**LAPORAN PROJEK ILMIAH TAHAP AKHIR II**
**WXES 3182**

# C PROGRAMMING TUTORING SIMULATION WITH INTERACTIVE MULTIMEDIA "CYBERC"

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# ABSTRACT

Technology gives us physical access to a wealth of information. However, the information housed on servers throughout the globe and in software and print resources is so abundant that finding what one needs is a daunting task. Information literacy has the duty to put that information to good use.

CyberC is a web-based interactive multimedia learning package system developed for anyone whom is interested in learning knowledge on C programming. CyberC is designed to create an information rich environment of education resources, which can be obtained at any time and from any place to save the users' time.

Lessons and quizzes will be laid out to offer users interactive multimedia learning experience. Besides these, there will be games and more fun elements to allow users to have an enjoyable time.

Rapid Application Development Model is used to develop CyberC. This model emphasizes on prototyping loops which will means iterative process to ensure best quality product. The development tools include Macromedia Dreamweaver MX, Macromedia Flash MX, JavaScript, ActionScript, ASP.NET and Microsoft Access 2002.

It is hoped that CyberC will be able to promote users interest towards C programming, which is powerful and useful. Various approaches are implemented in CyberC to ensure maximum knowledge offered and available. After all, learning starts when you enjoy it.

# ACKNOWLEDGEMENTS

From being a vaguely understood concept into the main root of the system that I have built for my final year project, I have come to quite a fair distance into understanding C Programming Tutoring Simulation and digging it inside out. With the help, support and guidance that given to me, have lead to the successful of my project.

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# CHAPTER 1

# INTRODUCTION

# CHAPTER 1: INTRODUCTION

## 1.1 PROJECT OVERVIEW

No doubt the internet is one of the greatest inventions in this technology-driven era. Most of us do not go to library as frequent as before to get study materials. Information can be easily accessed with the help of Internet rather than traditional hard copies. Further more, the world is turning to graphical user interface that provides an interactive learning space for the community. Multimedia is any presentation that involves two or more media, such as text, graphics or sound. [1]

In this Information Technology age, printed source is outdated and people demand for interactivity in what they learn. Therefore, a C Programming Tutoring Simulation is developed to fully utilize the power of Information Technology in education field. It is named CyberC. CyberC is a web-based multimedia application which is informative, interesting and entertaining. It will be designed for either distance learning or even in the lecturer hall. Online interactive learning is always the easy and efficient choice.

CyberC provides an overview of C programming for those who are equipped with little or no programming language experience, yet offer the deep and rigorous treatment of theory and practice demanded by traditional C courses. This is an excellent application for one to understanding the basics of C programming concepts.

CyberC contains rich collection of examples, exercises, and quizzes from various fields to provide learners with a chance to solve interesting real-world problems. CyberC will teach with the attached example.

Lessons that contains in CyberC are presented in a sequence that allows the programmer deal with C programming language in a proper way. Step by step approach will ensure that they can differentiate between what they should do and what should read. Each lesson begins with an overview of the topic.

In the nutshell, CyberC sets a comfortable and effective learning space. Besides that, it also provides rapid and efficient way in learning C programming language. With CyberC, time and money wouldn't waste as it can be access anywhere, anytime without any printed resources required.

## 1.2 PROJECT OBJECTIVES

Our life is getting better with the invention of technology. The current era is stated as Information Age. Therefore, internet is become part and parcel of our life.

The objectives that aim to achieve for this specific module are as following:

- **Deliver interactive learning over the borderless geographical location**

  In the new generation, printed source is outdated and people want interactivity in what they learn on the spot. Multimedia presentations will not wear out their patience. In addition, there is no necessity to go to library to search for books with the helps of computers; it eases the effort to obtain information for learning C Programming. Therefore, time saving and extra-time can used to learn other things. It creates a space where learning C can be a reality at anywhere and anytime. Besides that, it provides distance learning.

- **Build the interest within users themselves so that they are more than willing to learn C Programming Language**

  Interest can be developing with the user friendly interface and the help of audio visual. CyberC provides an interactive learning space. It also encourage people to study effectively as it is well proven non interactive learning mediums are less attractive.

- **Increase the quality of C learning and the usability of C Programming language**

  With the interest that builds in the learner towards C programming language, indirectly, it can increase the quality of C Programming language and its usability. Therefore, they can fully utilized the power of C programming language and enhance their selves by learning others high level language. This can increase quality programmers in our society and further enhance either the current or invest new Technology.

- **Produce computer literate users and towards succeed of Multimedia Super Corridor**

  Smart school is one of the prime projects of Multimedia Super Corridor. This is to create Information and Communication Technology Literary among the citizen. Nowadays, those who are lack of computer and internet skills will not be able to compete for the best jobs around and the gaps between technological "have" and "have not" should not be growing in the near future.

- **Provide guided self study**

  Train users to be more self independent and are able to handle self study in a more disciplined manner. CyberC is developed to be self-contained, independent unit of a planned series of learning activities designed to help students to accomplish certain well defined objectives. Students should become their own learning manager. There is a self-test to test their latest progress. CyberC focuses on the problem solving skills rather than just sitting back and receiving all the information (spoon-fed).

## 1.3 PROJECT SCOPE

CyberC is an interactive multimedia learning for C programming language which includes audio and visual approach. This means learners can read, see and play with it. Flashy presentations will be applied to capture learners' interest. It can be accessed from anywhere and anytime.

### 1.3.1 SYSTEM SCOPE

Basically, it comprises of four main major sections: Lessons, quizzes, exercises and references.

i) **Lessons**

This section will provide C programming language's information to the users and it is arranged in the order to ease users to learn C well.

**ii) Quizzes**

This section provides opportunities for the learners to test their understanding of the particular lesson. Immediate feedbacks to the learners are also provided.

**iii) Exercises**

Questions will be given in every lesson in the subjective format. Learners will applied what they learnt and have an in-depth understanding for every lesson. Doing is more effective and makes a stronger impact than seeing. Solutions of every question will be provided.

**iv) References**

This section contains links to the others valuable C resources web sites. This provides learners with more references in C programming language.

### 1.3.2 USER SCOPE

CyberC is suitable for anyone who interested in learning C Programming Language and it is recommended for people aged 15 and above. From the survey that carried out and informal interview, most of the people suggest that C Programming Language should include in Form Three syllabus because nowadays Form One students are learning page maker while Form Two students are learning HTML. With their knowledge in computer, therefore, it is suitable to learn C programming Language in Form Three. Besides that, it is late to learn C programming Language during university

level because if one have the knowledge before enter university, other high level languages can be learned to equip one for future job.

There are three intended categories of users for CyberC. There are:

- Non programmers who want to learn C programming language.
- Programmers who do not know C programming language.
- C Programmers who want to polish their C skills.

## 1.4 PROJECT MOTIVATION

Computer data processing is controlled by a set of instructions. These instructions form computer programs. Computer programs guide the computer through orderly sets of actions specified by computer programmers with various programming languages. Therefore, programming languages assist in communication between people and computer. [1]

C is a very essential programming language. One can proceed to anywhere with C Programming knowledge. With the basic knowledge of C programming, one is more than prepared for any other high level languages' challenges as semantics of all languages are almost similar.

Human thrive on multiple input. Researches have long recognized that human will remember well when they do it themselves rather than just see and hear it. Multimedia learning provides interactive characteristic. In an interactive multimedia, users can choose their own path throughout the presentation. The interactive dimension makes learning exciting and lively. Users will determine the presentation flow rather than sitting back and let someone else take control. By using well designed interactive multimedia

learning for C, users learn more within the shortest possible time. The current multimedia learning for C that is available on the Internet is required a payment in order to user the system. Those available that free of charge are in plain texts without multimedia elements. With CyberC, users can enjoy interactive multimedia learning for C freely without any constraint and this will improve users' comprehension and retention in C rather than learning from the books. [1]

The increasing number of users connected to the internet everyday has make CyberC a web based application. Web application education would totally take over searching material in the library.

Users will benefit through more interesting lessons and greater retention of the material presented in CyberC. This will increases users' interest in learning C programming language.

## 1.5 EXPECTED OUTCOME

CyberC would ease in the learning C Programming language. Utilizing the internet enable users to access the application regardless location and time. Therefore it will be flexible and indirectly saving time and money. In another hand, it will helps in understanding C programming language effectively without any doubt. Learning through audio visual effect is more efficient than printer sources.

CyberC will be a way moving towards smart school. It will replace ordinary classroom to cyber classroom and study material will be running on computer. It will also create paperless environment. CyberC will help lecturers to provide the programming

syllabus and they can spend more time with students' problems and other study matter. Students are always trained to be more independent.

Besides that, CyberC will prepare one for a new languages challenge. Learning in another programming language isn't a problem with a C knowledge.

An interactive multimedia learning tool like CyberC will encourage students to be more enthusiastic in learning C Programming Language. Therefore, CyberC is believed to be able to contribute towards the development of the community.

## 1.6 PROJECT LIMITATIONS

Nothing is perfect so as CyberC. There are some limitations in the applications.

- **Limited Timeline**

  The time that available to develop CyberC is limited which is 180 days.

- **High cost**

  It needs high processor speed, memory, disk space and data throughput. Therefore this leads to high cost.

- **Slow**

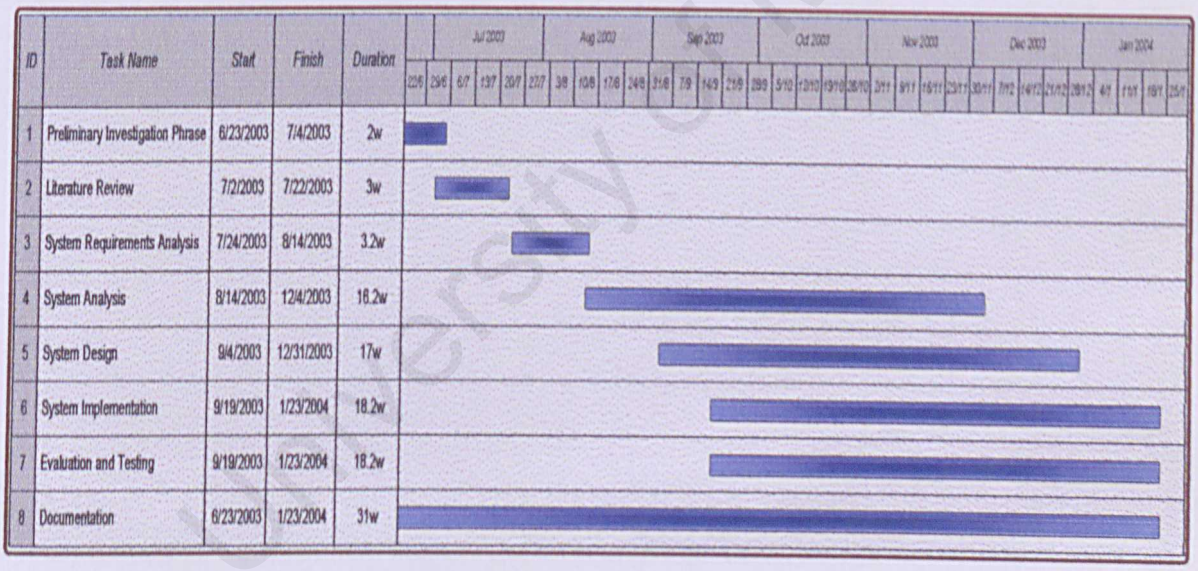
  Multimedia elements like sound, images or animation need higher bandwidth than text files because of the size. The drawback is data flow through network will be slow.

## 1.7 SCHEDULE

In developing the application, the following series of activities will be carried out.

- Preliminary Investigation
- Literature Review
- System Requirements Analysis
- System Analysis
- System Design
- System Implementation
- Evaluation and Testing
- Documentation

The figure below represents the project schedule of CyberC.



| ID | Task Name | Start | Finish | Duration |
|---|---|---|---|---|
| 1 | Preliminary Investigation Phrase | 6/23/2003 | 7/4/2003 | 2w |
| 2 | Literature Review | 7/2/2003 | 7/22/2003 | 3w |
| 3 | System Requirements Analysis | 7/24/2003 | 8/14/2003 | 3.2w |
| 4 | System Analysis | 8/14/2003 | 12/4/2003 | 16.2w |
| 5 | System Design | 9/4/2003 | 12/31/2003 | 17w |
| 6 | System Implementation | 9/19/2003 | 1/23/2004 | 18.2w |
| 7 | Evaluation and Testing | 9/19/2003 | 1/23/2004 | 18.2w |
| 8 | Documentation | 6/23/2003 | 1/23/2004 | 31w |

**Figure 1.1 Gantt chart for CyberC**

## 1.8 SUMMARY

Chapter 1 introduces the project in general view and the rationale of the project. It consists of definitions of the proposed project, parties that should be taken into consideration in making the project success, its objectives, expected outcome and its scopes. The proposed project research and development will take 8 months to complete. The whole project development started early of July 2003 and will follow a series of development activities in the development process. Series of activities are being matched with their corresponding development stage of software development cycle. There is a Gantt chart to represent each task or activity for a time constraint.


# CHAPTER 2

# LITERATURE REVIEW

# CHAPTER 2: LITERATURE REVIEW

## 2.1 AN INTRODUCTION TO LITERATURE REVIEW

A literature review is an evaluative report of information found in the literature related to once selected area of study. The literature means the works you consulted in order to understand and investigate the research problem. The review include describe, summarize, evaluate and clarify the literature. The activities in this stage are facts finding, summarizing, analysis and synthesis of the features and modules that the future system built will have. It gives a theoretical base for the research and help to determine the nature of the research. [2]

A literature review is more than the research for information and goes beyond being a descriptive annotated bibliography. Its purpose is to convey to the reader what knowledge and ideas have been established on a topic and what their strengths and weaknesses are. [3]

The objectives of writing literature review are

- Information seeking : the ability to scan the literature efficiently, using manual or computerized method, to identify a set of useful articles and books.
- Critical appraisal : the ability to apply principles of analysis and to identify unbiased and valid studied.
- System understanding : Ensure a better understanding of the system that will be developed and choose the best way to plan and organize work. [2]

## 2.2 DOMAIN STUDIES

This chapter describes the concept and the definition of multimedia learning of C programming in web base. Besides that, it contains all the research on existing systems that has been done. This is to extract useful and accurate contents and features for the system to be developed.

## 2.3 INTERNET

### 2.3.1 AN INTRODUCTION TO INTERNET

Internet stands for inter-network. The internet is a global computers network with an estimated of 100 million users worldwide. According to one estimate, more than 300,000 new web pages appear every seven days and the total amount of information available on this worldwide network doubles every year. The internet is the first mass medium that involves computers and uses digitized data. It's the first truly democratic mass medium. [5]

Internet is linking local area network (LAN) into a huge, distance-conquering network. In this network, every connected computer can directly exchange data with any other computers on the network. One is able to communicate with any others computer which support Transmission Control Protocol/Internet Protocol. One can connected to the network when the computer used has a modem and a phone line. The LANs and computers can nested to the internet are maintained by large organizations such as corporations and universities, as well as by internet service providers (ISPs), who sell internet subscriptions to the public. [5]

### 2.3.2 THE INTERNET HISTORY

During the Cold War in the mid of 1960's, it become apparent that there was a need for a bombproof communications system. A concept was devised to link computers together throughout the country. With the system, most of the sections in the country could be nuked and messages could still get through. [6]

The internet was first envisioned by MIT scientist J. C.R. Licklider's idea of a galactic network, which led to 1960s-era work on packet switching theory at the Massachusetts Institute of Technology (MIT).The internet is also based on studies at a private sector military think tank, California-based Rand Corporation, that called for the construction of a military network that could continue to function even if enemies knocked out portions of the network. Rank researchers had independently concluded that a packet switching network offered the best chance of survivability in wartime. Under the leadership of Lawrence G. Roberts at Defense Advanced Research Projects Agency (DARPA), these researches formulated the specifications for the Advance Research Projects Agency Network ARPANET. In 1968, the agency requested bids for development work. [6]

ARPANET went online in September 1969 and connected four computers located in California and Utah. ARPANET became an international network in 1973.By 1981, ARPANET connected 213 computers. By 1984, it connected 1000 computers and by 1987, this figure had risen to 10, 000. [6]

However, ARPANET was a test bed of development platform for packet switching technology. The origin ARPANET protocols had many deficiencies. ARPANET researched Robert Kahn and Vincent Cert addressed the network's

shortcomings, they created the Internet protocols that are now use throughout the world. On January 1, 1983, the Internet protocols went online for the first time. By the late 1990s, the internet was on its way to becoming a new mass medium of global proportions. [6]

## 2.4 WORLD WIDE WEB

The World Wide Web is a global hypertext system implemented on the internet. Hypertext provides an intuitive, fun way of browsing through information. In a hypertext document, certain words, called hyperlinks, are underlined or otherwise highlighted. When users click a hyperlink with the mouse, the web client, called browser, retrieves and displays the document associated with that hyperlink. This retrieves and displays World Wide Web is a group of network of information resources in internet. Information can be access by using web internet such as Internet Explorer and Netscape Communicator.

The World Wide Web allows computers users to locate and view over the Internet multimedia-based documents, (for an example, documents with text, graphics, animations, audios and videos) on almost any subject.

According to Computimes, New Straits Times,1 February 1999, there are 320 million web pages in the world and this figure is increasing every day. [7]

## 2.5 MULTIMEDIA

*Multimedia is the seamless integration of text, sound, images of all kinds and control software within a single digital information environment"*

~ Tony Feldman, Multimedia Consultant

*The implementation of multimedia capabilities in computers is just the latest episode in a long series: cave painting, hand-crafted manuscripts, the printing press, radio and television...These advances reflect the innate desire of man to create outlets for creative expression, to use technology and imagination to gain empowerment and freedom of ideas"*

~ Glen Ochsenreiter, Director Multimedia PC Council [6]

### 2.5.1 AN INTRODUCTION TO MULTIMEDIA

Multimedia is a presentation that involves any combination of two or more of the following elements: text, image, sound, speech, video, and computer programs. These mediums are digitally controlled by a computer. [7]

Multimedia enhances the information for better communication and understanding. The combination of sounds and speech are used on radio, newspapers use a combination of text and images, and television combines all these elements and uses it to relay a message to the viewer. Television doesn't allow users to assess the information at their own speed. The message is transmitted one-way via cables or radio waves to their television sets. The user doesn't have the option to interact with this type of multimedia presentation. [7]

With the use of computers, the user allowed to be involved and interactive with the multimedia presentation. This is interactive multimedia. The user has control over the flow of data. Each user can follow a uniquely "personal" trail through the information. This dynamic interaction allows the user to perceive the information at their own speed and getting feedback were necessary. [7]

Multimedia is used in advertising, entertainment, public information, training and education. Educational computer programs which use multimedia and the interaction of the student allows the student to see their mistakes immediately and guide them to learn a concept more quickly. The student can also move at their own speed, by reviewing or skipping material that they are unfamiliar or familiar with.

Multimedia enables us to simulate an environment allowing the user to feel like they are actually there.

The applications of multimedia are constantly growing. They are becoming more domestic and millions of people are going to be affected in the way they communicate with one another. [7]

### 2.5.2 MULTIMEDIA ON THE INTERNET

Multimedia via Internet is the presentation of text, graphics, audio and video in an interactive hypermedia-application within a WWW browser. Interactivity occurs via keyboard, mouse and other input devices. Interactivity has helped make the World Wide Web so popular. [8] Most Web pages include graphics along with text and many also offer animations, videos and sounds. The Web navigation method, called hypertext, enables users to browse as they please. By blending multimedia with the Web,

hypermedia becomes possible. In many web pages, for instance, user can click parts of a graphic to access a different page. In hypermedia, media other than text becomes the vehicle for navigating to new material. [9]

Since the introduction of the WWW, click able navigation introduced the concept of hypertext and hypermedia to many computer users all over the world.

### 2.5.3 WHY USE MULTIMEDIA

- Multi sensory experience: learning aids, multiple stimuli
- Interactivity: flexible pace/manner, input/ feedback
- Enhanced Communication: multiple avenues for information exchange
- Memory aid: Information association for knowledge input and retrieval [8]

### 2.5.4 ADVANTAGE OF MULTIMEDIA

The following is the advantage of multimedia:

- Cost effective (less travel, repeat use, instructor, safety)
- Higher quality of data transmission
- Noise free – 2 states of signal representation
- Ease of manipulation – edit sound, color, transition
- Error correction/detection [8]

### 2.5.5 USAGE OF MULTIMEDIA

Currently, multimedia is widely used in various fields:

- Effective business communication, discussions

  (Presentation, video-conferencing)

- Marketing & Sales – electronic catalogue, shopping kiosks

  (shop directory, bookstore info search, advertising)

- Education & Training
- Computer-based training:
- Online multimedia learning
- Medicine – x-ray archiving, surgery simulations [8]

### 2.5.6 PROBLEM WITH MULTIMEDIA

- Development cost – technology, software, hardware, skilled designers, royalty
- Technical barriers – LAN/WAN bandwidth, compatible computers/servers, storage
- Social & physical barriers – disturbance (work, environment, best practice)
- Legal problems – copyright, different legal systems, misleading info
- Security problems – access control [8]

### 2.5.7 INTERACTIVITY

Interaction is based on the principle that the users decide where to go when given a series of options. Interaction implies the basic concept of immersion, navigation and manipulation.

Immersion : The presentation must be interesting in order to attract the users' attention

Navigation : User can choose to go any place in the presentation.

Manipulation : The presentation must give different options to interact with in addition to navigation [8]

## 2.6 AN INTRODUCTION TO E-LEARNING

In 'Campaign for Learning', the UK National Advisory Group on Continuing Education and Lifelong Learning ,chaired by Professor Bob Fryer, suggested that, learning is a process of active engagement with experience. It may involve an increase in skills, knowledge, understanding, values and the capacity to reflect. Effective learning leads to change, development and a desire to learn more. [12]

In 1961, the American psychologist, GA Kimble, defined learning as a relatively permanent change in a behavioral potentially that occurs as a result of reinforced practice. A definition of learning might refer to change in behavior due to practice but it would need to isolate other factors such as physical changes within and outside the learning. Learning becomes effective when it is apply to their life. Learning can boosts our confidence and bring a better quality of life. [12]

E-learning is the delivery of a learning or education program by electronic means. E-learning involves the use of a computer or electronic device such as mobile phone in some way to provide educational or learning material. [13]

E-learning can be CD-ROM based, network-based, Intranet-based or Internet-based. It can include text, video, audio, animation and virtual environments. It can be a very rich learning experience that can even surpass the level of training in a crowded classroom. It is self paced and hands-on learning. [14]

E-learning provides faster learning at reduced costs, increased access to learning resources and clear accountability for all participants in the learning process. Besides that, it gives flexibility to the learners in terms of timings and place of learning as long as there is a properly configured computer.The learning can be on any level, elementary school, college or corporate. It is made up of several components. These components of learning are enhancing by technology. Web based learning or online learning is one of the components and is the fastest growing method for providing training and education. [15]

E-learning can suffer from many of the same pitfalls as classroom training, such as boring slides, monotonous speech, and little opportunity for interaction.[14]

### 2.6.1 CATEGORIES OF E-LEARNING

E-learning falls into four categories, from the very basic to the very advanced. The categories are:

- **Knowledge databases**

  While not necessarily seen as actual training, these databases are the most basic form of e-learning. Knowledge databases that on software sites offering indexed explanations and guidance for software questions, along with step-by-step instructions for performing specific tasks. These are usually *moderately* interactive, meaning that users can either type in a key word or phrase to search the database, or make a selection from an alphabetical list. [16]

- **Online support**

  Online support is also a form of e-learning and functions in a similar manner to knowledge databases. Online support comes in the form of forums, chat rooms, online bulletin boards, e-mail, or live instant-messaging support. Slightly more interactive than knowledge databases, online support offers the opportunity for more specific questions and answers, as well as more immediate answers. [16]

- **Asynchronous training**

  This is e-learning in the more traditional sense of the word. It involves self-paced learning, either CD-ROM-based, Network-based, Intranet-based or Internet-based. It may include access to instructors through online bulletin boards, online discussion groups and e-mail. Or, it may be totally self-contained with links to reference materials in place of a live instructor. [16]

- **Synchronous training**

  Synchronous training is done in real-time with a live instructor facilitating the training. Everyone logs in at a set time and can communicate directly with the instructor and with each other. Users can raise their cyber hand and even view the cyber whiteboard. It lasts for a set amount of time, from a single session to several weeks, months or even years. This type of training usually takes place via Internet Web sites, audio or video-conferencing, Internet telephony, or even two-way live broadcasts to students in a classroom. [16]

### 2.6.2 BENEFITS OF E-LEARNING

| Benefits | Description |
|---|---|
| **Anywhere, anytime, anyone** | The growth of the World Wide Web, high capacity corporate networks and high speed desktop will made e-learning available to people 24 hours a day, seven days a week around the globe. This makes e-learning convenient for students since they can at any time and any place. |
| **Substantial cost and time savings** | E-learning eliminates the need for students to travel to specific locations for the purpose of education. According to Training Magazine, corporate save between 50%-70% when replacing instructor-led training with electronic content delivery. This brings about savings on the time and cost of travel that would otherwise have been incurred in conventional learning models. |
| **Just-in-time access** | Web-based products allow instructors to update lessons and |

| | |
|---|---|
| **to timely information** | materials across the entire network instantly. This keeps content fresh and consistent and gives students immediate access to the most current data. Information can be retrieved just before it is required, rather than being learned once in a classroom and subsequently forgotten. Training Magazine reported that technology-based training has proven to have a 50%-60% better consistency of learning than traditional classroom learning. |
| **Improved collaboration and interactivity among students** | E-learning allows different learning styles of different students, and fosters cognitive learning through a variety of interactive exercises. Cognitive learning leads to better understanding and recall of knowledge. E-learning enables stronger and more meaningful collaboration on a one-to-one, one-to-many and many-to-one basis, involving students and teachers. Study found that online students had more peer contact with others in the class, enjoyed it more, spent more time on class work, understood the material better and performed on average 20% better than students who were taught in the traditional classroom. |
| **Higher retention of content through personalized learning** | Since they can customize the learning material to their own needs, students have more control over their learning process and can better understand the material, leading to a 60% faster learning curve, compared to instructor-led training. The |

| | |
|---|---|
| | average content retention rate for an instructor-led class is only 58%, the more intensive e-learning experience enhances the retention rate by 25%-60%. |
| **Online training is less intimidating than instructor-led courses** | Students taking an online course enter a risk free environment in which they can try new things and make mistakes without exposing themselves. This characteristic is particularly valuable when trying to learn soft skills, such as leadership and decision making. A good learning program shows the consequences of students' actions and where and why they went wrong. After a failure, students can go back and try again. This type of learning experience eliminates the embarrassment of failure in front of a group. |
| **Self-paced** | An individual may proceed through a course or program as the information is fully comprehended. Students can convert information to knowledge on their own timetables. |
| **Uniformity of Content** | The information delivered can be consistent to all users, therefore reducing the possibility for misinterpretations. |
| **Career Oriented** | E-learners acquire skills required in the job market. Thus, jobseekers get jobs quickly, while employed students get empowered to rise in their career, or even change careers if interested. |
| **Allows learning to be broken down into** | E-learning courses are constituted of "Learning Objects", which allow learning to be divided into discrete learning units. |

| | |
|---|---|
| **units** | This is in sharp contrast to conventional learning where students are forced to take up complete courses even if they require to learn only selected components of the course. |
| **Cross platform** | Online education is accessible by Windows, Macintosh and Unix users. |

**Table 2.1 Benefits of E-learning** [16] and [17]

## 2.7 C PROGRAMMING LANGUAGE

C is a general purpose language that is not tied to any operating system and computer. C programming language was created by systems programmer Dennis Ritchie in the early of 1970s. It is the programming language that was used to develop UNIX operating system at Bell Laboratories.

