ONLINE TUTORIAL AND TEST FOR SYSTEM ANALYSIS AND DESIGN

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WXES 3182 PROJEK ILMIAH TAHAP II

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ABSTRACT

Online Tutorial and Test for System Analysis and Design is a system that is being created to simplify lecturer and students work towards producing better performance and time management. Besides that, this system also will help the students and the lecturer in many ways to overcome the problems that they are facing in current method.

This is a Web based system and the system comes with one language that is in English. This system use ASP.NET for its server side scripting and VB.NET for its client side scripting. The systems' database is SQL Server 2000. Besides that, Macromedia Dreamweaver UltraDev tools are used to simplify the creation of this system.

This system is being created for the paper System Analysis and Design in Faculty of Computer Science and Information Technology (FCSIT) in University Malaya. This system comes with the features such as online information, lecture notes, getting tutorial and test question; submit tutorial and test answers, tutorial and test submission conformation and marks for tutorial and test. This system also has the features to generate and modify the student's performance graph according to their marks.

This system has the capability to be improved in the future with other additional features such as online discussion, news group, supports many papers and another language that is in Bahasa Malaysia.

ABSTRAK

"Online Tutorial and Test for System Analysis and Design" merupakan sistem yang memudahkan kerja pensyarah dan pelajar kearah pengurusan masa dan prestasi yang baik. Selain itu, sistem ini juga mengatasi masalah yang dihadapi oleh para pelajar dan pensyarah berbanding cara lama yang digunakan.

Sistem ini terdiri daripada halaman Web dan mempunyai satu bahasa iaitu Bahasa Inggeris. Sistem ini menggunakan "ASP.NET" untuk "server side scripting" dan "VB.NET" untuk "client side scripting." Sistem ini menggunakan "SQL Server 2000" sebagai ruang storan datanya. Sistem ini juga menggunakan peralatan "Macromedia Dreamweaver UltraDev" untuk memudahkan penjanaan halaman Web sistem ini.

Sistem ini direka bagi kertas "System Analysis and Design" di Fakulti Sains Komputer dan Teknologi Maklumat (FCSIT) di Universiti Malaya. Sistem ini mengandungi ciri-ciri seperti pemberitahuan maklumat, mendapatkan nota kuliah, mendapatkan soalan tutorial dan ujian, penghantaran jawapan tutorial dan ujian, pengesahan penghantaran jawapan tutorial dan ujian dan pemaparan markah tutorial dan ujian melalui sistem dalam talian. Sistem ini mengandungi ciri-ciri penjanaan dan pengubahsuaian graf dengan menggunakan markah para pelajar.

Sistem ini boleh dipertingkatkan dengan penambahan ciri-ciri seperti perbincangan dalam talian, kumpulan berita, mengandungi Bahasa Malaysia dan lebih banyak kertas.

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1.1 Intro Project

On-line Tutorial and Test for System Analysis and Design is a project that is created to simplify lectures and students work with trying to fully maximize the technology. With the help of this project, they can do their work very efficiently and right on time without troubling their self.

1.2 Problem Domain

The main purpose of this project is to solve the problems are facing by two categories of people, there are:

i. Students, and

ii. Lectures.

1.2.1 Students Problem

Students are the main categories facing a lot of problems due to current implementation of tutorial and exam for System Analysis and Design paper. Some of the main problems are:

- Long queue (crowded) for Photostat
- Photostat shop operating hours very short
- Few Photostat services available
- Lack of men power to operate the Photostat machine
- Photostat services are slow
- Server down when access the internet for online notes
- No PC available in the labs, hence have to depend on cyber café

- Questions are uploaded, right before class (or late)
- Not enough Photostat copy of tutorial questions at Lecture Hall
- Lecture not in the room to get the tutorial questions
- Lectures are not available when passing up tutorials
- Limited time period for passing up
- Delay in passing up tutorials in office because of over crowd of students
- Tutorial answers are not received by the lecturer when passing up at pigeon hole
- Delay in passing up tutorial in lecture hall or tutorial room due to requirement to sign up the students acceptance form

1.2.2 Lecturers Problem

Besides students, lecturers also facing problems due to the implementation of current method and they are:

- Students tutorial submission not received by the lecturer
- Overcrowding of people in lecturer room when students have to pass up tutorial to the lecturer and sign the form for confirmation of submission
- Students marks have to keyed in computer to output a graph and as a lecturer record and mistakes may happen due to handling many student
- Very difficult to confirm students submission
- Have to spend a lot of time to sorting out students paper according to marks, name, or labs
- Very difficult to read students handwriting

1.3 Objectives

This problem is created to simplify lectures and students task towards implementing the available technology in the online system for System Analysis and Design paper.

The systems objectives are:

1) To help two categories of people, that are students and lecturers to over come the problems that they are facing in the current implementation.
2) To improve time usage among this two categories of people towards better time management and less time work for a better result with the twist of the technology.
3) To brake the boundaries for the two categories of people from getting information from the online system to get their work done on time as long they have a computer and can connect to the internet.
4) To improve computer usage among the university students towards online system and web based.

1.4 Project Scope and Limitation

1.4.1 Project Scope

This system is user friendly and the system's consists of 2 main module, that is administrator module and user module.

1.4.2 Project Limitations

The system has certain limitations which have to take note and they are:

1) The system's language
    - The system is only designed for one language, which is English.

2) The system cannot run on Netscape browsers

- The system is designed on an ASP.NET platform and ASP.NET is not able to run on Netscape browsers, for example Netscape Communicator or Navigator

3) The system is for one paper

- The system is only done for one paper that is System Analysis and Design

4) The system type

- The system is a web based system and not stand alone, thus the systems user must be connected to the internet before using the system

5) The system's target user

- The systems target users is the students taking System Analysis and Design paper in FSKTM

1.5 Project Schedule

The project schedule planed for the time period of the creation of the system is as follow:

Table 1.5: Project Schedule

MONTHS	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB
WEEKS / TASK NAME	34	1234	1234	1234	1234	1234	1234	1234	1
1. Requirement Analysis									
2. Systems Design									
3. Program Design									
4. Coding									
5. Unit & Integration Testing									
6. System Testing									
7. Acceptance Testing									
8. Operation & Maintenance									
9. Documentation									

CHAPTER 2: LITERATURE REVIEW

2.1 Some Design Strategies for Developing an Online Course

Before the semester starts, it is recommended that all faculties planning to teach a distance learning course receive training in both the specific course management and delivery system being used and in the techniques of designing an effective online course. Many instructors who have previously taught distance learning classes are willingly to serve as mentors to a course is presented online, it may be similar in format to its traditional counterpart, but developing a successful online course is an ongoing process. As instructors gain experience using the new technology, they become aware of more effective ways to present the material, such as graphic, video, audio, testing software, etc. Also links to Websites must be updated regularly, since previously used links are not always active and new links will be added as additional relevant Web sites are discovered. Often, student in the class will alert instructor and class members to Web sites that they have found helpful while doing research for an assignment or project (Harrison & Bergen, 2000).

Teaching in this format requires that the instructor be more organized than in a regular classroom. A "welcome" message to the students is a good place to explain the broad structure of the course. The differences between the major components of the software should be made clear. Most systems distinguish an area for announcements, a place for class discussion, and a way to send and receive private e-mail messages. Students should be clear on the function of each area. Depending on the particular course delivery system

being used, instructor messages and/or course materials are usually posted in read only announcement areas (Harrison & Bergen, 2000).

Another important component is a discussion list, which is basically a public bulletin board where the students and the instructor post messages for everyone in the class to see. This is the area where class "discussion" takes place; questions can be posted and answered. Usually, the discussion is organized into folders, with a separate folder used for each topic. There are a variety of ways that these folders could be organized; some faculty organize them around chapters in the text book, others around weekly discussion questions, and some around weekly discussion questions, and some around assignments. It is recommended that the organization be worked out before the class begins to enable students to follow more easily the participation component of the class. Last, everyone in the class has the ability to receive and send private e-mail messages. It is important that students understand the difference between sending a public message to the full discussion list and a private e-mail message to one other person (Harrison & Bergen, 2000).

It is preferable to have a copy of the course outline available even before the class begins, in order to give students an overview of what to expect. As in a traditional course, the course outline should contain any prerequisites for the class, the objectives, a brief listing of the topics to be covered, the required materials such as texts, specific grading criteria and participation requirements for the course, and a bibliography. If possible, it is helpful to have the entire course organized into weekly modules before the students actually come online. Many college level courses, online or not, have a paper or

a series of papers as a requirement. Along with the course outline, information such papers should be posted at the start of the semester (Harrison & Bergen, 2000).

It is also helpful to include links to Web sites that students may find helpful as they begin to prepare their paper. In a traditional class, students are expected to present the highlights of their papers to the class in oral presentations. However since this is not possible in online course, we include a folder in the discussion area titled "Tidbits from My Research" to allow students to share interesting information uncovered in their paper research. Contributions to this folder count as part of the required two message a week. In our experience, students enjoy contributing to this folder and have posted some interesting observations in this area. Sometimes students will find that they are doing similar topics and will suggest books or Internet resources to each other (Harrison & Bergen, 2000).

We use combination of online quizzes and proctored tests to determine if the students are in fact learning the material that is required in the course. Each type of test achieves a different purpose. The online quizzes can be posted by the instructor and then taken by the students at a time convenient for them (Harrison & Bergen, 2000).

2.2 Designing for Interaction, Learner Control, and Feedback During Web-Based Learning

Instructional design is a process for planning episodes of guided learning. The process of instructional design can be utilized for a host educational delivery options, including web based learning. The concept of instructional design promoted here is based on

general systems theory, is systematic, systemic, learner centered, and humanistic. Hackbarth presents an 18 step linear model for the development of instructional programs, and Figure 2.2 (Manal & Robert, 1997) depicts the fundamental components and their juxtaposition as they would be during the implementation of the entire instructional development process (Manal & Robert, 1997).

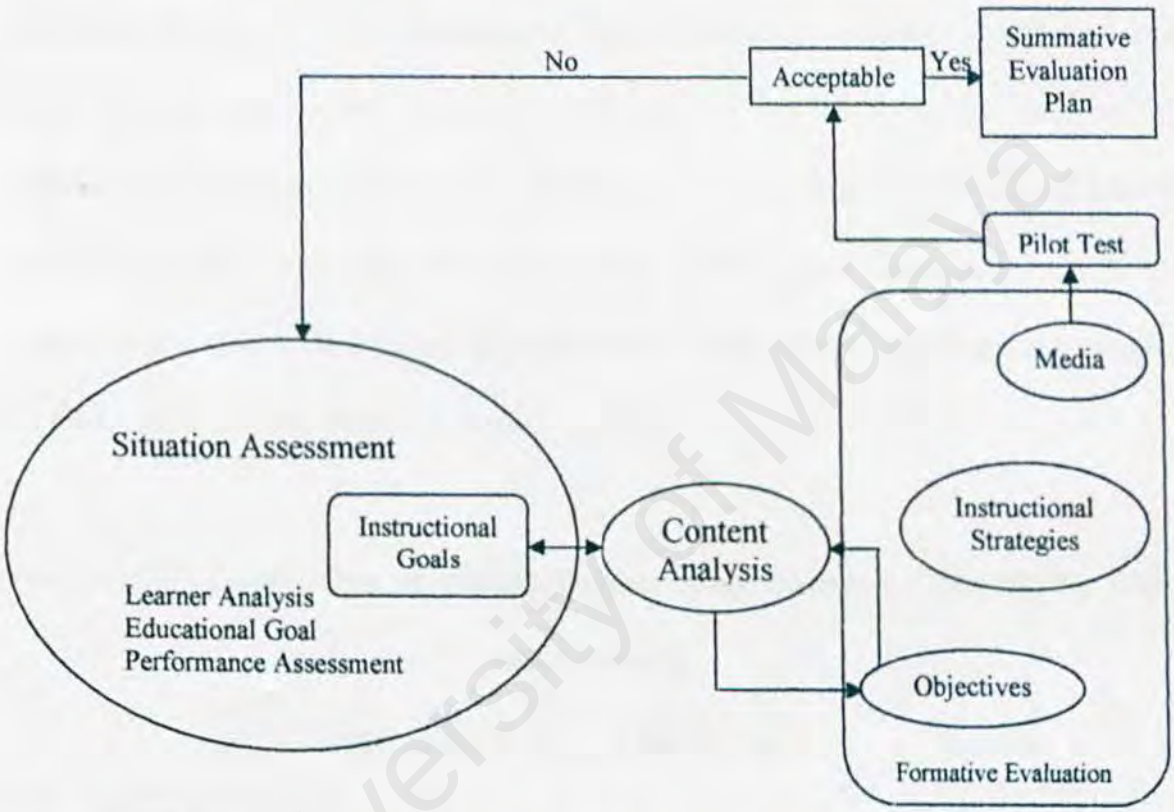

Figure 2.2: Fundamental components of the instructional design process

A hyper medium such as World Wide Web (WWW) can be designed to allow learners access to the information using paths that reflect and support their own associative thinking process. The Web is a world wide repository of linked information known as hypermedia, and incorporates text documents that allow for graphic, audio, and video elements to become links to other documents or multimedia elements. Consequently,

Web developers could address the learning preferences of their viewers by providing material which incorporates sound, graphic, and text elements through frames, image maps, and tables. Frames offer the ability to have multiple screens and allows for multi dimensional access to separate documents sets. Image maps can be varied in size to manage screen space and downloading time. Image maps can be reduced or enlarged in size, and can be placed in strategic locations on the screen according to the user's preference. A table is a two dimensional matrix formed by intersecting columns and rows, creating information locations within a grid of cells. Tables provide an organizational structure and are multi dimensional in applications. Each cell of a table can be hyperlinked to another set of documents. Table 2.2(a) (Manal & Robert, 1997) presents a table that compares and contrasts frames, image maps, and tables as strategies for Web based learning (Manal & Robert, 1997).

Table 2.2(a): Implications of utilizing frames, image maps and tables during Web based learning.

	Application	**Limitations**	**Cognitive Implications**
Frames Table format that divides screen into two or more partitions. Each partition acts as a separate screen. Dynamic and can hold large amounts of information. Main partition can serve as the	Provide overall organization. Outline navigation access. Match content structures.	Require advanced Web development skills. Not all browsers can read frames. Might appear too structured and confining.	Highly organized, dynamic and flexible. Provide the learner opportunity to compare and contrast. Enable the learner to restructure information according to his or

"projector" where links can be viewed on this main screen.			her own perception.
Image Maps Visual graphical cues, icons, geometric or abstract drawings, pictures, photographs. Each pixel can be sensitized to hyperlink to a separate document.	Enhance visual play of information. Excellent navigational aid when clearly understood. Can represent concept, charts, and other graphical information.	May incur extended download periods. Consumes computer memory. May be misleading or difficult to understand if not labeled. May not be appropriate or useful for non visual learners.	Add aesthetic appeal. Enable learner to see the whole picture. Facilitate field dependent and field independent viewing. Decrease sense of disorientation caused by an information overload. Aid immediate and delayed recall.
Tables A two dimensional matrix or structure for locating information. Includes labels of main ideas in rows and columns. Main ideas are entered into a grid of cells.	Good tool for summarizing. Good tool for synthesizing. Allow learner to see the various relationships between key concepts at a glance. Display a large amount of meaningful information.	Lack sufficient detail when used as conventional table without hyper linking capabilities. Require advanced Web development skills. Learner unable to re-size.	Provide a holistic picture or schema. Supply coherent structure within which detailed information could be added. Identify important key concepts.

