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I

Abstract

Nowadays, client-server systems are one of the popular systems architecture to be built up either through the network or the Internet. Through client-server systems, users can be added and monitored by the system administrator and users can access as well as exchange data through the particular client-server system. This will bring lots of benefits to them.

As my faculty, FSKTM is going to merge into electronics system; every fields of the faculty system will be changed into the electronic system. With the virtual FSKTM for distance learning, all the properties and methods of the distance learning will be merged into this new electronic system. All the distance just need to connect to the internet and straight away can access to the website for their online learning.

I had decided to develop an online virtual faculty system for distance learning, which is a client-server based system. Through this online virtual faculty system, user will be able to learn or study through the FSKTM 's website. All that the client needs to do is to connect to our centralized server for exchange and updating of data. However, this client-server system does not involve online transactions. All the students need to pay before they can access to this website for their study.

Every field of distance learning will be run through the system except for the final exam part. All the students need to come to the university to sit for the exam or go to a learning center to take the exam. All the students can download the complete notes of course they have registered for each semester contact with the lecturers using various methods and etc

Figure	Page
Figure 2.1 Three or More Tier Client-Server Architecture Diagram	22
Figure 2.2 Enhanced Architecture to Deploy and develop web-enabled Applications	1 24
Figure 3.1 System Prototyping Model	48
Figure 4.1 VIRTUAL FSKTM Structure Chart	70
Figure 4.2 Administrator Structure Chart	71
Figure 4.3 Student Structure Chart	71
Figure 4.4 General User Structure Chart	71
Figure 4.5 General Data Flow	73
Figure 4.6 Data Flow for Authentication and Authorization	74
Figure 4.7 Data Flow for Students	75
Figure 4.8 Data Flow for Administrator	76
Figure 4.9 Web-Page Design	78

Page
79
80
80
80
80
80
81
81
81
81
82
82
82
82
82
82
82

C. The second

Title	Pages
Acknowledgement	I
Abstract	п
List of Figures	ш
List of Tables	IV
Table of Content	V-IX
Chapter 1	
1.1 Introduction	1
1.2 Objectives	2-3
1.3 Scope	3-4
1.4 Project Schedule	5-6
1.5 Software and Hardware Requirements	7
1.5.1 Software and Hardware Requirements for students	7
1.5.2 Software and Hardware Requirements for developer	8
1.6 Overview of All Chapters	9
Chapter 2	
2.1 Distance Learning	10
2.1.1 Advantages of Distance Learning	10
2.2 Internet	11-12
2.2.1 Main use of Internet	12
2.2.2 the role of Internet in education	13
2.2.3 World Wide Web	13
2.2.4 Beginning of Interactivity	14
2.2.5 Web Application	14
2.2.6 Components	14

2.2.6.1 Web Browsers	14
2.2.6.2 Web Server	15-18
2.2.6.3 Web Database Server	18-19
2.2.7 Client-Server Architecture	20
2.2.7.1 Stand Alone Architecture VS Client Server	
Architecture	20-21
2.2.8 Two Tier Client-Server Architecture	21
2.2.9 N-Tier Client Server Architecture	21
2.2.10 Advantages of three or more tier architecture	22
2.2.11 Evaluation of Client Server Computing	22-23
2.2.12 Web Security	24-25
2.3 Development Platform	26
2.3.1 UNIX	26-27
2.3.2 LINUX	27-28
2.3.3.1 Windows NT	27-28
2.3.3.2 Windows 2000 Server	28-30
2.3.4 Web Application Programming Technology	30
2.3.4.1 Microsoft Visual Interdev	30-32
2.3.4.2 ASP	32-33
2.3.4.3 ASP Compare to CGI	33-34
2.3.4.4 ASP Compare to ISAPI	34
2.3.4.5 ASP Compare to PERL	34
2.3.5. Scripting Language	34
2.3.5.1 JavaScript	35
2.3.5.2 Jscript	35-36

2.3.5.3 VBScript	36-37
2.3.6 Microsoft NetMeeting	38
2.4 Definition	39
2.4.1 History of FSKTM	40
2.4.2 History of Distance Learning in FSKTM	41-42
2.4.3 Mission of Distance Learning	42
2.4.4 Objectives of Distance Learning	42
2.5 Traditional Distance Learning System	43
2.6 Existing Virtual Distance Learning System	44
2.6.1 University Tun Abdul Razak (UNITAR)	44-45
2.7 VIRTUAL FSKTM Distance Learning System	45-48
Summary	48
Chapter 3	
3.1 Methodology of system development	49-50
3.2 Information Collecting Method	51
3.2.1 Research on previous, current and existing distance	e
Learning system	51
3.2.2 Surfing in the Internet	52
3.2.3 Survey on distance learning students	53-55
3.3 Analysis Requirement of system	56
3.3.1 Functional requirement	56
3.3.1.1 Administrator Module	56
3.3.1.2 Students or users Module	57-58
3.3.1.3 General Module	58-59
3.3.2 Non-Functional Requirement	59-61
3.4 Authoring Development Tools	61-65

3.5 System Requirement	65-66
Summary	67-68
Chapter 4	
4.0 System Design	69
4.1 Objective	69-70
4.2 VIRTUAL FSKTM Structure Chart	70-71
4.3 ER Diagram	72
4.3.1 Data Flow Diagram	72-76
4.4 User Interface Design	77
4.5 Web-Page Design	78
4.6 Database Design	79
4.7 Data Dictionary	79-81
4.8 Expected Outcome	83
Summary	84
Chapter 5 Coding and Testing	
5.1 Coding	86
5.2 Program Documentation	87
5.3 Internal Documentation	87-88
5.4 Testing	88
5.5 Testing Strategy	88
5.6 Testing Planning	89
5.7 Different type of Testing	89
5.7.1 Unit Testing	90
5.7.2 Module Testing	91

5.7.3 Integration Testing	91
5.7.4 System Testing	91
5.7.5 Function Testing	91
5.7.6 Performance Testing	92
Summary	93
Chapter 6	
6.1 System Strengths	94-96
6.2 System Constraints	96
6.3 Problems and Solutions	96-98
6.4 Future Enhancements	98-99
6.5 Knowledge and Experience Gained	99-100
Chapter 7	
Conclusion	101

User Manual	101-111
Reference	112-114

VIRTUAL FSKTM

1.1 Introduction

All the final year students of FSKTM have to develop a final year project, which will be divided into 2 stages. The students can choose either develop the project in-group or personally. I have decided to do this final year project personally.

I had decided to develop an online learning system, Virtual FSKTM for distance learning of my faculty as my final year project, which was assigned to me and the adviser of this final year project is lecturer, Cik Nurul Fazmidar.

Basically, this online learning system is a client-server system, whereby all distance-learning students will be connected to our centralized server through the Internet. All distance-learning students will benefit from our online learning system through browsing certain web pages. Those who are interested can study my faculties courses through the internet All the information about the schedule, notes, references and related information will be posted on the faculty web page. Besides that, a 'frequent questions and answers section' will be included in our web page for users' enquiry. Users must login to our web page before they can continue to other stage.

Finally, I hope that this online learning system will be beneficial to the faculty and the society. Hopefully, this system will help the users save the time taken to learn without the hassle of visiting the faculty or using other methods in the traditional method distance learning.

1.2 Objectives

The virtual FSKTM system is specially designed for all the distance-learning students of my faculty, the Faculty of Computer Science and Information Technology of University Malaya. With this virtual system, all the distance-learning students can learn and study through the internet and no need to go to the distance learning center for their lecturer or tutorial. Everything of their study or courses except the mid semester test and final exam part can be done by accessing through the internet. For their project or assignment, they just need to submit by sending to the e-mail address of the lecturer.

The objectives of Virtual FSKTM are listed:

1) Provide a better system for FSKTM to manage all the distance-learning students.

This system enable administrator to control the registration of new students and all the authorized students to access to the system for their features.

2) Save students' time

All features provided for them help to save their time especially when they are located far away from the campus or learning center.

3) Better information to meet degree students' needs

Virtual FSKTM will offer all the related fields and functions for all the students to get all the related information or update their owned particulars.

4) Improve Registration Control

Students who are interested to study the program can register through the online system in each intake. They will not miss out the intake which may held in next few months or next year if they continuous visit this homepage from time to time.

5) Improve the students who can enter to the higher education learning center.

As our government wants to improve the numbers of students who can study in the higher education learning center, Virtual FSKTM provides more opportunity to those who missed the chance to enter a university or want to continue their study after the working hours to gain a degree certificate.

1.3 Scope

The scope of the virtual FSKTM are listed below:

1) Introduction

It is a general introduction page for web user to access. They just can browse this page to get some general information about the distance-learning system of FSKTM. Besides this, they also can apply online to study for the courses that are offered by this faculty. For all the students who want to register from this website, they need to choose their payment method. They can pay with their credit card, or sending cheque or bank draft to the university.

2) Security login

All the registered students will be given a user id and login password. They only can access to the website to get the notes, study online and others after they have paid for their tuitions fees. They only can change the password. Their password will be encrypted before storing into the database, administrator also cannot get the correct password.

3) Records searching and retrieving

It is a part for students to select their record their data or information from the

database and displayed to them in the browser. All the data is just related to students like their results, results in detail, registered courses and others.

4) Courses

All the information about courses available for each semester will be displayed in the browser. Besides this, all the students also can download the completed notes from the website, get the information about references and syllabus for the course and etc.

5) Notice Board

This a place where students can check out all the enhancement of timetable, deadline of assignment, date, venue of final exam and also the subjects of the exam.

6) Contact

This is a general page that contains a few of ways to contact with lecturers. Chat room, online tutorial and other ways also will be provided for users to use.

7) Schedule

This will provide a timetable of all the lectures for the distance-learning students to inform them the actual time of their lecture and others.

8) Frequently Ask Question

This section will provides all the frequently ask question from all the visitors of the website. For example, if a student paid for his or fees already but he or she want drop for that semester, the percentage of refund will be showed. All the questions and answers will be showed to all visitors.

Chuah Hai Ping WET990014

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1.4 Project schedule

Dates	Activities
June (2001) - July	Research on possible software/ tools used.
	Research on other possible homepage layout.
August	Analysis user requirement and learn related software/tools.
	Prepare the documentation and viva.
	Start design user interface.
September	Start develops the system module by module.
October – January (2002)	Software development and testing.

Table 1.2 Expected Activities Involved



Igure 1.1 Project Timeline

VIRTUAL FSKTM

The timeline for the activities of the project are as follows:

Activity	Start Date	End Date	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Concept Definition	9 Jun 2001	13 Jun 2001		twate	requ	reme	ts af	divis.		
Research and Literature Review	14 Jun 2001	4 July 2001								
Requirement Specification and Analysis	5 July 2001	1 Aug 2001				101		2		2
System Design	2 Aug 2001	5 Sep 2001	dipha	proc		1.	No.		off V	rinde
Incremental Prototyping	6 Sep 2001	26 Dec 2001	ndov	98	Ó	MB	of P	8.54		finde
Integration and Testing	27 Dec 2001	24 Jan 2002	X							
Documentation	9 Jun 2001	24 Jan 2002			1000	uppx)	rted i	22466	rosol	

Duration

Figure 1.1 Project Timeline

1.5 Software and Hardware Requirements

The virtual FSKTM is purposely designed for FSKTM, Faculty of Computer Science and Information Technology of University of Malaya and all the distance-learning students of this faculty. With features above, the software requirements are divided into 2 groups

- a) Students
- b) Administrators.

1.5.1 Software and Hardware Requirement for students

Hardware Requirement:

- Pentium 166MHz or higher processor (Pentium II or higher processor recommended), or any Alpha processor running Microsoft Windows NT Workstation.
- 64 MB of RAM for Windows 98, 128 MB of RAM for Windows NT Workstation.
- iii) At least 300 MB of available disk space.
- iv) VGA 640x480 or higher-resolution screen supported by Microsoft Windows.
- v) A CD-ROM disc drive.
- vi) A mouse or other suitable pointing device.
- vii) A 56kps modem and internet access account

Software Requirement:

- Microsoft Windows 98 or later, or Microsoft Windows NT Workstation 4.0 (Service Pack 3 recommended) or later.
- ii) Microsoft Internet Explorer

1.5.2 Software and Hardware Requirement For Developer

(Administrator)

Hardware Requirement:

- Pentium II 400 MHz or higher processor (Pentium III or higher processor recommended), or any Alpha processor running Microsoft Windows NT Server.
- ii) 128 MB of RAM for Windows 2000 server
- iii) At least 1000 MB of available disk space.
- iv) VGA 640x480 or higher-resolution screen supported by Microsoft Windows.
- v) A CD-ROM disc drive.
- vi) A mouse or other suitable pointing device.