C programming language is a high level language which allows programmers to write instructions that look almost like English and contain commonly used mathematical notations. Therefore, it is relatively to learn. C was originally intended to be used for system programming and writing operating system and compilers.

C is a hardware-independent and not specialized to any particular area of application; applications written in C can run with little or no modifications of a wide range of different computer systems. Input and output are not part of the programming language but are provided by the library functions and the computer operating system.

C is a basic programming language. C is more widely use today. Some of the applications include:

- Automatic Teller Machine
- Computer games
- Device drivers [11]

### 2.7.1 THE HISTORY OF C PROGRAMMING LANGUAGE

C evolved from two previous languages, BCPL and B. BCPL was developed in 1967 by Martin Richards as a language for writing operating systems software and compilers. Ken Thompson modeled many features in his language B after their counterparts in BCPL and used B in 1970 to create early versions in UNIX operating system at Bell Laboratories on a DEC PDP-7 computer. Both BCPL and B were type less languages. Every data item occupied one word in memory and the burden of typing variables fell on the shoulders of the programmer.

The C language was evolved from B by Denis Ritchie at Bell Laboratories and was originally implemented on a DEC PDP-11 computer in 1972. C uses many of the important concepts of BCPL and B while adding data typing and other powerful features. C initially became widely known as the development language of the UNIX operating system.

By the late 1970s, C had evolved into what is now referred to as "traditional C". The publication in 1978 of Kernighan and Ritchie's book, The Programming Language, brought wide attention to the language. This publication became one of the most successful computer science books of all time. [11]

## 2.8 CURRENT AVAILABLE SERVICES

Study had been done on various existing C learning packages. It includes CD-ROM based and Web-based.

### 2.8.1 CD-ROM BASED

**a) C & C++ Multimedia Cyber Classroom**

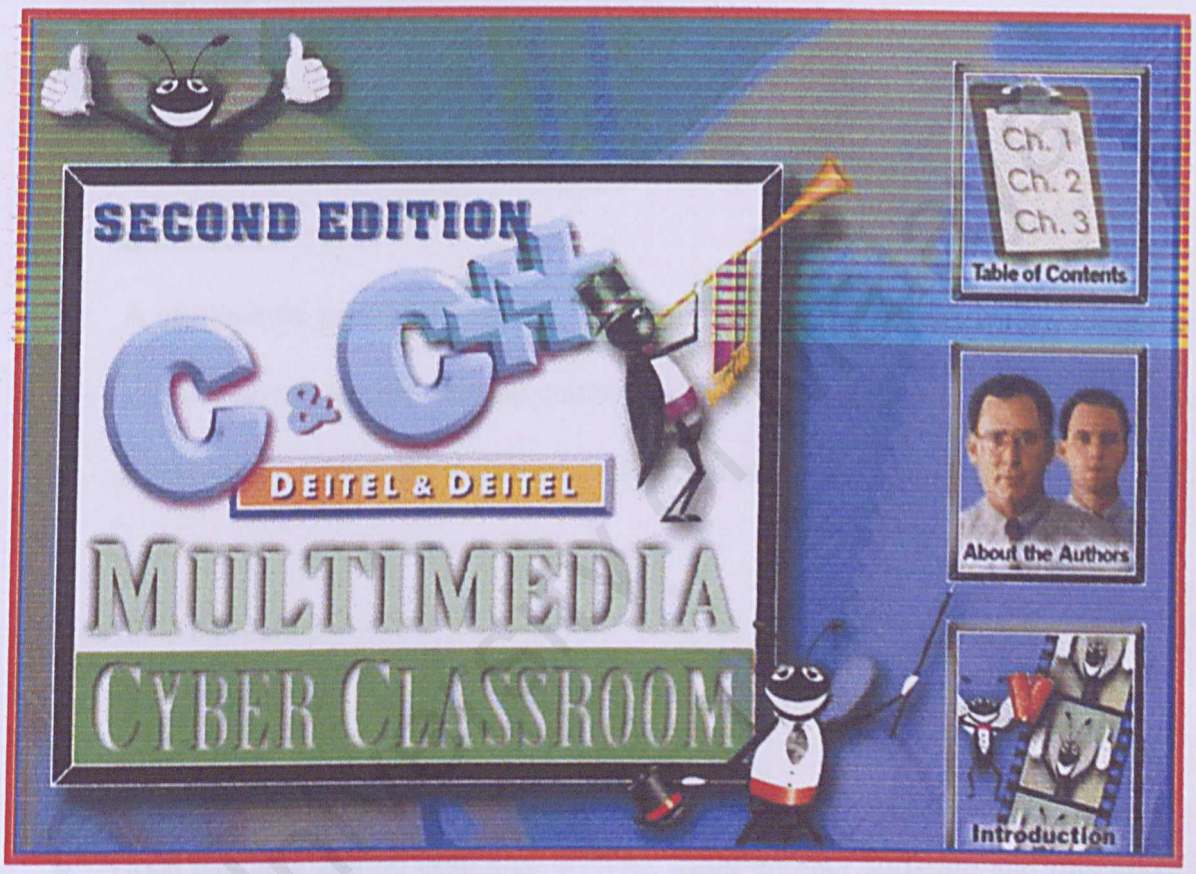



**Figure 2.1 C & C++ Multimedia Cyber Classroom Interface**

**About the Course**

**The Main Interface Contents:**

Table of Contents:

- Provide the list of topics that available in the training course with linking to the particular topic.
- About Authors :
- Introduce the authors, about their qualification and advice.
- Introduction :
- A multimedia presentation using window media player to provide a general idea about C++ interactive training course, the syllabus covered in the training course and how to navigate through the training course.

**Course's Features:**

- Objectives of every topic are given to provide a general idea about the topic.
- Code example is given in every topics
- Code example can be compiled without using another software and this make a clearer view to the users about the output of the code example.
- Code example can be saving into another location.
- Explanation line by line of the code example is given by the authors.
- Provide common error in every topics
- Provide good practices in every topics
- Exercises and lab question are provided in various types.
- Answer is given in another folder in the CD ROM

- Quotes given
- Provide text search
- Index content is provided
- Graphical icons

**Course's Interfaces:**

- Simple background
- Easy navigation

**Opinion About the Training Course**

**Praises:**

- Integrate C++ compiler in the training course.
- Help file are given.
- Objectives are providing in every chapter.

**Critics:**

- The course is not in a full screen window.
- New window is open when ever clicking a link and this end up with a lot of windows opened in the desktop.
- There are no tool tips for the graphic icons where the icons are subjective.

### 2.8.2 WEB BASED

**a) GurukulOnline Learning Solution (Demo System)**

**URL** : http://www.gurukulonline.com/elearning_introduction.asp

**Date Accessed** : 23 July 2003

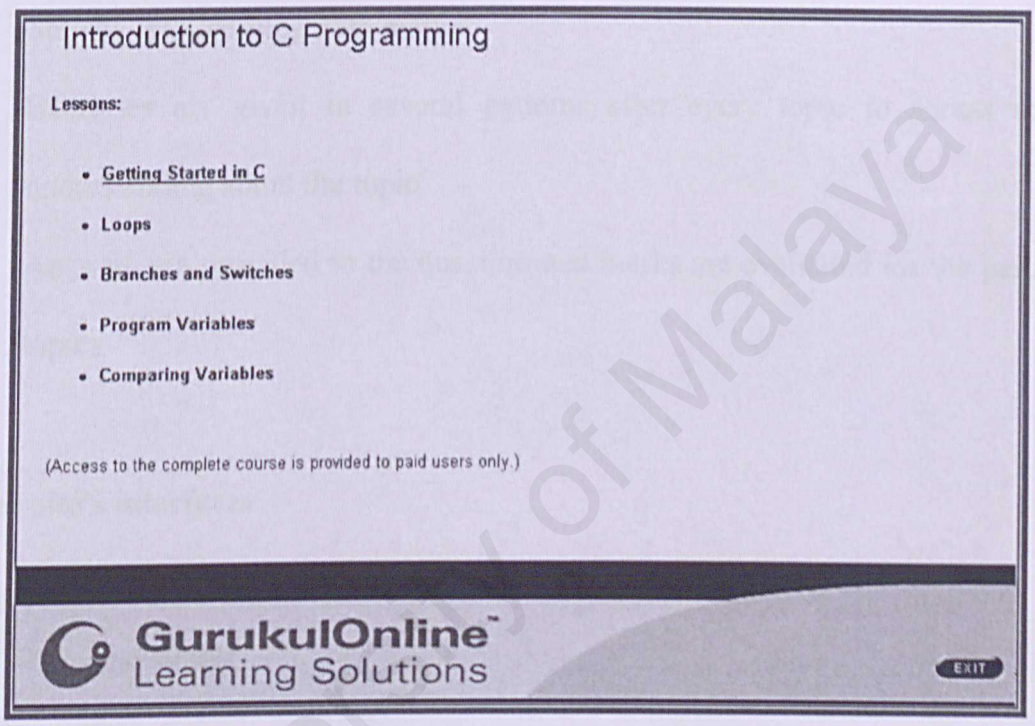



**Figure 2.2 GurukulOnline e-learning in C Programming Interface**

**About the web site**

The GurukulOnline Learning Solutions is a payable learning center. This version is the demo system. It provides a lot of learning topics. Due to the proposed system, C programming is chosen for the demo proposed. It divided into 3 parts, beginner in C, Intermediate in C and Advance in C.

**Course's main contents**

- Table contents of the course.
- Exit from the course.

**Course's features**

- Objective of the topic are given
- Step by step learning with picture.
- Exercises are given in several patterns after every topic to access student understanding about the topic.
- Answers are provided to the question and marks are evaluated for the particular topics.

**Web site's interfaces**

- Easy navigation with buttons on the bottom left.
- Plain and simple.

**Opinion about the web site**

**Praises:**

- Every topic has objectives.

**Critics:**

- It is not in a full screen window
- The text in the course is not attractive

- The interface is not attractive enough to attract reader attention

**b) MindLeaders**

**URL:**

http://courses.mindleaders.com/dpec/login.jsp?userid=demo4you&password=trybuy

Date Accessed : 23 July 2003


**Figure 2.3 MindLeaders Interface**

**About the website:**

This is one of the free online training courses that are available in the E-learning center. However, C programming course in E-learning center is not a free course. It cost about $139.99 for full 12 months unlimited access. Therefore, HTML training course is used as an example.

**Web Site's Main Contents:**

- Topics that covered in the course
- Course tools session that provides learner assessment, course information and course resources.
- Search function
- Help session

**The Web Sites Features:**

- Tutorials are given in a various format and answer are provided to the question in every topics.
- Certificate is given to the learner who completed the course.
- Help files to assist the user of confusion.

**The Web Site's Interface:**

- Simple background
- Uses simple pictures

**Opinion about the Web Site:**

**Praises:**

- Help file provided.

**Critics:**

- The navigation bar at the left side is complex and this make a confusion feeling.

c) **C Programming Tutorial**

**URL** : http://plus.about.com/librar/blctut.htm

**Date Accessed** : 23 July 2003

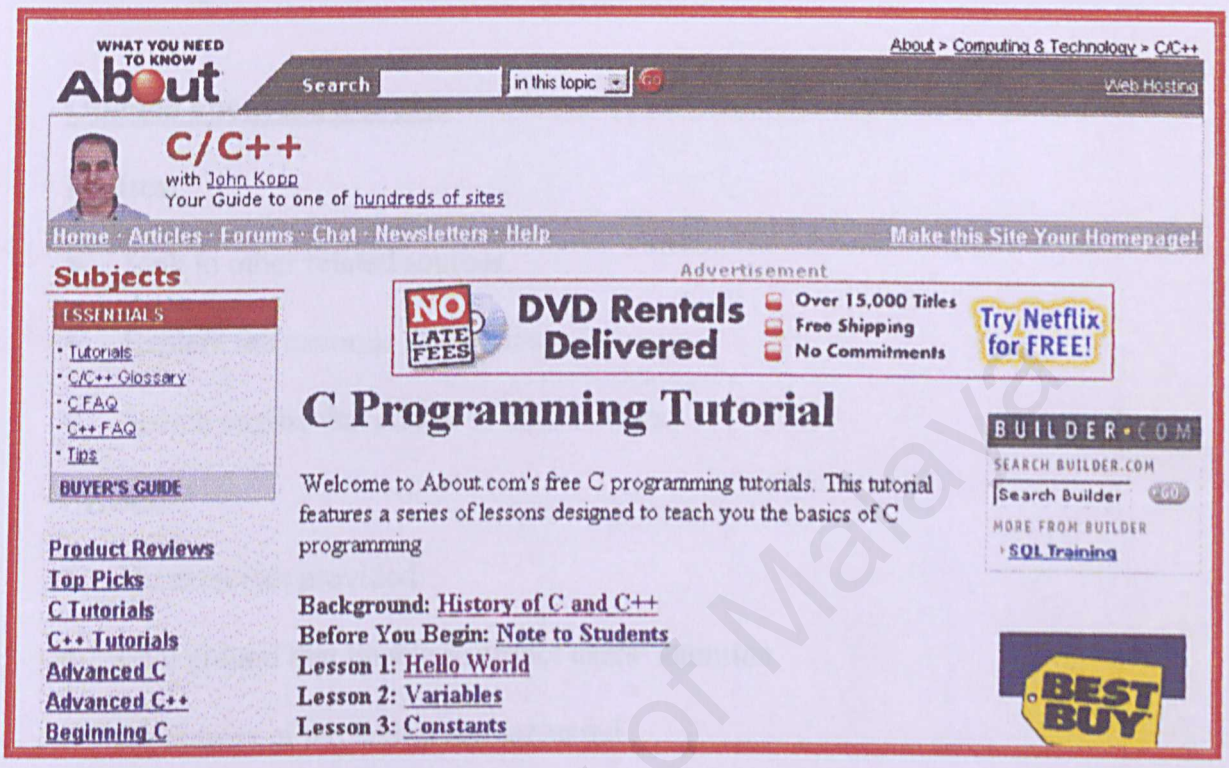



**Figure 2.4 C Programming Tutorial Interface**

**About the website:**

**Web Site's main contents**

- Lessons that covered in the tutorials
- Related link

**Course's features**

- Teach by example
- Search engine provided

**Web site's Interface**

- Links to other resources
- Plain background

**Opinion about the web site**

**Praises:**

- Link to other related sources.
- Explain the example line by line.
- Search engine that enable to assists users.

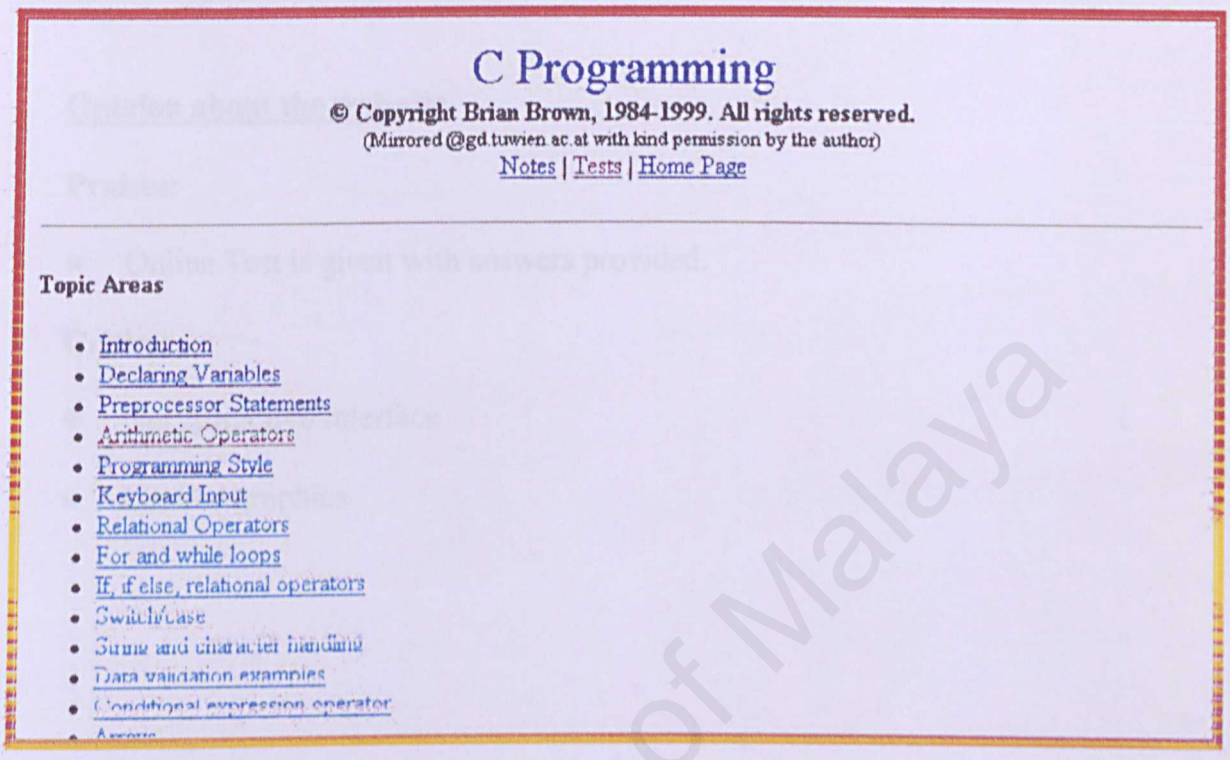
**Critics:**

- No exercises provided.
- Background that unable to attract users' attention.
- Objectives of the lesson are not stated.

d) **C programming**

**URL** : http://gd.tuwien.ac.at/languages/c/programming-bbrown

**Date Accessed**: 23 July 2003



C Programming

© Copyright Brian Brown, 1984-1999. All rights reserved.
(Mirrored @gd.tuwien.ac.at with kind permission by the author)
Notes | Tests | Home Page

Topic Areas

- Introduction
- Declaring Variables
- Preprocessor Statements
- Arithmetic Operators
- Programming Style
- Keyboard Input
- Relational Operators
- For and while loops
- If, if else, relational operators
- Switch/case
- Strings and character handling
- Data validation examples
- Conditional expression operator
- Arrays

**Figure 2.5 Interface of C programming**

**About the Web Site**

**Web Site's Main Contents:**

- Topics areas
- Test
- Author's homepage

**Course's features:**

- Exercises are given
- Answers are provided to the exercises.
- Index is provided

**Web Site's Interface**

- Plain background
- Simple navigation

**Opinion about the web site**

**Praises:**

- Online Test is given with answers provided.

**Critics:**

- Not Attractive Interface
- Limited graphics

## 2.9 Summaries of the existing system of E-learning

All the existing systems that study can be summarize as follow:

| | CD-ROM based | Web -based | | | |
|---|---|---|---|---|---|
| **E-learning center** | **Cyber Classroom** | **GurukulOnline** | **MindLeader** | **C Programming tutorial** | **C Programming** |
| **Objectives of the chapter provided** | Yes | Yes | No | No | No |
| **Exercises provided** | Yes | Yes | Yes | No | Yes |
| **Assessments** | Yes | Yes | Yes | No | No |
| **Help File** | Yes | No | Yes | Yes | No |
| **References** | No | No | No | Yes | No |
| **Download time** | Average | Average | Average | Average | Average |
| **Fonts size** | Formal | Formal | Formal | Formal | Formal |
| **Colour** | Stylish | Plain | Plain | Plain | Plain |
| **Multimedia presentation** | Yes | No | No | No | No |

| | | | | | |
|---|---|---|---|---|---|
| **Audio** | Yes | No | No | No | No |
| **Navigation Ease** | Yes | Yes | Yes | Moderate | Moderate |
| **Layout** | Formal | Formal | Formal | Formal | Formal |

**Table 2.2 Summaries on existing C tutoring system**

All the shortage of the existing system above will be enhance in CyberC which is:

- Can be access without any payment
- Contains multimedia elements
- Provide Audio
- Provide relevant reference
- Attractive interface
- User friendliness
- Exercises provided
- Provides objective for every chapter
- Provides help file

## 2.10 Questionnaires

A survey was conducted in Faculty Computer Science and Information Technology (FCSIT). Questionnaire was distributed among 120 students which is 30% of 425 undergraduates that currently undergoing C programming language. The total number of students that is presently taking C programming language subject was get from the FCSIT's office from Cik Aisha. The objective of this survey is to find out the popularity of web-based learning system among undergraduates. Here are the questions asked and the results obtained from the survey conducted in the bracket.

1. What do you think of C?

   a) Interesting (69) b) Moderate (48) c) Boring (3)

2. How do you rate C Programming language's importance?

   a) Very important (22)

   b) Important (71)

   c) Less important (18)

   d) Not important (9)

3. How do you rate C Programming difficulties?

   a) Easy to learn (18)

   b) Moderate (76)

   c) Confusing (26)

4. How many hours you spent on C books a week?

a) < 3 hours (66)

b) 3-5 hours (49)

c) > 5 hours (5)

5. Please check the problems that were face during process of learning C programming language?

a) Insufficient study material (27)

b) Lack of quality lecturers (49)

c) Insufficient information from reference (31)

d) Scope of studies irrelevant to daily applications (56)

e) Lack of practical exercises (74)

e) Others (0)

6. Which is the best source for C Programming language?

a) Online websites (59)

b) Lecturers (21)

c) Books (30)

d) Peers (10)

7. How would you rate doing interactive quiz on C programming language?

a) Eases memorization (71)

b) Increase understanding (86)

c) Interesting (67)

d) A waste of time (10)

8. Do you think having an open discussion on C topics on the Internet is worthwhile?

a) Yes (79) b) No (41)

9. What age do you think is recommended for someone to start learning C Programming Language?

a) 12-14 (3)

b) 15-18 (62)

c) 19-21 (42)

d) 21 and above (13)

**Information gained from the survey is as follow:**

Problems that face during learning C programming Language:

| Reasons | Totals |
|---|---|
| Insufficient | 31 |
| Insufficient study | 27 |
| Lack of practical | 74 |
| Lack of quality | 49 |
| Others | 0 |
| Scope of studied | 56 |

**Table 2.3 Problems of learning C**

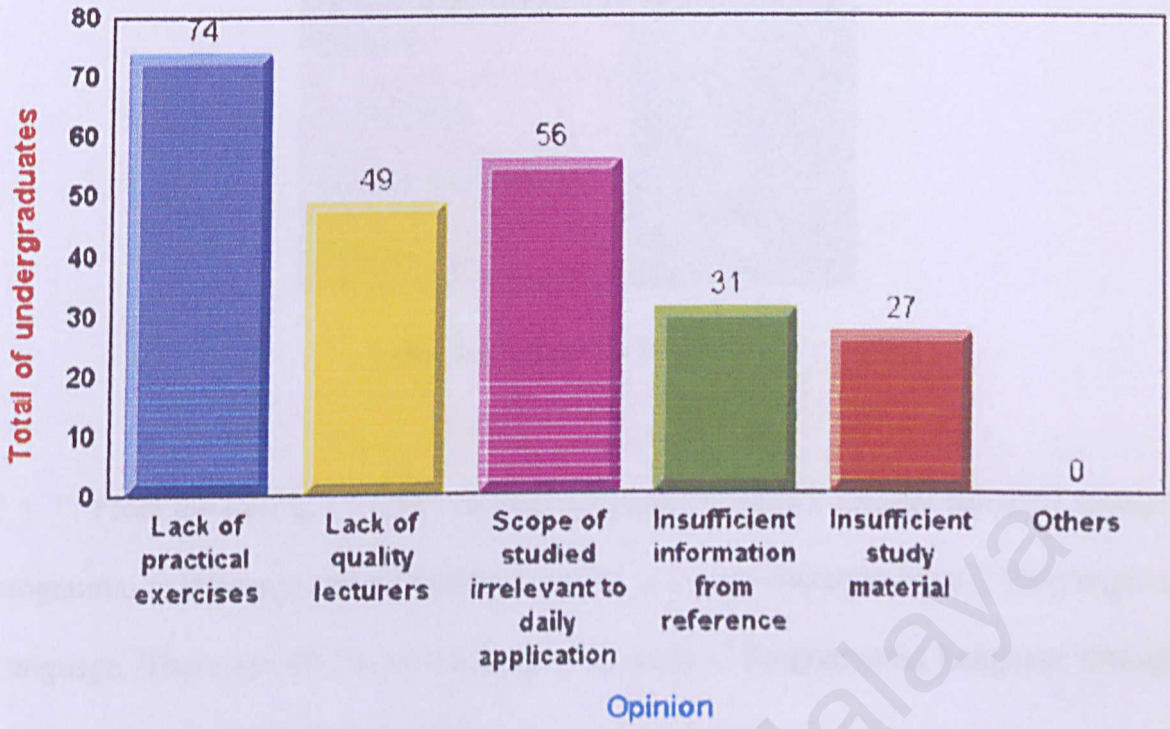



**Chart 2.1 Problems faced during learning C**

From the results, there are 62% of undergraduates that face problems of lack of practical exercises, 47% found that scope of the studies irrelevant to daily applications, 41% said that lack of qualities lecturers that can transfer better information about C to them, 26% lack of information from reference although that is a reference book and only 23% stating lack of study material.

Therefore, it can be concluded that the major problem face by undergraduates during learning C programming language is lack of practical exercises. In order to overcome this problem, CyberC is designed with lots of quizzes and exercises to increase users' understanding of C Programming Language.

| Source | Total |
|---|---|
| Books | 34 |
| Lecturers | 29 |
| Online websites | 47 |
| Peers | 10 |

**Table 2.4 Source for learning C**

From the results, I found that undergraduates of FCSIT that are currently taking C programming language agree of using websites as a main source to learn C Programming Language. There are 49.1% of them agree to study C Programming Language through websites whereas 25% of them prefer learning from books.

