NAMA : **CHEN KOK FOONG**
NO MATRIKS : **WEK 98036**
SUBJEK : **PROJEK ILMIAH (WXES 3181 & 3182)**
TAJUK ILMIAH : **PANGKALAN DATA PERINTAH-PERINTAH AM DAN PEKELILING KEMENTERIAN PENDIDIKAN**
GURU PENASIHAT : **PN ABRIZAH ABDULLAH**

Abstract

Ministry of Education Malaysia's Web Based Circular Information System (MOE's WBCIS) aims to enhance the level of searching and retrieval of government documents by providing an effective and faster way of locating circulars on education. In an effort to achieve Vision 2020, MOE's WBCIS takes the initiative from the implementation of Electronic Government (EG) to upgrade the quality of document delivery in and efficient and effective manner.

The objectives of MOE's WBCIS, among others, are to help the MOE staffs to manage the circular system easily and fast. The system provides an interactive and effective search engine that enables users to search and retrieve education circulars via the net.

Waterfall methodology has been chosen MOE's WBCIS. The tools used for development the system are Ms Visual Interdev6, Ms Visual Basic, Ms Access, HTML editor. The languages chosen are ASP and visual basic.

There are two modules involve in MOE's WBCIS. They are Administrator Module and User Module. User functionality includes search circulars based on keywords (title), circular type and date. This module also let user cancel the search and view the search results. Whereas, authentication (authorized user only can access to database with user name and password), upload, download and modify records of circulars can be found in the Administrator Module.

It is expected that with the implementation of MOE's WBCIS, the system will ease the work of MOE staffs and fully support the Electronic Government initiative towards achieving paperless environment for government documentation.

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CHAPTER ONE: INTRODUCTION

1.1 Project Background

Education circular is a form of formal gazetted document prepared by the Ministry of Education (MOE). Circulars introduce new procedure or reference from MOE to all level of school. Consequently, the circular is distributed to each school's headmaster or headmistress.

This proposed proposal involved developing a web-based search interface which allow fast and easy access toward searching and retrieving information on circulars of the MOE. As Internet is becoming a major influence in every individual life, academic staffs or researchers will get to know in detail on each circular in a fast and efficient way. Communities now benefited from this electronic communications.

There are five types of circulars in MOE, they are 'Pekeliling Ikhtisas', 'Pekeliling Perkhidmatan', 'Pekeliling Perbendaharaan', Pekeliling Perkhidmatan Awam' and 'Pekeliling Khas'. The existing method to search for a particular circular in MOE is based on number and title listing. If the number of circulars increase, it will be troublesome to list the circulars as the listing will be very long. With the proposed proposal, the searching will require user to input the title, date and type of circulars to get the relevance circular. This will be discussed in detail in Chapter Two.

1.2 Purpose of Project

The Ministry of Education's Web Based Circular Information System (MOE's WBCIS) in this proposed report is to create an interactive and attractive website for academic staffs and researchers to do their references. The aim is to bring the level of searching and retrieval of government documents one step further by providing the most effective and much faster way of locating circulars. This is done by allocate all the circulars in the server database and retrieval of documents from the client side such as user's home or office.

MOE's WBCIS implements the vision of Electronic Government (EG) where Government, business and citizens work together for the benefit of the nation. The achievement of this vision calls for the application of information and multimedia technology to improve the productivity of the Civil Service. The implementation of EG provides a golden opportunity

to the public sector to upgrade the quality of service delivery. The dual objectives of EG are to reinvent the Government in making it more efficient and effective and act as a catalyst for the development of the MSC [1].

1.3 Project Objectives

The objectives of developing this project are as follow:

i. Help the MOEs staff to manage the system easily and fast. They can upload files of circular to database with just a button.
ii. Design and develop a web page to be up with the existing MOE www.moe.gov.my for fast reference.
iii. Let the headmaster, teacher, academic staff and researchers gain benefit from the system with easy access and informative site.
iv. Improve the level of delivery service. Services provided by Government will improve, as citizens will have better access to higher quality and an ever-expanding spectrum of services tailored to individual needs.
v. Increased effectiveness and efficiency of circulating Government document.
vi. Implement paperless environment for government documentation.

1.4 Project Scope

This project is divided into two major modules namely the **user module** and the **administrator module**. The user module will be accessible to the user. Only authorized user can access the administration module.

USER MODULE

The user module consists series of pages that can be accessed by any users on the Internet especially academicians, teachers, educational officers and individual interested in education. It provides the following capability:

i. An interactive site to provide information on 'Pekeliling Ikhtisas' and 'Pekeliling Perkhidmatan'.
ii. Enable user to do fast retrieval of education circulars based on **title, date, number of entries** and **types of circular**.
iii. View the result of circulars.

ADMINISTRATOR MODULE

Administrator module will allow authorized administrator to access and maintain the database. The main functions provided are as follow:

i. Authentication (with user name and password)
ii. Ease the administrator work of maintaining the system.
iii. Upload circulars to site.
iv. Modify or delete circulars from database.

1.5 Project Significance

The MOE has gazetted many circulars in various aspects such as 'Pekeliling Ikhtisas', 'Pekeliling Perkhidmatan', 'Pekeliling Khas', 'Pekeliling Perbendaharaan' and 'Pekeliling dan Surat Pekeliling Perkhidmatan Awam' for the reference of public. With the evolution of electronic media, massive information can be uploaded to server, and to be displayed in the Internet. Thus, by putting on the circular of education on the web, users from Malaysia and all over the world have a chance to view the circulars. This will certainly create awareness to the public in education from the changes or new implementation done by government.

Another factor in showing the significance of this project will be the relevance of it to the information technology age currently in Malaysia. With the launching of MSC project, studying through the Internet and doing references on the Internet is given main priority.

One main features that the government trying to achieve is to introduce a paperless environment where all information is circulated electronically. This is already implemented in many countries such as the 'Digital Library Project'.

MOE's WBCIS is helping government in achieving the target of EG. It will employ multimedia technologies to facilitate a collaborative administrative environment and the efficient delivery of government services through the channel of Internet.

Last but not least, with a more user friendly and easy to access module being introduced in the MOE, of course it will bring fame to the country.

1.6 Hard Ware and Software Requirement

The recommended hardware configuration is as follows :

i. Pentium 100Mhz and above or AMD K6-2 300Mhz (3D NOW) and above
ii. 16 MB RAM and above
iii. 100 MB Free Hard disk space and above
iv. PS/2 Keyboard (else a converter is required)
v. A Server

The system runs on Windows 95/98 or Windows NT platform. List of software are as

follows :

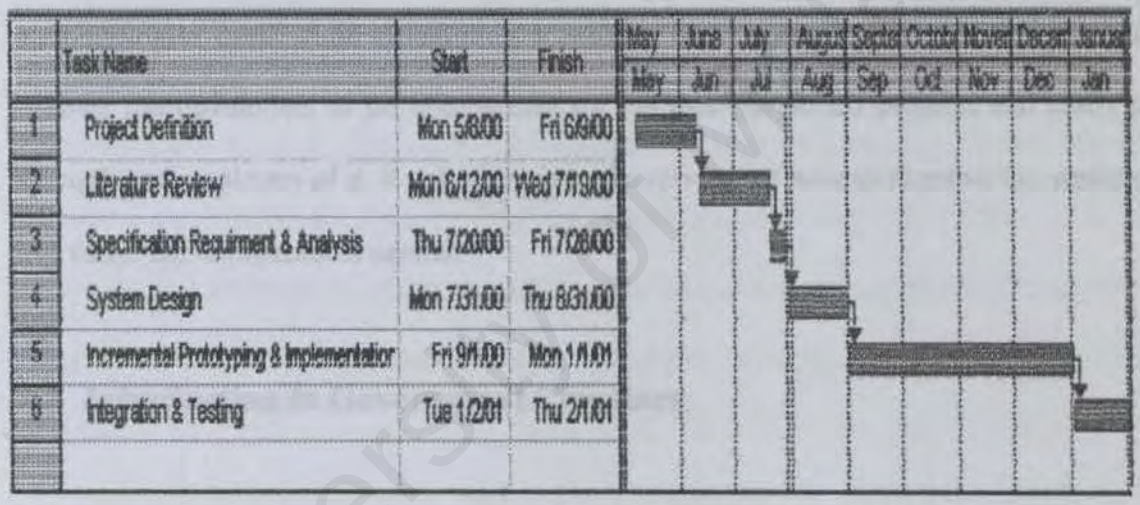
i. Visual Basic 6.0

ii. MS Visual Interdev 6.0

iii. MS Access

iv. HTML Editor

1.7 Project Schedule



	Task Name	Start	Finish
1	Project Definition	Mon 5/8/00	Fri 6/9/00
2	Literature Review	Mon 6/12/00	Wed 7/19/00
3	Specification Requirment & Analysis	Thu 7/20/00	Fri 7/28/00
4	System Design	Mon 7/31/00	Thu 8/31/00
5	Incremental Prototyping & Implementation	Fri 9/1/00	Mon 1/1/01
6	Integration & Testing	Tue 1/2/01	Thu 2/1/01

1.8 Summary

In Chapter One, the main objectives of this MOE's WBCIS have been clearly clarified. This proposed system can be summarized in one main reason, that is to enhance the level of searching and retrieving of education circulars from the MOE's website.

CHAPTER TWO: LITERATURE REVIEW

2.1 Purpose

Review of literature is a background study about the knowledge and information gained to develop this project. Its' purpose is to get a better understanding on the development tools that can be used to develop a project and also to get a better knowledge on the development methodologies used while developing a project. Besides that, review of literature also enables the developers to do comparison on the past-developed projects and study the strength and weakness of it. It will also give an overview of how to improve the weakness and fulfill the requirements needed.

2.2 Introduction to Government Circulars

Circulars to be implemented in an organization are planned and determined by leaders or administrators at the top level management. Circular is a 'guideline' for well defined actions plan to meet the objectives of an organization. Government administrators and officers refer to circular as guideline in the area of education, treasury and public service to provide better services to the public.

Therefore, a circular can be assumed as an official statement that is received and issued by the authorities such as government. The public can understand the purposes or objectives that an organization (especially government bodies) is trying to archive. By understanding the objectives, the public can have a clear picture how an action plan is implemented at the national or state level.

Circulars, department education and the like contribute to policies of government. All the implementation of the organizations' action plans will be carry out in a more organized, smooth and efficient manner.

There are a few types of circulars in Malaysia among them are education circular, treasury circular and public service circular. This document will only cover one of the many circulars in Malaysia, that is the Education Circular as the background of research for the purpose of developing an information system to retrieve information related to the circular.

i. Education circular ('Pekeliling Ikhtisas', 'Pekeliling Perkhidmatan' and 'Pekeliling Khas') - to be used by academic staff mainly headmaster to implement actions or procedures to schools and academic institution.
ii. Treasury circular (Pekeliling Perbendaharaan) – to record all the budget of government spending in facility, education, medical and the like.

iii. Public service circular (Pekeliling dan Surat Pekeliling Perkhidmatan Awam) to provide guideline to government state level authorities in distributing good services to society.

Before going into details about the National Education Circular, let me briefly explain what is an education circular. This is the type of circular that emphasizes priority to social values that are fair, spiritual and humanity.

The National Education Circular was gazetted since 1959. It is divided into three main category:

i. 'Pekeliling Ikhtisas' – this category involves action by headmaster or senior academic staff to schools.
ii. 'Pekeliling Perkhidmatan' – this category involves order from the highest administrator of education ministry to make sure the headmaster or state representative have done their job in well manner.
iii. 'Pekeliling Khas' – specially allocated to the institution of disable such as blind or deaf school.

2.3 Dissemination Information of Government Documents Via the Web

With the implementation of EG, on-line information enables the general public to access the following information on the public and private sector electronically via the Internet and other media. The features available from this service include the following:

General information

i. Government services
ii. Government regulations
iii. Government announcements, speeches, news
iv. Registered company information
v. Economic information
vi. Social, cultural, tourist information

Private information

i. Personal health information
ii. Personal summons/fine record
iii. Personal license/permit status
iv. Personal EPF/SOCSO balance
v. Other personal data records

Electronic communication enables the general public to communicate to the government electronically via the Internet and other media. Benefits of electronic communication to the public and government include:

Citizen

i. Choice of multiple delivery channels for communication services

ii. Highly accessible communication and up-to-date information

iii. Convenience offered by extended hours, 24 hours-7 days a week

iv. Civic and business participation in government

v. Better informed, technology literate citizen

vi. Transfer and sharing of values

Government

i. Greater government visibility and transparency to public

ii. Enhanced modes of communication to citizen and business

iii. Increased cost effectiveness of communication – "paper-less"

iv. Timely and efficient government information update

v. Transfer and sharing of values

vi. Enhanced profile of an open and IT sophisticated government

Consequently, MOE's WBCIS is a system that corresponding to the implementation of EG.

2.4 Review of the Existing MOE Circular System

Before a project is being developed, it needs a lot of studies and analysis. Faculty of Computer Science and Information Technology (FCSIT), University of Malaya, was

chosen as the test bed for the project. After gathering some feedback, suggestion and information, I have decided to develop a web-based search engine system that could overcome the shortcomings and maximize the functionality of the searching and retrieving process in the MOE.

From the aspect of user, with the existing system on MOE, he or she will only be able to search or retrieve circulars based on **listing** and **title** criteria. All the circulars are presented solely in a static web page manner. A static web page means that it only can display the content of a web page with pure HTML code. No scripts such as Java scripts or ASP scripts are used. All the coding is hard coded. No task can be carried out such as getting the current time from CPU. The pictures below indicate the existing MOE system using static web pages:

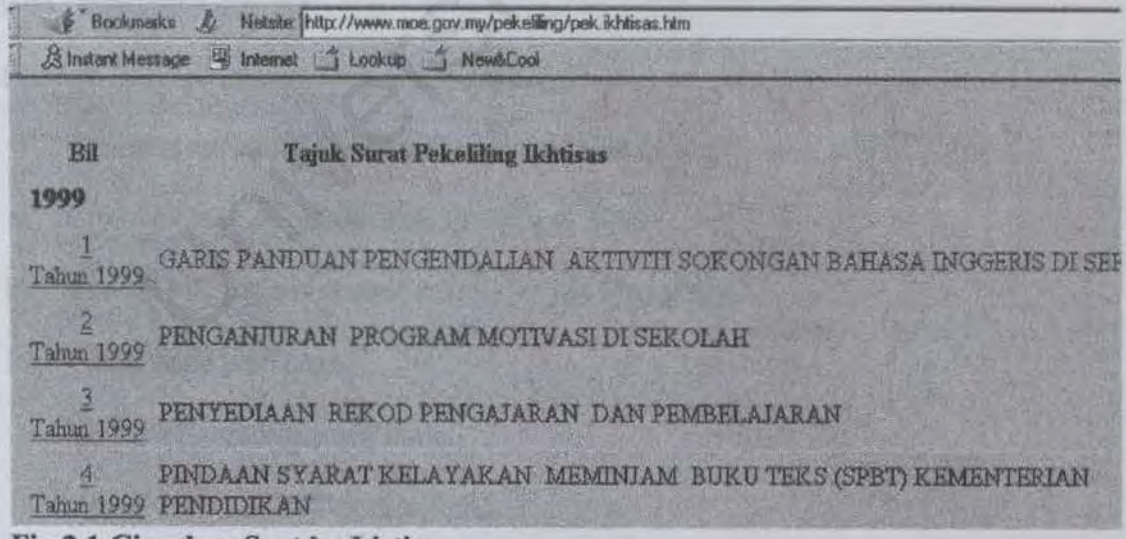


Fig 2.1 Circulars Sort by Listing

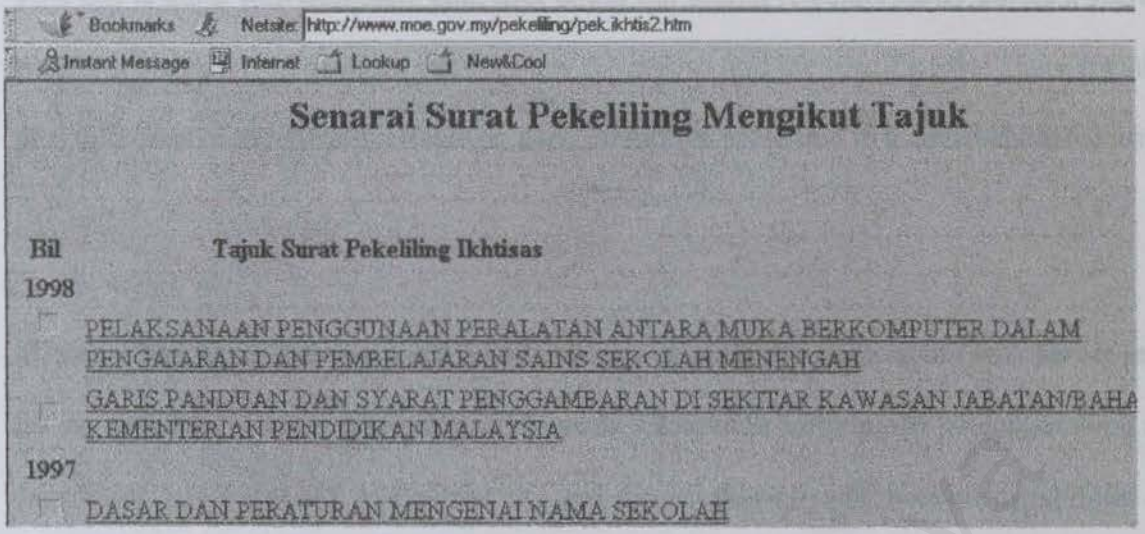


Fig 2.2 Circulars Sort by Title

After reviewing on the existing sites, the following personal evaluations are given.

❖ Ministry Education of Malaysia

URL: http://moe.gov.my

Feature:

i. Circulars are sorted based on listing and title.

ii. Circulars rank only from year of 1996 to 2000.

iii. The HTML page is created mainly by Ms FrontPage

iv. Using static web page.

v. No search capability available.

Personal Evaluation:

This site is quite well designed. But, user could not search circulars easily unless a search engine is provided. The system cannot carry the task to find the specific title. There are still pros and cons of the system. However, each circular is presented in a comprehensive way.

Where as, by using dynamic web pages, we can do multiple tasks in the web server and giving response to users instructions. By using client-side scripting in languages such as JavaScript, VB Script and ASP Script, the web page author can add dynamic capabilities to static pages limited only by the author's imagination and creativity. Cascading Style Sheets - CSS version 2 (CSS2) gives the web page author unprecedented control over page layout; CSS2 also incorporates many features critical to web accessibility issues and mobile computing [2]. In my project, I am going to implement the ASP and VB Script to create dynamic web pages that could serve user's instructions to improve the existing MOE system. The proposed search engine system for circulars will be based on **title** and **date**. A database (Microsoft SQL Server 7.0) will be established to keep all the existing and record of circulars as the current MOE circular system does not own one.

To clarify the difference between static and dynamic web pages, it is important to have a clear view of the both. Fig. 2.3 and Fig. 2.4 show how these two trends of web page work:

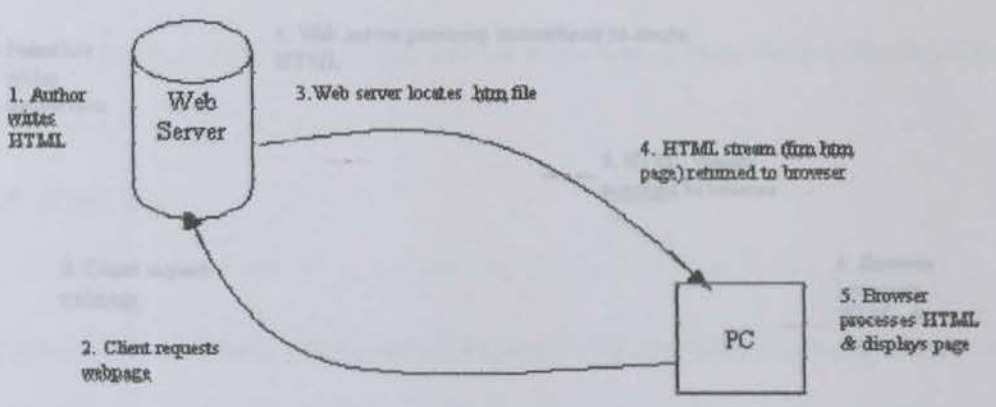


Fig. 2.3 Static Web Page

i. A web author writes page composed of pure HTML, and saves it within an .htm file

ii. Users type a page request into their browsers, and the request is passed from the browser to the web server.

iii. The web server locates the .htm page.

iv. The web server sends the HTML stream back across the network to the browser.

v. The browser processes the HTML and displays the page.