Web based learning structures are modified by the characteristic of the media that carry the information. Web designs begin by creating a storyboard that maps out the various interrelationships between each document. The process begins with designing an instructional flowchart that identifies the educational goals and purposes for each document to be delivered on the web. Each page should contain all necessary navigational aids that allow the user to move back and forth from one level to the next with ease by minimizing possible disorientation. Furthermore, consistency in background colour, text font size should also be taken into consideration. One of the main strengths of the Web is its multi dimensionality, allowing information to be accessed in a variety of ways. The Web also allows for 3 dimensional (3D) representation of information, including animated rotating 3D effects. The model depicted in Table 2.2(b) (Manal & Robert, 1997) offers guidelines for developing instructional programs on the WWW in the spirit of Hackbarth and presents a two phase approach to considering fundamental instructional design components and attributes of the WWW. The information contained in the matrices can be modified to satisfy variations in situational contexts (Manal & Robert, 1997).

Table 2.2(b): Web Based Learning Design Model

Web Based Learning Design Model: Phase One		
Web Element	**Theory**	**Application**
Inquire	• Source of motivation for international learning.	• Ask questions. • Search for answers. • Seek alternative ways and perspectives. • Entertain big ideas and small ideas.
Analyze Situation	• Understand characteristics of the	• Ascertain capabilities of the learner.

	learning environment. • Provides rationale for action.	• Ascertain culture of the learner. • Ascertain environment of the learner. • Ascertain prior knowledge of the learner. • Ascertain current skills of the learner.
Identify Content	• Entails knowledge construction and skills acquisition. • Determines design of Web page.	• Implement established curriculum or as negotiated by teacher and student(s). • Select Web techniques that best represent the content.
Explain Purpose	• Promotes trust and self confidence • Avoids ambiguity. • Focuses teacher and student expectations.	• Web facilitator negotiates with student sample the expectations of the instruction. • Mirror successful instructional Web sites.
Organize Context	• Maximizes available time. • Facilitates record keeping. • Facilitates planning.	• Recall content of previous instruction. • Coordinate the learning episodes. • Include variety of learning opportunities. • Arrange student practice, feedback, and assessment.
Select Strategies	• Optimize the learning and teaching process. • Accommodate diverse learning styles. • Determine Web techniques that best serve the purpose.	• Identify the various cognitive learning strategies that could be further supported through the various Web organizational and design techniques. • Match Web technique with method most suited for the type of learning. • Utilize interactive techniques. • Utilize the multi dimensionality of the Web such as hyper linking, interactive forms, JAVA & VRML.
Locate Resources	• Ensure Web is most suited to this particular episode. • Facilitate learning process. • Facilitate ordering of supplies.	• Identify more appropriate media if available. • Provide a facilitator and a teacher. • Make technical support available. • Point to additional educational resources. • Archive products of Web based

		learning.
Web Based Learning Design Model: Phase Two		
Deconstruct Prototype or Template	• Learner engages in experiences that allow the formation of mental structures.	• Create or identify existing material such as Web templates. • Engage in elaboration processes. • Conduct hypothesis testing until satisfied.
Debug	• Testing prior to placing online. • Assess effectiveness and usability of instruction.	• Develop a check list. • Page through browser and correct errors. • Try out with one student, small groups, and large groups.
Disseminate	• Make available world wide.	• Upload files onto the Internet.
Evaluate	• Determine value and benefit to society.	• Send out online surveys to all users. • Conduct video conferencing. • Observe interaction and navigation patterns.
Acknowledge	• Develop group ownership of the Web site. • Provides protection against liability.	• Recognize the work and effort of others. • Give credit where credit is due. • Include appropriate disclaimers.
Reflect	• Improve upon quality and efficiency of process. • Provide future opportunities for further accomplishment.	• Reflect in action; while you are engaged in the process. • Reflect on action; at the completion of the process.

2.3 The World Wide Web and Higher Education: The Promise of Virtual Universities and Online Libraries

Higher education is facing a paradigm shift of historic proportions. The extensive development of the world's telecommunications infrastructure, which as supported remarkable growth of the Internet, has placed powerful tools in the hands of educators to access incredibly diverse global sources of textual, visual and audio based information

on virtually every subject. Perhaps more importantly, the World Wide Web (WWW) is beginning to provide a medium for faculty to offer their own expertise and create Web based courses for students any where in the world. Computer mediated communications in general, and the Internet in particular, offer the opportunity to interact one a global basis on just about any topic in which human beings are interested. Both casual curiosity and earners research can uncover thousands of personal, corporate and governmental databases world wide (John, 1997).

Many universities and colleges are placing and emphasis on distance education not only as a way to reach working adults, but also as a method of reining in the costs associated with expanding and maintaining an increasingly expensive campus infrastructure. Also, with more working adults seeking to continue their education for career advancement and recareering in a constantly shifting job market, higher education institution are seeking innovative ways to provide flexible course offering through new media. The convergence of these forces has led to the beginning of virtual universities. Thanks to widespread access to the Internet, universities are beginning to provide more and more of their resources through the WWW. Class schedules, course catalogs and online encyclopedias were just the start (John, 1997).

Thousands of professors are also creating Web pages for their courses complete with syllabi, assignment reading material, and links to appropriate resources. The next step is a more comprehensive packaging of class, library and administrative access through the Web so that eventually a student who so chooses will not have to set foot on a physical campus. At the point we have a virtual university. Current developments in media

technology and communications infrastructure are beginning to make it possible to develop courses for use "on demand." In additional to the traditional correspondence methods, college courses over the Internet. The satellite television network, Mind Extension University, for example, which acts as both broker and delivery medium for degree programs from several universities, provides one example in which students can work on a master's of business administration from Colorado State University or a master's in library science from the University of Arizona, along with a growing repertoire of programs from a number of universities nationwide (John, 1997).

The National Technological University has, for years, delivered graduated engineering classes from schools such as Purdue and Arizona State University through its own satellite television network. Recently UCLA Extension and The Home Education Network have begun to deliver continuing higher education through computer mediated distance learning. Students have access to lectures, class discussions, papers, and other course materials 24 hours a day from any location that has a computer and a modem. Cable television provides could become major players in the future of online education. They not only have the bandwidth in many areas to provide channels for the delivery of video based instructions, but also are beginning to offer higher speed Internet access over the same fiber optic cables. Many courses offered via the distance education technology will combine video delivery with Internet based communications (John, 1997).

In some ways, the need for careful instructional design is greater in Web based courses. Instructors do not have the face to face interaction and non verbal feedback they have in

a traditional class room. This opportunity to interpret first hand the responses of their students has always helped teachers in measuring the effectiveness of the class. *Thomas Fox McManus*, in his valuable online resource, *Delivering Instructions on the World Wide Web*, states that (John, 1997):

> "... it is important to note the difference between design metaphor and instructional or interface metaphor. The design metaphor deals with how the designers organize the learning domain during the creation of the learning environment; while interface metaphor deals with how the learner accesses knowledge within the environment. One of the assumptions behind the model is that the role of the guide will be taken by the instructional medium rather than by a teacher in a class room situation. Another important aspect of this model is that it differentiates between design goals and learner objectives. Design goals are that knowledge with the designers' hope that the learner will construct from the environment. Learner objectives are what the learner actually comes to the environment wanting to learn (John, 1997)."

Online communication can produce far more student instructor interaction in a large class then would other wise take place. For example, Jon Storslee, who teaches a graduate education course at Arizona State University over Phoenix area cable TV, uses Web based resources and constant e-mail communication to interact with his students. He often spends between four and five hours per day reading and responding to the e-mail from the 50 students in the class. In addition to this, students who watch the class live on cable TV can call in their questions on the air. When thoughtfully developed, the Web based instructional interface does not constitute one way delivery of information, but rather the opportunity for access to class material, a gateway, leading the learner to numerous resources, and a method to facilitate communications among the learner, the instructor and other students (John, 1997).

2.4 Delivering Instruction on the World Wide Web: Overview and Basic Design Principle

There are three keys to the educational value of the World Wide Web that are important to the instructional designer: hypertext, the delivery of multimedia, and true interactivity. Hypertext on the Web provides the simplest form of user interaction, enabling user control of information. Clicking on hyperlinked text or images will take the user to another page or another image that may exist on the user's computer or on a computer halfway around the world. This new page could contain anything from the definition of the hyperlinked word to a full treatise on the topic. Graphical browsers enable the delivery of the multimedia on the Web. Photographs or radiographs can be digitized for about the cost of a 35mm slide and provide durable, excellent reproductions to an unlimited number of users (Robin, 1997).

Audio, video and animation can likewise be delivered, to many users with a one time cost and no decline in quality with repeated uses. True interactivity goes beyond static Web pages and page linking, and creates truly interactive pages with information exchange between the user and the server. Forms are the simplest interaction and allow the user to transmit data to the server; for example, completed test answers. CGI scripting can be utilized to program responses back to the users; for example, graded test answers returned to the user online. Others features make the World Wide Web an attractive medium for delivery of instructions. The cross platform distribution of the Web means that the designer of computer based instruction (CBI) no longer has to worry about producing separate versions of a program for Macintosh, Dos and Windows (Robin, 1997).

The users' computers can be located on or off campus, in the next state, or on the other side of the world. The Web enables commercial designers to allow access to their programs only after fees have been paid, corporate designers to secure their programs so that only employees have an access and other educators to share their programs as broadly as they choose. Once the hardware and software are in place, costs are limited to program development, with no diskettes to distribute and install and minimal incremental costs. The graphical browsers provide a user friendly interface that learners only have to learn once. The Web enables seamless integration of lessons for many sites. For example, Lesson One or any part thereof can be in California and Lesson Two in Switzerland. This creates the opportunity to enlist participation by multiple faculty members at multiple sites and established consortia to develop rich, cross specialty instructional program (Robin, 1997).

Another benefit of Web program is the ease of updating and expansion. New information can be uploaded as quickly as it can be keyed into correct format, producing instruction materials that may be years ahead of text books. Good instructional design for the Web begins with the same principles as any good CBI design. It has been argued that constructivist models are better suited to the Web than objectivist. Perhaps a better distinction is that the Web provides the means for higher level instructions, such as problem solving and for increased learner control, but can also successfully be used for mundane drill and practice. The medium does not dictate the design. The interface should incorporate human computer interface design principles and not just transfer paper or previous non graphical interfaces to the screen, should provide more than just electronic page turning, confirm to industry standards, be

visually appealing, be return in user rather than programmer terminology and considered the difficulty in reading large blocks of text on screen (Robin, 1997).

It is important in both CBI and WBL design to define objectives, organize instructions and use consistent navigation standards. Providing adequate, timely feedback to the users is also a major consideration. The global access to the Web program distributes every error world wide and makes formative evaluation even more critical then for CBI installed on individual computers. Below are listed other essential consideration for successful instructional design for the World Wide Web (Robin, 1997):

- Learner Analysis
- Setting Analysis
- Internal Resources
- External Resources
- Collaborations
- Web Design Features
- Development
- Updating and Expansion
- Evaluation

2.5 The Five Levels of Web Use in Education: Factors to Consider in Planning Online Courses

Level 0: No Web Use

To begin, though, we offer a definitional level 0. By default, this level implies no use of the Web at all. We believe that this level of Web use, though standard now, will eventually become as uncommon as level five (Stephen & Marshall, 1999).

Level 1: Information Web Use

The informational level of Web use is the most common and easiest to manage. Informational Web use consists solely of providing relatively stable information to the student. Typically, this information is administrative in nature and may not convey course content directly. Students, may access this information from time to time during the course for reference purposes but they would not be expected to review on a frequent basis. Level One Web use typically consists of the instructor placing items such as the syllabus, course schedule and contact information on the Web for student review. This sort of information is easily created by the instructor or an assistant, requires little or no daily maintenance and takes minimal space and bandwidth (Stephen & Marshall, 1999).

Level 2: Supplemental Web Use

The supplemental level of Web use is becoming more common, is more useful than the informational level, and is only slightly more difficult to manage than the informational level. The key difference between Level Two and Level One is that the supplemental

level actually provides course content information for the learner. As the name suggests, however, this informational is not critical to the course; it is intended as an addendum to the core content. At this level, the main part of the educational experience is provided in a classroom setting. Students may access this information frequently if not on a daily basis. Level Two consists of the instructor placing course notes and other handouts on the Web. A typical example will be a Power Point presentation saved as a HTML document and placed on the Web for students to review later. Level Two use requires a bit more technical know how the instructor, daily or weekly maintenance, and low to moderate space and bandwidth, depending upon the nature of the material place online. For example, a textual outline of course notes would require very little bandwidth compare to a 30 slide, graphic rich Power Point presentation. One point to consider using supplemental Web use is the timing or placing information online. One colleague found that if lecture notes were placed on the Web prior to class, then session attendance dropped significantly (Stephen & Marshall, 1999).

Level 3: Essential Web Use

Essential refers to the fact that the student cannot be a productive member of the class with out regular Web access. The essential level of Web use is still fairly uncommon today. At this level, the student obtains most, if not all, of the course content information from the Web. At this level, one might think, for lack of a better example, of the Web replacing the textbook in the course. We suggest that this thinking, while convenient, is ultimately counterproductive to the effective use of the Web and education. It is indicative of a traditional, directed instruction approach to education and may limit more effective and creative uses of the technology. It also suggests that

simply changing the medium makes a significant impact on the course content. Course content may be created by the instructor or compiled by the instructor, but is likely a combination of both. It requires the instructor to have HTML skills along with ample course development time. If the instructor does not have these skills, he or she must have access to somebody who does have the skills. Classes still meet face to face, but students are expected to use the Web based course materials extensively. Essential course material made available online requires that the students take a more proactive approach to ensuring their own learning (Stephen & Marshall, 1999).

Level 4: Communal Web Use

The communal level of Web based instruction is only just beginning to receive widespread use. At this level, classes meet both face to face and online. Course content may be provided in an online environment or in a traditional classroom. Ideally, students generate much of the course content themselves. This level goes beyond basic HTML and requires the use of other online tools, such as the Internet chat, bulletin boards, and perhaps one and two way desktop video. This level requires both the instructor and the students to have good HTML skills as well as effective technology skills in general. At this writing, online group collaboration tools are generally not as user friendly and "bug-free" as one might hope. Novice technology users might not be able to get past the frustrations of imperfect tools to get to meaningful interaction about the course content (Stephen & Marshall, 1999).