Besides that, there is a high percentage of students which is 65.8%, interested participating in an open discussion over the internet probably because they no longer fell pressured or threatened by the presence of a lecturer. This also will enable introduced students to participate more freely.

In the nutshell, CyberC should be customized to fulfill the users' requirements for quality C programming language learning section.

## 2.11 REVIEW OF DEVELOPMENT TOOLS

### 2.11.1 APPLICATION PLATFORM

In computers, a platform is an underlying computer system on which application programs can run. An operating system is the program that controls all the other parts of a computer system. It includes both the hardware and the software. Most importantly, it allows making use of the facilities provided by the system.

#### 2.11.1.1 UNIX

UNIX is an operating system. The first version of UNIX was created in 1969 by Kenneth Thompson and Dennis Ritchie, system engineers at AT&T's Bell Labs. It went through many revisions and gained in popularity until 1977, when it was first made commercially available by Interactive Systems Corporation.

The UNIX operating system has three important features; a kernel, the shell and a file system.

- The kernel, which schedules tasks and manages storage;
- The shell, which connects and interprets users' commands, calls programs from memory, and executes them; and
- The tools and applications that offer additional functionality to the operating system [19]

The features of UNIX are:

- Multitasking capability

  UNIX enable computer to do several things at once. Users do not have to wait for one application to end before starting another one.

- Multi-user capability

  It can take the commands of a number of users. It can run programs, access files, and print documents at the same time. It lets several users access the same document by compartmentalizing the document so that the changes of one user don't override the changes of another user.

- Portability

  It permits to move from one brand of computer to another with a minimum of code changes. At a time when different computer lines of the same vendor didn't talk to each other yet alone machines of multiple vendors that meant a great savings in both hardware and software upgrades. It also meant that the operating system could be upgraded without having the entire customer's data inputted again. And new versions of UNIX were backward compatible with older versions, making it easier for companies to upgrade in an orderly manner.

### 2.11.1.2 LINUX

Linux is a free Unix-type operating system originally created by programmer from Finland, Linus Torvalds, with the assistance of developers around the world. It is developed under the GNU General Public License. The source code for Linux is freely available to everyone. [20]

The features of Linux are:

- **Linux is network-friendly.**

Linux has excellent networking facilities: allowing users to share CPUs, share modems and others. Linux is an ideal environment to run servers such as a web server (e.g. Apache), or an FTP server. One of the major litmus tests of the quality and utility of a modern operating system is how well it networks. Since Linux was developed by a team of programmers over the Internet, its networking features were given high priority. Linux is capable of acting as client and/or server to any of the popular operating systems in use today, and is quite capable of being used to run Internet Service Providers. Linux supports most of the major protocols, and quite a few of the minor ones. Support for Internet, Novell, Windows, and Appletalk networking have been part of the Linux kernel for some time now. With support for Simple Network Management Protocol and other services (such as Domain Name Service), Linux is also well suited to

serving large networks. Finally, all these networking options will run quite acceptably on minimal hardware configurations.

- **Commercial software is available for Linux.**

Commercial software is available for Linux if users' needs aren't satisfied by the free software.

- **Linux is easily (and cheaply, and quickly) upgraded.**

After any length of time a typical installation of Windows and software gets into a complete mess. Often the only way to clear out all the debris is to reformat the hard disk and start again. Linux, however, is much better for maintaining the system. Major upgrades to commercial operating systems come very slowly. The major distributions of Linux, on the other hand, are releasing major updates every six months or so. Minor upgrades also take longer to acknowledge and fix in commercial systems. Recent problems with Netscape Navigator and Microsoft Internet Explorer are good examples of this. In the case of the "denial of service" TCP/IP bug, a Linux patch was posted for it mere hours after the problem was isolated. Anyone who is technically capable can fix the bugs, too, merely by changing the code in question and recompiling.

- **Linux supports an even number of multiple processors as standard, as well as true multitasking**
- **Linux is stable**

Many people have problems with Windows crashing for no particularly good reason, often causing people to lose work. Sometimes it is just an

annoyance, but other times it can be quite serious. There are documented cases of Linux servers running for over a year at a time without a system-halting crash. Linux is one of the more stable operating systems available today. This is due in large part to the fact that Linux was written by programmers who were writing for other programmers and not for the corporate system. The only people who made the decisions on what went into the system were programmers. Also, the deadline pressure is not as strong when one is developing as a hobby.

- **Linux is secure**

Linux is an implementation of the UNIX design philosophy, which means that it is a multi-user system from the word "go." This has numerous advantages, even for a system where only one or two people will be using it. Security, which is necessary for protection of sensitive information, is built into Linux at selectable levels. More importantly, the system is designed to multi-task. Whether one user is running several programs or several users are running one program, Linux is capable of managing the traffic. [21]

#### 2.11.1.3 Microsoft Windows XP

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. [22]Windows XP Professional delivers the new standard in reliability and performance. This operating system is designed

for businesses of all sizes and for users who demand the most from their computing experience.

It was launched by Microsoft Corporation on 25 October 2001. [22]

Windows XP's robust, easy-to-use operating system and new usability enhancements are changing the way home and office users compute.

Features of Window XP are:

| Features | Description | Benefit |
|---|---|---|
| **Reliable** | | |
| **Windows File Protection** | Protects core system files from being overwritten by application installations. If a file is overwritten, Window File Protection will restore the correct version. | By safeguarding system files, Windows XP Professional mitigates many of the most common system failures. |
| **Windows Installer** | A system service that helps users install, configure, track, update, and remove software programs. | Will help minimize user downtime and increase system stability. |
| **Enhanced Software restriction policies** | Provide administrators a policy-driven mechanism to identify software running in their environment and control its ability to execute. This facility can be used in virus and Trojan | Can contribute to improved system integrity, manageability and ultimately, lower cost of ownership of PC. |

| | | |
|---|---|---|
| | horse prevention and software lockdown. | |
| **Preemptive multitasking architecture** | Designed to allow multiple applications to run simultaneously while ensuring great system response and stability | Run most demanding applications while still experiencing impressive system response time. |
| **Scalable memory and processor support** | Supports up to 4 gigabytes of RAM and up to two symmetric multiprocessors. | Users who need the highest level of performance will be able to work with the latest hardware. |
| **Encrypting File System (EFS) with multi user support** | Encrypts each file with a randomly generated key. The encryption and decryption processes are transparent to the user. In Windows XP, EFS can provide multiple users access to an encrypted document. | The highest level of protection from hackers and data theft. |
| **Easy to use** | | |
| **Adaptive user environment** | Adapts to the way an individual user works. With a redesigned Start menu, the most frequently | A cleaner work environment allows the user to be more sufficient. |

| | | |
|---|---|---|
| | used applications are shown first. | Users can find the crucial data and applications the need quickly and easily. |
| **Easily publish information to the Web** | Files and folders can be easily published to a Web services that uses the WebDAV protocol. | Users will be able to publish important information to Web servers. |

**Table 2.5 Features of Windows XP [24]**

### iv. Application Platform Comparison

| Comparison | Linux | UNIX | Microsoft Windows XP |
|---|---|---|---|
| **Installation issue** | Need concept on disk portioning and mounting file system. | Need concept on disk portioning and mounting file system. | Easy I install using interface wizard. |
| **User friendly** | Not user-friendly because user interfaces is too cryptic. | Not user-friendly because user interfaces is too cryptic. | User friendly with window based interface. |
| **Security** | Vulnerability is high because distribution of source code is widely available. | Vulnerability is high because distribution of source code is widely available. | Vulnerability is low because of the application are not truly available in the Internet. |
| **Cost effective** | Cost effective because it is freeware | Not cost effective because with certain modification, the whole operating system need to be recompiled. | Cost effective operating system. Budget between RM2000 and fully functional intact server is running in matters of days. |

| | | | |
|---|---|---|---|
| **Stability** | Stable | Stable | Sometimes unstable due to system and registry problems. |
| **Compatibility with web development tools** | Less compatible with development tools because it does not offer much development tools. | Incompatible with development tools because it does not offer much development tools. | Compatible with web development tools. |

**Table 2.6 Comparison of Application Platforms**

### 2.11.2 WEB SERVER

A web server is a program that use the client/server model and the World Wide Web (HTTP), serves the files from the web pages to web users (whose computers contain HTTP clients that forward their request). Every computer on the Internet that contains a web site must have a web server program (or else the site files mist be sent to computer that has a web server program).Web servers often come as part of a larger package of Internet and Intranet related programs for serving email, downloading requests for FTP files and building and publishing web pages.[25]

#### 2.11.2.1 IIS (INTERNET INFORMATION SERVER)

IIS is a group of Internet Servers (including a web or HTP (Hypertext Transfer Protocol) server and a File Transfer Protocol Server) with additional capabilities for Microsoft's Windows NT and Windows

2000 server operating system. IIS 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 program for building and administering web sites, a search engine and support for writing web based application that access database. Microsoft points out that IIS is tightly integrated with the 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 websites using Microsoft FrontPage Product (with WYSIWYG user interface). Web developer can use Microsoft ASP technologies, which means that application including ActiveX Controls can be imbedded in web pages that modify the content sent back to users. Developer 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. ASP and ISAPI program run more efficiently than CGI and server-side include (SSI) programs, two current technologies. However, there are comparable interfaces on other platforms.

Microsoft's includes special capabilities for server administers designed to appeal to ISPs. It includes a single window (or "console") from which all services and users can be administered. It is designed to be easy to add components as snap-ins that one does not initially install. The administrative windows can be customized for access by individual customer. IIS includes security features that promise that it is easy to

install. It works closely with the Microsoft Transaction Server to access database and provide control at the transaction level. It also works with Microsoft's Netshow in the delivery of streaming audio and video, delayed or live. [25]

#### 2.11.2.2 PWS (PERSONAL WEB SERVER)

PWS is Microsoft's slimmed down web server, which provides a basis of which to develop corporate networked applications. PWS for Windows 95/98 turns any Windows 95/98 computer into a web server and enables easy publication of web pages. Easy to install and administer, PWS simplifies sharing information on their corporate Intranets or Internet for al users. PWS is ideal for developing, testing and staging web application, as well as peer to peer publishing with its support for sharing files over HTTP and FTP protocols. Just like Microsoft IIS, PWS support all ISAPI extensions and CGI scripts. PWS has been optimized for interactive workstations user, and does not have the system requirements of a full web server such as IIS (Internet Information Services). [25]

#### 2.11.2.3 APACHE

The Apache Server is a powerful, flexible, HTTP 1.1 compliant web server. It is highly configurable and extensible with third-party modules. It provides full source code and comes with an unrestrictive license. It runs on Windows NT/9x, OS/2, and most versions of UNIX, as

well as several other operating systems. Apache is actively being developed and encourages user feedback through new ideas, bug reports and patches.

The Apache server allows administrators to easily set up password-protected pages with enormous numbers of authorized users, without slowing down the server. It also permits administrators to set up customized files or even CGI scripts, which are returned by the server in response to errors and problems.

Apache is also flexible enough to perform multiple Directory Index directives, where administrators can instruct the server to either send back index.html or run index.cgi when a directory URL is requested, whichever it finds in the directory. Those running Apache server will also find that it has unlimited flexible URL rewriting and aliasing. Apache has no fixed limit on the numbers of Aliases and Redirects that may be declared in its configuration files. In addition, a powerful rewriting engine can be used to solve most URL manipulation problems. [25]

#### 2.11.2.4 COMPARISON OF IIS AND APACHE

| Comparison | Apache | IIS |
|---|---|---|
| **Strengths** | Freeware, good performance, reliability, support for HTTP 1.1 Protocol, Quick technical | Free download, superior administration control, HTTP 1.1 support, virtual server support, excellent |

| | | |
|---|---|---|
| | support via use net newsgroup | combination with Windows NT |
| **Weaknesses** | NT version is in its infancy, lack of graphical administration tools for configuration and administration tasks. | NNTP does not support USENET feeds, SMTP does not support POP3 mailboxes. |

**Table 2.7 Comparison between Apache and IIS**

### 2.11.3 WEB BROWSER

A web browser is a software program residing on a computer that uses to view pages on and navigate the World Wide Web. When uses a browser to request a page on a website, that browser is making a web connection to a web server.

The web browser processes the web pages that it receives from a web server and displays the pages to the user. Depending on the browser that uses and the features it includes, users might be able to play multimedia files, view and interact with Java applets, read e-mail, or use other advanced features.

Some of the most popular web browsers today are Microsoft Internet Explorer, Netscape Navigator, and Mozilla. Unfortunately, most browsers today parse web pages differently. Web designers must pay special attention to the way a browser behaves, or users might not see the pages as the designers intended. Therefore, web designers test their pages on multiple browsers before publishing them on their website. [26]

### 2.11.3.1 Microsoft Internet Explorer

Internet Explorer (IE) is the browser developed by Microsoft. While statistics are imperfect, it can reasonably say that some version of IE is used by over 75% of the general population especially among PC users.

Internet Explorer 6.0 allows users to choose whether to accept or reject cookies (little text files that Web sites store on the users PC so that they can identify the user when the user visit again) from individual Web sites. Most sites use cookies to personalize the browsing or shopping experience. Web media sites like CNET.com, use cookies to track which pages the users have viewed on the site to get a better idea of what type of content is popular with Web surfers. Other sites, however, use cookies to build profiles of users' web surfing and shopping habits, which they then use to tailor ads and marketing campaigns to users' preferences. In other words, it pays to be able to decide exactly which sites users trust and want to accept cookies from.

Besides that, Internet Explorer has a Print Preview feature. In Internet Explorer 6.0, the Print Preview window sports a new drop-down menu that lets users select whether to print an entire Web page, just a selected frame, or all frames individually (one per page). [27]

### 2.11.3.2 Netscape

Netscape is a World Wide Web browser from Netscape Communications Corporation. The first beta-test version was released free to the Internet on 13 October 1994. Netscape evolved from NCSA Mosaic (with which it shares at least one author) and runs on the X Window System under various versions of Unix, on Microsoft Windows and on the Apple Macintosh.

It features integrated support for sending electronic mail and reading Usenet news, as well as RSA encryption to allow secure communications for commercial applications such as exchanging credit card numbers with net retailers. It provides multiple simultaneous interruptible text and image loading; native inline JPEG image display; display and interaction with documents as they load; multiple independent windows. Netscape was designed with 14.4 kbps modem links in mind.[28]

### 2.11.3.3 Internet Explorer vs. Netscape

At the height of the browser war between Microsoft and Netscape, the competing companies released new browser versions one after another. Recently, however, the war has been downgraded to a minor skirmish. [29]

Internet Explorer 6.0 and Netscape Navigator can be compared with the following features:

- Loading Time

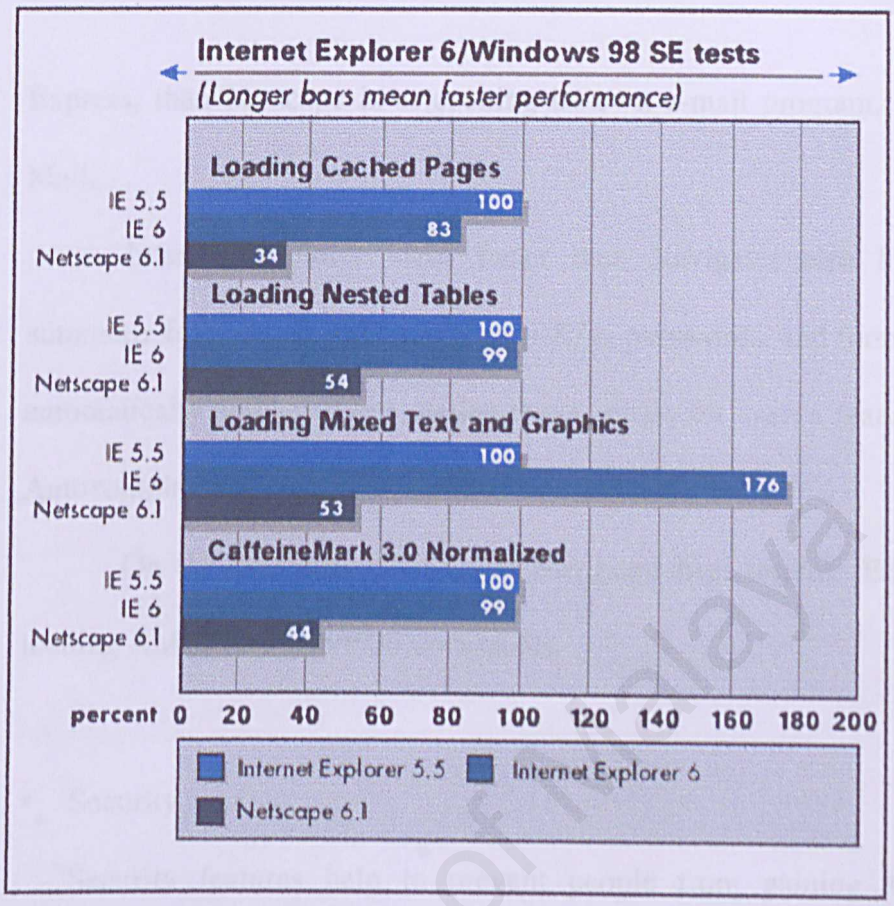



**Chart 2.2 Loading speed between Internet Explorer and Netscape Navigator**

In general, Internet Explorer 6.0 performed tasks faster than Netscape Navigator 7.0. CNET.com performance tests found that Netscape's HTML load speed (the time it takes to load a simple Web site) was actually about twice as long as that of Internet Explorer, but the difference is barely perceptible over most dial-up or lower-speed broadband connections. Anecdotally, they found that Netscape 7.01 renders most Web pages as fast as, if not slightly faster than, Internet Explorer. However, Internet Explorer is still a tad speedier at launching its e-mail client, Outlook

Express, than Netscape is at opening its own e-mail program, Netscape Mail.

Internet Explorer loads faster then Navigator also has many automatic features, like remembering URLs, passwords, and form text and automatically adding or completing those entries for user, a feature called Autocomplete.

On the other hand, Netscape Navigator beat Internet Explorer at loading XML, CSS and PDF documents.

- Security

  Security features help to prevent people from gaining access to information without permission. Besides that, it can protect the computer from unsafe software.

  Both Netscape and Internet Explorer provide essentially the same level of security for online transactions, supporting Secure Sockets Layer (SSL) version 2 and 3 and support site certificates. They can now support 128 bits keys for their security codes which is much stronger security then was 40 bits keys.

- Others

  I.E. also has far superior bookmarking functions allowing users to create new folders on the fly when users bookmark web pages. Netscape forces users to create bookmark folders ahead of time or after the fact by going to the edit bookmark screen. This is inconvenience for organized bookmarking. [30]

### 2.11.4 Summary Internet Explorer Vs Netscape

| **Performance** | **Internet Explorer 6.0** | **Netscape Navigator 7.0** |
|---|---|---|
| **Loading Time** | Faster | Slower |
| **Accept/Reject cookies** | ✓ | ✓ |
| **Current page refresh automatically when users link to the other related link.** | Have to click update button. | Continuously update according to the page users are visiting. |
| **Email Management Features** | Good | Insufficient |
| **Bookmark Control** | Good | Insufficient |
| **Interface** | Average | Attractive |

**Table 2.8 Comparison between IE 6.0 and Netscape**

## 2.12 WEB APPLICATION PROGRAMMING

### 2.12.1 HTML (HYPERTEXT MARKUP LANGUAGE)

In order to publish information for global distribution, a universally understood language, a kind of publishing mother tongue that all computers may potentially understand. The publishing language used by the World Wide Web is HTML (Hypertext Markup Language).

HTML was originally developed by Tim Berners-Lee while at CERN, Geneva and popularized by the Mosaic browser developed by computer scientists at NCSA, the University of Illinois, Urbana-Champaign, United States of America. During the course of 1990s, it has blossomed with the explosive growth of the web. During this time, HTML has been extended in a number of ways. Since the web depends on web page authors and vendors sharing the same conventions for HTML, this motivated joint work on specifications for HTML.

HTML gives the following abilities to authors:

- Publish online documents with headings, text, tables, lists, graphics and others
- Retrieve online information via hypertext links at the click of a button.
- Design forms for conduction transactions with remote services, for use in searching information, making reservations, ordering products and others.
- Include spreadsheets, video clips, sound clips and other application directly in the document.[31]

### 2.12.2 XML (EXTENSIBLE MARKUP LANGUAGE)

Extensible Markup Language (XML) describes a class of data objects called XML documents and partially describes the behaviors of computer programs which process them. XML is an application profile or restricted form of Standard Generalized Markup Language (SGML is a system for defining markup languages).By construction, XML documents are conforming SGML documents.

XML documents are made up of storage units called entities, which contain either parsed or unparsed data. Parsed data is made up of characters, some of which form character data and some of which form markup. Markup encodes a description of the documents storage layout and logical structure. XML provides a mechanism to impose constraints on storage layout and logical structure.

A software module called an XML processor is used to read XML documents and provide access to their content and structure. It is assumed that an XML processor is doing its work on behalf of another module, called the application. This specification describes the required behavior of an XML processor in terms of how it must read XML data and the information it must provide to the application.

XML was developed by an XML Working Group (originally known as the SGML Editorial Review Board) formed under the auspices of the World Wide Web Consortium (W3C) in 1996. It was chaired by Jon Bosak of Sun Microsystems with the active participation of an XML Special Interest Group (previously known as the SGML Working Group) also organized by the W3C. The membership of the XML Working Group is given in an appendix. Dan Connolly served as the WG's contact with the W3C.

A markup language is a mechanism to identify structures in a document. The XML specification defines a standard way to add markup to documents. [32]

### 2.12.3 XHTML (EXTENSIBLE HYPERTEXT TRANSFER PROTOCOL)

On January 26, 2000, the W3C announced that HTML 4 has been reformulated into XHTML 1.0. XHTML is HTML 4 written as an XML application.

There are two primary parts to XHTML:

- HTML

  4

  HTML 4 is a markup language used for displaying text and documents across different platforms and machines. It was originally intended for a very specific audience, and has expanded to include hypertext, multimedia, as well as the style of the documents displayed.

- XML

  XML is an extensible markup language that was developed to retain the flexibility and power of HTML while reducing most of the complexity.

Therefore, XHTML combines the flexibility of HTML with the extensibility of XML. [33]

### 2.12.4 DIFFERENT BETWEEN HTML AND XHTML

| | HTML | XHTML |
|---|---|---|
| **Element name**<br><br>*Example:* | HTML is not case sensitive.<br><br>*<B>This is bold* | XHTML is case sensitive. It only accept small cap element name.<br><br>*This is bold* |
| **Element types omission**<br><br>*Example:* | HTML allows the end tags to be omitted.<br><br>* Have a Nice Day* | XHTML requires start tag and end tag for every element types.<br><br>* Have a Nice Day * |
| **Element loop**<br><br>*Example:* | HTML do not consider about the order of the element loop.<br><br>* Hello World * | XHTML consider about the order of the element loop.<br><br>* Hello World * |
| **Attribute Value**<br><br>*Example:* | The attribute contents are understood by the web without "".<br><br>*<img src = flower.jpg height = 200 width = 300 alt = Rose.>* | All the attribute contents must contain in "".<br><br>*<img src = flower.jpg height = "200" width = "300" alt = "Rose.">* |
| **Boolean Attribute**<br><br>*Example:* | Boolean attribute can be shortening in HTML.<br><br>*<OPTION selected>* | Boolean attribute can not be shortening, it must be in full.<br><br>*<OPTION selected = "selected">.* |

**Table 2.9 Comparison between HTML and XHTML**

## 2.13 CLIENT-SIDE SCRIPTING LANGUAGE

Client–side scripting involved the execution of the scripting language by the browser that interprets the web page. The client-side scripting is browser specific that is dependent on the type of browsers that executes the script without contracting a server. Client-side scripting is not very secure because the code is visible to the users. [34]

### 2.13.1 VB SCRIPT

Microsoft VB Scripting Edition (VBScript) is a subset of the Microsoft Visual Basic language. It is implemented as fast, portable, lightweight interpreter for use in WWW browser and other application that use Microsoft ActiveX Controls, Automation Servers and Java applets. VBScript is currently available as part of Microsoft Internet Explorer and Microsoft Internet Information Server.

When used in Microsoft Internet Explorer, VBScript is directly comparable to Microsoft JavaScript. Like JavaScript, VBScript is a pure interpreter that process source code embedded directly in the HTML. VBScript code like JavaScript does not produce standalone applets but is used to add intelligence and interactivity to HTML documents.

VBScript is a valuable alternative to JavaScript in activating web pages. There are three separate classes of object available win VBScript:

- Object provided by the VBScript engine
- Objects provided by the Internet Explorer
- Objects provided by the web page author

The VBScript engine provides the core run time functionally. [34]

### 2.13.2 JAVASCRIPT

JavaScript is one of the most popular client-side scripting languages today. It is supported by almost all browsers on the market. Web developers use JavaScript to do these actions:

- Validate user actions.
- Create scrolling messages in a browser's status bar.
- Animate text or images.

JavaScript can be inserted in the HTML file. HTML uses tags to mark the start and end of the code. The <script> tag tells the browser that the following chunk of text, bounded by the closing </script> tag, is not HTML, but rather script code to be processed.

Although using JavaScript seems much like inserting HTML content, JavaScript is more difficult to learn than HTML. [26]

### 2.13.3 LINGO SCRIPT

Lingo is the Director scripting language which enables you to create an interactive movie. Lingo script is use to create interesting movie. The following are the types of Lingo script

- **Sprite scripts** are assigned to a sprite in the score. A single sprite can have multiple sprite scripts.
- **Frame scripts** are assigned to a specific frame in the score.(eg. go to the frame)

- **Cast Member scripts** are assigned to a cast member. A cast member can have only a single script.
- **Movie scripts** are assigned to entire movie while the movie plays.
- **Parent scripts** can be used only by object-oriented programming techniques.[35]

### 2.13.4 ACTIONSCRIPT

ActionScript is similar to the core JavaScript programming language. ActionScript, the scripting language of Macromedia Flash, lets users to add interactivity to a movie. ActionScript provides elements, such as actions, operators, and objects that put together in scripts that tell the movie what to do; set up the movie so that events, such as button clicks and key presses, trigger these scripts. For example, user can use ActionScript to create navigation buttons for their movie.