Software Requirement:

- i) Microsoft Windows 2000 Server
- ii) Microsoft SQL Server 7.0
- iii) Microsoft Visual Studio (Visual Interdev) 6.0

(Used to developing HTML page and ASP (Active Server Pages))

iv) IIS (Internet Information Services) 5.0

(Used to provide IIS for Visual Interdev to contact server to create project)

v) Front Page Server Extensions

1.6 Overview of All chapters

Chapter I ---- Introduction

This chapter consists of the introduction to Virtual FSKTM system, objectives, scopes, hardware and software requirements of the project.

Chapter II – Literature Review

The literature review covers the definition of the Virtual FSKTM, online system for students, administrators. This chapter also contains some searching methods, growing of Internet and its use in education, all components involved, client-server architecture , web application programming technology development platform and a summary.

Chapter III ----- Methodology and System Analysis

This chapter covers the analysis phase of the project, such as the user requirements, functional requirements and non-functional requirements of the system.

Chapter IV ----- System Design

The design phase in this chapter includes system design, database design, program design and user interface design.

Chapter V-Coding and Testing

This chapter discusses coding and testing strategy that used in the development of the system and also documentation of the program.

Chapter VI- Implementation

Problems, implementation and other related errors has been discussed in this chapter to

find out the solution and reasons.

Chapter VII – Conclusion

Conclusion of the system and final year project has been made.

2.1.1 Advantages of Distance Learning

- 1) Opportunity in education, career and percent
- 2) A way to enhance life
- 3) A way to improve one's l
- 4) Invest in one's future Course taken

without having to and the lecture at campus.

are available at any times that convenient to onesel

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2.1 Distance Learning

At its most basic level, Distance Learning (DL) occurs when a teacher and learner(s) are separated by physical distance, and technology (I e . voice, video, data and print) is used to bridge the instructional gap. Thus, Distance Learning refers to the ability of delivering organized knowledge and information to individuals located in geographically remote locations from their instructors. Generally, the more personalized the interaction between the instructor and the learners, the more effective a learning course will be. The main difference of distance learning is user may never visit the institution. He or she is studying with and will probably never meet the tutors in person. [1].

2.1.1 Advantages of Distance Learning

- 1) Opportunity in education, career and personal Life
- 2) A way to enhance life
- 3) A way to improve one's knowledge
- Invest in one's future by earning a degree or certificate from the course taken without having to attend the lecture at campus
- 5) Courses taken are available at any times that convenient to oneself

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2.2 Internet

The Internet has come a long way since the old APRANET days. Originally designed for research use by the Department of Defense, Internet has become a haven for people who have experienced the value of communicating with people around the world.

Internet is a network of computer networks. Internet is worldwide network that is set up by many networks all across the nation. As of 1998, the Internet has more than 100 million users worldwide and the number of users are growing rapidly. More than 100 countries in the world are linked into the exchange of data, news and opinions. The different types of computers are connected to the Internet are able to communicate with each other using TCP/IP (Transmission Control Protocol / Internet Protocol). This includes federal networks, regional networks, educational and some foreign networks. The connection between different networks is called "gateway". These gateways serve to transfer the electronic data worldwide.

The computers connected to the Internet (host computers) can be either connected permanently through a leased line of connected on and off through the use of a dial-up accounts. The host computer (host) is a computer that is connected to the Internet. It has a unique IP address[2] to communicate with the other computers on the Internet. Unlike other online services, which are centrally controlled, the Internet is decentralized by the design. Each Internet computer, called a host, is independent. Its operators can choose which, Internet service, to use and which local services to make available to the global Internet Community. Remarkably, this anarchy by the design works exceeding by well.

There are a variety of ways to access the Internet. Most online services, such as the America Online, after access to some Internet Services. It is also possible to gain access through a commercial Internet Service Provider(ISP)

2.2.1 Main use of Internet

The Internet has opened up any number of possibilities for applications by providing a ready-made network for business to use. A user is said to be online when he or she is connected to another computer (or a network[3]) and is able to exchange data or information. Various parties such as the business organization, government agencies, universities or colleges, research institutions and individuals provide the information on the Internet.

The main uses of Internet are do research, download software, education, business, Tele-medicine, entertainment, sending mail, IRC (Internet Relay Chat), newsgroup, get information and etc.

2.2.2 The Role of Internet in Education

In the late 1981, the academic community began to see the Internet as a valuable tool. Professors and students at the universities around the world began using the Internet as a way to gain valuable research and knowledge about myriad capability (ftp), and news group discussions all distributed to the growth of Internet audience. Internet provides a new learning environment for the students other than the traditional classroom. It helps in online education. There are various websites in the Internet that provides educational resources for public access. For examples, the websites regarding Science, Maths, Sports and etc. Educational materials can also be found

on the Internet. The students can do self-study, get research information obtain a degree and etc, through the Internet.

2.2.3 World Wide Web

The world wide web has many origins. Most people point to the time period between 1989-1991 when the council European pour I a Recherne Nucleaire (CERN) European for Particle Physics in Geneva, Switzerland and developed the basic concepts of sharing information through the use of a consistent and universal interface. The web is the most popular service on the Internet. The web provides an alternative way to transmit various types of information including text, graphics, image, video, audio and etc.

2.2.4 Beginning of Interactivity

As demand and expectation mounts, the original static files evolve to a more dynamic appearance. Most of the information provided by current sites on the Internet consists of link between static informational pages. A cool animated GIF adds to the aesthetic appeal of a page, but the international content and the way it is presented is the measure by which the site is ultimately judged. The key to having a successful site is to provide interactive and up to date dynamic content.

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2.2.5 Web Application

Web application is like other except it is residing on a web server. Users can use Internet or Intranet and browser to retrieve input. The advantages of web applications are listed below:

- 1) Users no need to install any files in their owned computers
- Enables user access from any where any time as long as they are connected to the Intranet or Internet

It also evolves from the traditional client/server application and at the same time, requires extensive planning and it is not a simple task. Web application use Internet protocols such as TCP/IP, HTTP[4] and HTML[5] for information display and networking protocols. Nowadays a variety other technologies available such as Java, Scripting techniques (Visual Basic Script and Java Scripting Language), Dynamic Hypertext Markup Language (DHTML), Active Server Pages and etc.

2.2.6 Components

2.2.6.1 Web Browsers

Web browsers are client program used to search through the information provided by a specific type of server. It helps to view and navigate through the information on the Internet. The first browser in browsing Internet is Mosaic, which is developed by Mark Andersen in 1993. Browser makes the Internet easier to access. Besides this, it also provides a graphical, text-lowed terminal interface to the web server. The more important function of browser is translates client requesting information send by the web server into a graphical user interface within the browser. It also responsible

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Chuah Hai Ping WET990014

sending the request of the client in the HTML form to

the server.

The two most common browsers nowadays is

a) Netscape

Advantage of Netscape

- 1) It is available for a wide variety of platforms
- 2) Large installed base
- 3) Code released into public domain
- 4) Available free to everyone

Disadvantage of Netscape

- 1) Does not integrate with Windows 95
- 2) Does not have operating revenue to support development costs

b) Internet Explorer

Advantage of Internet Explorer

1) Available free to everyone

Disadvantage of Internet Explorer

1) Available only on specific platforms, example Windows and Macintosh

2.2.6.2 Web Server

The web server is used to deliver HTML to the client browser which request for the Information. Besides this, it also acts as a client to the database server when web browser try to access the information stored in the database. In this criteria, the web

VIRTUAL FSKTM

server will accept query from browsers and posts the query to the database server. Once the database server accepts the query, the web server will receive the selected results and format into HTML and send back to the browser to display to user.

IIS 4.0/ 5.0 [6]

IIS 4.0 or 5.0 where IIS 5.0 is the latest version provides a transactional based web server that is tightly integrated with the NT operating system. The advantages of IIS 4.0 or 5.0 are listed below:

1) Improvement in HTTP related service areas.

2) Additional functionality in managing and developing application functionality The advancements enable IIS to manage multiple web site, tailor site or application specific settings. Besides this, it also enables HTTP1.1 support for web development. Other than this, IIS 4.0 also includes transactional based applications, process isolations, SSL support, Active X Data object (ADO) and new development tools. All the benefits of IIS can be seen in the services it provided. More effectively, it also provides a high speed, secure platform for publishing information on internal networks or Internet. For the server site, all the server are specifically designed to provide the kind of performance that is necessary for handling an increased number of web users and users also connected with high speed link, such as ISDN [7] and leased lines. The Transactional ASP features of IIS allows application with script, and components to perform multiple actions. If a failure occurs during a particular transaction, IIS automatically back up the server to the start of the transaction, allowing the user to recover from failure without any lost of data. This feature makes sure that the transaction run in a successful way and very useful to all the companies

that are running the e-commerce besides the traditional business in their companies as the e-commerce is growing rapidly nowadays.

FTP Server

It is a program to transfer file from one system to another. It can accomplishes several tasks which are listed below:

a) Connection can be established between the machine and a remote site.

b) Enables limited directory related operations to be performed at that site.

c) File transfer between the remote site and our machine or vice versa.

Email Server

This server is used for managing services. Message Transfer Agent (MTA) program is required to manage the email-server

Usenet Server

It is a method for communicating ideas. The feature is similar to an electronic bulletin where users can post a message for several time to see. News is sent to a server by using Network News Transport Protocol (NNTP) where everyone can access.

Gopher Server

It is a tool that enables user to retrieve information that has been served in Gopher Servers at various sites across the net. Besides this, it is a program that enables database access from all around the Internet.

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FrontPage Server Extensions

FrontPage Server Extensions is one of the required tools to help developers to debug all the error in the asp pages. The Microsoft FrontPage provides it.

2.2.6.3 Web Database Server

Oracle 8 Server [8]

It is a multi user database that provides unprecedented ease-of-use and is pre-tuned and pre-configured for today's dynamic workgroup and line-of-business environments. Besides this, it also includes a fully integrated set of easy-to-use management tools, full distribution and reputation and web features. Replication and distributed data access allow users to share relational data access applications and servers. Expensive, separate licenses are required for each its database engine.

SQL Server 7.0

Sequence Query Language (SQL)[9] server is designed to cater for enterprise database. It is a relational database system that is scalable, reliable and high performance. This database system is designed for Window NT based system and can highly integrate with Back office family of Server. The ease of integration makes it a suitable database for we-based applications.

Features

1) Efficient support for text and image

Text and images are not store as a part of the data but in a separate collection of pages of their own. For each of these values, all that is scored in the data row is

a 16-byte pointer. For each row, this pointer points to the location of the data. A row containing multiple text or image columns has one pointer for each column. All these text and images is important for web publishing.

2) The intuitive administration Interface

This server use the Microsoft Management Console (MMC) to provide easy to use interface. This help to ensure the database consistency and accuracy.

3) Integrate with Window 2000 security

Database permissions can be assigned directly to Window 2000 server users. Microsoft SQL server roles can be defined to include not only Window 2000 server users and groups but also SQL server users and roles. Database access and permissions are managed by using Window 2000 groups, New fixed server and database roles such as database creator, disk admin and system admin provide flexibility and security that the administrator login.

4) Web Assistant

It is an extremely easy to use tool for generating standard HTML likes from SQL server. With the SQL server Web Assistant wizard, an HTML page can be generated once or as a regular scheduled SQL server task. An HTML file can be updated whenever relevant data changes by using trigger.

5) Multithreaded

It is more conservative with available system resources from the multiprocessing system like Oracle Corporation's Oracle server

2.2.7 Client Server Architecture

2.2.7.1 Stand Alone Architecture VS Client Server Architecture Stand Alone Architecture

A standalone computer is a computer that did not establish any connection to any other computer. It cannot access to any computers to share resources or services that are available or offered. There isn't any interaction among this standalone computer with other computer. The functions are available from this computer cannot be used by others.

Network

Two or more computers connect together in order to share data, hardware and software that connected to or kept in each of these computers is computer network. All the connected computers communicate with each other with the network cables.

Client-Server Computing

In this architecture, one main computer, which normally call, as server will provide services to another computer or may be a group of computers. This type of computing allow customers to access information resources and services located anywhere within the customers information network.

Client

Client will request a service to be performed from a server. The requested services may be to run a application, passing query to the database to retrieve data, print a document or even perform a backup or recovery procedure.

Server

Server is a computer with faster processor, high capacity hard disk drive and more capacity in memory. With all these features, it is able to process all the requested service from client as it act as resource that handle client's request. Typically it is through of as a midrange or mainframe system.