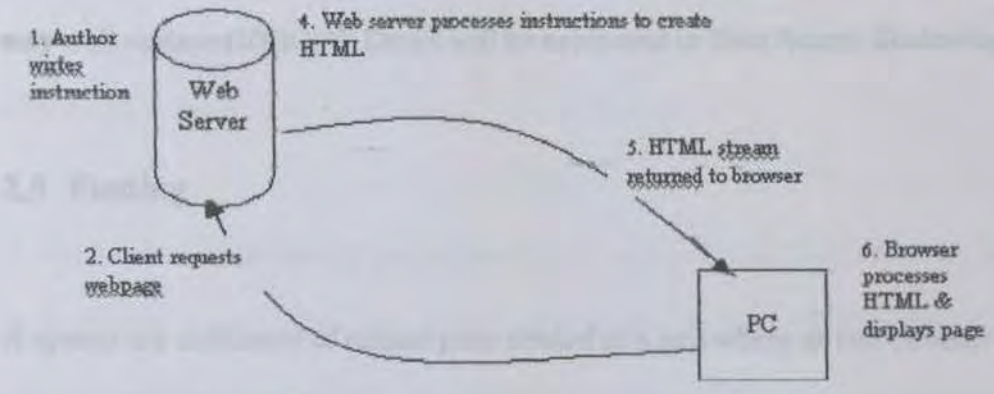


Fig. 2.4 Dynamic Web Page

i. A web author writes a set of instructions for creating HTML, and saves these instructions within a file.

ii. Users type a page request into their browser, and the request is passed from the browser to the web server.

iii. The web server locates the file of instructions.

iv. The web server follows the instructions in order to create a stream of HTML

v. The web server sends the newly-created HTML stream back across the network to the browser.

vi. The browser processes the HTML and displays the page.

As for administrator, he or she will need to access and maintain the database. This is because with the existence of database to handle record of circulars, one will have to log in system and upload the latest circulars to database (OLE-DB). OLE-DB is the next step in the evolution of the anonymous data store. It is more generic than ODBC (Open Database

Connectivity). It introduces the notion of data providers and data consumers. Eventually, it may well replace ODBC[3]. Detail will be explained in Data Access Technology.

2.5 Finding

A system is a collection of related parts treated as a unit where its components interact. Therefore, different systems can be developed in different ways. To develop a system, a lot of information need to be gathered about the system itself, the procedures involved to develop the system and the methodologies used to develop the system. All this information can be obtained from various sources.

There are number of ways of gathering information. Such as system users, computer program, procedure manuals and reports, forms and documents. Each source will yield different information and facts and it depends on how the search is being done. For example, if Internet is being used to find information, each keyword or phrase that is being searched will yield various site which is totally different from one site to another.

To gather information from users, the available methods are through interviews, reading, survey, observation and questionnaire. Computer program can be used to determine the details of data structures or processes. Procedure manuals specify user activities in a business process. They can be used to determine user activities, which is important in detailed system design. Reports indicate the kinds of outputs needed by users. Forms and

documents are useful sources of information about the system data flows and transactions. If these sources are being used, the most recent and relevant forms and documents must be obtained and examined.

As for the web-based search engine project, many books and few previously done projects were used as guide and to gain information as well as better idea of how to develop the system. Furthermore, Internet was surfed and information was gathered from various sites on software to be used to develop the project, methodologies for system development and information on development tools. The search engines that were used to gather information include MSN search, Yahoo search, Infoseek search, MSN search and the like. I also have gathered all the available circulars from www.moe.gov.my for my research purposes. As a result from this search, the found sources can be divided into two that includes the printed resources and the electronic resources.

2.5.1 Reviews On Other Sites of Education Circular

After reviewing various education circular sites on the Internet, I have chosen five ideal sites as discussion:

A) Ministry Education of New Zealand

URL: http://www.minedu.govt.nz

Feature:

i. Circulars are sorted based on number with title. They arrange the circulars in descending order such as 2000/15, 2000/14, 2000/13 and so on.

ii. Circulars rank only from year of 1996 to 2000.

iii. The HTML is written by Transit Central SDK 4.0 of InfoAccess Inc. www.infoaccess.com

iv. Database is used to store circulars because indexing is allocated to each circular.

v. Although a search engine is available, it is not solely for searching circulars. For example, if a user type in "Uniform Circular" under the "School" category, all the circulars from 1996 to 2000 will be displayed including the non-relevant circular.

Personal Evaluation:

This site is quite well designed. User can search a related topic by writing into the 'Search' field. But, for searching circular, it cannot carry the task to find the specific title. There are still pros and cons of the system. However, each circular is presented in a proper way.

B) Ministry Education of Ireland

URL: http://www.tui.ie/circ.htm

Feature:

i. Circulars are listed according to title only. Each title is linked to its own static HTML page.

ii. Circulars rank only from year of 1989 to 2000.

iii. Circulars are mainly for teachers and academician.

iv. Circulars are prepared for the Internet by the Teachers' Union of Ireland from the original published by the Department of Education & Science.

v. No search criteria are available.

Personal Evaluation:

This site mainly publishes circulars for Teachers' Union of Ireland. User can find a related topic by clicking the linking of each listing. Although it does not support search features, but all the circulars are presented in an attractive manner. There are 2 features available too, that are 'Back To Top' and 'Back To Circulars' in each circular.

C) Ministry Education of United Kingdom

URL : http://www.dfee.gov.uk/circulars/searchci.htm

Feature:

i. This site provides a user-friendly interface (GUI) for user.

ii. It is upgraded by the new Department For Education And Development (DFEE) numbering system United Kingdom.

iii. This site provides guidance on the law affecting schools that is still applicable. Guidance on the law was published in circulars in a separate numbered series until 2000.

iv. It provides a search engine for education circular using keywords.

v. We could set the number of entries using the 'Max Rows' in the system.

vi. After the search, results of the searching will be displayed. The page consists of four columns: No, Score, File and Title.

vii. No – Normal numbering of results that is 1, 2, 3 and the like.

viii. Score – Rate given to a document to measure the relevance of the document searched with the specified topic (0 to 1).

ix. File – File name listed.

x. Title – Title of the document.

xi. A dynamic web server with database is used to produce customer demands.

xii. The search engine is designed by Thoughtbubble studio@thoughtbubble.co.uk.

Personal Evaluation:

This site gives me a lot of idea on designing the proposed MOE's circular web-based search engine. It is efficient and effective in retrieving circulars. It is simple and easy to use. Different from many other sites, it contains a search engine which enable us to find particular circular easily. This site is going to be a good model for my system design.

D) Ministry Education of India

URL : http://www.education.nic.in/htmlweb/main.htm

Feature:

i. No specific categorization for circulars.

ii. Although search is available, but unable to search the desired circular.

iii. Most circulars are in mixed topic such as school development, scholarship and the likes.

Personal Evaluation:

This site has little to do with education circulars. It does not emphasize much on circulars. Although there is a search engine, it is not mainly for education circulars.

E) Ministry Education of United States

URL : http://search.ed.gov/

Feature:

i. Search engine available but not for education circulars.
ii. There are many sites of education ministry of US such as Ohio, Indiana, Borland and the like that holds their own circulars respectively.
iii. No specific search engine is available manly for education circulars.
iv. This site provides 10 results per search with percentage of relevance in each document.
v. Circulars found are not categorized and in different form of file such as word document, PDF, PPT and the likes.

Personal Evaluation:

This site is fast for searching documents and comprehensive but not for education circulars. The form of presentation output is attractive and could be used as guidance in developing search engine system.

Conclusion:

It can be said that very few sites on the Internet provide a search engine for education circular. While browsing Internet, I have searched through Search, Yahoo, Lycos, Infoseek, MSN, Hotbot, Cari, Amazon and some others popular search engine. The conclusion is that most of the circulars are listed directly on the Internet with an URL. There is no proper way to handle all the circulars in a systematic manner until I found out the three sites as mentioned above (including the MOE sites). Of course there might be more sites that are more efficient in which I do not manage to obtain because time is the factor. From these sites, I have gathered useful information and idea on how to design the proposed system.

2.6 Reviewing Development Platform

Platform is the foundation for each system that is going to develop. Different kinds of application will run in different platform. However, most of the applications available in the market only support one kind of platform. Following is the platform that takes into consideration in MOE's WBCIS7.

2.6.1 Windows NT Server

Microsoft Windows NT Server is one of the powerful operating systems for business computing. It has matured by virtue of being put to wide use. NT is also a powerful OS that reliable, secure, multithreaded, symmetric processing, support client/server system [4]. Much has changed since the 1996 launch of Microsoft Windows NT Server 4.0. Customer

requirements for a server operating system have evolved to include support for applications, Web services, communications, and much more. As most organizations have sought to keep computer system costs down, they have demanded more versatility from their server operating systems. Windows NT 4.0 has been proven in demanding customer environments to be a reliable operating system. Customers such as Barnes and Noble, The Boeing Company, Chicago Stock Exchange, Dell Computer, Nasdaq and many others run mission-critical applications on Windows NT 4.0.

One multipurpose server can often replace several disparate, single-purpose servers - an efficiency that helps simplify and consolidate the computing environment. Further, the server operating system has taken an increasingly critical role in conducting everyday business, and networks and computing systems have grown more complex. Security issues have become more important: As organizations have more of their business wrapped up in the network they have more to protect. NT can control the access control of user in accessing certain file or application. This can be use for implementing the access control for the Administrator in MOE.

Today's Windows NT Server 4.0 has become comprehensive server operating system, combining best of class application services, file and print services, communications services, and Web services. The combination of Windows NT Server 4.0 and its built-in Web server, Microsoft Internet Information Server 4.0 (IIS), delivers up to 52 percent better Web server performance with Active Server Pages. Microsoft Management console, released with Windows NT Server's built-in

Web server, Internet Information Server (IIS) 4.0, combines the administration tasks of IIS into one tool and makes it easy for administrators to create task-based consoles that can be delegated to the appropriate administrator. This provides administrators with one integrated utility for managing their applications and Web environment.

Table 2.1 - NT Server 4.0 Features

Customer Requirement	**Windows NT Server 4.0**
Reliability – Guaranteed server uptime	• Several OEMs offer 99.9 percent uptime guarantees on Windows NT Server 4.0. • Support for high availability application clustering and TCP/IP-based load balancing. • Journaling file system for file-level reliability and recoverability.
Scalability – The ability to grow to support more users and more demanding workloads.	• Supports 4 GB of RAM by default (2 GB kernel and 2 GB User/Application). Up to 3 GB is available for memory-intensive applications such as databases. • 64-bit file system, which is capable of file sizes up to 18.4 quintillion bytes (much larger than 2GB). • Integrated file cache for faster access to commonly

	used files. • Asynchronous I/O, allowing threads to process other tasks while waiting on I/O, an efficiency that improves performance and scalability. • Best single, dual, and quad processor TPC-C performance results, demonstrating SMP scalability. • Windows Load Balancing Services for distributing loads across multiple servers.
Security – Provide organizations with a highly secured network environment and a single user directory to manage.	• Single, secure sign-on across multiple servers in a networked environment. • System services run in a secure context, providing higher levels of security for multi-user services.
Application Availability – Provide a wide range of operating system-integrated applications to reduce the cost of deploying	• Over 8,000 Windows NT compatible applications available. • Over 4,000 applications that run on Windows NT Server. • 650 applications carry the Designed for BackOffice Logo, offering directory and security integration.

the cost of deploying and managing business solutions.	• Extensive internal and external beta testing to ensure binary compatibility across services and applications

As a result, Windows NT Server will be used as the development platform.

2.7 Reviewing Database Management System

Organizations are using information technology as a competitive advantage-for improved decision-making, better customer support, and host of other key applications. These applications are becoming increasingly important as the number of users, transactions, and amount of data grow. When implementing mission-critical database applications, enterprise businesses require solutions different from those of small business and departmental organizations. All share concerns about ease-of-use and price but the most important issues for the enterprise are availability, scalability, interoperability and manageability. Thus, it is important choosing the correct database management system before any system is designed.

2.7.1 SQL Server 7.0

SQL Server 7.0 provides a comprehensive platform for developing and deploying large-scale, mission-critical e-commerce, online transaction processing, and data warehousing applications. SQL Server 7.0 will be treated as server for the MOE's WBCIS.

Availability

The number one goal for IT professionals is to deliver highly reliable applications to their users. Planned downtime for common tasks such as configuration changes, software updates, and performance tuning, must be minimized. Preventing hardware and software failures and administrative errors from becoming catastrophes is even more important. An executive level commitment to a multi-phased approach is essential for improving reliability in the enterprise. The most important considerations are:

i. People: sufficient, expert resources and ongoing training
ii. Process: consistent and proven systems management
iii. Partnerships: collaboration with independent software vendors and consulting services
iv. Technology: capable products, solid architectural design, and implementation

SQL Server 7.0 is the key foundation technology for enterprise database applications. The modern architecture and simplified, yet sophisticated, features promote sound database design, solid implementation, and reliable processes. High performance utilities (for backup and restore operations, data import-export, index building, and other common tasks) minimize time and overhead, thereby freeing up valuable resources for more strategic operations. Automatic tuning also increases availability, since the database does not need to be shut down to perform optimally.

Scalability

Database sizes are expanding, especially for data warehousing applications where more data means better information for decision support. Growing numbers of users are equipped with more powerful tools, for interacting with more intelligent applications. Users not only expect fast performance but the ability to work from remote or mobile locations. SQL Server 7.0 is designed to handle all of these scalability challenges while delivering industry-leading price/performance. Advanced features, combined with the latest generation of scalable servers, provide enterprise businesses with the ability to support the largest e-commerce, line of business, and data warehousing applications. Furthermore, businesses can easily deploy applications built with SQL Server on systems from laptops to the largest servers because of 100% code-compatibility across all platforms. The SQL Server enables industry-leading performance with support for the latest generation of 8-processor servers and larger amounts of memory.

Interoperability

Heterogeneous environments are common in the enterprise. Databases and applications from multiple vendors must co-exist. Custom applications drive "best of breed" solutions using components from different vendors. In these environments, IT managers need to evolve their infrastructure and hold down costs, even while capitalizing on new technologies and existing investments. SQL Server 7.0 preserves investments in legacy and heterogeneous systems with easy data access and applications interoperability. Microsoft provides numerous additional interoperability solutions with connectivity to non-SQL Server data sources including Oracle and Jet, and several non-relational data sources such

as Microsoft Excel, Paradox, and flat files. Microsoft SNA Server handles IBM DB2 and host connectivity. Windows NT includes numerous solutions with Services for Unix, Message Queuing, and Transaction Services. Microsoft Visual Studio includes features for development on additional database platforms.

SQL Server includes a suite of comprehensive, easy-to-use tools that address different needs for database solutions. Data Transformation Services is a highly flexible tool that facilitates the transfer of data between an extensive variety of sources and destinations. For example, it can be used to populate an e-commerce site from a host data source or create a data warehouse from several heterogeneous databases. Additionally, SQL Server supports different heterogeneous query and replication models.

Manageability

Skilled DBAs (Database Administrators) are a scarce resource. Increased demands are placed on IT managers for more varied and complicated applications without an equivalent increase in resources. SQL Server frees up these DBA resources for strategic operations with an extensive set of sophisticated, yet simplified, wizards and tools.

SQL Server provides an infrastructure with the Enterprise Manager for automated, distributed management of large numbers of servers. Servers can be configured into groups for performing common, scheduled tasks. A suite of tools can be used to monitor, profile, and analyze server performance with support for troubleshooting problems. Event handling takes care of exceptions and reports can be rolled up to a central site. Paging and e-mail notification can alert DBAs to critical problems.

Many server installation and configuration options have been streamlined and simplified, although advanced features are still available for the knowledgeable DBA. For example, by default the server dynamically adjusts its memory and lock resource use. A SQL Server database can increase allocated resources when necessary without over committing them and decrease the resources used when they are no longer needed. Database files can automatically grow from their originally specified size, and can shrink and return space to the operating system. SQL Server also works with third-party solutions for heterogeneous database management.

2.8 Microsoft Universal Data Access Technology

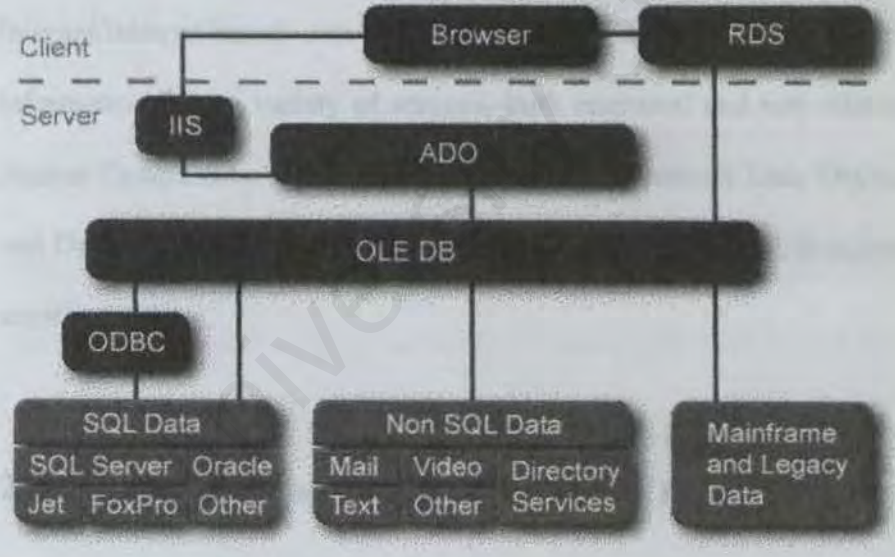


Figure 2.5 Universal Data Access Architecture

Universal Data Access is Microsoft's strategy for providing access to information across the enterprise. Today, companies building database solutions face a number of challenges as they seek to gain maximum business advantage from the data and information distributed throughout their corporations. Universal Data Access provides high-performance access to a variety of information sources, including relational and non-relational, and an easy to use programming interface that is tool and language independent. These technologies enable corporations to integrate diverse data sources, create easy-to-maintain solutions, and use their choice of best of breed tools, applications, and platform services.

Microsoft Data Access Components (MDAC) provides easy-to-use, high-performance access to all types of data throughout the enterprise. Developers creating client/server and Internet/intranet-based data driven solutions use these components to easily integrate information from a variety of sources, both relational and non-relational. Microsoft Data Access Components consists of new versions of ActiveX Data Objects (ADO), OLE DB, and Open Database Connectivity (ODBC) which are released, documented, and supported together.

2.8.1 Open Database Connectivity (ODBC)

Open Database Connectivity (ODBC) is a widely accepted application programming interface (API) for database access. This UDA is important in developing the MOE's

WBCS. It is based on the Call-Level Interface (CLI) specifications from X/Open and ISO/IEC for database APIs and uses Structured Query Language (SQL) as its database access language.

ODBC is designed for maximum interoperability—that is, the ability of a single application to access different database management systems (DBMSs) with the same source code. Database applications call functions in the ODBC interface, which are implemented in database-specific modules called drivers. The use of drivers isolates applications from database-specific calls in the same way that printer drivers isolate word processing programs from printer-specific commands. Because drivers are loaded at run time, a user only has to add a new driver to access a new DBMS; it is not necessary to recompile or relink the application

X/Open and ISO CLI Alignment

ODBC 3.0 aligns with, and is a superset of, the X/Open and ISO Call-Level Interface (CLI) standards. As a result of this alignment, several new features have been added.

Descriptors- A descriptor is a data structure that holds information about either columns in a result set or dynamic parameters in an SQL statement. Descriptors streamline many application operations, providing a direct and uniform way to access column or parameter data.

Diagnostics - In ODBC 3.0, information about the outcome of function calls is included in a diagnostic area. Each environment, connection, statement, and descriptor handle has a diagnostic area. The diagnostic area's header fields return general function execution information; its record fields describe the latest errors or warnings returned by an ODBC function associated with the handle.

Catalog Function Column Names - The names of columns in the result set of catalog functions align with the names in the X/Open and ISO CLI standards.

2.9 Web Development Technology

Developing web-based applications relies on many network and application components working together to deliver information to the requesting client. In the once, only web browser extracted information from the web server. However, after some standardization of HTML languages, image specification and protocol stacks, the world become a global network of computer.