In Flash, users use the Actions panel to write scripts with ActionScript. Using the panel in normal editing mode, you build scripts by choosing options from menus and lists. Using the panel in expert editing mode, you enter text directly into the Script pane. In both modes, code hints help you complete actions and insert properties and events. Once you have a script, you can attach it to a button, movie clip, or frame to create the interactivity you need. [36]

## 2.14 SERVER-SIDE SCRIPTING LANGUAGE

A server-side script is a script that is interpreted by the web server. It is an instruction set that is processed by the server and the resulting set that is processed by the server and the resulting data sent to a client when an HTTP request is made for the server-side script, the filename suffix informs the web server that the contents of the file are to be processed on the server side script instructions and translates them into appropriate HTML code. The server then returns the whole file as pure HTML, which is then interpreted by the browser. This means, clients does not receive any code from server but receives only the output of the server-side scripting [31].

### 2.14.1 ASP (ACTIVE SERVER PAGES)

ASP is one for the latest server based technology from the Microsoft for building dynamic and interactive web pages. The basic of ASP is the Microsoft IIS software.

Basically, ASP is a VBScript and Jscript interpreter that is integrated with IIS, together with an interface for other custom components. It is also able to include other web page component like ActiveX controls and Java Applets. Therefore since ASP bind together, other various server based systems to help build interactive web pages is considered as a glue technology.

ASP is also being considered for the e-commerce project because of its main feature especially in web server technologies. These reasons are as follows:

i. It is suitable for publishing and collecting data from the web.

ii. Provides a way for building secure transactions, server based application and web sites.

iii. It is suitable for building multi-tier Internet and Intranet application.

iv. Provides Active Database Object, one of the Active Server Components allow easy but powerful connections to be made to almost any database system for which an open Database Connectivity (ODBC) driver is a available.

v. Works together with Windows NT and IIS to provide a comprehensive set of key software technology which enables secure exchange of information over public networks, access control to server resources and confident identification of server and client.

vi. Has pre-built Active Server Components, which provide plug-in objects that will perform specific tasks.

vii. Can interact with almost any existing dynamic web page technology such as CGI, ISAPI and scripts written in PERL, Python and AWK.

viii. Support client-server program. Furthermore, the combination of ASP client-site scripting and objects can be used to create client server application.

ix. It is able to create side code dynamically on the server. [34]

### 2.14.2 ASP.NET

ASP.Net is a set of technologies in the Microsoft.Net Framework for building Web applications and Web Services. ASP.Net pages execute on the server and generate markup such as HTML, WML or XML that is sent to a desktop or mobile browser. ASP.Net pages use a compiled, event driven programming model that improves performance and enables the separation of application logic and user interface. ASP.Net pages and ASP.NET XML Web Services files contains server-side logic written in Visual

Basic.Net, C#.Net or any .Net compatible language. Web applications and XML Web Services take advantage of the features of the common language runtime, such as type safety, inheritance, language interoperability, versioning and integrated security. [37]

### 2.14.3 COMMON GATEWAY INTERFACE (CGI)

Before Java, the standard of developing an interaction homepage was by using CGI. CGI is a standard for interfacing external applications with information servers, such as HTTP or Web servers. Without CGI, a plain HTML document that the Web daemon retrieves is static. A CGI program, on the other hand, is executed in real time, so that it can output dynamic information. The program executed by web daemon will transmit information to the database engine, and retrieve the result back again, and display them to the client.

Any script can be called a CGI as long as it is installed on the server end. A CGI program can be written in any language that allows it to be executed on the system such as C/C++, FORTRAN, Perl, VB, Apple Script and others. CGI is installed on the server end that makes it able to do things such as summit a form, create a guest book or forum, keep track of any rotate advertisements and others.

There are some security precautions that need to be implemented when it comes to using CGI programs. Probably the one that will affect the typical web user the most is the fact that CGI programs need to reside in a special directory, so that the Web Server knows to execute the program rather than just display it to the browser. This directory is usually under direct control of the Web master, prohibiting the average user from creating

CGI programs. There are other ways to allow access to CGI scripts, but it is up to the Webmaster to set these up for the programmer. [34]

### 2.14.4 COLD FUSION MX

ColdFusion MX is a powerful web application server that able to create robust sites and applications without a long learning curve. ColdFusion MX does not require coding in traditional programming languages (for example, C/C++, Java, XML), although it supports these traditional programming languages.

ColdFusion MX consists of the following core components:

- ColdFusion application server
- ColdFusion Markup Language (CFML)
- ColdFusion Administrator [38]

### 2.14.5 COMPARISON OF ASP AND ASP.NET

| Comparison | ASP | ASP.Net |
|---|---|---|
| Nature of Language | Interpreted, development is streamlined, variable types do not need to be well known in advance, and one can dynamically evaluate expressions. | Compiled, convert web pages into executable program. Because of this conversion, each page is likely to load slowly on the first pass, but more quickly on subsequent executions. Also the compiler checks the entire page for potential errors, and |

| | | |
|---|---|---|
| | | catches many errors that an interpreter might let slip for hours or days after deployment (or even longer) |
| **Weakness of Nature** | Notorious for missing simple errors until an unusual condition causes them to execute previously unused sections of code. Interpreters typically load the server more heavily as well. | Compilers typically demand that one adhere to more rigorous programming techniques, such as strong variables typing. They also make it harder to debug code. |
| **Usage of Multiple Languages** | One can mix multiple languages on the same page. | One can not mix multiple languages on the same page but one can still use different languages in different documents if necessary. |
| **Usage of VB Technologies** | Using VBScript | Using the Visual Basic.Net Language |
| **Syntax** | One can define global variables or subroutines inside script delimiters. | One can not define global variables or subroutines inside script delimiters. Instead, one must use a <SCRIPT> tag with a run at attribute. |

| | | |
|---|---|---|
| **Ease with HTML and scripts** | Let one intermix script and HTML | Does not let one intermix script and HTML |
| **Supports** | Web authors are given easy access to external subroutines from within their ASP pages. These subroutines especially when they come in the form of AvtiveX controls developed by programming teams can be quite powerful and able to open up whole new vistas to content authors. | ASP.Net does support ActiveX controls, but the rigorous programming model will make learning how to access their subroutines a daunting task for non-programmers. |
| **Configurations** | ASP uses the IIS metabase for configuration. | ASP.Net uses XML configuration files. |

**Table 2.10 Comparison between HTML and XHTML**

## 2.15 AUTHORING TOOL (WEB APPLICATION DEVELOPMENT TOOL)

### 2.15.1 MICROSOFT VISUAL INTERDEV 6.0

Microsoft Visual Interdev 6.0 comes part of Microsoft's suite of professional programming tools known as Visual Studio. Visual Interdev is a tool for designing dynamic web application. It is, in fact just a development environment and a collection of useful tool and utilities.

Visual Interdev 6.0 is the tool that Microsoft is promoting as their favored ASP editing tool. One simple but very useful features of Visual Interdev 6.0 is that it highlights ASP <% and %> tags in yellow, and ASP scripts itself is highlighted using blue of legal keywords that stands out from the HTML.

In addition, Visual Interdev boosts strong links with SQL Server, which makes it very easy to setup databases combining ASP and SQL Server. It also provides several useful web based tools for doing things like checking links, highlighting the broken ones on one's site, and allowing to drag-and-drop pages from one location to another.

Visual Interdev does have a couple of drawbacks. It's the most different to master of the editors discussed here and also the most expensive. But it is undoubtedly the most powerful of these editors as it offers many more tools and features to the developers. [39]

**Benefits of Visual Interdev 6.0**

It is a rapid end-to-end application development. It allows professional developers to design debug and deploy cross platform HTML plus script based web applications faster than ever before.

It is a powerful, integrated database tools. It include a complete set of database programming and design tools, allowing developers to build enterprise-class, data-driven web applications within a single, integrated IDE.

### 2.15.2 MICROSOFT FRONTPAGE 2002

Microsoft FrontPage 2002 is another tool for creating and designing web pages. It makes creating a Web site easier than ever. FrontPage shares toolbars, menus, themes, background, spell checking, and Format Painter with Microsoft Office. FrontPage 2000 also makes adding forms and databases into sites easier.

Besides that, it also provides the tools that need to keep the site up-to-date and error-free. It can easily manage content, hyperlinks, tasks, pages, and publishing through a simple interface.

Microsoft FrontPage 2002 gives Web developers ease and power and can be used by small and medium sized businesses, professionals, educators, web designers, hobbyists and individuals to create their on-line presence. It is user friendly and cheaper alternative for the novice. Users can quickly author in HTML view by using buttons and menu items. Besides that, it can enhance one's HTML and ASP codes. [40]

### 2.15.3 NOTEPAD

Notepad is a basic text editor that can use to create simple documents. The most common use for Notepad is to view or edit text (.txt) files, but many users find Notepad a simple tool for creating Web pages.

Because Notepad supports only very basic formatting, accidentally save special formatting in documents that need to remain pure text is not allow. This is especially useful when creating HTML documents for a Web page because special characters or other formatting may not appear in the published Web page or may even cause errors.

It doesn't highlight the ASP codes in any way, but it also doesn't generate any extra codes. It doesn't feature many additional functions, but because it is so simple that it os still a very popular choice. In Window 2000, Notepad offers a Goto feature (under the Edit Menu), which allows one to move around one documents using line numbers.

Notepad files can save as Unicode, ANSI, UTF-8, or big-endian Unicode. These formats provide greater flexibility when working with documents that use different character sets. [27]

### 2.15.4 MACROMEDIA DREAMWEAVER MX

Dreamweaver MX is the best WYSIWYG editor on the market for serious Web Developers. Dreamweaver offers all the tools and features a Web application producer needs to create dynamic and useful Web pages.

The Professional Choice for building websites and Internet Applications. For the first time, every member of your development team-designers, developers, and programmers-can work in a single integrated environment to create, build, and manage

websites and Internet applications. Macromedia Dreamweaver MX combines its renowned visual layout tools with the rapid web application development features of Dreamweaver UltraDev and the extensive code-editing support of Macromedia Home Site. So the world's best way to create professional websites is now the easiest way to build powerful Internet applications. [41]

### 2.15.5 MACROMEDIA FLASH MX

Macromedia Flash MX is the professional standard authoring tool for producing high impact Web experiences. It is developed by Macromedia to create vector graphics-based animation programs with full-screen navigation interfaces, graphic illustrations, and simple interactivity in a resizable file format that is small enough to stream across a normal modem connection. The software is ubiquitous on the Web, both because of its speed (vector-based animations, which can adapt to different display sizes and resolutions, play as they download) and for the smooth way it renders graphics. Flash files, unlike animated but rasterized GIF and JPEG, are compact, efficient, and designed for optimized delivery. It uses Action Script programming which is similar to Java to enhance the interactivity of the tool. [42]

New features in Flash MX enhance the approachability, creativity, and power of Flash. Designers who require a higher level of control and integration with industry-standard design tools have an unparalleled creative application for creating media-rich content. Powerful new features build on this creativity, giving application developers access to new capabilities that make Flash MX a robust and exciting application development environment. Developers can work with advanced scripting and debugging

tools, built-in code reference, and predefined components to rapidly deploy rich Web applications.

Known as a do-it-yourself animation package, Flash MX gives Web designers the ability to import artwork using whatever bitmap or illustration tool they prefer, and to create animation and special effects, and add sound and interactivity. The content is then saved as file with a .SWF file name extension.

Web users with Intel Pentium or Power Macintosh processors can download Flash Player to view Flash content, which performs across multiple browsers and platforms. Flash is lauded for being one of the Web's most accessible plug-in. According to an independent study cited by Macromedia, 89.9 percent of Web users already have Flash Player installed. [42]

### 2.15.6 MACROMEDIA DIRECTOR 8.5

Macromedia Director 8.5 Shockwave Studio is the world's foremost authoring tool for creating interactive multimedia. Developers rely on Director to create attention-grabbing business presentations, advertising kiosks, interactive entertainment and educational products. To see some of the exciting and varied ways in which developers use Director

Director 8.5 Shockwave Studio offers several new features that enhance the capabilities of Macromedia Director and Shockwave movies. The main improvements of are as follows:

- Support for interactive three-dimensional (3D) graphics.

- Enhancements to the Shockwave Multi-user Server and Xtra that enable server-side scripting, multithreading, and file access. Using server-side scripts can dramatically simplify the multi-user movies by placing most of the required logic on the server.
- Support for Flash 5 and additions to Lingo that provide control over the new features of Flash 5 movies.

Macromedia Director 8.5 Shockwave Studio adds three-dimensional (3D) images, text, and animations to the suite of Macromedia design and development tools. 3D cast members in the Director movies allow realistic spatial rendering of graphical objects. With Director 8.5 3D features, users can create and view images that have depth as well as height and width. [43]

## 2.16 DATABASE MANAGEMENT SYSTEM

### 2.16.1 MICROSOFT ACCESS 2002

Microsoft Access 2002 is a powerful database management system that functions in the window environment and allows users to create and process data in a database. It is the latest generation of Microsoft's database management system gives a powerful new ways to use the application as the front end of high–end database engine. [44]

### 2.16.2 MICROSOFT SQL SERVER 2000

Microsoft SQL Server is a significant tool in many regards. From data warehousing to application that require not only a large amount of information but also

many different simultaneous users, SQL Server is a key component in answering data management requirements. It is a powerful and comprehensive database. [45]

## 2.17 Chapter Summary

The main objective of this chapter is to gain information for this project. Research on e-learning, multimedia and C programming language concepts is done to have a clear understanding on the requirements of this project.

The strengths of the existing system application were studied to get a better idea about this project. Besides that, current existing systems weaknesses were identified to be solved in this project.

Platforms, Development Tools, Scripting language and others are reviewed in this chapter so that the most suitable tools and languages are selected for this project.


# CHAPTER 3

# METHODOLOGY

# CHAPTER 3: METHODOLOGY

## 3.1 METHODOLOGY CONSIDERATION

Methodology is a set of ordered tasks involving activities, constraints, deliverables and resources that produce and maintain most or all information systems and software. [46]

It is a method used to develop software and maintain the software. It is encompasses a representation approach, comprehensive analysis capabilities, and the capability to make prediction regarding the effects of changes to the process. It involves study of how to navigate through each phase of the software process model and how to represent phase products such as structure charts, stimulus-response threads, and state transition diagrams. [47]

Besides that, methodology is an algorithm that finds a solution in the given environment of the multi-layered finite space consisting of the analysis, design, implementation, and testing plane, starting with the root represented by the problem statement and ending with the goal represented by the system acceptance test. [48]

## 3.2 BENEFITS OF A GOOD METHODOLOGY

It is essential to choose a good methodology that suite the project that develops in order to identify the phases that have a clear beginning and end at which milestones can be established. A process is important because it imposes consistency and structure on a set of activities. This helps in inconsistencies, redundancies and omissions in the process, as these problems are noted and corrected the process becomes more effective

A good methodology will provide the following benefits:

- Provides a standard framework for the developers so that they are in the right track and develop the system consistently
- Provides better understanding of the system requirements
- Able to identify errors and omission during development
- Ensures produces high quality and timely results without imposing a large overhead on a project.
- Facilitate and enhance the planned process toward greater effectiveness, efficiency and reliability.
- Facilitate project management [48]

## 3.3 CONCLUSION ON THE DEVELOPMENT METHODOLOGY

The methodology used in C programming Tutoring Simulation is Rapid Application Development (RAD).

Rapid Application Development is a methodology for compressing the analysis, design, build and test phases into a series of short, iterative development cycles. It emphasizes obtained clearly requirements and evolutionary construction of working prototypes of a system to accelerate the system development process.

RAD uses prototypes to accelerate requirements analysis and system design. A prototype is a smaller-scale, representative or working model of the users' requirements or a proposed design for an information system. Prototyping is a technique for quickly building a functioning but incomplete model of the system.

The following diagram gives a visual layout of the Rapid Application Development.

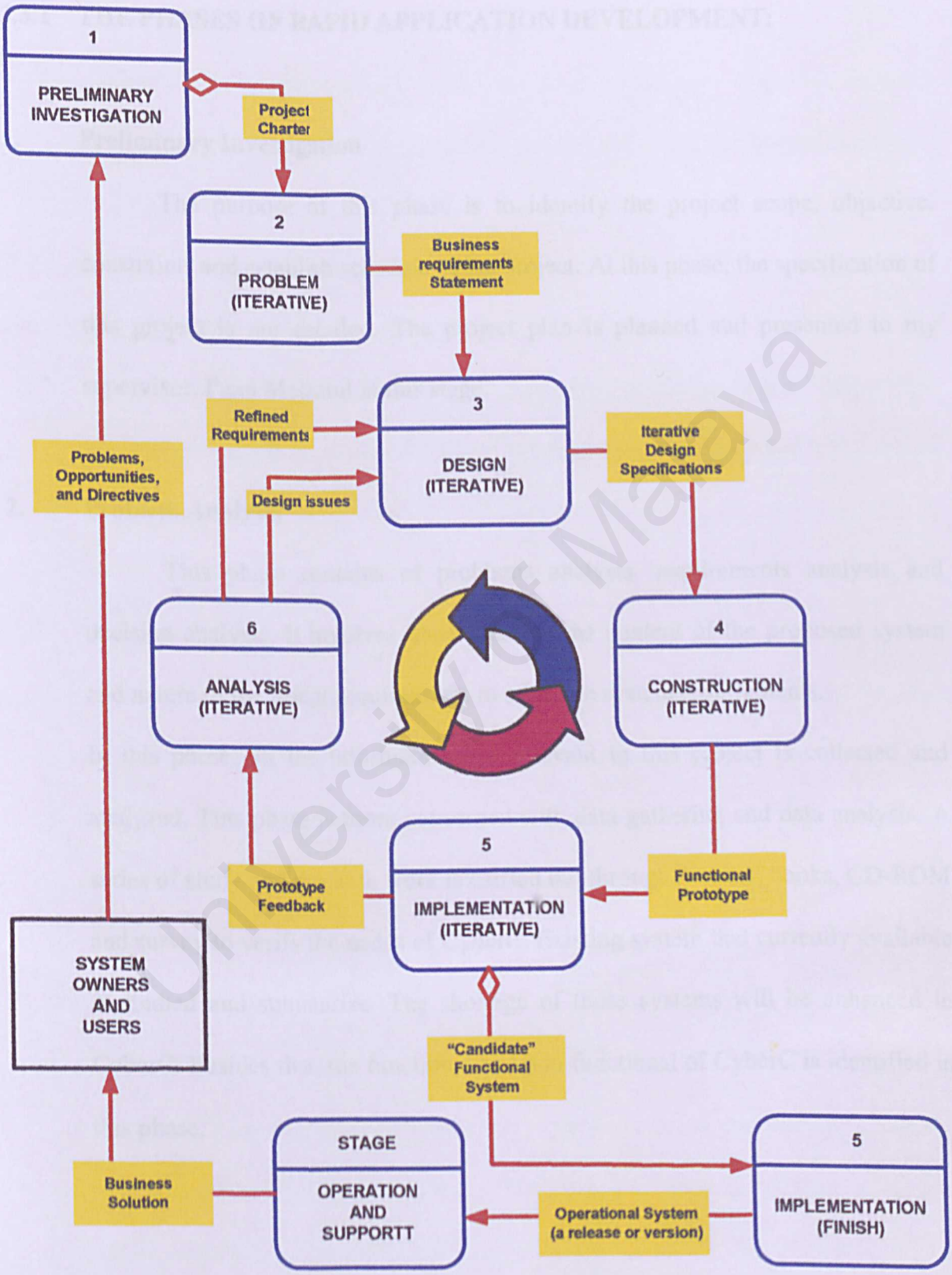



**Figure 3.1 Rapid Application Development Route [49]**

### 3.3.1 THE PHASES OF RAPID APPLICATION DEVELOPMENT:

**1. Preliminary Investigation**

The purpose of this phase is to identify the project scope, objective, constraints and establish schedule of the project. At this phase, the specification of this project is not detailed. The project plan is planned and presented to my supervisor, Puan Maizatul at this stage.

**2. Problem Analysis**

This phase contains of problems analysis, requirements analysis and decision analysis. It involves understanding the content of the proposed system and nature of the initial requirements to establish system requirements.

In this phase, all the information that relevant to this project is collected and analyzed. This phase is more concerned with data gathering and data analysis. A series of study and research work is carried out through internet, books, CD-ROM and survey to verify the needs of CyberC. Existing system that currently available is studied and summarize. The shortage of those systems will be enhanced in CyberC. Besides that, the functional and non-functional of CyberC is identified in this phase.

**Prototyping Loop**

This phase is iterative until it meets the final acceptance. This loop includes system design, system construction, system implementation and system analysis.

**3. Iterative Design**

In this stage, a prototype design is build based upon the results of the analysis of the initial requirements. The prototype is used to identify and refined the requirements of CyberC. This phase is repeats until the design of the system is satisfied and meets all the CyberC requirements.

**4. Iterative Construction**

This phase involves the actual coding of the prototype. The prototype will be included with JavaScript and ActionScript to further enhance the functionality of CyberC. Therefore, it needs greater time spent on this phase to work with the prototype.

**5. Iterative Implementation**

Prototype will be implemented which is uploaded to the internet using brinkster web hosting, in order to let users experience on the working prototype and give their feedback about CyberC. Requirements will be clarify and new requirements will be identified and provide feedback to the CyberC user interface design for the next iteration by loop back to the system design to redesign or modified the system.

**6. Iterative Analysis**

This phase is revisited to the feedback of the prototype. This analysis tends to focus on revising requirements and concerns with the design. The analysis cycles then back to iterative design and continue with the prototyping loop.

**7. System Implementation**

The functional prototypes will placed into operation in this phase. The addition of requirements will be release as the next version of CyberC and they may continue through the design-by-prototyping-loop.

### 3.3.2 TIME BOX

Technique that used to limit the duration of prototyping loop is timeboxing and the duration of the prototyping loop is 60-120 days. This is important in order to meet the dateline of CyberC.

## 3.4 JUSTIFICATION OF METHODOLOGY

The reasons for choosing Rapid Application Development as the development methodology are:

- **Meet earlier schedule**

Due to the limited time that available to develop CyberC, Rapid Application Development is chosen which it has the short development life cycle. CyberC can be built in the shortest possible time with prototyping. Prototyping makes requirements and problems of CyberC detected earlier, therefore reducing the CyberC development time.

- **Clarify/Define Requirements**

Requirements of CyberC can be identify in the early stage by gather the initial requirement via prototypes. Visibility requirements is easier to evolve and can determine whether the requirements are really fulfills the system requirements. This enables gaining understanding of the requirements, reducing the complexity of the problem and providing an early validation of the system design.

Early requirements validation is one of the key issues in development a system because failures to validate requirements can result in frequent changes in later stage of the system development. Therefore, incomplete and inconsistent requirements and missing functionality can be prevented.

- **Visibility**

  Prototyping provides a look at the dynamic states of CyberC before build it. The special problems of reliability, throughput and response time as well as system features are addressed in the best prototypes. Therefore, the problems can be fixed earlier and functionality of the system can be further identified.

- **Reduce risk**

  Errors and omissions tend to be detected early in prototypes than in system models. It is low risk for new application specification like CyberC which its requirements are not well specified. Prototype that used during feasibility studies promotes understanding of problem before trying to implement solution. It reduces risk and uncertainty because the technical solution is test iteratively instead of making a wholesale commitment to any solution.

- **Managing changes of requests**

  With prototyping, changes of requests can be done without great effort. Modifications to the requirements of CyberC are easily and possible to be done.

- **Demonstrate progress**

  Prototyping may demonstrate progress at an early stage of development. It will produce some useful deliverables of CyberC. This may provide proof of the system concept. Functionally feasible that demonstrates can stretches imagination, leading to more creative inputs and a more forward-looking CyberC.

- **Save on initial maintenance**

  Acceptance testing is doing all along the way to validate the requirements. Therefore, it reduces redesign and saves time for maintenance because problems are detected early.

## 3.5 CHAPTER SUMMARY

This chapter covers the methodology used in developing the proposed system which is Rapid Application Model. The justification of the development also included in this chapter.


# CHAPTER 4

# SYSTEM ANALYSIS AND DESIGN

# CHAPTER 4: SYSTEM ANALYSIS AND DESIGN

## 4.1 SYSTEM ANALYSIS

System analysis is a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose. It is a term that collectively describes the early phases of system development. Therefore, system analysis is an essential and important phases that must go through to determine all the requirements of a system before proceedings into subsequent phase. [49]

## 4.2 REQUIREMENT ANALYSIS

System requirement is the description of the needs and desires for an information system. A requirement may describe functions, features or attributes and constraints. Requirement analysis analyses and determines functional requirements and non-functional requirements of e-learning in C programming.

The primary goal of this stage is to develop a basis of mutual understanding between the system owner and the project developer about the requirements for the system. This is the initial baseline for determining whether the completed product performs as the system owners requested and expected.

This stage involves analysis of the system owner needs, translation of those needs into formal requirements and planning the testing activities to validate the performance of the product. [49]

### 4.2.1 FUNCTIONAL REQUIREMENTS

Functional requirements are concise textual statements of the functions or services that must be provide in an information system to satisfy the users need and be acceptable to the users. This includes how the system should reacts to a particular input and how the system should behave in particular situations. The system is considered incomplete if any of the necessary functions is not included. It is intended for top management, user management, and others who are not directly involved in the development of the system [1]. The following are the functional requirements for CyberC in structured format.

**1.0 User Registration and login Module**

This section will capture the user personal information.

1.1 Users will be given a username and password when they register according to their choice and the username is unique.

1.2 Users will have their own username and password in order to logging to the system.

1.3 Users will be given unlimited changes to logging to the system.

1.4 Only registered users can view the entire module available except guest book which they can give their comment about this system physically.

**Rational**: This is to recognize the users and only the particular user can view his/her own result and personal details.

## 2.0 Lessons Module

This module will gives information about C programming language to the users.

2.1 It contains of 15 lessons and it is divided into three volumes which determine the level of the syllabus.

i. Volume 1

Introduction to C programming

Control Structure: If-else, While, Do-while, Switch

ii. Volume 2

Functions, Array, Pointers and Strings

iii. Volume 3

C File Processing

2.2 Before each lesson, the objective of the lesson will be given.

**Rational:** This will ease the users to start from which volume depends on their experience and knowledge in C programming language

## 3.0 Quizzes Module

There are various kind of quizzes will be given in CyberC to attract users' attention. The type of the quizzes that available is different from a subtopic to a subtopic. Therefore, the users would not feel boring doing the same kind of quizzes after each topic.

3.1 The quizzes for a particular subtopic will be generated randomly which means each time the same users will get the different question for the same quizzes.

3.2 Answers of the questions will be prompted.

3.2 The score of the quizzes will be generated and display to the user but it would not store in the database.

**Rational:** This is to ensure the users' understanding and refresh what they learn after each subtopic in a lesson. Besides that, the question is generating randomly to eliminate users' boringness when they revise their lesson and would not get the same question as previous.