2.2.8 Two Tier Client Server Architecture

This is an architecture where only two computers connected or linked together to share services to perform certain tasks. Computer with faster processor and better features will act as server or resources to handle all the requested services from the client. Only one client is able to connect to the server to request it's requested services.

2.2.9 N Tier Client Server Architecture (Web Based Client Server)

Many positions can be created as needed. The arterially, there are:

- 1) A user Interface
 - 2) A set of business objects that checks and organize the client's request
 - 3) A mirror image of those business objects that provides persistence code
 - 4) A database

The ease of maintenance, upgrade and extend at N-tier architecture make it

becomes the most suitable architecture for web development

Three or More Tier Client Server Architecture Diagram



Client

Application Logic Servers (Business Rules) **Database Server**

Figure 2.1

2.2.10 Advantages of Three or More Tier Client Server Architecture

- 1) Easy for maintenance, upgrade and extend
- 2) More functions can be provided for users to use

2.2.11 Evolution of Client Server computing

In the 1970s, departmental managers found that relying on several main frame loafed

applications hindered their ability to rapidly respond to business demands.

Application development time within the central information system (IS) was too

VIRTUAL FSKTM

slow and the result was not tutored to the specific needs of a department. Though the deployment of PCs enabled workers have computing power and data at their command quickly, this has its drawback. In a pure PC environment, co-operation among users was difficult. Even within a department, there needed a departmental formatting and data usage standards. The solution to these requirements is departmental–level client server architecture. The success of departmental architecture proved the way for the enterprise level client server computing The dominant theme of such architecture is the reestablishment of control over data by the centralize organization in the content of a distributed computing system, here enter the client server computing concept. Today the most common type of server is the database server besides as a data storage it also handles requests and responds from the clients.

2.2.12 Web development Technology

Developing web-based applications relies on many network and application components working together to deliver information to requesting client. In the once, any web browser executed information from the web server. However, after some standardization of HTML languages, image specifications and protocol stacks, the world become a 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 are fast for granted when developing traditionally applications.



Enhanced architecture to deploy and develop web-enabled applications

Figure 2.2

2.2.13 Web Security [12]

Nowadays the most important factor that delays the Internet adaptation is concerned with the security. All the web security includes hacker clients, computer viruses, online theft and the breaking of encryption schemas.

The growing trend towards connecting www server with corporate databases raises critical security concerns. All the web security methods involves both the client and server. Majority there are four problems occurred.

A) Encryption

Chuah Hai Ping WET990014

It is an important tool in computer security but at the same time it does not solve all the problems. If this tool is not used properly, it may have some site effect on the performance of the entire system. For the even worse case, it will give an unwarranted sense of security. It is important to know the situations in which encryption is useful and to use it efficiently.

B) Authentication

It is not secure where anyone can just attempt to login to a computer system. The most common authentication mechanism is a password in which the only authorised users know the key. In this mechanism, the concept used is who know the user id and the password, he or she is the authorised user to access to the system. However, it seems to be a secure system, but when due to some unethical behaviour of humans lead to its quality degradation.

C) Firewalls

A firewall is a gatekeeper computer that sits between the Internet and the network. The main function of a firewall is to protect the privates network by filtering traffic to and from the Internet based on the defined policies. It is used to define who can get on the network and when one can get to access it. Typically, a firewall provide two network interfaces where one connects to the internal protected network and the other connects to the external unprotected network.

D) Non repudiation

This means, incontestable that a document or message was really originally, originated by oneself. As far the security problem, it requires some
unforgivable electronic signatures that can be used in a court of law.

2.3 Development Platform

Operating System

2.3.1 UNIX

Unix was initially developed out BellLabs and become operational on a PDP-7 in the year 1970. It is not a single operating system, refers to a family of operating systems which includes AIX, BSDI, Digital Unix, Free BSD, HP-UX, IPIX, Linux, NetBSD, Open BSD, Pyramid, SCO, Sunos, just to name the more prominent onts. Unix is a multitasking operating system originally intended for mini computers but implemented on a wide range of machines from powerful microcomputers to supercomputer. Other than this, Unix also comes equipped with a number user devices and interfaces that are considered part of a system. These can be grouped into the shell, other interface software and the components of the C compiler. C compiler , assembler, louder and others. Layer outside of this consists of user applications and those user interface to compiler.

2.3.2 LINUX

Linux is an operating system that was initially created as a hobby by a young student, Linux Toorvalds, at the University of Helkinki in Finland. It is a complete operating system that is similar but not identical to UNIX. It supports a wide variety of hardware, ranging from 386's/486's/Pentiums/PentiumII's to more exotic hardware such as Digital Alpha Computers, Power PCs and Silicon Graphics workstations.

VIRTUAL FSKTM

WXET3182 Latihan Ilmiah II

The most unique characteristics of UNIX are freely distributable. This means that source code for Kernel and most software cannot be withheld All the companies cannot change for it.

Features of UNIX:

- Comes with a complete development environment, including C, C++, Fotran compilers, toolkits such as Q+ and scripting languages such as Perl, Awk and others.
- Excellent networking facilities: allows you to share CPUs, share modems and etc, all of which are not included or available with windows 95.
- Ideal environment to tune servers such as a web server (e.g. Apache) or a FTP s server.
- 4) Support multiple processors as standard.
- 5) True multitasking, able to run more than one program at the same time.
- A window system, called X; the equivalent of windows but much more flexible.

2.3.3.1 Windows NT

Windows NT is a Microsoft Windows personal computer operating system designed for users and businesses needing advanced capability. NT's technology is the base for the Microsoft successor operating system, Windows 2000. Windows NT (which may originally have stood for "New Technology," although Microsoft doesn't say) is actually two products: Microsoft NT Workstation and Microsoft NT Server. The Workstation is designed for users, especially business users, who need faster performance and a system a little more fail-safe than Windows 95 and Windows 98. The Server is designed for

business machines that need to provide services for network-attached computers. The Server is required, together with an Internet server such as Microsoft's Internet Information Server (IIS), for a Windows system that plans to serve Web pages.

Windows NT Workstation: Microsoft says that 32-bit applications will run 20% faster on this system than on Windows 95 (assuming both have 32 megabytes of RAM). Since older 16-bit applications run in a separate address space, one can crash without crashing other applications or the operating system. Security and management features not available on Windows 95 are provided. The Workstation has the same desktop user interface as Windows 95.

Windows NT Server: The NT Server is probably the second most installed network server operating system after Novell's NetWare operating system. Microsoft claims that its NT servers are beginning to replace both NetWare and the various UNIX-based systems such as those of Sun Microsystems and Hewlett-Packard. NT Server 5.0. essentially became what was renamed Windows 2000.

2.3.3.2 Windows 2000 server

It is a Microsoft's 32 bit as designed for high end workstations, servers and corporate networks based on Windows NT 4.0 server. Windows 2000 server [13] is suitable for building and hosting web-based applications. Other than this, it is also flexible and compatible which could original featly reduced software and hardware costs. Features:

1) Open architecture that supports a wide range of commercial off-the-shell and

development tools, applications, services and devices.

- Server administrations is easy since the graphical user interface is familiar and and easy to use.
- Multitasking and multithreading operating system. Multitasking and multithreading feature is crucial to provide the required responsiveness.
- 4) As the previous NT 4.0 Server, there is industrial-strength reliability and security in Windows 2000/NT server. It is evaluated as being C2-compilant by the National Computer Centre (NCSC). The C2 security level is based on the requirements outlined in US. Department of Defence Trusted-computers system evaluation criteria, also know as the "arrange book". The C2 security level includes
 - a) Object protection on a user and group basis.
 - b) Password is protected with a secure authorization database. Unique user or names are required.
 - c) Auditory of security related events.
 - d) Authorized users may only assign authorization for access.
 - e) Objects must be protected from reuse.
- 5) Supports Remote Access Service (RAS) to gain transparent access to a remote Windows 2000 network, Microsoft users can use the RAS once connection established to the remote network, the standard administration tools use the resources of the network just as though the connection had been made to local network resources.
- 6) Built in Web server and browser.

- 7) Support COM [14] and DCOM
- 8) Allowing Object Linking and Embedding (OLEDB) [15]. The OLE allow Windows 2000 to combine info from several applications into one compound document using the special object linking embedding capabilities of WIN based applications.

2.3.4 Web Application Programming Technology

2.3.4.1 Microsoft Visual Interdev

Microsoft Visual InterDev is a powerful development environment for rapidly creating database-driven web application. Integrated visual design tools, debugging and database features enable user to build interactive, cross-platform web sites quickly and easily. [16]

Features of Visual InterDev

 Visual InterDev provide a robust, integrated development environment to address the many capabilities of the web. Integrated of various technologies can be done, like ActiveX Controls and Active Server Components to create a powerful application.
The integrated development environment enables developer to use scripting languages like VBScript and JavaScript to crate dynamic application and web pages.

2) Visual InterDev includes a wide robust of visual tools to augment application developer's productivity. HTML editing is significantly enhanced through the use of the HTML Layout Editor and a version of the FrontPage HTML editor. The HTML Layout Editor, introduced with the ActiveX control Pad from Microsoft, enables the developer to control the X and Y coordinates to ensure that the ActiveX Control are displayed in the proper manner.

3) Visual InterDev also provides WYSIWYG editing through its own FrontPage 97 HTML editor. FrontPage can visually author the HTML page. Content authors can use FrontPage to crate files that are completely compatible with Visual InterDev's version of the FrontPage Editor. Visual InterDev also provides site management tools that are very similar to those tools provided in FrontPage.

4) The Script wizard enables developer to associate specific actions with associated ActiveX Control events. By linking these events and actions, the script wizard generates all of the necessary script language for developer. Once the languages are generated, developer had the ability to modify and add to the code. This process cans save developer considerable development time by generating the routine scripts and enabling developer to focus on the more advance code for the application.

5) Visual InterDev also includes two tools for spicing up web pages. These tools focus on multimedia creation and management. The Microsoft Image Composer and Microsoft Music Producer enable developer to create graphical images, music and sound for the web site. The Music Producer enables developer to create music and sound effect for the web site.

6) Visual InterDev provides some very robust database tools. The Visual Data Tools included with Visual InterDev are easy to use and significantly reduce the time and effort for adding database capability. Some of the features include the following:

a) Data View

Visual InterDev project window that enables you to view your entire database

objects including tables, views, stored procedures and triggers.

b) Query Designer

A tool that enables you to visually builds your database queries and tests the results.

c) Database Designer

A tool that enables you to design, create and maintain your database

2.3.4.2 ASP [17]

It is the latest server-based technology from Microsoft, which can be used to build dynamic and interactive web pages. The basic of ASP is Microsoft's IIS. We have pay attention that ASP is not an application. ASP can interpreter of VB script and Java Script that is integrated with IIS, together with an interface for other custom components. Besides this, it is also able to include other web pages components like ActiveX control and Java Applets. It is considered a glue technology that can binds together other various server-based systems to help to build interactive web pages.

Features

- 1) Suitable for publishing and collecting data on the web.
- It also provides a way for building secure transactions, server based applications and web sites.
- 3) ASP also works together with Window NT and IIS to provide a comprehensive set of key software Technologies which enable secure exchange of information over public networks, access control to server resources and confident identification of server and client.
- 4) Active Database Object, one of the Active Server Components also provided to

VIRTUAL FSKTM

Chuah Hai Ping WET990014

allow easy but powerful connections to be made to almost any database system for which an Open Database Connectivity (ODBC) driver is available.

- 5) Pre-build Active Server Components, which provide plug-in objects that will perform specific tasks also provided by ASP.
- 6) It can interacts with almost any other existing dynamic web pages technology such as CGI (Common Gateway Interface), ISAPI (Internet Server Application Programming Interface) and scripts written in PERL, Python [18] and Awk.
- 7) Suitable for building multi-tier Internet and Intranet applications. It supports client-server programming. Combination of ASP, client-side scripting and objects cab be used to create client-server applications. Client side code can be created dynamically on the server.

2.3.4.3 ASP Compare to CGI

ASP provides all the functionality of CGI [19] applications in an easier-to-use and more robust environment. It is a easier way for server to access information in a form not readable by the client (such as an SQL database) and then act as a gateway between the two to produce information that the client can view and use.

With CGI, server creates as many processes as the number of client requests required. The more concurrent requests, more concurrent processes created by the server. Creating a process for every request is time consuming and requires large amount of server RAM. This can restrict the resources available for sharing from the server applications itself, slowing down performance, increasing wait times on the web. ASP instead runs in the same process as the web-server, more handling client request and more efficiency. It is much more easier to develop dynamic content and web application with ASP.