To transform the global network into a reliable application, the original architecture of the web must be enhanced to meet the needs that we take for granted when developing traditional applications. Figure 2.9 shows the enhanced architecture to deploy and develop web-enabled applications. [7]

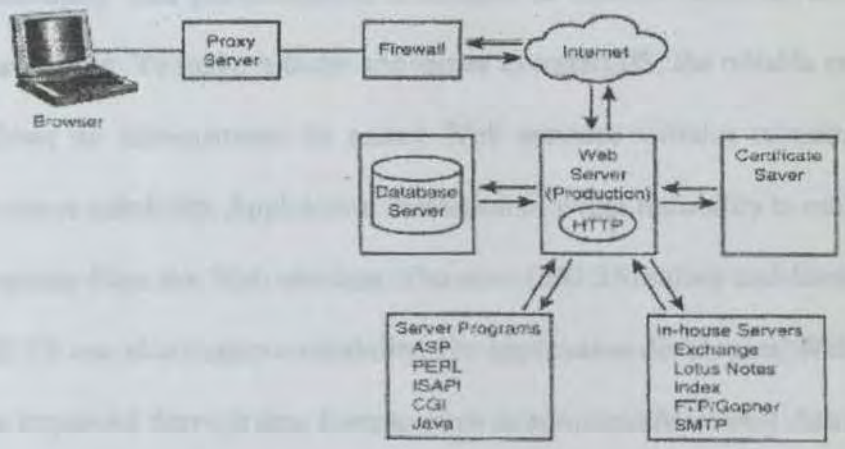


Figure 2.6 Evolution Web Architecture for Web-enabled Application

2.9.1 Internet Information Server

As the Internet becomes more woven into mainstream businesses, so grows the need to have Web services interwoven with mainstream business computing. Internet Information Services 5.0 runs as an enterprise service within Windows 2000. This version improves the Web server's reliability, performance, management, security, and application services. With IIS 4.0, Microsoft focused on security, administration, programmability, and support for Internet standards. IIS 5.0 builds on the features and capabilities needed to deliver Web sites required in an increasingly Internet-centric business environment. And it makes it even easier to use the technologies delivered in prior versions. In particular, IIS 5.0 features improvements in the following four major areas:

Reliability and performance. A number of features make IIS more reliable and better performing. To make it faster and easier to restart IIS, the reliable restart feature of IIS 5.0 allows an administrator to restart Web services without rebooting the computer. To improve reliability, Application Protection provides the ability to run applications in a pool, separate from the Web services. The new CPU Throttling and Socket Pooling features in IIS 5.0 can also improve reliability. For application developers, Web site performance can be improved through new features such as scriptless Microsoft Active Server Pages (ASP) processing, ASP self-tuning, and performance-enhanced ASP objects.

Management. IIS 5.0 is easier to install and maintain. A number of features support this increased ease-of-maintenance, including a simplified installation process, new security task wizards, the ability to account for time used by processes, more flexible remote administration, and the ability to create custom error messages.

Security. IIS 5.0 adds support for important industry-standard security protocols, including Digest Authentication, Server Gated Cryptography, Kerberos V5 authentication protocol, Transport Layer Security, and Fortezza. In addition, three new task wizards make it easier for administrators to manage a site's security settings.

Application environment. Developers will find that IIS 5.0 expands the Web server's application development environment by building on new technologies included in Windows 2000 Server. These include Active Directory and the expanded Component Object Model (COM+). In addition, enhancements to IIS Active Server Pages, such as

scriptless ASP processing, as well as improved flow control and error handling, let developers write more efficient Web-centric application.

After I choose Windows NT 4.0 as the platform, IIS will serve as a platform for web tools and applications for the PKM web-based system. IIS provides configuration and management of properties such as access permissions and logon requirement for clients, home and virtual directories, virtual servers. This option will be needed in the implementation of this project.

2.9.2 Active Sever Page

Active Server Pages (ASP) is a component of Microsoft's Web server software that allow user to embed server-side script code in Web pages. It is a server side enhancement because all the script code runs on the server. The users can now create web sites that are dynamic and database-driven by using the client side script, Java applets, dynamic HTML, or Active X Control.

Following are some of the benefit of Active Server Page:

i. It works with Window NT and IIS to provide a comprehensive set of technologies that enable secure exchange of information over public networks, access control to server resources and confident identification of server and client.

ii. It supports client/server programming. Thus, it can be used to build client/server applications.

iii. It is suitable for building multi-tier Internet and intranet applications.

After looking at the benefit and the architecture of the Active Server Page, it has been considered for the PKM web-based search engine.

2.9.3 Visual Basic and Visual Basic Scripting

Visual Basic is an extremely powerful, full-featured application development tool that exploits the key features of Microsoft Windows. It is easy to use through a graphical interface. Applications can be built in the short time by using it. It can be used to create several types of applications; such as Client applications, Office applications, Client-Side applications, Group-Ware applications, ASP Web-based applications and server side applications. Therefore, it can be widely used in developing different types of applications. [8]

Using Visual Basic, it will remove the need to do traditional window programming styles. Programmers only need to plan their program's logic and the design of the codes well without needed to know how to build the interface components, such as frames, command buttons and so on.

In Visual Basic 6.0, several other wizards are included to make the development task easier. These include Application Wizard, Active X Control Interface Wizard, Active X Document Migration Wizard, Data Form Wizard and Property Page Wizard.

Visual Basic Scripting is a lightweight scripting language that provides programming functionality based on the Visual Basic programming language. It is natively executed on the Internet Explorer browser and can be executed in the browser through plug-in technologies. It is the default scripting language for the IIS. [9]

VBScript lets the user interact with a Web page rather than simply view it. VBScript can take input from the user and check the data to make sure it is valid or meets certain criteria. Then, it can put an Internet server to work either by actually storing the data or causing some action to take place on the server based on the information given.

VBScript also play an important role in many ways, including validating data, pricing, providing impressive multimedia feedback, and initiating data storage. The user can use VBScript to sequence the questions based on responses. VBScript can perform calculations on data, such as computing the cost of an item after taking into account the sales tax.

Another important aspect of this programming model is that it let us use the intrinsic HTML form controls and Microsoft's ActiveX controls with VBScript to give Web pages an attractive look and feel. Intrinsic HTML form controls, a timer control that enables us to time events on Web pages and a pre-load control that lets us load bitmaps can be created.

The users can create 3-D animation effects, making the Web page come alive with moving objects in response to certain events. Figure 2.10 shows the VBScript-Host model.

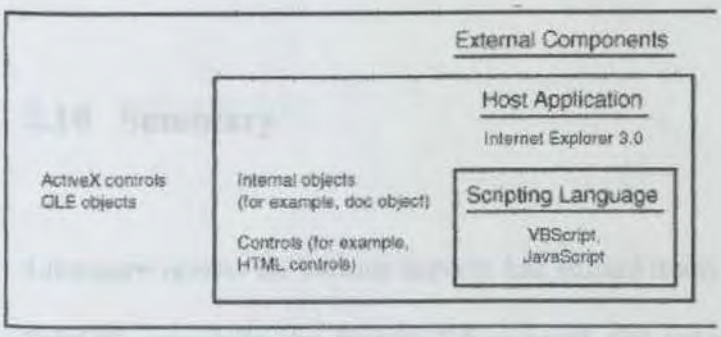


Figure 2.7 VBScript-Host Model

2.9.4 HTML

Without HTML, the World Wide Web wouldn't exist. HTML allows the individual elements on the Web to be brought together and presented as a collection. HTML isn't the only way to present information on the Web, but it's the glue that holds everything together. In addition to being a markup language for displaying text, images, and multimedia, HTML provides instructions to Web browsers in order to control how documents are viewed and how they relate to each other. For all its simplicity, HTML is a very powerful language.

The users can add many functions inside HTML. They can add their own VBScript and also JavaScript inside HTML to make it become a dynamic HTML. Besides displaying

information, they can show database record in the Internet and get response from other users.

2.10 Summary

Literature review on various aspects has gained many ideas for me to develop the MOE's WBCIS especially the Britain Educational site www.dfee.gov.uk/circulars/searchci.htm. Through reading, surveying web sites and review on several done thesis proposal, manage to gather enough information with guidance. There are many of choices in choosing the suitable development platform, database management system, latest technologies and web development platform. From careful consideration, Windows NT Server, Ms SQL Server 7.0, ODBC, ASP, Visual Basic and HTML are chosen to suit the requirement of MOE's WBCS.

CHAPTER THREE:

METHODOLOGY/ANALYISIS SYSTEM

3.1 Introduction

Although software design can be identified and defined as a distinct activity, it must be compatible in both concept and implementation with essential development activities such as analysis and coding that precede or follow it. To achieve this compatibility and to provide a framework for life-cycle automation, a pattern of thought or paradigm must be established. An example of a paradigm is the traditional waterfall model of development. MOE's WBCIS uses this methodology as it is stable and structured.

3.1.1 Waterfall Methodology

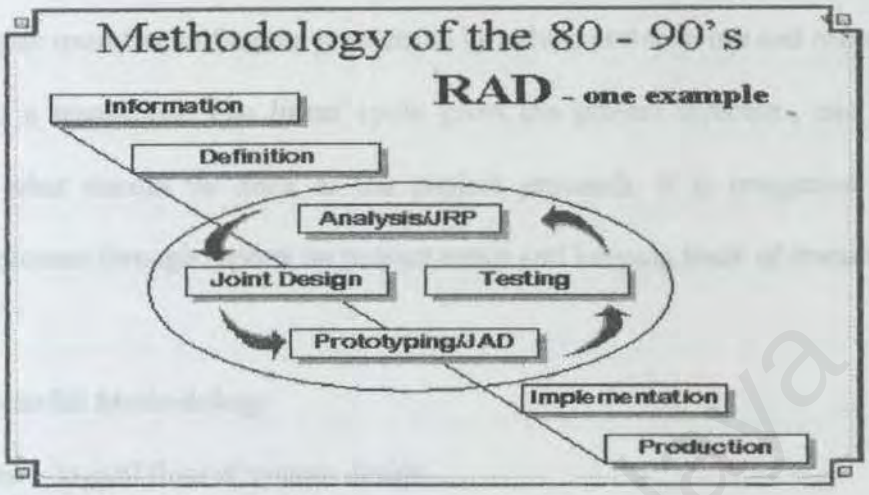


Fig 3.1 Example of Waterfall Methodology

This model stated that stages are depicted as cascading from one to another. One development stage will be completed before next begins. Thus, when all the requirements are elicited from the customer, analyzed for completeness and consistency, and documented in a requirements document, then the development team can go on to system design activities. The waterfall model presents a very high level view of what goes on during development, and it suggests to developers the sequence of events they should expect to encounter.

The waterfall model can be very useful in helping developers lay out what they need to do. Its simplicity makes it easy to explain to customer who are not familiar with software development; it makes explicit which intermediate products are necessary in order to begin the next stage of development.

Linear cycle phases or waterfall model cycles are chosen to encourage top-down problem solving. Designer must first define the problem to be solved and then use and ordered set of steps to reach a resolution. The linear cycle gives the project direction, and provides guidance on what should be done as the project proceeds. It is integrated with the management process through reports on project status and keeping track of resource needs.

Benefits of Waterfall Methodology:

i. Structured – logical flow of system design
ii. Repeatable – Consistent throughout the organization
iii. Predictable – Allow estimation of output
iv. Involves user participation – Gathering user requirements

3.2 Information Gathering Method

In developing a system, it is important to identify the system requirement. In order to identify them, a lot of information is needed. A few techniques have been used to find out what the system needs and users really want. The requirement elicitation takes quite a long time. This is due to several techniques need to be applied in order to get a complete requirement.

3.2.1 Reading

A lot of published literatures have been read in order to gather information of the users' needs, system development needs and technical issues of the proposed system. All these can be categorized into the printed material (especially books and journal) and non-printed material such as electronic document and the likes. Through reading, ideas are managed to get from books, magazines and journal to be implemented in the proposed MOE's WBCIS. Many useful information has been found from PC Magazine and In-Tech from local newspaper, Star which provide me with the latest technology in Information Technology and computing fields.

3.2.2 Document Analysis

The large number of existing documents and the production of a multitude of new ones every year raise important issues in efficient handling, retrieval and storage of these documents and the information which they contain. This has led to the emergence of new research domains dealing with the recognition by computers of the constituent elements of documents - including characters, symbols, text, lines, graphics, images, handwriting, signatures, etc. In addition, these new domains deal with automatic analyses of the overall physical and logical structures of documents, with the ultimate objective of a high-level understanding of their semantic content.

Circulars from the existing MOE's site have been analyzed. The documents present are in HTML text or word document file. Some of it also contains scanned file such as Optical

Character Recognition (OCR). In addition, the web site is created from Ms FrontPage. Most the HTML files are transferred from text file.

Interest in OCR has been reviewed and handwriting recognition during the last decade. Document analysis and recognition are obviously the next stage. From document analyzing, we have found out that the current MOE's system used two methods to locate the HTML file. First, by putting a scanned file into HTML file and second, by putting a document file into HTML format using MS FrontPage Editor. Automatic, intelligent processing of documents is at the intersections of many fields of research, especially of computer vision, image analysis, pattern recognition and artifical intelligence, as well as studies on reading, handwriting and linguistics. Although quality document related publications continue to appear in journals dedicated to these domains, the community will benefit from having this journal as a focal point for archival literature dedicated to document analysis and recognition.

3.2.3 Internet Research

Internet is used as the main resource for referring any ambiguities that arise during the entire development period. Through the Internet, not ideas were collected from the others system, some interesting web design also have been found out as reference of MOE's WBCIS. For instance, the site of Ministry Education of United Kingdom from Chapter Two has been found useful and gave many new inspiration for the MOE's WBCIS.

3.2.4 Observation

As the project is for MOE's WBCIS, the current search system of the MOE system had been reviewed. Through this technique, the method of searching circular and type of file used in the current system has been observed and defined. Besides, the current system is test to find out the functionality and the problem faced by the system itself. Review has been carried out to see whether it is economic to apply the new system and whether there is enough equipment to develop the new system.

3.3 System Requirement Analysis

Under the system requirement analysis, the needs of the proposed users of the system were defined. We have plan a broad outline of the system, the technology to be used and the expected cost of the system. After the definition and planning, MOE's WBCIS is defined as a project that used to search education circular of Malaysia. It provides a friendly, faster and easier way for the user in their searching. It is a systematic system that simplifies the work done by the administrator too.

The project is divided into two main parts which one of them the user module whereas another main part is to let the administrator to upload or delete files from database.

3.3.1 Functional Requirement

A functional requirement describes an interaction between the system and its environment. Further, it describes how the system should behave given the certain stimuli.

Functional Requirement for User

i. User able to search circular based on keyword (title), date (dd/mm/yyyy) and type of circular.

ii. User able to cancel the current search by clicking the Clear button.

iii. A page of the relevant finding will be displayed after the search.

iv. Set the number of entry.

v. The corresponding URL for each circular from database is displayed.

Functional Requirement for Administrator

i. Enable administrator to update circulars into database in Administrator Module.

ii. Enable administrator to download, delete and edit file from database.

iii. Password and user names are located for administrator to increase security.

3.3.2 Limitation of MOE's WBCIS

i. MOE's WBCIS only can search for the five types of education circulars that are 'Pekeliling Ikhtisas', 'Pekeliling Perkhidmatan', 'Pekeliling Khas' and 'Pekeliling Perbendaharaan' and 'Pekeliling dan Surat Pekeliling Perkhidmatan Awam'

ii. Only 'Bahasa Malaysia' allows in search criteria as most of the circulars are in the mentioned language.

iii. Only 10, 20 or 30 entries are allowed for each search.

3.3.3 Non-Functional Requirement

A non-functional requirement or constraint describes a restriction on the system that limits one choice for constructing a solution to the problem. Below stated some of non-functional for MOE's WBCIS circular web-based search engine.

1. Reliability

   Reliability is the extents to which a system can be expected to perform its intended function with required precision and accuracy. Thus, the system should be reliable in performing its daily functions and operations. For example, whenever a button is clicked, the system should be able to perform some functionality or generate some message to inform the user what is happening.

2. Scalability

The scalability is to promise the capability of the system to migrate as a client or server to machines of greater or lesser power, depending upon requirements, with little or no change to underlying components. Database scalability issues can be resolved using distributed database architecture whereas web application scaling can be addressed by increasing bandwidth or by additional web servers.

3. Usability

The system should be developed in such as way that it is easy to use. It will enhance and support rather than limit or restrict the original process.

4. Security

The system should be equipped with sufficient security. Each access by the user should be authenticated and validated by the system. The system should not show any potential of leakage of information. The password should be encrypted.

5. Inter-Operability

The system has the capability to work with different types of applications to share data and process. The system can be integrated with the MOE's circular web-base search engine and other MOE system by just inserting the path into the main page.

6. On-Time

The system should be developed within the given time frame. In this period of time, all the requirement and also testing should be completed.

7. Manageability

The modules within the system should be easy to manage. This will make the maintenance and enhancement works simpler and not times consuming.

8. Flexibility

The system should have the capability to take advantage of new technologies and resources. The system should be able to implemented in the changing environment.

3.4 Tools and Technology Proposed

After analyzing all the available tools and software in Chapter 2, the most suitable tools and software development for MOE's WBCIS has been proposed.

3.4.1 Development Software

The software chosen are listed as below:

Visual Interdev 6.0

- Visual Interdev 6.0 is an advance editor for the ASP coding. It contains a great enhanced integrated development environment (IDE). It employs a tab metaphor to

enable us to easily transfer between different view of our project. The Properties window displays the properties for any object in the Visual Interdev Project 6 project including HTML Web Pages, Active Server Pages (ASP), ActiveX controls, and Java applets. This window enables the user to visually inspect the properties that have been set for an object and customized them to meet the needs of their applications.

Windows 95 Personal Web Server

- ASP web pages can be developed offline by using the windows 95 Personal Web Server (PWS). It replaces the IIS as the web server. It saves cost and time of development.

Visual Basic 6.0

- Visual Basic 6.0 is used as an add-on to ASP to develop modules of the system and also the ActiveX DLL file. It is easy to use through a graphical interface. It is widely accepted in developing different types of applications.

4. Adobe PhotoShop

- The Adobe PhotoShop is chosen to design the graphical picture that for the system. Using it, a lot of good and colorful graphical pictures can be easily produced in a short period of time.

3.4.2 Server and Server Platform

The server and server platform chosen are listed as below:

1. Windows NT 4.0 Server

   It is the main server operating system. It is user friendly, stable and provides the NT authentication and files system that can be used in the system's data repository components.

2. Internet Information Server 4.0 (IIS 4.0)

   Windows NT 4.0 operating supports IIS 4.0 very well. As a result of that, IIS 4.0 is chosen as the web server. It enables ASP scripts to process user demands from the database.

3. Microsoft SQL Server 7.0

   It is the systems database platform. It is stable and work well with other Microsoft end product. It supports multi-user environment. It can handle more burden of database processing even in a distributed environment. The database built can be easily integrated into others database platform using ODBC.

4. Internet Explorer

Internet Explorer is the most suitable browser for this system. IE 5.0 is needed for this web-application system. It supports most of the HTML scripts and also the Active X DLL that are used in the project.

3.4.3 Others Language Use

SQL Language

As SQL is a universal database query language that can be adapted into all the server operating system. The simple command like select, update, insert and delete can be used to select, updated and deleted data from the database. It is well supported by SQL server. It is easy to use and can be learned within a short time.

3.5 Summary

As conclusion, study has been carried out on the proposed MOE's WBCIS to find out the suitable methodology and functional requirement used. Waterfall Methodology has been chosen for its stability and structure. Various techniques of gathering information have been reviewed to gather sound and good information as guidance to the proposed system. Limitations of MOE's WBCIS have been clarified to lessen the doubt of future user. The development software and tool have been rectified as well.

CHAPTER FOUR:
SYSTEM DESIGN

4.1 Introduction

System design is a creative process of transforming the problem into solution and the description of the solution (Pfleeger, 1998). System design involves designing of program, forms of input, user interfaces, and database. User requirements and requests will be transform into a working model that can be used as guidance in system design. System design has to go through a thorough modification and testing before coming to a complete system. Amendment has to be done on every occurrence of mistakes especially in coding, user interfaces and database design. Under this chapter, the system design will be discussed into the following few components:

i. System functionality design

ii. Graphical User Interface Design

iii. Database Design

4.2 System Functionality Design

The system architecture, data flow diagram, and system structure chart for MOE's WBCIS will be discussed under the system functionality design.

4.2.1 System Architecture

Though client/server architecture can be very complex, there are generally, two kinds of client/server infrastructures to choose from. They are two and three-tiered. The choice between a two and three-tier architecture should be based on the scope and complexity of a project, the time available for completion, and the expected enhancement or obsolescence of the system. For the MOE-WBCIS, two-tier architecture is chosen base on the following explanation.

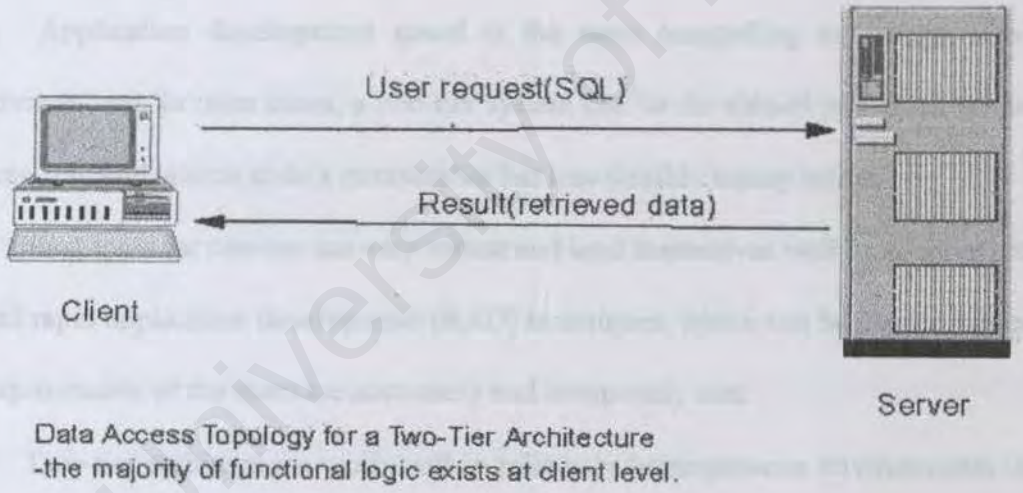


Fig 4.1 Two-tier architecture

Two-Tier Architecture

The two-tiered architecture contains two computers: a client (MOE's WBCIS remote user) and a server with areas of logic combined on the client. The three components of an application-presentation, processing and data are divided among two software entities or tiers: client application code and database server. In a data access topology, a data engine would process requests sent from the clients. Currently, the language used in these requests is most typically a form of SQL. Client sends request through MOE's WBCIS and with the SQL coding that already exist in the system, the dynamic server return the results to user. Presentation is handled exclusively by the client, processing is split between client and server, and data is stored on and accessed through the server.

