My ChatQuiz System

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ABSTRACT

MY ChatQuiz system is a web-based application, which is developed with the aim to provide a user-friendly, attractive and interactive online learning environment to educational student to enhance their knowledge and communication among each other. The system is mainly focusing on secondary educational students as target users of the system.

In general, MY ChatQuiz System consists of 4 main modules: Login module, chat module, quiz module and question bank management module.

Surveys and reviews of various literatures have been conducted extensively to gain a better understanding of the project. The process modeling of project development is based on the Waterfall model with prototyping sub process. The system is designed based on good and essential features identified from existing system available on the Web in order to fulfill the functional and non-functional requirements.

The system architecture of MY ChatQuiz System can be divided into client, web server and database server. The client, who is the web browser that can access information by connecting to the web server, it has to pass the request to the web server that will interact with the database. The database server processes the request and result is sent back to the web server and finally to the client.

MY ChatQuiz System will be developed with combination of Java, JSP and Servlets technologies on Microsoft Windows 2000 platform utilizing database created by Microsoft SQL server 2000 since current client-server based database system will be migrate to web-based database system.

ACKNOWLEDGEMENT

First and foremost, I'd like to thank my parents, who have been sources of warm, help and support to me for what seems like forever, as well as for supplying a warm shoulder to lean on when I needed advice or someone to complain to. My all siblings, thanks for being there! Thank you all from the bottom of my heart.

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CHAPTER 1 - INTRODUCTION

1.1 Project Overview

Nowadays, the world is heading towards the age of information technology, including our country. Internet is a public, cooperative, and self-sustaining facility accessible to hundreds of millions of people worldwide. There are lots of ways to communicate through the Internet, ranging from E-Mail to live audio and video conferencing. Chat system is also one of the most widely used web applications on the web. It facilitates instant communication. Peoples can communicate, share knowledge and ideas and get to know each other easily. We can see from here, that it provides a learning opportunity to exploit. So, why not use this to enhance users learning?

Technology advancements had imposed radical changes in the field of education today. With good management of technology, it could boost student motivation, knowledge and effectiveness in completing class work and suggests the study.

In general, MY ChatQuiz System is a web-based application, which is developed with the aim to provide a user-friendly, attractive and interactive online learning environment to users to enhance their knowledge and communication among each other. It consists of some attractive features such as public chat and quiz. The system is mainly focusing on secondary educational students as the features of the system are mostly designed based on the standard and level of understanding of those group users. As the system is a web-based application, all online users with good internet connection are also allowed and welcomed to enter this cyberspace.

1.2 Project Objectives

This project is aimed to:

1. To train the users think fast.
2. To help users or students in doing revision of their studies in this virtual internet environment
3. To enhance communication & learning between students or users by sharing knowledge
4. To provide an interactive and enjoyable learning environment to the users

1.3 Project Scopes

Before starting the development of the system, the boundary of the system must be clarified. MY ChatQuiz system is a web-based application, which can be generally divided into database server, web server and client side (browser).

The database is stored in the database server and client can access the related data through the web server by online, which will interact with the database and retrieve information. In general, the system is divided into a few main subsystems as following:

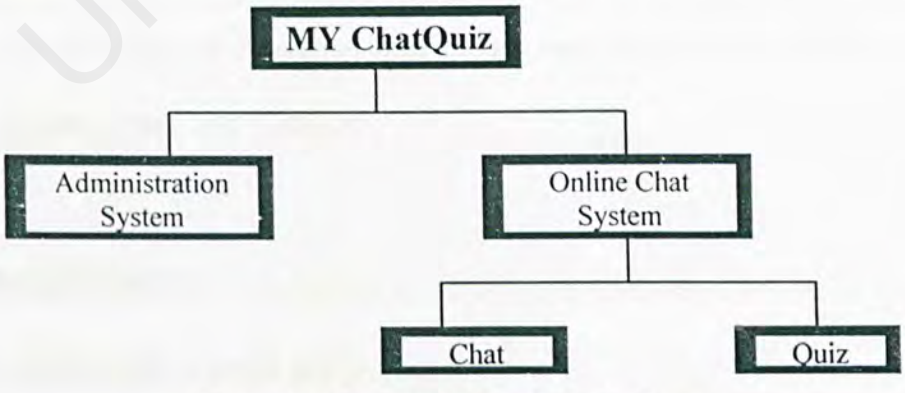

Figure 1.1: Scope of MY ChatQuiz System

- ***Administration system***

Administration module is responsible to monitor the database system, quiz and chat room system.

- Each administrator is required sign up and login to the system for administration purpose such as updating database, inserting quiz questions and generating report.
- Question bank is storage for storing the quiz questions (located at database side). The questions are grouped by level/standard (Form 1 - Form5). The questions are randomly retrieved from there when a quiz session is running.
- The system will provide an interactive environment by prompting meaningful and useful messages, commands or instructions to the users.

- ***Online Chatting system***

Each user is required login to chat using their login ID to represent them. Users are required to enter password when they join the system.

- **Chat**

  Users can chat with all other users. The chat content will be made public, means that the entire users of the system can view the content of the chat.

- **Quiz**

  This is a type of individual quiz. User can select their quiz session from the options 'Level' and 'Category.

1.4 Target Users

The targeted audiences for this project are:

- Secondary educational students, Form 1 to Form 5
- Online users who are interested

1.5 Project Limitations

For every project, there are always some limitations to the program that has been developed. By identifying the limitations or constraints in the program, there would be much easier for future enhancement. They would be:

- **System access**

  The system is a web-based application; it means that the system is only accessible to online users (with internet access). The user without internet connection would not be able to access and use this system.

- **Doesn't support Multilanguage environment**

  The system doesn't support Multilanguage feature. It's only available in English version.

- **Limited number of questions in database**

  Due to the time constraint during the development of the system, there are fewer questions prepared by the author to be stored in the question bank.

- **Limited target user**

  Due to the time constraint, it is impossible to the author to go in very detail research and prototyping work to work out more and wider possible range of questions when developing the system. So that, the prepared quiz questions will be more focusing on secondary school syllabus.

1.6 Project Schedule

ID	Task Name	Start	Finish	Duration
1	**First Stage**	6/3/2002	9/1/2002	13w
2	Feasibility Study & Project Proposal	6/3/2002	6/16/2002	2w
3	Introduction	6/16/2002	7/1/2002	2w
4	Literature Review	7/2/2002	7/15/2002	2w
5	System Analysis & Methodology study	7/16/2002	7/28/2002	1.8w
6	System Design	7/29/2002	8/11/2002	2w
7	Viva	8/12/2002	9/1/2002	3w
8	**Seoond Stage**	10/21/2002	2/7/2003	15.71w
9	System Coding	9/2/2002	12/29/2002	17w
10	System Testing	10/28/2002	1/5/2003	10w
11	System Implementation	1/6/2003	1/19/2003	2w
12	System Documentation	6/17/2002	1/30/2003	32.57w
13	Viva	1/20/2003	2/7/2003	2.71w

Figure 1.2: Schedule of MY ChatQuiz System

1.7 Conclusion

In this chapter, a brief introduction for the project was given. The topics included are project overview, project objectives, project scope, target user, project limitation and project schedule.

The project overview gives a briefly explanation for this project. Besides, the boundary or scope of the project and the objectives expected to achieve at the end of this proposed system are listed out in this chapter. By identifying the target users of the system earlier, this can enable the author and developer of the system to generate the system content that it is best suite to target users.

Project schedule has been made in order to manage time allocation properly during the system development. Limitations or constraints of the system have been identified in this chapter too. It is believed that there would be easier for future enhancement of this system.

CHAPTER 2 – LITERATURE REVIEW

Literature review is regarding finding and studies on all related information to the system. The purpose of this study is to get a better understanding the topic of the project and the requirement for the development. It contains all the related issues, supporting facts and some information from journal or previous research.

2.1 What Is

2.1.1 System

A **system** is a collection of elements or components that are organized for a common purpose. A computer system is a functional unit, consisting of one or more computers and associated software, that (a) uses common storage for all or part of a program and also for all or part of the data necessary for the execution of the program, (b) executes user-written or user-designated programs, and (c) performs user-designated data manipulation, including arithmetic and logic operations.

A computer system consists of hardware components too that have been carefully chosen so that they work well together and software components or programs that run in the computer. It may be a stand-alone system or may consist of several interconnected systems.

2.1.2 Online & Online Computer System

Online is the condition of being connected to a computer or a telecommunications system. The term is frequently used to describe someone who is currently connected to the Internet. In other word, when a user connects to the Internet, the user is online.

Online computer system is a computer system that is part of, or is embedded in, a larger entity, such as a communication system, and that interacts in real or near-real time with the entity and its users. *(Real time is a level of computer responsiveness that a user senses as sufficiently immediate or that enables the computer to keep up with some external process.)*

2.1.3 Chat

Chat is a way of communication between 2 or more parties in a friendly informal manner. On the Internet, chat is any system that allows any number of logged-in users to have a typed, real-time, on-line conversation, either by all users logging into the same computer, or more commonly nowadays, via a network. It brings people who are miles apart onto the same screen and allows real interactivity with immediate effect.

Usually, this "talking" is the exchange of typed-in messages requiring one site as the repository for the messages (or "chat site") and a group of users who take part from anywhere on the Internet.

2.1.4 Quiz

In noun form, **quiz** is an examination consisting of a few short questions, and it is carried out personally or among groups of peoples. In verb form, quiz is, examine someone's knowledge of something. Nowadays, there's various type of quizzes. Pop

quiz, a type of quizzes that given without prior warning, is one of the popular quiz that being carried out nowadays.

2.1.5 MY ChatQuiz System

MY ChatQuiz system, also called online MY ChatQuiz system is a web-based *(something that is found only on the Internet or something using Internet as platform to function)* application that provides a cyberspace to play chatting and quizzing. As chat system facilitates instant communication, it creates a suitable interactive environment to do quizzing and interacts with online users effectively.

2.2 Quiz - Manually to Online

Quiz is an activity that can be carried out at any time, any place by anyone. It is intended to test the level of a person's knowledge of something. There must be a specific field relating to the quiz. But, there're no any fixed rules that should follow by all quizzes. It depends on the quiz organizer about how to control the implementation of the quiz, as long as it achieves objectives of the quiz. Besides, there's various type of quizzes nowadays by considering the quiz topic. Sport quiz for instance, it is a type of quiz to test the respondent about his/her knowledge on sport area and so on.

In manually style, the traditional method of ink and paper material is used as a tool to work out most of the quizzes. The organizer will prepare a number of related questions and the questions will be printed on papers. Then, the user or respondent will be required to answer the questions within a fixed period of time. Most of quizzes have their own

prefixed evaluation result. After the user has filled up their answers, their answers will be marked and evaluation will make on them based on their collected points.

Publishing or reading materials will never be the same again with the introduction and expansion of information technology. Now in the fast paced world, electronic publishing prevails. Information is no longer recorded using the method of ink and paper only, but is stored in databases, which reside in servers (computing system). Quiz is one of the examples of applications that have been made applicable on Internet, from manually to online style. When a user connects to Internet, he/she can access a quiz game easily whenever he/she wants without using ink and paper. Internet facilitates instant communication (chat system), so that it provides a good opportunity to create an interactive environment to undergo an online quiz. Online users communicate with the administrator (quizmaster) interactively, that the system computer administrator will act as the organizer of the quiz and users will be tested by the questions that displaying on monitor screen. After that, the answers will be marked and the result will be evaluated by the computer system.

2.2.1 Quiz for Secondary School

At school, quiz is a common activity. It is another form of evaluation on students besides examinations. The purpose of the quiz is to test student's knowledge and understanding of certain case or subject. This can be carried out in a formal or informal way. Usually, it needs a proper preparation or consideration before having a quiz among the students, such as time decision, a suitable space or big enough classroom to accommodate a group of students who take the quiz.

Normally, teacher is the organizer of a quiz. But a quiz can be also carried out in school club societies as well. This is usually handled by students itself (club committees)

and the club members will be the respondents that being tested. This is not only can improve the students' knowledge, but also can train the students' ability in handling an event.

2.3 Analysis on Existing System

2.3.1 Analysis On "1001 Periodic Table Quiz Question"

URL: http://www.1001-periodic-table-quiz-questions.com

This is an educational website that was researched, developed and designed by Alwyn Botha. It provides over 1300 free science and chemistry questions per age and topic for school, college and university students. Besides that, it also provides some of useful information for student revision. The basic characteristics or features of the system are:

- It is a web application, which is accessible with internet connection.
- It doesn't need permission to link to this page.
- The quizzes in it are focusing on science and chemistry field.
- The quizzes are grouped by educational level or age,.range between Grade 1(6 years old) to Grade 12 or higher.
- Each group has various types of quiz sessions that are differentiate by the topic that being tested, which are suitable to the group's level.
- Most of the quiz questions are presented in multiple choices answer style, but there're still having the style of 'fill in the blank', including pictorial questions as well.
- Users are given chances to send suggestions to the author of the website.

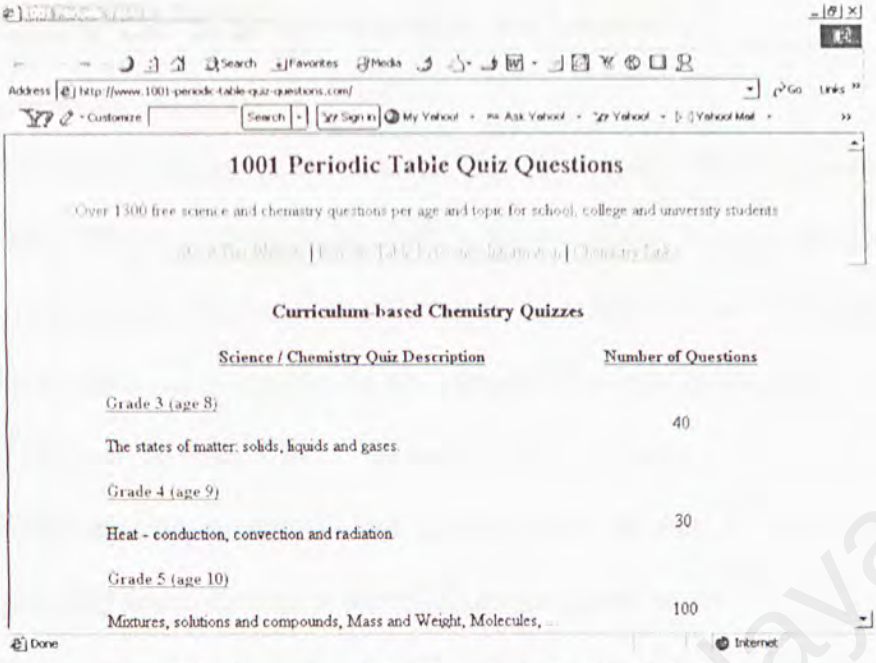

Figure 2.1: Overview of 1001 Periodic Table Quiz Question

Advantages of this system

- Easy access, anytime, anywhere with a web browser and get connected.
- It's free! No need any subscription.
- Besides quizzing, there is a lot of related information that have been put on this website as well. So that, users can also learns from there.

Disadvantages of this system

- The evaluation of the quiz is done by counting the total marks, but without any explanation or advises to the participant.
- The layout and appearances of pages is not attractive.
- There's no time limit for answering the questions. This may not effective to carry out the quiz.

2.3.2 Analysis On "International High IQ Society"

URL: http://www/highiqsociety.org

This website belongs to International High IQ Society. The International High IQ Society, the 2nd largest high-IQ organization in the world, was founded in New York City by Nethan Haselbauer. He created the Society in April 2000 to enable bright people from around the world to come together on the internet. The main goals of the Society are to foster intellectual thinking and to provide social opportunities for their members. Generally the website provides some features such as free IQ test, puzzle game, tournaments, chat room, discussion forum, IQ magazine and so on.

IQ free test is one of the significant features that have been included in this website. It's similar to a general quiz, but it concentrates on testing IQ knowledge.

- They offer 7 IQ tests that measure different aspects of intelligence.
- Each of tests can be taken online free of charge.
- Results will be provided immediately upon completion
- Person who scores 126 or above on any of the tests may become a member of the society.
- 7 IQ tests are: 1- Ultimate IQ test, 2- Timed test 5 minutes, 3- Verbal IQ test, 4- Logic IQ test, 5- Timed test 12 minutes, 6- Culture Fair IQ test, 7- Test for exceptional intelligence.

Advantages of the system

- It is entirely web-based making it conveniently accessible from any computer connected to the Internet.
- It is free of charge to take part in some of the features, e.g.: IQ test.

- The use interface is user-friendly and the layout and appearance is attractive.
- Some of the tests will state the time limitation for answering the questions. It is a good way to test IQ knowledge.
- The tests are designed to be much harder than the average IQ test, and therefore, be more accurate at higher levels. Participants can join this system and can be evaluated by with standard.

Disadvantages of the system

- Membership can be only obtained by scoring above a specific score on the IQ tests or an admission test.
- Lifetime membership fee of $50 will be charged.
- Some of features are only accessed by members of the society such as chat room, discussion forum and online tournament game.

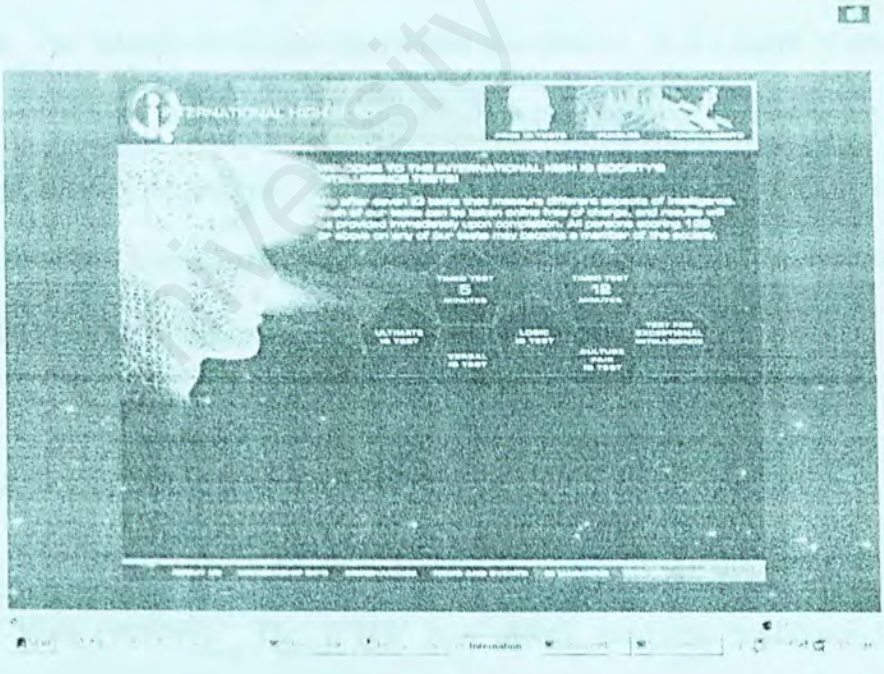

Figure 2.2: Overview of International High IQ Society Intelligence Tests.

2.4 Software & Technologies

2.4.1 Internet & World Wide Web (WWW)

2.4.1.1 Internet

The **Internet** is the ultimate network (network of networks). It is a huge collection of computer networks connecting millions of computers, people, software programs, databases, and files. The parts and players are spread around world and interact continuously. Any two connected computers can be considered a network. Any two connected networks become an internet (small " i "). Technological advancements over the last few years have enabled almost all computers to be networked together, giving birth to today's Internet (capital "I ").

The Internet is the transport vehicle for the information stored in files or documents on another computer. It can be compared to an international communications utility servicing computers. It is sometimes compared to a giant international plumbing system. The Internet itself does not contain information. It is a slight misstatement to say a "document was found *on* the Internet." It would be more correct to say it was found *through* or *using* the Internet. What it was found in (or on) is one of the computers linked to the Internet. Computers on the Internet may use one or all of the Internet services: E-mail, FTP, Telnet, Gopher, and WWW.

2.4.1.2 World Wide Web (WWW)

The Internet owes its great popularity to one important application: the **World Wide Web (WWW)**. The WWW is a global, seamless environment in which all information that is accessible from the Internet can be accessed in a consistent and simple way by using a standard set of naming and access conventions. The WWW incorporates

all of the Internet services above and much more. Users can retrieve documents, view images, animation, and video, listen to sound files, speak and hear voice, and view programs that run on practically any software in the world, providing user's computer has the hardware and software to do these things.

When the user log onto the Internet using browser, the user is viewing documents on the WWW. The current foundation on which the WWW function is the programming language called HTML. It is HTML and other programming imbedded within HTML that make possible Hypertext. Hypertext is the ability to have web pages containing links, which are areas in a page or buttons or graphics on which we can click our mouse button to retrieve another document into computer.

How do hypertext links work? Every document or file or site or movie or sound file or anything the user find on the Web has a unique URL (uniform resource locator) that identifies what computer the thing is on, where it is within that computer, and its specific file name. Every Hypertext link on every web page in the world contains one of the URLs. When the user click on a link of any kind on a Web page, the user send a request to retrieve the unique document on some computer in the world that is uniquely identified by that URL.