2.3.4.4 ASP Compare to ISAPI

ISAPI [20] requires all of the programming and layout to be contain in a dll [21] file written in C++. Compare to ASP, ISAPI is more difficult to create and maintain. With the ASP files and HTML, writer can script an external components from the output. ASP separates the layout and design from the business logic.

2.3.4.5 ASP Compare to Perl

Perl [22] and other scripting languages are not robust development tools by themselves. ASP provides a familiar framework and objects for building complex applications that require data from relational databases and legacy resources. Any scripting languages are supported virtually by ASP to build these applications.

2.3.5 Scripting Languages

There are three majoring scripting languages, which are supported by ASP. These three scripting languages are:

- a. JavaScript
- b. Jscript

c. VBScript

2.3.5.1 JavaScript

Originally it is called Live Script. It is developed by Netscape and soon modified and renamed in order to tap into the Java craze that was sweeping the Internet. Netscape offered Java Script as much simpler way of bringing interactivity to a web page.

Features:

- 1) It is faster and more transparent to the users than Java
- It is not compiled as Java code and does not have to be downloaded as a separate binary face.
- 3) It can be included right in the HTML and read on the fly by the browsers
- 4) It saves a good deal of server access time for loading a web page.
- 5) It is undeniable much simpler than Java, but does not make it easy as JavaScript is a programming language and is not just a markup language like HTML.
- 6) By looking at the code of a JavaScript enhanced page, non-programmers could easily plagiarize an entire JavaScript applet and enhance web pages with a simple cut and paste.

2.3.5.2 Jscript

It is Microsoft implementation of the ECNA 262 language specification. It is a full implementation plus some enhancements that take advantage of capabilities of Microsoft Internet Explorer.

Features:

1) Easy to use and easy to learn

Jscript is an interpreted object based scripting language. Although it has fewer Capabilities than full-fledged object oriented languages like C++ and Java, Jscript is more than sufficiency powerful for its intended purposes.

- It is a loosely type language. Data types of variables do not have to be declared explicitly and it performs conversion automatically when needed.
- It can manipulate those objects on a web page, tying together any number of applets and other HTML objects to create a virtual applications.

Disadvantages of Jscript

- It lacks extensible hierarchy of classes, ability to en appellate objects internals, and a study set of exception handling abilities.
- 2) Stand-alone applications could not be written in it and it has a little capability for reading or writing files, can run only in the presence of an interpreter, either in a web-server or a web browser.

2.3.5.3. VB Script

It is a smaller subset of the Visual Basic for application language. It is intended use in Internet and Intranet application development and it is currently supported in Microsoft Internet Explorer version 3.0 and above. It brings much of the power and flexibility of the Visual Basic language to the Internet and Intranet. On the client side, there is the opportunity to interact with Active X controls to provide active and increasing content. On the server side, it is used to integrate with the HTML to provide a new level of functionality and ease of use in website development.

Features and Limitations

1) Array handling

Many times it is useful to change the base of an array variable for a specific implementation. In VB Script, all arrays on must have a lower bound of zero. The same concept is true for multi-dimensional arrays. All lower bounds begin at zero.

2) Collections and classes

These are two of the most cherished features in the most recent release of Visual Basic. Object Oriented development is closer supported by the addition cannot be created within VB Script. To add functionality within a class, the class must be created in Visual Basic and then create an OLE component. An instance of the class can then be created from within an Active Server Pages script by using the Create Object syntax.

3) Conversion

There are number of conversion functions that are supported in VB Script. The most glassing omission in the Format command.

4) Data Types

No intrinsic data types are found in VB script. The only data type available is the variant, which makes complete sense considering that VB Script is an OLE implemented language. All parsing of values between OLE Objects is performed through variant variables.

Chuah Hai Ping WET990014

Microsoft Windows Net Meeting

Microsoft NetMeeting was installed in the Windows 98 and above operating system. This is a basic requirement to run a video or audio conferencing through the online system. It is easy to use, user-friendly and just need a small camera to get the source and send to the client or server.

38

2.4 Definition

Nowadays the client-server architecture is getting more popular. In the Internet, people can do a lot of things or work. Everything can be done in the virtual world. Virtual FSKTM can be separated into 2 short phases, which are listed below:

a) Virtual

Everything or field that are related with the study of distance learning except the final exam part are done in the virtual world that appeared in the Internet. All the lecture, notes, tutorial, assignment and others excluding the final exam part will be done through the accessing of the internet. Notes and tutorial can be downloaded. Assignment just need to send to the lecturer through the email provided. For the final exam part, all students need to go to the University or the nearest distance-learning center to take the exam. They also need to contact the person in charged for the confirmation for the exam.

b) FSKTM

This is a short form for the Faculty of Information Technology and Computer Science of University of Malaya in Bahasa Malaysia (Fakulti Sains Komputer Dan Teknologi Maklumat). The faculty of Computer Science and Information Technology was formed in the 1st of April 1993 by the Senate of the University.

Chuah Hai Ping WET990014

2.4.1 History of FSKTM

Before the forming of this faculty, all the courses are done in the Computer Center of the University, which was formed in the mid year of 1967. Starting from session 1990/91, the computer center of University Malaya offered the Bachelor of Computer Science, which take a period of study in 4 years. The first badge student was graduated in the session 1993/94 with 8 students graduated with first class degree. In the meeting dated 1st of April 1993, the Senate of University agreed to form a research board for the Computer Center. The research board agreed new faculty, which named Faculty of Computer Science and Information Technology. The council of University Malaya approved the forming of September 1994. At the same time, the council has made the decision to abolish the computer center of university and replaced it with the computer service department which is under the Chancellery

The Education Minister launched the building of this faculty in the 26th of September, 1996.In the session 1996/97, the faculty started offered the second degree course, Bachelor of Information Technology with the intake of 50 students in the same session. In the 21st of September 1998, the additional building of the faculty was launched by the Deputy Education Minister, Dato Fong Chan Onn.

Chuah Hai Ping WET990014

2.4.2 History of Distance Learning in FSKTM

The distance learning of this faculty was started in the year of 1994. In the same year, the Senate of University Malaya has approved the forming of distance learning center on 17 November 1994. The distance-learning center of University Malaya will conduct and plan for all the off campus courses. The off campus courses are offered to make the ease to follow all the study in University Malaya in the nearest distance-learning center or the minimum distance from the places where the student working or no need to come to the campus. The distance-learning program is also an alternative that gives chance to all the student that cannot enter to the higher education learning center to continue their study and improve their academic study.

The purpose of Distance-Learning is expanded to be parallel with the mission and philosophy of the government of Malaysia to provide the all the citizens that educated with knowledge and scale in many fields. With the crisis in certain fields, the government focusing more on the development of programs in engineering and computer science. Besides this, the government also want to increate more students in each intakes of all these courses.

As the most outstanding higher education center in Malaysia, University Malaya always prepares to face the development and enhancement in the country's education and helping the government to provide education facilities

which are always changing and based on technology for all the citizen in the country.

The Distance Learning Center of University Malaya planned and arranged the academic programs in all the focusing fields through the communication modes and the latest information technology. University Malaya wants to find partners that can provide the communication system with the higher technology and also can share its vision.

2.4.3 Mission of Distance Learning

The mission of Distance Learning is to provide more opportunities to continue study to higher level which has better quality without destroying the quality of Malaysia's Education

2.4.4 Objective of Distance Learning

- To make sure the Distance-Learning Program running based on the principle that approved by University Malaya and the Ministry of Education.
- To open more chances or opportunities to candidate that cannot enter to the programs that offered by University Malaya in an alternative way.

2.5 Traditional Distance Leaning System

Traditional Distance Learning System (School of Distance Education, USM [23]) Since 1971, University Science of Malaysia has starting offered degree program in its distance learning education system by setting up the School of Distance Education. The distance education programs began with printed lecture notes; followed by modular instruction in 1983. In previous time, School of Distance Learning of USM used traditional method in distance learning. Students need to go to specified center or main campus at night or during the weekend to attend all the lectures. The technology in previous time is not as advance as today and features can be offered to students are limited. Students have to get what they want by themselves and using any available methods to them like go to the campus to check out for exam schedule, enter to the library to get past year exam papers and etc. All this situation will burden them and sometimes they cannot make it because their time is limited as they are working during the office hours and the open time of library is limited in certain duration only.

Nowadays most of all the university or colleges have changed their method in teaching. They will use the more advance technology to build up a better system for all the students especially distance learning students. School of Distance Learning of USM using a better system than the previous one for all the distance learning students. Consultancy, notes, and other related features also provided for them to use. For general visitors, they will be able to visit special designed section for them. All the mission, history, objectives and etc of the school of distance learning can be got. The current system is better than the

previous one because a lot of new features are set up for the students.

2.6 Existing Virtual Distance Learning System

2.6.1 University Tun Abdul Razak

University Tun Abdul Razak (UNITAR [24]) is the first virtual university in Malaysia. All the programs, which are offered by this university, are run through the online system. As the pioneer in education that use virtual method, UNITAR offered degree and master degree programs to all the qualified students. All the notes, tutorials and etc will be done by using the online system. This mean that all the registered students can attend to the lecture or tutorial from any location and any time as long as they are connected to the Internet when the lecturer is giving the lecture or tutorial. This system is ideal for those who want to study but having some problems to come to the real campus for the study. It is anew system in the education field of our country. A lot of new features are provided by this virtual university. Those who are interested in all the programs can apply by using the provided forms and they will be informed soon about the status whether success or not. Frequently asked questions also provided for the use of those who may concern. This section answered all the questions about courses, registration and other related questions in the detail method. This will help to reduce the job of administrator while doing the maintenance or updating the system. Other than this, they also can reduce the work of administrator. All students also can save their time as they no need to go to the campus to attend the lecture or tutorial. All facilities are provided for the ease of them to use. Before they can proceed to the lecture or tutorial section, they need to login into the system with the unique user id and password. All these

Chuah Hai Ping WET990014

features for lecture or tutorial are grouped into a section called VOISS[21]. All the students need to login with their student id and password before they can proceed to this section. For those who are new students, they can get the detail information regarding the registration and methods and fees. Besides this, there is a virtual library for them to use. This virtual library provides a lot of useful materials, information, references and other related catalogues for the students to use. This virtual library is included in the same website. Link to other library such as National Library also provided for students to search for more information and references when they considered what they have got is not enough. The virtual library to search for the needed material or references and can access by using the online system. They need to login to the system because they can using the provided virtual library. Visitor cannot access to this virtual library. All features that are needed for a virtual university learning system are completely available.

2.7 VIRTUAL FSKTM Distance Learning System

Student Section

FSKTM Distance Learning System provides a more flexible and better system for those who are working and interested in study to get a degree certificate at night or after their working hours. Nowadays the technology is more advance than last time. All fields this system except the final exam part for each semester will be done in new ways that is more flexible and convenient to all the distance learning students. At first, for the registration part, the system is easier to use than the previous system. For those who are interested, they just need to register through the online system

VIRTUAL FSKTM

WXET3182 Latihan Ilmiah II

Chuah Hai Ping WET990014

by filling in the provided forms in the website. They will be informed whether they are offered in that intake or not after a duration. If they still doubt to the system, they can check out the frequently asked questions in the same page for the related information like refund of fees, paying methods and etc. They also can email to persons in-charge of the system to get more information. If they are offered, they receive a letter offer from the university in certain times. After this procedure, they need to confirm with the university whether they accept or reject the offer. Once they pay for the fees, they will be given a user id and login password before proceeding in the web site. After the first time login, they can change their password. In this website, complete notes, tutorial questions and answers, past year exam paper will be provided for the use of students. They can download all this provided features from the website after they have login into the system. All these features help them in study by saving their time make them feel more convenient because they no need to spend time to come to the university to get all these information or materials. If they are located far away from the campus, there is another problem for them to get the sources of notes, past year exam papers and all the other related materials. All the provided features help them to solve the problems.

Besides this, they also can chat with their course mate or communicate with lecturers in the text based chat room to discuss their problem in their study. For all the lectures, they need to use net meeting in the Window 98 or above operating system to plug in and attend to the lectures at the specified time. This feature is better than the traditional method as all the student can interact with the lecturer face to face although they are located in different area or may be far away from one to another.

VIRTUAL FSKTM

WXET3182 Latihan Ilmiah II

Chuah Hai Ping WET990014

Other than this, all the distance learning system's students also can edit their profile like update the latest address, email address and all their related particulars. They also can select their records like registered courses for current semester, result , personal information and etc from the database and view in the browser. They cannot update or delete all these records except the personal information. Once the latest result is got, the administrator of the system will update the database for the ease of student to check out and view in the browser.