Level 5: Immersive Web Use

The immersive level is still quite uncommon today. While several excellent examples of it do exist, most organizations do not have the infrastructure needed to support it, nor do most instructors have the skills required to implement it. At this level, classes do not meet face to face. All of the course content and course interaction occur online. Note that we are not referring to the more traditional idea of distance learning. Instead, this level should be seen as a sophisticated, constructivist virtual learning community. While it may include some degree of traditional content presentation, students practice, feedback, and assessment practices found in traditional distance instruction, it is often comprised of learner centered, constructivist pedagogies. At this level, both instructor and students must have a high level of technical expertise and sophisticated learning strategies (Stephen & Marshall, 1999).

Table 2.5 (Stephen & Marshall, 1999) shows the factors and levels of Web Based Instruction (WBI).

Table 2.5: Factors and Levels of Web Based Instruction (WBI)

Factors	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Distance	Low	Low	Low	Medium	High	High
Stability of Material	Stable	Stable	Stable	Dynamic	Dynamic	Dynamic
Need for Multimedia	None	Low	Low	High	High	High
Need for Students Tracking	None	Low	Low	High	High	High
Number of Students	Large	Large	Large	Large	Small	Small

Amount of Interaction	Low	Low	Low	Low	High	High
Social Pressure to Use Web	None	High	High	Medium	Low	Low
Need for Offline Reference	None	Low	Low	High	High	High
Infrastructure	None	Low	Low	Moderate	High	High
Comfort Levels	None	Low	Medium	Medium	High	High
Access	None	Low	Low	Moderate	High	High

2.6 A Suggested Model for a Working Cyberschool

Reservations are voiced in the literature on the merits of use of various technologies in schools. Proponents of the use of the technologies in schools, on the other hand, hold rather than far reaching views for their benefits. They envision a paradigm shift effected by introduction of technologies, away from traditional, canonized instruction and toward a more participatory approach to teaching and learning. Affirming a guarded optimism, this model, representing the voices of Kamiak Cyberschool students and staff, proposes that the use of computer technology in schools offer a new way of learning. Duffy and Jonassen (1992) suggest that students learn with particular effectiveness when they are engaged in constructing personally meaningful artifacts. At Kamiak Cyberschool, 95% of students cited the use of computers, interactive media, and online resources and project based learning as the primary factors contributing to their initial engagement, defines specifically as being "being actively involved in or committed" (Mahnaz, 2000).

Instead of the structured pedagogical approach of lecture and assignments, the students in this program were given the use of computers and online resources in order to take

an active part in the construction and production of their learning. To these 95% of the students, the newness of the approach to their learning was the primary factor in their initial engagement, and the nucleus around which all other characteristic of this school were made possible. When asked whether they would still come to the program if there were no computers in the Cyberschool, no one said that they would. I think I would die, one student said. Or, the computer's what keeps my interest, keeps my focus (Mahnaz, 2000).

In this model, use of computers, interactive media, and online resources builds on the initial engagement of students in technology to sustain their interest. The curriculum in this model follows that of the district, but is technology driven, project based, adaptive to different learning styles, and conducive to creative thinking and learning. Using computers, interactive media, and online resources as well as textbooks, an individualized course of study for each student may be mapped out in a student or teacher conference, allowing for incorporating mutually acceptable projects in each student's personal growth activity plan. Students have latitude to choose as many credits as they wish within graduation requirements, but they follow a self paced, independent schedule of study, and they are required to demonstrate quarterly progress toward completion of assigned work for each of the credits (Mahnaz, 2000).

It is suggested that a technology driven, project based environment, in which students follow an individualized and self paced learning plan, lends itself to a flexible attendance requirement. In the case of Kamiak Cyberschool, changes in state rules and regulations governing contact and instruction time in public schools allowed for this

flexibility. The students in the Cyberschool are required to attend school seven hours per week, with another 20 hours of school related work performed at home. Attendance and daily work are recorded in a log sheet, and procedures are also put in place to check truancy and lack of demonstrated progress toward completion of registered credits. One to one interaction allows the students to seek solutions to their specific issues and design their learning projects in close collaboration with the instructors. In this model, a self paced technology driven curriculum and flexible school hours afford teachers the adequate time they require to diagnose the needs and capacities of students and design an appropriate learning plan adaptive to their learning styles (Mahnaz, 2000).

This model suggests that improved student relations are also facilitated in a technology driven, flexible hour program for two reasons. First, since the students attend the school at different hours during the week, it is less possible for students to form exclusive groupings. The non cliquish school environment was cited by 63% of Cyberschool students as the next most important component to their sustained engagement (Mahnaz, 2000).

2.7 E-Commerce Web Page

One of the lecturer in Faculty Computer Science and Information Technology (FCSIT) in University Malaya has created a web page. The web page is being used for his lecturing purpose, such as;

1) Course Information
2) Lecture Notes
3) Tutorial Questions

4) Answer for Tutorial Questions

5) Online Tutorial Submission

6) Online Tutorial Submission Conformation

The web page is being used for his E-Commerce and Data Mining subject. The web page address is http://perdana.fsktm.um.edu.my/~tehyw/. The lecturer will placed all the information and announcement in the web page, so that the students can check the latest update from wherever they are. The lecturer also placed the lecture notes on his web page where the students can download them. The students also can check the tutorial questions from the web page and submit the answer for the tutorial questions via online to the lecturer web page. After submit the tutorial answer, they also can check their submission through online from the lecturers web page via query section which also apart of the system. When the students keyed in the students user name or tutorial question number, the query result will list out the tutorial that had received by the system according to the query question that had key in to the system. The lecturer also, will place the tutorial answers in his web page after received all the tutorial submission from the students.

The drawbacks of the system is, the system requires the students detail every time when they passing up the tutorial answers. The system only supports text tutorial submission which has to type in the provided place in the system. The system is not able to support graph, tables and pictures.

2.8 Questionnaire Analysis

To determine the problems are facing by the students, a survey has been conducted. The details of the survey are as follow:

Description	: A survey has been conducted in a form of questionnaire.
Time Frame	: 3 weeks
Date	: 12th August 2002 – 2nd September 2002
Place	: FCSIT, University Malaya
Participants	: Students in FCSIT, University Malaya
Number of questions	: 12
Number of questionnaires handed out	: 80
Number of questionnaires returned	: 80

2.8.1 Section A – Your Feedback Analysis

Question 1: Where do you normally access the internet to get your tutorial questions and other information regarding this paper (SAD)?

Table 2.8.1(a): Question 1 Response

Answers	Response	Percentage (%)
Faculty	73	91.25
Cyber café	14	17.5
Home	14	17.5
Library	6	7.5

Others	2	2.5

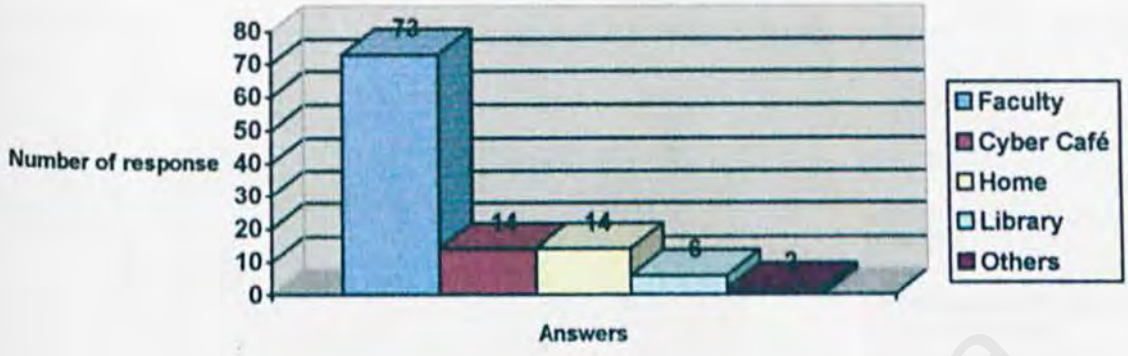

Figure 2.8.1(a): Question 1 Response

From the Figure 2.8.1(a), we can conclude that majority of the students accessing the Internet from the faculty that is 91.25%. Although accessing the Internet from the faculty is the highest but they are also students accessing the Internet from cyber café, home, library and others. The others option was accessing the Internet from friend's house and office. The faculty was the highest because, they are a lot of computers provided to the students and most of the times, the students will be in the faculty which makes them convenience using Internet in the faculty.

Question 2: What web browser are you using to access the internet?

Table 2.8.1(b): Question 2 Response

Answers	Response	Percentage (%)
Internet Explorer	79	98.75

Netscape (Navigator or Communicator)	8	10
Others	0	0

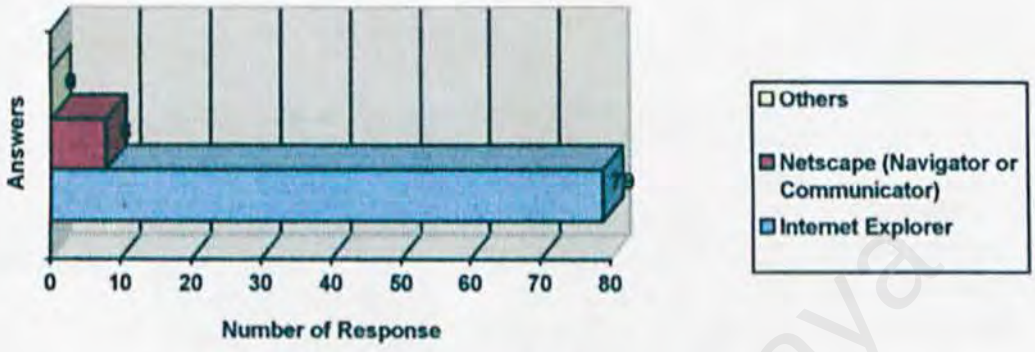

Figure 2.8.1(b): Question 2 Response

Most of the students are using Internet Explorer as their Web browsers to access the Internet. Table 2.8.1(b) shows that 98.75% of the students are using Internet Explorer compare to 10% using Netscape browsers such as Netscape Navigator or Communicator. Since majority of the students are using Internet Explorer, so it won't be a problem to browse this systems' Web page because this system has limitation that only supports Internet Explorer.

Question 3: How do you get your tutorial questions?

Table 2.8.1(c): Question 3 Response

Answers	Response	Percentage (%)
Photostat	67	83.75

Web (Online)	65	81.25
Lecture Hall	33	41.25
Lecture Room	26	32.5
Others	2	2.5

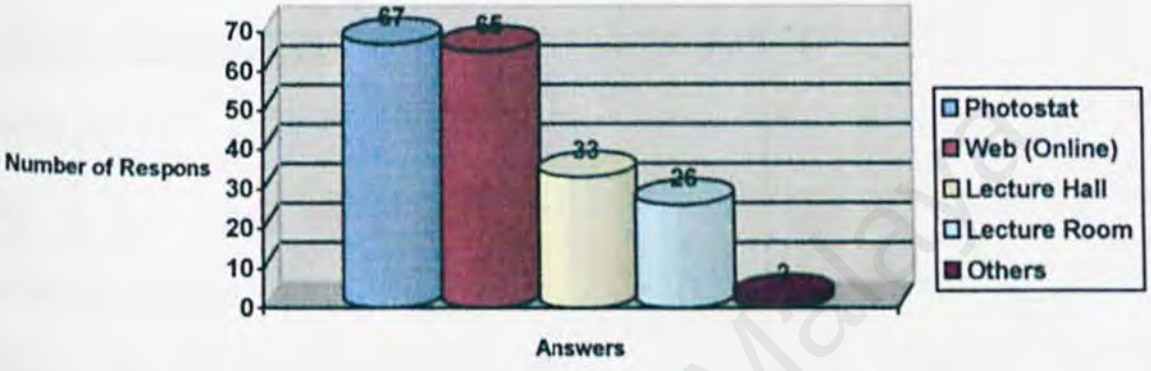

Figure 2.8.1(c): Question 3 Response

Majority of the students are getting the tutorial questions from Photostat and Web (Online). Since this systems' use the Web (Online) method to distribute the tutorial questions, so it won't be a problem to them to use this system. Getting the tutorial questions from Lecture Hall and Lecture Room are 41.25% and 32.5%. The others method is only 2.5% which not mentioned by the students.

Question 4: What are the problems you encounter to obtain your tutorial questions?

Table 2.8.1(d): Question 4 Response

Answers	Response	Percentage (%)
Long queue (crowded)	54	67.5
Operating hours very short	18	22.5
Few Photostat services available	20	25
Lack of men power to operate the machine	15	18.75
Photostat services are slow	32	40
Others	1	1.25

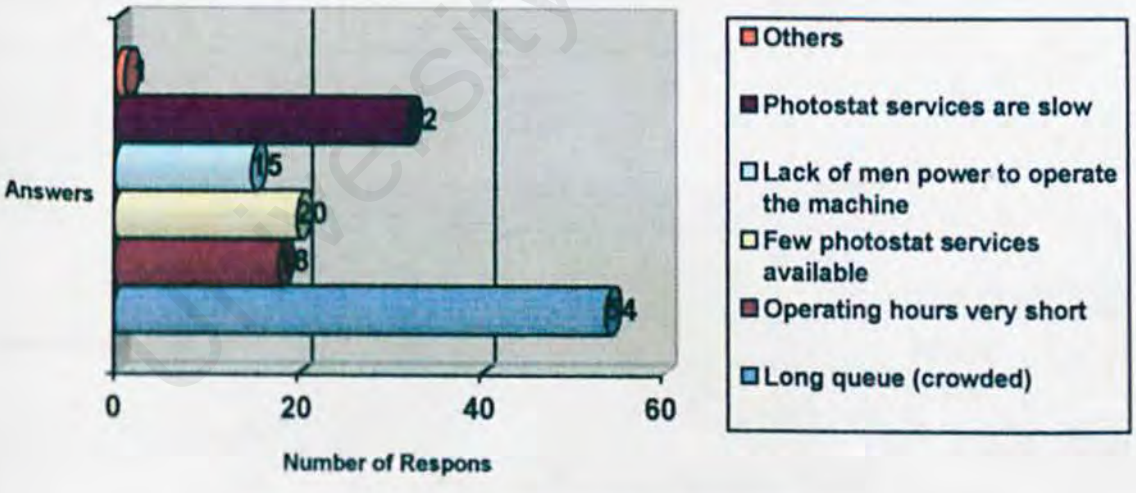

Figure 2.8.1(d): Question 4 Response

Students are facing problem due to long queue (crowded) in Photostat shop and because of Photostat services are slow that is 67.5% and 40%. Students are facing long queue

problem because of many students trying to get same things at a same time. For example students are trying to get tutorial questions after the class finish, so this may cause many students crowding in one place at a same time. Other than that students also facing problem because of few Photostat service available (25%), operating hours very short (22.5%), lack of men power to operate the machine (18.75%) and others (1.25%).