Advantages of Two-Tier System

1. Application development speed is the most compelling advantage of a two-tier environment. In most cases, a two-tier system can be developed in a small fraction of the time it would take to code a comparable but less-flexible legacy system.

2. Most tools for two-tier are very robust and lend themselves well to iterative prototyping and rapid application development (RAD) techniques, which can be used to ensure that the requirements of the users are accurately and completely met.

3. Two-tier architectures work well in relatively homogeneous environments with fairly static business rules. They are less suitable for dispersed, heterogeneous environments with rapidly changing rules.

4.2.2 Data Flow Diagram

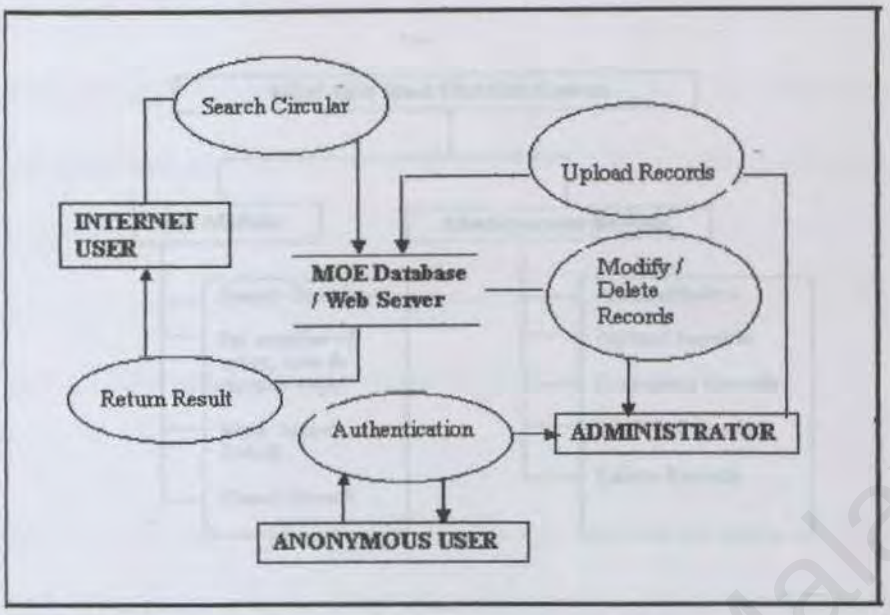


Fig 4.2 MOE-WBCIS Data Flow Diagram

Data Flow Diagram (DFD) indicates the flow of program in a chronological order. It represents how the whole system works in a simple and understandable way. From the diagram, the end user of MOE-WBCIS will be Internet user and administrator. Internet user will key the name circular of circular that they wish to find and send the request through Internet. The searching criteria will base on keyword, title of circular, date (dd/mm/yyyy), number of entries and type of circular. Web server will process the request and return the found result to Internet user. Where as, the system is going to let administrator to upload and delete or modify records from MOE database. This only can be done if the correct user name and password have been provided.

4.2.3 System Structure Chart

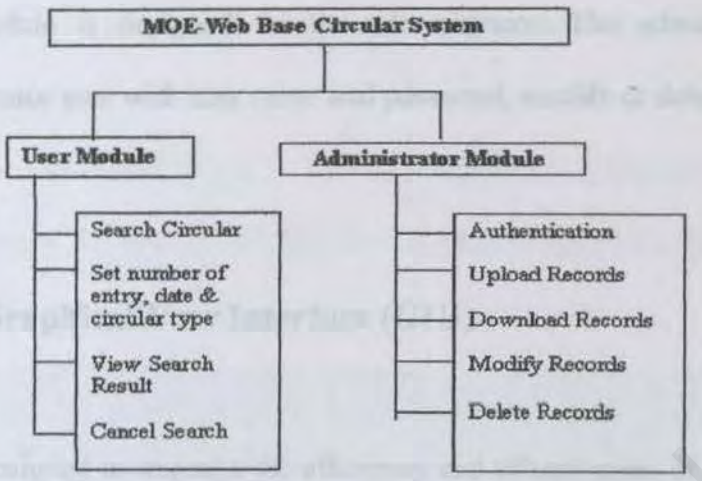


Figure 4.3 MOE-WBCIS Structure Chart

The MOE-WBCIS is divided into two main modules, the user and the administrator. Each module will perform different system function. Each of these modules is further divided into sub-modules as shown in the Figure 4.3.

User Module

This module is designed for the user. This module provides much functionality to the user. The users can search circular, set number of entry for each search, search by date, keywords (title) and circular type, view the search result and cancel search.

Administrator Module

This module is designed for the administrator. The administrator can assign new administrator user with user name and password, modify or delete records of circular from database.

4.3 Graphical User Interface (GUI)

GUI is designed to improve the efficiency and effectiveness of the user and administrator when using the system. Thus, the interface design for the MOE-WBCIS is tentative and amendable. It is easy to understand and easy to use. The users do not have to remember any Dos Commands. User only needs to click on the command button to access the system functions. Interface design for the MOE-WBCIS has been created as friendly as possible. The design is able to prevent failures and improper procedures.

4.3.1 Design of Screen

The design of the graphical user interface for MOE-WBCIS is divided into the administrator screen and the user screen. Fig 4.4 and Fig 4.5 indicate sketches for the user and administrator respectively. Both figures are not complete design since there might have many modifications need to be solved during process of developing the system. To access

the function of the system, the user access to the MOE web page (http://www.gov.my) and key in the desired circulars. A page with important features in Fig 4.5 will be displayed with introduction added (information regarding types of circulars, importance of circulars and the likes). For the administrator part, graphical interface design for the system is divided into two frames (Fig 4.5). The left frame contains the menu control while the right frame contains the task or the function display for the selected control. Following are outline of the graphical interface design for the MOE-WBCIS.

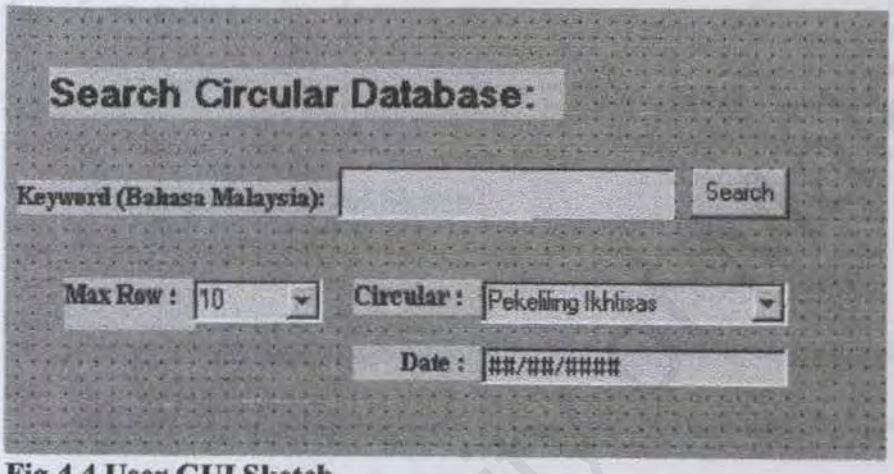


Fig 4.4 User GUI Sketch

The search criteria will be based on keywords, max rows of output, types of circulars and date. Max Rows indicates the number of circulars as output. The number will be 10, 20 or 30 per search. Circulars are divided into 'Pekeliling Ikhtisas', 'Pekeliling Perkhidmatan', 'Pekeliling Khas', Pekeliling Perbendaharaan' and 'Pekeliling dan Surat Pekeliling Perkhidmatan Awam'.

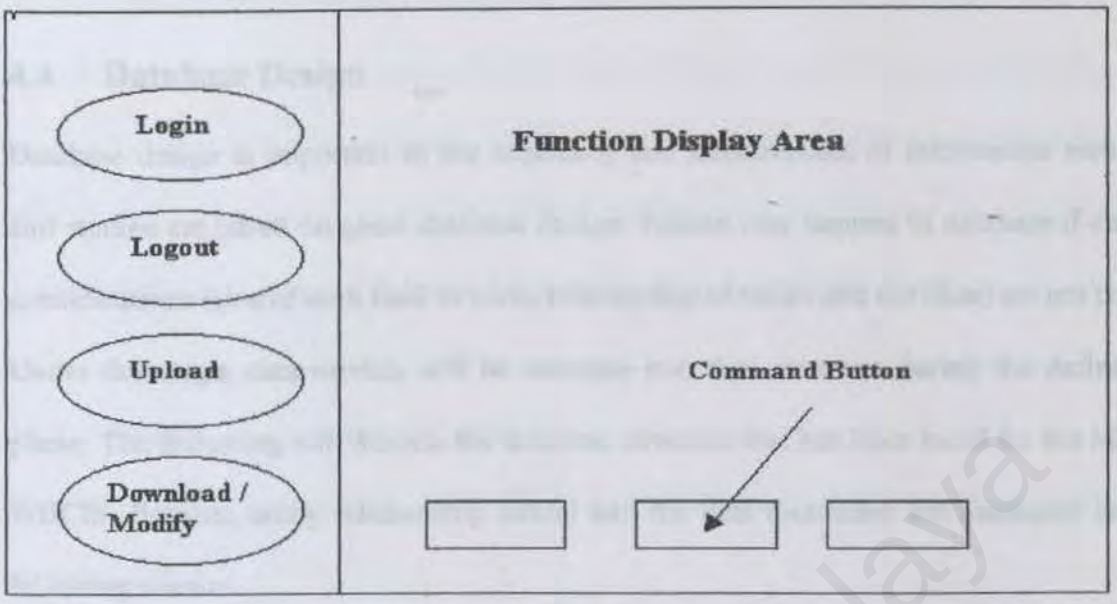


Fig 4.5 Administrator GUI Sketch

While for administrator, menu control will include login, logout, upload and download or modify features. For instance, when administrator choose Login, function display area will provides user name and password columns respectively. Command buttons will display 'Enter' and 'Cancel' to execute or abort the Login function. For Logout function, message like "Are you sure to exit?" will display while command buttons will change to 'OK' and 'No'. For Upload, Download or Modify functions, the five types of circular that mentioned in user module will be displayed in function display area. Administrator has to choose one type of the circulars. The command buttons will change to 'Upload', and 'Undo' for Upload function while 'Download', 'Modify' and 'Undo' for Download/Modify function.

4.4 Database Design

Database design is important as the efficiency and effectiveness of information retrieval and storage are based on good database design. Failure may happen to database if earlier considerations (size of each field in table, relationship of tables and the likes) are not taken. Under this stage, data models will be translate into data structure during the definition phase. The following will discuss the database structure that has been build for the MOE-WBCIS. Besides, entity relationship model and the data dictionary are discussed in the following session.

4.4.1 Database Structure

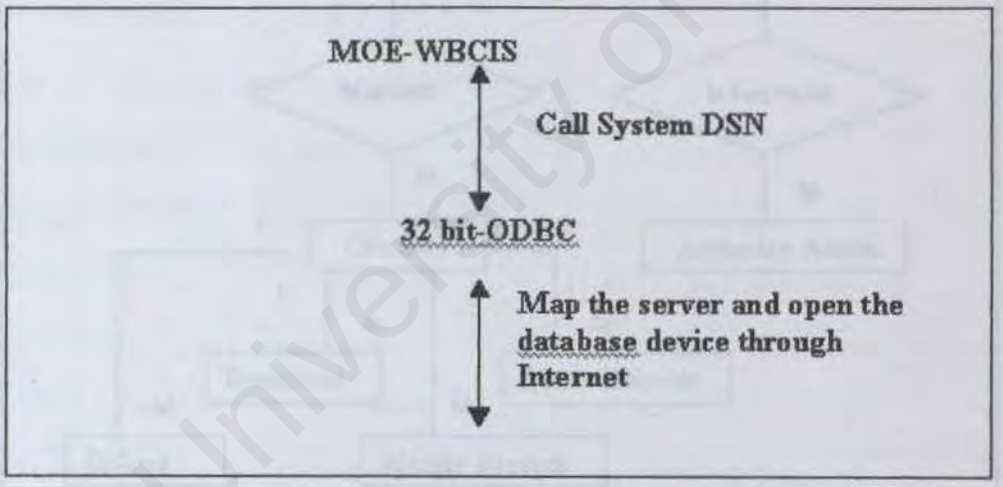


Fig 4.6 The Mapping of Database to Application

MOE-WBCIS uses Microsoft SQL Server 7.0 as the database platform. Fig 4.6 illustrates the mapping of the SQL Server to the application via ODBC. When a user clicks the search button in remote area, MOE's WBCIS will call the Data Source Name (DSN) to establish

the connection string of system to database. The system DSN that drives the connection is SQL Server. 32-bit Open DataBase Connectivity (ODBC) is used to stores information on how to connect to the data provider. Here, the data provider is SQL Server (with MOE's WBCIS database stored). Through the ODBC, MOE's WBCIS database device is opened and information in database accessible. Requests are processed and return to user.

4.4.2 Entity-Relationship (E-R) Model

The following figure is the relationship of the database that illustrated with an E-R diagram.

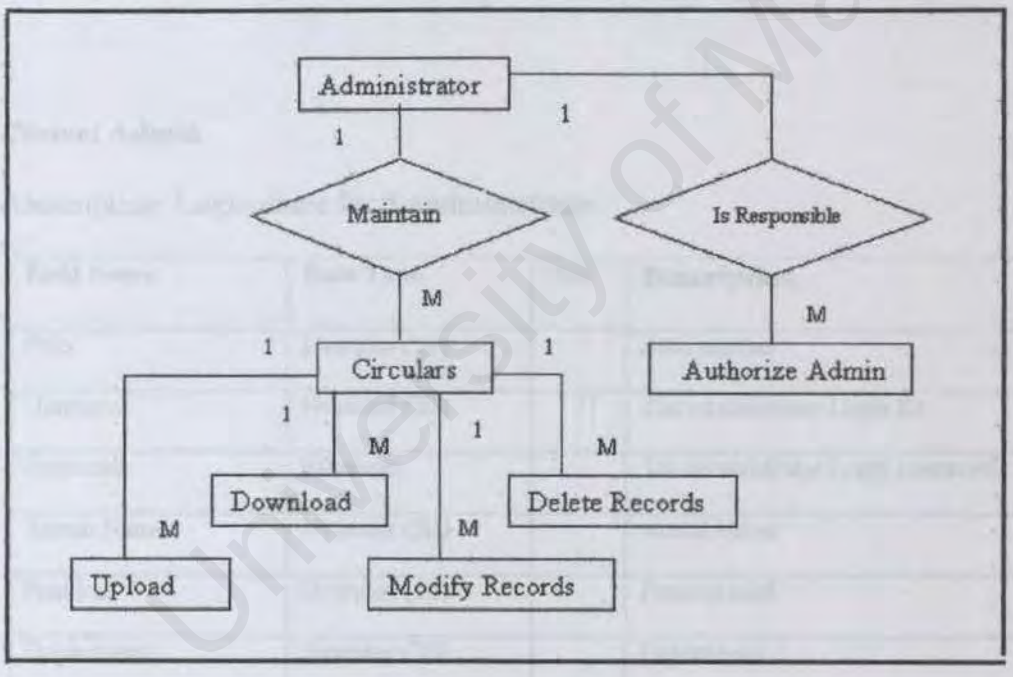


Figure 4.7 MOE-WBCIS Database E-R Diagram

From the Entity-Relationship diagram, the Administrator is responsible to Authorize Admin and Maintain Circulars. The Administrator needs to assign authorize user as administrator to the system and maintain the records on circulars. The relationship between Circulars-Upload, Circulars-Download, Circulars-Modify Records and Circulars-Delete Records is one to many.

4.4.3 Data Dictionary

The following are the data dictionary that explains the items and fields of the database that used in the MOE's WBCIS. The database name is MOECS. It is named **MOECS** to represent the Ministry of Education Circular System.

Name: Admin

Description: Login name for the administrator.

Field Name	Data Type	Null	Description
*No	Nvarchar (20)		Auto number
Username	Nvarchar (20)		The administrator Login ID
Password	Password		The administrator Login password
Admin Name	Nvarchar (20)		Actual Name
Position	Nvarchar (20)		Position hold
Department	Nvarchar (20)		Department
Remarks	Nvarchar (20)		Coments
MyDate	Date		Date User Join System

Table 4.1 Admin Table

Name: Circulars

Description: Circulars record from MOE

Field Name	Data Type	Null	Description
CirID	Decimal		The Circular ID for the record
*Title	Nvarchar(100)		The title of the circular
*CirDate	Datetime		The date of the circular
Keywords	Nvarchar (100)		Keywords
Description	Nvarchar (100)		The circular status (available or not)
CirType	Nvarchar (20)		Type of circular Ikhtisas, Perkhidmatan, Khas, Perbendaharaan, Perkhidmatan Awam
Location	Nvarchar (20)		Physical directory

Table 4.2 Circular Table

Name: GuestBook

Description: Capture message from search user

Field Name	Data Type	Null	Description
ID	Decimal		Number of records
Name	Nvarchar(20)		The title of the circular
Email	Datetime		The date of the circular
Date_Entered	Nvarchar (20)		Keywords
URL	Nvarchar (20)		The circular status (available or not)
Message	Nvarchar (100)		Physical directory

Table 4.2 GuestBook Table

* Represent the **primary key**

4.6 Output Expectation

The design of output serves the purpose of providing the information that the user needs, based on the criteria selected by the users. The MOE-WBCIS provides the functions of searching and retrieving circulars based on the MOE database. The output is design in such a way that can be easily comprehended by user. Below is the draft outline of design of the output for user module.

MOE Circular Search Result
Search Topic : *Discipline*

No	*Score*	*File*	*Title*
1	0.99	1/1999	Kelakuan Pelajar
2	0.98	3/1995	Masalah Disiplin
3	0.97	2/1997	Tindakan Tatatertib
4	0.97	4/2000	Tindakan Tatatertib(2)
5	0.96	6/1976	Tanggungjawab Pihak Sekolah
6	0.96	4/1980	Kesan Negatif Gejala Masyarakat
7	0.80	2/1991	Masalah Disiplin(2)
8	0.71	1/1992	Program Kaunseling
9	0.60	3/1994	Kaunseling Karier
10	0.20	2/1990	Kaunselor

Fig 4.6 Outline Design for User Output

From Fig 4.6, four columns will be displayed after user key in the search circulars, first column indicates number, following by score, then file name and lastly title of the document. Score means the percentage of relevance for a circular in the user's search. There is a hyper link to each title so that user can view the found circular. Full text of circular available in each HTML file.

4.7 Summary

A good system design will lead to easier development of a system. In this chapter, the system architecture, data flow diagram, system structure chart, graphical user interface, database and expected output of system have been designed. However, all these designs might need minor or major changes as there is no promise that all the primary designs are good and perfect. Amendments might occur during process of developing MOE's WBCIS.

CHAPTER FIVE: SYSTEM IMPLEMENTATION

INTRODUCTION

Under this stage, the design model of the Ministry of Education's Web Based Circular Information System (MOE's WBCIS) site is transformed into a workable product. The system implementation of the MOE's WBCIS will be divided into two components, which are the platform development and the modules implementation.

5.1 SYSTEMS REQUIREMENTS

Currently, the specifications of the two machines for development in this project are:

(Server)	(Client)
– runs Windows 2000 Server, Microsoft SQL Server 7.0 and Internet Information Server 4.0 – consists of 128 MB RAM with a Pentium processor 266 MHz or above and a NIC (Network Interface Card) of Ethernet 10/100Mbps speed.	– runs Windows 98 or Windows NT Workstation 4.0, Visual InterDev 6.0, Visual Basic 6.0, Internet Explorer 5.0, and Personal Web Server / Internet Information Server 4.0 – consists of 64 MB RAM with a Pentium processor 266 MHz or above and a NIC of Ethernet 10/100Mbps speed.

Table 5.1 : Systems requirements

It is obvious that Server is in bottleneck state since it is running several servers at the same time in one machine. The state is caused by the competition for memory resource and CPU time by IIS5.0 and Microsoft SQL Server 7.0.

In the Server, the amount of RAM and the processing power are adequate to perform the tasks of a server, although the processor can be upgraded to a faster processor for optimization.

As in Client, its specification still enables it to run smoothly with an acceptable response time to developers during the development and testing stages.