Besides this, the system will provide a notice board. The main use of this notice board is for all the lecturer to make their announcement regarding the lectures or other fields like enhancement of tutorial. Students just need to view this notice board to get the latest announcement of their study. It is very important to browse this website to get the latest announcement and make sure that did not wasting anytime or missing the lecture or tutorials. The exam timetable also will be included in the notice board to make sure that they know all the timetable for the exam, venue and contact person for their exam.

Administrator Section

The administrator of the system can easily update the notice board and all the fields in the web site by logging into the system with their user id and password. After this procedure, they can update all the notes, tutorial answers and make all the latest enhancement through the online system. With this feature, it is easier for the administrator to update the web site and making any announcement. Lecturer just need to login to the system before giving the lecture through the video conferencing. When the result of each semester's exam comes out, the administrator just need to

update all the students' result by using this online system. For all the provided notes , tutorial questions and answers and past year exam paper, the administrator just need to upload to the server with the same methods.

Summary of Chapter 2

In this chapter, we have discussed the definition of distance learning, the growing of Internet and its function in education. It is getting more important nowadays that all the distance learning system will be using the Internet for the ease of administrator and also all the students. Web applications are getting more popular nowadays as the users no need to install any program to use the application but just need to connect to the Internet with certain devices and software. All components involved in these applications such as server, browser and database server need to be known before developing the system. Different type of operating system of server, database server, browser and web development technology change very fast nowadays and comparison should be made before choosing the specific tools, server, database server and programming languages to build up the system in future. The N-tier clientserver architecture is another feature in the dynamic web application system. Internet that help to develop the distance learning system for those who want to study after the working hours. With the client-server architecture, there are more connection can be made at the same time to different server. History, objectives and missions of FSKTM distance learning system also listed out. All these are needed to make sure that we know the criteria and condition of the faculty. Comparison among the traditional distance learning system and Virtual FSKTM has been done. Other than this, I also compared the first Virtual University in Malaysia, UNITAR as a current system to the Virtual FSKTM.

Chuah Hai Ping WET990014

Virtual FSKTM is a better system for distance learning students of Faculty of Computer Science and Information Technology of University Malaya.

Chapter 3 Methodology And Analysis System

3.1 Methodology of System Development

The system development strategy is a description of the way, which this project is done in actuality.

The system development will be using the waterfall method with prototype [25]. This method is suitable to develop this system because we can look through the development of each phase with the pre-build features. If the features is not match the requirement of the system, we still can make the correction in the development phase before implementing and using the actual system in the real life system.

The diagram below show the six phases that involved in the development of the system that will be built out.



Figure 3.1 System Prototyping Model

Virtual FSKTM

a) Requirement Analysis

This will carry out the analysis of all the requirement of the system. Research

and analysis of the system. Representation of the system will be done.

b) Quick Design

System will be designed out in quick way. Some functions of the system may be

enhanced later after this phase.

c) Construction Prototype

Prototype web system is created, tested and redefined.

d) Prototype Evaluation

The tested version of the prototype is presented to the user to test and suggest modifications.

e) Refine Requirement

Justify requirements or add in new requirements.

f) Engineer Product

Activity (b) to (e) is repeated until all requirements are formalized or until the prototype has evolved into a production system.

3.2 Information Collecting Methods

All the information that I need to use in this final year project are gathered by using the following methods:

- 1) Research on the previous, current and existing distance learning system
- Surfing in Internet to check out the existing distance learning system and doing research based on all these systems.
- 3) Survey on distance learning students (Local and overseas)

3.2.1 Research on the previous, current and existing distance learning system

Research has been done on previous, current and existing distance learning system. All the comparison has been written in Chapter 2. Previous distance learning system is the traditional system. This system has been using since the starting of distance learning until the appearance of advance technology. The new technology makes a new trend for all traditional system. All these system have been moved to the new system where the lecturer or provider will be using the online system for all the features in their distance learning system. For the existing system, some of these systems provide limited features and facilities for students to use. The limitation of the system will make some problems for the students as they need to full fill the uncompleted features. Example, most of the existing system. The students need to search or find out the exam paper by themselves in any methods. This is not much more difference from traditional system where students need to get it by themselves.

Virtual FSKTM

3.2.2 Surfing in Internet

There is another way to get latest information regarding distance-learning system in the world wide web. Nowadays, there are many universities either located locally or overseas offered degree or master degree through the online system. Surfing in the Internet can give more information according to the scope and objectives of this project. A few overseas universities also offered courses by using the distance learning method. All the URL [26] are listed below:

- a) The Virtual University Gazette, www.geteducated.com
- b) Virtual University Summer 2001 Calendar, www.vu.org
- c) http://distance.uta.edu/
- d) http://www.virtualusystems.com/
- e) http://www.ivlu.com/

All these websites are related to distance learning education either in degree or master degree program that offered to those are interested and qualified. All the features inside all these websites are similar to one another. Notes will be available to students as they are located far away from the main campus. Research has been done in all these websites to find out all the features either are same or differences and build out a better system for distance learning student of FSKTM in future. All these websites just provide notes to the students and some information regarding the university. For the payment of the tuition fees, students need to pay by using their credit card or sending bank draft to the university. Features that are provided for them are limited.

Virtual FSKTM

3.2.3 Survey on distance learning students (local and overseas)

Questionnaires of survey

1) Do you feel that it is a burden to attend lecture in campus or learning center?

a) Yes b) No

- 2) What new features that you hope to get from an e-learning system?
 - a) Past Year Exam papers
 - b) Online lecture and tutorial
 - c) Chat room
 - d) Record searching
 - e) Others: Please specify_____

You can select more than one.

3) Do you think that it is better that tutorial can be done in the online system?

a) Yes b) No

4) Do you communicate with other course mate?

a) Yes b) No

If yes please proceed to question 5 else go to question 6

- 5) How do you communicate with other course mate?
 - a) Email
 - b) Online Chat
 - c) Telephone
 - d) Others: Please specify

WXET3182 Latihan Ilmiah II	Virtual FSKTM	Chuah Hai Ping WET990014
6) Do you contact with your	r lecturers?	
a) Yes b) No		
If yes please proceed to qu	uestion 7	
7) How do you contact lectu	irers?	analyzed the collected
a) Email		
b) Telephone		
c) Others: Please specify	ter. They feel that it is a burden f	
8) How often you contact y	our lecturer?	
a) Once per month	renem also comment that it is ben	
b) Once per week		
c) Twice per month		
d) Others: Please specify	save a lot of time and vides a	
Thank You		users and the rest only
	the Surse mate. 40% only com	
		ith lecturer, they just use

Chuah Hai Ping WET990014

Analysis of survey

I have done a survey on distance learning students who are located in this country or overseas to find out what the features that need to set up for the use of them. The total number of students is ten. From the survey that I have done, I analyzed the collected information to design a better system for FSKTM distance learning students. 70% of the interviewed students said that it is better they can attend the lecture without going to the campus or learning center. They feel that it is a burden for them, as they need to work and sometimes even worse that they have to work for overtime and cannot attend the lecture or tutorial. 80% of them also comment that it is better that if a system can provides past year exam papers. Sometimes they cannot get some past year exam papers when they are preparing for the exam as they need these material as a reference. Besides this, they also mention that tutorial need to do by using the online system. An online learning system helps them to save a lot of time and provides a lot of useful features and functions for them. 70% of them did not contact with their lecturers and the rest only contact with the lecturer when they think it is needed to do so. 60% of the interviewed students did not contact with their course mate. 40% only communicate with course mate who are their friend at the same time. For those who contact with lecturer, they just use the email but not other functions. All of them said that it is better that entire learning system can provide a chat room for them to communicate with others. Other than this, 70% of them also mentioned that it is better if they can attend the lecture or tutorial at home and no need to go to the campus or learning center.

3.3 Analysis Requirement of System

Requirement of Virtual FSKTM system can be divided into two parts listed below:

- a) Functional Requirement
- b) Non-functional Requirement

3.3.1 Functional Requirement

Functional Requirement has three parts, which are:

- a) Administrator
- b) Students or users.
- c) General

3.3.1.1 Administrator Module

This part will allow administrator of the system to update the system with the latest information of all the students from this online system.

a) Login Id and Password

They also need to login to the system with their login id and password. Once they consider need to change the password, they also can do so after logging into the system.

b) Maintenance

For each semester result, they can straight away update the database by using this online system. Other than this, they also can update all the notes, tutorial questions and answers and past year exam paper from time to time or when they consider that it is needed. This part will be broken into a few sub modules where administrator can easily update with the specific title.

c) Video Conferencing

Lecturer needs to attend to the computer when they want to give lecture. This feature will be built out for them and they just need to follow the instructions when they want to apply or use it during the lecture time or tutorial time.

3.3.1.2 Student or Users Module

The students' part of the Virtual FSKTM system contain more functions for distance learning students.

a) Login Id and password

They need both login id and password to login to the system before proceeding.

After first time login, they can change the provided passwords. They also can use

this functions when they consider need to do so.

b) Course

All the notes, tutorial questions and answers, past exam papers and other will be provided to them to download. All of these will be classified according to the courses of each semester. Only all the offered courses in each semester will be available in this section.

c) Chat room

They also can use text based chat room to chat with others to discuss their problem in their study.

d) Notice Board

There is a notice board inside this system, the administrator will update this notice board from time to time to make sure that all the student will get the latest information or announcement or enhancement on any schedule or subject.

e) Video Conferencing

The most important feature is the video conferencing. This feature is used for lecture and tutorials. They can interact with the lecturer or tutor face to face to discuss their problem and find out the solution.

f) Edit Profile

They can edit their owned profile in the system. All the latest information of their owned particulars can be viewed or updated by using the unique student id. Other than this, they also can check their result either in general format or in detail format.

3.3.1.3 General Module

If the user is not a student of FSKTM distance learning student, the available functions for them is limited in this web site.

a) Introduction

They just can view the introduction of the faculty, courses offered to distance learning students and etc.

b) FAQ (Frequently Asked Questions)

A section called frequently asked questions would be published to answer all the questions that are always asked by users who interested but still doubt about the study. If they still doubt or having enquiry about the courses, they may contact with the person in charge to answer their questions.

c) Registration

For those who are interested in the study, they can straight away register by filling in the forms that are available through this online system in the duration of each intake. They need to fill in all the required field before submit to the system to apply for the course that they want to study. If they facing any problem, they can click on the icon with the word help which will provide instruction for them to fill in the form. Once they have missed the current intake, they have to wait for another intake, which may be in next year or next few months.

d) Contact

They can write mail to the person in charged with the provided email address or make a phone call to the office to ask for the answers for their questions with the specified telephone number and contact person.

3.3.2 Non Functional Requirement

There are seven parts in non-functional requirement:

a) User friendliness

This factor is important to be considered that user will feel that the system is userfriendly to use. If the system is not user-friendly, they may feel that the system cannot process their request in certain time and very hard to use all the built applications.

b) Security

This is the factor or condition that users will doubt that whether the system is secure or not in real life usage. They may ask that all their data sent to the server can be seen or view by the others especially those who like to hack the web server in the Internet. If a system is not secure, all the users will lose confidence to use it or input data from the browser to send to web server to process. This is very important especially when they are using their owned credit card to pay for the fees.

c) Reliability

Reliability means that the system can be trusted or not by users. If the reliability level is low, user will feel that it is not secure to apply all the web applications that are provided for them.

d) Maintainability

We have to consider that the system to be built up can easily maintained by the administrators or the system analyst of the system. If the system is not easily to do the maintenance, the will wasting a lot of time and resources. In addition, it will increasing the costing of the run-time system.

e) Efficiency

Efficiency means a process or procedure that can be called or accepted in an unlimited number of times to produce similar outcomes or outputs at a creditable part or speed.

f) Expandability

This is the factor where the system can be extended in future. A good system is a system that can be extended to process more request of client or users in future or meet the need of use at the same time.

g) Modularity
WXET3182 Latihan Ilmiah II

This is an important factor for a good programming design. Usually system are broken or divided into sub module so that distinct functions for objects could be isolated from another. At the same time, this factor also makes testing and maintenance of the system going to be much more easier.

3.4 Authoring Development Tools

As we have discussed the entire development platform in chapter 2, we have to decide which tool will be used to develop the system. The specific tools will be used are listed below with all the reasons.

a) Windows 2000 server

Client-server architecture of this online system needs a server to process all request of clients and send back to the browser to display to users. The built-in NT technology of this operating system will provide Internet Information Services (IIS) to run all the web applications provided by Active Server Pages (ASP). In addition, the built-in NT of Windows 2000 server provides the environment to run the Sequence Query Language Server 7.0 (SQL Server). The security of this operating system is better than other operating system for server.

b) Internet Information Services 5.0

IIS is needed when we want to develop the web site using ASP with Microsoft Visual Interdev. The Microsoft Visual Interdev also can develop static HTML and Dynamic HTML page when developer is using it to build out the system.