Answer for Question 4: Photocopy - Long queue (crowded)

Table 2.8.1(e): Answer 4 Photocopy - Long Queue (crowded)

Answers	Response	Percentage (%)
Time Consume	54	67.5
Cost	4	5
Risk	2	2.5
Poor Service	11	13.75

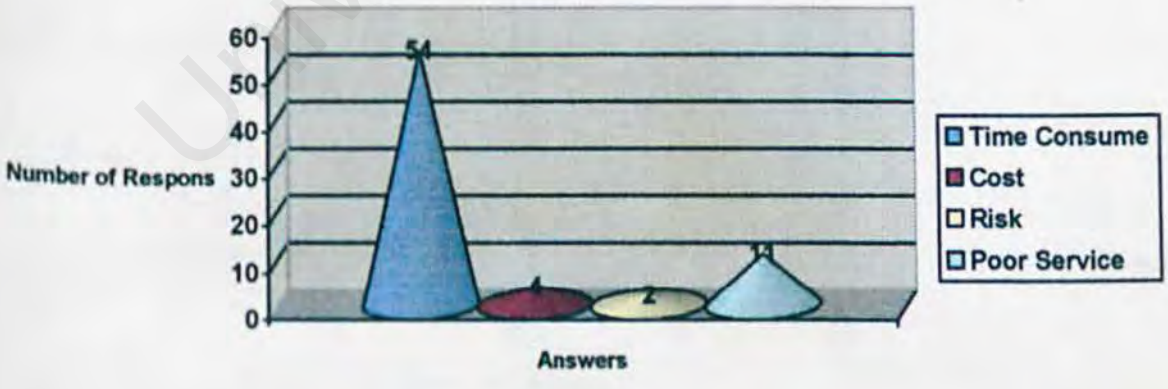

Figure 2.8.1(e): Answer 4 Photocopy - Long Queue (crowded)

Hence to long queue (crowded) problem students are facing the impacts in time consume which is 67.5%, followed by poor service - 13.75%, cost – 5% and risk - 2.5%. From the table 2.8.1(e), we can conclude that the highest impact that the students are facing is time consume and this may accrued because of students are late for class, back home or to college.

Answer for Question 4: Photocopy - Operating hours very short

Table 2.8.1(f): Answer 4 Photocopy - Operating Hours Very Short

Answers	Response	Percentage (%)
Time Consume	18	22.5
Cost	1	1.25
Risk	9	11.25
Poor Service	12	15

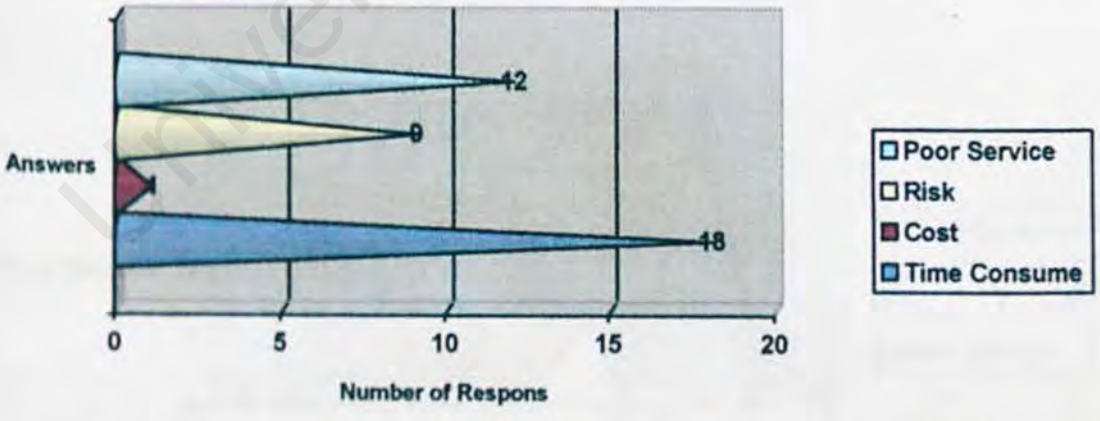

Figure 2.8.1(f): Answer 4 Photocopy - Operating Hours Very Short

The impact of the operating hours very short is time consume (22.5%), poor service (15%), risk (11.25%) and cost (1.25%). Students are facing time consume impact more for the operating hours very short problem compare to other three impacts. This is because students can't depend on the Photostat service available here and have to rush to other Photostat shop for the service due to very short operating hours and this is may not flexible for them.

Answer for Question 4: Photocopy – Few Photostat services available

Table 2.8.1(g): Answer 4 Photocopy - Few Photostat Services Available

Answers	Response	Percentage (%)
Time Consume	12	15
Cost	6	7.5
Risk	5	6.25
Poor Service	20	25

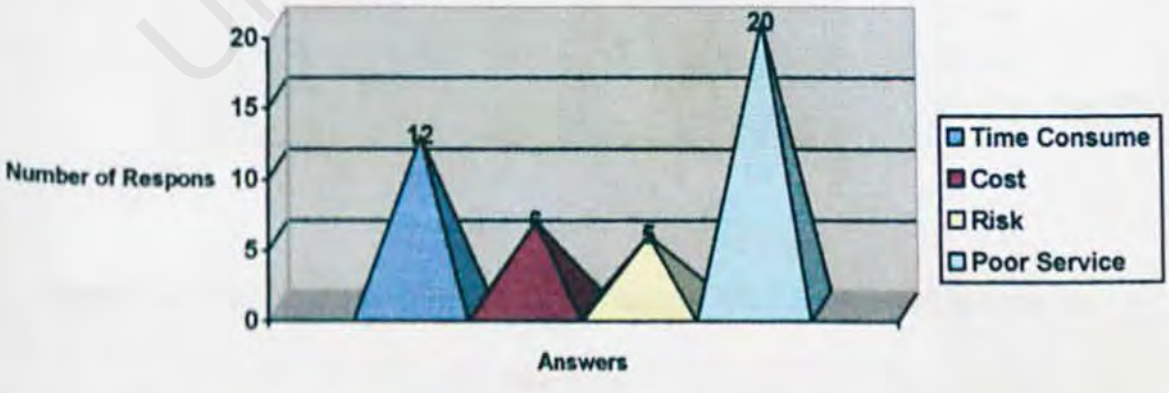

Figure 2.8.1(g): Answer 4 Photocopy - Few Photostat Services Available

For few Photostat services available, students are facing impact from poor service that is 25%, followed by time consume – 15%, cost – 7.5% and risk – 6.25%. Hence to only one Photostat shop available, students are facing problem if the shop out of service, early close or Photostat machine down.

Answer for Question 4: Photocopy – Lack of men power to operate the machine

Table 2.8.1(h): Answer 4 Photocopy - Lack of Men Power to Operate the Machine

Answers	Response	Percentage (%)
Time Consume	15	18.75
Cost	3	3.75
Risk	4	5
Poor Service	6	7.5

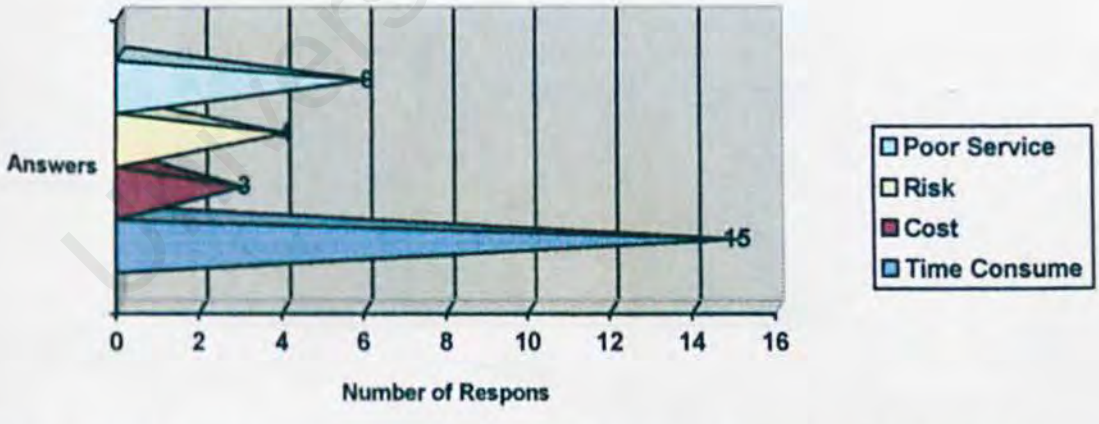

Figure 2.8.1(h): Answer 4 Photocopy - Lack of Men Power to Operate the Machine

Time consume is the high impact for the problem, lack of men power to operate the machine. This is because few people working in the shop and this cause to late service problem and time consume impacts. The next impacts faced are poor service, followed by risk and cost.

Answer for Question 4: Photocopy – Photostat services are slow

Table 2.8.1(i): Answer 4 Photocopy - Photostat Services are Slow

Answers	Response	Percentage (%)
Time Consume	17	21.25
Cost	4	5
Risk	1	1.25
Poor Service	32	40

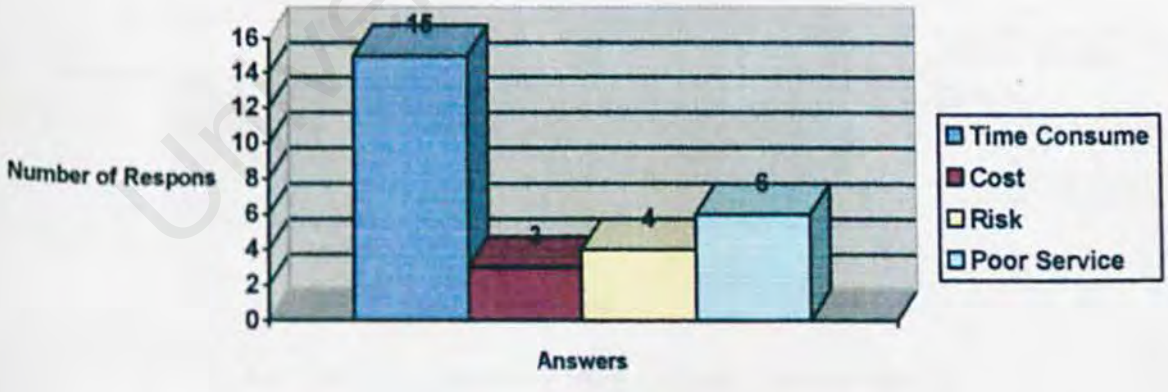

Figure 2.8.1(i): Answer 4 Photocopy - Photostat Services are Slow

Time consume is the high impacts for the problem Photostat services are slow followed by poor service, risk and cost. Students are facing time consume impacts because of the service are very slow and they have to wait for along time to get their work done.

Answer for Question 4: Web Online – Server down

Table 2.8.1(j): Answer 4 Web Online - Server down

Answers	Response	Percentage (%)
Time Consume	20	25
Cost	8	10
Risk	12	15
Poor Service	16	20

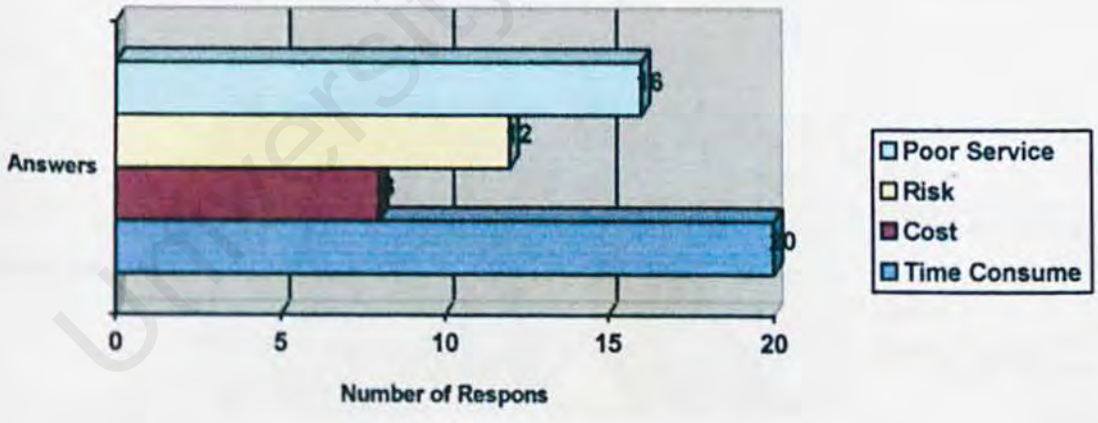

Figure 2.8.1(j): Answer 4 Web Online - Server down

For the server down problem, time consume is the high impact that is 25%, followed by poor service with 20%, risk with 15% and cost with 10%. Students facing time

consume impact due to server down problem because they have to spend a lot of time to get their work done.

Answer for Question 4: Web Online – No PC available in the labs, hence have to depend on cyber café

Table 2.8.1(k): Answer 4 Web Online - No PC available in the labs, hence have to depend on cyber cafe

Answers	Response	Percentage (%)
Time Consume	6	7.5
Cost	15	18.75
Risk	3	3.75
Poor Service	6	7.5

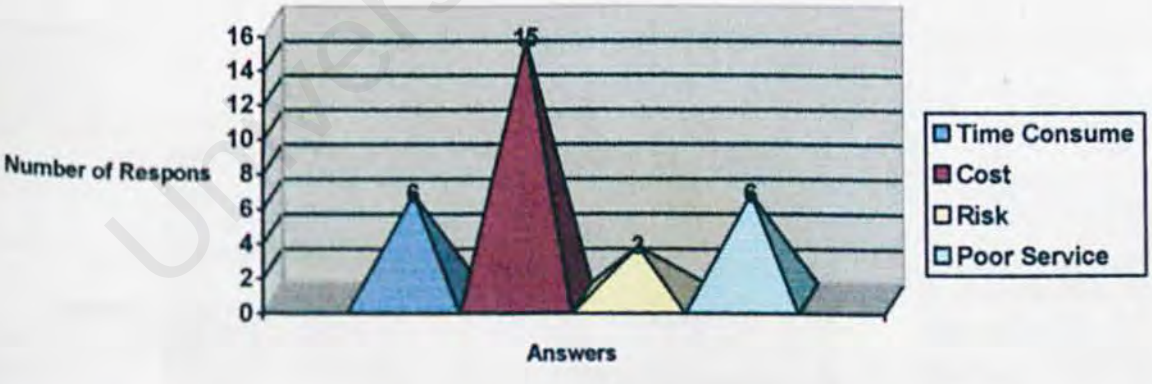

Figure 2.8.1(k): Answer 4 Web Online - No PC available in the labs, hence have to depend on cyber café

Cost is the high impact for the problem no pc available in the labs, hence has to depend on cyber café with 18.75%. This is because all the pc is occupied by other students and they have to depend to cyber café, which will cost them. The other impacts are time consume and poor service each with 7.5% and followed by risk with 3.75%.