5.1.1 FUNCTIONS OF DEVELOPMENT TOOLS

Tools/software used for development include those meant for:

i) Operating system – Ms Windows 2000

ii) Tools for Coding – Ms Visual InterDev 6.0, Ms Visual Basic 6.0, Ms Internet Information Server 5.0, Ms FrontPage.

iii) Graphics Design Tools – Adobe Photoshop 5.0, Ms Paint, Macromedia Dreamweaver3.

iv) Browser of web pages – Internet Explorer 5.0 or above

5.1.2 PROGRAM CODING TOOLS/SOFTWARE

a. Ms Visual InterDev 6.0

Creates ASP Script, Java Script and VB Script and refines web pages for the whole system.

b. Ms Internet Information Server 5.0

Maps local directory to virtual directory. Creates local web site.

c. Ms Transaction Server 4.0

Storing components (*dll* files) in newly created packages.

5.1.3 DATABASE IMPLEMENTATION TOOLS

a. SQL Server 7.0

Create new database and table and fields for storing data of circulars. Create and test queries.

b. SQL 7.0 Enterprise Manager

View and edit tables created in the database. View relationships between the tables.

5.1.4 GRAPHICS CREATION TOOLS

a. Adobe Photoshop 5.0 and Macromedia DreamWeaver3

Create and maximizing graphics quality.

b. Ms FrontPage 2000

Add in useful components such as combo box, table, text field, button, ActiveX control, applet or flash plug in designing the page.

5.2 Platform Development

The platform development will include setting up the Windows 2000, SQL 7.0 Server and configure the IIS server. Servers and development tools installations are the very first step before starting off with any development work. When using Microsoft's products, it is essential to know the sequence of products installations to ensure smooth execution without system errors. Hard disk is formatted using NT File system format to ensure a more stable and secured NT transaction across the platform. Several steps are involved during the installation.

5.2.1 Setting Windows 2000 Server

1. First, install Ms 2000 Server with Service Pack 1.
2. Install network components that are needed like DNS and RAS.
3. Install IE 5.0.
4. Install IIS 5.0, Index Server, Ms Transaction Server etc. from Control Panel.
5. Install Visual Studio 6.0 (with Visual Basic 6.0 and Visual InterDev 6.0 included)
6. Install Ms SQL Server 7.0, SQL Service Pack and other BackOffice 4.0 components if needed.

5.2.2 Setting SQL Server

The SQL server was installed in main server. After the Microsoft SQL server had been installed successfully, databases named **MOECS** was created. Then, I created the tables according to the database design. This database will become the database storage for the system. The tables were created for keeping the data used in all modules of the MOE's WBCIS web site.

We allocated the hard disk space for the database to maximize the performance of the SQL server and to ensure there is enough of space to store the record. The file growth of the database is set to 10% of the original database size.

5.2.3 Configure Internet Information Server

After installing the IIS, the virtual directory was created so that the user can access the application. The users can access the application through the following address. **http://SeverName/moe.gov.my/default.asp**. This will be taught in detail in user manual.

5.3 Coding Approach

Most of the time, this system is designed using ASP script. Java and VB script are used to add in more features for the web pages. There are two main approach used in the coding, that is the searching and admin codes.

5.3.1 Searching

For searching part, two modules were implemented. One is simple searching while the other is complex searching. For both the modules, users can search circulars based on 3 criteria such as circular type, date and keywords.

User can browse or search circulars with three conditions:

1. With circular type and keywords but without date.
2. With circular type and date but without keyword.
3. With circular type, keywords and date.

Portion of the important sample codes for searching are as follow:

```
'2)with date and keyword
Elseif  DocMonth1 <> "00" AND DocDay1 <> "00" AND DocYear1 <> "" AND DocMonth2 <> "00" AND
DocDay2 <> "00" AND DocYear2 <> "" AND katakunci <>"" then
        Response.Write "with keyword and date<BR>"
        if len(KC1)=0 THEN
        Response.Write "<B>Sila masukkan kata kunci!</B>"

        elseif len(DocYear2)<>4 or len(DocYear1)<>4 or not isnumeric(DocYear1) or not
      isnumeric(DocYear2) then
                        Response.Write "<B>Sila masukkan tahun dengan betul!</B>"
        ELSE
                Response.Write " Jenis Pek:" &DocType &"<BR>"
```

```
Response.Write " Hasil Pencarian Untuk : <B>" &KataKunci &"</B><BR>"

'set connection to database

set con= Server.CreateObject("ADODB.Connection")

con.Open strDB

'recordset object

set rs = Server.CreateObject("ADODB.Recordset")

rs.CursorLocation = adUseClient

rs.PageSize = maxRow

rs.CacheSize = maxRow

'Searching the records for the keywords entered base on keywords, description field, dates, cirtype


Select Case UBound(Keyword)

    Case 0    rs.Open "select * from Circulars where CirType = '" & DocType &
              "'" & _ " AND CirDate >= cdate('" & DocfrmDate & "') AND CirDate
              <= cdate('" & DoctoDate & "') AND (Keywords like '%" & Keyword
              (0) & "%' OR Description like '%" & Keyword(0) & "%') " & _
              " order by CirDate desc", con , adOpenForwardOnly,
              adLockReadOnly, adCmdText

    Case 1    rs.Open "select * from Circulars where CirType = '" & DocType &
              "'" & _ " AND CirDate >= cdate('" & DocfrmDate & "') AND CirDate
              <= cdate('" & DoctoDate & "') AND (Keywords like '%" & Keyword
              (0) & "%' OR Description like '%" & Keyword(0) & "%') " & _
              " AND (Keywords like '%" & Keyword(1) & "%' OR Description like
              '%" & Keyword(1) & "%') order by CirDate desc", con

    Case 2    rs.Open "select * from Circulars where CirType = '" & DocType &
              "'" & _" AND CirDate >= cdate('" & DocfrmDate & "') AND CirDate
```

```
            <= cdate('" & DoctoDate & "') AND (Keywords like '%" & Keyword
            (0) & "%' OR Description like '%" & Keyword(0) & "%')" & _
             " AND (Keywords like '%" & Keyword(1) & "%' OR Description like
            '%" & Keyword(1) & "%') AND (Keywords like '%" & Keyword(2) &
             "%' OR Description like '%" & Keyword(2) & "%') order by CirDate
             desc", con
Case ELSE rs.Open "select * from Circulars where CirType = '" & DocType &
            "'" & _" AND CirDate >= cdate('" & DocfrmDate & "') AND CirDate
            <= cdate('" & DoctoDate & "') AND (Keywords like '%" & Keyword
            (0) & "%' OR Description like '%" & Keyword(0) & "%')" & _
            " AND (Keywords like '%" & Keyword(1) & "%' OR Description like
            '%" & Keyword(1) & "%') AND (Keywords like '%" & Keyword(2) &
            "%' OR Description like '%" & Keyword(2) & "%') AND (Keywords
            like '%" & Keyword(3) & "%' OR Description like '%" & Keyword(3)
            & "%')" & _" AND (Keywords like '%" & Keyword(4) & "%' OR
            Description like '%" & Keyword(4) & "%') ORDER by CirDate
            desc", con
        End Select


' If the returning recordset is not empty
        If not rs.EOF then
        totalpages = rs.PageCount
        rs.AbsolutePage = currentPage


' Showing total number of pages found and the current page number
```

```
        Response.Write "Muka surat " & currentPage & " daripada " & totalPages &"<br>"
        Response.Write "Jumlah rekod dijumpai : " & rs.RecordCount & "<br>"
        Response.Write "<br><br>"

' Showing relevant records
        Response.Write "<Table Border=1> <TR><TD><B>No<B></TD> <TD><B>
    Bilangan Tahun<B></TD> <TD><B>Tajuk<B></TD> <TD><B>Tarikh Penerbitan
    <B></TD>"
        For i = 1 To rs.PageSize
            If Not rs.EOF then
                rcount = i
                If currentPage > 1 Then
                    For x = 1 To (currentPage - 1)
                        rcount = maxRow + rcount
                    Next
                End If

        Response.Write "<TR><TD>" & rcount & ")" & "</TD>" & "<TD>"
    & "<B><a href ='" & rs("Location") & "' >" &rs("Title") & "</a></B>" & "</TD>" & _
        "<TD>" & rs("Description") & "</TD>" & "<TD>" & rs("CirDate") & "</TD></TR>"

            rs.MoveNext
            End If
        Next
        Response.Write "</Table>"
```

```
' Links to move through the records
        If currentPage > 1 Then
        Response.Write "<a href=""" & Request.ServerVariable ("SCRIPT_NAME")          &
        _"?currentPage=" & currentPage - 1 & "&KataKunci=" & KataKunci & _
        "&maxRow=" & maxRow & "&DocType=" & DocType & "&DocfrmDate=" &
        DocfrmDate & _"&DocMonth1=" & DocMonth1 & "&DocDay1=" & DocDay1 &
        "&DocYear1=" & DocYear1 & _"&DocMonth2=" & DocMonth2 & "&DocDay2=" &
        DocDay2 & "&DocYear2=" & DocYear2 & _"&DoctoDate=" & DoctoDate &
        "&btt=" & btt &  """name=B1>Kembali</a>"
                Else
                Response.Write "<u style=""color : silver;"">Kembali</u>"
        End If

Response.Write "          "

        If CInt(currentPage) <> CInt(totalPages) Then

        Response.Write "" & vbcrlf & "<a href=""" & Request.ServerVariables
("SCRIPT_NAME") & _"?currentPage=" & currentPage + 1  &
"&KataKunci=" & KataKunci & "&maxRow=" &  maxRow & _
"&DocType=" & DocType & "&DocfrmDate=" & DocfrmDate &
"&DoctoDate=" & DoctoDate & _"&DocMonth1=" & DocMonth1 &
"&DocDay1=" & DocDay1 & "&DocYear1=" & DocYear1 & _
"&DocMonth2=" & DocMonth2 & "&DocDay2=" & DocDay2 & "&btt=" &
btt & "&DocYear2=" & DocYear2 & _"""name=B1 value=Cari>Seterusnya</a>" & vbcrlf
```

```
                    Else
                        Response.Write "<u style=""color : silver;"">Seterusnya</u>"
                End If
        Else
        Response.Write "<b>Maaf, tiada rekod dijumpai. Sila cuba lagi.</b>" & vbcrlf
        End If
' Done, Now release Objects
        con.Close
        Set con = Nothing
        Set rs = Nothing
        End If
```

The algorithms for the searching codes are:

1. Open a connection to database.
2. Create a server recordset.
3. Create a powerful SQL statement.
4. Execute the SQL statement using the opened recordset.
5. Showing the records found into a table.
6. Display the document found providing hyperlink to it.

5.3.2 Administration

For the administration part, most of the algorithms are similar to searching but slightly different in ways such as editing, deleting and adding of admin user or circulars can be done in this part.

The algorithms for administration code are:

1. Open a connection to database.
2. Create a server recordset.
3. Create a powerful SQL statement.
4. Execute the SQL statement using the opened recordset.
5. Edit, delete or add the opened records.
6. Displaying the records.

5.3.3 ERROR HANDLING

To ensure that the system handles errors gracefully, global and local functions were included in the codes. An example of the local error is as below:

```
NewCollectionErr:
        OObjectContext.SetAbort
        Set NewCollection = RaiseError("NewCollection")
```

The RaiseError method, which is a global error handling function, will be called upon execution of the third line of the code. The error prompted by the system would contain the error source (which file cause the error), and error description.

5.4 Summary

Chapter 5 describes the approaches used in writing codes, scripts languages used to enhance the whole web pages system and algorithms used in implementing the system. The design of the algorithm is important to make sure a stable system to be developed and minimized the problems occur in future enhancement. Error checking is important as well to make sure that the system runs smoothly and without showing unnecessary error messages.

CHAPTER SIX:SYSTEM TESTING

Introduction

A testing strategy is a general approach to the testing process rather than a method of devising particular system or component test.

Testing provides a method to uncover logical error and to test the system reliability. Some types of tests depend on what is being tested, components, group of components, or the whole system.

In developing a system, testing usually involves several stages. First, each program component is tested on its own, isolated from the other components in the system. Such testing is known as **unit testing** or **component testing**. This stage of testing verifies that the component functions properly with the types of input and output expected from studying the component's design. After each component has been tested, the interaction between these components must be tested again to ensure that the components can be integrated.

When all components have been unit-tested, the next step is ensuring that the interfaces among the components are defined and handled properly. This step is called **integration testing**, also known as module testing, which verifies that the all the components work together as described in the module or system design specifications.

Finally, **system testing** is performed to make certain that the whole system works according to users' specifications. Developers will join the users to perform this stage of testing where the system is checked against the users' requirements description. If there is a need for change, system modification will then be carried out if the users' requirements were not met as described in the specifications. If the users are satisfied with the system's characteristics, the system is ready to be deployed for use.

For this system, the top-down testing is used, to test the system components as soon as it is coded. Top-down testing tests the high-levels of a system before testing its detailed components. After the top-level component has been tested, its stub components are implemented and tested. This process continues recursively until the bottom-level components are implemented.

6.1 UNIT TESTING

Unit testing concentrates on the smallest unit of software design, which is the module. A module is a collection of components which are independent from each other. After each component unit has been tested, the interaction between these components is tested. Unit testing is done concurrently with the prototyping phase in the development of this project. For example, "registering a new administration user" is one of the sub-modules with many sub-functions, such as insertion of user information and error handling, and these functions are tested to ensure that the module is error free.

The code was also examined and debugged in order to identify any fault coding. Debugging ASP codes were difficult, as there were no proper ASP debugger and tester used in the project. The "Response.Write" command is inserted into the code to exam the value of the variable. For example

```
<%
        count = Request.form("txtID")
        If icount > 10 then
                Displaydata()
        End if
%>
```

The code can be debugged as below:

```
<%
        count = Request.form("txtID")
        Response.write count & "value"     ' this will print out the value of variable count
        If count > 10 then
                Response.write "Run"       ' this will print out if the statement is run
                Displaydata()
        End if
%>
```

In the development of MOE's WBCIS system, unit testing was done after the development of each module and not the end of the development of the whole system. The object and

ASP codes were thoroughly checked and tested to ensure that the functions and data were implemented properly as indicated in the design. If there were errors, debugging would be carried out to identify the error before testing the units again.

Other units that were independently unit-tested are:

1) **Opening** and **closing** of **connection** to the database.
2) **Insertion** of new records into database.
3) **Modification** of existing records.
4) **Validation** of admin user's username and password before granting permission to use the admin system.
5) **Execution** of **SQL** statements.
6) Returned query results from search module based on several criteria.
7) Adding or removing of circular records from or to database.
8) Clearing or updating of the list.

6.2 MODULE TESTING

The objective of module testing (also known as integration testing) is to take unit-tested modules and build program structure that encapsulates all of the related modules. This testing will ensure that the module calling sequence in this project is systematic.

In module testing, two or more units in which either unit that uses output data from or provides input data for another unit were tested in collection. These units have related characteristics to perform a common goal or function such as the search engine function which comprised of SQL statement generating, query form submission, and displaying query results.

All the VB objects (basic and class modules), Java scripts and VB scripts were integrated and tested to ensure the success of the integration. The next step was to combine the execution of ASP scripts and the modules to make sure that the ASP scripts can "communicate" with the modules.

For **user module**, the following test has been carried out:

1. The combinations of different search criteria (**circular type**, **date** and **keywords**) were fully tested.
2. Once the desired criteria have been filled up, the "**Cari**" or "**Search**" is pressed to search for query results.
3. The **accuracy** of the search results was examined from the output results in a table.
4. **Error checking** has been done thoroughly to make sure user key in the correct search criteria.
5. A button "**Pencarian Pakar**" or "**Advance Search**" is inserted in normal search module for usage of advance user.
6. Vice versa, "**Pencarian Mudah**" or "**Simple Search**" is inserted in advance search module for usage of normal user.

7. The "**Back**" and "**Next**" hyperlink are examined well to make sure continuity of records to be displayed.

For **administration module**, the following test has been carried out:

1. The **login module** for admin users is checked to make sure only valid user access to the administration system.
2. Once entering the system, there are four modules allocated in it, that is the **Edit/Delete Records**, **Add New Records**, **Add Admin User** and **Log Out** module.
3. Each module has been tested thoroughly to make sure the reliable data is inserted, modified and deleted through database.

6.3 SYSTEM TESTING

The last testing procedure is system testing. Once all the modules are tested, they are tested in concert to verify that all the elements are functioning and interfacing with each other properly. The testing result will show whether or not the entire system specifications and objectives are achieved.

The three system tests performed are as below:

1) Security Testing

This system is tested to be secured from improper penetration and unauthorized access, for example the implementation of user login.

2) Recovery Testing

This testing was done, where some of the critical services like IIS Admin Service and SQL Service Manager were stopped, and the system recovered properly after rebooting of computer.

3) Compatibility Testing

This test was performed, and the interface functions according to the requirements. The accuracy of data retrieval was high, and the speed of data retrieval was acceptable.

6.4 TEST CASES

As there are too many test cases involved, only two test case examples will be shown.

6.4.1 EXAMPLE 1

Navigation testing for this system is tested to be functioning properly, when all links in the content frame of the web page navigate to the appropriate web pages correctly.

6.4.2 EXAMPLE 2

Log in module was tested when I input different user ID and Password to confirm only the right person can access to the administration system.

6.5 Summary

Testing is one of the important steps in developing a system. Precision and accuracy of output data is considered during this process. Unit, module and integration testing has been carried out for the MOE WBCIS system. The objective of a system will only achieve after all the thorough testing done by different user with different aspects.

CHAPTER SEVEN : SYSTEM EVALUATION

Introduction

Evaluation was implemented more than simply comparing the obtained output with expected information. It also relates to user environment, attitudes, information priorities, and several other concerns that are to be considered carefully before effectiveness can be concluded.

At all phases of the system approaches, evaluation is a process that occurs continuously, drawing on a variety of sources and information.

The role of this evaluation phase was to determine:

1. The extent to which the expected outcomes have been realized,
2. The prescriptive value of the process where extraneous factors were taken consideration.

7.1 One to One Evaluation

It was conducted extensively during the initial information design and development. The procedures were informal and were mainly used to identify potential major problems associated with the planning information design.

The evaluation were carried out by my supervisor and course mates. They have provided me valuable advices and ideas to modify the system for its deficiency.

7.2 System Strength

7.2.1 Web Enabled

The system was based on the web technology. It was using the client server approach that allowed processing load to be shared between the client and the server, thus reducing the burden on the server and allow it to provide better service.

7.2.2 Comprehensive Search Engine

The main objective for this system is to provide a comprehensive search engine. It is capable of letting user to choose their desired search criteria base on date, circular type and keywords with different combinations. The search features also divided into simple search and advance search (Boolean Search).

7.2.3 Simplicity of User Interface

The graphic interface design of the system was designed to let the users feel comfortable and easy-to-use. There are Bahasa Malaysia and English version for the search module as well as administration module. The GUI ensured user friendliness. Thus, the users should find it easy to use.

7.2.4 Scalability

Hardware and applications could be easily added to the existing system without influence the existing applications. This was because the system was not hardware dependent.

7.2.5 More Organized Circulars

With the comprehensive search features, the circulars are organized in a more systematic way. Outputs from the search make it easier for users to do reference and doing research. It's might as well shorten the time needed to search for particular circular.

7.3 System Limitation

7.3.1. Browser Limitation

The system only supports Internet Explorer 5.0 and above. This is due to most of added scripts are written in VB Script, which was not supported by other browser such as Netscape Communicator.

7.3.2. Amendment of Physical Document (Circular)

The admin module is unable to call the Microsoft Word document (known as object) to be edited using ASP code. Admin user can only update details of particular document into database. To edit the document, user needs to open the document manually from the physical directory. This will be explained in detail in the user manual.

7.3.3. Natural Language

The search module is done based on natural language. This means indexer will have to key in comprehensive keywords to the database to make the search more sophisticated. No thesaurus keywords are used. Character such as "", ( ) and others funny character are not allowed in both simple and advance searching.

7.4 Problems Encountered and Solutions

During the entire development of the MOE's WBCIS web site, many and various problems were encountered. Some of them could be overcome through certain solution while some of them were not. The problems that encountered can be divided into different types. The following are some of the problems that arouse during the development process.

7.4.1 Retrieving Samples of Circular from MOE

I only managed to get two types of solid circulars from MOE. For other three types of circular such as Pekeliling Perkhidmatan, Perbendaharaan and Perkhidmatan Awam, I were unable to have it as there are no published book for them. Luckily, with the help of my supervisor, Pn. Abrizah, I manage to get few examples of them.

7.4.2 Set Up and Configuration

The set up of the server are critical for the operation of the application development. However, the setup process took a long time because lacked of experience. Besides, the

repeated failure of the server required re-installation as a remedy and this consumed time and effort. The woes solved with the help of my course mates.

I also encountered problems during the exportation of database from Access to SQL server. After the exportation, some of the data structure of the database was changed and I needed to design the database again.