IIS 5.0 has improvement in HTTP related service areas. This features make the development of Dynamic HTML (DHTML) to be more effective and easier especially

Chuah Hai Ping WET990014

when there are connections established to the database server when the users using or running the web applications from the browser. The more easier and better connection to the database server will improve the processing of server and save a lot of resources. Thus, the waiting time for user will be less and in the end all the users will feel that the entire system is user-friendly.

The additional functionality in managing provides another good feature for the use of developer and web developer at the same time. Functionality in managing all the applications help developer manage and arrange all the web applications in a better method and save a lot of resources in server. In addition, they also can save a lot of time and resources when doing the maintenance of the system as all the web applications are managed and arranged correctly. A well-managed system is very important. If a system is not well managed, the maintenance will be wasting a lot of time and resources.

With IIS, developer can develop all the application functionality. If there is no IIS installed in the server site, developer or programmer cannot debug all the error in the ASP pages. This may be will produce out a system with a lot of bugs.

c) Microsoft Visual Interdev

WXET3182

Latihan Ilmiah II

This tool will be used to develop out all the ASP and HTML pages either in static or dynamic. The integrated development environment enables developer to use scripting languages like VBScript and JavaScript to crate dynamic application and web pages. In addition, its environment is similar to FrontPage 97 and makes all the developer more easier to use when developing web pages. WYSIWYG in Visual Interdev provides another feature to developer. They can easily edit the designed page with Microsoft FrontPage. All these pages can be ASP or HTML. At the same time, this software also included two more tools which are focus on multimedia creation and management. These two tools are Microsoft Image Composer and Microsoft Music Producer which enable developer to create graphical images, music and sound effect for the web site and make it more interactive and attractive.

d) Active Server Pages (ASP)

ASP is faster and better than other web application programming technology like CGI, ISAPI and Perl. Active X components, ODBC, Active Server Components and and other pre-built features make it suitable to publish and collect data from the web page. The integration with Windows NT and IIS make it suitable to provide a client-server architecture and dynamic web application to the Internet users. In addition, it can also enable secure exchange of information over public networks, access control to server resources and confident identification of server and client. ODBC driver establishes another connection to the database at the same time for users to retrieve or insert data into the database.

e) Java Script

This scripting language is powerful and can do a lot of functions at the client-site. Using this scripting language can do validation of user's input data. All the client page which getting data from user will be validated by this scripting language. If the validation is done by the server site scripting language, it will use a lot of memory in the server and wasting a lot of resources in the server. Thus it will effect the performance of server and increasing the waiting time. In addition, Java Script can

produce out interactive function in client-side to make all the user feel more comfortable and user-friendly while surfing the entire page or using the web applications.

f) Visual Basic Script (VBScript)

Visual Basic Script is another powerful and useful web application scripting language for building dynamic web pages. It is a server-side scripting language that can establishes connection to the database server with the ADODB connection and ODBC driver to do query with all the data in the specific database. Other than this, the server site scripting is also very secure. This scripting language will request all the validated user's data and use in certain query like insert, select, update or delete data from the database.

g) Microsoft Sequence Query Language Server (SQL Server) 7.0

Microsoft SQL Server 7.0 is specially designed for the use of dynamic web page. It provides easy use tools for users to create database, create table, modify table and other action in the interface. This feature help the administrator save a lot of time and resources when building out the system or doing the maintenance for the system in future. It can store multiple types of data like date/time, characters, integer, floating point, encrypted password, images and others in the database.

h) Microsoft FrontPage Server Extensions

This component is needed by Microsoft Visual Interdev to enable that developer of the system can debug on the server site. If this component is not installed, developer

cannot debug all the error in the asp pages that are written by themselves. A system developed out with bugs is not a good system. If the users cannot get they expected from the system during the critical time, they will feel very angry and disappointed to the system.

3.5 System Requirement

Virtual FSKTM is a web-based system. As usual, a we-based system can be categorized into two main components: client and server. This system will allow students to browse this web site and input data for applications if there are registered students and processed by the server. It is a dynamic system where client-server architecture is needed for building out. The required architecture is N-tier architecture where user can retrieve data from database when they are using the web applications.

N-tier client server architecture is suitable for this system because:

- a) This is a web-based system that allow users to input request and processed by the web server.
- b) Dynamic web pages are built and used in this system. Therefore the web server need to establish a connection to the database server to get for the required information from the database inside database server.
- c) Administrator needs to update the database from time to time and doing the maintenance by using this online system with their login id and password.
 The same system will be used to update students' information especially after exam of each semester.

Local Intranet

Local Intranet is a networking product that similar to Internet. All the applications that can be found in the Internet also can be run through the Local Intranet but just limited to all the computers that are linked together in the local intranet. We can develop web application by using Local Intranet. Minimum two computers equipped with needed accessories such as network card, cable, installed operating system and other components can be used to build up a local intranet. If there are more computers on the local intranet. the condition is better where developer can find out more problems that may occurred when implementing or testing the system by uploading all the components to the real life server in the faculty. All troubleshooting methods can be learned from a local intranet as the developer may face many problems while coding or testing the system in the duration of coding and testing. This will help the developer to code out a better system and debug all the error before upload to real life server. All these solutions also can be documented for the use in future as a reference to do the troubleshooting when the system is having some problems in the video conferencing. If all the bugs are found after uploading to the real life server, a lot of time and resources have to be used to disconnect the system from server and debug it.

Camera

It is a basic hardware that will be used in the video conferencing of the system. All the students who will be using this system in future need to make sure that they have this hardware. If they did not have such camera, they are not able to use the video conferencing for lecture or other features.

3.6 Summary

In chapter 3, we have discussed the method will be used for the system development. the method is water fall with prototype method. This method is suitable for developing the web system because users can check out the products while developers are coding for the system. During the developing phase, user can redefine the requirement to avoid the enhancement after the completion of the system. Other than this, we have to know the information collecting methods that have been used. First method is doing research on existing system. Second method is surfing in the Internet and doing research on the website, which provides or offered distance learning program to public. Research on the existing system provides material on the weakness on all these system and features that should be built in the coming system. Comparison between Virtual FSKTM and other website in same category produced a better guild line to develop the system in the coming phases. Analysis System requirement section discussed all the modules to be developed out for Virtual FSKTM. There are three modules inside the web system. These three modules are administrator module, student module and general module. Each module has their owned functions or features, which are unique. Authorized tools are Windows 2000 server, Microsoft Visual Interdev, IIS 5.0, Microsoft Sequence Server 7.0, VBScript, JavaScript, FrontPage Server Extensions and Active Server Pages (ASP). All these tools are selected to develop the system because of the special and unique features. These tools will help developer to build up a better system for all the distance learning students to use. The requirements of the system are listed also in section 3.5. Client-server architecture is needed to develop the system. This is because it is a dynamic system where a lot of applications will be prepared for users. The development

Chuah Hai Ping WET990014

phase of the system also will using the local intranet to build out the actual system due to developer's properties. The main function of this requirement is to produce the environment for developing video conferencing feature. Other than this, cameras also will be used to develop the video conferencing. If this feature cannot build out, the system will lost its unique.

4.1 Objectives

WXET3182

Latihan Ilmiah II

- The detailed design specifications that describe the features of
- Input, output, validated data, databases and architectures need to be described detail
- D Support Education Activities
- It will help the education performance when the Distance Learning Program of FSKTM can run in a better, efficiencies weatwe way.
- 3) Meet User Requirements
 - a) Performing appropriate concerning concerning
- b) Providing not your result
- Sc) Using approxime methods of intersection
 - d) Providing overall reliability
 - e) Presently proper form of information

4.0 System Design

System design is an important factor that need to be considered in the development of a system. It determines the success of a system. System specification describes the features of a system, the components or elements of a system and their appearance to the users. Requirements that found in the analysis stage are the one actuality that will be translated into the design specification.

4.1 Objectives

1) Specify logical Design Elements

The detailed design specifications that describe the features of an dynamic web system. Input, output, validated data, databases and architectures need to be described detail to prevent the enhancement after the success of the system.

²⁾ Support Education Activities

It will help the education performance where as the Distance Learning Program of FSKTM can run in a better, efficient and creative way.

3) Meet User Requirements

- a) Performing appropriate procedures correctly
- b) Providing accurate results
- c) Using appropriate methods of interaction
- d) Providing overall reliability
- e) Presently proper form of information

WXET3182 ' Latihan Ilmiah II

Virtual FSKTM

Chuah Hai Ping WET990014

4) Easy to use

- a) Favorable human engineering
- b) Ergonomic design that is physically comfortable and contributes to user

effectiveness and efficiently

5) Provide Software specifications

Specific components and functions with adequate detail of the system will be designed

out to construct the web application correctly

6) Confirm to Design Standards

Design and specifications of the design in accordance with prescribed rules and

practices of the faculty.

4.2 VIRTUAL FSKTM Structure Chart



WXET3182 Latihan Ilmiah II

Administrator Structure Chart



Figure 4.4

WXET3182 Latihan Ilmiah II

4.3 ER Diagram

4.3.1 Data Flow Diagram (DFD)

Elements of Data Flow Diagram

Entity
 Represent an object



2) Process

- Transforms or manipulates data within the system

- A process in represented by a rectangle which has 3 parts: I) Identifier
 - II) Location or person performs the process
 - III) Process name

D Store Data

3) Data Source, where data is held for a time within the system

It consists of 2 parts, identifier and the simple description of data stored.

Data

Data Flow, is a directed line which represents the information flow between two objects. The arrow denotes the direction of the data flow. Each data flow is labeled with the name or details of the information represented by the data flow.

WXET3182 ` Latihan Ilmiah II

General Data Flow





Data Flow for Authentication and Authorization Module







Figure 4.7

Data Flow For Administrator



Figure 4.8

4.4 User-Interface Design

The quality of system input determines the quality of system outputs.

It is vital that input forms and screens should be designed with this critical relationship in mind. A well-designed input forms and visual display terminal (VDT) screens should meet the objectiveness, accuracy, ease of use, consistency, simplicity and attractiveness. All these objectives are attainable through the use of basic design principles, knowledge of what is needed as input for the system, and an understanding of how user should respond to different elements in the forms and screens.

User interface design is based on the Graphical User Interface (GUI). Some of the Human Computer Interface (HCI) principles general principles of designing an interactive system have been considered and applied.

This phase needs careful design of the arrangement of functionality and modules to avoid having a page with too many conditions.

4.5 Web-Page Design

Virtual (SKIN) Microsoft Interne	et Explorer	
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	Figure 4.9	

WXET3182 ' Latihan Ilmiah II

Virtual FSKTM

4.6 Database Design

All databases in Virtual FSKTM will be designed by using the Microsoft Sequence

Query Language Server 7.0. All the relationship among all the tables will be described

to enable developer easy to use in the coding phase.

4.6.1 Data Dictionary

All the tables inside this web-system's database server will be showed after categorized

by using the relationship among all these tables.

Each tables that listed below will be showing the actual data including the type and the

description of the data.

