testing by User

Besides testing Digital Dictionary System by myself, I also had invited a few of my friend to test this system. They are from various IT background, some of them have basic knowledge about IT and other are expert in IT. From this stage, I know whether my system have provided with user requirement or not.

6.5 Conclusion

In the 6, I had discussed about the introduction and purposes of having the System Testing (6.1). System Testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding.

Next, I also took a look on type of testing (6.2) that was used to test Digital Dictionary. The objective is to ensure that the codes written would run the way I had designed it to function and execute. In system testing, it has a very different objective that is to ensure that the system does what were proposed and achieve all its objectives as well as user requirements.

Besides that, I had discussed the test cases (6.3) used for the testing of the system. Test cases use a set of input data to test the system and evaluate the result generated. It exercises the system to detect failure and faults so that the system will be error free when it is delivered to the user.

7.0 SYSTEM EVALUATION

7.1 Introduction and Purpose of System Evaluation

System evaluation can well define as methods to evaluate the developed system whether it achieves all the functional and non functional requirements. Besides that, system evaluation is done to evaluate the effectiveness and efficiency of the developed system as well as achieving all the objectives of the system.

Some of the system evaluation that is going to be described includes system strength, system constraint and limitations, evaluation by users, future enhancements, problems encountered and solutions as well as knowledge and experience gained. In system strength and system limitations, I will discussed about strengths and limitations that possessed by Digital Dictionary.

Users that have been testing this system will also give evaluation and their point of view towards Digital Dictionary. While future enhancements will be suggested to improve ability of the system as well as minimize all the constraints and limitations. Finally, this chapter will discuss about the knowledge and experience gained throughout the development, implementation and testing of the Digital Dictionary system.

7.2 Problem Encountered and Solutions

7.2.1 Difficulties in Determining the Appropriate Development Tool

Choosing a suitable tool is a critical process as all tools available have their strength and weakness. There are many development tools that are available such as ASP and PHP. Besides, the availability of a technology, hardware and supporting software to support its learning curve, compatibility with the existence operating system and technologies. A great deal of reading and research from many sources like books and Internet regarding the problems helped to solve the problem and choose the suitable tools.

7.2.2 Difficult to implement Stemming Function

Stemming is important to define an input based on the root word. It is a sub function from Artificial Intelligent technique. It contain prefix, suffix and affix augmentation. This function needs a list of all augmentation in Malays and English. It becomes difficult for me to distinguish some of the word that have a different augmentation but have a same spelling root word such as '***moves***' and '***does***'. The '***moves***' have augmentation '***S***' whiles '***does***' have an '***Es***' augmentation so I need to define in coding how to separate both this word.

7.2.3 Difficult to implement Trace Incorrect Word Function

This function also an ideas from Artificial Intelligent technique. This function applies a CBR technique to get percentage between incorrect words from user with true word in database. From the percentage the system can suggest some of word that has a similar spelling with the input word from user. It difficult for me to define the best coding and try to understand the error occur when running the system.

7.3 Evaluation by End User

Digital Dictionary has been tested by several users from various background, IT literates and non-IT literate. Some of them have been asked to test a user module while some of the others will test administrator module.

After tested the Digital Dictionary system, they have been ask to give their opinion and evaluation on the system. I will divide them into two groups, which are the IT background and the non-IT background. The following are their evaluation and comment:

1. The Description should explain the types of word such as it use for verb, transitive, adjective or etc
2. It can be interesting if this system is provided with audio pronunciation and images.
3. This system can trace incorrect word and can define the words that have augmentation.
4. This system also should display output in the shortest time.

7.4 System Strengths

The system strengths that available in Digital Dictionary are as followed:

- Security and User Authentication
- Easy-to-use and Friendly User Interface
- Maintainability of data and Digital Dictionary

Security and User Authentication

Security is one of the important aspects of Digital Dictionary. The security measures implemented by this system are using username and password as well as using different URL for different modules.

Only a valid username and password that matches will enable the user to access the system and make any editing or modification to the database especially the administrator. For example, a normal user cannot access the administrator system and it is one of the precaution taken to ensure security and user integrity.

Password column will encrypt all character input to keep user password a secret. In other word, other will not able to interpret user password from just observing from screen.