2.4.1.3 Relationship between the web and the Internet

A lot of people think the Internet and the WWW is the same thing. In fact, the Internet has been around considerably longer than the WWW or what we call Web. The basis for the Web is the Internet. The Web is built on the Internet, and makes use of many of the mechanisms the Internet provides.

The Internet is the physical aspect – computers, networks, and services. It allows the users to connect to thousands of other computers across the world. But it doesn't mean that those systems user's can look at, and understand, the information there.

The Web is an abstraction and common set of services on top of the Internet. It is the set of protocols and tools that let the users share information with each other. The Web was developed with the concept of "universal readership". Any participating system should be able to read the information on any connected system using a common set of tools: browsers, servers/gateways, addressing schemes, common protocols, format negotiation.

2.4.2 Network Architecture Review

Client/Server

The term client/server was first used in the 1980s in reference to personal computers (PCs) on a network. The actual client/server model started gaining acceptance in the late 1980s. A **client/server** system consists of 2 different types of programs – client programs and server programs. A client program initiates contact with a separate server program (usually on a different machine) for a specific function or purpose. The client exists in the position of the requester for the service provided by the server. When user connected to the Internet, user's computer becomes a web client in a worldwide client/server network.

A typical example of a client/server application is a web browser. The client (web browser) sends a request to a server application running on another machine somewhere. The server receives the request, retrieves the necessary information - in this case a web page, and returns the information to the client application. The client application is

responsible for displaying the data returned from the server in a format acceptable to the user. There're many advantages to the client/server system. For example:

- It lets the users consolidate data in one place. Because data always accessed by requesting it from the server, everyone always knows where to get the data they need.
- It makes it easier for administrators to create reports on what data is available, and to track or monitor the use of that data.
- It makes it easier for administrator to save backup copies of data, and to restore that data in case of an accident.
- It concentrates processor-intensive tasks on a powerful server computer, freeing up the processors of slower client computers.

The characteristics of client/server architecture are:

1. Combination of a client or front-end portion that interacts with the user, and a server or back-end portion that interacts with the shared resource. The client process contains solution-specific logic and provides the interface between the user and the rest of the application system. The server process acts as a software engine that manages shared resources such as database, modem, printers, or high-powered processors.
2. The front-end task and back-end task have fundamentally different requirements for computing resources such as processor speeds, memory, disk speeds and capacities, and I/O devices.
3. The environment is typically heterogeneous and multivendor. The hardware platform and OS of client and server are not usually the same. Client and server processes communicate through a well-defined set of standard application program interfaces (API's) and RPC's.

4. Scalability. They can scale horizontally or vertically. Horizontal scaling means adding or removing client workstations with only a slight performance impact. Vertical scaling means migrating to a larger and faster server machine or multiservers.

2.4.2.1 2 -tier Client/Server

2-tier client/server was among the 1st form of client/server architecture. A 2-tier client/server model began to emerge with the applications developed for LANs in the late 80s and early 90s. In 2-tier client/server architecture, the client communicates directly with the database server with no intervening servers. The design allocates the user system interface exclusively to the client and it is usually located in the user's desktop environment. The database management services are usually in a server that is a more powerful machine that services many clients. Processing management is split between the client and server, creating 2 layers. The database management server provides stored procedures and triggers.

Generally, 2-tier architectures consist of 3 components distributed in 2 layers: client and server. The 3 components are:

1. User System Interface (such as session, text input, dialog, and display management services)
2. Processing Management (such as process development, process enactment, process monitoring, and process resource services)
3. Database Management (such as data and file services)

The conversation that occurs between a web browser and a web server is similar to any conversation between client and server generally. Of course, other computers are

involved in the process of transporting packets of information across the Internet. Those details are part of the transportation facility that is handled by TCP/IP.

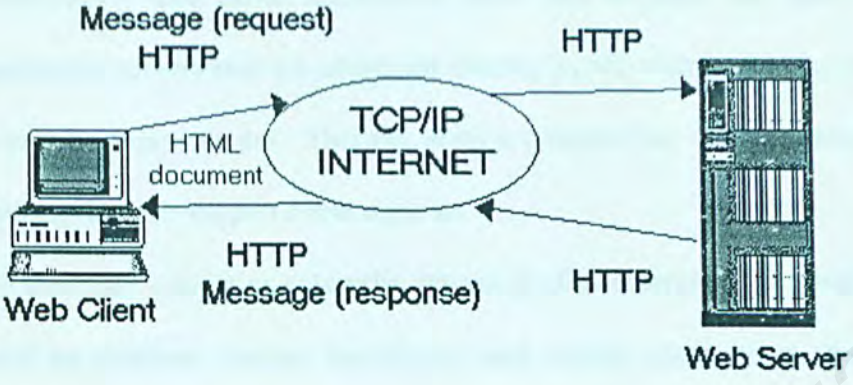

Figure 2.3: Message flow in two-tier client/server architecture.

2.4.2.2 3 -tier Client/Server

A newer generation of C/S implementations takes the 2-tier segmented model a step further and adds a middle tier to achieve a '3-tier' architecture. The best example of a 3-tier application is a web application. **3-tier client/server** architecture introduces a server (or an 'agent') between the client environment and the data server environment. The role of this agent is many folds. It can provide translation services (as in adapting a legacy application on a mainframe to a C/S environment), metering services (as in acting as a transaction monitor to limit the number of simultaneous requests to a given server), or intelligent agent services (as in mapping a request to a number of different servers, collating the results, and returning a single response to the client.) The software components 3-tier architecture:

1. *Client-tier* – contains programs executed by users (web client). These can be browsers, network-capable application programs, Java-based programs or other web-enabled programming environments running within the client tier-both inside

and outside of corporate firewalls. These programs can be written in virtually any programming language.

2. *Middle-tier* – also called application server tier, contains web server and other application servers that are addressed directly by the clients, such as existing web servers or proxy servers. This tier hosts a combination of presentation logic and business logic to support client requests.
3. *Backend tier* – contains enterprise resources (EIS-enterprise information system), such as database system mainframe and legacy applications, and packaged enterprise resource planning (ERP) applications

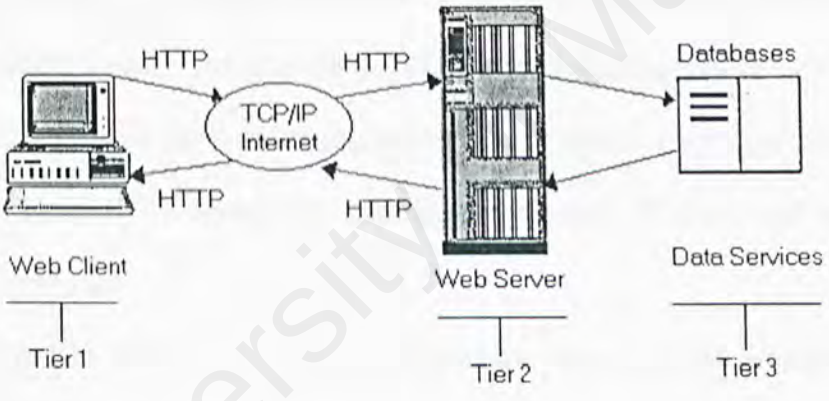

Figure 2.4: Message flow in three-tier client/server architecture

2.4.3 Operating System

An Operating system (OS) is the program that, after being initially loaded into the computer by a boot program, manages all the other programs in a computer. The other programs are called application/application programs. The application programs make use of the operating system by making requests for services through a defined application

program interface (API). In addition, users can interact directly with the operating system through a user interface such as a command language or a graphical user interface (GUI). On computers that can provide parallel processing, an OS can manage how to divide the program so that it runs on more than one processor at a time.

2.4.3.1 UNIX

UNIX is a multi-tasking multi-user OS. It is originated at Bell Labs in 1969 as an interactive time-sharing system. Ken Thompson and Dennis Ritchie are considered the inventors of UNIX. In 1974, UNIX became the first OS written in the C language. UNIX has evolved as a kind of large freeware product, with many extensions and new ideas provided in a variety of versions of UNIX by different companies, universities, and individuals. Partly because it was not a proprietary OS owned by any one of the leading computer companies and partly because it is written in a standard language and embraced many popular ideas, UNIX became the first open or standard OS that could be improved or enhanced by anyone.

It is used in widely sold workstation products from Sun Microsystems, Silicon Graphics, IBM and a number of other companies. It is currently the most popular OS found on multi-user installations. In fact most of the internet servers run on UNIX system. The UNIX environment and the client/server program model were important elements in the development of the Internet and the reshaping of computing as centered in networks rather than in individual computers.

2.4.3.2 Linux

Linux is an UNIX-like OS that was designed to provide personal computer users a free or very low-cost OS comparable to traditional and usually more expensive UNIX

system. It has a reputation as a very efficient and fast-performing system. Linux comes in versions for all the major microprocessor platforms including the Intel, PowerPC, Sparc and Alpha platforms. It's also available on IBM's S/390.

Linux is a remarkably complete operating system, including a GUI, an X Window System, TCP/IP, the Emacs editor, and other components usually found in a comprehensive UNIX system. Unlike Windows and other proprietary systems, Linux is publicly open and extendible by contributors. Because it conforms to the Portable Operating System Interface standard user and programming interfaces, developers can write programs that can be ported to other OS.

An important reason why Linux has become so popular today is the ease of availability through the so-called "distributions". Distributions bundle the Linux operating system together with useful applications developed by independent groups, and usually have an installation program.

2.4.3.3 Windows 98

Windows 98 (called "Memphis" during development and previously called "Windows 97" based on an earlier schedule) is a widely installed product in Microsoft's evolution of the Windows OS for personal computers. Windows 98 expresses Microsoft's belief that users want and should have a global view of their potential resources and that Web technology should be an important part of the user interface. Although building Microsoft's own Web browser into the user desktop has been an issue in the U.S. Justice Department's suit, Windows 98 was released as planned with its tightly integrated browser. In Windows 98, Microsoft's Internet Explorer is an integral part of the OS. Using the Active Desktop of Windows 98, user can view and access desktop objects that

reside on the WWW as well as local files and application. The Windows 98 desktop is, in fact, a web page with HTML links and features that exploit Microsoft's ActiveX control.

Windows 2000, and evolution of the Windows OS, that is designed for personal or small-office professional or business use, are gradually replacing Windows 98.

2.4.3.4 Windows 2000 (W2K)

Windows 2000 (W2K) is one of the commercial versions of Microsoft's evolving OS. Previously called Windows NT 5.0, Microsoft emphasizes that Windows 2000 is evolutionary and "Built on NT Technology". Windows 2000 is designed to appeal to small business and professional users as well as to the more technical and larger business market for which the NT was designed.

The Windows 2000 product line consists of four products:

- Windows 2000 Professional, aimed at individuals and businesses of all sizes.
- Windows 2000 Server, aimed at small-to-medium size businesses.
- Windows 2000 Advanced Server, aimed at being a network operating system server and/or an application server, including those involving large databases.
- Windows 2000 Data center Server, designed for large data warehouses, online transaction processing (OLTP), econometric analysis, and other applications requiring high-speed computation and large databases.

2.4.3.5 Windows XP

Windows XP is the latest version of the Windows desktop OS for the pc. Microsoft and trade publication writers view Windows XP as the most important version of Windows since Win95. Windows XP is built on the Windows 2000 kernel but brings a new, more personalized look to the desktop that will also make it easier for users to scan

or import images and to acquire music files on the web and transfer them to portable devices. The new Windows allows different family members to use their own desktop and personal sets of files. In addition to the "My Computer" and "My Documents" views provided in Windows 2000, Windows XP users see "My Music" and "My Pictures". The Start Menu has been redesigned to make the most-used programs easiest to find. Windows XP comes in a Professional version and a Home Edition version.

2.4.4 Programming Languages & Technologies

2.4.4.1 Markup Languages

Markup refers to the sequence of characters or other symbols that insert at certain places in a text or word processing file to tell the browser or indicate how the file should look when it is printed or displayed for user or to describe the document's logical structure. The markup indicators are often called "tags".

Markup can be inserted by the document creator directly by typing the symbols in, by using an editor and selecting prepackaged markup symbols (to save keystrokes), or by using a more sophisticated editor that lets the user to create the document the user want it to appear. Generally, a markup language is a mechanism to identify structures in a document.

2.4.4.1.1 Hypertext Markup Language (HTML)

HTML is a formal recommendation by the World Wide Consortium (W3C) and is generally adhered to by the major browsers, Microsoft's Internet Explorer and Netscape's Navigator, which also provide some additional non-standard codes.

The vast majority of web documents are created and presented in the HTML. HTML is not a programming language like BASIC, COBOL or C++. It's more properly described as a markup language, or a page-description language. It consists of a set of markup symbols or codes that inserted in a file. What it does is allow the user to create pages of text, images and other elements, that can be viewed or displayed on WWW using a web browser. The markup tells the web browser how to display a web page's words and images for the user. Each individual markup code is referred to as an element (but many people also refer to it as a tag). HTML elements often have attributes that affect the rendering of the element's context by modifying the function of the element.

HTML's strength is its wide support in many applications on many platforms. HTML documents that do not rely on browser-specific tags should be similar in appearance on the most commonly used browsers. The combination of HTTP and HTML ensures that a document can be widely viewed on many platforms. Anyway, several emerging technologies such as the Extensible Markup Language (XML) are currently being developed that promise dramatically enhanced content management on the web.

2.4.4.1.2 Extensible Markup Language (XML)

XML is a coding system that allows any type of information to be delivered across the web. XML has been designed for ease of implementation and for interoperability with both SGML and HTML. It was created so that richly structured documents could be used over the web. The only viable alternatives, HTML and SGML, are not practical for this purpose.

XML standard provides a mechanism for structuring content and data. It allows applications to transfer both page content and information on how the content is structured.

It is similar to the language of today's web pages, HTML. XML is "extensible" because, unlike HTML, the markup symbols are unlimited and self-defining. For example, HTML describes the content of a web page (mainly text and graphic images) only in terms of how it is to be displayed and interacted with. E.g.: the letter "p" placed within markup tags starts a new paragraph. XML describes the content in terms of what data is being described. E.g.: the word "phonenum" placed within markup tags could indicate that the data that followed was a phone number.

XML specifies neither semantics nor a tag set. In fact XML is really a meta-language for describing markup languages. In other words, XML provides a facility to define tags and the structural relationships between them. Since there's no predefined tag set, there can't be any preconceived semantics. All of the semantics of an XML document will either be defined by the applications that process them or by style sheets (variations in presentation).

Today XML is a W3C Recommendation. This means that XML has been reviewed and approved by the members of the W3C. XML is therefore deemed "stable" and ready for widespread deployment. A Recommendation is the highest level a W3C document can be assigned. XML became a Recommendation on February 10, 1998.

2.4.4.2 Web Programming Technologies

2.4.4.2.1 ColdFusion

More and more often now we'll see a .cfm extension in our browser location bar, indicating that we are at a site powered by **ColdFusion**. It enables servers to access data as the server builds an HTML page. It is a rapid applications development tool that enables the rapid creation of the interactive, dynamic, and information-rich Web sites. It has gained popularity because it is easy to learn, is extremely flexible and powerful, and

runs on UNIX and Windows platforms. This cross-platform compatibility means that developers can work independently of their environment.

ColdFusion is a module installed onto the web server. Like ASP, ColdFusion pages are readable by any browser. ColdFusion also utilizes a proprietary set of tags, which are processed by the ColdFusion Server software. This server software can run on multiple platforms, including IIS, Netscape Enterprise Server and Unix/Apache.

ColdFusion has its own page markup language, called ColdFusion Markup Language (CFML). CFML encompasses the Web's Hypertext Markup Language (HTML) and Extensible Markup Language (XML). Applications can access databases using Microsoft's OLE DB, Open Database Connectivity (ODBC), or drivers that access Oracle and Sybase databases.

A drawback is that the ColdFusion software doesn't come for free and indeed developers could find themselves paying well in excess of a thousand dollars for the privilege of running Cold Fusion on their web server.

2.4.4.2.2 PHP

PHP is a web programming language for easily building dynamic web pages. It is freely available and used primarily on Linux web servers. It provides an easier way to accomplish web related programming tasks, which are accomplished only with difficulty in more complex and powerful languages, such as Perl or C.

PHP is open-source and cross-platform. PHP runs on Windows NT and many UNIX versions, and it can be built as an Apache module and as a binary that can run as a CGI. When built as an Apache module, PHP is especially speedy.

PHP is an alternative to Microsoft's ASP technology. It is ideally suited to the web because as with ASP, PHP scripts live inside web pages right along with the HTML tags

and content. For that reason, PHP is called an embedded scripting language. Developers can embed programs in their web pages, making the dynamic. They can treat programs just like web pages. PHP pages can contain both regular HTML and PHP code. This allows the users to develop web applications quickly.

However, unlike some web scripting languages, PHP makes a clear distinction between sections of PHP code and sections of the HTML document. When the web server fills a request for a PHP enabled page, it first looks through the page content for sections of PHP code and executes any it finds. Any normal HTML sections are passed to the browser without any changes. This means that users can freely mix snippets of program into a web page anywhere. An HTML page that includes a PHP script is typically given a file name suffix of ".php" ".php3," or ".phtml".

2.4.4.2.3 Active Server Page (ASP)

Active Server Page (ASP) is a competing technology from Microsoft for server-side scripting. It runs only on Microsoft's web server platform, included with the Windows NT operating system. However, even though the Microsoft web server platform requirement is limiting, there are many sites on the Internet, which use ASP technology for tailored delivery of web-based content.

An ASP is an HTML page that includes one or more scripts (such as VBScript) that are processed on a Microsoft web server before the page is sent to the user. It commonly relied on either of the JavaScript or VBScript scripting languages (although it was also possible to use any scripting language installed on Windows, such as PerlScript) to create dynamic web pages.

An ASP is somewhat similar to a server-side include or a common gateway interface (CGI) application in that all involve programs that run on the server, usually

tailoring a page for the user. ASP is a module (the asp.dll file) that developers attach to web server, and it then processes the JavaScript/VBScript on the web server, and turns it into HTML, before sending it into the server, rather than doing it on the browser.

ASP is a feature of the Microsoft Internet Information Server (IIS), but, since the server-side script is just building a regular HTML page, it can be delivered to almost any browser. User can create an ASP file by including a script written in VBScript or JScript in an HTML file or by using ActiveX Data Objects (ADOs) program statements in the HTML file. Users name the HTML file with the ".asp" file suffix.

Microsoft recommends the use of the server-side ASP rather than a client-side script, where there is actually a choice, because the server-side script will result in an easily displayable HTML page. Client-side scripts (for example, with JavaScript) may not work as intended on older browsers.

2.4.4.2.4 Java

Java is a programming language expressly designed for use in the distributed environment of the Internet, such as creating applets and applications on the Internet. Basically, Java program fall in 2 main groups: Applets and applications. Java applications are stand-alone Java Programs that can be run by using the Java Interpreter whereas Java Applets are run from a WWW browser capable of interpreting Java, such as Microsoft Internet Explorer or Netscape Navigator. Java applets will run on almost any operating system without requiring recompilation. Its advantages are: familiarity (derived from C++), platform independence (will run on any platform which implements the Java Virtual Machine), performance (byte-code compiled faster than fully interpreted), and safety (downloaded applets are checked for integrity, and only interpreted by trusted Virtual Machine).

Java was designed to have the "look and feel" of the C++ language, but it is simpler to use than C++ and enforces an object-oriented programming model. It can be used to create complete applications that may run on a single computer or be distributed among servers and clients in a network. It can also be used to build a small application module or applet for use as part of a Web page. Applets make it possible for a Web page user to interact with the page. The major characteristics of Java are:

- The Java programs are portable in a network. Source program is compiled into bytecode, which can be run anywhere in a network on a server or client that has a Java virtual machine (JVM). The JVM interprets the bytecode into code that will run on the real computer hardware.
- The code is robust; unlike programs written in C++ and perhaps some other languages, the Java objects can contain no references to data external to themselves or other known objects. This ensures that an instruction cannot contain the address of data storage in another application or in the operating system itself, either of which would cause the program and perhaps the operating system itself to terminate or "crash." The JVM makes a number of checks on each object to ensure integrity.
- Java is object-oriented; an object can take advantage of being part of a class of objects and inherit code that is common to the class.
- In addition to being executed at the client rather than the server, a Java applet has other characteristics designed to make it run fast.
- Java is easier to learn.

Java was introduced by Sun Microsystems in 1995 and instantly created a new sense of the interactive possibilities of the Web. Both of the major Web browsers include

a JVM. Almost all major operating system developers (IBM, Microsoft, and others) have added Java compilers as part of their product offerings.

The JVM includes an optional "just-in-time" (JIT) compiler that dynamically compiles bytecode into executable code as an alternative to interpreting one bytecode instruction at a time. In many cases, the dynamic JIT compilation is faster than the virtual machine interpretation.