Table Student Table 4.1

Data	Type	Description
Matrix Number	Character	Student ID
Name	Character	Student's Name
Age	Character	Student's age
Date of Birth	Date	Student's Birthday Date
Address	Character	Student's Current Address
Session (Intake)	Character	Intake's Session
Semester (Intake)	Character	Intake's Semester
Session (Current)	Character	Current Session
Semester (Current)	Character	Current Semester
New IC	Number	Student's New IC Number
Old IC	Number	Student's Old IC Number
Post Code	Number	Post Code
City	Character	City
State	Character	State
Telephone	Number	Student's phone number
Email	Character	Student's email address
Marriage Status	Character	Student's marriage status
Sex	Character	Student's sex
Race	Character	Student's race
Program	Character	Program of Study

Table Schedule1 (Lecture) Table 4.2

Date	Date	Lecture's date
Time	Time	Lecture's time
Subject	Character	Lecture's subject
Code	Character	Subject's Code

Table Schedule2 (Tutorial) Table 4.3

Date	Date	Tutorial's date
Time	Time	Tutorial's time
Subject	Character	Tutorial's subject
Code	Character	Subject's Code

Table Schedule3 (Exam) Table 4.4

Date	Date	Exam's Date
Time	Time	Exam's time
Subject	Character	Subject
Code	Character	Subject's Code
Venue	Character	Exam's Venue
In charged Person	Character	Person in charge of exam

Table Registered Course Table 4.5

Matrix Number	Character	Student's ID
Name	Character	Student's Name
Session	Character	Current's Session
Semester	Character	Current's Semester
Code	Character	Subject's Code
Credit Hours	Number	Subject's Credit Hours

Table Result Table 4.6

Matrix Number	Character	Student's ID
Name	Character	Student's Name
Session	Character	Intake Session
Semester	Character	Intake Semester
Credit Hours	Number	Subject's Credit Hours
Grade	Character	Student's Grade
Value	Number	Grade's value

Table Result (Detail) Table 4.7

Matrix Number	Character	Student's ID
Name	Character	Student's Name
Session	Character	Intake Session
Semester	Character	Intake Semester
Gain Credits	Number	Total Gained Credits
Collected Points	Decimal Points	Total Collected Points
Collected Credits	Decimal Points	Total collected credits
Credit Counted	Number	Total Counted Credits
Total Points	Decimal Points	Total Collected Points
Calculated Points	Decimal Points	GPA
Average Calculated Points	Decimal Points	CGPA

Table Subject Table 4.8

Code	Character	Subject's Code.
Credit Hours	Number	Subject's Credit Hours
Semester	Character	Semester to be offered/ Current Semester
Lecturer	Character	Lecturer who teach the subject
Reference	Character	Subject's Reference
Notes	Character	Note's Path in Server
Tutorial Question	Character	Tutorial's Question
Tutorial Answers	Character	Tutorial's Answers

Table Subject (Registered Students) Table 4.9

Code	Character	Subject's Code
Credit Hours	Number	Subject's Credit Hours
Semester	Character	Semester to be offered/ Current Semester
Matrix Number	Character	Registered Student's
Name	Character	Registered Student's

Table Lecturer Table 4.10

Name	Character	Lecturer's name	
Password	Character	Login's Password	

Table Semester Table 4.11

Sem	Character	Semester
0		

Table Notice Board Table 4.12

Announcement	Character	Announcement
Person	Character	Person who make
		announcement
Date1	Date	Date of the announcement

Table Notes Table 4.13

Name1	Character	Name of the file
Code	Character	Code of the file
Path	Character	Path of the file in database

Table Credit Hou	Table Credit Hours Table 4.14		
Hours	Integer	Credit Hours	

Table Subjects Table 4.15

Title	Character	Title of subject
Code	Character	Code of the subject

Table Assignment Table 4.16

Name1	Character	Student's name
Code	Character	Code
Path	Character	Path
Date	Character	Date of submit ion
MatrikNumber	Character	Student's ID

Table TempRegister Table 4.17

Name1	Character	Name for student who register
Age	Integer	Age
Address	Character	Address
Email	Character	Email address
State	Character	State
PostCode	Character	Post Code
ICNumber	Integer	IC Number
Birthday	Character	Birthday
Gender	Character	Gender
Course	Character	Course

WXET3182 ` Latihan Ilmiah II

Virtual FSKTM

4.7 Data Entry Procedure Design

There is an important factor in system design. This factor is to ensure that all the data entered into the system is accurate. If the entered data is not accurate, it will bring some problems to the system or the administrator. Accurate data is supported with restricted option and assuming quality through validation.

Input Validation

The main purpose of input validation is to catch the error during input, prior to processing and storage. There are 2 types of validation:

- a) Validating input transactions
- b) Validating input data

Validating Input transactions

The most common criteria of this validation are submitting data by unauthorized person. This is a situation where unauthorized person submits data the system to process. A good system should be able to prevent unauthorized person from submitting data to the system. Below are some ways to protect the system from these criteria:

- 1) Specifying the read write access person for the document
- 2) Using Controlled section that validates the user right to the section
- 3) Hiding irrelevant data from user view to edit

Validating Input Data

The most important function is to test the missing data. For some criteria or situation, certain data must be present to perform some tasks. The common procedure of checking data missing data is to check for null string value of the field. Other than this, we need to

test for invalid data type like non numeric data, invalid date format and so on. If invalid data is entered to process, the system will generate error and cannot complete the specified tasks.

4.8 Expected Outcomes

1) Only authorized students are allowed to access to the system

We have to make sure that only authorized students can access to the system by using the provided user id and passwords. For those who are not registered students, they only can access to the general section which is specially designed for them. All students need to login before proceeding to the provided section.

2) Students are allowed to change their password

All registered students are allowed to change their password. This features is used to make sure that all the students can protect their owned password from being changed or hacked by others. Their password will be encrypted before storing in the database.

- 3) User who are interested in the study allowed to register for each intake This expected outcomes would make sure that those who are interested to study could register by using all the provided forms. They can register by filling in all the provided forms.
- Enable administrator to do the maintenance work on the change of result, subjects and others.

This system will enable administrator to do the maintenance of the system. At the same time, he or she also can update the website with the latest information or enhancement regarding every fields.

WXET3182 ` Latihan Ilmiah II

Summary

In chapter 4 we have discussed the system design. At first, we have to look at the objectives of system design. It is an important factor for the success of the system. We need to define all the objectives before proceeding to the design phase. All these objectives declared a better situation for the developer to build out the system. The system is divided into three sub structures which are administrator structure, student structure and general visitor structure. Each structure has its owned unique features for its users. User interface design is another important factor that will influence the success of the system for all applications. If the interface of the system is not well-designed, user will lost their confidence to use it. The database design produced a better guideline for the developer during the coding and testing phase. Relationship among all these tables or databases also shown the important of all these important data.

For the data entry procedures, we need to make sure each transaction is a authorized transaction. If an unauthorized user is able to run an authorized transaction, this system is not secure and can be hacked by hackers. Other than this, validation will be done to make sure that user enters correct data. It is an important factor to protect the server by doing not important tasks. The correct data is very important especially a validated date, number only for identification number and etc.

WXET 3182 Latihan Ilmiah II

Chapter 5 Coding and Testing

This is the most important phase for the development of Virtual FSKTM. In this phase, source code will be written until the whole system are produced out. At the same time, testing will be ran by the developer to check for any not functioning program or error in the source code which will influence the performance of the whole system.

5.1 Coding

In coding phase, developer or programmer will write out all the source code for the whole system until all the expected result are produced. There are two types of coding approach, one is top-down and the other one is bottom-up. The bottom-up coding is based on coding some complete lower level modules and leaving the high level modules merely as skeletons that are used to call the lower modules, whereas the top-down approach is the reverse. There are three main modules in this system:

- a) Administrator Module
- b) Student Module
- c) Visitor Module

These three modules are related to each other where Administrator Module is the main module which will do the maintenance for the whole system including the other two module. All the back end maintenance needed to be completed before user or visitor can use by accessing the front end side. This system will use the top-down approach as all the back end function need to be done before users can using or accessing from the front end side. All the data and information needed key-in into database before the system can be launch to user to use.

WXET 3182 Latihan Ilmiah II

5.2 Program Documentation

It is one of the all documentation used in this system. Program documentation is a set of written descriptions that explain to a reader what the programs do and how they do it. Programmer of this system will produce a written document, which will describe all functions and its source code in a customized standard. The program documentation will be attached to the report of the system before submitting.

5.3 Internal Documentation

It is used in the program writing where developer will write out description of the source near the source code. This type of description only can be found when user can read through the written source code. Description will be written either at the top of the source code or on the right hand side of the source code. In Active Server Pages, which the default language is Visual Basic Script, description will be written by using the comment format showed as below.

Example:

Dim a ' Declare variable a

If Java Script, default client side scripting language for ASP, is used, then the description will be written in the following format.

- 1) Var a; // Declare variable a
- 2) Var a; /*Declare variable a */

All above format will be used in this project to write description for source code which need to explain to administrator to how the program function and what they need to do if they want to make any enhancement in future or add in any new features.

WXET 3182 Latihan Ilmiah II

Virtual FSKTM

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Internal documentation will help to administrator to understand the program of the system before they make any changes or enhancement in the system. In the same time, it will save their time.

5.4 Testing

The objective of testing is to find error and fault. Fault identification is the process of determining what fault or faults caused the failure, and fault correction or removal is the process of making changes to the system so that the faults are removed. Testing is another important phase of the development of the system. In this phase, developer will test all the function or features of the system to make sure it can be run. If any error or bugs are found in the system, developer will find out the solution to solve the problem or try to debug the system. It is better that developer can get a few of tester with experience to test the system and get opinions from them to build out a better system. It will help the developer to produce a better system with the waterfall with prototype methodology.

5.5 Testing Strategy

We need to find out a testing strategy before running any testing on the system. This testing strategy will guide the developer or tester during the testing of the system where they can write down or mark down the error on the specified features or function. They will not confused with the error in any function or miss out any function or modules that they did not tested yet.

5.6 Testing Planning

Test planning helps in designing and organizing tests, so that testing is carried out appropriately and thoroughly. The steps for the test planning are :

- a) Establishing test objective
- b) Designing test case
- c) Writing test case
- d) Testing test case
- e) Executing test
- f) Evaluating test results

5.7 Different type of Testing

There are many type of testing, which can be used to perform testing on a system. These type of testing which can be used in this system are listed below;

- 1) Unit Testing
- 2) Module Testing
- 3) Integration Testing
- 4) System Testing
- 5) Function Testing
- 6) Performance Testing

5.7.1 Unit Testing

It is the basic testing case for any system. Unit testing tries to look for all the possible errors that will occur in a program. A complete test process should test all of the following categories of test data:

- a) Normal data to test a given correct data will produce the expected results
- b) Erroneous data for a given erroneous data, like invalid date format, does the system detect it or not?
- c) Boundaries value analysis data that are out of the range specified will be used to test the system because errors may occur at the extreme point
- d) Condition testing data some functions may be active under certain condition, therefore a set of data are tested on all possible conditions

Unit testing involves testing each program on its own, isolated from the other programs in the system. The following steps specify how unit testing is carried out for this system:

- a) The code of the program is examined by reading through it to spot for algorithmic faults and syntax faults.
- b) All command buttons, text boxes and other control objects are tested to check its functionality.
- c) Different types of test data are used like number, character, date and etc. to test all the control objects.
- d) Test cases are developed to ensure that the input is properly converted to the desired output.

WXET 3182 Latihan Ilmiah II

5.7.2 Module Testing

This is run through after the unit testing. Each developed module will be tested to make sure that all features inside the module can be run. During this testing case, all modules are independent where there is no relationship among these modules.

5.7.3 Integration Testing

It is an important stage where all the modules in the system will be integrated and combined into one system. Before the integration, all the modules are independent where there is no relationship among all them. During the integration, these modules will be combined to produce one standard system.

5.7.4 System Testing

The purpose of this testing is to check out whether the system function as expected or not. In certain case, the system cannot work as normal where programmer also did not detect these kind of faults in other case of testing.

5.7.5 Function Testing

Function testing is based on the system functional requirements. Tester will try to find out either the system is functioning as described or not. Three main modules in VIRTUAL FSKTM, Administrator Module, User Module and Visitor Module including their sub modules will be tested for functioning or not. Tester will find out all functions in each module work as normal or not.

WXET 3182 Latihan Ilmiah II

Virtual FSKTM

5.7.6 Performance Testing

This kind of testing will find out whether the system's performance. In some condition, the system will work in a very smooth way where its performance is very good and there is not any problem occurred. Some system will not work in a smooth way. Its performance is slower than what the developer expected but there is no error or bugs appeared. If this condition is detected, normally the programmer will try to find out better solution or ways to improve the system's performance. Although there is no error where found or detected but enhancement needed to be made to develop a better and faster system. Normally developer will try their best to improve the developed system to make it perform in a faster speed until it meet the requirement.

Summary

In this chapter, we have discussed the main purpose of coding and testing. In the coding phase, internal documentation should be done to allow administrator to know what task that the source code will execute or where should the source code to be modified if they want to make any enhancement in future. This system can be improved in future by adding related features that are useful to the students and administrator.

At the same time, testing strategy is needed before testing of the system is running. Another important factor is the planning of testing. A good testing plan can help tester to check out for more fault or run time error in the system. Before doing any testing, we have to find out cases that will be appear or might be happen during the testing of system. It will help the developer to perform a better testing and minimize the error that did not tested by them. Conclusion testing should be run from time to time to minimize the error of the system.

Chapter 6 System Evaluation

6.1 System Strengths

This system is evaluated systematically as follow:

a) Security

This system is implemented with security login. For both administrator and user, login is required before using the system. The login screen requires user id and password only. If the user enters the wrong password for three times, this system will not allow the user to access the system even though the correct password is entered the fourth time. The administrator needs to set the user back to active user before the user can login again with the correct password.