**4.0 Exercises Module**

Exercises will be providing after each lesson.

4.1 The questions of a particular exercise will be generated randomly to prevent users need to do the same question if they want more practice for the particular exercise.

4.2 The scores of the exercises will be generated and display to the user.

4.3 The scores of the exercises will be recorded and store in the database for users' reference.

4.4 Users can view results of the exercises that they have done and graph can be generated from the result.

**Rational:** This is to test the users' understanding after finishing a particular lesson. Practical can leads to better understanding and recall of knowledge.

**5.0 Forum**

Difficulties question in C programming language can be post in order to get other users opinions and discuss about the solution.

5.1 Only registered users can post questions in the forum room.

5.2 The questions that post by the users will be approved by the administrator before it is display to the other users. It is to eliminates questions that out of scope and not relevant.

5.3 Any registered users can reply to the questions that display in the forum room and answer that not relevant will be filtered by administrator.

**Rational:** Difficulties that face by the users can be question out and search for opinion from the other users to get a solution to it. Besides that, this can foster up the relationship among the users of CyberC.

**6.0 Reference Module**

6.1 Related link to C programming will be provided.

**Rational:** This is to provide additional information about C programming language to the users.

**7.0 Help File**

7.1 Helps topics will be provided to help users to accomplish their tasks.

7.2 User manual of the system will be provided.

**Rational:** This section is to assist the users when they face problem accessing the system. Besides that, users can search for keyword.

**8.0 Game Module**

Several games will be given in this section.

8.1 The games are related to C programming language.

8.2 Score of the games will be generated and display to the users.

**Rational:** Most of the people are willing to play games more than study. This indirectly increases the users' interest in C programming language and learning about C programming in order to play the games. Besides that, this can test their skills in C programming language and enhance the users understanding.

**9.0 Guest book Module**

9.1 Users' name will be in nick

9.2 Non-user are allow to sign the guest book as well

9.3 Comments will be recorded

**Rational:** This section is to get feedback from the users about CyberC. The comments will be considered in order to enhance the system.

**10.0 Mail**

10.1 Users of this websites can send CyberC websites to their friends and more people can learn C programming language effectively as it is a powerful language.

**Rational:** This is to promote CyberC to as many people as possible

**11.0 Data Management Module**

11.1 Only for administrator to manage the database of CyberC.

11.2 Add / Delete / Update Quizzes and Exercises Modules.

11.3 Approved posted forum and display to the users.

11.4 Manage users account and unauthorized a user status.

**Rational:** This is to maintain CyberC and keeps CyberC contents fresh and up to date.

### 4.2.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements are description of the features, characteristics, and attributes of the system as well as any constraints that may limit the boundaries of the proposed solution. Non-functional requirements that are included in the system in order to enhance system performance and descried the constraints imposed on the system. Non-functional requirements are as important as the functional requirements. This section states the non-functional requirements for e-learning in C programming. [1]

**1.0 User friendliness**

In order to easily use by novice user who would not able to comprehend complex interface, the system should have a user-friendly interface. User interface design creates an effective communication medium between a human and a computer

1.1 The system should use Graphical User Interface (GUI) approach in order to provide better understanding of how to use the system

1.2 The interface should use the meaningful captions and titles in order to help the uses to use the system without any confusion.

1.3 The system should provide a simple menu so that user can obtain an overview of the system.

**Rational:** This would not cause trouble of using the system to users and provides better communication between the system and users.

**2.0 Attractive interface**

2.1 Comfortable background

2.2 Colour of the overall system will be consistent so that it will not distractive

**Rational:** As this is a learning site, therefore it would attract people attention to access this site if this website looks attractive because nowadays most of the people not interested in study purposes.

**3.0 Response Time**

3.1 The system should response instantly when users access the website of the system

**Rational:** This is eliminates people from fade up if the system download time is short and response spontaneously.

**4.0 Interactive**

4.1 The system should present response with every step of users take.

**Rational:** This is to gives users response while they use the system

**5.0 Reliability**

The frequency and critically of system failure where failure is an unacceptable effect or behavior occurring under permissible operating system

5.1 Failures of system should not occurs or not frequent.

5.2 CyberC should suitable for all kinds of computer platform and not cause destructive to user's machine.

5.3 CyberC should last longer, minimum five years.

**Rational:** This is to get users' reliable on CyberC.

## 6.0 Maintainability

Changes can be made easily to satisfy new requirements or to correct deficiencies.

6.1 New module can be added in CyberC.

6.2 Lessons, quizzes and exercises can be updated to the latest format according to the current educational trends.

6.3 Quizzes and tutorials that outdated can be deleted to maintain database space.

6.4 System faults can be detected and fixed in the shortest time.

**Rational:** The system can be adapted if there is a changes in requirements or enhance in the future.

## 7 Security

7.1 Users who need to use this system have to register.

7.2 Registered need password and username to logging to the system.

**Rational:** System can recognize the user and personal information and result of the user will not exposed to the other people.

## 4.3 DEVELOPMENT REQUIREMENTS

### 4.3.1 HARDWARE REQUIREMENTS:

| | Hardware Required | Description |
|---|---|---|
| **Processor** | Pentium II 300 MHz or equivalent | The minimum requirements in order to author Macromedia Dreamweaver MX |
| **Operating System** | Microsoft Windows XP | This platform is chosen because most of the computer in FSKTM is currently installed with Microsoft Windows XP. |
| **Memory** | 128 MB RAM | This amount required to run Macromedia Dreamweaver MX and Macromedia Flash MX. |
| **Hard Disk space** | 500 MB Hard disk | This amount of hard disk space required to store the database of the database, documentation and the entire system component. |
| **External device** | Printer | Printer needs to print all the documents that needs for the system development |

| | | |
|---|---|---|
| **Others** | Internet Connection | This is to test the system when it is upload to the internet |

**Table 4.1 Hardware Requirement for development side**

### 4.3.2 SOFTWARE REQUIREMENTS:

| | **Software Required** | **Description** |
|---|---|---|
| **Office Version** | Microsoft Office XP | Needed for produced system documentation |
| **Authoring Tools** | Flash MX<br>Dreamweaver MX | Creates and manages CyberC as a online application. |
| **Graphic Authoring** | Adobe Photoshop 7.0 | Editing graphic that needed in the system |
| **Sound Authoring** | Cool Edit | This is used to recorded required audio and insert in the system |
| **Web Browser** | Internet Explorer 5.5 | This application is used enable users view online files including ative server pages |
| **Web Server** | Internet Information Service | Used to open the path way for clients to get access to web files |
| **Web Technology** | ASP.NET | A client side scripting language for provides interactivity with the server |
| **Playback** | Macromedia Flash Player | This needed to play back movies in |

| | | |
|---|---|---|
| | 6.0 | browsers (SWF). |
| **Database Management System** | Microsoft Access XP | This is used to create the database |

**Table 4.2 Software Requirement for development side**

## 4.4 User Side Requirements

User Side requirements will be much lower than development side because they just need it to view the system and the output will be dependent on the users' processor speed and internet connection.

### 4.4.1 HARDWARE REQUIREMENTS:

This requirement is making according to the Macromedia Dreamweaver MX and Flash Player.

For Windows

Intel Pentium 200MHz processor or equivalent processor running

Windows 98, Windows ME, Windows NT, Windows 2000 or Windows XP

32 MB RAM (128 MB is recommended)

20 MB of available disk space

Internet Connection

A 16-bit color monitor capable of 1024 x 768 resolutions

For Macintosh

Macintosh PowerPC with System 8.6 or later

Mac OS 9.1, Mac OS 9.2.1, or Mac OS X 10.1 or later

32 MB RAM (128 is recommended)

20 MB of available disk space

Internet Connection

### 4.4.2 SOFTWARE REQUIREMENTS

For Windows

Microsoft Internet Explorer 4.4, Netscape Navigator 4.5 or later

Macromedia Flash player 5.0 or above

For Macintosh

Microsoft Internet Explorer 4.4, Netscape Navigator 4.5 or later

Macromedia Flash Player 5.0 or above

## 4.5 DEVELOPMENT TOOL ANALYSIS

### 4.5.1 OPERATING SYSTEM

Windows technology is chosen as the development platform because it is easy to install using interface wizard and user friendly compare to the other operating system. Microsoft Windows XP will be the chosen operating system for develop CyberC.

The main reason choosing Microsoft Windows XP as the development operating system because most of the computers in Faculty of Computer Science and Information

System are currently run with Microsoft Windows XP. Besides that, most of the home personal computers are installed with Microsoft Windows XP. [24]

Microsoft Windows XP is among the latest operating system and this can make sure the system can last longer and would not outdated in the coming few years.

### 4.5.2 WEB AUTHORING TOOLS

- **Macromedia Flash MX**

Macromedia Flash MX is chosen as animation developer for CyberC because it is easy to use with its user-friendly interface. Therefore, motion graphics with synchronized sound can be creating in the shortest time. Besides that, it uses compact vector graphics that enable users download rapidly and scale to the users' screen size.

- **Macromedia Dreamweaver MX (XHTML editor)**

Macromedia Dreamweaver MX is chosen as the management tool for CyberC because it is a professional visual editor for managing and creating web pages. It provides users two views which are codes and design in a screen which ease in design the page layout.

Macromedia Dreamweaver writes clean code without a lot of proprietary and self-serving tags. Besides that, Macromedia Dreamweaver can easily integrate with Macromedia Flash MX that used to create animation for CyberC.

### 4.5.3 CLIENT-SIDE SCRIPTING LANGUAGE

XHTML will be chosen as client-side scripting language because it provides neat and clean coding than HTML. CyberC will be enhanced with JavaScript and ActionScript.

### 4.5.4 SERVER-SIDE SCRIPTING LANGUAGE

ASP.NET will be chosen as the server-side scripting language. The time that required familiar with ASP.NET is shorter than CGI. Therefore, this can reduce the development time. The reasons why ASP.NET is chosen over ASP are:

- **Easy programming model**

ASP.NET server controls enable an HTML-like style of declarative programming that let one build great pages with far less code than with classic ASP. ASP.NET pages work in all browsers including Internet Explorer, Navigator Netscape, Opera and American Online.

- **Compiled Execution**

ASP.NET is much faster than classic ASP. No explicit compile step is required. ASP.NET will automatically detect any changes, dynamically compile the files if needed and store the compiled results to reuse for subsequent requests.

[MSDN Library, 2002]

### 4.5.5 WEB SERVER

Internet Information Server (IIS) is chosen as CyberC web server because it is easy to install and user-friendly rather than Apache which have complex configuration. Therefore, the time that needs to configure and manage IIS is shorter than Apache.

Since Microsoft Windows XP will be used as the platform for developing CyberC and ASP.NET will be chosen as the server-side scripting language, IIS is the best choice. IIS is included in Microsoft Windows XP as optional function that leads to easily configurable on Windows XP besides includes a broad range of administrative features for managing Web sites and Web server. With programmatic features like ASP.NET, flexible Web applications can be create.

### 4.6.6 DATABASE MANAGEMENT SYSTEM

Microsoft Access XP is chosen as the database management system. This version is chosen because it suits to run under Microsoft Windows XP which chosen as operating system for CyberC's development.

The main reason choosing Microsoft Access as CyberC database management system because it is suitable for use with medium sized databases which it only used to store users information, exercises answers and forum that posted.

Microsoft Access XP is powerful and easy to use. It can design the database quickly due to its user-friendly interface. This can reduces the time needed to develop the database and can concentrate more on the front-end of the system which is directly face with users.

## 4.6 INFORMATION GATHERING METHODS

Collecting information from various sources is necessary to seek further understanding towards this proposed system. The information collected assist in system analysis and requirements analysis. Several techniques have been adopted in order to elicit all the information required such as Internet surfing, referring to printed documents, analyzing pass year's thesis, analyzing existing systems, discussion with lecturer and questionnaires distribution.

**a) Internet Surfing**

Internet surfing is the major source for fact finding in the development of CyberC. It is due to its high speed, convenience and up to date information. Needed information about C programming can easily be access by search engines and there is a lot of information available from different sources. Besides that, uncertainty question can be questioned and discuss over the internet friends in a forum. Indirectly, opinions can be obtained from people all over the world. Information on existing C programming learning package is collected from the World Wide Web as well.

**b) Printed Documents**

Reference books that from the University Malaya's main library provide ample information for clear understanding about the concept of development tool such as Macromedia Flash and Dreamweaver that are needed in CyberC development.

c) **Pass Years Thesis**

Several pass year theses documentations had been studied to get a better idea on software development skills. Besides that, it provides a guideline in producing CyberC report. Those theses are reached from the Faculty of Computer Science and Information Technology, University Malaya's documentation room.

d) **Analyzing Existing Systems**

Observing the existing systems can generate ideas that help in CyberC development. However, most existing systems available on the Internet such as "GurukulOnline" and "MindLeader" require payment in order to use the system. Only demo systems can be view without any charges. Therefore, only a small part of the existing system can be accessed. Existing systems such as "C Programming Tutorial System" that can be viewed without any payment in the internet are usually in plain text without much multimedia elements.

e) **Discussion with Supervisor**

Useful advices had been given for each conversation conducted with supervisor of project via personal meetings or emails. Theses format had been provided by supervisor in order to complete CyberC project plan in a correct manner.

f) **Questionnaires distributions**

A survey conduct through questionnaires is carried out to collect information and opinions from respondents. The questionnaire is distributed to respondents, who can then complete the questionnaire on their own time. Questionnaires allow collected facts from a large number of people while maintaining uniform responses. Fixed-format questionnaire is used to conduct the survey. The respondent is given several answers to the given questions and they must choose from the available answers. This makes the result much easier to tabulate.

## 4.7 SYSTEM DESIGN

System design focuses on the technical or implementation concerns of the system. It is a process of transforming the problems into a solution and referred as the description of a solution. The description of a system may change during the system development life cycle since the nature of the solution may change as the solution is described or implemented. During the design phase of CyberC, the features and components of the system are specified.

The development of the CyberC is done using a prototype approach and it is a client-server application. The prototype approach allows all or part of the system to be constructed quickly to understand and clarify some issues. Besides that, it ensures that the requirements could be reduced in the development. [49]

## 4.8 DATABASE DESIGN

The database for CyberC is used to store the users information, forum that posted, reply to forum, answer of the exercises and result of the exercises that taken by users. Besides that, it also stores users comment about CyberC for CyberC enhancement purposes.

### 4.8.1 DATA DICTIONARY

a) Table Name : Usermaster

Description : This table stores the login information of users for validation of logging into the system

| Column Name | Data Type | Length | Description |
|---|---|---|---|
| UserID | Text | 8 - 10 | Identification of the user in CyberC |
| Password | Text | 8 - 10 | Password to validate logging in |
| Name | Text | 50 | Full name of the users |
| AccessRights | Text | 5 | To determine whether is administrator or users |
| Isbanned | Number | 1 | To determine the authorize to logging to the system |
| Email | Text | 50 | Email of the users |
| Country | Text | 50 | Country of the user |
| Gender | Text | 50 | Gender of the user |
| Age | Text | 50 | Age of the user |
| Education | Text | 50 | Education level of the user |
| Date Register | Date / Time | 17 | The date and time the user register |

**Table 4.3: User Login Table**

b) Table Name : Exercise

Description : To store the answer for each question of the exercises in CyberC.

| Column Name | Data Type | Length | Description |
|---|---|---|---|
| ExerciseID | Text | 50 | To store the special ID for the exercise |
| Question | Memo | 25000 | Question |

| | | | |
|---|---|---|---|
| Answer_A | Text | 50 | To store the option for an answer if question is objective |
| Answer_B | Text | 50 | To store the option for an answer if question is objective |
| Answer_C | Text | 50 | To store the option for an answer if question is objective |
| Answer_D | Text | 50 | To store the option for an answer if question is objective |
| Answer_E | Text | 50 | To store the option for an answer if question is objective |

**Table 4.4: Exercise Table**

c) Table Name : ViewTopic

Description : To store the topic available in the forum

| Column Name | Data Type | Length | Description |
|---|---|---|---|
| TopicID | AutoNumber | 50 | To store the special ID for forum |
| Name | Text | 50 | The topic of the forum name |

**Table 4.5: Forum's topic table**

d) Table Name : Thread

Description : To store the thread for each topic in the forum

| Column Name | Data Type | Length | Description |
|---|---|---|---|
| ThreadID | AutoNumber | 50 | To store the special ID for thread |
| Name | Text | 50 | The name of the thread |
| TopicID | Number | 50 | The special number of the topic |

**Table 4.6 : Forum's thread table**

e) Table Name : Messages

Description : To store the message posting to the forum

| Column Name | Data Type | Length | Description |
|---|---|---|---|
| MessagesID | AutoNumber | 50 | Auto-generation of number |
| Subject | Text | 50 | Subject of the message |
| Message | Text | 25000 | To store the answer posted to forum |
| Author | Text | 8 -10 | Identification of the user |
| ThreadID | Text | 50 | To store the thread special ID |
| Posted | Date/Time | 17 | To store the date the reply is posted |

**Table 4.8: Posted forum table**

f) Table Name : Guestbook

Description : To store the comments from the users for CyberC.

| Column Name | Data Type | Length | Description |
|---|---|---|---|
| EntryID | Number | 50 | The auto-generation of number |
| UserName | Text | 8 - 10 | To store the nick name of the user |
| Comments | Memo | 100 | To store the comment provided |
| Email | Text | 50 | Email of the users |
| TimeSign | Date/Time | 17 | To store the date the comments is oisted |
| Status | Number | 1 | To store the status of comment approval |

**Table 4.8: Guest book table**

### 4.8.2 ENTITY RELATIONSHIP (ER) DIAGRAM

Entity Relationship Diagram used organize and document CyberC's data. The following diagram represents the CyberC database relationship.

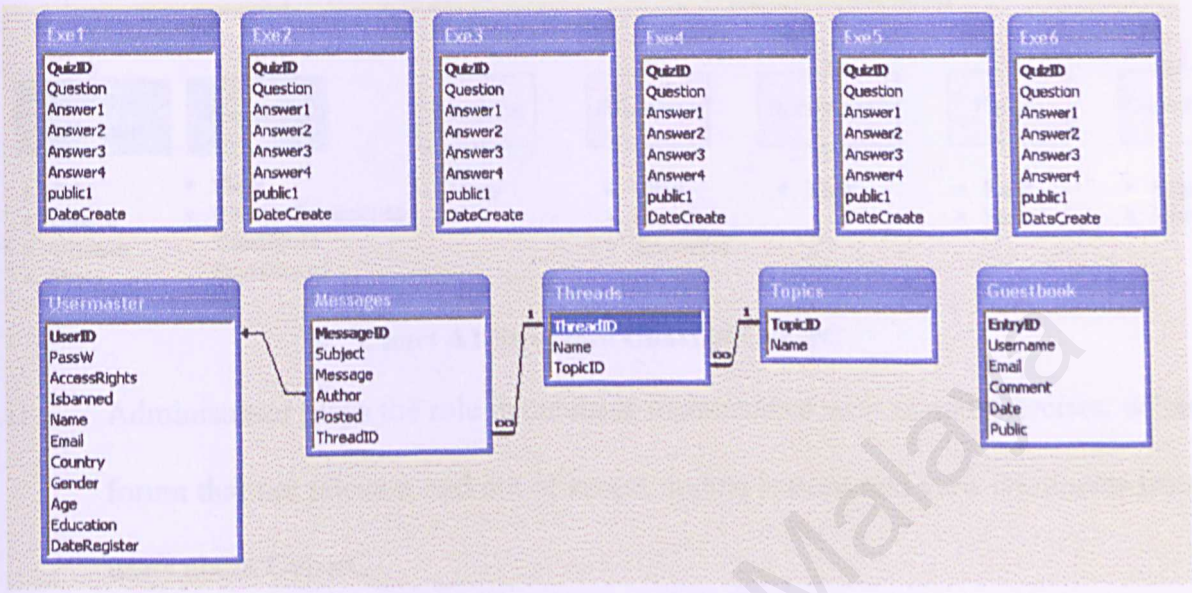



**Figure 4.1 CyberC ER-Diagram**

## 4.9 PROGRAM DESIGN

System functionality design is based on the system requirements stated in System Analysis. It translates the system requirements into system functionality. This design focuses on the system structure design, flow charts and data flow designs. CyberC is divided into two categories which are administrator and users. Figure 4.1 shows the structure chart of the system.

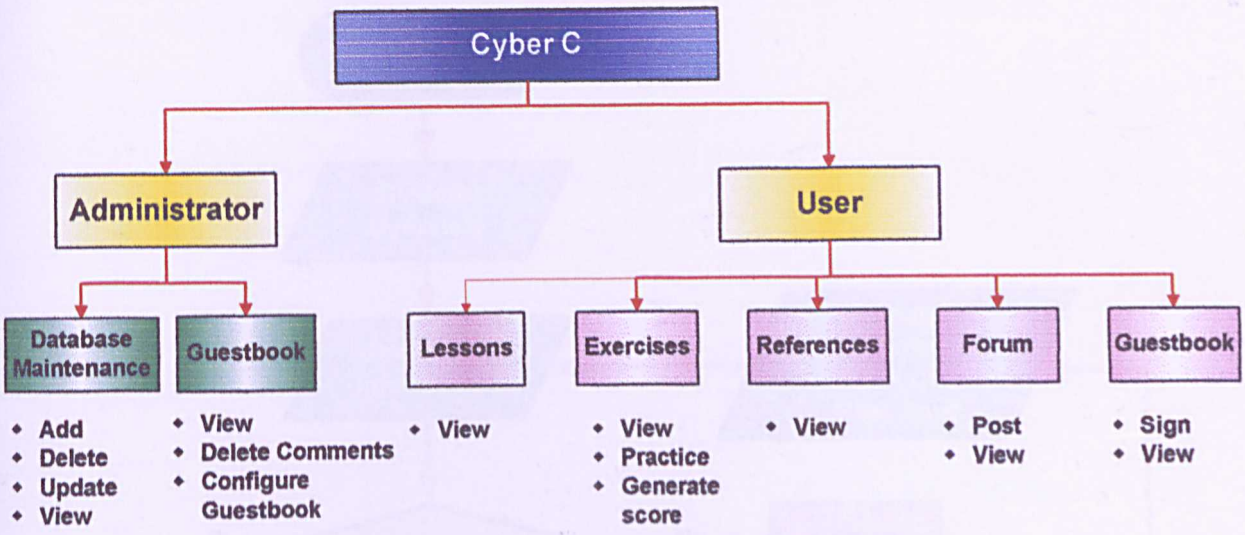



**Chart 4.1 Structure Chart of CyberC**

i) Administrator plays the role in database maintenance such as add exercises, delete forum that not relevant and out of scope, update lessons and view comments from users about CyberC.

ii) Users can view lessons, practice exercises, view references about C programming language, post and view forum and sign guest book.

### 4.9.1 FLOW CHARTS

Flows Chart determines the sequences of process in CyberC. Figure 4.2 shows the general data flows of users.

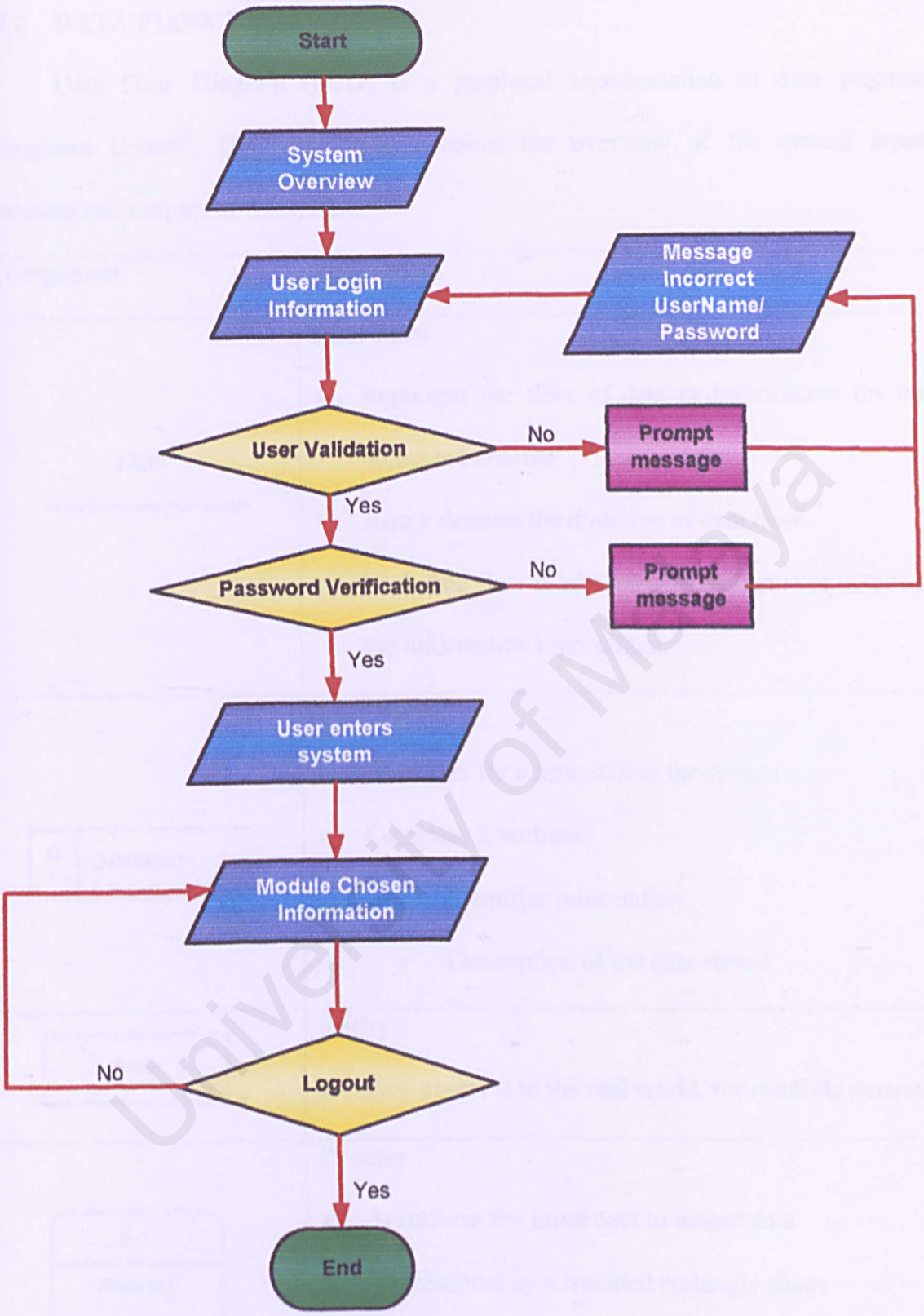



**Chart 4.2: General data flow for users of CyberC**

### 4.9.2 DATA FLOW DIAGRAMS

Data Flow Diagram (DFD) is a graphical representation of data processes throughout CyberC. DFD graphically depicts the overview of the system inputs, processes and outputs of the system.