Answer for Question 4: Web Online – Questions are uploaded, right before the class (or late)

Table 2.8.1(l): Answer 4 Web Online - Questions are uploaded, right before the class (or late)

Answers	Response	Percentage (%)
Time Consume	20	25
Cost	2	2.5
Risk	12	15
Poor Service	9	11.25

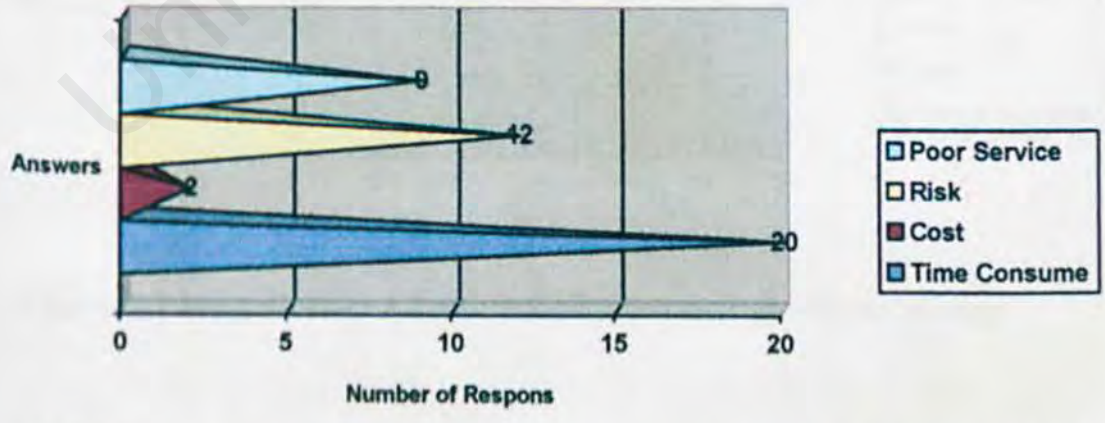

Figure 2.8.1(l): Answer 4 Web Online - Questions are uploaded, right before the class (or late)

For the questions are uploaded, right before the class (or late) problem, time consume is the high impact with 25% and followed by risk 15%. Students are facing time consume problem because they have to few times access the Web page to get the tutorial questions and this will take a lot of time.

Answer for Question 4: Lecture Hall – Not enough Photostat copy

Table 2.8.1(m): Answer 4 Lecture Hall – Not enough Photostat copy

Answers	Response	Percentage (%)
Time Consume	6	7.5
Cost	6	7.5
Risk	8	10
Poor Service	16	20

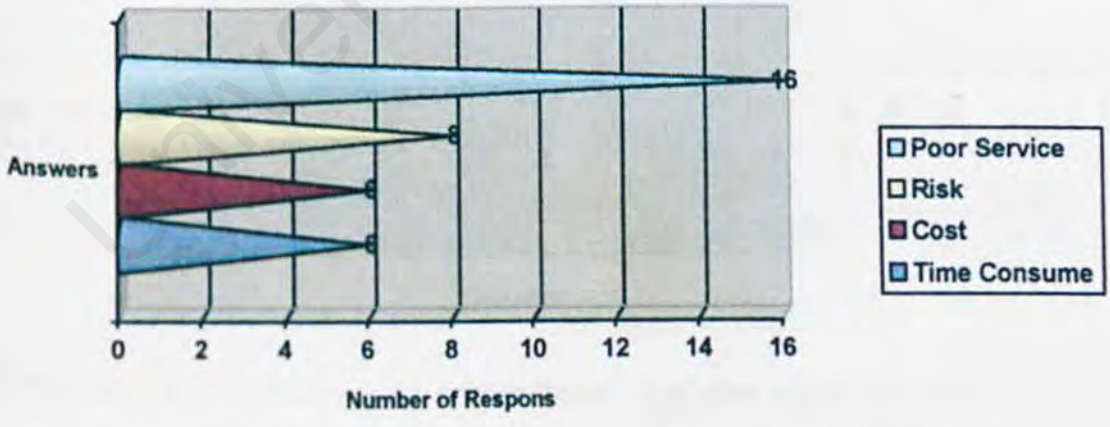

Figure 2.8.1(m): Answer 4 Lecture Hall – Not enough Photostat copy

Poor service is the high impact for the not enough Photostat copy problem with 20%. This is because the lecturer are not prepare enough copy for the need of the students or not make sure that each person take only one copy so that it is enough for every one.

Answer for Question 4: Lecture Room - Lecture not in the room

Table 2.8.1(n): Answer 4 Lecture Room - Lecture not in the room

Answers	Response	Percentage (%)
Time Consume	7	8.75
Cost	3	3.75
Risk	6	7.5
Poor Service	4	5

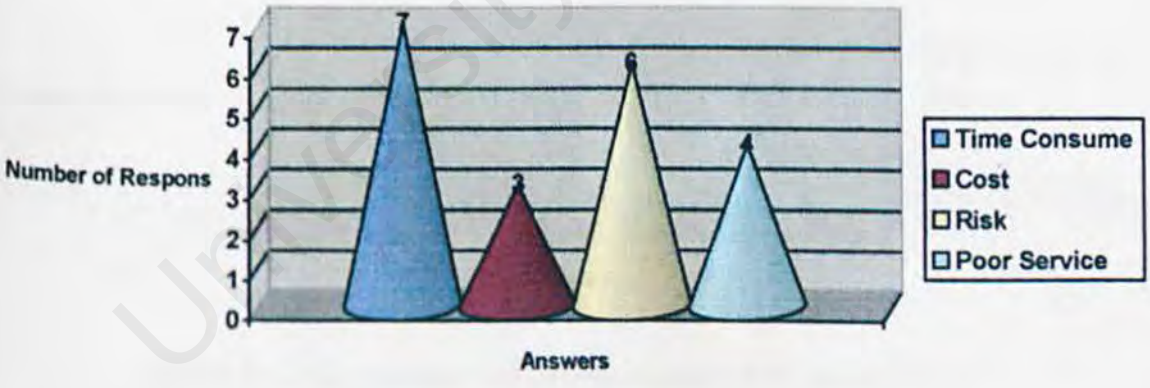

Figure 2.8.1(n): Answer 4 Lecture Room - Lecture not in the room

For the problem lecture not in the room, time consume is the highest impact with 8.75%. The next impact is risk with 7.5% and poor service with 5%. Students are facing

time consume impacts because when they find for the lecturer, lecturer are not in the room and this cause them to find for the lecturer for few more times.

Answer for Question 4: Lecture Room - Not enough copy

Table 2.8.1(o): Answer 4 Lecture Room - Not enough copy

Answers	Response	Percentage (%)
Time Consume	5	6.25
Cost	4	5
Risk	6	7.5
Poor Service	9	11.25

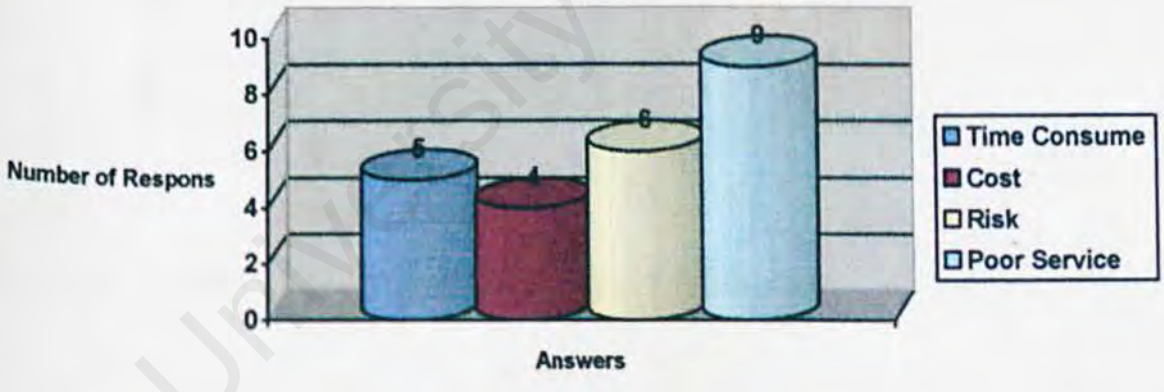

Figure 2.8.1(o): Answer 4 Lecture Room - Not enough copy

Poor service is the impact for the not enough copy problems with 11.25% and followed by risk with 7.5%. This is because the students are not getting enough copy for each of them due to not enough copy Photostatted or students are taking more than one copy which should be detected by the lecturer when hand over the papers.

Question 5: How are you passing up your tutorials?

Table 2.8.1(p): Question 5 Response

Answers	Response	Percentage (%)
Lecture Room	42	52.5
Office	24	30
Pigeon Hole	25	31.25
Lecture Hall / Tutorials	38	47.5

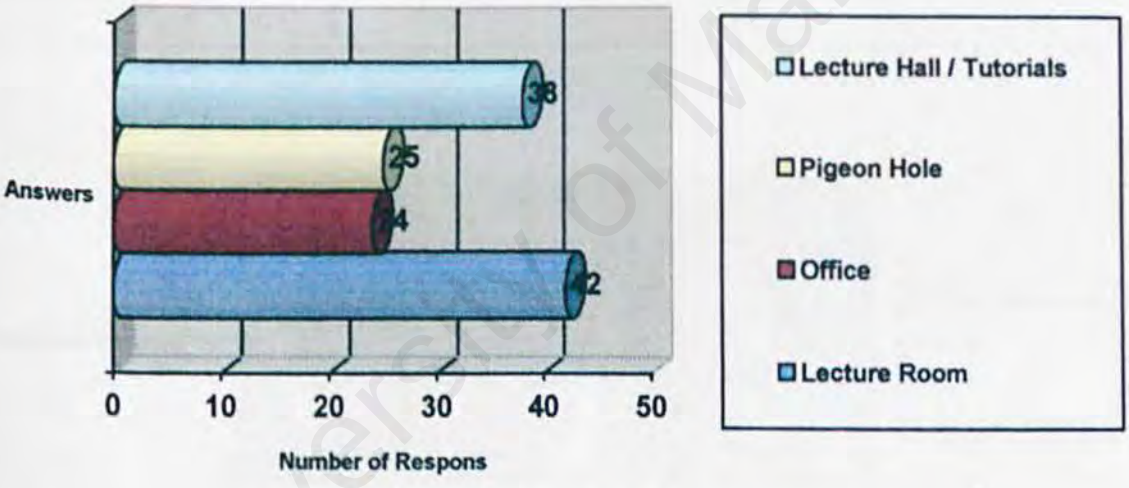

Figure 2.8.1(p): Question 5 Response

Passing tutorials through lecture room is the highest with 52.5%, followed by Lecture hall / tutorials with 47.5%, pigeon hole with 31.25% and office with 30%. Lecturers are using all four type of passing tutorial question and among the four types the most famous is lecture room and lecture hall / tutorials.

Question 6: What are the problems faced when passing up your tutorials?

Answer for Question 6: Lecture Room - Lecture are not available

Table 2.8.1(q): Answer 6 Lecture Room - Lecture are not available

Answers	Response	Percentage (%)
Time Consume	20	25
Cost	1	1.25
Risk	16	20
Poor Service	2	2.5

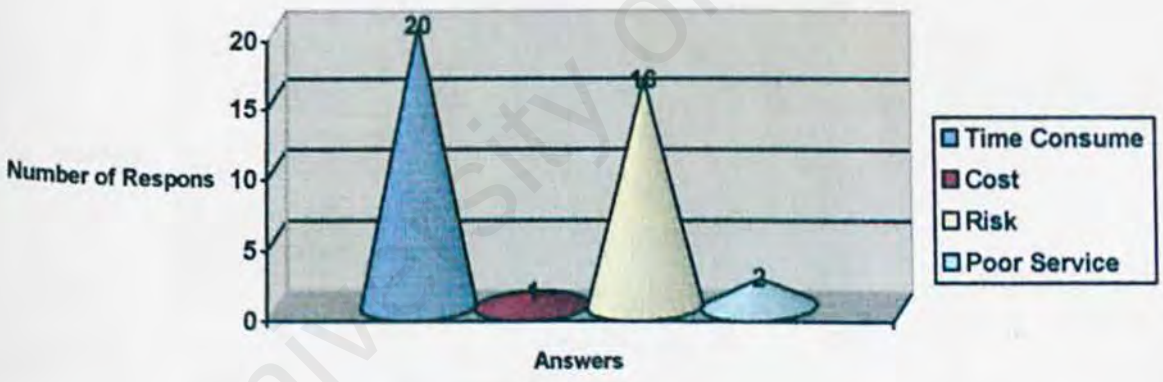

Figure 2.8.1(q): Answer 6 Lecture Room - Lecture are not available

For the lecture are not available problem, the impacts are time consume with 25% and risk with 20%. These are the highest impacts that the students are facing and this is because the students have to find for the lecturer for few times and it is risk to them if they couldn't find the lecturer and the tutorial couldn't pass up right on time.

Answer for Question 6: Lecture Room - The time period to pass up is limited and fixed schedule

Table 2.8.1(r): Answer 6 Lecture Room - The time period to pass up is limited and fixed schedule

Answers	Response	Percentage (%)
Time Consume	27	33.75
Cost	2	2.5
Risk	13	16.25
Poor Service	1	1.25

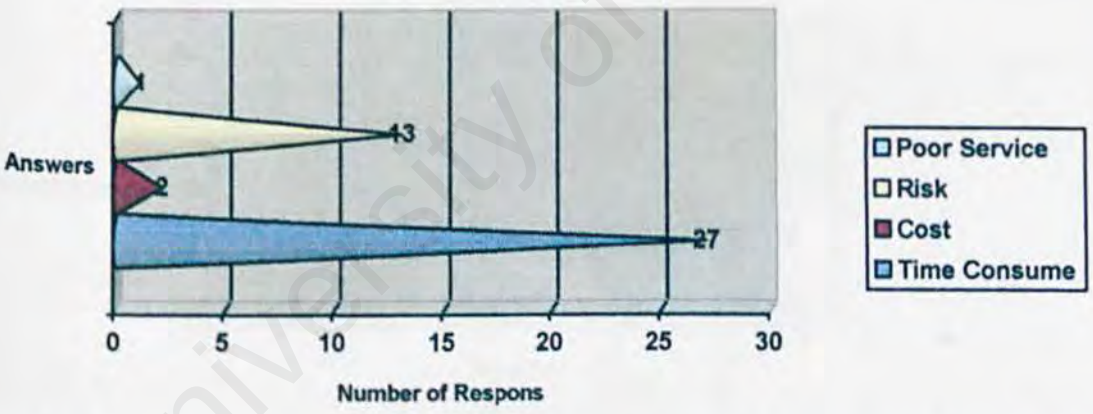

Figure 2.8.1(r): Answer 6 Lecture Room - The time period to pass up is limited and fixed schedule

Time consume shows the highest impact in this problem with 33.75% and followed by risk 16.25%. This is because the limited time period to pass up tutorials may clash with the student's time table, or the students don't have classes on that day and they have to come along the way just to pass up their tutorials.