2.4.4.2.5 Java Server Pages (JSP)

JavaServer Pages (JSP) is a technology that allows us to combine markup (HTML or XML) with Java code to dynamically generate web pages. In other words, JSP technology uses HTML and XML-like tags and scriptlets written in the Java programming language. It combines Java and HTML to provide dynamic content in web pages. It separates the user interface (display logic) from content generation enabling designers to change the overall page layout without altering the underlying dynamic content. This is the main advantage of JSP. The person who updates the look of the page does not have to understand Java code, and the person who updates the JavaBeans class does not have to be proficient at designing web pages.

The JSP specification is implemented by several web servers, as opposed to ASP which is only supported under IIS, and plug-ins are available that allow programmers to use JSP with IIS 4.0/5.x. One of the main advantages of JSP is the portability of code between different servers. JSP is also very powerful, faster than ASP, and instantly familiar to Java programmers. It allows the Java program to leverage the aspects of the Java2 platform such as JavaBeans and the Java 2 libraries. JSP isn't directly related ASP, but it does boast the ability to embed Java code into web pages using server-side tags.

Generally, a JSP page is a page created by the web developer that includes JSP technology-specific tags, declarations, and possibly scriptlets, in combination with other static (HTML or XML) tags. A JSP page has the extension .jsp; this signals to the web server that the JSP engine will process elements on this page.

Although developers can embed as much Java code as they like into a JSP page, they can use JSP pages with JavaBeans classes to define web templates for building a web site made up of pages with a similar look and feel. The JavaBeans class does the data rendering, so the templates have no Java code, which means they can be maintained by an HTML editor.

If a designer has a simple web-based application using a JSP page, the designer can bind content to application logic using custom tags or scriptlets instead of a JavaBeans class. Custom tags are bundled into tag libraries that are imported into a JSP page. Scriptlets are small Java code segments embedded directly in the JSP page. JSP pages are typically compiled into Java platform Servlets classes. As a result, JSP pages require a Java virtual machine (JVM) that supports the Java platform Servlets specification.

As part of the Java family of APIs, JSP technology shares the **Write Once, Run Anywhere** benefits of the Java platform, with easy access to a broad range of Java APIs. JSP technology enables a tiered development methodology that lets organizations leverage internal programming expertise to create applications that are fast to deploy and easy to maintain. In conclusion, JSP technology makes it faster and easier than ever to build web-based applications.

The main advantage of JSP pages over Servletss is that JSP allows a more logical division between the display (the generated HTML) and the server-side logic that dictates how the page is filled. It's easy to modify the appearance of a JSP page without having to alter any Java code, either in the page or in the JavaBean

JSP is comparable to other technologies such as PHP and ASP, which combine programming/scripting with a markup language like HTML. The key difference would be the programming language of choice. For example, PHP uses a C/C++/Java hybrid, ASP uses VBScript, and JSP utilizes the full power of the Java programming language.

Below shows the comparison of ASP and JSP technology:

	ASP technology	JSP technology
Web Server	Microsoft IIS or Personal Web Server	Any Web server, including Apache, Netscape, and IIS
Platforms	Microsoft Windows (Accessing other platforms requires third-party ASP porting products.)	Most popular platforms, including the Solaris Operating Environment, Microsoft Windows, Mac OS, Linux, and other UNIX platform implementations
Reusable, Cross-Platform Components	No	JavaBeans, Enterprise JavaBeans, custom JSP tags
Security Against System Crashes	No	Yes
Memory Leak Protection	No	Yes
Scripting Language	VBScript, JScript	Java
Customizable Tags	No	Yes
Compatible with Legacy Databases	Yes (COM)	Yes (using JDBC API)
Ability to Integrate with Data Sources	Works with any ODBC-compliant database	Works with any ODBC- and JDBC technology-compliant database
Components	COM components	JavaBeans, Enterprise JavaBeans, or extensible JSP tags
Extensive Tool Support	Yes	Yes

Table 2.1: Comparing JavaServer Pages™ and Microsoft® Active Server Pages™ Technologies

(The biggest difference between JSP and ASP technologies lies in the approach to the software design itself. JSP technology is designed to be both platform and server independent, created with input from a broader community of tool, server, and database vendors. In contrast, ASP is a Microsoft technology that relies primarily on Microsoft technologies.)

2.4.4.2.6 Java Servlets

Servlets are the Java platform technology of choice for extending and enhancing web servers. They are programs that run on a web server and build web pages. Servlets provide a component-based, platform-independent method for building web-based applications, without the performance limitations of CGI programs. A Servlets receives a request from a client, dynamically generates the response (possibly querying databases to fulfill the request), and then send the response containing an HTML or XML document to the client.

As mentioned before, Servlets are server and platform-independent, 100% pure Java server-side modules that fit seamlessly into a web server framework and can be used to extend the capabilities of a web server with minimal overhead, maintenance, and support. Unlike other languages, Servlets involve no platform-specific consideration or modifications; they are Java application components that are downloaded, on demand, to the part of the system that needs them.

Servlets are similar to CGI but much easier to write, since Servlets use Java classes and streams. They are also faster to execute because Servlets are compiled to Java Byte code and at run time the Servlets instance is kept in memory – each client request spawns a new thread. Servlets make it easy to generate data to an HTTP response stream in a dynamic fashion.

Since JSP pages get automatically translated into Java Servlets, there's no difference between what we can do in a JSP page and in a Servlets. Both JSP pages and Servlets are executed in a single Java Virtual Machine (JVM), eliminating the need for the web server to create a new process each time a web-page request arrives, which is a big advantage over mechanisms like CGI scripts.

Today, Servlets are a popular choice for building interactive web applications. Third-party Servlets containers are available for Apache Web Server, iPlanet Web Server, Microsoft IIS, and others. Servlets containers can also be integrated with web-enabled application servers, such as BEA WebLogic Application Server, IBM WebSphere, iPlanet Application Server, and others.

2.4.4.3 Web Scripting Languages

Script & Scripting

A script is really just another word for a program (resembles programming language). It is just a set of instructions that take place automatically when we run the script (cause it to work). It is interpreted or carried out by another program rather than by the computer processor. It means it doesn't need to be compiled to run. A server-side script is a script that's executed on the server, whereas client-side script is a script that is downloaded to the client (browser), along with the HTML page, and is executed on the client.

In general, scripting languages are easier and faster to code in than the more structured and compiled languages such as C and C++ and are ideal for programs of very limited capability or that can reuse and tie together existing compiled programs. However, a script takes longer to run than a compiled program since each instruction is being

handled by another program first (requiring additional instructions) rather than directly by the basic instruction processor.

2.4.4.3.1 JavaScript

JavaScript should not be confused with Java. Compared to Java, it is easier to learn than Java, but lacks some of the portability of Java and the speed of byte code. It is limited in performance because it is not compiled before execution. Basic online applications and functions can be added to Web pages with JavaScript, but the number and complexity of available application programming interface functions are fewer than those available with Java.

JavaScript is Netscape's cross-platform, object-based scripting language for client and server applications. It can be embedded directly in HTML. It allows creating dynamic web-based applications that runs over the Internet. Client applications run in a browser, such as Netscape Navigator, and server applications run on a server, such as Netscape Enterprise Server.

JavaScript enhances the interactivity of web pages by allowing calculations, forms checking and processing, development of interactive games with animation, inclusion of special effects like floating windows and zooming, the customization of graphics selections, the creation of security passwords for user authentication, the gathering of user feedback and the capture of events such as keystrokes, mouse movement and mouse clicks. For example, if buttons on a web page that light up when our mouse goes over them, we've probably seen JavaScript in action.

One of the powerful characteristic of JavaScript is almost all browsers support it. Unlike VBScript, Microsoft's Internet Explorer is the only browser that supports it.

Currently, all Netscape Browser of version 2.0 and above supports JavaScript. Because of this, JavaScript has become the de facto scripting language on the client.

Similar to Java, JavaScript programs are platform independent. Scripts can be written using any text editor on any platform. There is no other software required for writing JavaScript other than having a good knowledge of JavaScript itself and a viewer for testing the finished JavaScript.

As mentioned before, JavaScript is based on Java, and is mostly syntactically compatible, but differs from Java. See Table 2.1:

JavaScript	Java
Interpreted (not compiled) by client	Compiled bytecodes downloaded from server, executed on client
Object-based. No distinction between types of objects. Inheritance is through the prototype mechanism and properties and methods can be added to any object dynamically.	Object-oriented. Objects are divided into classes and instances with all inheritance through the class hierarchy. Classes and instances cannot have properties or methods added dynamically.
Code integrated with, and embedded in HTML	Applets distinct from HTML (accessed from HTML pages)
Variable data types not declared (loose typing)	Variable data types must be declared (strong typing)
Dynamic binding. Object references checked at runtime.	Static binding. Object references must exist at compile-time
Cannot automatically write to hard-disk	Cannot automatically write to hard-disk

Table 2.2: Comparisons between JavaScript and Java

2.4.4.3.2 JScript

Microsoft Corporation has developed its own version of JavaScript called **JScript,** which has essentially the same functionality as JavaScript. It is a powerful scripting language. It allows scripting of events, objects and actions to create Internet applications. It is very easy to learn, just it is not more difficult to learn than HTML. A people without knowledge of programming language can also write Jscript for the web pages.

It brings dynamic and powerful capabilities to web pages. With Jscript, new dynamic elements exceeded the simple click-and –wait feature. Users will not just read the pages but also interact with them. The pages come alive for any user, even with the slowest Internet connections. Users will get quick responses, because the interaction does not involve the server but can take place in the user's browser. This interaction can also change the pages into an application. Putting together a few buttons, a text box and some codes can produce application. Jscript can be used to solve common problems, such as validating form input, and can also be used to create dramatic and visually appealing content, which would be impossible with HTML.

Comparing with VBScripts, developers commonly use JScript to write client-side scripts because it's the common standard for browser scripting, and not all browsers can run VBScript. By the way, JScript is also used on the server as well.

Jscript, like the other scripting languages works only within an application. Currently, it works with Microsoft Internet Explorer and Netscape's Navigator browsers and the LiveWire server environment. But Jscript application will not function independently. All it takes to write Jscript program is a Jscript compatible browser and text editor.

2.4.4.3.3 VBScript

VBScript is Microsoft's planned candidate for an Internet scripting language that is a subset of its Visual Basic programming language designed for interpretation by web browsers. VBScript is Microsoft's answer to Netscape's popular JavaScript. Both are designed to work with an interpreter that comes with a web browser - that is, at the user or client end of the web client/server session. VBScript is designed for use with Microsoft's Internet Explorer browser together with other programming that can be run at the client, including ActiveX control, automation servers, and Java applet. Always, VBScript is the default ASP scripting language.

Although Microsoft does support Netscape's JavaScript (it converts it into its own JScript), Netscape does not support VBScript. For this reason, VBScript is best used for intranet web sites that use the Internet Explorer browser only.

2.4.5 Web Application Development Tools

2.4.5.1 Microsoft Front Page

Ms Front Page adds value to creating Web application by adding the visual components that's missing from Visual Interdev. Ms Front page enable users to quickly generate HTML and save a lot of time and frustration spent on getting complicated HTML page layout properly adjusted. After the page is created, users can edit the HTML source code to create the dynamic content on the page while relying on the HTML tags to quickly generate the look and feel of the page.

It's ultimately a weaker but easier application to use. It offers three views of web page generally. The *Normal* tab gives a WYSIWYG (what you see is what you get) page creation view, *HTML* tab allows user or developer to write and modify code explicitly.

The markup of a web page is provided by system, user can directly do page creation. In the *Preview* tab, it gives a quick view of what the page should look like in browser.

2.4.5.2 Visual InterDev

Microsoft Visual InterDev comes as part of Microsoft suite of professional programming tools, known as Visual Studio. Visual InterDev is a tool for building a dynamic, data-driven Web site. Visual InterDev is a software package that combines a powerful HTML WYSIWYG (what you see is what you get) editor with a thorough source-editing interface that will simplify all the coding. The Visual InterDev development environment itself runs on Microsoft Windows 95 or Microsoft Windows NT 4.0 or later. Using Visual InterDev, one can assemble pages that use Microsoft's ActiveX technologies, including ASP technology. Visual InterDev includes an HTML editor and support for dynamic HTML.

Visual InterDev 6.0 is the latest version. Visual InterDev 6.0 enables developers to build applications accessible from any platform running a standard Web browser such as Microsoft Internet Explorer or Netscape Navigator. Visual InterDev 6.0 also features a new integrated WYSIWYG editor for ASP & Dynamic HTML pages, enhanced database programming tools, and end-to-end debugging facilities for multi-tier applications built with HTML and Script.

Visual InterDev does not have a compile of drawbacks. It is the most difficult to master of the editors discussed here. But having said that, it's undoubtedly the most powerful of these editors as it offers many tools and features to the developer.

Comparing with Microsoft Front Page, Visual InterDev is a web development tool designed for programmers, while Microsoft FrontPage is a web-authoring tool designed for non-programmers. Microsoft FrontPage is a member of the Microsoft Office family,

and looks and works like other Office applications. Visual InterDev is a member of the Microsoft Visual Tools family, and looks and works like other Microsoft visual development tools, including Microsoft Visual C++®, Microsoft Visual J++™, Microsoft Visual FoxPro and Microsoft Visual Basic.

Because most Web sites are created by teams of people, including both programmers and non-programmers, Visual InterDev and Microsoft FrontPage interoperate so that teams of people with different sets of skills can work together on the same Web site. Webmasters, technical developers, database administrators, and MIS personnel would require Visual InterDev. On the other hand, content publishers - such as sales, marketing, graphic arts, and finance - would need FrontPage.

2.4.5.3 EditPlus

EditPlus is an Internet-ready 32-bit Text editor, HTML editor and Programmer's editor for Windows. While it can serve as a good replacement for Notepad, it also offers many powerful features for Web page authors and programmers.

- Syntax highlighting for HTML, CSS, PHP, ASP, Perl, C/C++, Java, JavaScript and VBScript. Also, it can be extended for other programming languages based on custom syntax files.
- Seamless Web browser for previewing HTML pages, and FTP commands for uploading local files to FTP server.
- Other features include HTML toolbar, user tools, line number, ruler, URL highlighting. Auto-completion, cliptext, column selection, powerful search and replace, multiple undo/redo, spell checker, customizable keyboard shortcuts, and more.

2.4.5.4 NetBeans IDE

In general, the NetBeans is a platform where can build any kind of applications and a full-featured professional IDE. The **NetBeans IDE** (Integrated Development Environment) is a development environment with fully featured- a tool for programmers to write, compile, debug and deploy programs. It is written in Java - but can support any programming language. It can be used to develop code in Java, HTML, XML, JSP, C/C++ and other languages. The IDE is modular, and there is a huge variety of commercial and free extension to it to support various technologies. It is a free product with no restrictions on how it can be used. NetBeans Release 3.3.2 is the latest release of the NetBeans IDE.

When users download the NetBeans IDE, the users get a development tool for writing Java programs. There are plug-in modules available that support other languages and technologies, from C and C++ to XML, HTML and Java Server Pages, to almost any technology we can think of. Some of its features are:

- Syntax highlighting code editor - with support for code completion, annotations, macros and auto-indentation, capable of mixed-mode operation for multi-language documents.
- Support for the Java, C, C++, XML and HTML languages.
- Support for JSP, XML, RMI, CORBA, JINI, JDBC and Servlets technologies - integrated support to make it easier write code that uses these technologies.
- Support for Ant, CVS and other version control systems - Version control systems integrate smoothly and easily into the IDE.
- Pluggable support for compilers, debuggers and execution services - Execution, compilation, debugging and deployment are not tied to a specific Java Virtual Machine, as with other IDE's.

- Visual design tools for graphically creating and manipulating visual components.
- Wizards and code generation and management tools for creating code faster and more easily.
- Cross-platform - since the IDE is written entirely in the Java language, it will run on a huge number of operating systems.

2.4.6 Web Server & Client

Server refers to a running program (a process) on a networked computer that accepts requests from programs running on other computers to perform a service and responds appropriately. The requesting processes are referred to as a **client**. Or, in general, client refers as a program that initiates communication with server. *(A single machine can be both a client and a server depending on the software configuration. The only thing that designates a computer as a server computer is the fact that it runs server software. Similarly, the only thing that designates a client computer is the fact that it runs client software.*)

2.4.6.1 Web Server

Specific to the Web, a **web server** is a network server that manages access to files, folders and other resources over the Internet or a local intranet via the platform-neutral HTTP. In addition, web servers possess unique Web networking characteristics. They handle permissions, execute programs, keep track of directories and files and communicate with client computers. These client computers (**web client**) make requests for files and actions from server computers using HTTP. The web browser in local computer is a client that requests HTML files from web servers.

Web browsers and servers communicate with one another using HTTP protocol. HTTP is a close cousin of HTML but operates at a lower level. HTTP sends user browsers request to the web server and copies server response back to the browser.

2.4.6.1.1 Apache Web Server

Apache is a powerful, flexible, HTTP/1.1 compliant and freely available web server that is distributed under an open source license. It is maintained by the Apache Software Foundation. Version 2.0 runs on most UNIX-based operating systems (such as Linux, Solaris, Digital UNIX and AIX), on other UNIX/POSIX-derived systems (such as Rhapsody, BeOS, and BS2000/OSD), on AmigaOS, and on Windows 2000. It can be downloaded and installed on a person's workstation. It is a very robust web server and has gained wide popularity among web administrators.

The following is a list of Apache features for the current version 2.0:

- Serves static and dynamic CGI Web pages. Can interface with many dynamic content generation technologies such as Perl, Java Servlets, or PHP.
- Highly configurable. Apache is composed of many modules that can be optionally added or removed, as well as configured.
- Extensive security features. Several forms of authentication, including SSL encryption are available.
- Portable (implementations are available for many platforms, including Windows, UNIX, Linux, and OS/2).

According to the Netcraft (www.netcraft.com) Web server survey in February 2001, 60% of all Web sites on the Internet are using Apache (62% including Apache derivatives), making Apache more widely used than all other Web servers. This level of

respect from the Internet community comes from the following benefits and advantages provided by the Apache server software:

- It is stable
- Several major Web sites, including www.amazon.com and Microsoft's hotmail service, are using it.
- The entire program and related components are open-source.
- It works on a large number of platforms (all popular variants of UNIX, some of the not-so-popular variants of UNIX, and even Windows NT).
- It is extremely flexible
- It has proved to be secure.

2.4.6.1.2 Tomcat

The **Tomcat** server is a Java based Web Application container that was created to run Servlets and JSP in Web applications. Tomcat is the official reference implementation of the Java Servlets and JSP technologies. It was developed under the Apache license in an open and participatory environment. It is more recognized as Servlets container or Servlets engine. Servlets engine is an application, which processes the dynamic requests from the web server.

Tomcat works fine as server on its own, in secure (https) or insecure mode. However, on a heavily used site with a very large number of plain html files, Tomcat is often used alongside Apache. When it is in the standalone operation mode, it is able to serve dynamic content like JSP or Servlets. However, when it is integrated with external web server, Tomcat will just have the same function, as fore mentioned, but that external web server will serve static page like HTML page. So, if the web-application consists

only dynamic content generated by JSP and Servlets, then the external web server is unnecessary.

2.4.6.1.3 Personal Web Server (PWS)

PWS (Personal Web Server) is Microsoft's version of a web server program for individual PC users who want to share web pages and other files from their hard drive. PWS is a scaled-down version of Microsoft's Internet Information Server (IIS), the professional, commercial web server found on many hosting services. PWS can be used with a full-time Internet connection to server web pages for a web site with limited traffic. It can also be used for testing a web site offline or from a "staging" site before putting it on a main web site that is exposed to larger traffic. Generally, PWS provides the following capabilities:

1. Allow webs (set of files that comprise a particular web site) to be published as a whole with a single command.
2. Allow publishing web sites from the local computer to a remote computer, from a remote computer to the local computer (normally for a b existing web site that users wants to develop and test on a local computer), or between remote web sites.
3. Provides CGI, IDC, ASP and Microsoft IsSAPI programs, and the FrontPage WebBots on user's local computer, so the user can test their webs locally in the browser before making them public.
4. Sets permissions and properties of webs and folders.
5. Set up virtual directories on the server
6. User can browse his/her webs from another computer on the Internet, when he/she is logged on. This is handy for demonstrating his/her web sites to clients, friends, etc.

2.4.6.1.4 Internet Information Server (IIS)

IIS (Internet Information Server) is a group of Internet servers (including a Web or HTTP server and a FTP server) with additional capabilities for Microsoft's Windows NT and Windows 2000 Server operation systems. It is Microsoft's entry to compete in the Internet server market that is also addressed by Apache, Sun Microsystems, O'Reilly, and others. With IIS, Microsoft includes a set of programs for building and administering web sites, a search engine, and support for writing web-based applications that access databases. In other words, it provides full Intranet and Internet Web capabilities, ranging from publishing information to complete access to data stored in various client/server databases. Microsoft points out that IIS is tightly integrated with Windows NT and 2000 Servers in a number of ways, resulting in faster web page serving.

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

2.4.6.2 Web Browser

A browser is an application program that provides a way to look at and interact with all the information on the World Wide Web (surfing). The word "browser" seems to have originated prior to the Web as a generic term for user interfaces that let them browse

(navigate through and read) text files online. By the time the first Web browser with a graphical user interface was generally available (Mosaic, in 1993), the term seemed to apply to Web content, too. Technically, a **web browser** is a client program that uses the HTTP to make requests of web servers throughout the Internet on behalf of the browser user.