7.4.3 Changes Requirement from the User

It is very difficult to develop and implement the system when the requirement changes very frequently. Sometimes it is easy to change the requirement, however, the coding need to be changed a lot in order to follow the new requirements.

7.5 Future Enhancement

The future enhancement is a need to enable the system improves its efficiency and effectiveness.

The most important enhancement on this system is the administration user could update details of particular circular simultaneously to database as well as to the physical document itself. This will shorten the time for administrator to do the amendment jobs on circular's document.

The second point is that thesaurus method is implemented in the search engine to add completeness to the search engine besides using only natural language in the keywords field. By this way, many related document could be get easily with a sophisticated search engine.

The third point is to make sure that the system could be run under any browser.

The final point is that current system is only limited to two languages. It needs to be enhanced so that it can support more than two languages. This is due to different organization is using different type of language.

7.6 Knowledge and Experience Gained

Throughout this project, there was a lot of valuable knowledge and experience gained. I have learned how to set up Windows 2000 server. Setup domain for the server and using SQL server to manage the database created. As the project progressed, so did the number of clearer views on how Internet technologies work, ASP concepts and maintaining and configuring IIS. Learning to program in HTML, ASP, VBScript and VB proved to be a valuable experience and knowledge. Throughout the literature survey, there is a new world regarding the Web search engines, client-server architecture, and security issues which opens my eyes to the current technologies.

7.7 Summary

This chapter described briefly on how the MOE's WBCIS system is evaluated. Different views have been suggested by user and solutions have been tried to solve the problem. The system strengths and constraints have been discussed to make users of the system have more clearer picture of the whole system. Future enhancement has been suggested to make the system more advance and complete.

Apart from technical knowledge, there is also non-technical knowledge in which contributed to the completion of the project, such as communication skills, organizing skills, and problem solving skills.

Conclusion

Overall, this project has reasonable achieved its objective and requirements as determined during system analysis phase. This system does not only let users to browse for desired circular, it also enable user search for circulars based on different criteria. The output of the search result is displayed in well manner for easier reference and research work.

The system generates timely, accurate and relevant information. This is very important for almost all the organization. The feasibility of the system depends on how much the organization will benefit from its implementation.

However, there are also some limitations that the system can't be done. It needs to be enhanced in order to transform it to a more advance system. It is hoped that this system will bring benefits to the members of MOE.

Bibliography

[1] http://www.mampu.gov.my/EG/MainPage.htm
Published by Malaysian Administrative Modernization & Information Technology Unit (MAMPU) and Multimedia Development Corridor (MDC)

[2] The Fifth International Conference on Web-Based Learning
October 2-5, 1999
Sponsored by the University of New Brunswick and the WWW Courseware Developers.
http://www.unb.ca/wwwdev/naweb99/schedule/dhtml.html

[3] "Beginning ASP 3.0"
Chapter 12: ASP & Data Store Access, Pg. 461
Wrox Press Ltd.

[4] Cowart, Robert, *Windows NT Server 4*, Sybex, 1997.

[5] REDMOND, Wash. - March 8, 1998

[6] REDMOND, Wash., March 16, 1999,
Aberdeen Group Study Finds SQL Server the TCO Leader for ADP
http://www.image-in-usa.com/pr01.htm

Glossary

1. MOE's WBCIS - Ministry of Education's Web Based Circular Information System
2. EG – electronic Government
3. MSC – Multimedia Super Corridor
4. Circular - A gazette document provided by Government to citizen as references and guidance.
5. MOE - Ministry of Education.
6. MS – Microsoft Company
7. DSN – Data Source Name

8. CSS - Cascading Style Sheet. An extension to HTML to allow styles, e.g colour, font and size to be specified for certain element of hypertext document.
9. DHTML - Dynamic Hyper Text Markup Language. An extension of HTML giving greater control over the layout of page elements and the ability to have web pages which change and interact with the user without having to communicate with the server.
10. GIF - Graphics Interchange Format. A service mark used for colour graphics file format, often used on the World Wide Web to store graphics.
11. GUI - Graphical User Interface. An interface having windows, graphical symbols, pop-down menus and other structures that are often manipulated with a mouse pointer.
12. HTML - Hyper Text Markup Language. A standardized system of tagging text for formatting, locating images and other nontext files and placing links or references to other documents.
13. HTTP- Hyper Text Transfer Protocol. A standard means of using TCP/IP for communicating HTML document over networks.
14. ODBC- Open Database Connectivity. An interface by which application programs can access and process SQL databases in a DBMS-independent manner.
15. SQL -Structured Query Language. A language for defining the structure and processing of relational database.
16. URL -Universal Resource Locator. The address of the file on the Internet.
17. WWW - World Wide Web. A collection of Internet sites that offer text, graphics, sound and animation resources through the hypertext transfer protocol.

USER MANUAL

Figure List

OVERVIEW

Ministry of Education Malaysia's Web Based Circular Information System (MOE's WBCIS) aims to enhance the level of searching and retrieval of government documents by providing an effective and faster way of locating circulars on education.

The objectives of MOE's WBCIS, among others, are to help the MOE staffs to manage the circular system easily and fast. The system provides an interactive and effective search engine that enables users to search and retrieve education circulars via the net.

Thus, this user manual will describe in detail each module involves in the whole system. User manual is important and is believed to be the main guidance for all users to a new system. With this manual written, it is hopefully will help user to drive the system fast, easily and effectively.

System Requirement

(A) The recommended hardware configuration for user module is as follows:

1. Pentium II 233 Mhz and above or AMD K6-2 300Mhz (3D NOW) and above
2. 64 MB RAM and above
3. 100 MB Free Hard disk space and above
4. PS/2 Keyboard (else a converter is required)
5. Quality Display Card

(B) The system runs on Windows 2000 or Windows NT platform. List of certified software are as follows :

1. Microsoft 2000
   - Internet Information Service 4.0 or above (IIS4.0 or IIS5.0)
   - Windows 2000 Service Pack 1

2. Microsoft SQL 7.0
   - To execute database

3. Internet Explorer IE 5.0 or above
   - Enable browsing of circulars

FEATURE LIST:

A. User Module

1. Provides information on circular of Pekeliling Ikhtisas, Pekeliling Perkhidmatan, Pendidikan Khas, Perbendaharaan and Perkhidmatan Awam.
2. Enable user to do fast retrieval of education circulars based on different criteria such as **keywords, date, types of circular** and **number of entries**.
3. User can do simple or expert searching.
4. View the search result of circulars based on maximum hits retrieve.

B. Administrator Module

1. Log In module to let only validate user use the system.
2. Records of database and document can be edited or deleted based on search criteria.
3. Add new records of circular to database.
4. Add new administration user to database.

A. Search Module

1. Main Page

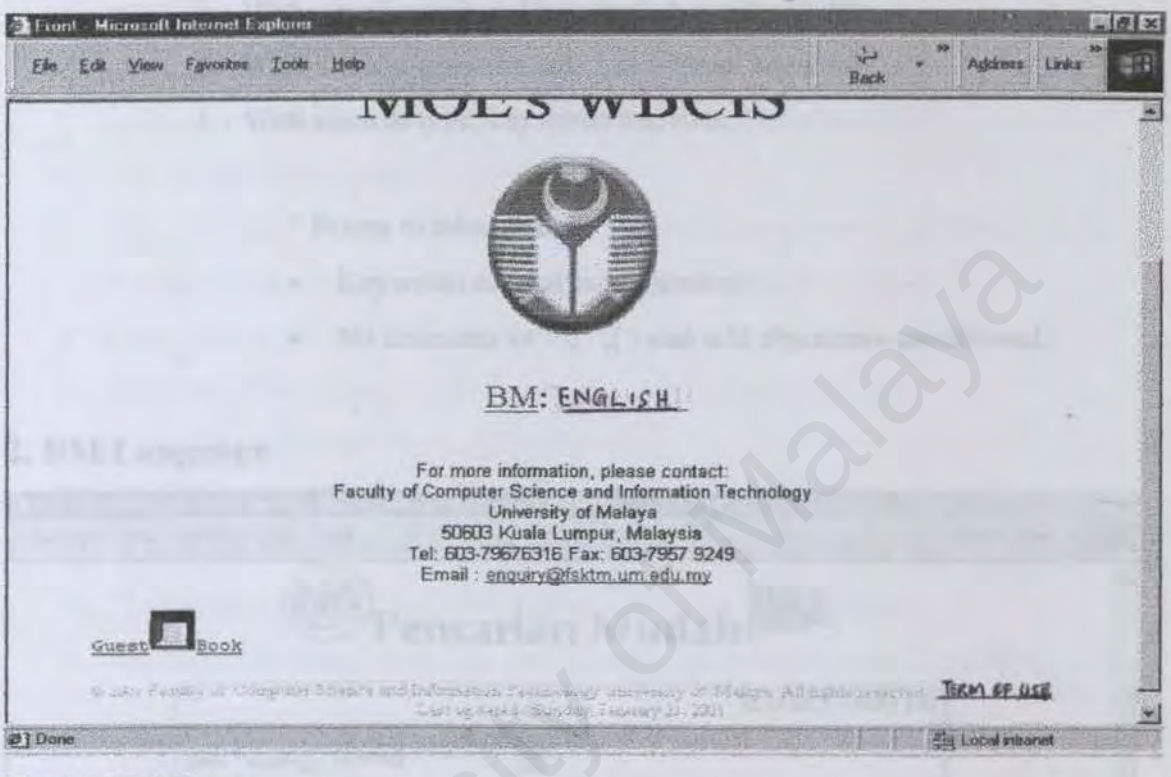


Fig 1.1 Main Page

1. The first page when entering the MOE's WBCIS page will as above.
2. There is a **logo** in this page. It is linked to the administration side when user clicks it. This linkage is mainly for **admin user** only.
3. Below the logo written 2 linkages, one **BM** while the other **English**.
4. BM will lead user to search circulars using Bahasa Malaysia while English is designed for English user only.
5. For any enquiry, user may click the URL enquiry@fsktm.um.edu.my to ask question.
6. User can write in their opinion through **GuestBook**.

7. **Terms of Usage** show the rules of usage for this web page.

Before further explanation, there is one similarity for all search modules. That is the **combinations** of search can be done as follow:

1. With circular type and keywords but without date.
2. With circular type and date but without keyword.
3. With circular type, keywords and date.

* Points to take notes:

- Keywords are not case sensitive
- No character as "", '',( ) and odd characters are allowed.

2. BM Language

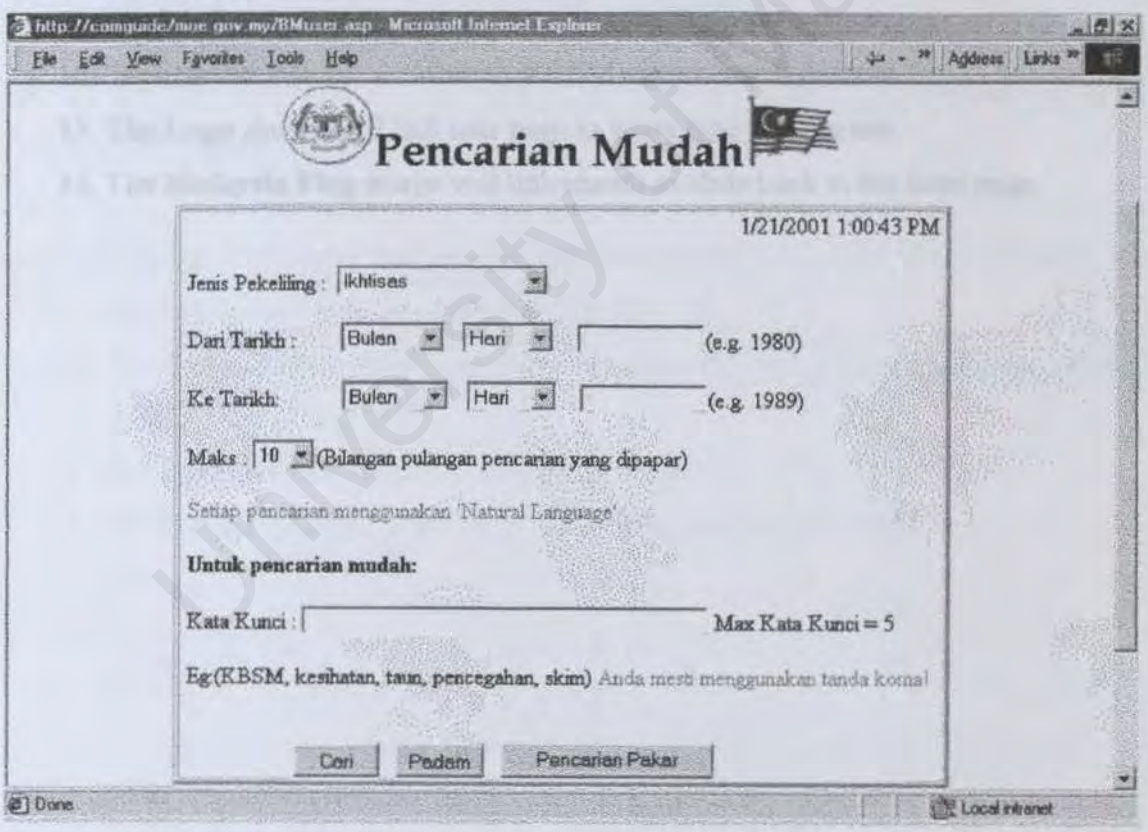


Fig 1.2 BM Simple Search

1. When entering BM language, the first page user see is the simple search module **(Pencarian Mudah)**.
2. The search is using **natural language**.
3. The key words enter must be accompanied by a **coma**.
4. Maximum numbers of keyword are **5**.
5. Users may use mouse or Tab button to maneuver along the page.
6. "**Jenis Pekeliling**" means type of circular.
7. "**Dari Tarikh**" means the beginning of date that user intends to search while "**Ke Tarikh**" means the end of date for that particular search.
8. **Maks** means number of result rows return after the searching done.
9. The field "**Kata Kunci**" will capture the keyword insert.
10. Press "**Cari**" button to search for circulars.
11. "**Padam**" means reset.
12. "**Pencarian Pakar**" will link to the BM expert search module.
13. The **Logo** shown will link user page to www.moe.gov.my site.
14. The **Malaysia Flag** image will link search module back to the front page.

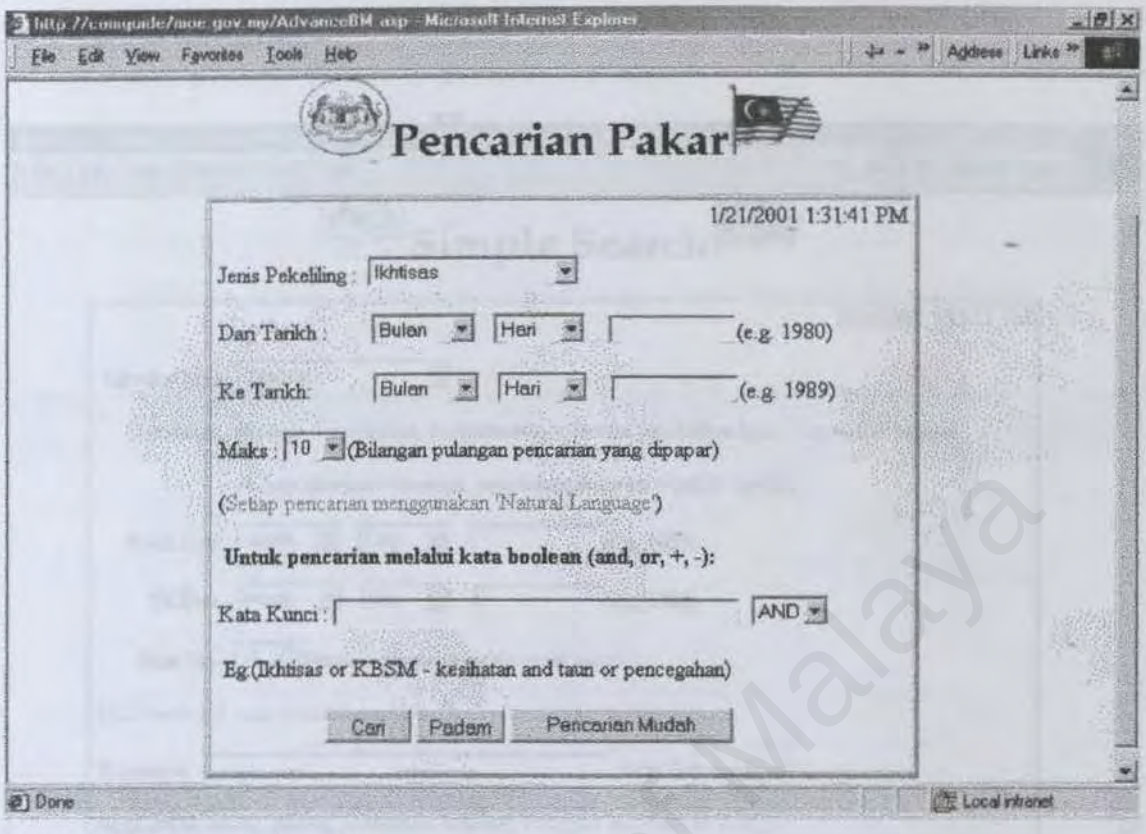


Fig 1.3 BM Expert Search

1. All the fields and explanation are same as Fig 1.2 BM Simple Search from statement 2 to 14 except statement 2 and 9.
2. Here, searching is done using Boolean search. The Boolean character includes **AND**, **OR**, +, - and **NOT**.
3. Keywords are separated by Boolean character.
4. "**Pencarian Mudah**" will link to the BM simple search module.

3. English Language

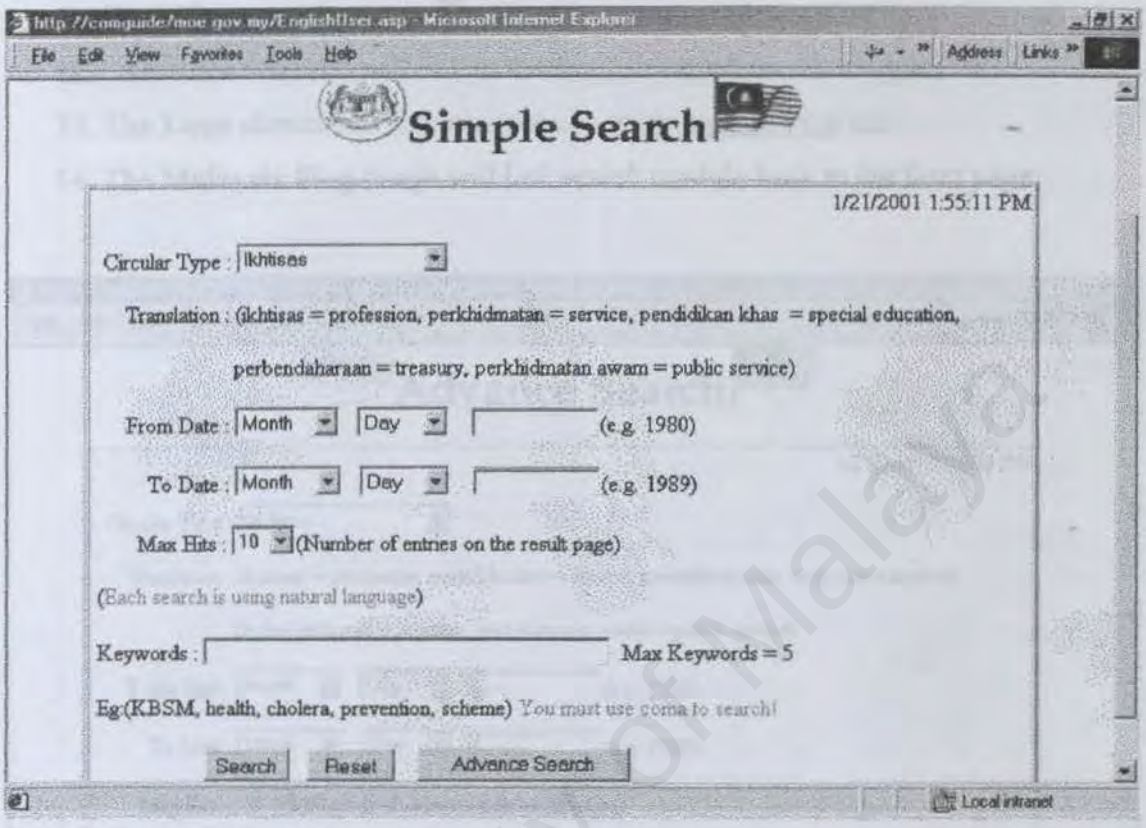


Fig 1.4 English Simple Search

1. When entering English language, the first page user see is the **Simple Search** module.
2. The search is using **natural language**.
3. The key words enter must be accompanied by a **coma**.
4. Maximum numbers of keyword are **5**.
5. Users may use mouse or Tab button to maneuver along the page.
6. "**Circular Type**" means type of circular.
7. "**From Date**" means the beginning of date that user intends to search while "**To Date**" means the end of date for that particular search.
8. **Maks Hits** means number of result rows return after the searching done.