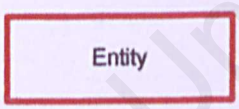
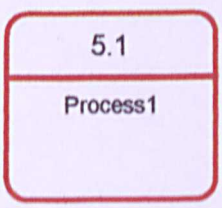
| Component | Description |
|---|---|
| Data  | **Data Flow**<br>➢ Represent the flow of data or information for one object ore another<br>➢ Arrow denotes the direction of data flow<br>➢ Each data flow is labeled with the name or details of the information represented. |
|  | **Data Store**<br>➢ Hold data for a time within the system<br>➢ Comprise 2 sections:<br>• Identifier information<br>• Description of the data stored |
|  | **Entity**<br>➢ Any object \s in the real world, for example person |
|  | **Process**<br>➢ Transform the input data to output data<br>➢ Represented by a rounded rectangle shape |

**Figure 4.2 Symbols in Data Flow Diagram**

a) **The Context Level Diagram of CyberC**

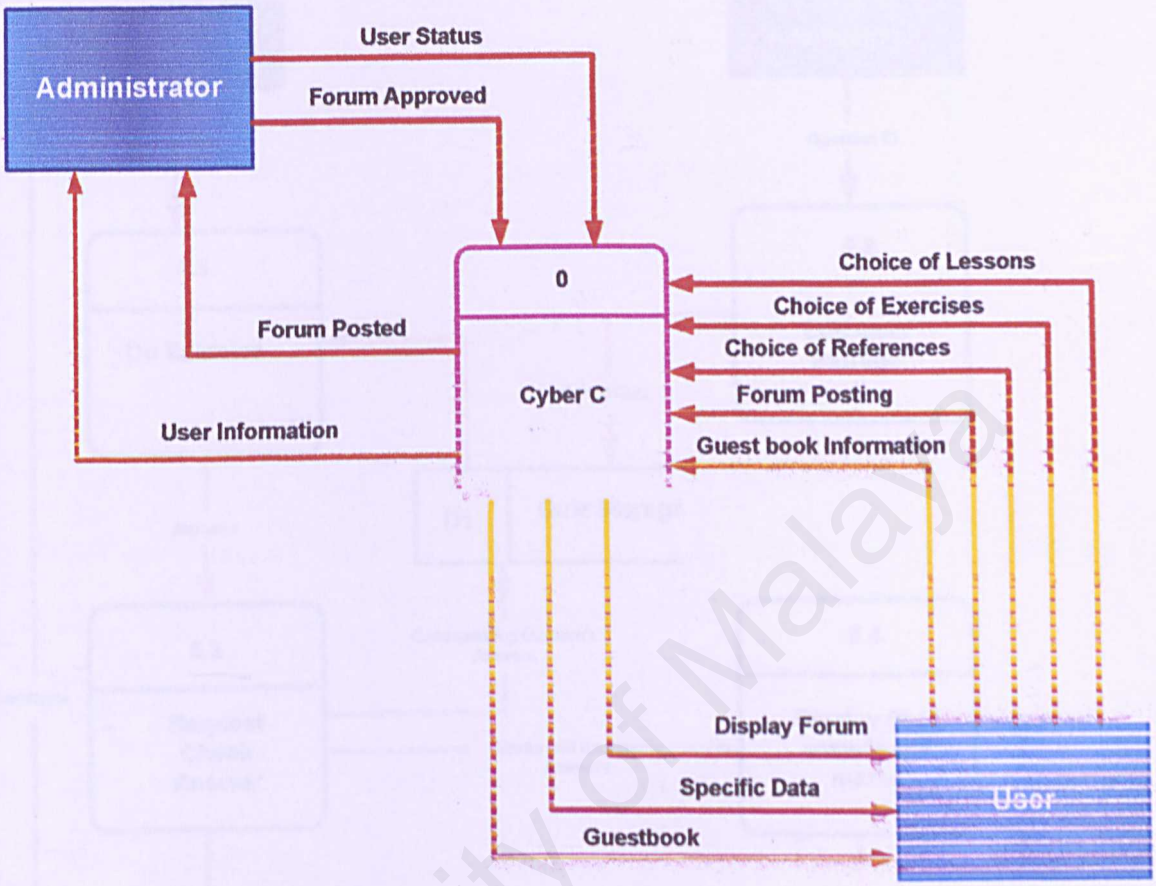



**Figure 4.3 The context level diagram of CyberC**

b) **The Data Flow Diagram of User Login Module**

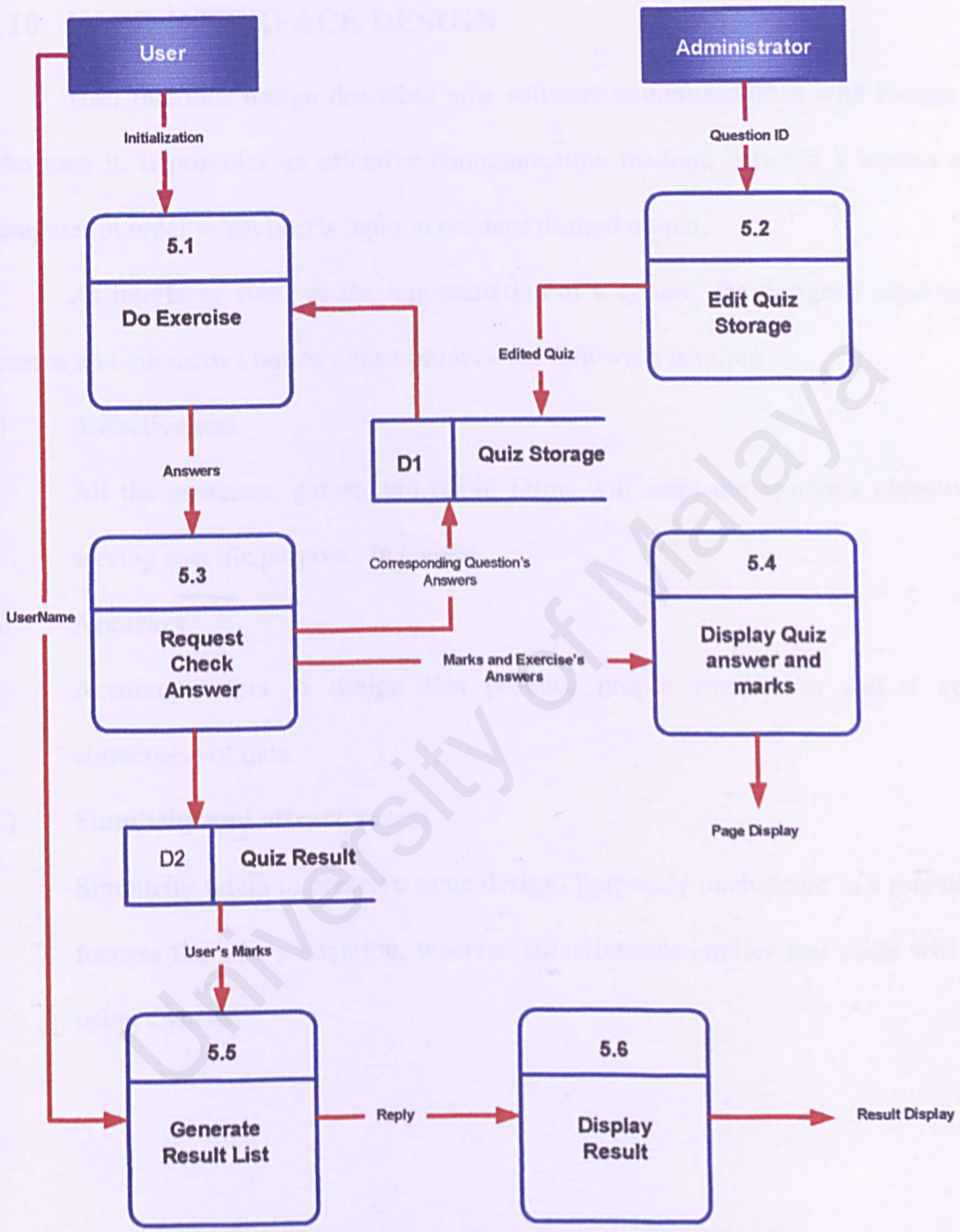



**Chart 4.3 Data Flow Diagram of Exercises Module**

## 4.10 USER INTERFACE DESIGN

User interface design describes how software communications with human user who uses it. It provides an effective communication medium between a human and a computer in order to get user's input to produce desired output.

As interfaces stand as the representation of a system, the designed input forms, screens and interactive buttons must produce the following features:

**a) Effectiveness**

All the exercises, games and fill-in forms will meet the system's objective by serving specific purposes in CyberC.

**b) Accuracy**

Accuracy refers to design that produce proper completion and it ensures correctness of data

**C) Simplicity and attractiveness**

Simplicity refers to preserve same designs purposely uncluttered in a manner that focuses the user's attention, whereas attractiveness implies that users will enjoy using CyberC.


**Figure 4.4 Prototype of CyberC**

## 4.11 Chapter Summary

This chapter clearly stated the functional and non-functional requirements of CyberC in order to build an operable and successful system. The justification of which software and hardware to use is also elaborated in great detailed. It also takes into account the information collection techniques that has been used during the documentation of the system

Besides that, it also describes in details how CyberC will meet the requirements identified during analysis phase. The CyberC database design describes the database schema. All the related fields for the CyberC are being identified and defined. Finally, the program design is being decomposed into smaller identifiable sub system. The ER-Diagram and Data Flow Diagram of CyberC are created. The ER-Diagram used to model the system raw data before the creation of Data Flow Diagram. The DFD shows the creation, reading, deletion, or updating of data in CyberC database.


# CHAPTER 5

# SYSTEM IMPLEMENTATION

# CHAPTER 5: SYSTEM IMPLEMENTATION

## 5.1 INTRODUCTION

This chapter will explain the coding methods, techniques, important scripts involved in the development or implementation of CyberC as well as the functions or effects that are produced by these methods or scripts.

System Implementation is a phase that reviews the specification of the system requirements and then transforms it into an operational system through coding and animations. It integrates the designed modules or functions to develop a system based on the given requirements. It includes system development environment, program coding, and animation and database development. In order to achieve that, appropriate tools and languages are required to be chosen in a careful manner to avoid wastage of time and cost.

## 5.2 DEVELOPMENT ENVIRONMENT

Development environment has certain impacts on the development of a system. Choosing the suitable tool could speed up system development.

### 5.2.1 DEVELOPMENT TOOL

Tools used for development include:

a. Operating System : Microsoft Windows XP

b. Application Environment : Microsoft Visual Studio.NET

c. Web Server : Microsoft Internet Server 5.1

d. Program Coding : ASP.NET

e. Animation Generation : Macromedia Flash MX

f. Database Development : Microsoft Access 2000

g. Graphic creation : Adobe Photoshop 7.0

h. Web development : Microsoft Dreamweaver MX

#### 5.2.1.1 OPERATING SYSTEM

Microsoft Windows XP is used to initial the development when using Microsoft Visual Studio.NET and Macromedia Flash MX.

#### 5.2.1.2 APPLICATION ENVIRONMENT

Microsoft Visual Studio.NET used to be the platform for CyberC application.

#### 5.2.1.3 WEB SERVER

Microsoft Internet Information Services is chosen because it supports the execution of client and server side programming.

#### 5.2.1.4 PROGRAM CODING

ASP.NET is used to build the platform of CyberC. Within this platform, HTML code, ADO.NET and scripting languages are integrated with ASP.NET

#### 5.2.1.5 ANIMTATION GENERATION

Macromedia Flash MX is used to develop the animation file within CyberC. It used with ActionScript to enhance the animation. It used to development the introduction page of CyberC, lessons section and how to use Microsoft Visual C++ section.

#### 5.2.1.6 DATABASE DEVELOPMENT TOOL

Microsoft Access 2000 is chosen to build the database structure for CyberC. It is used to store the users' information, view and edit tables created in the database.

#### 5.2.1.7 GRAPHIC CREATION TOOL

Adobe Photoshop 7.0 is used to create graphic needed in the CyberC. Besides that, it also used to edit those pictures and setting the graphic resolution.

#### 5.2.1.8 WEB DEVELOPMENT TOOL

Macromedia Dreamweaver MX is used to develop CyberC interface. HTML and JavaScript is used in Macromedia Dreamweaver to create Web behaviors.

## 5.3 ANIMATION AND MULTIMEDIA APPROACHES

Animation contains in CyberC is created using Macromedia Flash MX. Macromedia Flash MX is the professional standard authoring tool for producing high-impact Web experiences. It provides a lot of flexibility in creating animation.

### 5.3.1 ANIMATION CREATION

The graphics created in Macromedia Flash MX are vector graphics. Most of the object and graphic that used in the animation for CyberC are created in Flash MX itself using the authoring tool provided. Only certain graphic like screenshot images are edited using Adobe Photoshop 7.0 then imported into flash.

The animation is done on separate layer before it is being group together to form a meaningful object. A group of layer forms either a movie clip or part of the movie clip. Those layers consists keyframe that moves along with the timeline. A keyframe is a frame, which defines a change in an animation .The order in which frames and keyframes appear in the Timeline, determines the order in which they are displayed in the movie. The keyframes is arranged in the Timeline to edit the sequence of events in the movie. Dragging a keyframe in the Timeline can change the length of an animation. Figure 5.1 is a part of Timeline in CyberC introduction page and Figure 5.2 is part of the animation created using Flash MX.

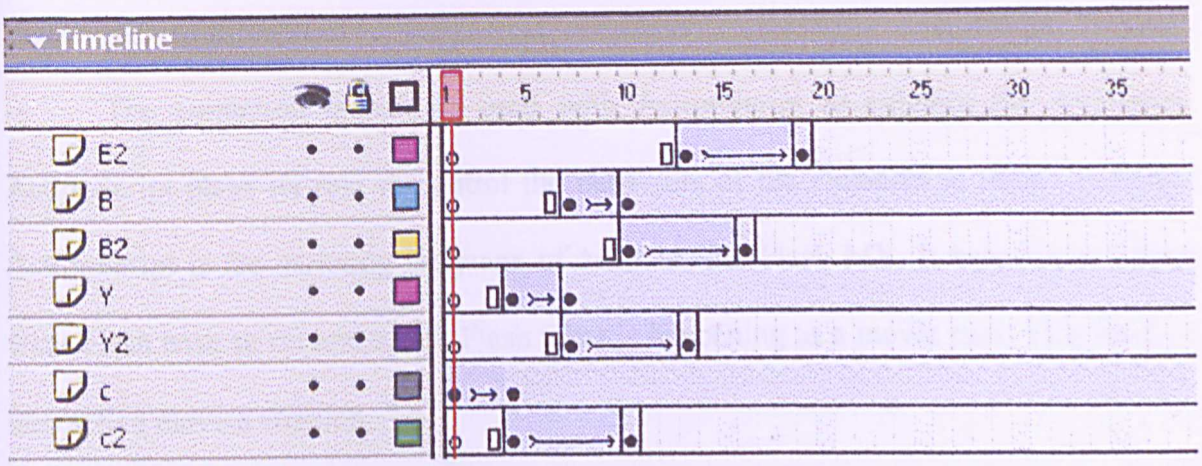



Figure 5.1 Screenshot of Timeline in CyberC introduction page


Figure 5.2 Screenshot of animation created using Flash MX

### 5.3.2 SCRIPTING

The animation created is used with ActionScript to enhance the animation. ActionScript plays its role in control the behaviors of the elements or object in Flash. ActionScript is the scripting language of Macromedia Flash MX. It behaves in telling what Flash have to do and to ask Flash what is happening as a movie runs. This leads to interactive movies creation.

Frame actions are used to modify the movie flow. To make a movie perform an action when the playhead reaches a frame in the Timeline, a frame action is assigned to it. For an example, to move from frame 10 to 20, an action will assign to the frame 10, which is *gotoAndPlay (20);*

.

### 5.3.3 BUTTON CREATION

Buttons created in flash is used to control the movie flow. The button function is creating using ActionScript. To make the movie perform an action when a button is clicked or rolled over, an action is assigned to the button.

Figure 5.3 shows an example of button created in Flash and used in CyberC lessons section.

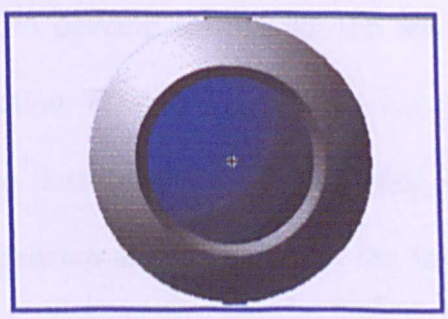


Figure 5.3 Button created using Flash MX

### 5.3.4 LOAD SOUND INTO MOVIE

Sounds are imported into flash and edited using the sound-editing controls provide in Flash MX. After editing the sound to the desired result, it is loaded into the movie dynamically using ActionScript. Besides that, sounds are added to buttons to make them more interactive.

### 5.3.5 QUIZZES CREATION

Quizzes in the lessons section are created using Flash. It is loaded randomly from a text file using ActionScript into the movie. It is calling from a text file rather than write the script straight away in the Flash is to increase the maintainability. This means new quizzes can be added into the text file easily rather than into the Flash using ActionScript for users who are not a Flash expertise.

### 5.3.6 PUBLISH THE FLASH

Flash documents, which have the .fla filename extension, contain all the information required to develop and design the interactive content include the timeline of the animation. Flash documents are not the movies the Flash Player displays. Instead, FLA documents will be publishing as Flash movies, which have the .swf filename extension and contain only the information needed to display the movie and it is standalone.

## 5.4 CODING APPROACH

CyberC was developed modularly, mainly by using the bottom-up approach. This approach develops functions and procedures before proceeding to the higher-level modules.

## 5.5 CODING PRINCIPLE

Several programming principles are applied in the coding the program to ensure the system consistency, maintainability and readability.

- Indenting, formatting and commenting the code help to increase the program code's readability.
- Using a variable naming conversion consistently increase the program's consistency and maintainability.

## 5.6 DEVELOPMENT OF CYBERC

Most of the codes in CyberC are HTML tags, ASP.NET Scripts and Visual Studio.NET programming codes. HTML (Hypertext Markup Language) is used o create the user interface and design for the system. Besides that, JavaScript is used to handle interactive effects in CyberC. In order to make the web pages more dynamically as well as to process or execute the request from the user and validation of user input, ASP.NET is the script that used mostly in CyberC.

The main functions produced by ASP.NET scripts are as follows:

- Store the temporary information of a session, for an example, storing a UserID in a session variable to keep track which user is signing in at that time and provide a dynamic page that cater for that user.
- Enables authorized and registered users to submit input information for storage, for an example, storing message posted in forum in database.
- Enables users to work on question online and getting their questions mark automatically.
- Enable admin to view and manage users, forum and guestbook sections in CyberC.
- To retrieve the data from the database and display the information in the table form. For example, view guestbook and forum sections.
- Enables users to change their password and verify their current password before changing the password.
- Enables users to communicate with admin and tell their friends regarding CyberC website using email.

### 5.6.1 FORM CREATION

Forms are created using HTML for users to input and pass the data to the server. In the Registration Module, users are allowed to register themselves using form. The forms are done using HTML's form tag because HTML form can hold the data of the user and pass it to the ASP.NET code to process them.

### 5.6.2 PROCESSING OF FORM USING ASP.NET

After designing and creating form for the user to enter the input, the next stage is to insert ASP.NET code inside the processing page so that the data entered can be processed by the server and updated in the database. Figure 5.4 shows how the form is processed.

```
sql = "SELECT * from Usermaster WHERE UserID = '" & _
      Request.Form("TextBox1").ToString() & "'"

        Dim objCommand As New OleDbCommand(sql, conn)
        Dim objDataReader As OleDbDataReader
        objDataReader = objCommand.ExecuteReader()

        If objDataReader.Read() = True Then
            MsgError.Text = " -- The username already exist, please
                        choose another one -- "
            TextBox1.Text = ""
        Else
        objDataReader.Close()

            cmd = New OleDbCommand("INSERT INTO Usermaster(UserID,
                  PassW, Name, Email, Country, Gender, Age,
                  Education, AccessRights,Isbanned, DateRegister)
                  VALUES ('" + TextBox1.Text + "', '" + TextBox2.Text
                  + "','" + TextBox4.Text + "','" + TextBox5.Text +
                  "','" + DropDownList2.SelectedValue + "', '" +
                  DropDownList4.SelectedValue + "','" +
                  DropDownList1.SelectedValue + "','" +
                  DropDownList3.SelectedValue + "',0,0, Now)", conn)
          cmd.ExecuteNonQuery()
```

Figure 5.4 Processing of Registration Form by ASP.NET coding

## 5.7 DEBUGGING

Debugging is an activity to trace and fix errors in the system with minimum time required. In Visual Studio.NET, the process of debugging starts by pressing F5. The errors types detected by Visual Studio.NET include compiler error, run-time error and logic error. Besides that, the coding can be trace line by line by pressing F11. Figure 5.5 shows the output of the debugging process.

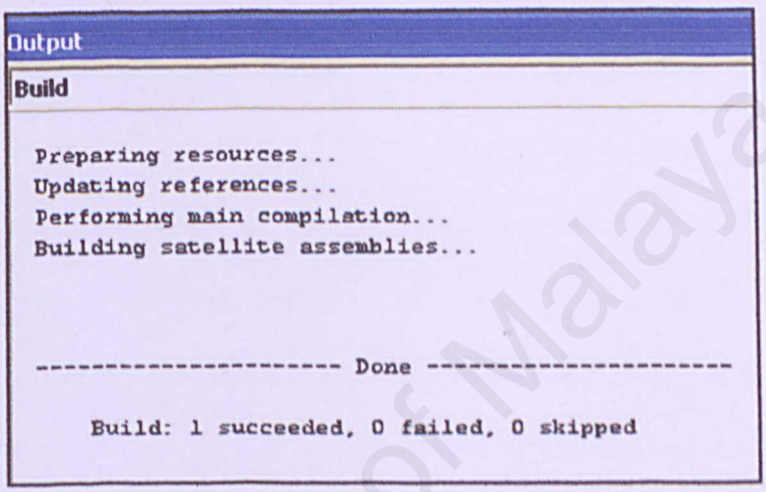



Figure 5.5 Output of the debugging process

## 5.8 SUMMARY

This chapter stated the System Implementation in CyberC from the creation of animation to the used of form for user input using ASP.NET in the back end. The development flow of CyberC is well layout in this chapter. Each and every process involved is also explained.


# CHAPTER 6
# SYSTEM TESTING

# CHAPTER 6: SYSTEM TESTING

## 6.1 INTRODUCTION

Testing is a processed of verification and validation of a system. It is the major quality control measure during prototyping. When a system is coming in its way, it is always important for developer to conduct various tests on it. The reason testing are done is because it needs to be well presentable to the users. Testing of systems is supposed to be conducted at various stage of the development process.

Testing not only mean to clear off bugs and coding error, but also to ensure the system is able to fulfill all the requirements specified. Therefore, through testing, a system is supposed to be not only bug free but also featuring all the requirements proposed.

## 6.2 TYPES OF TESTING

Testing can be classified into various categories. In the development of CyberC, tests conducted are according to the flow chart as of below:

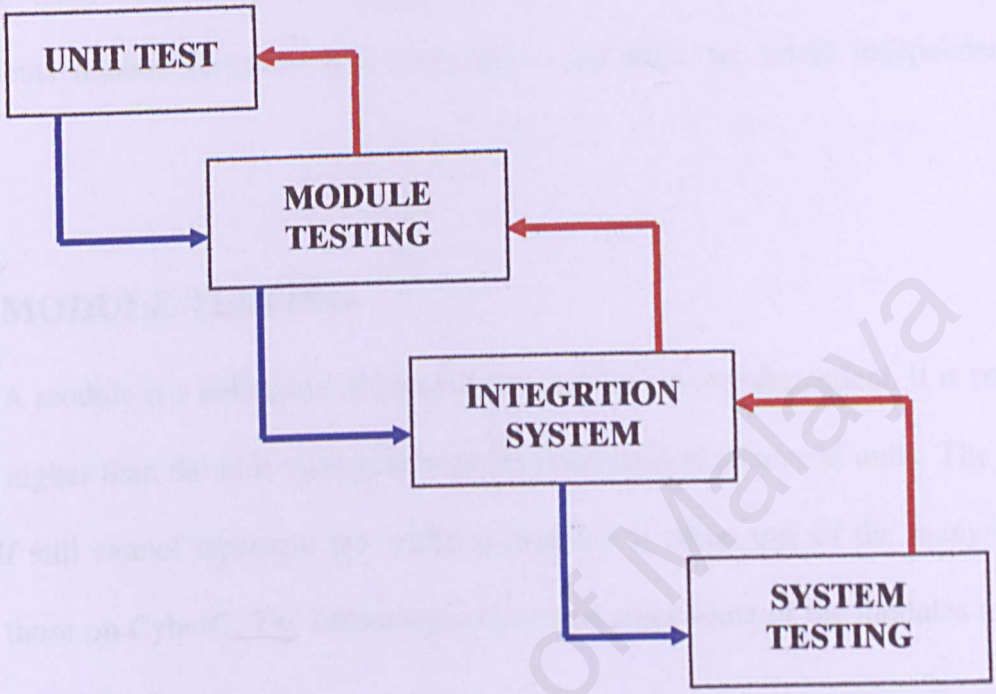



Figure 6.1 Testing Process

## 6.3 UNIT TESING

Unit testing concentrates on the smallest unit of software design. Each component is treated as a stand-alone entity and tested individually to ensure that they operate correctly.

At the beginning of the development, test data is loaded into the database in order to allow tests to be conducted. This test data include mock data that is input into the tables in the database, such as users, guestbook, messages for forum and much more.

Once the test data is successfully loaded, unit testing is conducted at the lowest operating level. At these basic units, testing is run to ensure that they operate correctly. These components include functions and subroutines. All these are tested independently on itself.

## 6.4 MODULE TESTING

A module is a collection of components, which are interdependent. It is somehow a stage higher than the unit testing. It tests the combination of several units. The module by itself still cannot represent the while system but it offers one of the many features among those on CyberC. The following section discusses some of the modules testing in detail.

**a) Login Module**

i. Login as user who has registered with the correct login ID and password.