Today, Netscape Navigator and Microsoft Internet Explore (IE) are the only 2 browsers that the vast majority of Internet users are aware of. Although the online services, such as America Online, originally had their own browsers, virtually all now offer the Netscape or Microsoft browser. Another recently offered and well-regarded browser is Opera.

2.4.6.2.1 Microsoft Internet Explorer (MSIE)

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

2.4.6.2.2 Netscape Navigator

Netscape is one of the 2 most popular web browsers and also the name of a company, Netscape Communications, now owned by America Online (AOL). Netscape's browser originally was called "Navigator", and is still called that in the suite of software, Communicator, of which it is now a part. The latest version of Netscape Navigator is 5.0, now available in a beta test version. Currently, almost all Internet users use either Netscape's browser or Microsoft's Internet Explorer browser, and many users use both.

2.4.7 Database System

Database & Database Management System (DBMS)

A **database** system is basically just a computerized record-keeping system. The database itself can be regarded as a kind of electronic filing cabinet; i.e., it is a repository or container for a collection of computerized data files. Users of the system can perform a variety of operations on such files, such as inserts, retrieves, changes, removes and delete files from the database.

The most prevalent type of database is the relational database, a tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. Structured Query Language (SQL-pronounced "sequel") is almost universally used with relational database systems such as IBM's DB2, Microsoft's Access, and database products from Oracle, Sybase, and Computer Associates to make interactive queries and manipulate data. SQL provides a complete set of keywords that enable programmers to define complex queries that select data from a table.

A **database management system (DBMS)**, sometimes just called a *database manager*, is the software that handles all access to the database. A DBMS can be thought of as a *file manager* that manages data in databases rather than files in file systems. The DBMS manages user requests (and requests from other programs) so that users and other programs are free from having to understand where the data is physically located on storage media and, in a multi-user system, which else may also be accessing the data. The most typical DBMS is a relational database management system (RDBMS). A standard user and program interface is the Structured Query Language (SQL). A newer kind of DBMS is the object-oriented database management system (ODBMS).

A DBMS is usually an inherent part of a database product. On PCs, Microsoft Access is a popular example of a single- or small-group user DBMS. Microsoft's SQL

Server is an example of a DBMS that serves database requests from multiple client users. Other popular DBMSs (these are all RDBMSs, by the way) are IBM's DB2, Oracle's line of database management products, and Sybase's products.

2.4.7.1 Microsoft Access

On PCs, **Microsoft Access** is a popular example of a single- or small-group user DBMS. Microsoft Access (the most current version is Office XP) is a relational database management system (RDBMS) designed for small companies and personal use. It utilizes Microsoft Jet Engine. Access is very user-friendly and has simple application creation and report generating tools.

2.4.7.2 Microsoft SQL Server

Ms SQL Server is a RDBMS for the Microsoft Windows platform that scales from a laptop database to enterprise-wide databases.

SQL Server provides agility to users' data management and analysis, allowing user's organization to adapt quickly and gracefully to derive competitive advantage in a fast-changing environment. From a data management and analysis perspective, it is critical to turn raw data into business intelligence and take full advantage of the opportunities presented by the Web. A complete database and data analysis package, SQL Server opens the door to the rapid development of a new generation of enterprise-class business applications that can give user's company a critical competitive advantage. The record-holder of important benchmark awards for scalability and speed, SQL Server is a fully web-enabled database product, providing core support for Extensible Markup Language (XML) and the ability to query across the Internet and beyond the firewall.

2.4.7.3 Oracle

Oracle says it is the world's leading supplier of software for information management but it is best known for its sophisticated relational database products (notably Oracle9i), which are used in Fortune 1000 corporations and by many of the largest web sites. Oracle provides a very consistent environment across all these platforms – from tools, to administration interfaces, to the Data Definition Language (DDL) and SQL directory. Its relational database was the world's first to support the SQL, now an industry standard.

Oracle targets high-end workstations and minicomputers as the server platforms on which to run its database systems. Along with Sun Microsystems, Oracle has long been a champion of network computers. It now boasts that it was the world's first software company to develop and deploy 100% Internet-enabled enterprise software across its entire product line: database, server, enterprise business applications, and application development and decision support tools. In fact, Oracle CEO Ellison has said, "If the Internet turns out not to be the future of computing, we're toast. But if it is, we're golden". Based in Redwood Shores, California, it has more than 43,000 employees worldwide and does business in over 150 countries. Oracle (ORCL) is publicly traded on the Nasdaq.

2.4.7.4 MySQL

MySQL is an **open source** RDBMS that uses SQL. Because it is open source, anyone can download MySQL and tailor it to their needs in accordance with the general public license. The main goals of MySQL are speed, robustness and ease of use.

The MySQL relational database system was first released in Jan 1998. It is fully multithreaded using kernel threads, provides application program interfaces (APIs) for C, C++, Eiffel, Java, Perl, PHP, Python, and Tcl, allows for many column types, and offers

full operator and function support in the SELECT and WHERE parts of queries. MySQL currently runs on the Linux, UNIX, and Windows platforms.

(Open source – In general, open source refers to any program whose source code is made available for use or modification as users or other developers see fit. (Historically, the makes of proprietary software have generally not made source code available.) Open source software is usually developed as a public collaboration and made freely available)

2.4.7.5 Database Connectivity

Connecting to a database is basically what we would think. It establishes a connection between an application (in this case one of the web pages) and the database itself so that commands and data can be passed back and forth. Choosing the suitable data access interfaces as it can result in better performance, easier of programming steps and also performing flexibly.

2.4.7.5.1 Open Database Connectivity (ODBC)

Open Database Connectivity (ODBC) is an open standard application programming interface (API) for accessing a database. By using ODBC statements in a program, users can access files in a number of different databases, including Access, dBase, DB2, Excel, and Text. In addition to the ODBC software, a separate module or driver is needed for each database to be accessed. The main proponent and supplier of ODBC programming support is Microsoft.

ODBC is based on and closely aligned with The Open Group standard SQL Call-Level Interface. It allows programs to use SQL requests that will access databases without

having to know the proprietary interfaces to the databases. ODBC handles the SQL request and converts it into a request the individual database system understands.

ODBC was created by the SQL Access Group and first released in September 1992. Although Microsoft Windows was the first to provide an ODBC product, versions now exist for UNIX, OS/2, and Macintosh platforms as well.

2.4.7.5.2 Java Database Connectivity (JDBC)

Java Database Connectivity (JDBC) is an API specification for connecting programs written in Java to the data in popular databases. It is essentially a portable bridge to relational databases. The API lets the users encode access request statements in SQL that are then passed to the program that manages the database. It returns the results through a similar interface. JDBC is very similar to the SQL Access Group's ODBC and, with a small "bridge" program, users can use the JDBC interface to access databases through the ODBC interface. For example, user could write a program designed to access many popular database products on a number of OS platforms. When accessing a database on a PC running Microsoft's Windows 2000 and, for example, a Microsoft Access database, user's program with JDBC statements would be able to access the Microsoft Access database.

JDBC actually has two levels of interface. In addition to the main interface, there is also an API from a JDBC "manager" that in turn communicates with individual database product "drivers," the JDBC-ODBC bridge if necessary, and a JDBC network driver when the Java program is running in a network environment (that is, accessing a remote database).

2.5 Conclusion

Literature review has given a deeper insight of developing the system we want. It directs us to the most effective way to build a good application. It equips us with some knowledge of strength and limitations of development tools so that we will be able to choose the right tools. After made comparison of strength and weaknesses of some example of application that is similar to MY ChatQuiz System, this has given me some ideas and inspirations about the way to improve the performance of this proposed system. The following chapter is where the analysis at the system needs is being done.

CHAPTER 3 – SYSTEM ANALYSIS & METHODOLOGY

Installing a system without proper planning and analyzing leads to great dissatisfaction and frequently causes the system to fall into disuse. Hence, system analysis is an essential and important phase that is used to determine clearly of all the requirements specifications before proceeding into subsequent phase.

Besides ascertaining the function and non-functional requirement of MY ChatQuiz System, these analyses also bring out consideration of the development tools and determine the methodology to use. Creating a process model helps to find inconsistencies, redundancies and omissions in the process and in its constituent parts. A good methodology will be useful to see how the organizing process activities can make development more effective. This chapter will discuss the methodology used for this thesis project and the requirements analysis.

3.1 Software Development Life Cycle

When a process involves the building of some product, the process is referred as a life cycle. Software development process is sometimes called the **software development life cycle (SDLC)**, because it describes the life a software product from its conception to its implementation, delivery use, and maintenance.

SDLC involves a set of activities that analysts, designers and users carry out to develop and implement a system. In the others words, the SDLC is a phased approach to

analysis and design which holds that systems are best through the use of a specified cycle of analyst and user activities. Often SDLC are suitable for specific environments. Just remember in mind, an SDLC will help developers to guide them through a project. But it won't solve the problems for them. Usually, the SDLC consists of seven different phases as shown in figure 3.1:

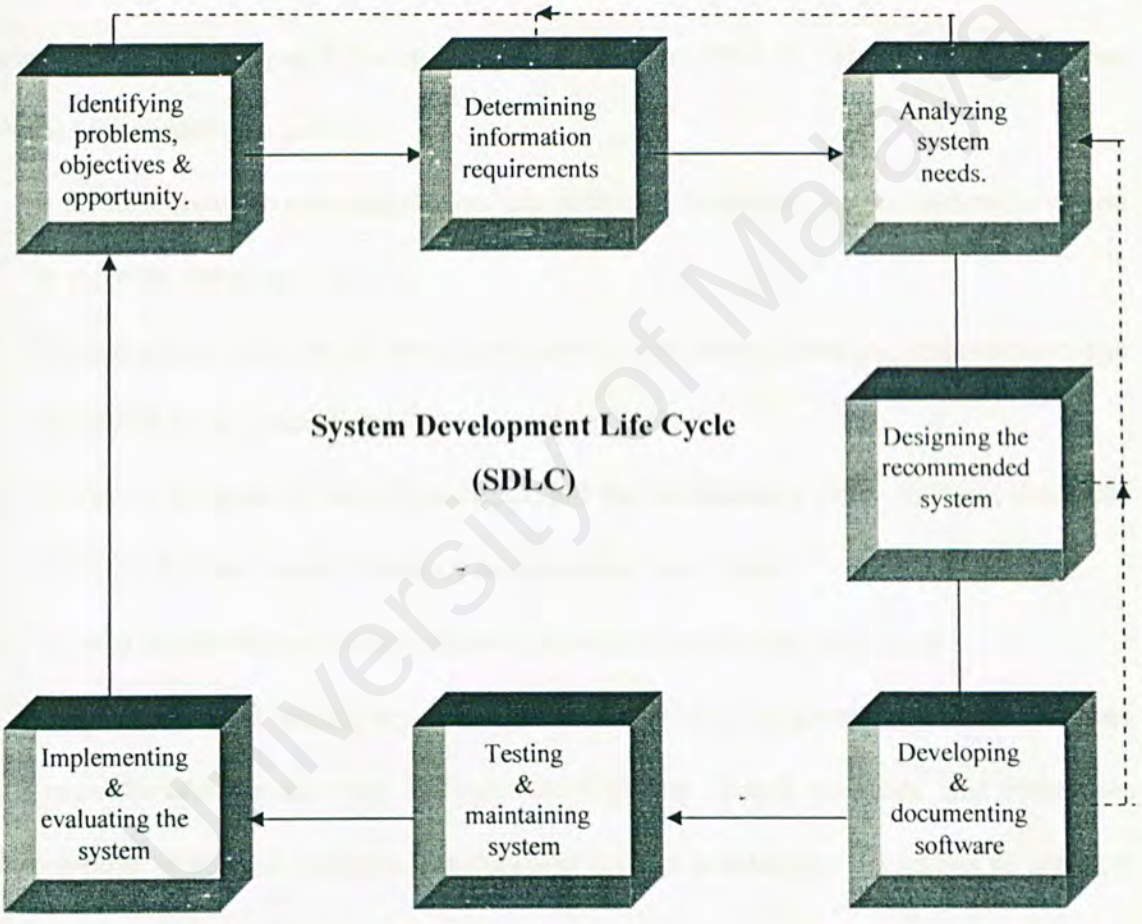

Figure 3.1: Illustration of the seven phases in SDLC

3.2 System Methodology

Methodologies are set of procedures, techniques, and processes used to direct the activities of each phase of a software life cycle. In general, methodology cannot be true or false, only more or less useful.

Process can be a useful organizer, but it is not an end unto itself. The real benefit of process is forcing people to think before doing. Since it helps developers to organize their thinking, building a software process model and discussing its subprocesses help the team understand this gap between what should be and what is. There are several other reasons for modeling a process:

1. It forms a common understanding of the activities, resources, and constraints involved in software development.
2. Process model helps the development teams to find inconsistencies, redundancies, and omissions in the process and in its constituent parts
3. To reflect the goals of development, so that the development team evaluates candidate activities for their appropriateness in addressing these goals.
4. To help the development team understand where the tailoring is to occur.

Many process models are described in the software engineering literature. Some are *prescriptions* for the way software development should progress, and others are *descriptions* of the way software development is done in actuality. Examples of common software process models are:

- Waterfall Model
- Waterfall Model with Prototyping
- V Model
- Prototyping Model
- Operational Specification Model

- Transformation Model
- Phased Development: Increments and Iterations Model
- Spiral Model

Each of them has it own strength, depending on the situations it is used, the way it is applied and who involved in the development process. Different system process decomposes these activities in different ways. However, some of methodologies and process model are more suitable than others for some type of system or application. If the wrong is chosen, it will probably reduce the quality or the usefulness of the system to be developed.

3.2.1 Waterfall Model

Many more complex models are really just embellishments of the Waterfall. In Waterfall model, the process is divided into a succession of separate steps or phases carried out in sequence (as shown on diagram below). It is an approach to development that emphasizes completing a phase of the development before proceeding to the next phase.

The Waterfall process model is used to prescribe or specify what the software is supposed to do (gather and define system requirements) before development begins. After the requirement is defined in specification, it then breaks the complex mission of development into several logic steps (design, code, test, and so forth) to schedule the project and then the development begins, following what is outlined in the specification and design. However, the Waterfall models are extremely sensitive to task sequence, since it assumes that the project follows a relatively uniform and orderly sequence of development steps. This may cause drawbacks for the model. So that, the application of

the Waterfall model should be limited to situations where the requirements and the implementation of those requirements are very well understood.

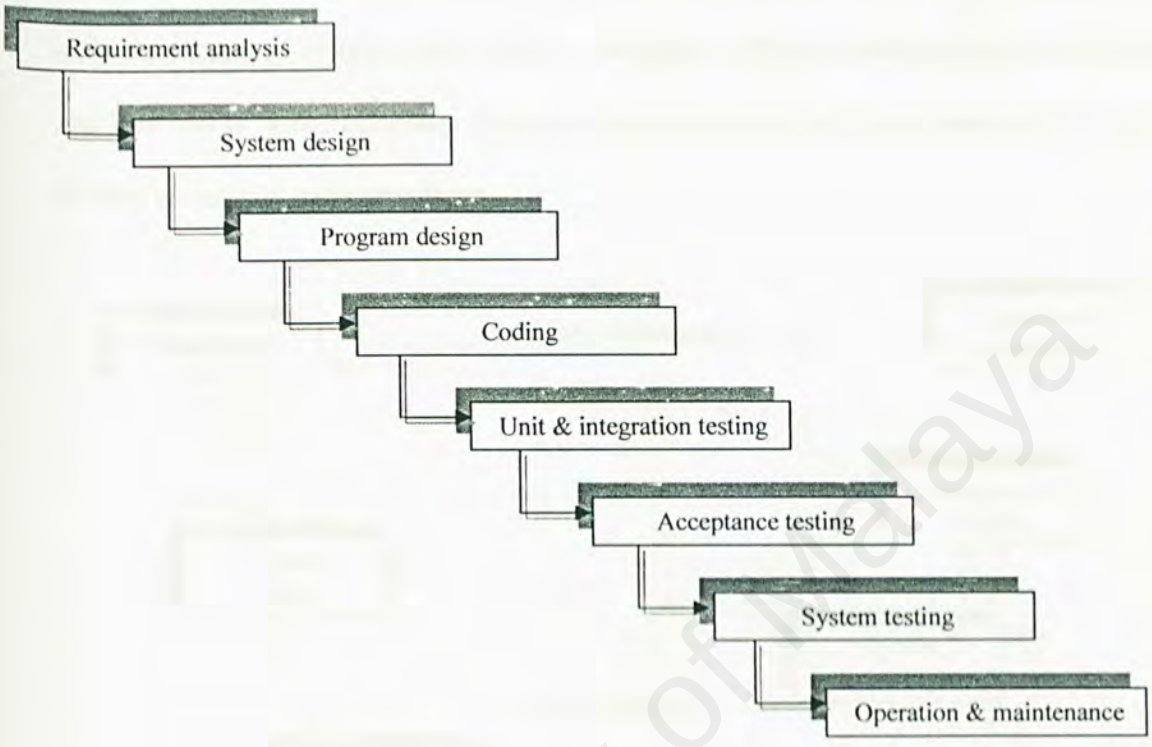

Figure 3.2: The Waterfall model

3.2.2 V Model

The V model is a variation of the Waterfall model that demonstrates how the testing activities are related to analysis and design. It focuses on testing throughout the development life cycle, early development of test requirements, and early detection of errors. Each major deliverable in the development process is assessed, verified, validated and tested. The deliverables of each phase need to be verified and validated to ensure that they are complete and correct.

Work proceeds to the next phase in the V-Model when all project deliverables in a phase have met all verification and validation requirements. The process of verification

and validation is an attempt to catch as many errors as possible within the development life cycle. Each successive phase of testing ensures that the specifications defined in the deliverable of the corresponding phase have been implemented. This is achieved by the early development of test requirements. The main difference between Waterfall model and V model is Waterfall model focuses on documents and artifacts whereas the V model focuses on activity and correctness.

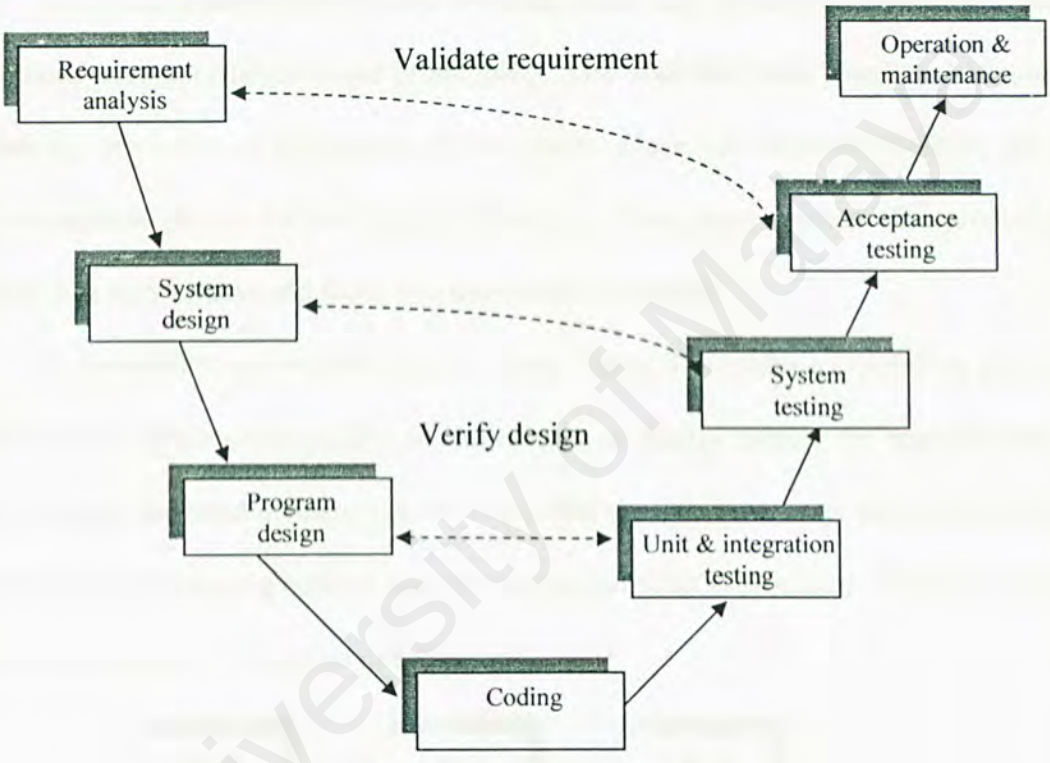

Figure 3.3: The V model

3.2.3 Prototyping Model

The prototyping model is a systems development method (SDM) in which a prototype (an early approximation of a final system or product or a throw-away version of a system) is built, tested, and then reworked as necessary until an acceptable prototype is finally achieved from which the complete system or product can now be developed.

Prototyping can test the feasibility of an approach, and prototypes can serve as a proof of concept for radically new software. The power of the prototyping is to communicate with the customer. Prototypes can be an effective tool for communication between developers and users. This model works best in scenarios where not all of the project requirements are known in detail ahead of time. It is an iterative, trial-and-error process that takes place between the developers and the users.