9. The field "**Keywords**" will capture the keyword insert.
10. Press "**Search**" button to search for circulars.
11. "**Reset**" means reset.
12. "**Advance Search**" will link to the English expert search module.
13. The **Logo** shown will link user page to www.moe.gov.my site.
14. The **Malaysia Flag** image will link search module back to the front page.

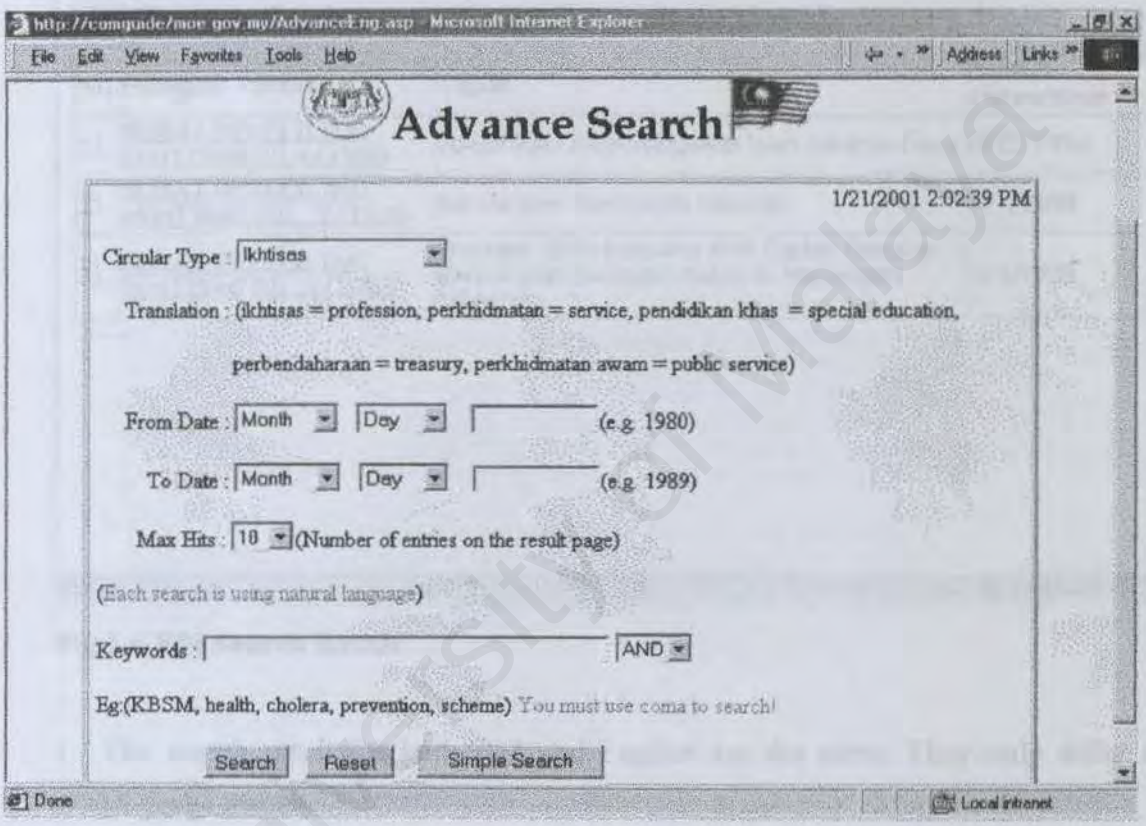


Fig 1.5 English Expert Search

1. All the fields and explanation are same as Fig 1.4 English Simple Search from statement 2 to 14 except statement 2 and 9.
2. Here, searching is done using Boolean search. The Boolean character includes **AND**, **OR**, +, - and **NOT**.
3. Keywords are separated by Boolean character.

4. "**Simple Search**" will link to the Eglish simple search module.

4. Search Result

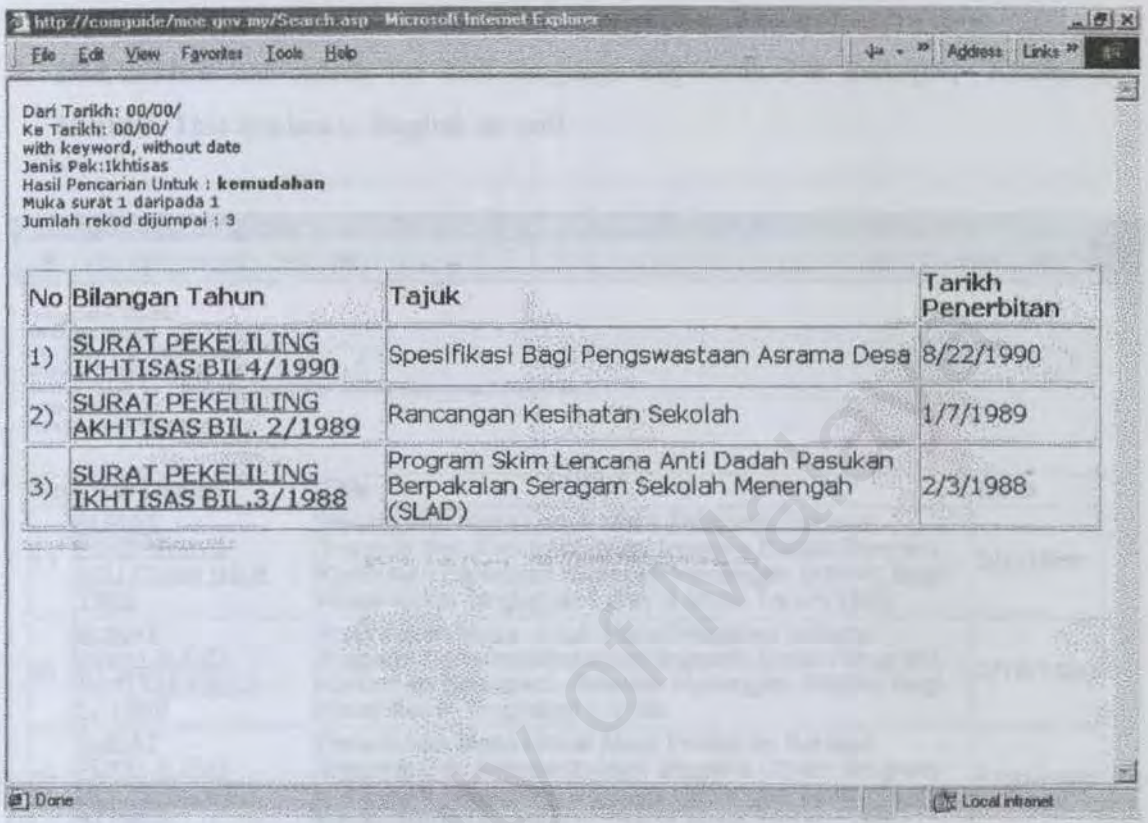


Fig 1.6 BM Search Result

1. The search result for both BM and English are the same. They only differ in language display.
2. The **date**, **search combinations**, **types** of circulars, **keywords** entered, **page number**, **total** records found will be displayed at the beginning of page.
3. The search result is return as table.
4. "Bilangan Tahun" shows the listing year of the particular circular.
5. "Tajuk means title of circular.
6. "Tarikh" means date.

7. To see the document, click the hyperlink from "Bilangan Tahun" and it will display the particular circular.
8. The "Kembali" and "Seterusnya" link the display result if they are more than the max row as set earlier.
9. BM module can search for both language keywords. For example, "Kesihatan, Health". This implies to English as well.

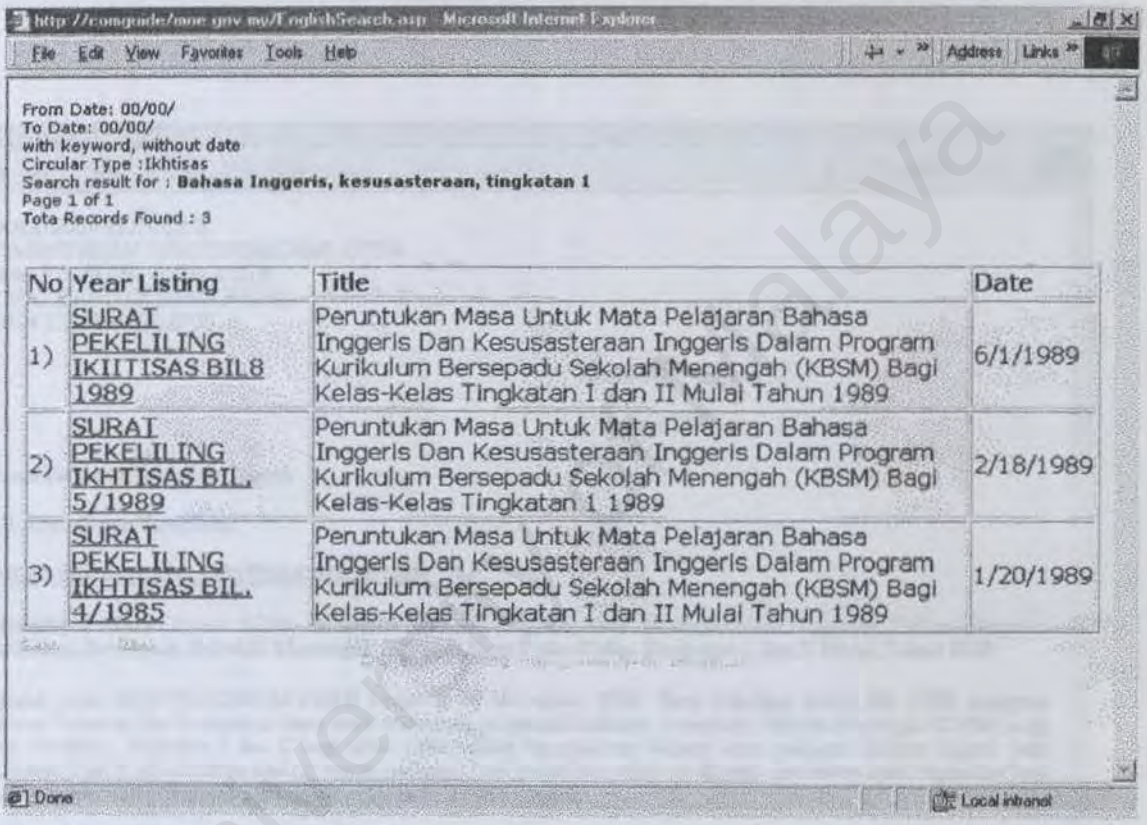
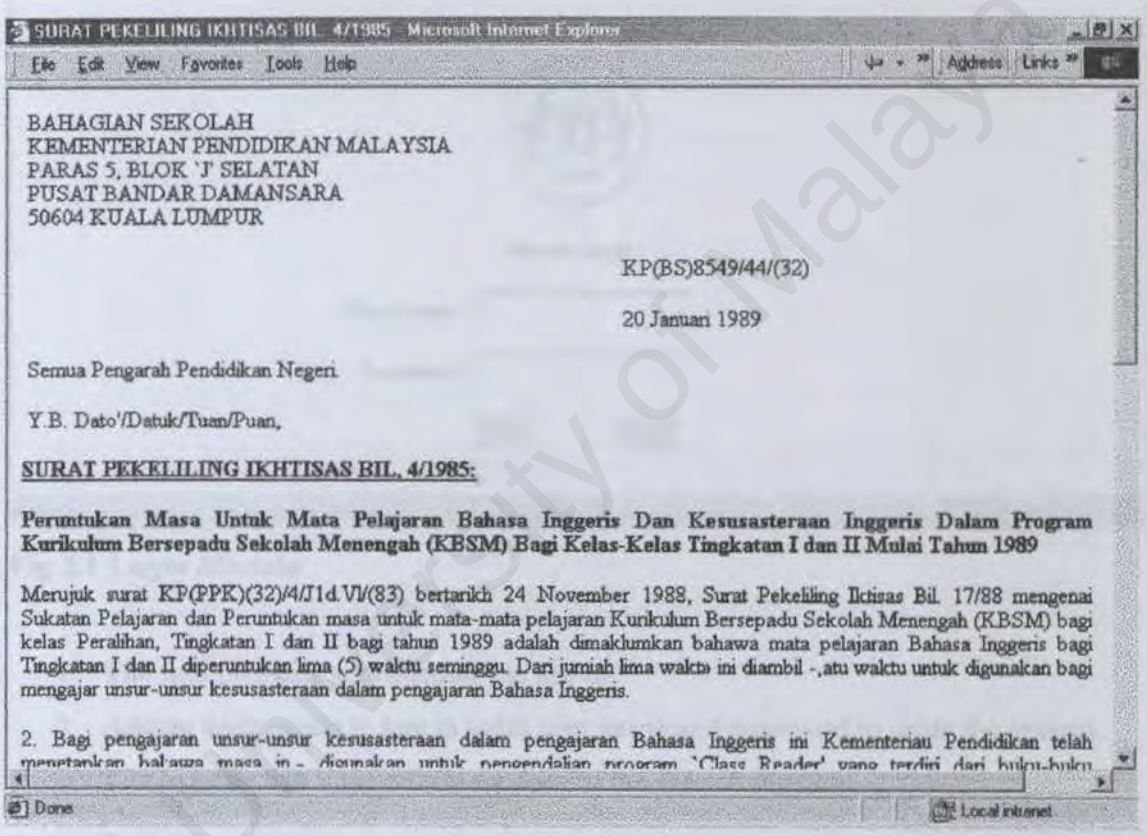


Fig 1.7 English Search Result

1. Almost all the display feature in English same as BM in fig 1.6 BM Search Result.
2. The **date, search combinations, types** of circulars, **keywords** entered, **page number, total** records found will be displayed at the beginning of page.
3. The search result is return as table.
4. "Listing Year" shows the year listing of the particular circular.

5. "Title" means title of circular.
6. "Date" means date for that circular.
7. To see the document, click the hyperlink from "Year Listing" filed and it will display the particular circular in HTML form.
8. The "Back" and "Next" link the display result if they are more than the max row as set earlier.
9. English module can search for both language keywords. For example, "Kesihatan, Health". This implies to English as well.


SURAT PEKELILING IKHTISAS BIL. 4/1985 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address Links

BAHAGIAN SEKOLAH
KEMENTERIAN PENDIDIKAN MALAYSIA
PARAS 5, BLOK 'J' SELATAN
PUSAT BANDAR DAMANSARA
50604 KUALA LUMPUR

KP(BS)8549/44/(32)

20 Januari 1989

Semua Pengarah Pendidikan Negeri

Y.B. Dato'/Datuk/Tuan/Puan,

SURAT PEKELILING IKHTISAS BIL. 4/1985:

Peruntukan Masa Untuk Mata Pelajaran Bahasa Inggeris Dan Kesusasteraan Inggeris Dalam Program Kurikulum Bersepadu Sekolah Menengah (KBSM) Bagi Kelas-Kelas Tingkatan I dan II Mulai Tahun 1989

Merujuk surat KP(PPK)(32)/4/J1d.VI/(83) bertarikh 24 November 1988, Surat Pekeliling Ikhtisas Bil. 17/88 mengenai Sukatan Pelajaran dan Peruntukan masa untuk mata-mata pelajaran Kurikulum Bersepadu Sekolah Menengah (KBSM) bagi kelas Peralihan, Tingkatan I dan II bagi tahun 1989 adalah dimaklumkan bahawa mata pelajaran Bahasa Inggeris bagi Tingkatan I dan II diperuntukan lima (5) waktu seminggu. Dari jumlah lima waktu ini diambil satu waktu untuk digunakan bagi mengajar unsur-unsur kesusasteraan dalam pengajaran Bahasa Inggeris.

2. Bagi pengajaran unsur-unsur kesusasteraan dalam pengajaran Bahasa Inggeris ini Kementerian Pendidikan telah menetapkan bahawa masa ini digunakan untuk penggunaan program 'Class Reader' yang terdiri dari buku-buku

Done

Local intranet

Fig 1.8 Sample Document

- This is a sample of circular document when the link in "Year Listing" or "Bilangan Tahun" is pressed.

B. Administration Module

1.User Login

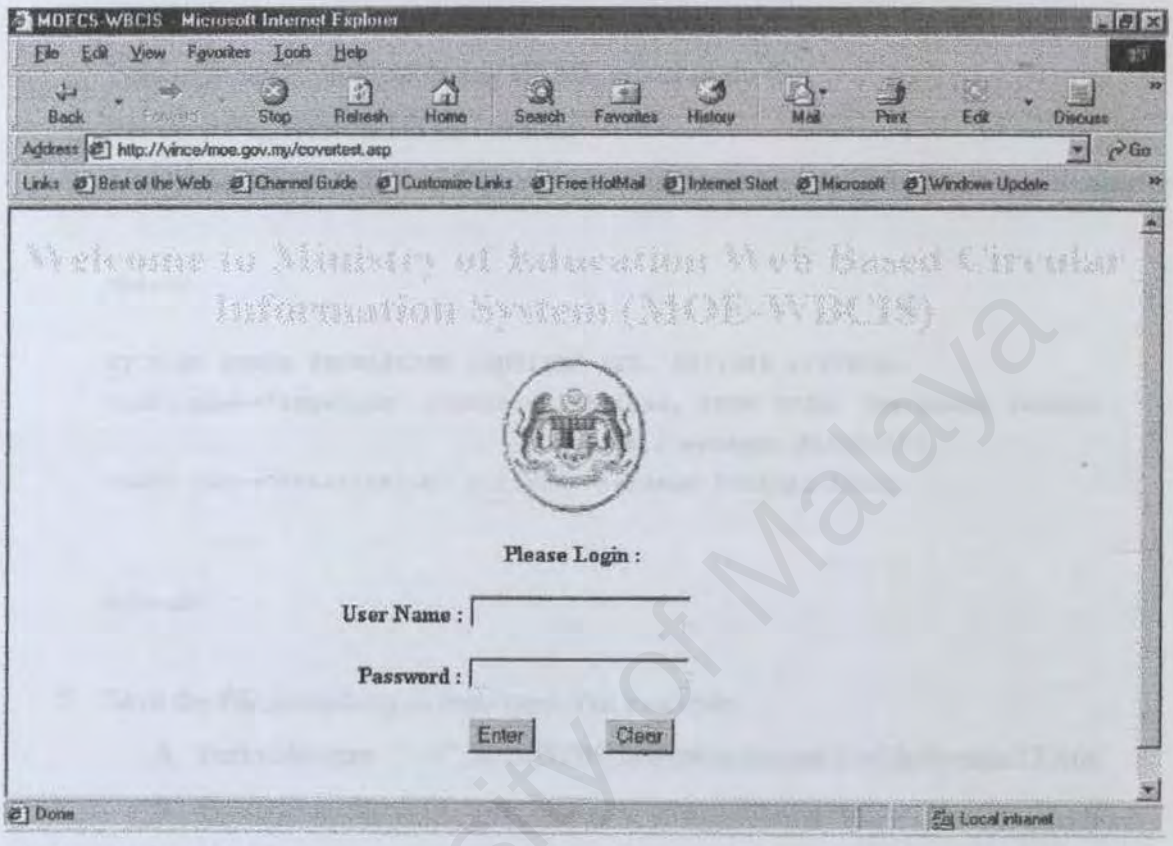


Fig 2.1 Login Module

1. The first page for administrator is log in.
2. **Admin user** needs to key in valid user name and password to enter the system.
3. The **logo** shown links admin module to the **search module**.

2. Important Steps:

A. Transfer Word file to HTML file

Before any further explanation, user need to take the following consideration:

1. **Transform** all the circulars from MS Word **(.doc)** file to **(.HTM)** file
2. User may use FrontPage or any HTML editor to do this.
3. For each file, view its HTML source.
4. Add **Title**, **Keywords**, and **Description** using **meta name** in the head tag. Example:

```
<head>

<TITLE> SURAT PEKELILING IKHTISAS BIL. 10/1988 </TITLE>
<meta name="keywords" content="ikhtisas, KBSM KBSR, kesihatan jasmani,
                               mental, senaman fizikal">
<meta name="description" content="Senaman Beramai-Ramai


</head>
```

5. Save the file according to their type. For example:
   A. Perkhidmatan : C:\MOEWBCIS\Perkhidmatan\Perkhidmatan23.htm
   B. Pendidikan Khas : C:\MOEWBCIS\Pendidikan Khas \Khas23.htm
   C. Perbendaharaan : C:\MOEWBCIS\ Perbendaharaan \Perbendaharaan23.htm
   D. Khas : C:\MOEWBCIS\ikhtisas\ikhtisas23.htm
   E. Perkhidmatan Awam: C:\MOEWBCIS\perkhidmatan awam\awam23.htm
6. Then only update the details to database using **Add New Records Module** in **fig 2.4**

B. Set Up IIS

1. Open the IIS from control panel.
2. Open the Default Web Page

3. Create a new virtual directory by right click the Default Web Page and name it **Circular** (Whatever proper name could be given). Set the default page to **front.asp** from properties.
4. Point the file from the physical directory, example:
   C:\MOEWBCIS
5. Open the IE 5, type in the following address:
   http://ComputerName/Circular/
6. The first page will shown up.