The user then is allowed to access lessons, interactive exercises available, post question to the forum and change their password.

ii. Login as administrator

The administrator will be allowed to manage the users' information, add new administrator, manage guestbook that posted to CyberC and manage messages and add topic to forum, adding question for exercises and change their password.

iii. Login as user or administrator with either incorrect login ID or password.

The program will alert the user with invalid login. The user is given addition chance to sign in to the system.

b) **Registration Module**

i. The program will check and validate every required fields of the form whether the user has filled it.

ii. The program will not proceed to process the user registration unless the form is completed and validated.

iii. The program will check whether other user has registered the login ID that new user wants to register. If it so, it will prompt the user with a notification of fail registration and ask the user to re-register again.

iv. If the registration is successful, it will automatically proceed to the main content of CyberC

c) **Guestbook Module**

Any user who wants to send feedback form regarding CyberC has to fill in the comment field. A message will be prompt the user to fill in the field.

## 6.5 INTEGRATION TESTING

When the integration testing is conducted, it involves test on numerous modules that had been integrated to formulate entire system. Usually modules that tested to be correct during the modules testing may not appear to be correct after it is integrated. This is because once integration is executed; modules may face variables or constant collision. Such collision will cause program to report errors once it is integrated. A good keynames organization is essential to avoid this program error.

## 6.6 SYSTEM TESTING

Integrated systems are integrated to obtain the entire system. System testing is concerned with finding errors, which result from unanticipated interaction between modules and system components. It is also concerned with ensuring that the system meets its functional and non-functional requirements. System testing verifies that elements are functioning properly, and the overall system performance and objectives are achieved.

System testing itself can be divided into few more ports that are like:

a) **Performance Test**

Performance test is conducted to detect the runtime errors. Performance test not only test on the scripting and coding but it also test on the system's hardware performance and stability.

b) **Endurance Test**

Endurance test is conducted to test whether the system can handle a large amount of data in the database. This includes the loading time when the data are retrieved from the database.

c) **Usability Test**

Usability test refers to the completeness of the system and it fulfillment towards the functionalities specified during the proposal of the system. This includes comparing the features provided within the system and the list of functionalities requirements produced.

## 6.7 SUMMARY

Chapter 6 documented the system's testing methods approached used. All the tests selected and conducted are recorded within this chapter. These entire tests are conducted accordingly to the sequence stated.


# CHAPTER 7

# SYSTEM EVALUATION

# CHAPTER 7: SYSTEM EVALUATION

## 7.1 INTRODUCTION

System evaluation is considered as the last phase of system development life cycle. Much problems and errors were detected and corrected since the beginning of CyberC development. Throughout this chapter, all the problems face will be revealed and discussed. Evaluations and comments on the system will also be highlighted in order to identify the strengths and limitations. From here as well, the necessity for future enhancements will be discussed.

## 7.2 PROBLEMS AND SOLUTIONS

### a) Lack of Knowledge in Web Development

This problem is significantly proven as major as CyberC is developed all round as a web- based system. Therefore, in order to equip myself with more knowledge on web development, there are a few options that I decided to do. First of all, I surfed through the Internet to expand my knowledge on web development. Experts forums and discussion were ransacked and dug to get more information towards developing an ideal web- based e- learning system. Besides that, I also browsed through the collection of books in the library to know more about this issue. Suitable web programming languages were studied in detail to understand its strength and limitations as well as its level of contribute towards the future of CyberC. The next option that I sought is getting advice from the supervisor.

### b) Working Out an Interesting User Interface

As CyberC is an e- tutoring system, it is essential to create a user interface that will attract users as well as building the curiosity feelings in them. Elements of the user interface must be interactive and responsive. This includes respond even when users roll the mouse over images, buttons, links et cetera. Besides that, the color management also requires ample of effort and concentration. Different colors will provide different kind of effect to the page. Users' mood of learning will drastically be affected if the wrong color is picked. In order to create a great user interface for CyberC, I looked through major sites and analysis the elements used by them in their

interface. Similarities are recorded and outstanding features found are also recorded. From these records, decisions on choices for user interface can be finalized.

**c) Time Constraint**

The development duration for CyberC is rather short. Besides that, the development period also comes together within a study semester. Therefore there is a need to juggle the time spent on each activity. A smart time management and planning is required to accommodate all these activities. As lack of knowledge and experience were mentioned in one of the points above, time has to be spent to actually equip myself with this knowledge.

## 7.3 EVALUATION BY ENDUSERS

In the process of completing the CyberC system, numerous users were invited to try out the system as well as conducting acceptance test on it. Users selected to be involved in this test are first year students from Engineering Faculty, University of Malaya whom are taking C programming subject currently. Comments and critics from these users are evaluated and reconsidered before the system is considered as complete. These comments are obtained after they have try out each and every part of the system. From the evaluations of the system users, it can be concluded that they are satisfied with the system and its functionalities.

## 7.4 SYSTEM STRENGTHS

Below are the strengths of CyberC: -

**a) Interactive Learning Experience for Users**

Users of CyberC will be offered with interactive learning experience throughout the usage of CyberC. They will be able to enjoy then fun and thrills of learning in a whole new style.

**b) Availability to Every Corner of The World.**

As CyberC is a web- based system, it is always available to users from all over the world. All the users need to have is a personal computer and a connection to the Internet.

**c) Simple and User- Friendly Interfaces**

The interface of the system is simple and easy to use. The system provides an interesting and easy to navigate layout. Precise guidance such as tool tips are also given to guide the users.

**d) Management of Users**

CyberC allows administrators of the system to actually have much control over the users of the system. Administrators can add in new questions and quizzes, filter the signing of guest books and forum postings.

**e) Mailing Services**

Users of the system can send in emails to the administrators for technical supports, bugs reporting and so forth. Besides that, users can also send emails from the system to tell their friends about the system.

**f) Random Generation of Questions in Exercises and Quizzes**

Questions are loaded randomly from the database to avoid users from feeling dull and boring. Such random questions will provide them new challenges every time they pursue into that particular quiz.

## 7.5 FUTURE ENHANCEMENTS

### a) Allows Addition Of New Lessons

As part of the enhancement of the system, the administrator should be allowed to add in new lessons and chapters easily. Currently the system only allows the addition of new questions for that particular chapter but not a whole new chapter.

### b) Downloading of Lessons for Offline Viewing

In the future, the users should be allowed to download the lessons files to their computer so that it can easily be shared and viewed at computers without Internet connection.

## 7.6 KNOWLEDGE AND EXPERIENCE GAINED

From the development of CyberC, the knowledge and experience gained are very invaluable. Knowledge and experience on web development as well as web programming was very much practiced throughout this duration of time. Besides that, problem solving and decision-making skills are also developed within myself.

Aside from the knowledge and skills mentioned above, independency was also developed from these few months of developing CyberC.

## 7.7 CONCLUSION

As a summary, CyberC has manage to accomplished the specified system objectives and fulfilled all the requirements stated regardless of whether it is functional or non- functional. The knowledge garnered will be extremely useful for future usage on the career world. Time used to master languages like ASP.NET, VB.NET, HTML, JavaScript and more will not be a waste, as these languages are very highly demanded out there. The application of knowledge learnt from subjects taught throughout these 3 years in Bachelor of Computer Science is also contributed in the process of CyberC development.

CyberC has been fully tested and is a reliable system. Each and every procedure selected including those for software engineering, concepts, principles, techniques are picked after thorough studies on it. Its suitability is analyzed before it is decided to be used. All these experience gained will be especially useful in the future involvements of either software or web development.


# APPENDIX

# REFERENCES

# REFERENCES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# APPENDIX

# CYBERC USER GUIDE

# CONTENTS OF THE CYBERC USER GUIDE

# CHAPTER1: HARDWARE AND SOFTWARE REQUIREMENTS

## 1.1 Hardware Requirements:

Intel Pentium 200MHz processor or equivalent processor running

Windows 98, Windows ME, Windows NT, Windows 2000 or Windows XP

32 MB RAM (128 MB is recommended)

20 MB of available disk space

Internet Connection

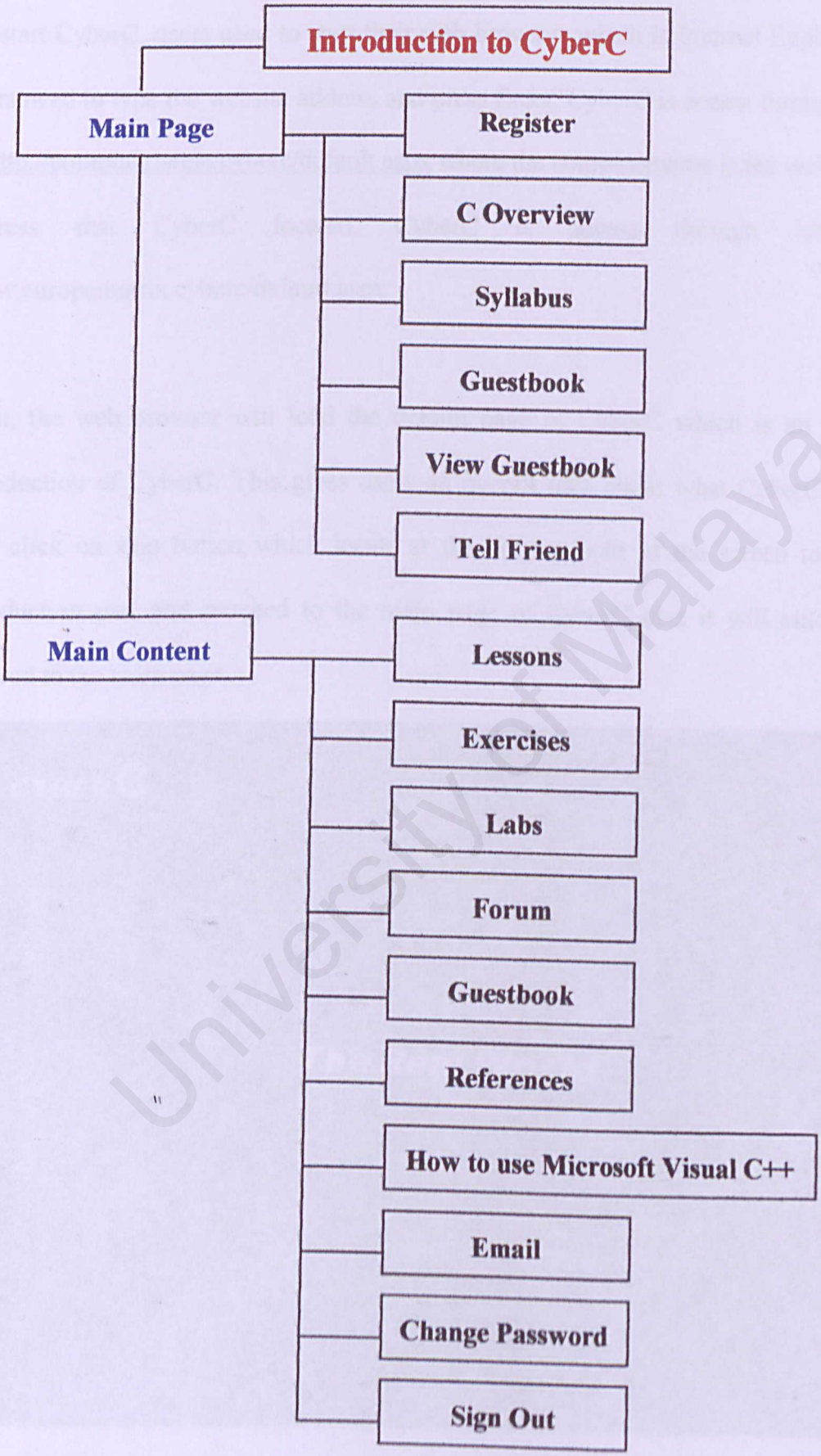
A 16-bit color monitor capable of 1024 x 768 resolutions

## 1.2 Software Requirements:

Microsoft Internet Explorer 4.4, Netscape Navigator 4.5 or later

Macromedia Flash player 5.0 or above

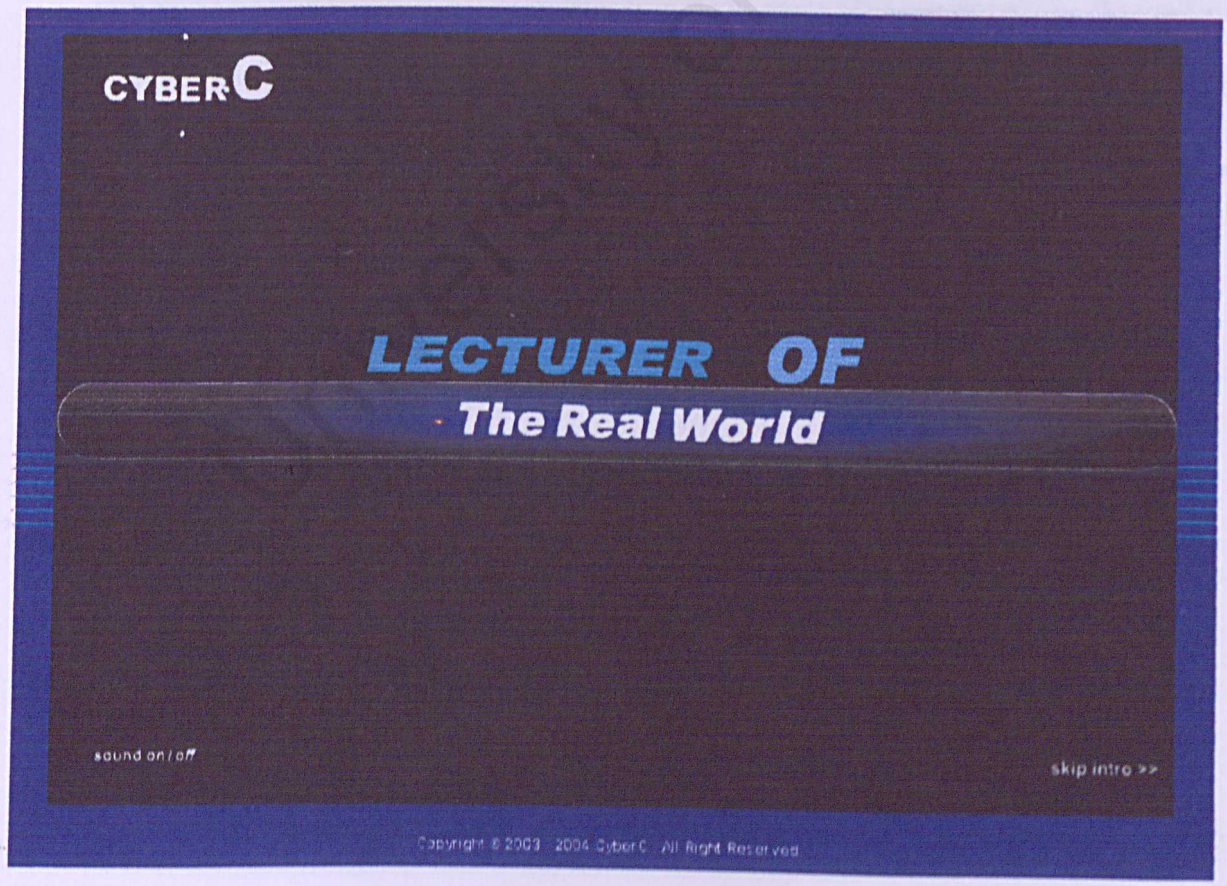
## CHAPTER 2: NAVIGATING MAP OF CYBERC



## CHAPTER 3: STARTING CYBERC

To start CyberC, users need to start their web browser, which is Internet Explorer. Then users need to type the website address and press Enter. CyberC is access through intranet at http://computername/cyberc/default.aspx where the computername is the web server IP address that CyberC located. CyberC is access through internet at www.europematrix.cyberc/default.aspx

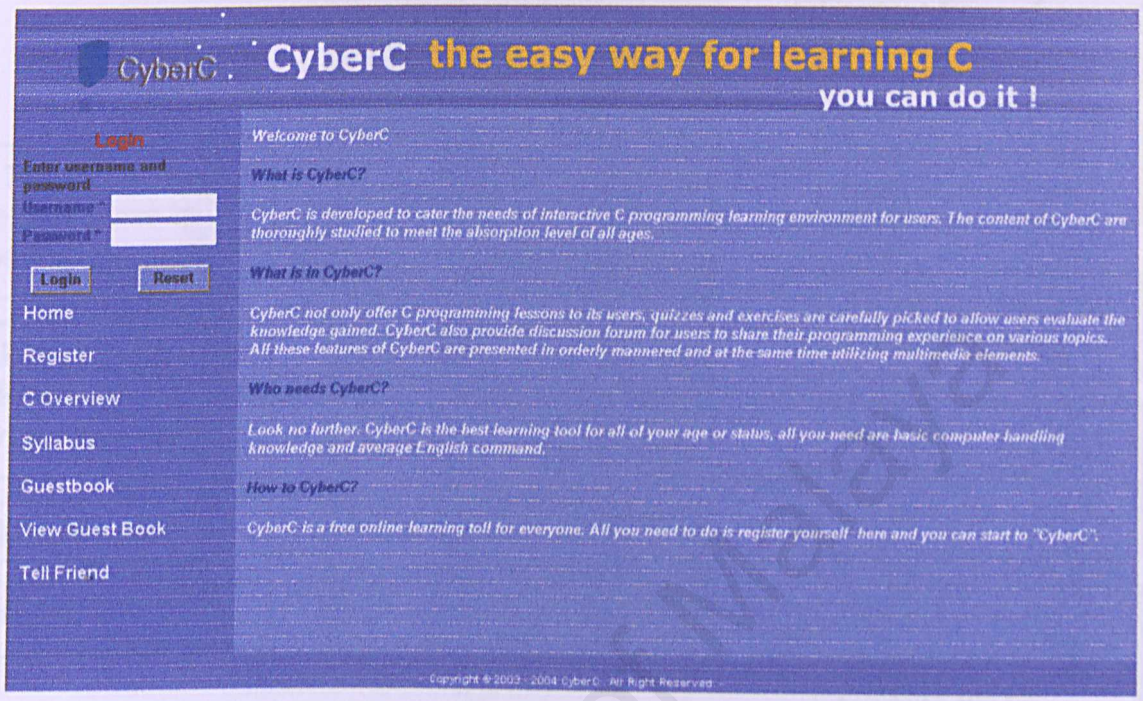
Then, the web browser will load the default page of CyberC which is an animation introduction of CyberC. This gives users an overall idea about what CyberC is. Users may click on skip button which locate at the bottom right of the screen to skip this introduction part and proceed to the main page of CyberC else it will automatically proceed to the main page.



# CHAPTER 4: USING CYBERC FOR USER

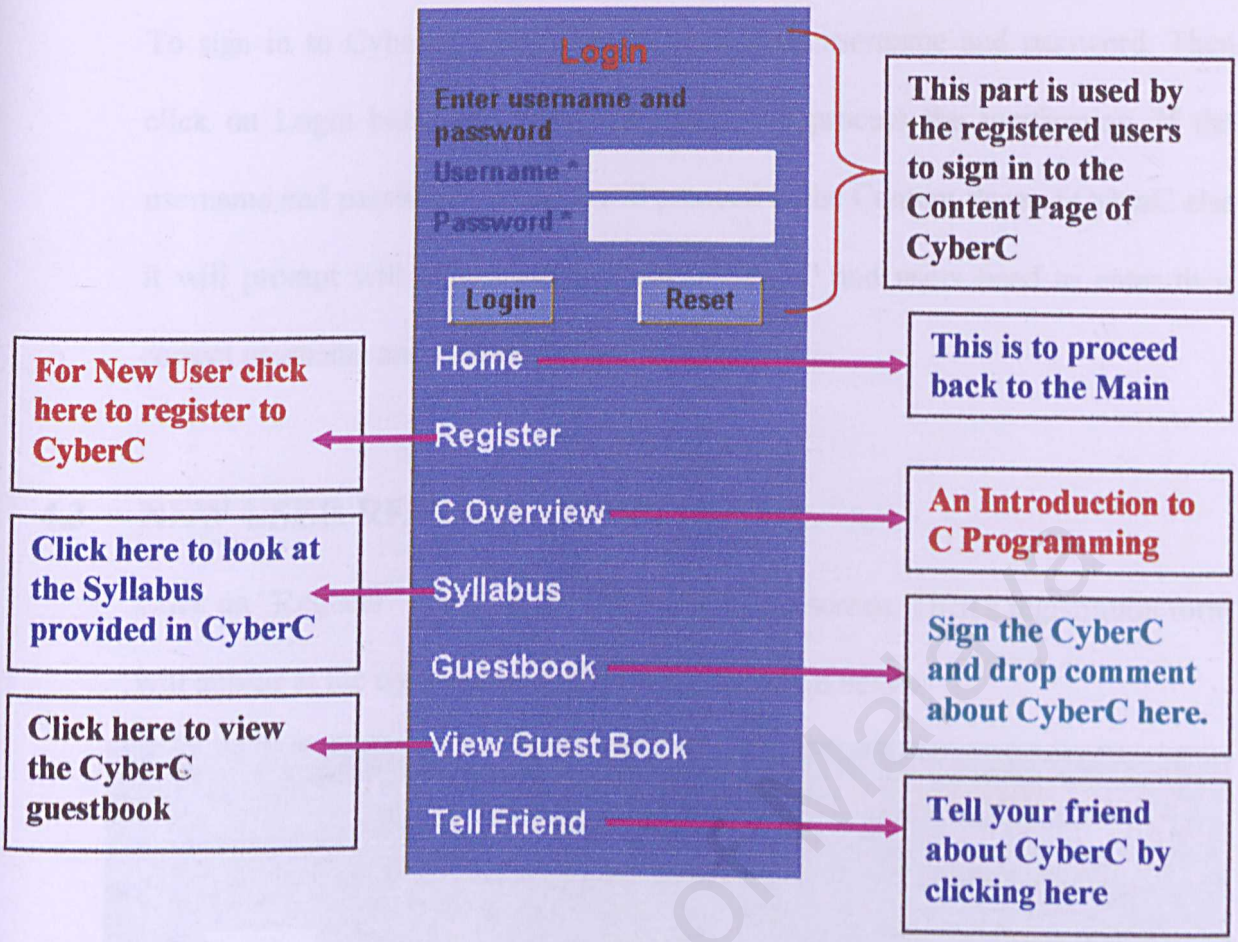
## 4.1 MAIN PAGE

The screen shot below shows the main page of CyberC.




When users enter this main page, existing users may sign in to CyberC to proceed to the Content Page of CyberC else new users need to register before enable to sign in to CyberC.

Basically, the left frame of this screen is the main menu of this main page.

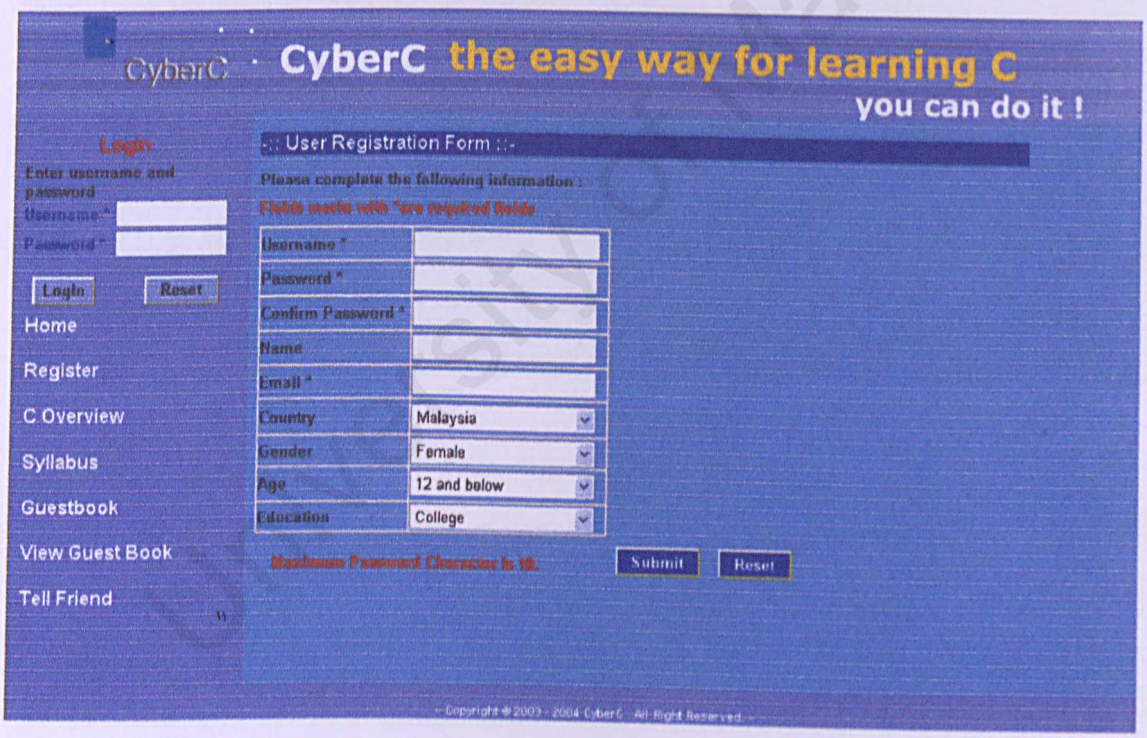


## 4.2 LOGIN

To sign in to CyberC, users need to enter their username and password. Then click on Login button to allow the system to process the verification. If the username and password match, it will proceed to the Content Page of CyberC else it will prompt will a message of "invalid login" and users need to enter their correct username and password again.