The critical difference between Waterfall model and prototyping approach is quick turnaround between designing and prototyping. The Waterfall model has the shortcoming of lacking flexibility of adjustment of the design. Once the document is done, all the implementation should follow that specification. Once some aspects of a product are missed, it is very hard to add those into the complete product.

To avoid this, prototyping step is taken. Since this model allows all or part of a system to be constructed quickly to understand or clarify issues, the requirements or design require repeated investigation to ensure that the developer, user and customer have a common understanding both of what is needed and what is proposed. The main goal is reducing risk and uncertainty in development.

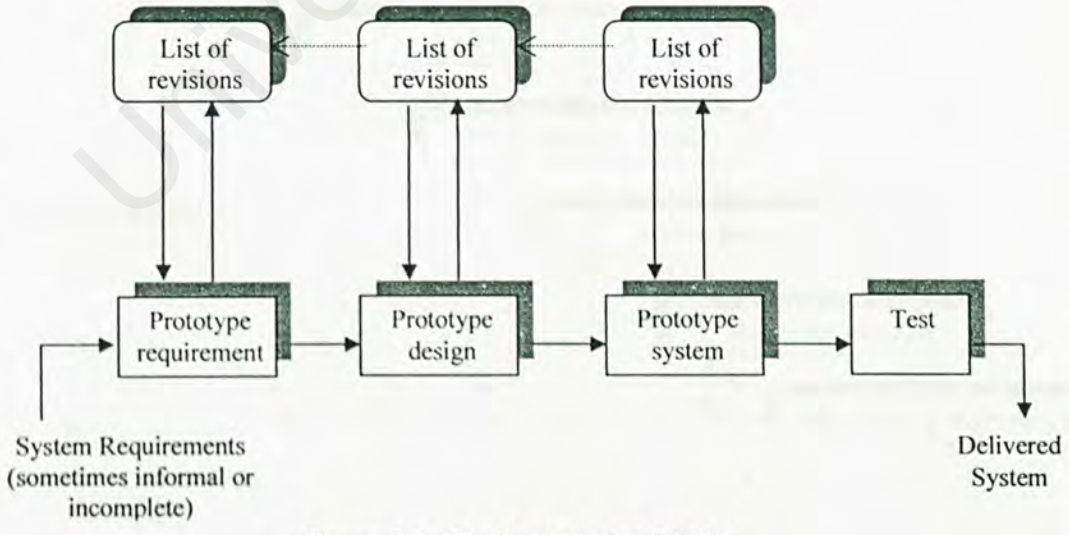

Figure 3.4: The Prototyping Model

3.2.4 Waterfall Model with Prototyping

Prototyping may be used with the Waterfall. The Waterfall model with prototyping is a hybrid model consists of Waterfall model and prototyping process. Why prototyping? Because it's hard to get things right the first time.

Prototyping is such a sub process that can be used to improve understanding. It can be useful to demonstrate technical feasibility when the technical risk is high. It can also be used to better understand and extract user requirements. In either case, the goal is to limit cost by understanding the problem before committing more resources.

With this hybrid model, major kinks of the requirements are addressed and fixed well before the requirements are officially validated during system testing. Similarly, parts of the design may be prototyped.

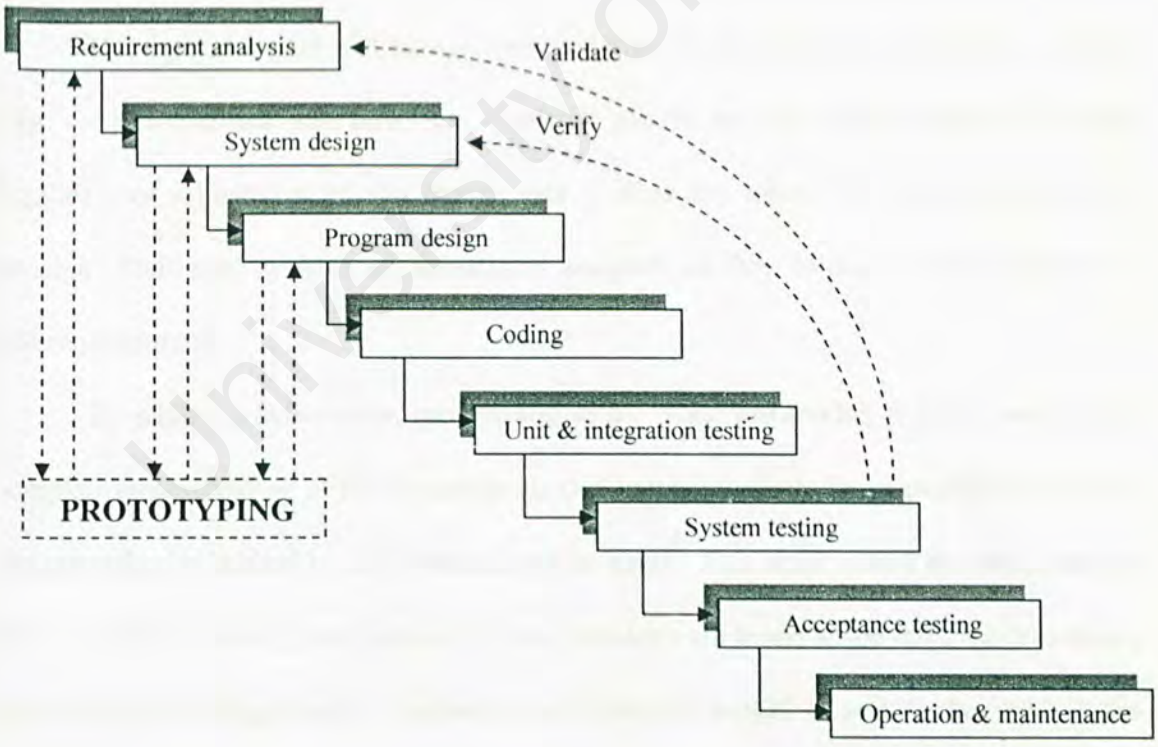

Figure 3.5: The Waterfall Model with Prototyping

Prototyping is useful for validation and verification. Validation ensures that the system has implemented all of the requirements. Verification ensures that each function works correctly. The process of verification and validation is an attempt to catch as many errors as possible within the development life cycle.

3.3 Why Waterfall Model With Prototyping?

As mentioned before, each methodology and model has its own strength and weakness. It depends on the situations it is used, the way it is applied and who involved in the development process. There's no true or false, just more or less useful. Anyway, the **Waterfall model with prototyping** has been chosen as MY ChatQuiz System methodology

This hybrid model will give a better solution for the problems that occur on their own. As mentioned just now, the waterfall model has the shortcoming of lacking flexibility of adjustment of the design and it does not allow for much reflection or revision. Delivered systems are sometimes unusable, as they do not meet the customer's real requirements.

By adding a subprocess, prototyping in the Waterfall model, it helps provide the complete understanding of the requirements that is typical of hardware production--which understanding is critical to the Waterfall model itself. This ensures that the requirements are consistent, feasible, and practical, if not, revisions are made at the requirements stage, rather that at testing stage. Anyway, the Waterfall model is suit to be used if the requirements and the implementation of those requirements are very well understood.

Beside that, the problem with the Prototyping model is planning, costing and estimating a prototyping project is outside the experience of many software project

managers. Since each major deliverable in the development process is needed to be assessed, verified, validated and tested, it needs a thorough plan to manage that properly. Procedures for change and configuration management may be unsuitable for controlling the rapid change inherent in prototyping. Manager may exert pressure on prototype evaluation to reach swift conclusion about the prototype. There are several advantages of the Waterfall with Prototype model:

1. It presents a very high-level view of what goes on during development.
2. It can help to reduce the uncertainty about what the system should do and therefore enhance the understanding.
3. User involvement in early stage ensures the system is developed more closely to user's need.
4. Provides opportunity to explore alternative, strategies and revisions.
5. Emphasizes early planning, customer input and design.
6. Emphasizes testing as an integral part of the life cycle.
7. Provides quality gates at each life cycle phase.

One of the issues that have to take into account is the prototyping subprocess. In order to implement the SDLC successfully with this chosen methodology, the prototyping subprocess must be managed carefully to avoid distraction - work on the prototype can take attention away from the problems to be solved and seduction - developers can be trapped in an endless loop of refinement.

After refining the Waterfall model and prototyping model to suit this project, justification has been done. It has shown in Figure 3.5

1) Requirement Analysis

This is the activity that determines, at least initially, what the system to be designed and built must do. In this phase, all the information about this project is gathered, including boundary and requirements of the system. System requirements are identified and analyzed. It concerns with 4 basic categories of information:

1) Function – the basic capabilities of the system (define)
2) Form – the realization and appearance of functions within the system (design)
3) Criteria – the desired system attributes or characteristics
4) Constrains – limitations on possible or acceptable solutions.

Anyway, to reduce risk and uncertainty with requirements, prototyping process is used to help improve understanding. Defined and well-understood requirements are the foundation of design as well as the basis for quality.

2) System Design

System design is the next phase. The system design includes a complete description of the functions and interactions involved. This phase decomposes the software system into its actual constituent (architectural) components and then iteratively decomposes those components into smaller and smaller subcomponents until the subcomponents located at the leaves of the resulting design tree are small enough so that we would expect a person to be able to 'get his or her arms around it' easily. It is also involves drafting out data flow diagrams (DFD) that resembles the functionality of the system and its subsystem logically. Prototyping is used in this phase together with the Waterfall model to reduce the uncertainty about what the system should do. Design prototyping helps in assessing alternative design strategies and decide which is best for the

project. It is because sometimes the designers may address requirements with several radically different designs to see which has the best properties.

3) Program Design

Defines and documents algorithms for each module in the design tree that will be realized as code; also called detail design by others

4) Coding

Transforms algorithms defined during the detailed design phase into a computer-understandable language using some tools. This is usually performed in two steps: converting the algorithm into high-level language (usually performed by people) and converting the high level language into a machine language (usually performed automatically by a compiler); also called programming.

5) Unit & Integration Testing

Checks each coded module for the presence of bugs. Unit & integration testing purpose is to ensure that each as-built module behaves according to its specification defined during detailed design. This stage also will interconnect sets of previously tested modules to ensure that the sets behave as well as they did as independently tested modules. Ideally each set of modules should correspond to a component in the design tree defined during unit testing.

When the programs have been written, they are tested as individual pieces of code before they can be linked together (module or unit testing). Once they work as desired, they will be putting together until the entire system is operational and test whether they work properly when joined with others (integration testing).

6) System Testing

System testing will checks that the entire system embedded in its actual hardware environment behave according to system requirements. During this phase, validation is carried out to ensure that the system has implemented all of the requirements, so that each system function can be traced back to a particular requirement in the specifications. Besides, this phase also verifies the requirement, ensures that each function works correctly.

- Verification: "are we building the product right?" - the software should conform to its specification
- Validation: "are we building the right product?" - the software should do what the user really requires

7) Acceptance Testing

This phase is conducted by the user rather than the developer of the system, validates the requirements by associating a testing step with each element of the specification. This type of testing checks to see that all requirements have been fully implemented before the system is accepted and launched.

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8) Operation & Maintenance

The last phase is the operation and maintenance. The system is installed and put into use. Maintenance involves fixing errors, which are not discovered in the earlier stages of the life cycle, improving the implementation of the system units and enhancing the system's functionality as new requirement are discovered. The maintenance process is actually a full development life cycle, if a coding change is made, then the design, coding,

and three testing stage must be performed. If a requirement change has occurred, then all the phases must be performed.

3.4 Types of Literature Review

3.4.1 Reading & document review

Information was gathered through search for reference material in the library regarding to web technologies and development tools. Besides, study on similar work of senior in the FSKTM document room is done to learn the tools, concept, approach and methodologies they used. Purchasing and borrowing reference materials from course mates.

3.4.2 Observation

Observation is another approach for literature review of this project such as the rule and the way of playing quizzes. Besides that, observation on the existing similar web application on the Internet always provides the most useful review for the project before the development of the system start. Comparison on the various similar systems can give some good idea that can be adopted to this system.

3.4.3 Internet surfing

Internet is used in order to get the latest news and useful information related to web technologies and some existing similar system. Study on existing system in the market take a combination of ideas and information obtained to build the system0

3.4.4 Inquiry

Made direct inquiry to seniors or friends who are already experienced with the web for advice and guidance regarding to the system.

3.5 Requirement Analysis

A **requirement** is a feature of the system or a description of something the system is capable of doing in order to fulfill the system's purpose whereas **analysis** is the act of defining *what* a system will do. (**Design** is the act of defining *how* the requirements defined during analysis will be implemented in a specific hardware or software environment.).

Understanding of system intent and function starts with an examination of requirements. Thus, requirement analysis is the first and the most basic step to be taken in each SDLC. Requirement Analysis enables the system engineer to specify software elements, and establishes design constraints that software must meet. A complete understanding of software requirement is essential to the success of a software development effort. No matter how well designed on well coded, a poorly analyzed and specified program will disappoint the user and bring grief to the developer. Usually, requirements can be divided into 2 types: **functional** and **nonfunctional**. A functional requirement describes an interaction between the system and its environment. Nonfunctional requirements are the constraints under which a system must operate and the standards which must be met by the delivered system.

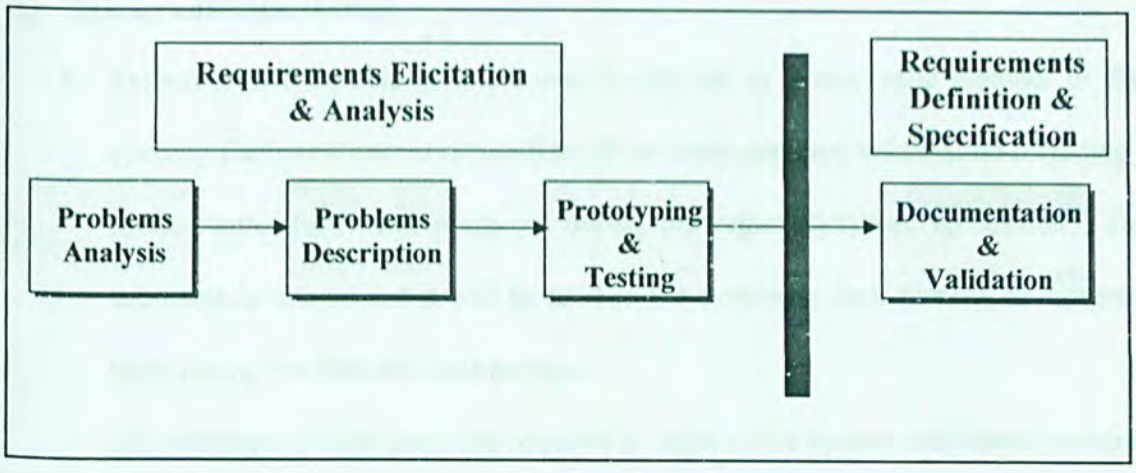


Figure 3.6: The process of determining requirements

Requirement elicitation is an especially critical part of the process. Requirement elicitation enables to explain the requirement definition of the system. Requirements definition is a complete listing of everything the customer expects the proposed system to do. It represents an understanding between customer and developer of what the customer need or wants and it usually written jointly with developer. On the other hand, the requirements specification restates the requirements definition in technical term appropriate for the development of a system design. It is the technical counterpart to the requirements definition document and requirement analysts write it.

3.5.1 Functional Requirements

A functional requirement describes an interaction between the system and its environment. Since the requirements describe a system's behavior, hence the functional requirement also explains how the system should behave given certain stimuli. In short, the functional requirement may explicitly state what the system should do.

a) **Sign up and login section**

- System should be able to allow user to sign up as a new valid member of this system. Each new user is required to fill up some personal information including a username/nickname and password during the registration/sign up session. The username is unique and it will be used in the system as their identity to represent them during the chat and quiz process.
- All members or valid users are required to login to the system with their username and password at login page in order to access all the functions and pages in the site.
- Administrators of the system are required to login to the system for administration purpose. This is to protect the server and the database from unauthorized access.

b) **Administration section**

- System should be able to allow each administrator of the system to manage the system such as manipulates question bank (add, delete or update questions)

c) **Quiz section**

- Each registered user is allowed to join quiz game.
- System should be able to conduct a quiz individual manner.
- System should be able to keep track of the time spent for answering question in the quiz.

d) **Public chat section**

- Each registered user is allowed to chat.
- All chat messages sent out by all users are displayable on the main board of the chat system to be viewed by other users.

3.5.2 Nonfunctional Requirements

Nonfunctional requirements are the constraints under which a system must operate and the standards which must be met by the delivered system. The nonfunctional requirements of the MY ChatQuiz system are as below:

a) User-friendly

The system should be user-friendly to enhance the interaction between the users and the system. All the features and functions provided by the system should be easy to use & can be understood easily by the users from any level. This is important because some of the potential users are not technology savvy or highly computer and IT-skilled people, Form 1 student for instance. They are non-technical and will be easily frustrated with complicated computing features and commands. Therefore the design for the interface, linkage between must have a high overall view.

b) Reliability

Reliability is referred to the expectation of a system to perform its intended function accurately. Thus, the system should be reliable in performing its functions and operations. System will not produce any dangerous when it's used in a reasonable manner, which means in a manner that a typical user expects in normal. For example, whenever a button is clicked, the system should be able to execute that particular function or generate some message to inform the user what is happening.

c) **Respond time**

In order to provide an efficient MY ChatQuiz system, it should provide a fast response time to users. Unnecessary interaction between the server and the client will increase the response time. This is important to implement the chat and quiz process.

d) **Availability**

The system should be developed in a way that it is available to be accessed at anytime and anywhere.

e) **Modularity**

Modularity is a key factor in order to produce a good program. The system is broken into sections or modules so that functions of objects could be distinct from one another. His characteristic eases the testing and maintenance. In the system design, modularity of program sections is applied from the very beginning because this will lead to easy modification and enhancements in the future.

3.6 Web Technologies & Development Tools Analysis

3.6.1 Operating System Consideration

Windows 2000 have lead over Linux when considering the ease of use. Linux is relatively difficult to configure, and its UNIX-based commands are rather difficult to learn not to say mastering it for a full use in a short period. On the other hand, Windows 2000 are more user-friendly level software available for Windows 2000 as compared to Linux, which is essential for developing a system that requires the usage of other software. On

behalf of the administrator side, Windows 2000 offers easy-to-use wizards and complete set of help files for easier handling of administrative tasks.

Windows 2000 comprise of a user friendly Graphical User Interface which make it easy for both consumers and computer professionals to use. Although Linux also provides a user friendly GUI, it undoubtedly has much lower usage percentage in the market. UNIX was not chosen because it does not provide a user friendly GUI.

Windows 2000 is an upgrade version of Window NT 8 eventually offered a better solution compare to its predecessor. It's more reliable, faster and powerful than the earlier versions such as Windows 95 and 98. Windows 2000 has built in web server; IIS 5.0 which can be integrate with Tomcat to support JSP.

As a result, Windows 2000 was chosen as the platform and operating system of choice due to familiarity of use, ease-of-use, its capability, integrity with other software and the most importantly, it support JSP technology which has been chosen as web technology tool in this project.

3.6.2 Web Programming Technology Consideration

Combination of Java, JSP and Servlets technology was chosen over the other web programming language due to several reasons. As mentioned in Literature Review, Java is a very powerful language that has provided a lot of useful API features that can be used to develop different applications, such as features of this Chat application. Furthermore, Java has been well known as an open and free technology. JSP comes from Java's family, so JSP technology is used together with some of Java classes to build this system.

JSP provides a way to generate dynamic web pages that are both easier to write and faster to run. With JSP, programmers can embed as much Java code as they like into a JSP page, using JavaBeans and Enterprise JavaBeans lets the programmers concentrate

on page design and presentation in the JSP page and encourages them to move application logic into reusable components.

Compare to JSP, Servlets are great to be used when the application requires a lot of real programming to accomplish its task. Based on this point, Servlets has been chosen to process data insertion, deletion and modification.

3.6.3 Web Server Consideration

Apache and Tomcat integration (Apache Tomcat) will be used as web server to manage server system in this MY ChatQuiz system. This combination is chosen because they support JSP technology, which has been selected to develop this project. In reality, Tomcat is usually integrated with Apache HTTP server to provide better performance in dynamic content application. Since JSP technology has closely relationship with Servlet, Tomcat is used as Servlet engine to serve dynamic content (Servlet) whereas Apache serves static content (HTML).

3.6.4 Database System Consideration

Microsoft SQL Server 2000 was chosen as database system to develop MY ChatQuiz system. Compared with Microsoft Access, it has relatively higher data storage capacity. The main reason not using Oracle database is because of to set up an Oracle database Server need a large amount of budget that more expensive than using Microsoft SQL Server. Although MySQL is free, it does not have a user-friendly interface to set up a database. It will take a lot of time to develop a database for this system.

3.6.5 Development Tool Consideration

There're a lot of different types of effective authoring and development tools in the market now. So that, combination of several tools has been selected to perform better work during the system development, such as Microsoft Front Page and NetBean IDE.