Answer for Question 6: Office - Delay in passing up because of over crowding of students

Table 2.8.1(s): Answer 6 Office - Delay in passing up because of over crowding of students

Answers	Response	Percentage (%)
Time Consume	18	22.5
Cost	1	1.25
Risk	5	6.25
Poor Service	7	8.75

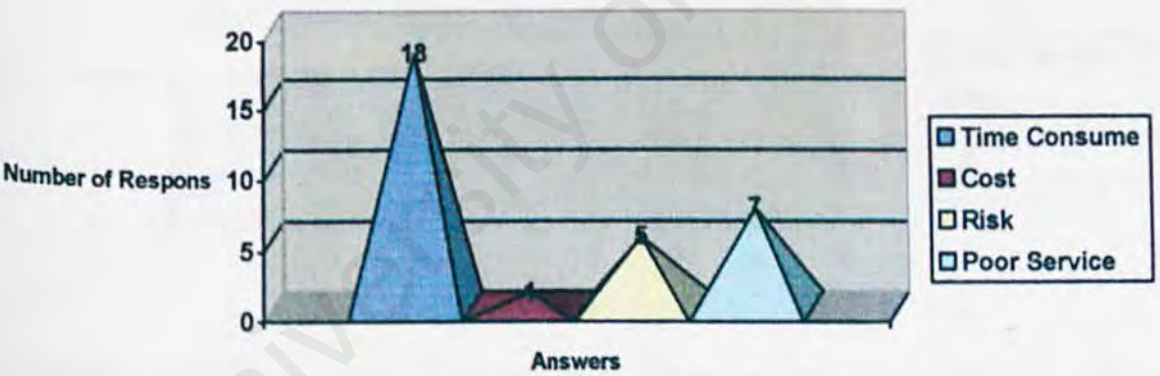

Figure 2.8.1(s): Answer 6 Office - Delay in passing up because of over crowding of students

Delay in passing up because of over crowding of students cause the highest impact on the time consume with 22.5%, followed by poor service, risk and cost. This is because a big number of students have to pass up the tutorials at a limited time period and this will cause over crowded of students and take a long time to pass up their work.

Answer for Question 6: Pigeon Hole - Tutorial answers are not received by the lecturer

Table 2.8.1(t): Answer 6 Pigeon Hole - Tutorial answers are not received by the lecturer

Answers	Response	Percentage (%)
Time Consume	8	10
Cost	0	0
Risk	16	20
Poor Service	4	5

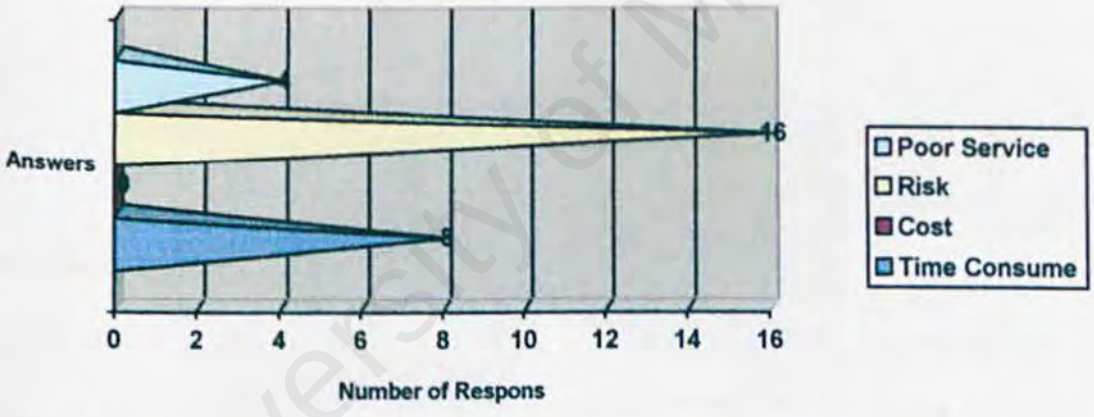

Figure 2.8.1(t): Answer 6 Pigeon Hole - Tutorial answers are not received by the lecturer

As seen in the above figure 2.8.1(t), risk and time consume causes a big impact. This is because when passing up in pigeon hole there is a high possibility the tutorial answers are getting lost or stole by others. Hence, the risk impacts are 20% and followed by other impacts.

Answer for Question 6: Lecture Hall / Tutorial Room - Delay in passing up the tutorial due to the requirement to sign up the students acceptance form

Table 2.8.1(u): Answer 6 Lecture Hall / Tutorial Room - Delay in passing up the tutorial due to the requirement to sign up the students acceptance form

Answers	Response	Percentage (%)
Time Consume	29	36.25
Cost	0	0
Risk	9	11.25
Poor Service	6	7.5

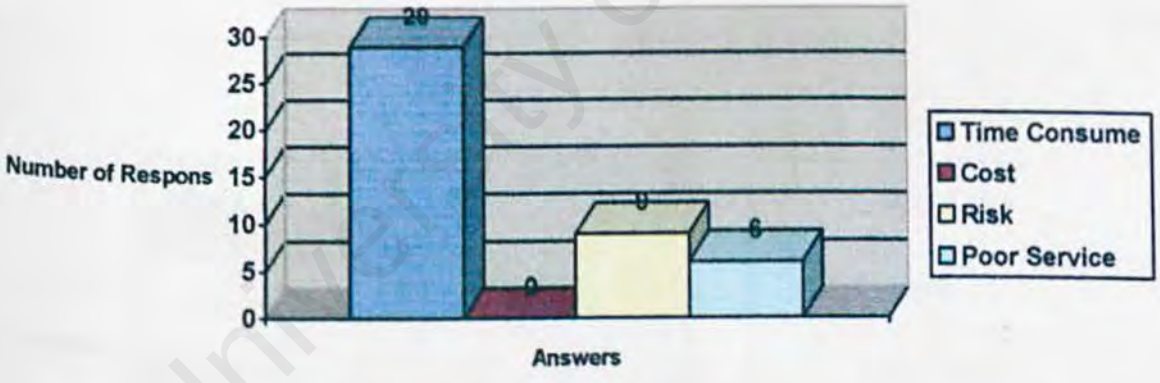

Figure 2.8.1(u): Answer 6 Lecture Hall / Tutorial Room - Delay in passing up the tutorial due to the requirement to sign up the students acceptance form

Time consume brings the highest impact in this problem, it is 36.25% and followed by the other impacts. This is because a big group of students have to queue up for their turn and find their name in the submission form and sign the form for conformation.

2.8.2 Section B – Your Suggestion Analysis

Question 1: Do you feel safe passing up your tutorials through online to SAD web page and no other person can access it except the lecturer?

Table 2.8.2(a): Question 1 Response

Answers	Response	Percentage (%)
Most Disagree	6	7.5
Disagree	6	7.5
Less Agree	10	12.5
Agree	35	43.75
Most Agree	23	28.75
Total	80	100

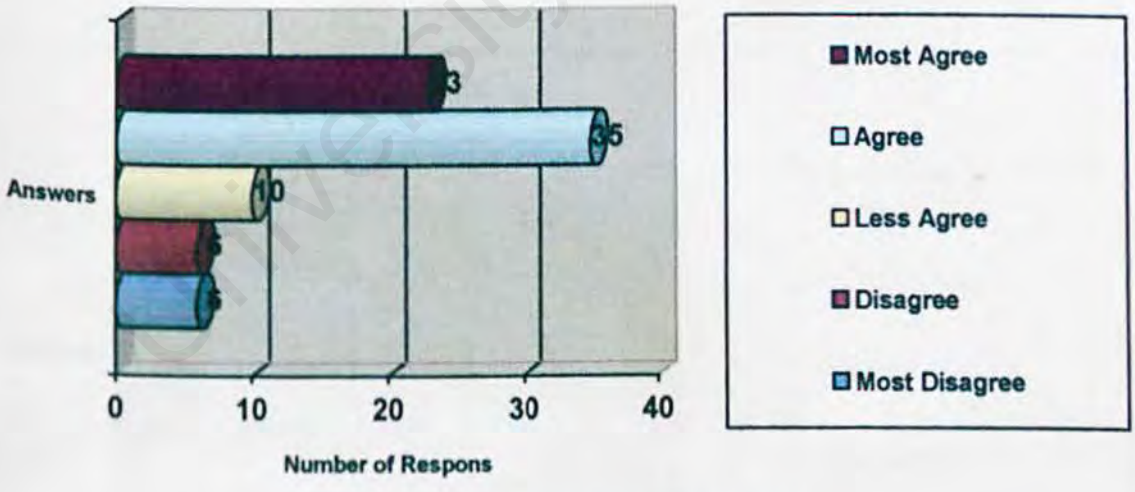

Figure 2.8.2(a): Question 1 Response

Most of the students have chosen most agree and agree for passing up tutorial questions through web site with 28.75% and 43.75%. This is because the tutorial question will be safe and it is easy to them passing up in that way.

Question 2: Would you like your tutorial submission to be confirmed?

Table 2.8.2(b): Question 2 Response

Answers	Response	Percentage (%)
Most Disagree	1	1.25
Disagree	5	6.25
Less Agree	2	2.5
Agree	23	28.75
Most Agree	49	61.25
Total	80	100

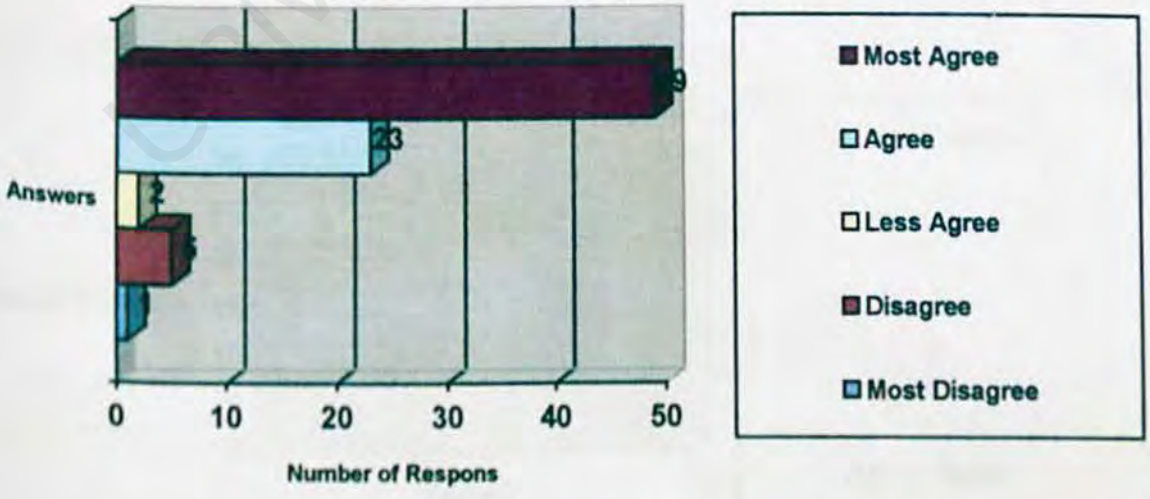

Figure 2.8.2(b): Question 2 Response

61.25% of the students have chosen most agree to confirm their submission when they passing up their tutorials and followed by 28.75% of the students agree with that. This is because the students feel safety by doing that and for making sure that the submission is received by the lecturer.

Question 3: Would you prefer to do the test online?

Table 2.8.2(c): Question 3 Response

Answers	Response	Percentage (%)
Most Disagree	11	13.75
Disagree	10	12.5
Less Agree	27	33.75
Agree	23	28.75
Most Agree	9	11.25
Total	80	100

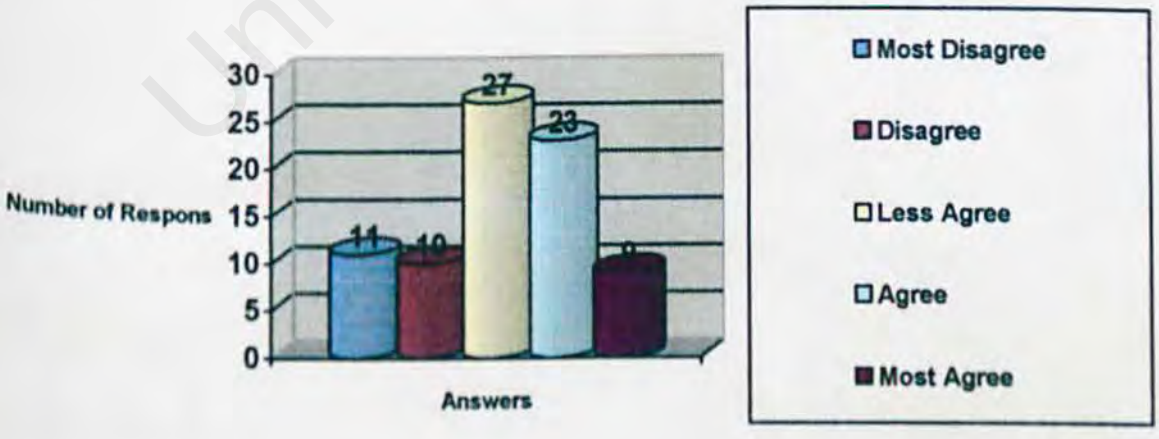

Figure 2.8.2(c): Question 3 Response

Majority of the students' shows less agree and agree for doing test online with 33.75% and 28.75%. Only 11.25% of the students are most agree with online test. This is because doing test online is still a new thing and they have not tried it before, so they have no confidence by doing that.

Question 4: What is your opinion to view the tutorials and test marks (in Grade) through online?

Table 2.8.2(d): Question 4 Response

Answers	Response	Percentage (%)
Most Disagree	6	7.5
Disagree	3	3.75
Less Agree	20	25
Agree	28	35
Most Agree	23	28.75
Total	80	100

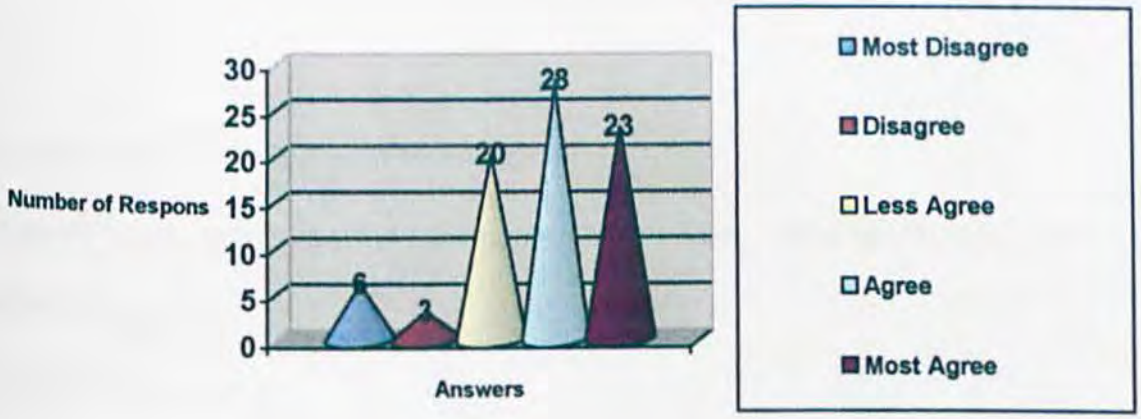

Figure 2.8.2(d): Question 4 Response

25% of the students shows most agree, followed by 35% with agree and 28.75% with less agree for view their tutorial and test marks in grade through online. Most of the students like to view their marks through online because they don't have go to lecturer's room every time to check whether their marks are placed.