For security purpose, only administrator login has the full access rights to the system and can make changes to the records in the database. There will be limited access rights for other user login.

b) Simple and user-friendly interface

Using Graphical User Interface (GUI) based development tools develops VIRTUAL FSKTM; therefore, all forms are kept simple. This is to provide a user-friendly system to the user for fast learning and ease of use. Command button, text box and other control objects are used to allow the user to execute command with ease. An action is just a click away and the user just needs minimal knowledge of mouse and keyboard to use this system.

c) Searching capability

VIRTUAL FSKTM

A good information retrieval system is designed such that it is easy to use even for a user. This system allows searches by using subject code, subject name, lecturer's name to retrieve record from the database.

d) Display process message

There are a lot of processes between the system and its database, therefore, it is important to inform the user what the system has done when clicking on any command button. Messages like 'Your Record has been saved' or 'Wrong password' will be displayed to inform the user. Without these messages, user might think that the system is faulty if no results are returned when a command is executed. In addition, user also knows that record is inserted into the database successfully.

e) Incorporates data validation

Data validation is done prior to insert record into the database. Before each form is submitted, validation will be done to make sure user enter data for each field. In certain situation, for example CGPA for student, administrator only can enter number or floating point only for CGPA. Using the same method before inserting into database also will validate other related field which data type is number.

f) Fast response to information retrieval

This system provides fast response to record searching and display in a report for the user.

g) Encryption of password

All the passwords in the system are encrypted and stored in the database. The user will not figure out the password if the user opens the database.

6.2 System Constraints

Due to time and knowledge limitation, there are a few system constraints; all of them are discussed below:

a) Database backup

Administrator needs to back up the database of the system to avoid any corruption from time to time. Besides this, they also need to do maintenance for the whole system from time to time.

b) Slow response time

If there are a lot of records in the database, the searching process will take more time because the system will search the database and then generate the search results in a report for the user.

6.3 Problems and Solutions

During the development of this system, a number of problems delay the progress of this system. All the problems and solutions are explained below:

a) Weakness of Microsoft SQL Server 7.0 database

If the database contains too many data, it will become unstable, as its original platform is not very stable.
Solution: Service Pack of SQL Server 7.0 need to be installed in the system to make it become more stable.

b) Date format

The date format of system developed is DD/MM/YYYY, but retrieving record from the database with this date format will give wrong results although the record of date in the database is also in the same format.

Solution: The format of date in SQL Server database follows US standard using MM/DD/YYYY. Although record is inserted using DD/MM/YYYY format, retrieving record will give wrong results if the format is DD/MM/YYYY. Therefore, date format should be MM/DD/YYYY to retrieve record from the database.

c) Error during moving the source code to another server

Error page were found during the running of the system in the new server. The connection path for the database hasn't set up. Restoring the backed up database will create the new database in the new server. New server name need to be specified in the connection paths to make sure that each page in this online system can be run.

d) Video Conferencing

This is one module of the system. Using the web cam and Microsoft Net meeting, which is installed in Windows, will run it. The main problem is speed connection. When the system is developing, it seems no problem because it is tested by using the Local Area Network (LAN) with 100 Mbps. If this module is running by using the normal Internet connection speed, it is not as smooth as the Local Area Network connection.

Reason: Nowadays there is a lot of high speed connection network and

97

line like ISDN, lease line and etc. If a normal student connect by using the normal Internet speed, this video conferencing will not run as normal. This is because they just using the normal phone line to connect to the server. At the same time, their modems are different types like 28.8 kbps or faster one 56.6kbps.

6.4 Future Enhancements

System development is a dynamic process and changes must be expected. For this information system, there can still have some improvements. However, one can hardly create a perfect system and Virtual FSKTM is no exception. Here are some suggestions for future enhancements:

a) Database backup

Once the system is corrupt, all the records in the database will lose and reinstall is needed to do again. This will take a lot of time to enter again all the reading material details into the database. Therefore a backup set of database is needed for restoring the old records.

b) Short phase searching

98

The system allows the administrator to type in short phase. This kind of article then can be search and view by the user with relevant search key.

c) Boolean searching

If the amount of reading material records are large in the database, Boolean searching method like AND and OR is also can be added to the system to enhance the searching capability.

6.5 Knowledge and Experience Gained

From the beginning of this project until the final documentation, a number of problems have occurred and experiences are learned from there. This project gives a lot of benefit and knowledge, there are:

a) The importance of all phases in SDLC

System analysis is an important phase in the system development life cycle (SDLC). This phase capture user requirements and the goal of the system. If this phase is wrong defined, it will cause faulty to the system development and later progress. With a complete and thorough system analysis, the system that is developed will fulfill all the requirements and achieve its goal.

WXET3182 Latihan Ilmiah II

System testing is also an important phase in SDLC. There is no application that is free of error in this world. However, with the procedures in the system testing phase, errors and faults in the system can be minimized. The functionality of each module or form can also be tested and confirmed that it meets the user requirements.

b) Development tools knowledge

This project is using Microsoft Visual Interdev 6.0 (VB), Microsoft SQL server 7.0 as authoring tools. Visual Interdev is a very powerful development tool for developing Windows environment online system. It is easy to use and provides graphical user interface. Microsoft SQL server 7.0 is used as database for this system; it is a database program suitable for storing records which data are very large. In addition, the weaknesses of SQL Server 7.0 database is discover and solution is also can be figure out.

c) Distance Learning knowledge and development for online education system

After the literature review, I have learned more knowledge on distance learning system. Besides this, management of a project also gained. I have gained more knowledge on distance-learning system where its students are normally those who missed out opportunity to continue their study in higher education learning center.

7.1 Conclusion

Virtual FSKTM is an online system to manage distance-learning student for Faculty of Computer Science and Information Technology of University Malaya. Besides this, distance-learning student also can access this online system to attend their lecture and tutorial without going to learning center.

This project gives me an opportunity to build a full application from scratch. It is a great challenge to develop a system alone. From this project, I have gained invaluable knowledge and experience during the progress of it. The knowledge which I obtained from university in these three years time gives me a strong foundation to take this project as long as to complete it. In addition, useful techniques, which have learned, are applied to this project.

This thesis makes me realize that tertiary education provides the foundation of computer science and information technology to undergraduates. There are more things to learn and experience in this fast growing world of information age. One has to constantly update oneself to keep up with the changing technology.

All in all, this thesis has armed me with invaluable knowledge and experience. As a result, I am better prepared to face future challenges in life.

1.1 VIRTUAL FSKTM

VIRTUAL FSKTM is an online learning system for distance-learning students who are studying the distance-learning program of Faculty of Computer Science and Information Technology of University Malaya. Student can access to the website for their built up module.

1.2 Hardware & Software Requirements

VIRTUAL FSKTM is specially designed for administrator and students of distancelearning program of FSCIT. The requirements of this application are:

- Pentium 166MHz or higher processor (Pentium II or higher processor recommended), or any Alpha processor running Microsoft Windows NT Workstation.
- 64 MB of RAM for Windows 98, 128 MB of RAM for Windows NT Workstation.
- iii) At least 300 MB of available disk space.
- iv) VGA 640x480 or higher-resolution screen supported by Microsoft Windows.
- v) A CD-ROM disc drive.
- vi) A mouse or other suitable pointing device.
- vii) A 56kps modem and Internet access account

Software Requirement:

- Microsoft Windows 98 or later, or Microsoft Windows NT Workstation
 4.0 (Service Pack 3 recommended) or later.
- ii) Microsoft Internet Explorer

2.1 Main Page Login



From the main login page of the website, user need to login by choosing their privilege before proceeding to the security login page. Only three types of privilege are available for them to choose. These three privileges are:

- A) Administrator
- B) Student
- C) Visitor

2.2 Security Login

Back	00000	arch ()Favorites	Hestory			
dress 🖉 http://e	ddie/thesis/welcomest	udent.asp				ත් ලංකා [Un
		VIRTUA	<u>il esktm</u>	0		
	Ple	ase enter you	ir student i	d and pass	word	
		Student	ld			
		Passwor	d/			
			inter Reset		e an eine ar sa	

After choosing the student privilege, the system will display a security login page where they need to login to the system with their owned student id and password. If either one of the required fields is not match with the record, they cannot access to the system.

2.3 Student Module

	VIR		2	
		Students Section		
<u>Video</u> Conferencing	Notice Board	Schedule	Courses	Assignment
<u>Notes</u>	<u>Contact</u>	Chat Room	Profile	Registration
This websit	e is best view with	Internet Explorer	C and above in	800X600

There are ten sub modules in the student's module. All these modules are showed in the above image.

Description of the sub modules:

1) Video Conferencing

This is a page with instructions to teach student to attend the lecture and tutorial by using their web camera and Microsoft Net Meeting.

2) Notice Board

This is a notice board where student can find out the latest announcement of the website.

3) Schedule

From this page, student can choose different type of schedule that they want to see

in the browser like lecture, tutorial and exam. Each category will contain the detail information like time, date and etc.

4) Courses

All the offered courses in each semester can be found in this sub module.

Lecturer names, credits hours semester to be offered, reference and other related information regarding all the courses.

5) Assignment

This page allows students to submit their assignment in the online system. They only can submit in three formats only which are:

a) Words format

- b) PowerPoint format
- c) Zip Format

The system only allow student to upload their assignment which size is not more than 1MB. If it is too big or too small, they cannot upload to the web server. Minimum requirement for each is 1kb and they only can upload each file for one time only as the overwrite function is disabled.

6) Notes

Students can choose the notes of subject that they want to download the notes from the website. Once they have selected the subject code, they will found the path for the file and can straight away download the file from the web server.

7) Contact

It is a page with detail information of lecturer, their email address and contact number and other related data.

8) Chat Room

It is text based chat room for student to discuss with their course-mate or friends about problem in their study. They just need to click in the hyperlink to enter to the chat room for chatting.

9) Profile

This section allows student to edit their owned profile like latest result, change their password and their address. Once they have changed their password, they need to login with their new password.

10) Registration

For each new semester, they access to this section to register for their courses. Courses that are offered to them will be based on the latest result.

3.1 Administrator Security Login



This is the page for administrator to login before doing any maintenance program. They need to login with their user name and password before proceeding to any maintenance of the system.

3.2 Administrator Module



The above page shows the main page of administrator. All related maintenance program are listed in the left banner of the page. These maintenance program are:

1) Notes

This module enable lecturer to upload their notes for their courses to the web server. Students only can download all the available notes after the uploading by administrator or lecturer.

2) Result

By using this module, administrator can do maintenance program on student result on each subject. These maintenance functions are:

a) INSERT Result

- b) SELECT Result
- c) UPDATE Result
- d) DELETE Result

3) Lecture

This section allows lecture time of each semester to be done. Same as Result module, the maintenance functions are:

- a) INSERT Lecture Time
- b) SELECT Lecture Time
- c) UPDATE Lecture Time
- d) DELETE Lecture Time

4) Tutorial

This module is similar to Lecture module but the main purpose is used for Tutorial time of the system. Available functions are listed below:

- a) INSERT Tutorial Time
- b) SELECT Tutorial Time
- c) UPDATE Tutorial Time
- d) DELETE Tutorial Time

5) Notice Board

All the announcement and notice that need to be stored in the database before displaying to users. This module offers below functions:

- a) INSERT Notice
- b) SELECT Notice

- c) UPDATE Notice
- d) DELETE Notice

6) Assignment

From this sub module page, lecturer can all the assignment submitted by students. All related information, student's id, date of submit ion can be found. Lecturer or administrator just need to key in student's id to find out the submitted assignment.

7) Exam

Same with other sub module, this module allows administrator to do maintenance on exam timetable.

Available functions are:

- a) INSERT Exam Time
- b) SELECT Exam Time
- c) UPDATE Exam Time
- d) DELETE Exam Time

8) New User

For each user that are approved for their application and paid for the fees, administrator will assign a new login id and the system will generate password to him or her. At the same time, their personal detail profile will be inserted into the database. Administrator also can search for activated user or delete user's account

9) Courses

Maintenance program of this module are :

a) INSERT Course Detail

- b) SELECT Course Detail
- c) UPDATE Course Detail
- d) DELETE Course Detail
- 10) Detail Result

The four functions are listed below:

- a) INSERT Student's Detail result
- b) SELECT Student's Detail Result
- c) UPDATE Student's Detail Result
- d) DELETE Student's Detail Result

11) Video Conferencing

Lecturers who are giving lecture need to read on the instructions on using the web cam for video conferencing.

Important Notes:

 For those sub modules with INSERT, SELECT, UPDATE and DELETE functions, administrator need to key in data for every field before they submitting the form to the other page.