Microsoft Front Page has provided a very user-friendly interface for web page HTML design in an easier and faster way. As JSP technology needs Java programming, NetBean IDE is selected to develop code in Java and JSP technology by providing a lot of features such as editing, compiling and debugging. In addition, it is a free product that can be downloaded from Internet. Visual InterDev doesn't support JSP and it's more suitable to use with ASP technology, so that it's not the choice here for this project.

3.6.6 Web Browser Consideration

The preferred web browser to be used for testing and serving the MY ChatQuiz System will be the Microsoft Internet Explorer 4.0 and Netscape's Navigator 4.0 above as they are the major browsers nowadays.

3.6.7 Summary

Below is the summary of the considerations that have been done on above:

Component	Description
Operating System	Windows 2000 Server
Web Server	Apache Tomcat 4.0.6
Database & DBMS	Microsoft SQL Server 2000
Web Programming Technology	Java, Servlets, JSP, JavaScript

Development Tool	NetBean IDE, Microsoft FrontPage
Web Browser	Internet Explorer 5.5 or above

Table 3.1: Summary of web technologies and development tools analysis

3.7 Hardware & Software Requirements

The table below shows the summary of hardware and software requirements that have been considered for the development of this project.

Requirement	Description
Hardware	- Pentium III or AMD with 400Mhz or above computer -Standard input and output devices -128 MB RAM -At least 500 MB free space
Software	-Windows 2000 Server -Apache Tomcat 4.0.6 Web Server -Microsoft SQL Server 2000 -Java Development Kit (JDK 1.3.1) -Java Plug-In -NetBean IDE 3.3.2 -Microsoft FrontPage 2000 -Microsoft Word 2000 (for documentation) -IE 5.0 or above

Table 3.2: Hardware and software requirements

3.8 Conclusion

In this chapter, the development methodology and system analysis of the proposed system have been described in each sub titles.

Waterfall model with prototyping is chosen as the system development methodology for this project. The introduction and the reason for using this model have described and explained in the early part of this chapter.

Before developing a system, it is very important to determine the requirement of the system. The deficient of the currently system, user capability and user expectations will be considered in determine the requirement of the proposed system. In order to identify the requirement for the proposed system, information gathering has been carried out. The information was gathered through data observation, reading, Internet surfing and inquires.

The result of the information gathering will be used to determine the system requirements. System requirements will be categorized into two types, functional requirements and non-functional requirements. These requirements were described in this chapter.

Development of an efficient system involves the integration of software and hardware components. In this chapter, the considerations on several system development tools have been carried out. The selection of the most suitable tools for development process is a critical decision that has impact on the flexibility of design, resource requirement, ease of development and ability to integrate various resources.

In the next chapter, the system design will be carried out. It will clearly identify and explain the various components of the proposed system such as architectural design, modules design, functional design, user interface design and others. Several suitable methods are needed to explain the system design phase.

CHAPTER 4 - SYSTEM DESIGN

Analysis is the act of defining *what* a system will do, whereas **design** is the act of defining *how* the requirements defined during analysis will be implemented in a specific hardware or software environment. System design is the following phase after system analysis has been done.

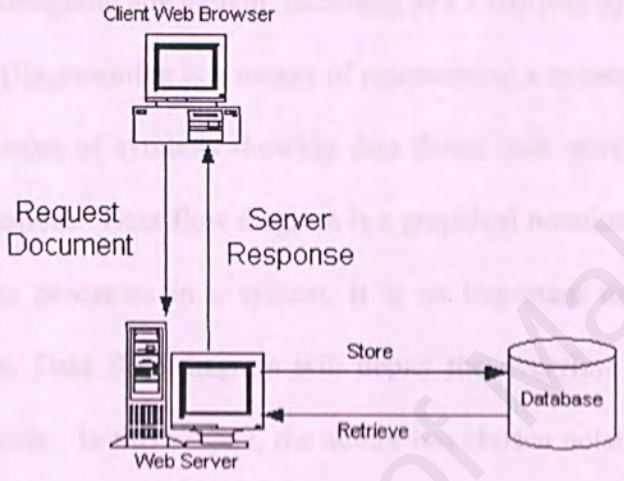
System design is a process to convert the conceptual ideas from requirement specification in system analysis to more technical specification. In system design phase, the requirements gathered during the analysis phase and researches conducted earlier were transmitted into a representation of system. System design will include architectural design, functionality design, database design and interface design for MY ChatQuiz System.

4.1 System Architectural Design

Architecture design is the earliest phase in system design process. Architecture associates the system capabilities identified in the requirement specification with the system components that will implement them. The architecture also describes the interconnections among these components. Below is the figure of distributed system architecture of MY ChatQuiz system described in terms of the topology of their configuration.

3-tier client server architecture on the web is used in this web-based application. Each machine (client and server) is assigned functions that it is best suited to perform. This architecture takes the form of web browser processing client side presentation in the

form of HTML, the web server using programming language and database server (SQL Server) for serving up the data. This web-based application that is deployed from a website requires an architecture that is robust, secure and scalable, and that can accommodate rapidly changing technologies. The middle tier is a web server that talks to a data repository.



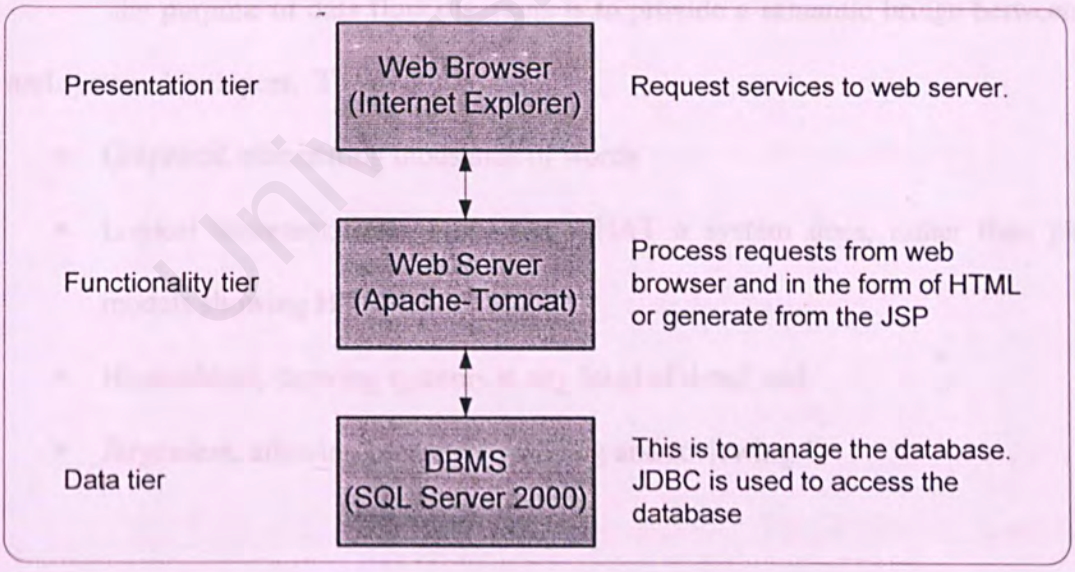


Figure 4.1: System architecture of MY ChatQuiz System

4.2 System Functionality Design

As mentioned clearly from the title, system functionality design describes the function of the system or how the system works. Data flow diagram (DFD), which is used to model processes logically, can be used to define system functionality. The goal of data flow diagramming is to have a commonly understood model of a system. So that, it is best suite to be used in designing any system, including MY ChatQuiz System.

Data Flow Diagramming is a means of representing a system at any level of detail with a graphic network of symbols showing data flows, data stores, data processes, and data sources/destinations. Data flow diagram is a graphical notation used to describe how data flows between processes in a system. It is an important tool of most structured analysis techniques. Data flow diagram will depict the overview of the system inputs, processes, and outputs. In this project, the author has chosen notation of C. Gane and T. Sarson in drawing out the data flow diagrams of MY ChatQuiz System.

The purpose of data flow diagrams is to provide a semantic bridge between users and system developers. The diagrams are:

- Graphical, eliminating thousands of words
- Logical representations, modeling WHAT a system does, rather than physical models showing HOW it does it
- Hierarchical, showing systems at any level of detail and
- Jargonless, allowing user understanding and reviewing

The Data Flow approach has four chief advantages over narrative explanations of many way data move through the system. The advantages are:

- Freedom from committing to the technical implementation of the system too early

- Further understanding of the inter relatedness of system and subsystems
- Communicating current system knowledge to users through data flow diagrams.
- Analysis of a proposed system to determined if the necessary data and processes have been defined.

The biggest advantage lies in the conceptual freedom found the use of the four symbols:

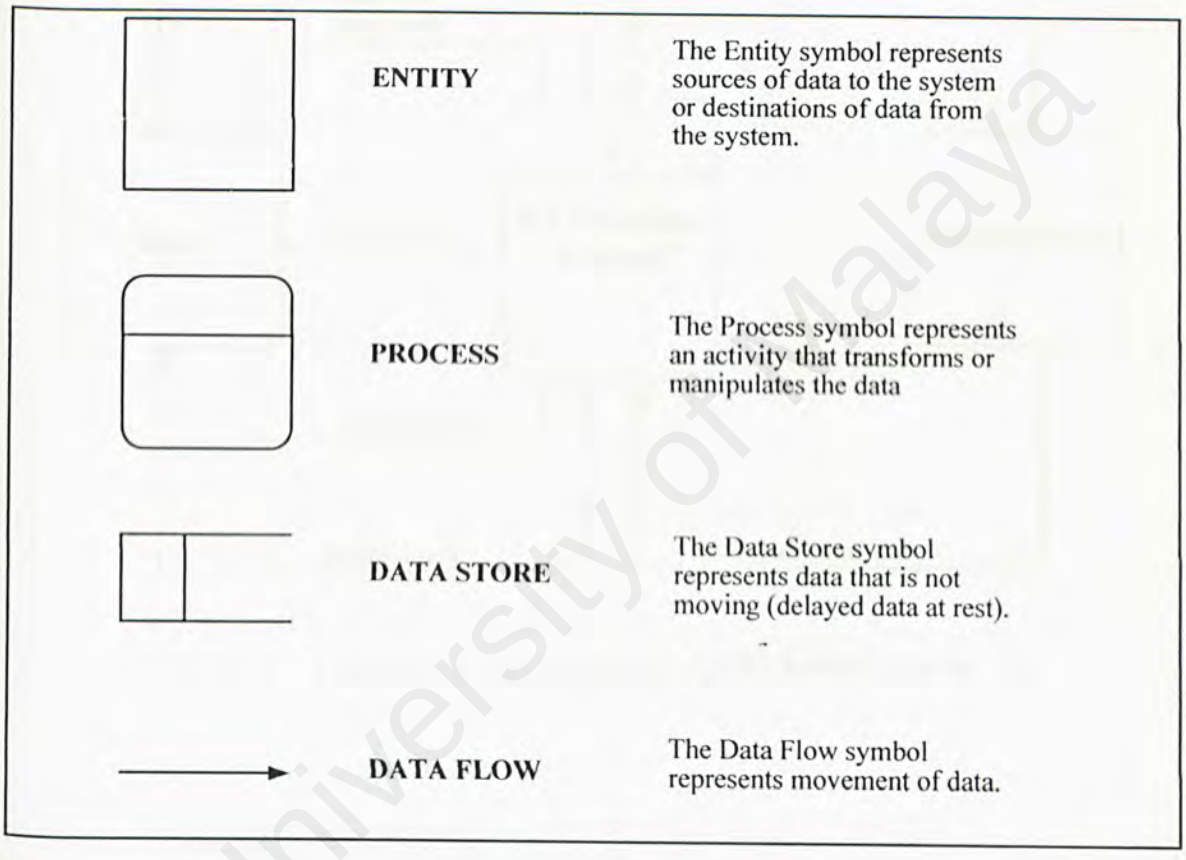


Figure 4.2: Data flow diagram symbols

The data flow diagram is conceptualized with a top-down perspective. Hence, the diagram will move from a general to specific diagram. So, Context Diagram will be drawn, and then followed by the Diagram 0. (In some cases, child diagrams are drawn if necessary)

4.2.1 DFD - Context Diagram

The Context Level Diagram representing an overview of the entire system. Figure 4.2 depicts the Context Level Diagram. It is the highest level in a data flow diagram and contains only one process, representing the entire of the proposed system.

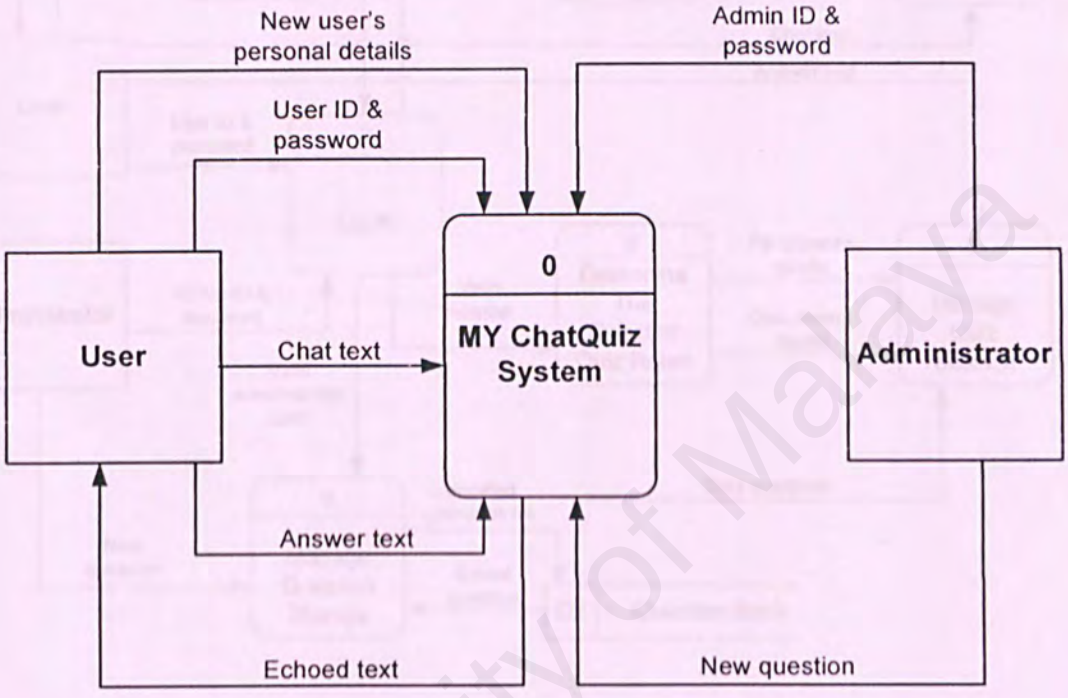


Figure 4.3: Context Diagram of MY ChatQuiz System

4.2.2 DFD – Diagram 0

Diagram 0 is the explosion of the context diagram. Diagram 0 is used to depict the major activities for the proposed system. There is one process for each major activity. Each process is analyzed to determine the data required and the output produced. Figure 4.3 illustrates the Diagram 0 for MY ChatQuiz system.

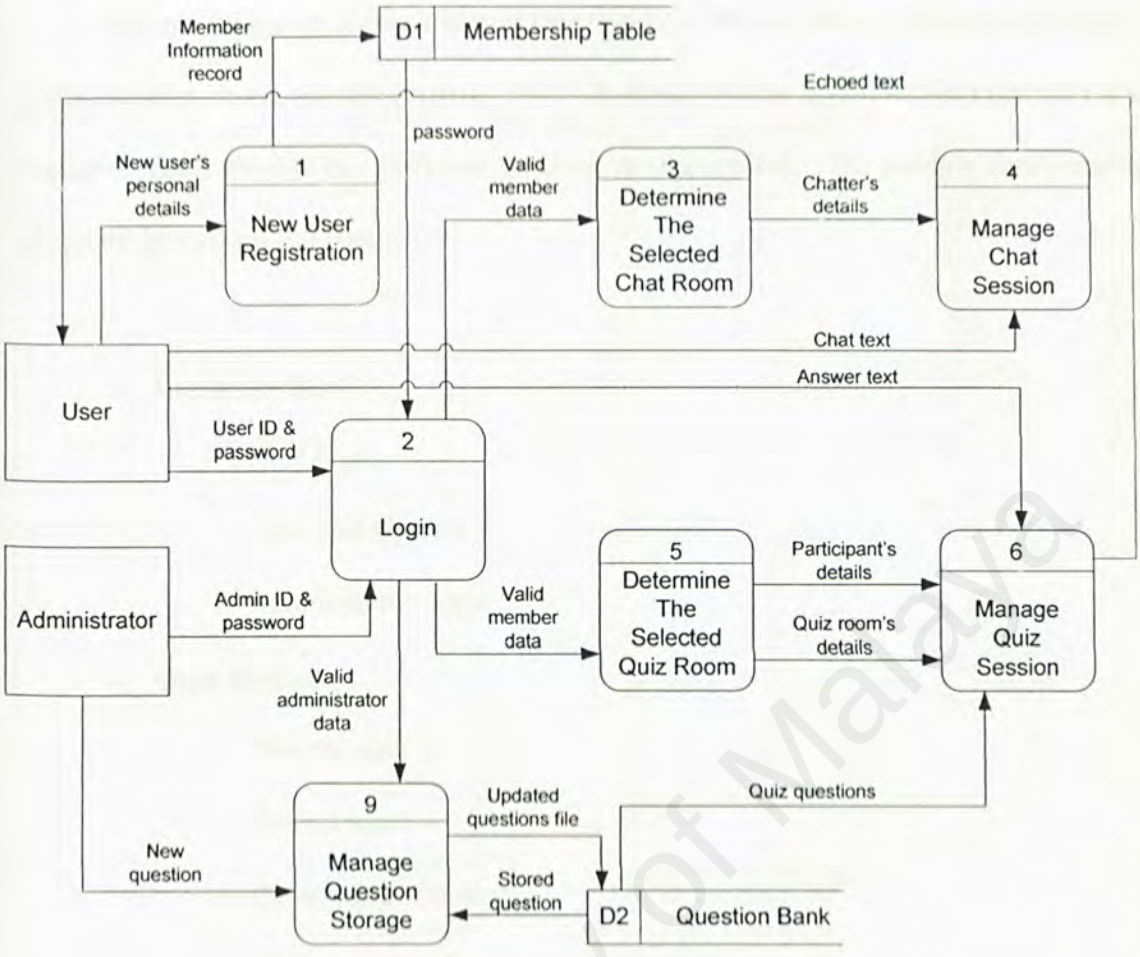


Figure 4.4: Diagram 0 of MY ChatQuiz System

4.3 System Module Design

No matter the design approach, each kind of decomposition separates the design into its composite parts, called modules. Generally, a module is a component of a system that provides services to other components but it is not a separate part of the system. We call a system is modular when each activity of the system is performed by exactly one component, and when the inputs and outputs of each component are well defined.