CHAPTER 3: METHODOLOGIES

3.1 Important of Development Methodology

There are many models in software engineering literature, which can be categorized as follow (Pfleeger, 2001):

1) Prescriptions
   - The way the software development should progress, and
2) Descriptions
   - The way the software development is done in activity

In theory, these 2 kinds of models should be similar or same but in practice there are not. Building a process model will help to understand this gap between what should be and what it is. They are several other reasons for modeling a process that are (Pfleeger, 2001):

a) When a description of a development process exists, it forms a common understanding of the activities, resources, and constraints involved in development of a project.

b) Creating a process model helps us find inconsistencies, redundancies, and omissions in the process and in its constituent parts. Once these problems are noted and corrected, the process becomes more effective.

c) The model should reflect the goals of development, such as finding faults early in development, and meeting required schedule constraints.

d) Every process should be tailored for the special situation in which it will be used. Building a process model helps the developer understand where that tailoring is to occur.

3.2 Types of Development Methodology

Every process models include system requirements as input and delivered product as an output. Many process models have been proposed over the years by the software developers worldwide. Among the most popular process models are as follows (Pfleeger, 2001):

- Waterfall Model
- V Model
- Prototyping Model
- Operational Specification
- Transformational Model
- Phased Development Model
- Spiral Model

3.3 Development Methodology Models Considered for This System

Amongst the many models existing, only 3 models are considered suitable to describe and represent this system and they are:

3.3.1) Waterfall Model

3.3.2) V Model

3.3.3) Prototyping

3.3.1) Waterfall Model

The Waterfall Model is one of the first process models to be introduced to software developers worldwide. As seen in the Figure 3.3.1, the stages in this model are depicted as cascading from one to another. The main feature of this model is that one development stage should be completed before the next stage begins. The Waterfall Model presents a very high-level view of what goes on during development (Pfleeger, 2001).

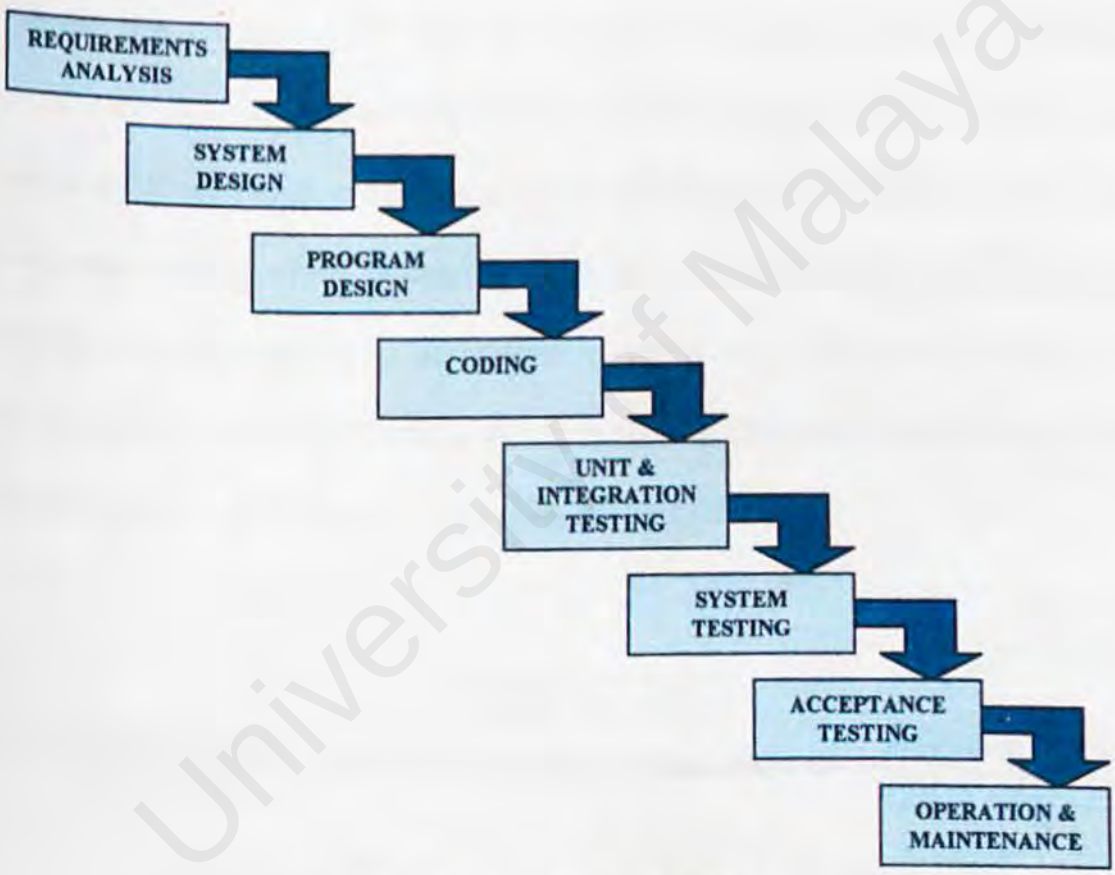

Figure 3.3.1 : Waterfall Model

Benefits: This model can be very useful in helping developers lay out what they need to do. Its simplicity eases the process of explaining the system to customers who are not familiar with software development (Pfleeger, 2001).

Drawbacks: However, the Waterfall Model has a major problem and that is, that this model does not reflect the way the code is really developed. There is no insight into how each activity transforms one artifact to another, such as requirements to design. The model provides no guidance to both managers and developers on how to handle changes to products and activities (Pfleeger, 2001).

3.3.2) V Model

V Model is a variation of the Waterfall Model, which demonstrates how the testing activities are related to analysis and design. As seen in the Figure 3.3.2, coding forms the point of the V, with analysis and design on the left, testing and maintenance on the right. Acceptance testing, which is conducted by the customer instead of the developer, validates the requirements by associating a testing step with each element of the specification and this type of testing checks to see that all requirements have been fully implemented before the system is accepted (Pfleeger, 2001).

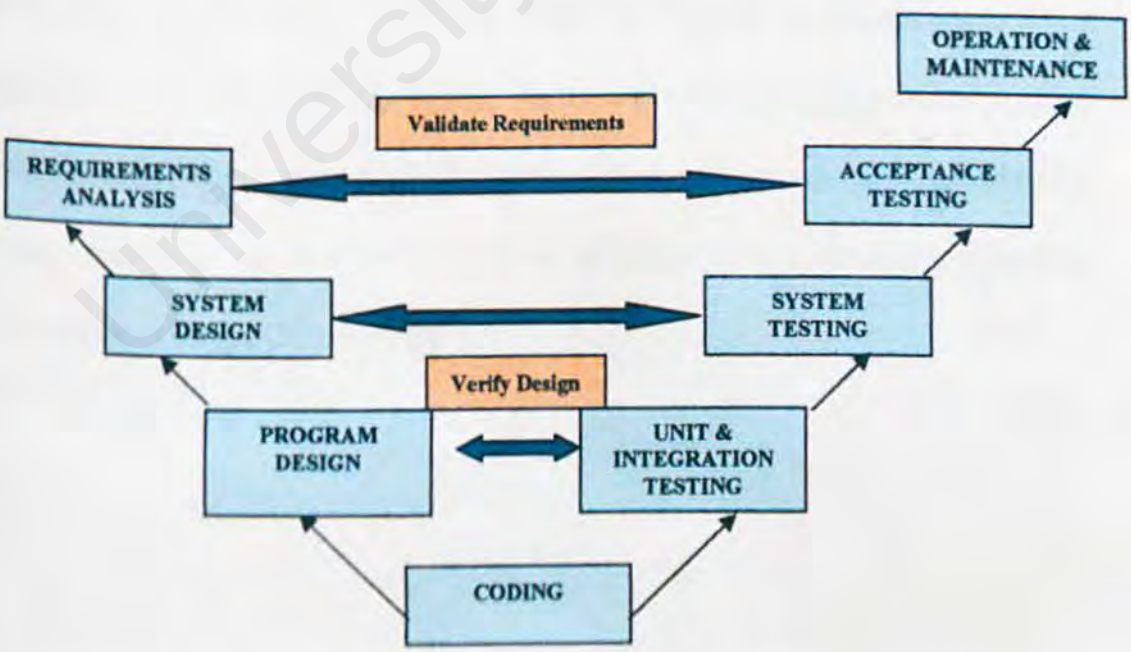

Figure 3.3.2: V Model

Benefits: If problems are found during verification and validation, then the left side of the V can be re-executed to fix and improve the requirements, design and code before the testing steps on the right are re-enacted. The focus of this model is activity and correctness (Pfleeger, 2001).

3.3.3) Prototyping Model

The prototyping model allows all or part of the system to be constructed quickly to understand or clarify issues. In this model, requirements or design require repeated investigation to ensure that the developer, user and customer have a common understanding both of what is needed and what is proposed. The main goal of prototyping is to reduce risk and uncertainty in development (Pfleeger, 2001).

For example, system development may begin with a nominal set of requirements supplied by the customers and users. Then, alternatives are explored by having the interested parties to look at possible screens, tables, reports and other system output that are used directly by the customers and users. As the users and customers decide on what they want, the requirements are revised. Once there is a common agreement on what the requirements should be, the developers move on to design. This process is repeated for all the development stages (Pfleeger, 2001).

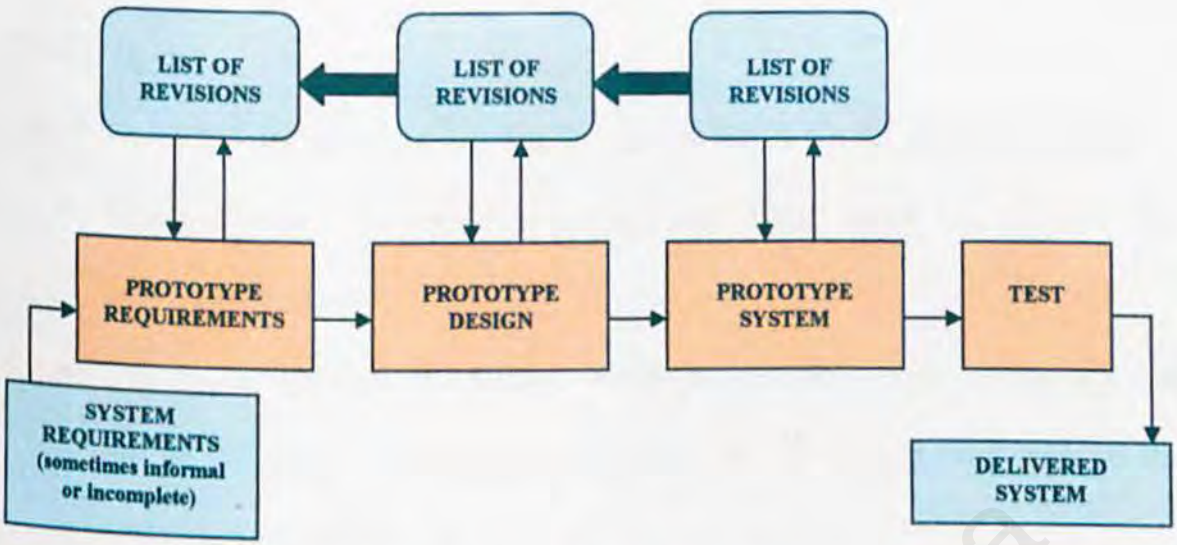

Figure 3.3.3 : Prototyping Model

Benefits: Prototyping could be considered a quality assurance technique, since its primary benefit and ultimate objective is to greatly meet the requirements of the user by the functionality of delivered software. Plus, when users are encouraged to take an active role in the development of a system, that system stands a much better change to become a source of pride for them (Pfleeger, 2001).

Drawbacks: Prototypes are normally built using substandard quality controls in order to speed the iteration. Thus they must be discarded after the prototyping phase, even if they solve significant problems Full prototypes of complex systems can be difficult or impossible to create quickly. Thus prototypes are often done in parts, which may miss critical requirements at the integration or complete system stage (Pfleeger, 2001).

3.4 Model Chosen for This System

3.4.1 V Model

The V Model was chosen for this system because the model has the following benefits:

- Testing activities are related to analysis and design, which will smoother the development process
- The model separated to 2 section that is, analysis and design on the left, and testing and maintenance on the right, which will helpful to keep track on the system development
- Acceptance testing, validates the requirement which is conducted by the customer to the better user friendly system
- Re-executed capabilities if problems encounter during verification and validation helps to solve problems very efficiently

3.4.2 Validation and verification

Validation ensures that the system has implemented all of the requirements so that each system function can be traced back to a particular requirement in the specification. Verification ensures that each function works correctly. In short, validation makes sure that the developer is building the right product, according to the specification and, and verification checks the quality of the implementation.

3.5 Method Used to Find Information

There are many type of methods can be used to find information and they are:

- The Internet
- Books
- Journals
- Other Project Papers
- Questionnaire
- Interview
- Observation

3.5.1 Method of Finding Information Used for This System

Although they have many methods to get information, but only few options which response to the need of this system and they are listed as below:

1) The Internet
2) Journals
3) Questionnaire
4) Interview

3.5.1.1 The Internet

The Internet was used to gather information related to this system and to search for other system which offering the same or similar features as this system. From the findings, they are a lot of systems which offering online learning in terms of notes and tutorial,

which guide the user by providing notes in web based form and power point slides. These are few web sites which are giving online learning support and they are:

1) http://java.sun.com/docs/books/tutorial/
2) http://www.silverplatter.com/tutor/mainintro.html
3) http://www.intap.net/~drw/cpp/
4) http://developer.java.sun.com/developer/onlineTraining/
5) http://www.eudora.com/techsupport/tutorials/
6) http://www.python.org/doc/current/tut/tut.html
7) http://homework.chem.uic.edu/NEXT.HTM#

The above web sites contains very basic functions and don't have the features which are similar to this system. However, they were web sites offering online tutorial submission features as this system and the web site address is http://perdana.fsktm.um.edu.my/~tehyw/.

3.5.1.2 Journals

The journals are the next sources were referred to gather information related to this system. Few journals were very helpful and they are gathered from University Malaya Library. The journals are as follow:

1) Educational Technology - Volume 37
2) Educational Technology - Volume 39
3) Educational Technology - Volume 40

3.5.1.3 Questionnaires

To get feedback from the students regarding the problems they are facing related to tutorial and test, questionnaires were given to students in Faculty of Computer Science and Information Technology (FCSIT) at University Malaya.