3.Main Page

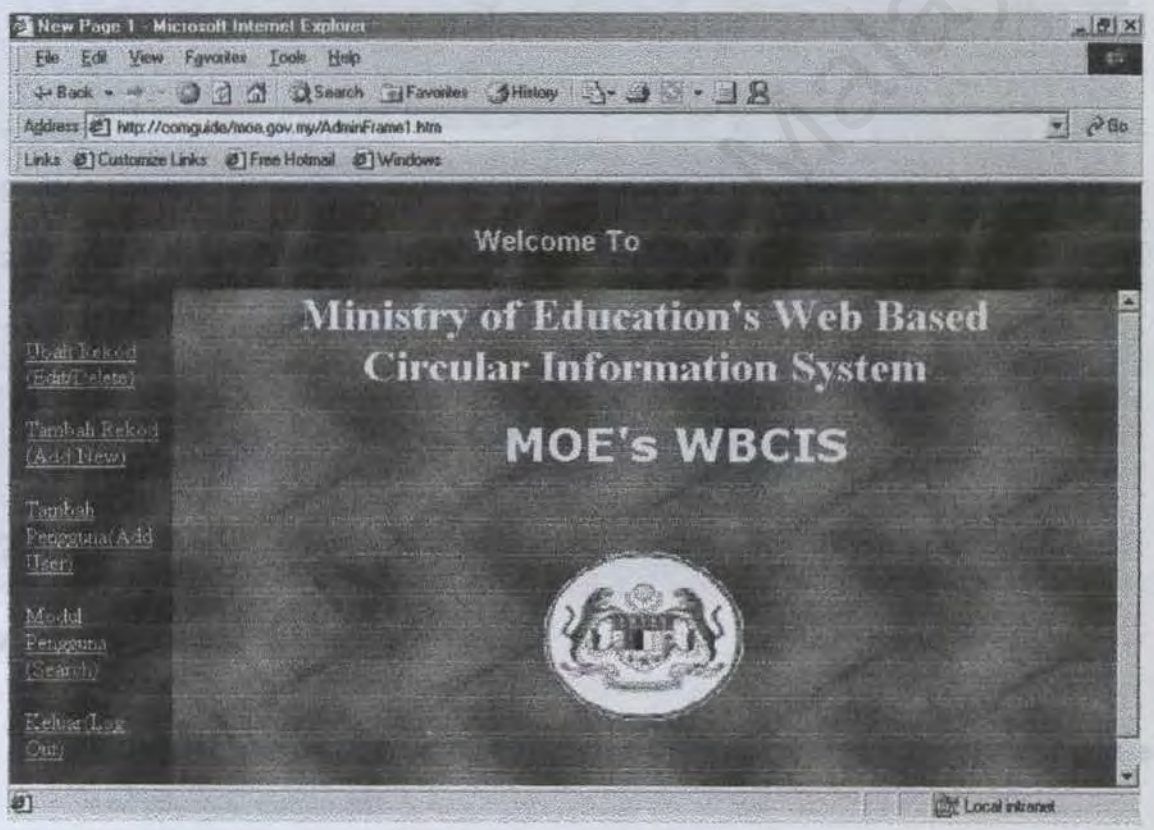


Fig 2.2 Admin Main Page

1. There are 3 modules allocated for admin system.

2. They are "**Ubah Rekod**" or **Edit/Delete Records**, "**Tambah Rekod**" or **Add New Records** and "**Tambah Pengguna**" or **Add New Admin User**.
3. The "**Modul Pengguna**" or **Search** used to link back to search module while "**Keluar**" or **Log Out** means exit.

4. Edit / Delete Records

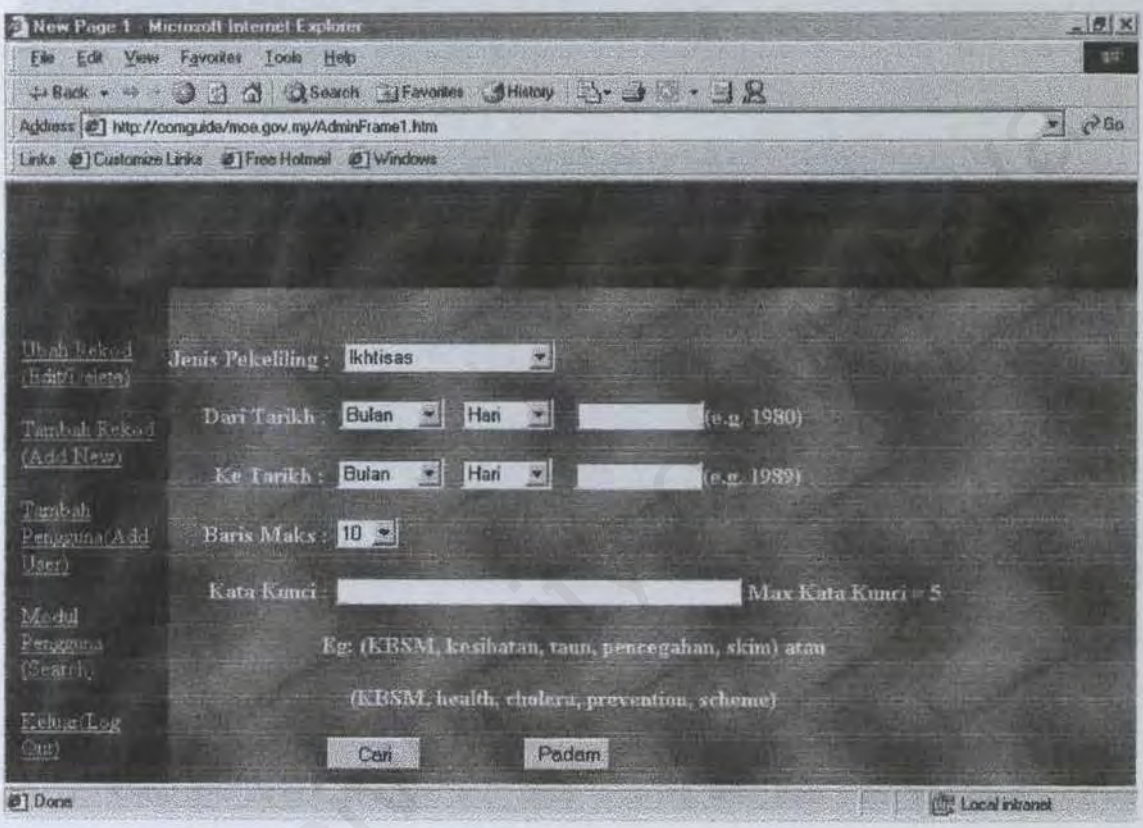


Fig 2.3 Edit/Delete Records

1. This module enable admin user to edit details of particular circular from database and physical document.
2. After "Cari" button is press based on the search criteria above, the result will be displayed as follow:

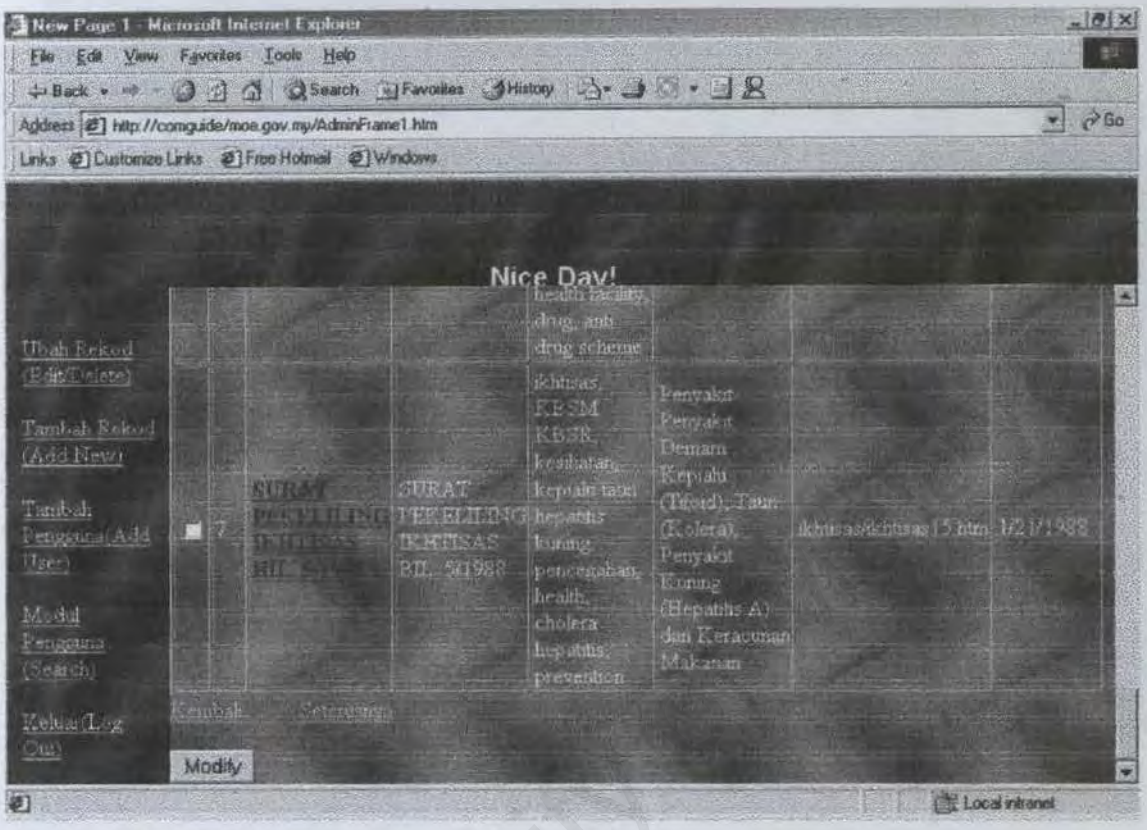


Fig 2.3.1 Edit/Delete Records

1. User may check the desired circular for modification.
2. Only **one check** is allow at a time to make sure user does not simply delete or modify information on circular.
3. If more then 2 checks were ticked and Modify button is pressed, a message "**Only one check is allowed!**" will display.
4. If user not checking any box but press Modify, another error message will occur.
5. To view the document, user can click the hyperlink displayed in the table as well.
6. After a box is checked, press **Modify**, the following screen will pop up:

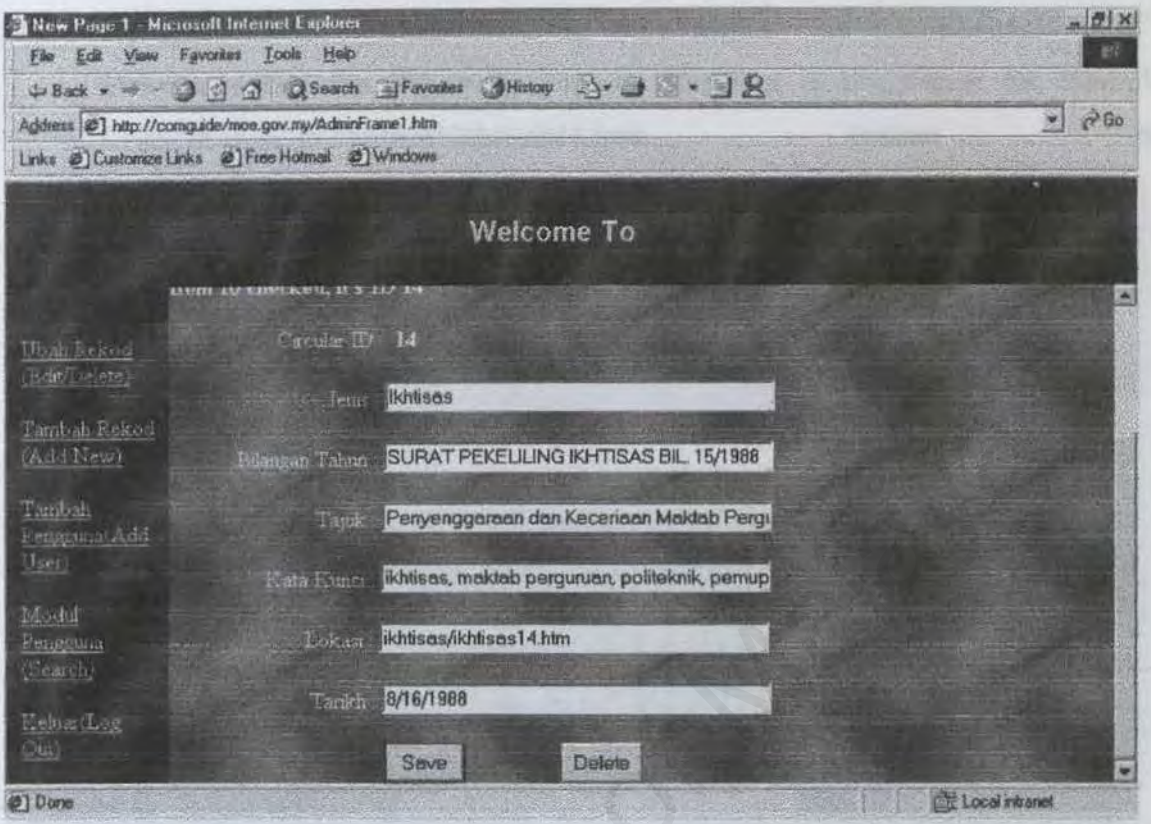


Fig 2.3.2 Edit/Delete Records

1. The Circular ID, Type, Listing Year, Title and Keywords, Location and Date of that circular is displayed.
2. From here, user may any field displayed in the text field shown.
3. After amendment has been done, click **Save** button, a message "**Circulars Details Updated**" will display.
4. If user want to delete the circular, click **Delete** button, a message "**Circulars Details Deleted"** will display.
5. **Important**: For any amendment, make sure the circulars details especially Date and Location are jot down so that user may edit the physical document under the system directory.

6. One field is very important to make sure the display of circular is correct. Let say the location "**ikhtisas/ikhtisas14.htm**" has change to "**ikhtisas/ikhtisas100.htm**". Make sure that the file under physical directory in the Server for example **C:\MOEWBCIS\Ikhtisas\Ikhtisas14.htm** rename to **C:\MOEWBCIS\Ikhtisas\Ikhtisas100.htm**

5. Add New Records

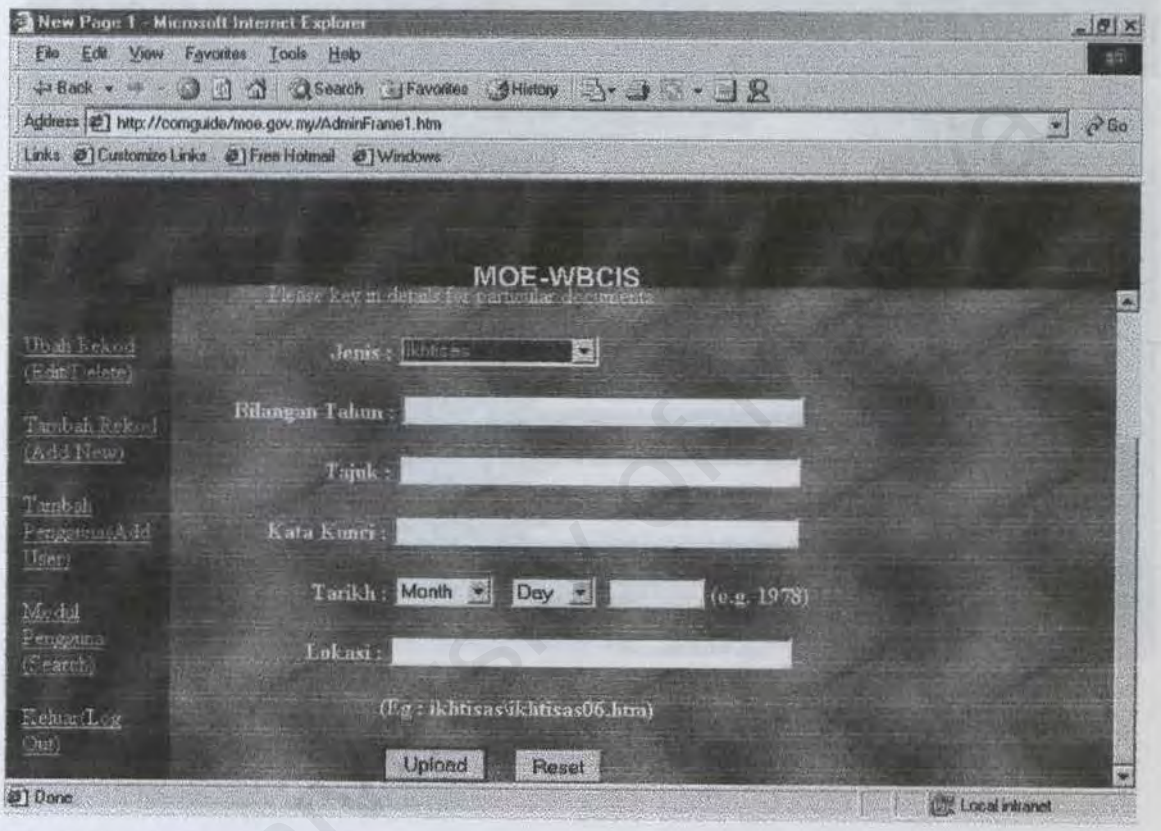


Fig 2.4 Add New Records

1. To add a new record to database, user needs to **take caution**.
2. First, jot down the "Bilangan Tahun", "Tajuk", "Kakata Kunci", "Tarikh" and "Lokasi".
3. Follow the step in **Important Steps** mentioned earliear.

4. After all the details is filled up and same with the details in physical HTML file, press **Upload** button to save details to database.

6. Add New User

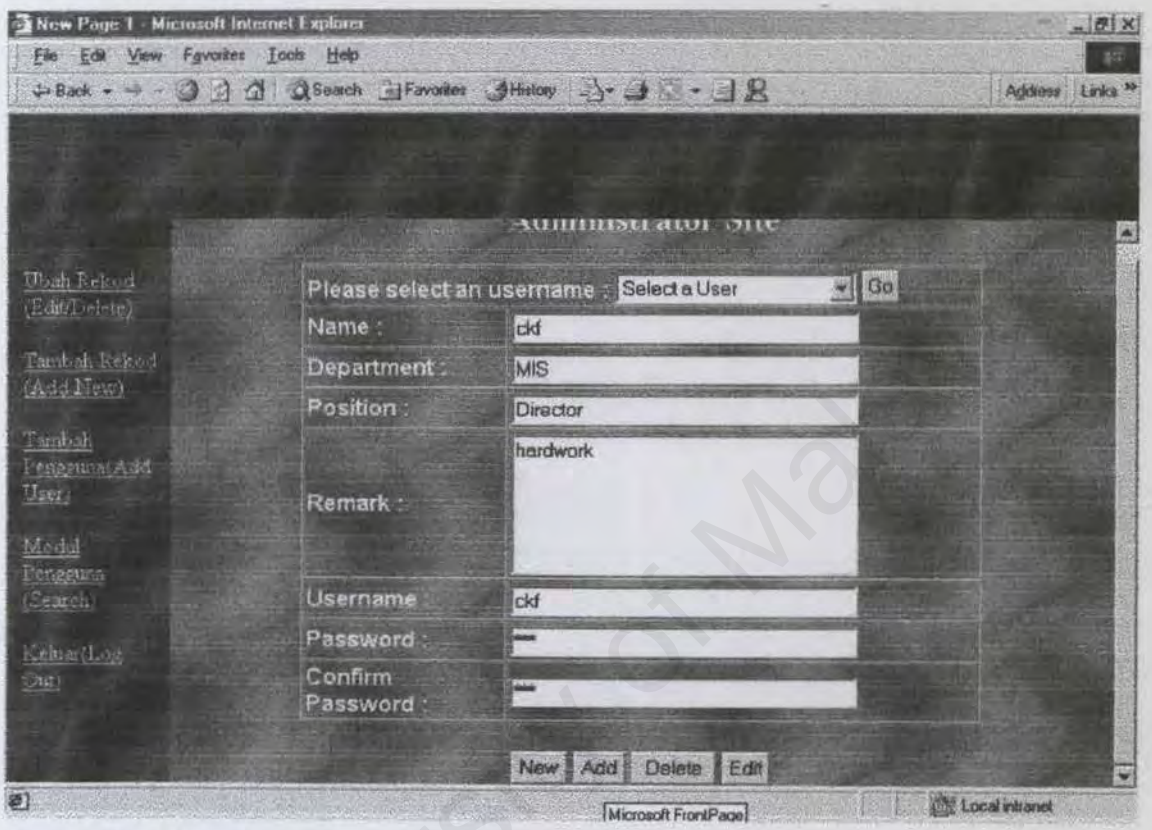


Fig 2.5 Add New User

1. This module add admin user.
2. Click on the "**Select a User**" combo box and particular username will display.
3. Click **Go** to view the details of that user.
4. To edit the details of that person, just amend it directly in the field and click **Edit** button. A message "**User details edited**" will display.
5. To add a new user, click **New** button, fill in the information and finally click **Add** button. A message "New User Added" is displayed.
6. Click **Delete** button to delete the chosen user.