The next diagram shows the structure design of MY ChatQuiz System. It consists of the modules and connecting arrows. MY ChatQuiz system is divided into several main modules. Each module has different function or responsible. The module functionality design of the system is as below:

- **Login module**
  - User login
  - New user sign up
  - Administrator login
- **Quiz module**
  - Timing control
  - Collect score
  - Questions prompting
  - Message prompting
- **Chat module**
  - Sent text
  - Echo and display text
- **Question bank management module (administration module)**
  - Update questions
  - Delete questions
  - Upload new question
  - Generate report

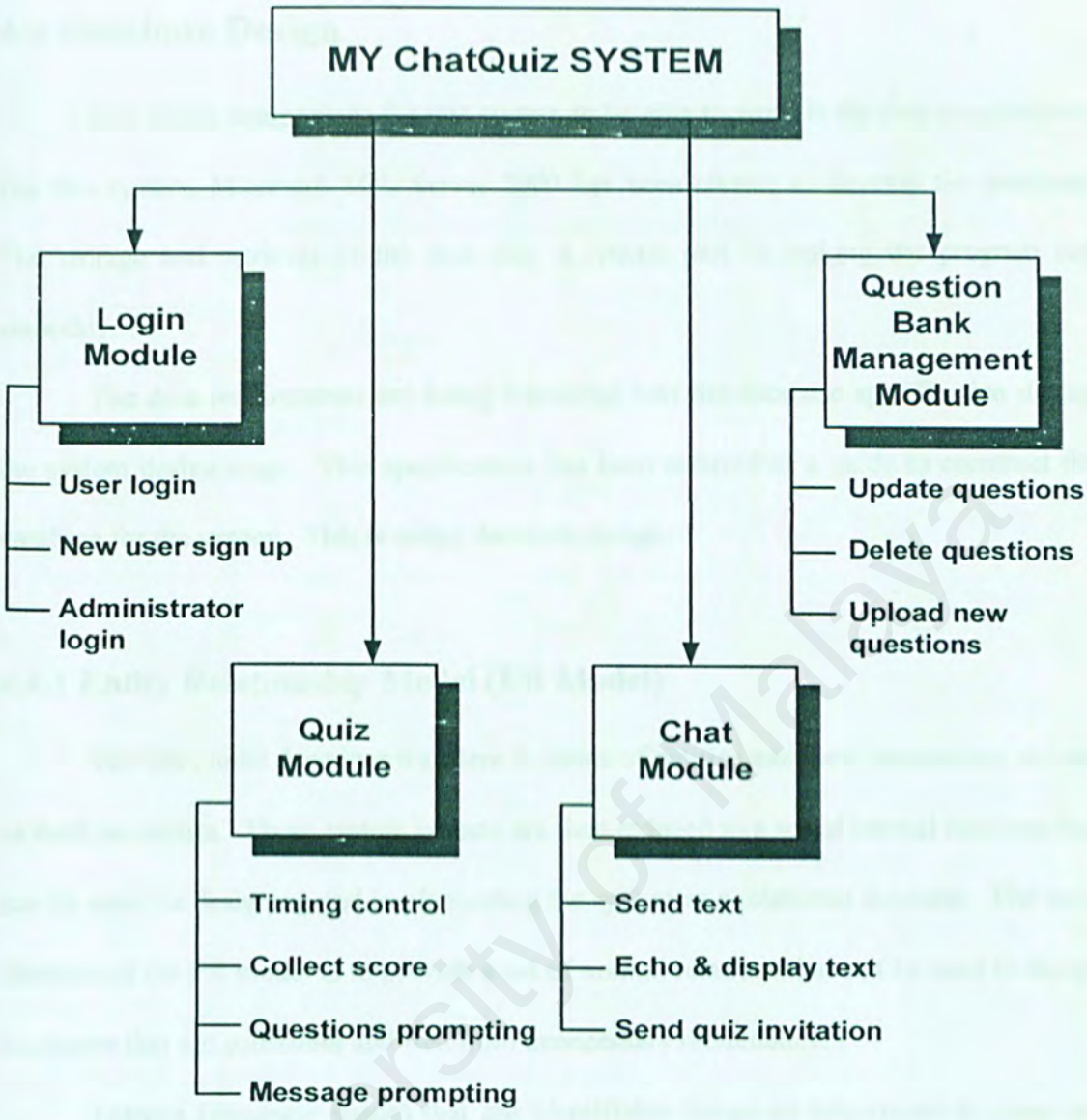


Figure 4.5: Structure design of MY ChatQuiz System

4.4 Database Design

One of the components for this system to be able to work is the data requirement. For this system, Microsoft SQL Server 2000 has been chosen to develop the database. The storage and retrieval of the data play a crucial part in making the program run smoothly.

The data requirements are being converted into the database specification during the system design stage. This specification has been referred as a guide to construct the database for the system. This is called database design.

4.4.1 Entity Relationship Model (ER Model)

The ER model describes a system in terms of entities and their interactions as well as their properties. These system objects are then reduced to a set of normal relations that can be used for designing and implementing the system as a relational database. The main function of the ER model is to provide a set of normal relations that can be used to design databases that are consistent and free from unnecessary redundancy.

Entities (rectangle shape) that are identifiable things of importance to users are defined with this model. All of the entities of a given type form an entity class. A particular entity is called an instance. There're attributes that describe the characteristics of each entity. In addition, one or more attributes identify an entity.

Relationships (diamond shape) are associations among entities. The ER model explicitly defines relationships; each relationship has a name; and there're relationship classes as well as relationship instances.

Relationship may also have attributes. 3 types of relationships: one-to-one (1:1), one-to-many (1: M) and many-to-many (M: N).

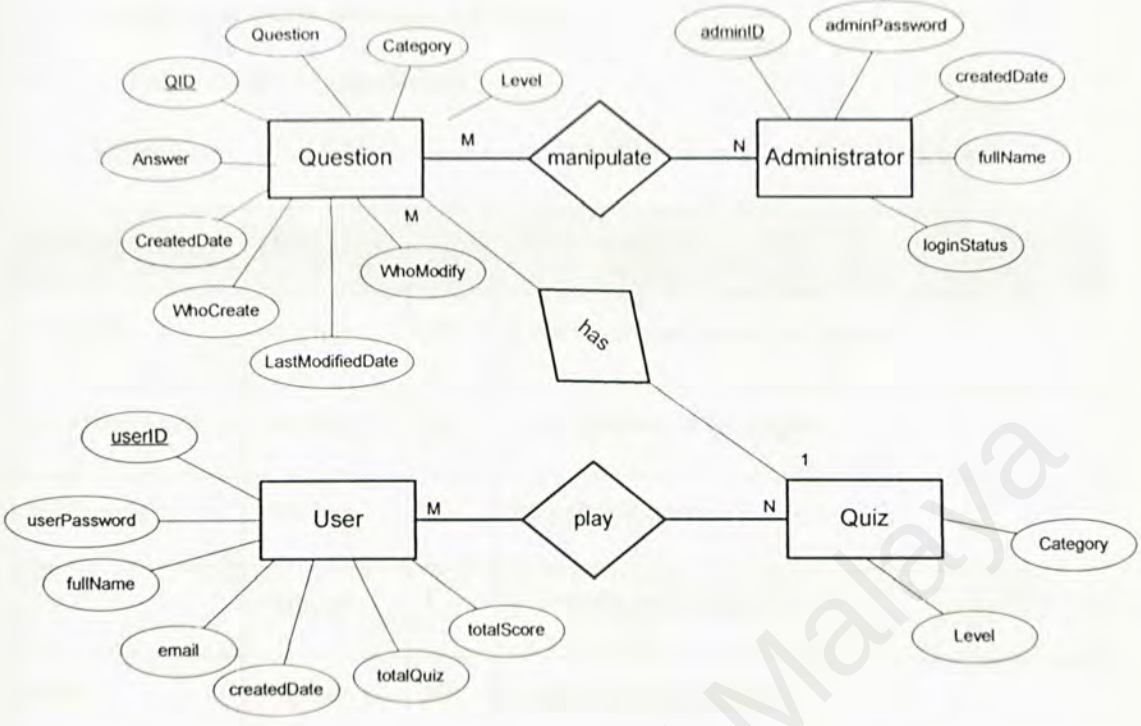


Figure 4.6: ER diagram of MY ChatQuiz System

4.4.2 Data Dictionary

Data dictionary is a storehouse of data about data. It is logical characteristic of current systems data stores. The data dictionary contains data defining other data. Data dictionary identifies processes where the data are used and where immediate access to information is needed. It also saves as the basic for identifying database requirement during system design. The data dictionary may be used to:

- Validate the data flow diagram for completeness and accuracy.
- Provide a starting point for developing screens and reports.
- Determine the contents of data stored in files.
- Develop the logic for data flow diagram process.

The data dictionary table in MY ChatQuiz system is shown as below:

(= primary key, size is measured in byte(s))*

1. Table name : userDetail

Description : This table is used to store information about members/users.

Field Name	Data type	Size	Description
*userID	varchar	50	User's unique name for login
userPassword	varchar	50	User password for login
fullName	varchar	50	Member's name
sex	varchar	1	F-female or M-Male
email	varchar	50	User's email address
createdDate	datetime	8	Date of user registers itself
totalScore	int	4	Obtained score from quiz (initially 0)
totalQuiz	int	4	Total of quiz sessions that has been participated by the user
DOB	datetime	8	Date of birth

Table 4.1: Data dictionary for user information

2. Table name : adminDetail

Description : This table is used to store information about administrators.

Field Name	Data type	Size	Description
*adminID	varchar	50	Admin Name for login

adminPassword	varchar	50	Admin password for login
fullName	varchar	50	Administrator's full name
createdDate	datetime	8	Date of administrator first registers itself
loginStatus	int	4	loginStatus (not login=0, already login=1)

Table 4.2: Data dictionary for administrator information

3. **Table name : questionDetail**

Description : This table is used to store information about quiz questions

Field Name	Data type	Size	Description
*QID	Int	4	ID for question
Question	varchar	500	Question description
Answer	varchar	4	Answer should be 'A','B','C' or 'D'
Level	int	4	Question level: 1->5
Category	varchar	50	Question category: e.g, Biology, Chemistry...
A	varchar	200	Choice A description
B	varchar	200	Choice B description
C	varchar	200	Choice C description
D	varchar	200	Choice D description
CreatedDate	datetime	8	Date of question created by administrator
LastModifiedDate	datetime	8	Date of last modified the question

WhoCreate	varchar	50	Who created this question
WhoModify	varchar	50	Who was the last modified this question

Table 4.3: Data dictionary for quiz question information

4.5 User Interface Design

User Interface Design is the specification of a conversion between the system user and the computer. It describes how software communicates with the human user who uses it. This conversion generally results in either input or output. MY ChatQuiz System will serve 2 types of users, the administrator and internet user. User interfaces can be tricky things to design, because different people have different styles of perceiving, understanding, and working.

The user interface design of this system focuses on the effective general interaction between the user and the system. It also takes into unambiguous and easy-to-use information displays.

There are a number of human engineering factors that incorporated in to the interface design of this system:

- The screen should be formatted so that the various type of information and instruction will always appear in the same display area and easy to be seen by the user.
- Users display an attribute sparingly.
- Simplify complex functions and reduce typing by providing the system user with selection lists and function keys

4.5.1 Screen Design

MY ChatQuiz system screen is presented in the form of web document on the browser. Data are displayed in as organized pattern. As MY ChatQuiz system has many function modules for its users, arrangement on how to present these functions is also a major concern. Clustering a page with too many functions may not be good strategy while replacing them in subsequent pages may render confusion to the user.

4.5.1.1 Client Site

4.5.1.1.1 Chat Session

This is the chat screen of the system. This page consists of a few separate but related areas. The sidebar on the left screen is the list of chatters. The bar at the center of the screen is the message board. It is the most important part of this main screen because this will be the area for chatters to communicate with each other. All messages or text will display on that board. Besides, there's a small horizontal area, which is for chatters to input their message.

Figure 4.7: User interface for chat session

4.5.1.1.2 Quiz Session

This is the quiz screen of the system. The sidebar on the right box has listed out the actions to be taken by the users before or after the quiz. The gray color box area is the board that displays the questions to be answered by the users. The number at the top right side is the timing.

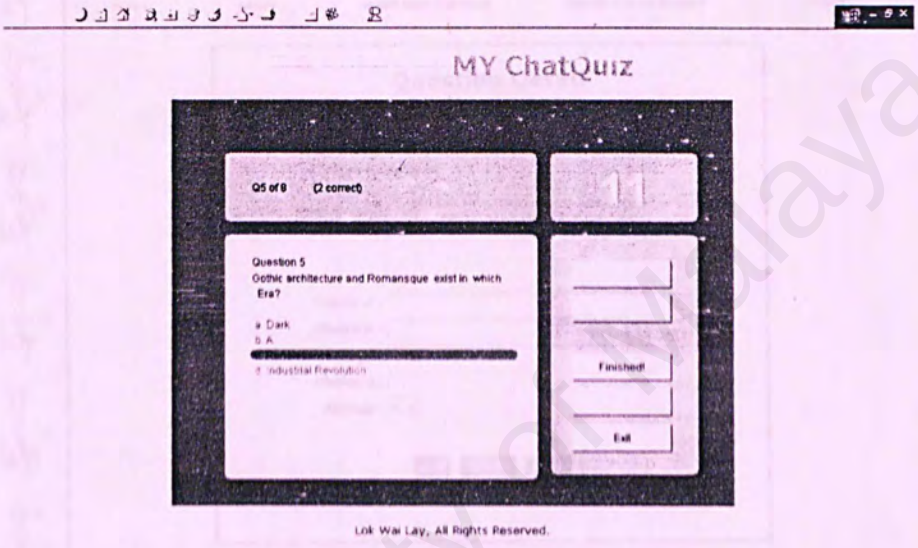


Figure 4.8: User interface for quiz session

4.5.1.2 Administration Site

4.5.1.2.1 Manipulate Questions Session

There're a few of manipulation task that administrators can do. Anyway, only the insertion has been included here as the example. A form is used to key-in new data.

Figure 4.9: Example of user interface for manipulating question

4.5.1.2.2 Question Bank Reviews

Below is the question bank review interface. At administration site, administrators can view the summary of the question bank. The summary will be presented in a table.

Figure 4.10: User interface of question bank review

4.6 Conclusion

This chapter shows the system structure and data flow of the MY ChatQuiz System. Besides, the ER diagram and the details data dictionary of the database were highlighted. Finally, a few of main user interfaces of the system were shown.

CHAPTER 5 – SYSTEM IMPLEMENTATION

System implementation in a nutshell is the construction of the application and the delivery of the application into the 'production phase'. The implementation phase takes place after the system design phase. It is a phase that integrating the designed modules or functions to develop a system based on the given requirements. System implementation includes building and testing its contained modules and sub-modules, involving system requirements and design into programs codes. Appropriate tools and languages are needed to code the programs. A number of software was chosen in this case.

5.1 Development Environment

Development environment consists of hardware and software configurations. Using the suitable hardware and software is an important factor to determine the successful of a project. The tools used to develop and documented the entire system is as listed below:

5.1.1 Hardware Configuration

Hardware Configuration	
1	Intel Pentium III 866 Mhz processor
2	128 SD RAM
3	20 GB Hard Disk
4	17" 256-colour monitor capable of 1028 x 728 resolution
5	1.44 MB Floppy Drive
6	56X CD-ROM Drive
7	Speaker
8	Other standard computer peripherals

Table 5.1: Hardware configuration of MY ChatQuiz System

5.1.2 Software Configuration

Software Configuration	
1	Windows 2000 Server Operating System
2	Jakarta-tomcat 4.0.6 Web Server
3	Microsoft SQL Server 2000 Database Server
4	Java Development Kit 1.3.1
5	Microsoft FrontPage 2000 for HTML layout design
6	Paint, Adobe Photo Shop 6.0 for graphical design
7	NetBean IDE 3.3.2 (Java coding environment)
8	Internet Explorer 6.0
9	Java Plug-In 1.3.1
10	Microsoft SQL Server 2000 Driver for JDBC
11	Microsoft Word 2000 for documentation

Table 5.2: Software configuration of MY ChatQuiz System

5.2 System Coding

System implementation phase involves programming or coding procedures, which converts the system requirements and design into program codes. That means programs that implement the design must be written. During the coding, the author has coded the system in a way that is understandable not only when revisit for testing, but also easier for future enhancement.

5.2.1 Coding Approach

Throughout the system implementation, the author has made used of a few different programming languages to generate different effects in the system. Basically, the development of the MY ChatQuiz can be divided to data management, programming/coding and integration.

Data management involved database preparation and user input data management. Coding, which is the most important phase is a process that converts the system

requirements and design into program codes. Integration is a process to integrate all the modules or subsystem into a whole complete functional system.

5.2.1.1 Data Management

5.2.1.1.1 Database Preparation

As mentioned before, MS SQL Server 2000 database was used as database server for MY ChatQuiz. It was acting like the question bank for the system because it was mainly used to store a big amount of quiz questions. Firstly, MS SQL Server 2000 was installed on the desktop pc (server). Then, relating tables (listed in Chapter 4) were created into it. Database preparation is important to do before starting the coding because there may involve process of data input by user that needs to store data into the database or retrieves certain vital information from the database.

5.2.1.1.2 Input Form Preparation

MY ChatQuiz involved a few of data input process by user. These data such as user details and quiz question details are needed to be stored into database. Therefore, form design was needed to be done carefully so that the user (internet user and administrator) know clearly about how to use the system effectively. Here, Ms FrontPage was used to develop and design the forms. Basically, tables in HTML language were used to design the form layout. CSS language was used to make the form interface nicer and consistent with other web interface. JavaScript was used also to do validation of data input process, page linked and others processes.

5.2.1.2 Coding

As mentioned earlier, the design has been translated into the form that can be understood by the machine with coding process. Coding process has made the design became reality. Coding or programming involves a great deal of creativity. Because each of programming languages has different functioning areas and its own strengths and weaknesses, several different languages have been used to build the MY ChatQuiz system.

5.2.1.2.1 Types of Languages

Below is the summary of languages that were being used in the system.

	Programming Languages
1	Java Server Pages (JSP)
2	HTML
3	Servlets
4	Java
5	Java Script (JS)
6	Cascading Style Sheet (CSS)

Table 5.3: Programming languages used in MY ChatQuiz system

a) Java Server Pages

Since MY ChatQuiz is considered as a web based system, the author had chosen JSP languages to develop all the web interfaces for the system such as administration site and internet user site. Compare with HTML that is only able to generate static web pages, JSP allows programmer to combine markup (HTML or XML) with Java code to provide dynamic function in the web pages, which means dynamically generate web pages. In other words, JSP technology uses HTML and XML-like tags and scriptlets written in the Java programming language. At here, the author didn't employ XML in this coding phase anyway. The author only coded all .jsp file of this system with Java and HTML combination.

NetBean editor and MS Front Page have been used to edit the JSP files. MS Front Page has provided the ability to design web layout in HTML faster and effectively whereas NetBean editor provided the ability of Java code compilation.

b) HTML

As mentioned before, HTML was mainly coded using MS Front Page 2000, a great HTML editor that provides many drag-and drop functions and user-friendly interface. For this system, HTML was coded combining with Java code to generate a file saved in .jsp extension.

c) Servlets

Servlets are programs that acting as a middle layer between a requests coming from a web browser or other HTTP client and databases or applications on the HTTP server. Servlets are great to be used when the application requires a lot of real programming to accomplish its task. It acts as a server-side form handler that processes the data, but generating HTML with Servlets can be tedious and can yield a result that is hard to modify. Compare with JSP technology, JSP can separate much of the presentation from the dynamic content by writing the HTML in the normal manner (using JSP scriptlets). Anyway, there're some of the programs which has not much HTML codes inside of it were coded using Servlets such as login and logout session and also user sign up data processing. For this system, Servlets were coded at NetBean IDE.

d) Java

Java was the main technology used to develop MY ChatQuiz. (JSP and Servlets languages are both under Java family). For this system which consists of 2 main modules,

chat and quiz, Java applet technology was being used to develop both modules. Usually, an applet is needed to be embedded in a HTML or JSP page in order to execute in a web browser. Since MY ChatQuiz is a web based system, the chat and quiz applets were embedded in JSP documents. When a browser loads the web page containing that particular applet, the applet downloads into the web browser and begins execution. In order to accomplish the tasks or the functions of the applet, a lot of java programs were also coded. For example, concept of java multithreading has been employed in the system to build a multiple client chat system.

e) Java Script

For client side scripting, Java Script was chosen as the scripting language. It was used to prompt an alert window when the user input invalid data and others useful functions. JavaScript can provide a fast interaction with system because it processes at client side, but not at server side. So, this is one of the reasons why Java Script was chosen. Java Script was coded using MS Front Page. Java Script is part of HTML that is inserted in a HTML page using script tag.

f) CSS

HTML is considered not a good language for page formatting. Anyway, CSS has been used in the system as the solution for that to do more control over page layout. Cascading Style Sheet (CSS) was coded using MS Front Page. In this system, CSS was being used to control interface presentation such as button colors and font style.

5.2.1.2.2 Example of Coding

a) Database connection

MY ChatQuiz involved a lot of process of data very often. In this system, Microsoft's JDBC driver has chosen to build connection with SQL Server database.

Below is a small part of RegisterUser.java servlet program that has added some codes for accessing to database to process user data. Before the process starts, database connection is needed. The database connection will be created according to the database name (chatquiz), login name (sa) and password (sa). If database failed, it will throw exception and prompt out error message indicating that the database connection is failed (at try-catch block). The codes are as follow:

```
private Connection connection;
private static String driver = "com.microsoft.jdbc.sqlserver.SQLServerDriver";
private static String url
="jdbc:microsoft:sqlserver://localhost:1433;SelectMethod=cursor;DatabaseName=chatquiz
;User=sa;Password=sa";
private static String name="sa";
private static String ppassword="sa";

public void init( ServletConfig config )
   throws ServletException {

        try {       Class.forName(driver);
                    connection=DriverManager.getConnection(url,name,ppassword);
        }
        catch( Exception exception ) {
            exception.printStackTrace();
        }
```

Figure 5.1: Example of database connection code

Anyway, the author has coded a program named 'DBConnection.java'. Whenever a java program needs to access database for data processing, that program only needs to import DBConnection class and reuse the particular methods by calling methods, such as 'createConnection()' method and so on. This has provided ability of reuse.

b) Using session object

Concept of HttpSession has been used broadly in Servlet and JSP files in this MY ChatQuiz system. The session object is used to share information for one user across multiple pages while visiting MY ChatQuiz web site. The system can detect the status of a user by checking the session object.