Easy-to-use and Friendly User Interface

In Digital Dictionary, each function provides a simple and friendly user interface. All the function can be performed easily by just clicking the buttons. User can direct access all the function at the interface such as choosing language, whether they want to display meaning or display description only or both of them. All word in database is provided with audio pronunciation that is in Malays and English.

Maintainability of Data and Digital Dictionary

Digital Dictionary provided functions to enable easy maintainability where administrator can manage the database event like adding, editing, view, and deleting by just navigate through links or by clicking buttons. Administrator will not have to interact directly with the database application; it can be done by itself. Administrator has to access one URL only to implement all the function.

7.5 System Constraint and limitation

1. It can't define some of the other incorrect word; it is because I can assume the possibility of input word from user.
2. Some of the word that has a complex augmentation especially the word in English is difficult for this system to trace the root word and match it to the database.

7.6 Future Enhancement

The future enhancements to Digital Dictionary arise due to the new ideas that come during the process of developing Digital Dictionary system and also from the system limitation that occurs to the system. Some of the future enhancements that are suitable to Digital Dictionary are as follows:

Method to update package's function (add/edit/view/delete)

Alternative methods have to be used to make sure the system is more effective and efficient to update the packages function. It is eliminate the manual process of acquiring function of packages before it is update to the database.

Database backup and recovery

Database backup and recovery should also be implemented to Digital Dictionary to backup data so that it can be recovered if the database is corrupted or there is a network failure occurs. This will ensure data integrity and prevent the activities of digital dictionary and prevent the activities of Digital Dictionary disrupted by the database failure.

Implement more Security Features

Extra security features have to be used for Digital Dictionary. It important to ensure an authorize Admin can't access the database or modified data in there. Some of the security features suggested was using Microsoft Secure Socket Layer (SSL), digital certificates, encryption technique, 'digital water making' and others.

7.7 Future Enhancement and Solution

The table below shows some of the problems encountered during the process of developing the Digital Dictionary system as well as the solutions taken to solve each problem:

Problem Encountered	Solutions
Problems with programming. A lot of problems occurs while doing the coding because lack of knowledge in ASP. The main problem is to design Stemming and Trace incorrect word functions.	Try to find more references on ASP and get help from friends who is more familiar with ASP problem solved.
Designing the user interfaces. Lack of idea to design a good user interface.	Plan to design the interfaces later and continued to develop the functions first. After developing the functions, got some ideas of interface and problem is solved.
Database connectivity Have problem to connect to the database and carry out the functions like adding, editing, view and deleting data from database. Beside, I got problem with SQL Server because I didn't have an experience using SQL database.	Bought a book regarding Microsoft SQL Server database connectivity and also seeks advice from the lectures and problem is solved.

7.8 Knowledge and Experience Gained

Throughout the process of developing the Digital Dictionary system including requirement analysis, system analysis, system design, system implement, system testing and system evaluation, the knowledge and experience gained includes:

- Having more skills and understanding towards system development and be able to put into practice and applied the theories that I have learned for past three years.
- More familiar with a lot of software tools, scripting language and programming language that used to develop Digital Dictionary such as Active Server Page(ASP), Java Script, Microsoft Visual Interdev, Dreamweaver MX, Adobe Photoshop 6.0 and a lot more.
- Exposed to have Client-Server development, database connectivity, network and connection for online application plus a little bit of Web site management.
- Exposed to the proper way developing a system, which has to be carry out one process at a time from the system definition and requirements to the system evaluation process.

7.9 Conclusion

In chapter 7, I had discussed briefly about the introduction and purpose of the system evaluation and its contents. Then I look at the system strengths as well as the system constraints and limitations. In these two sections, I highlighted the limitations that occur in the system.

Besides that, I had also took a look at the evaluation by users where I had listed the evaluation given by both IT literate and non-IT literate users that have tested the Digital Dictionary system. Next, I had discussed on the future enhancement. Here, there were a few suggested enhancements that are possible to be implemented in order to enhance the Digital Dictionary system.

I also touched on some problems encountered during the process of the developing the Digital Dictionary system as well as the solutions taken to solve each problem. Lastly, I also listed the knowledge and experience gained throughout the process of developing Digital Dictionary system including requirements analysis, system analysis, system design, system implementation, system testing and also system evaluation.

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