## 4.3 NEW USER REGISTRATION:

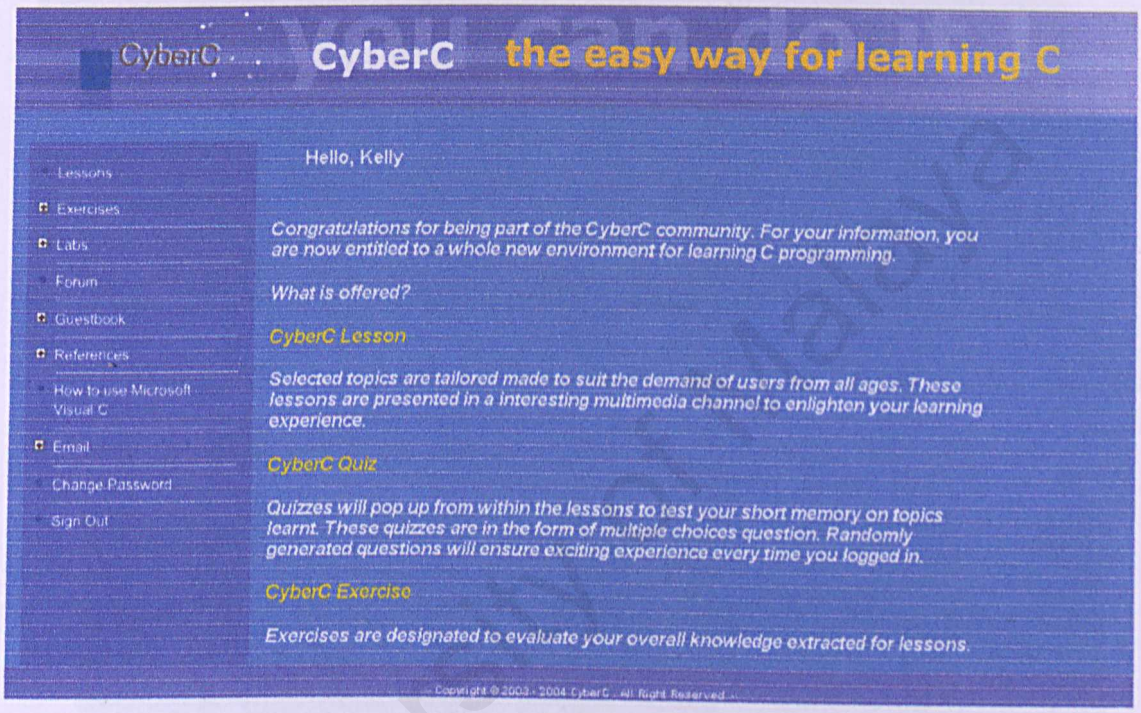
Click on "Register" button at the left frame of the screen. Then a registration form will appear at the right frame of the screen as shown below.




All the fields marks with * must be filled up. If any of the required fields left blank, a message will be prompt to inform the users to fill in the regarding field. After filled up all the fields needed, click on Submit button and it will automatically proceed to the Content Page of CyberC.

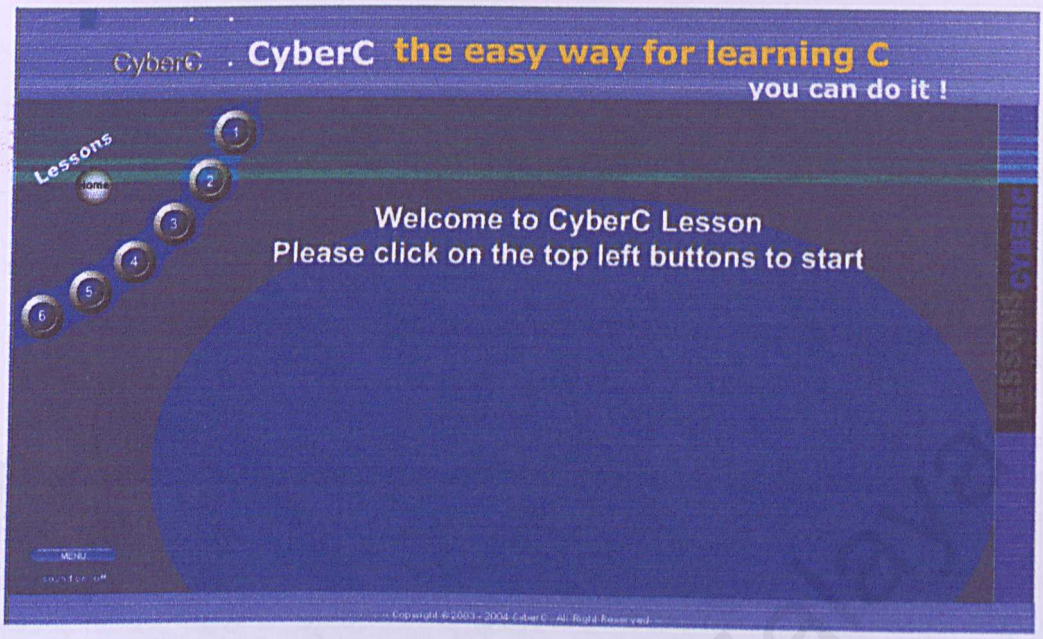
## 4.4 CONTENT PAGE

This the content page of CyberC which users able to browse through the lesson, Exercises, Labs, Forum, Sign and View Guest book, expose to how to use Microsoft Visual C++ in step by step, email administrator, tell friends about CyberC and can change their password. If the users want to log off from CyberC, simply click at the Logout button at the bottom left.

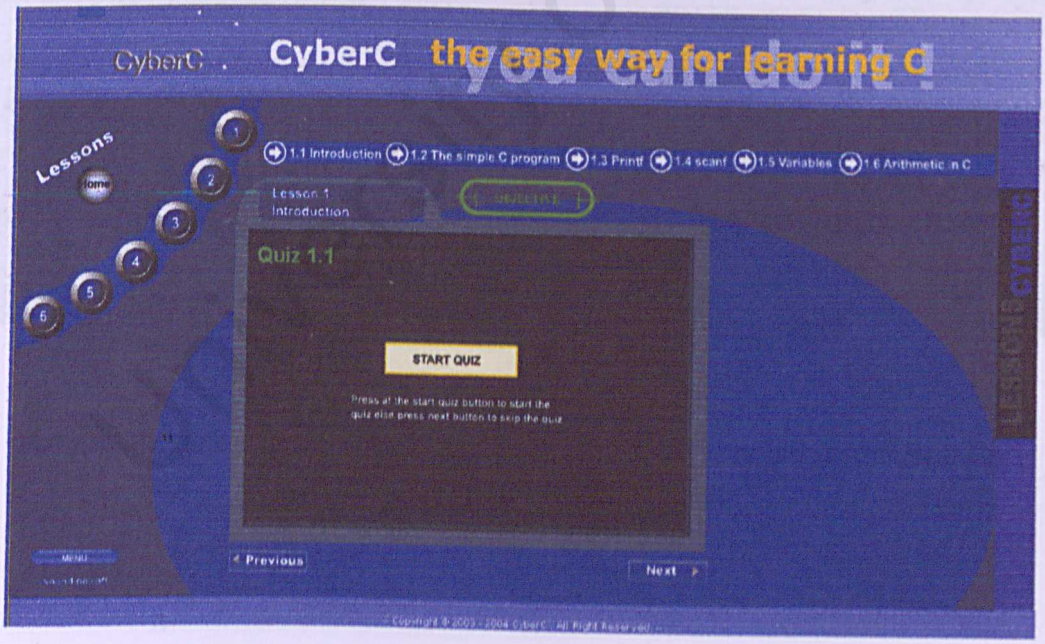


## 4.4.1 LESSONS

Click on Lessons button to start the lessons in CyberC.




To navigate through the lessons that contain in it, click on the six buttons that located at the top left of the screen.

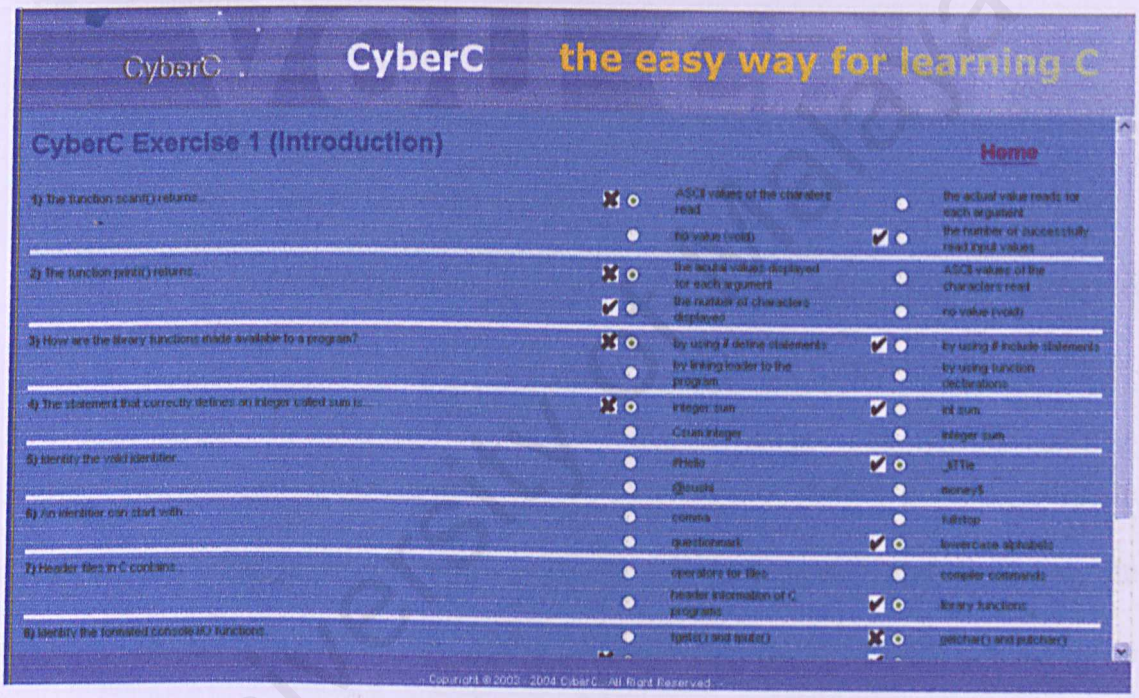



Besides that, if u reach a screen to start quiz, click on the start quiz button to start doing your quiz, your result and time used to do the quiz will be displayed after user finish the quiz. Click on play again to do the quiz again with different

questions. To navigate through this lessons page, user may move over the menu above the on and off sound to proceed to the other page.

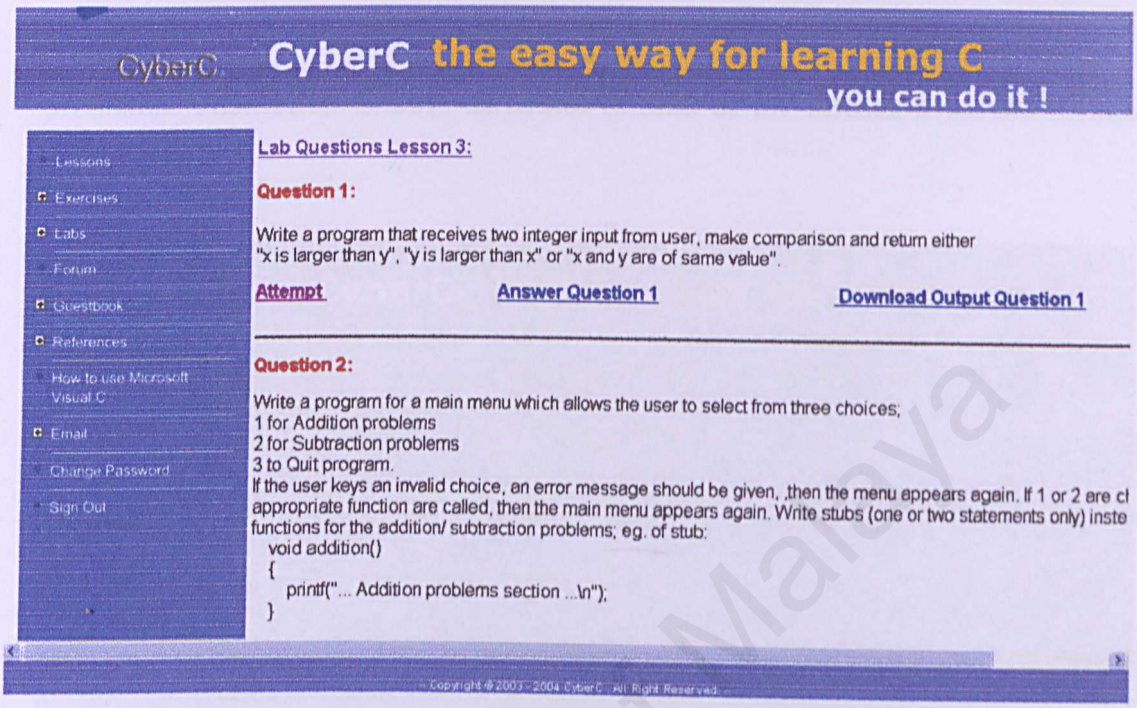
### 4.4.2 EXERCISES

Exercises are loaded randomly from the database every time users refresh the page. Users can check for the correct answer by clicking the check answer button and display the result by clicking display score.



### 4.4.3 LABS

Labs are divided into lessons. This means every lesson contains a lab section. Click on lab at the left frame and choose the desired lab.

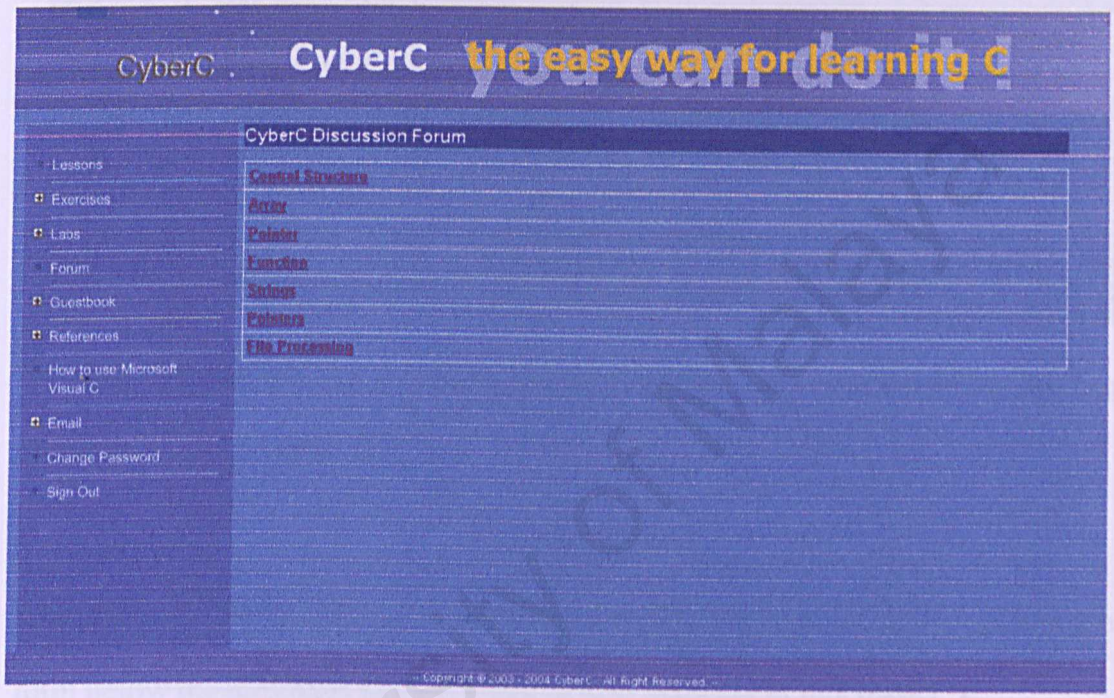



Every single lab question has three buttons.

- Click Attempt button to do lab question with the DJGPP compiler. Type in the codes in the text areas provided and click compile button to compile the coding typed. Users will be prompted with errors else users will be prompted to save or open the output of the coding which is the executable file for the coding.
- Users can click the middle button to view the answer of the question or download the output of the question to see output.
- For the downloading the output, click save to save the file to the computer else click open to view the output without saving.

### 4.4.4 FORUM

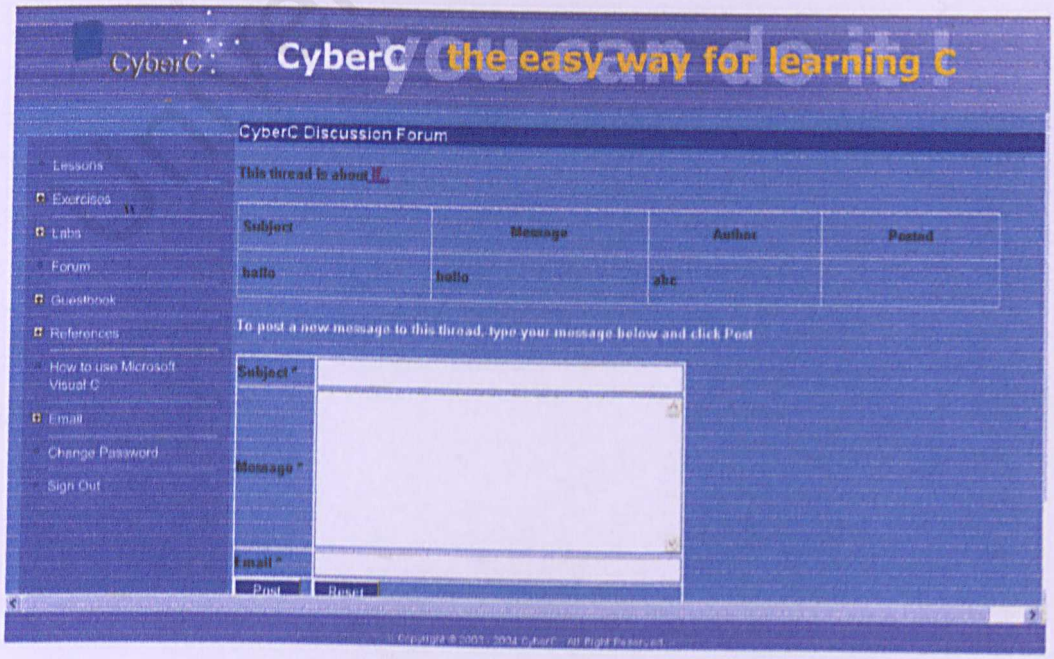
The forum contains of topics regarding C programming. Users need to click on the suitable topic to post their messages and browse through the right topic to look for the desired information. For an example, want to look for if statement problems. Then click Control Structure to look at the threads available in this topic.



This is the screen shot of Control Structure's Thread.


So click "if" to see the messages contains in the "if" thread besides posting messages to this thread.

The screenshot below shows that messages available in the "if" thread. Fill in the form below the messages table in order to post message to this thread.



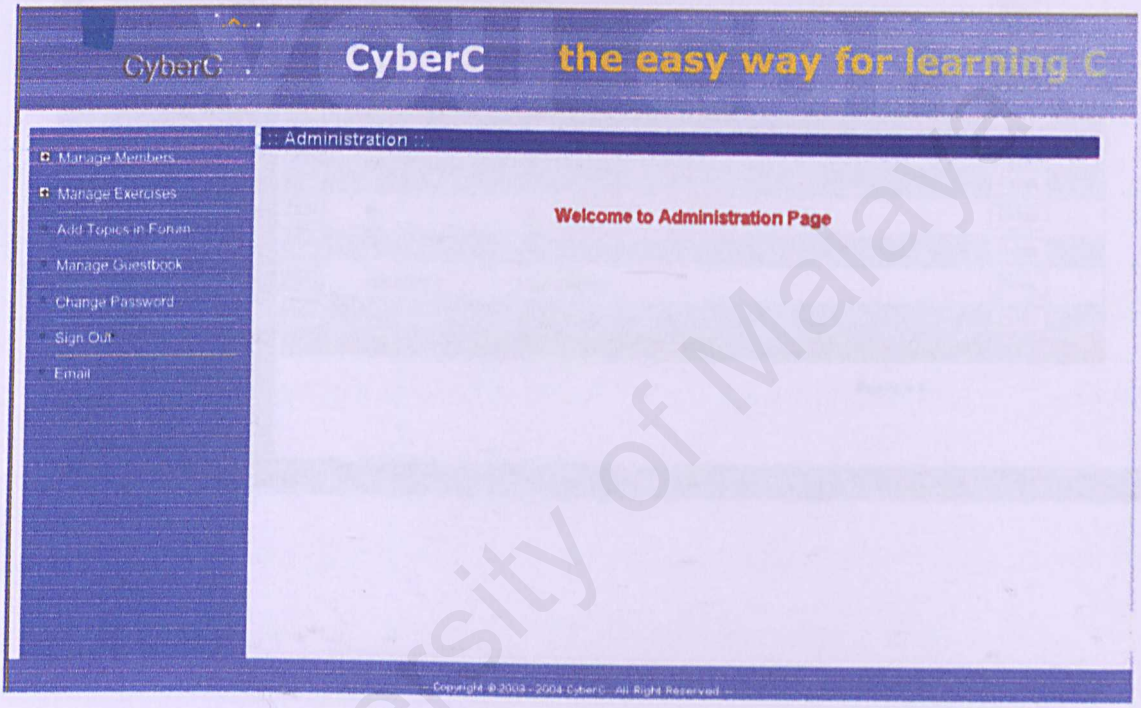
### 4.4.5 SIGN OUT

Click "Sign Out" button that located at the bottom left to exit from CyberC.

# CHAPTER 5: USING CYBERC FOR ADMINISTRATOR

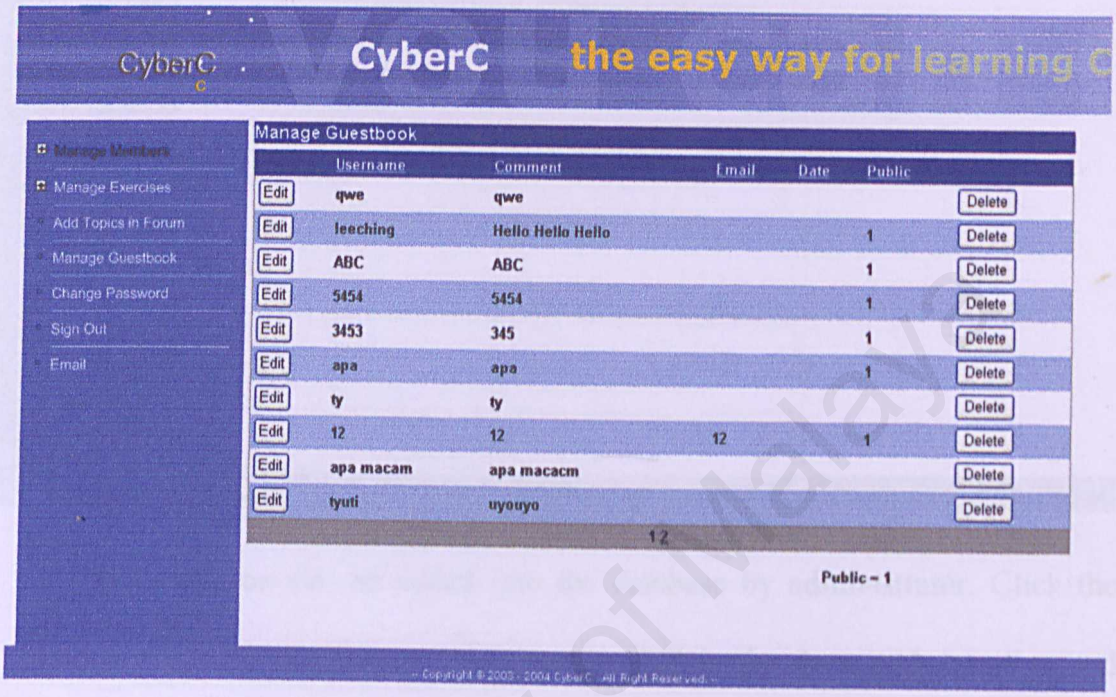
## 5.1 ADMINISTRATOR PAGE

After login from the main page of CyberC, administrator will be diverted to the Administration page. Administrator is allowed to manage the members of CyberC, add new administrator, manage guestbook sign by CyberC's users, add topics in the forum and add questions to the exercises.

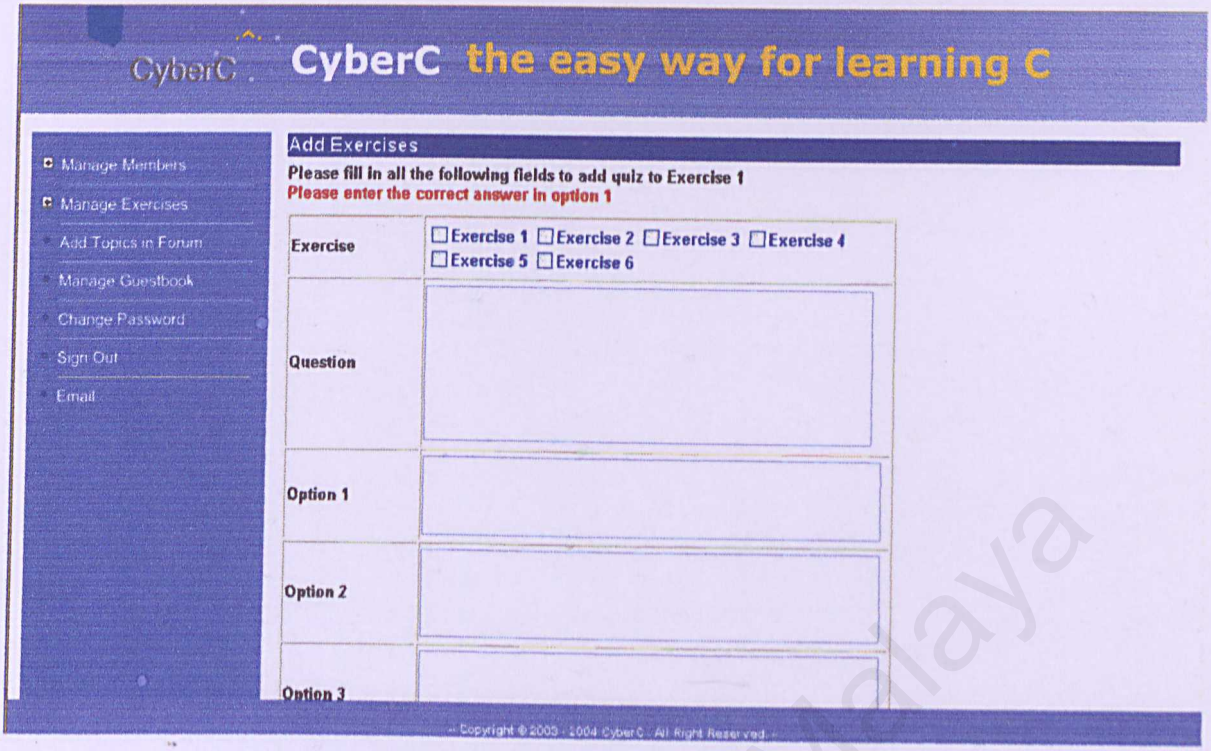


## 5.2 MANAGE GUESTBOOK

To update the information in the guestbook and make the guestbook public to user or private to user, click the edit button and the data can be updated. Click delete button to delete the entire row of information.



## 5.3 ADD EXERCISES QUESTION




Exercises question can be added into the database by administrator. Click the Manage Exercises and choose add exercise. Fill in the form with question and possible answers which is wanted to be added into the exercises section. Clicks submit after filled in all the required fields to add the question to database.

## 5.4 EXIT

Click sign out at the bottom left of the screen to sign out and exit from CyberC.