For example, if a web page is designed in a way that interacts with the session object, the system will do session checking whenever a user trying to access that page. Examples of the codes relating to session are as below:

```
HttpSession session = request.getSession(true);  //look up the session object

if(session.getAttribute(userdetail) == null)
{
      //stores an object into the session object
      session.setAttribute("userdetail ", userdetail);
}
```

```
//retrieves data (userDetail) that has been stashed away in the session object
userDetail userdetail = (userDetail)session.getAttribute("userdetail ");


if(userdetail == null)
{
      // if the userdetail session is null, redirect back to login page
      response.sendRedirect("userLogin.jsp");
       return;
}
```

Figure 5.2: Example of session code

As mentioned just now, session has been used broadly in the system. For example, session object was used in retaining a state of a user and passes the userID to the pages that interacts with session object as well as the chat and quiz applet.

c) Alert or error prompting

Java Script was chosen as the scripting language at client side. It is useful and effective to do checking process and to prompt error alert message when user has done some mistake during the interaction with system. Besides that, it is also useful in doing new page linking. Examples are as below:

```
//javascript function that link to next page (dbQuery.jsp) once the button is clicked
Function buttonClick()
{
      window.location.href="dbQuery.jsp";
}
```

```
//validData() function check user data validation before sending to database for
//processing
Function validData()
{
      if(document.signup.userID.value.length<1) {
            window.alert("Please enter your user ID");
            document.signup.userID.focus();
      }else if(document.signup.username.value.length<1) {
            window.alert("Please enter your name");
            document.signup.username.focus();
      }
}
```

Figure 5.3: Example of Javascript code

d) Setting up TCP connection with using Socket Programming

TCP networking programming in Java has been employed during the development of the chat system for MY ChatQuiz. Connection between a client and a server has to be established first before the communication. Java multithreading programming also has been included to develop a multithreaded server, a chat server that can accept multiple connections and that will broadcast everything it reads from any client. Below are some small parts of chat server coding:

```
package CHAT;
import java.io.*;
import java.net.*;
import java.util.*;

public class ServerConnectionThread extends Thread {

private Socket socket;
private ObjectInputStream in;
private ObjectOutputStream out;
private MessageListener listener;
private boolean running=true;

public ServerConnectionThread(Socket socket, MessageListener listener) {

try {  this.socket=socket; //socket that make connection to a client
       this.listener=listener;

    } catch(Exception e) {
        e.printStackTrace();
    }


try {  in = new ObjectInputStream(socket.getInputStream());
       out = new ObjectOutputStream(socket.getOutputStream());
       out.flush();
    } catch(Exception e) {
        e.printStackTrace();
    }

this.start();  //thread starts
}

//listen continuously for new messages and deliver them to messagelistener
public void run()
{      Object obj;
       while(running)
       {
             try{   obj=in.readObject();
                    listener.messageReceived(obj, this);

                } catch(Exception e) {
                     e.printStackTrace();
                     running=false;
                }
       }
         out=null;
         in=null;
         socket=null;
}
```

Figure 5.4: Example of Java networking with multithreading code

For summary, it requires a few steps to establish the chat server:

```
1) ServerSocket server = new ServerSocket (port);
2) Socket connection = server.accept();
3) ObjectInputStream input = new ObjectInputStream(connection.getInputStream);
4) ObjectOutputStream input = new ObjectOutputStream(connection.getInputStream);
5) connection.close();
```

Beside, it also requires a few steps to establish a client:

```
1) Socket connection = new Socket (serverAddress,port);
2) ObjectInputStream input = new ObjectInputStream(connection.getInputStream);
3) ObjectOutputStream input = new ObjectOutputStream(connection.getInputStream);
4) connection.close();
```

e) Randomly retrieve data from database

Since the quiz game in MY ChatQuiz is developed in a way each quiz question is retrieved randomly from database, java class 'Random' and Math have been used during the coding. Once the questions are all retrieved randomly, they will be putting into quiz applet. At the browser, the applet will get the question by using getParameter method.

```
level  = (request.getParameter("R1")).trim(); //get the selected level
catag  = (request.getParameter("D1")).trim(); //get the selected category
lvl    = Integer.parseInt(level);
int count;

try {   count = 0;
       result = stmt.executeQuery(
       "SELECT * FROM questionDetail where Category = '"+catag+"' and Level = "+lvl);
       while(result.next()) {
                que[count] = result.getString("Question");
                ca[count]  = result.getString("A");
                cb[count]  = result.getString("B");
                cc[count]  = result.getString("C");
                cd[count]  = result.getString("D");
                ans[count] = result.getString("Answer");
                count ++;//total of questions for a particular categories
           }
        }
        catch (Exception e) {
            e.printStackTrace();    }
```

Figure 5.5: Example of retrieving questions from database code

```
Random random = new Random();
int a = Math.abs(random.nextInt() % (br));  //br is total of question(20)
```

Figure 5.6: Random method

Code above is a small part of CreateQ.java program. System will first get all the questions from the database. Next, random block method will start processing to choose 20 questions from them randomly. This was accomplished by making uses of the command lines at figure 5.6.

f) Debugging

Debugging has also been carried during the coding. System debugging is being carried out occasionally to prevent any of the system bugs. For this system, the author has used a simple way to do debugging on the coding. All the debug codes will display on the display area of the Tomcat Dos window. By debugging, bugs or error on program flow can be detected.

```
System.out.println("Debug code puts here");
```

Figure 5.7: Debugging code

Anyway, debugging procedure also has been done during the testing phase.

5.2.1.3 Integration

Integration is also an important step to do during the implementation of MY ChatQuiz system. Because the system consists of several modules and sub system, integration was the last stage in the system to integrate all of them into a whole. In this step, some of the actions have been taken on the design of each module such as: Match font size and font color; Background color; Add in related hyperlink

5.2.2 Coding Principles

Several principles were applied during the development of this system to ensure good quality and the proper structure in the code generation.

5.2.2.1 Reusability

Reuse has been the most focusing principle during the coding phase for this system. Here, 'reuse' refers to creating components designed to be reused in subsequent applications. Reuse can improve product quality throughout the software development process. Productivity can be increased not only by reducing coding time, but also by reducing testing and documentation times. In this system, the author has coded several useful coding blocks, which to be reused in other program code such as header and footer code of every web page file and error checking methods.

5.2.2.2 Readability

Readability is also important during the system coding phase. Codes should be easy to read and understandable because it is very important when it comes to the enhancement of the system in the future by other people. In addition, the meaningful variable names and statement labels will also be helpful in reading and understanding the code.

5.2.2.3 Robustness

Robustness refers to the quality that causes a system to be able to handle unexpected error and echo back with proper responses. Errors handling should be done to

increase the robustness of the system. Appropriate errors message were displayed response to user's input.

5.3 Conclusion

For this phase, coding has been the most critical step to do. Coding has converted the system requirements and design into a 'functioning' system. The usage of suitable hardware and software tools can help to achieve the development objectives for system. To implement the system design into a full-integrated system, an effective system coding style and coding approach has been used used.

CHAPTER 6 – SYSTEM TESTING

Testing phase is the most important phase in every project as well MY ChatQuiz system because we can never assume that the system is defect-free. It is a procedure to detect some of the defects and errors occurred during the running of the system. As a result, this will determine the probability of success or failure of the developed system. Objectives of testing are:

1. To find out the error and fix it to ensure the requirements are fulfilled.
2. To verify the system component integration when all the sub-system has been linked together.
3. To guarantee that users can interact properly with the system itself.

6.1 Types of Testing

There're several stages of testing have been carried out in this phase:

1. Unit testing
2. Integration testing
3. System testing

6.1.1 Unit Testing

Unit testing also called module testing or component testing is a testing of the individual components such as the procedure, function or the object class for particular unit in the system. This testing is used to ensure that they operate correctly as what the user of this system desire. Basically, each component will be tested independently without affect other system components in the system.

While in the implementation phase, the unit testing was carried out when the system is in progress with the source-code generation. Each function in the system has to be ensured that it is implemented to meet the user requirement. Thus, this testing is carried out with the implementation in parallel.

For example, user information entry was tested first because it is the most basic information required by the system. User information will be saved totally into the database safely. Another example is button testing that verifies the buttons has already performed predefined functions and so on. And date function was also a unit that needed to be tested properly. The other units also were tested one after another using the test data that have been prepared earlier.

During the design of the system, the unit testing was performed to ensure the user interface designation as required by the user. The interface features were tested and evaluated periodically until it reaches the satisfaction level with all the buttons, images and the information display.

For MY ChatQuiz's administration system, there are a lot of operations that can be performed such as insertion, update and deletion of quiz question as well as report generation. Before these types of process execution, database connection has to be established first. It means they involved combinations of procedures and functions to

work together to execute their process successfully and effectively. So that, module testing is required to ensure each of them runs smoothly and harmonic.

Another case example is chat module which consists of 2 main sub-modules: chat client & chat server. Before integration, they had been tested separately to check errors or bugs. Client applet had been tested in IDE to check whether it is free of errors. And, it was tested to execute at browser whether the browser support that applet or not. Besides, server also has been tested to see if it is in ready mode to receive client thread.

6.1.2 Integration Testing

Integration testing is performed after all objects, components and individual sub modules have passed local unit tests. It is the process if verifying that the system the system components work together as described in the system and program design specifications. System with integrated sub modules and modules must go through integration testing to ensure valid linking and dynamic relationship establishments between modules of whole system and between sub-modules contained in all individual modules is no different. It is a systematic technique for constructing the program structure while at the same time conducting test to uncover errors associated with interfacing.

In this system, bottom up testing approach has been used to test the integration of all components and modules. Each component at the lowest level of the system hierarchy was tested individually first. Then the next components to be tested were those that call the previously tested one.

For example, login module, chat module and quiz module has been tested to see if there're any error occurs after they were being integrated. These 3 have to be integrated because only registered and login members are permitted to join the game or chat.

Information passing between modules such as userID has to be ensured that the flow is successful.

6.1.3 System Testing

System testing is a series of different tests whose primary purpose is to fully exercise the computer-based system. It is designed to reveal bugs not possible to individual components or to interactions between components and modules. Although each test has a different purpose, all work to verify that system elements have been properly integrated and perform allocated functions

During this testing, the author as well as a few of end-users has tried several times on inserting, updating and deleting particular test data to the system to test whether the system has working well with database. Besides, quiz game also has been tested thoroughly to ensure that the quiz run smoothly.

6.2 Test Case Design

A test case is a particular choice of input data to be used in testing a program whereas a test is a finite collection of test cases. Besides reviewing the source codes, some test cases have been used to test the system. This approach is used as observed. This strategy is needed to identify the variance between the prototype and the requirement. In this testing, different data is input into the program.

No.	Test Procedure	Expected Result	Fail/Pass	Remark
1	Connecting to the system.	Users should access the MY ChatQuiz with a minimal period of time.	Pass	
2	New user sign up	Users can submit the sign up form, register as new member and enter MY ChatQuiz home page	Pass	userID that already exists cannot be use again
3	Enter existing userID when signing up.	Error message is displayed to the user and requires that user to re-enter the name	Pass	userID must be unique to identify user
4	Registered member login	Users can login to MY ChatQuiz system with valid username and password.	Pass	
5	Hyperlink testing	User can view other web pages by clicking on hyperlinks	Pass	
6	Session object tracking	System can get user's detail whenever it needs by using session object assigned to each user	Pass	If session is null, the user may not permitted to view particular pages
7	Button testing	When user clicks a button, the button can be able to execute its predefined function.	Pass	
8	Drop down list	When a user selects from quiz	Pass	Different level has

	testing	level, the drop down list for category will change based on the selected level.		provided its own types of categories.
9	Initializing a quiz by choosing options given.	Once the user has chosen types of level and category, quiz applet will prompt out and begin execution.	Pass	Only registered member can play quiz
10	Join the chat room	Once the user click 'connect' button, connection with the chat server can be established and start chatting	Pass	Only registered member can join in chat room by using login ID as nick name
11	Sends chat message to the chat server	When a user key-in their message and click 'SEND', the message will be broadcasted by displaying on the chat text area	Pass	
12	Trying to join quiz or chat without logon before head	The user will be redirected to login page when the system has detected the session object representing that user is null.	Pass	Only registered member can join in chat room by using login ID as nick name
13	Retrieves quiz questions randomly from the database	Every quiz session will randomly extract 20 questions from the database.	Pass	User random method

14	Start another quiz once the previous one is end	The 2nd quiz will provide different set or different sequence of questions	Pass	Questions are retrieved randomly
15	Start a quiz without choosing the level and category before head	Alert box will prompt out and the user will be asked to re-choose again.	Pass	
16	During the quiz, the participant didn't answer the question	When it's time up (30 seconds), next question will automatically prompt out. User will get no points for the unanswered question.	Pass	Each question is allocated 30 seconds to answer.
17	Participant answered the question wrongly	No points is given	Pass	If answers the question correctly, points will be given.
18	Participant answered the question correctly	Points will be given	Pass	
19	Insert new quiz question	Once an administrator key-in the information, the question will be saved into database	Pass	
20	Delete question	The question will be deleted completely from the database.	Pass	

21	Update question	The old question will be updated once the administrator has modified it	Pass	
22	Question bank summary	A table containing summary of question will be displayed	Pass	
23	Logout	Users logs out from MY ChatQuiz. Session will be removed	Pass	

Figure 6.1: Summary of test case

6.3 Conclusion

The overall system testing yields the expected results. Up to this stage the system is fully tested. In the next chapter the evaluation of the whole system is being carried out. The problems faced during the development of the system, the system strengths and the system limitations are discussed in detail.

CHAPTER 7 – SYSTEM EVALUATION

System evaluation is a process of evaluating the capability and usability of developed system. Evaluation is needed to do for the entire MY ChatQuiz. It was evaluated to identify its strengths, limitations, and proposals were made for the future enhancements.

7.1 Problems Encountered & Solutions

The fundamental knowledge needed a foundation in building an application of this nature involves studies in fields such as the web-based system and information systems procedure. As MY ChatQuiz project has to be done within a short span of time and a lot of technical issues need to be resolved, a number of problems were encountered throughout the development of this system.

Solutions have been sought during testing and reference check with course mates. The following are some of the major problems encounter during the project system studies, analysis and development.

- **Difficulties in determining the appropriate development tools**

  There're many development tools available in the market. So that, it was a critical process to choose a suitable tool as all tools have their strengths and weakness. The availability of a technology and tool has learning curve and hardware and software requirements for running the tools were major considerations during the stage to select an appropriate tool.

To solve this problem, advises and views from lecturers, course mates and seniors were sought. Besides, a great deal of reading and research from the Internet and books regarding the market and compatibility between technologies also helped to clarify some doubts.

- **Lack of knowledge in the languages and tools**

  As there is no prior knowledge in programming in a web-based environment, a lot of studies need to be done. New programming languages like Java, JSP, Servlets and HTML need to be learnt within a short time span. For example, Java multithreading concept is needed to make clear because it is important to develop a multiple client chat system.

During the development of the system, a lot of time spent in looking for solutions to solve the problems that were occurred during the time. Besides, lack of experience with configuring and using Tomcat server, which are different with the software ever used, a lot of time is consumed to learn it while setting the right paths for the web application.

7.2 Evaluation by End-users

A questionnaire has been conducted to collect the evaluation from system end users. (Please refer appendix). The targeted end-users for this system include public users. From the questionnaire, 100% of the respondents for administration part said that this system is user-friendly and ease-to use. They did not encounter any problem when using the system. They can understand the instruction and information that given in system such

as insert and delete question page at administration site. The error messages that prompted to them are also easy to understand. They can also perform their task completely using this system.

For client site, the target end-users include >13 years old teenagers. Overall, they satisfied with the system. They gave comments that the quiz is challenging and can provide a good chance for learning. Anyway, 25% of the respondents said that the interface design of system main page does not really attract their attention. The interface design for this system is simple and not many animation or fancy design is added.

7.3 System Strengths

Because of the hard work and unlimited effort that have been putting into this system development for the past few months, the system has achieved a well satisfaction level of success.

- **Easy accessible**

  This system is a web-based application and can be accessed easily using the web browser such as Microsoft Internet Explorer 6.0. Besides that, administration system is also a web-based application. Administrators can easily do their admin tasks only by logon to the system using browser.

- **User friendly**

  The system interface design is attractive, user friendly and easily understood by any users. It tells the users how to work with this system. Users have the controls of the

system function flow by just clicking on the button. It incorporates a standard homepage with a consistent environment.

- **Providing interesting gaming environment**

  MY ChatQuiz's quiz feature is attractive and challenging because questions retrieval is done in random manner. User will get different set of questions every time he/she load the quiz. Also, because each question is allocated with a fixed duration to be answered, user has to think faster in order to get the score by giving the right answer before the timeout.

- **Reliable System with effective errors handling**

  A system without effective errors handling algorithm will spoil or create problem to the system. For example, system will become unstable if it detects a null parameter which is needed for incoming functions, so that error handling has been included in MY ChatQuiz to detect and handling the error. For instance, data input of user is validated and verified to prevent errors caused by the invalid input. If there is an input failure, an error message is send to inform the user about the error.

- **Database Transparency**

  Database transparency refers to the condition where the users do not need to know where the database resides, the system structure, the database management system (DBMS) or anything related to the system built. Users are just required to know how to communicate with these user friendly interfaces.

7.4 System Constraints

Even though this project has been completed successfully as per scheduled, there are several setbacks and constraints in this system. These constraints can be addressed in future development and system enhancements. The system still can be further made some improvements with better functions and features.

- **Web browser limitation**

  These web pages are developed and tested using Microsoft Internet Explorer 6.0. It is not fully tested in all web browsers such as Netscape Navigator or latest version of Microsoft Internet Explorer. Thus, it may not display correctly by using other web browser except Microsoft Internet Explorer 5.5.

- **Chat applet limitation**

  Because the chat applet for this system has been developed using the features of the Java 2 platform and java Swing class, the applet can be only executed properly in the browser that supports Java 2. Anyway, in order to execute the applet that in a browser that does not support Java 2, additional program, Java Plug-in is needed to bypass a browser's Java support and executes the applet.

- **Storing quiz score limitation**

  The quiz system has not included a function that can save the score collected by each user into database.

7.5 Future Enhancements

As mentioned on last session, the system still can be made some improvements with better functions and features. System constraints should be addressed to enhance the functionality and features of this system in the future. The current version of this system can be updated with some enhancement features discussed in the following section.

- **Browser Independent**

  The chat system should be designated to be viewed properly not only in browsers that support Java 2 platform, but also in browsers that doesn't. It means, Java Plug-In is not needed to execute the applet. This can be archived if develops the chat applet using class java.applet and not java.swing.

- **Quiz result storing and ranking**

  After the quiz is end, the score collected by user can be stored into the database. Thus, user can review their records. In addition, ranking module can be integrated into this system. This ranking can be based on total of score or total of quiz for the users.

- **Quiz question downloading**

  If a download feature is added into MY ChatQuiz, users can download questions set to enable them to do revision because all the quiz questions are set based on secondary education standard.

- **Public or multiple client quiz**

  MY ChatQuiz can be also included with 'multiple client quiz' besides individual style quiz, which has been developed successfully. It is about a group of users participate in

a same quiz session and those who can answer the question right within the shortest period of time will be given score.

7.6 Knowledge and Experience Gained

Throughout the MY ChatQuiz project development, a lot of new knowledge and experiences has been gained. These knowledge and experiences are very important as it not only made a better individual but it would also be useful for our future career and life. Therefore, the learning experience in this project is rather different from the assignment the author used to do in study. Thus, below describes the knowledge and experiences that is gained from this project development.

- **Improved programming skills and software configurations**

  As far as concerned, the author didn't have enough experience working with all the features provided by Tomcat, SQL Server 2000 and programming languages. The knowledge of configuring advanced software, such as Tomcat Server has been gained. The programming language involved in this project includes JAVA, JSP and Servlets combination. During the project development, the author was given a chance to learn these programming languages even though it may only the basic. This is an uneasy task as time is limited and JAVA programming requires a lot of time to master it well. However, the knowledge gained have improved and expanded the author's programming knowledge skills. This is especially true when the author has learnt database connection and error handling in JAVA programming, and simple back-end processing in Servlets that was implemented in this project.

- **Improved analytical thinking**

  During the development of the project, lots of decisions have to be made. Making decision is easy but making the right decision is not an easy task. Therefore, before a decision is made the problem and condition should be clearly defined and then conduct research on the relevant topics or seek opinion from other people. Thus, rationale and analytical thinking is required for decision because even a small decision will affect the down streams of the system modules. Nevertheless, this experience gained will assist the author in future career.

- **Improved project and time management skills**

  It's not an easy task to manage time for studies and project fairly. Initiative and discipline plays an important role in managing our time to ensure that the project would complete as per scheduled. Throughout this project, time management gradually improved. This is particularly true when working on this project besides going through other subjects with assignments at the same time. Thus, from this project, the author has learnt to plan and manage time properly and try to be able to work under pressure.

7.7 Summary

A thorough evaluation has been made throughout the system development. This system has achieved the development objectives with several system strengths. However, there are several limitations in this system and it was anticipated to be enhanced with more powerful functions and features in the future. In the system constraints and future enhancement sections, the limitations and enhancements for this system are discussed and

explained precisely. During the development of this system, a lot of useful knowledge and experience have been gained. Knowledge on programming and designing were improved.

7.8 Conclusion

Finally, this system has been successfully developed. The system objectives stated in the system proposal is achieved and attained. This system has integrated all the modules to fulfill the functional and non-functional requirements. However, there are some limitations in current version of this system. These limitations are planned to be enhanced with more efficient functions in the near future. This has created wider opportunity for individual who is innovative and interested to further modify and tailor the system based on their needs.

Besides that, much unvalued and useful knowledge have been gained throughout the system development such as programming languages, server configuration, the way of how to arrange time properly and others.

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