3.5.1.4 Interviews

To find out the problems are faced by the lecturers, two lectures from Faculty of Computer Science and Information Technology (FCSIT) at University Malaya was interviewed and they are:

1) Mr. Ang Tan Fong
2) Mrs. Sri Devi Ravana

CHAPTER 4: SYSTEM ANALYSIS

4.1 Requirements Analysis

A requirement is a feature of the system or a description of something the system is capable of doing in order to fulfill the system's purpose. The figure below illustrates the process of determining the requirements for a software-based system (Pfleeger, 2001).

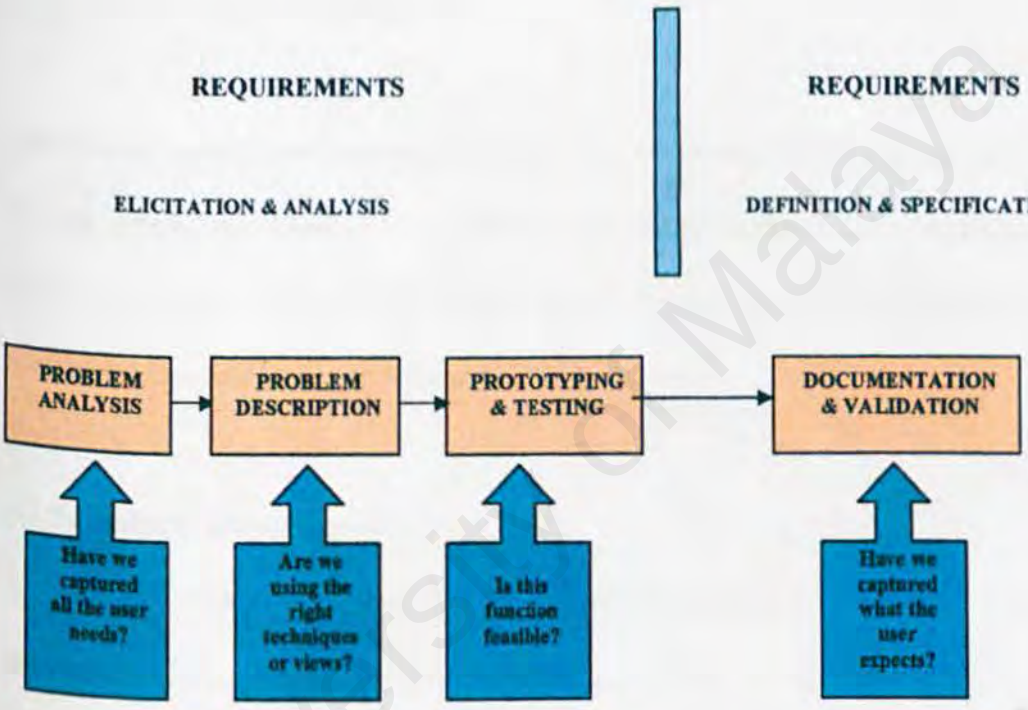

Figure 4.1: The process of determining requirements

In the requirements elicitation process, the developers will ask the same questions in many ways so that they are sure of what the users and customers want and need. There are 3 categories of requirements and they are (Pfleeger, 2001):

1) Requirements that absolutely must be met.
2) Requirements that is highly desirable but not necessary.
3) Requirements that are possible but could not be eliminated.

Requirements describe a system's behavior as the system acts on data or instructions. Objects or entities move from one state of being to another, for example from empty to full, from busy to still, or from sending to receiving. The requirements express the system and object states and the transition from one state to another (Pfleeger, 2001).

Requirements can be further divided into 2 types (Pfleeger, 2001):

1) Functional requirement
2) Non-functional requirement

Both functional and non-functional requirements are elicited from the customer in a formal, careful way because customers are not always good at describing exactly what they want or need, and developers are not always good at understanding the customer's business concerns (Pfleeger, 2001).

4.2 Functional Requirement

A functional requirement describes an interaction between the system and its environment. The administrator module consists of the following features:

1) Design:

- Enable the administrator to create, modify or add features for the following user module and their sub features:
    i. Login
    ii. Registration
    iii. Information
    iv. Notes
    v. Tutorial

vi. Test

2) File Access:

- Can access the students files (tutorial and test answers)

3) Graph Analysis

- Administrator can generate and modify the graph to view the students performance

The user module contains the following features:

1) Login

- Login function to the system.

2) Registration

- Register student's details.

3) Information:

- Consists of latest information

4) Notes:

- Consists of lecture notes

5) Tutorial:

a) Tutorial Questions

- Consists of tutorial questions for the paper

b) Tutorial Submission

- Consists tutorial submit process

c) Tutorial Submit Confirmation

- Display the name of the student passed up their tutorials

d) Tutorial Answers

- Contains answers for the tutorial questions

e) Tutorial Marks

- Displays the marks for the students according to the grade such as A, B+

6) Test

a) Test Question and Submission

- Consists test question and test submit process

b) Test Submit Confirmation

- Display the name of the student passed up their test

c) Test Answers

- Contains answers for the test questions

d) Test Marks

- Displays the marks for the students according to the grade such as A, B+

4.3 Non-functional Requirement

A non-functional requirement is a description about the features, characteristics and attributes of the system as well as the limitations and boundaries of the systems. The non-functional requirements are as follow:

- **User Friendly**

  The system and the system's interface is user friendly and easy to use.

- **Performance**

  The can be used almost all the times as long the internet connections is working properly and the server is active.

- **Efficiency**

  The system does not contain outdated information which will be not required by the users. It will response fast and accurately to the users needs.

- **Economy**

  The system is economy because it saves the faculty cost in terms of Photostat paper and ink compare to current method.

- **Security and Control**

  The administrator of the system has the full authority to the system and the user only can access the system to view, collect information and to submit their answers. However the user's answers, marks, and other information's are kept privacy.

- **Service**

  The system will be always updated to serve the server the user better and to avoid and unexpected result. The system also can be adjustable and the service can be improved to fulfill the user satisfactions in order the system to be reliable, flexible and expandable.

4.4 Hardware Requirements

The hardware requirements for the system are as follow:

- Pentium (Speed) : Minimum requirement - Pentium II (450 MHz)
  Recommended requirement – Pentium III (600 MHz)
- RAM : Minimum requirement – 64 MB
  Recommended requirement – 128 MB
- Hardisk free space : Minimum requirement – 500 MB
  Recommended requirement – 1.5 GB
- Modem speed : 56K (Internal or External)

4.5 Software Requirements

There are 3 type of software category available and there are:

1) Web Server Software
2) Client Side Software
3) Server Side Software

4.5.1 Web Server Software

The Web server market includes two distinct areas that are internet servers and public Web servers. Some Web server software runs on only one computer operating system, while others run on several operating systems. This section describes the three most popular Web server programs and there are (Netcraft, 2002):

1) Apache HTTP Server,
2) Microsoft Internet Information Server, and
3) iPlanet Enterprise Server (former name, Netscape Enterprise Server)

These popularity rankings were accumulated through surveys done by Netcraft, a networking consulting company in Bath, England. Netcraft conducts continual surveys to tally the number of the Web sites in existence and to measure the relative popularity of Internet Web server software.

4.5.1.1 Apache HTTP Server

Apache HTTP Server dominates the Web in part because it is free and performs very efficiently. It is powerful enough that IBM has licensed it for its own WebSphere applications server package. Apache runs on many operating systems such as AIX,

FreeBSD-UNIX, HP-UX, Linux, Microsoft Windows, SCO-UNIX, and Solaris, meanwhile the hardware supports them. Apache has a built in search engine and HTML authoring tools, and supports FTP. Apache has wizards available to create new sites and directories, and the server provides for multiple logs that can be automatically cycled or archived. Cycling a log means replacing the oldest log with the newest, thus recycling the space it occupies. Archiving a log means saving it, perhaps on a backup storage device. The log entries conform to the established, standard NCSA common log format to which many servers adhere. Apache applications development tools support CGI and several proprietary APIs. Once the API blocks are built, programmers can invoke them to perform their duties by using the common API interface. Apache supports server side technologies for generating dynamic Web pages. Apache supports the ODBC standard and can access Oracle, Sybase, Microsoft SQL Server, and IBM's DB2 databases (Schneider, 2002).

4.5.1.2 Microsoft Internet Information Server

Microsoft Internet Information Server comes bundled with Microsoft's Windows 2000 Server operating systems. IIS servers equally well as an internet Web server or as a public Web server program, and thus it is popular for both public sites and corporate intranet sites. A robust and capable Web server program, IIS is suitable for any size site. IIS as a Microsoft product was designed to run only on the Windows NT and 2000 operating systems. IIS includes an integrated search engine that allows users to create customized search forms with a variety of tools, including ASP, ActiveX Data Objects, and SQL database queries. IIS also includes Microsoft's Front Page HTML development tool and other reporting tools. IIS supports FTP, allowing users to download files and data from the IIS server site using the FTP protocol. IIS

creates log files in a standard format. IIS also supports automatic cycling or archiving of log files. The Microsoft Management Console (MMC), which is included in IIS, provides central server management from any server on the network. IIS also permits administrations from a remote browser. Because Windows NT lets us associate additional IP address with a single network interface card (NIC), IIS permits each virtual server to have its own IP address, which is known as multiple virtual hosts. IIS's inclusion of ASPs provides an application environment in which HTML pages, ActiveX components, and scripts can be combined to produce dynamic Web pages. IIS database support includes ODBC and Microsoft SQL (Schneider, 2002).

4.5.1.3 iPlanet Enterprise Server

Anyone developing a sophisticated, enterprise strength Web site will appreciate iPlanet's extensive server features. Although the iPlanet server is not free, its $1500 per CPU licensing fee is reasonable, and it allows a free 60 day trail download. The iPlanet software runs on many operating systems, including AIX, Digital UNIX, HP-UX, Solaris, and Windows. Some of the busiest and best known sites on the Internet, including BMW, Dilbert, E*Trade, Excite, Lycos and Schwab run, or have run some version of iPlanet Web Server. Independent reports from consulting firms such as the GartnerGroup show that iPlanet Web server software is in use at more than 40 percent of all public Web sites and at more than 60 percent of the top 100 enterprise Web sites. The iPlanet Web server provides a powerful development environment that supports development of Web based applications that can be run on the Internet, an intranet, or an extranet. The iPlanet Web server's management tools allow administrators to manage users and monitor server activity interactively. The

software provides cluster management, which is a way for an administrator to manage multiple remote servers as a single group. This allows the administrator to update configuration files remotely or to start and stop a group of servers. Like most other server programs, iPlanet supports dynamic application development, including CGI and the Java Servlet API for server side applications. Its ODBC conformance means that iPlanet Enterprise Server provides connectivity to a number of database products as well (Schneider, 2002).

4.5.1.4 Web Server Software Comparison

The table below shows the comparison between Apache HTTP Server, Microsoft Internet Information Server, and iPlanet Enterprise Server:

Table 4.5.1.4: Web Server Software Comparison

Web Server	Apache	IIS	iPlanet
Cost	Free	Free	$ 1,500 per CPU licensing fee, 60 day trial download
Operating Systems Support	AIX, FreeBSD-UNIX, HP-UX, Linux, Microsoft Windows, SCO-UNIX, Solaris	Microsoft Windows	AIX, Digital UNIX, HP-UX, Solaris, and Windows
Features	• Built in search engine • HTML authoring tools • Supports FTP • Has wizards to create new sites and directories • Server provides multiple logs with cycled or archived • Support CGI and several	• Supports Internet Web Server, or Public Web Server • Robust and capable for any size site • Integrated search engine with variety of tools including ASP, ActiveX Data Objects, SQL Database queries • Includes Microsoft Front Page HTML development tool and other reporting tools, • Support FTP • Standard log format with automatic cycling or archiving • MMC provides central server management from any server	• Powerful development environment that can run on the Internet, an Intranet, or Extranet • iPlanet's management tools enable administrators to manage users and monitor server activity interactively • provides cluster

	APIs • Supports server side technologies for generating dynamic web pages	on the network • Permits administration from a remote browser • Have multiple virtual hosts with own IP address • IIS's works with ASP, HTML pages, ActiveX components, and scripts to produce dynamic web pages	management which can manage multiple remote servers as a single group • supports dynamic application development including CGI, Java Servlet API
Database	Supports ODBC standard, Oracle, Sybase, Microsoft SQL Server, IBM's DB2	Supports ODBC, Microsoft SQL	Support ODBC

4.5.2 Client Side Software

Each of these technologies relies on a module or plug in, built into the browser to process the instructions. The client side technologies are a mishmash of scripting languages, controls, and fully fledged programming languages, and there are (Cornes et al, 2001):

1) JavaScript,
2) VBScript,
3) ActiveX Controls,
4) Java Applets, and
5) Curl.

4.5.2.1 JavaScript

JavaScript is the original scripting languages, and is not to be confused with Java. Java is a complete application programming languages in its own right. Netscape had originally developed a scripting language, known as LiveScript, to add interactivity to their Web server and browser range. It was introduced in the release of the

Netscape 2 browser, when Netscape joined forces with Sun and in the process, they changed its name to JavaScript. JavaScript borrows some of its syntax and basic structure from Java which in turn borrowed ideas from C, but has a different purpose and evolved from different origins meanwhile Live Script was developed separately to Java. JavaScript is much easier to learn than Java. It is designed to create small, efficient, applications that can do many things, from performing repetitive tasks, to handling events generated by the user. Microsoft introduced their own version of JavaScript, known as Jscript, in Internet Explorer 3.0 and have supported it ever since right up to, and including IE6. It has only minor difference from the Netscape versions of the language, although in older versions of both browsers, the differences were originally quite a lot wider (Cornes et al, 2001).

4.5.2.2 VBScript

In the Internet Explorer 3.0, Microsoft also introduced their new scripting language, VBScript, which was based on their Visual Basic programming language. VBScript was introduced to be a direct competitor to JavaScript. In terms of functionality there isn't much difference between the JavaScript and VBScript. It's more a matter of personal preference, where VBScript has a similarly reduced functionality. Visual Basic developers sometimes prefer VBScript because VBScript is, for the most part, a subset of Microsoft's Visual Basic language. However, it enjoys one advantage that makes it more attractive to novice programmers, in that, unlike JavaScript, it isn't case-sensitive and is therefore less fuzzy about the particulars of the code. The biggest drawback is that there isn't a single non Microsoft browser that supports VBScript for client side scripting. For a short while there were some proprietary plug-ins for Netscape that provided VBScript support, but these never took off.

Microsoft has replaced VBScript in their .NET framework, with VB.NET. VBScript only should be considered when working on Intranet pages where it is known that all clients are IE on Windows (Cornes et al, 2001).

4.5.2.3 ActiveX Controls

An ActiveX control is a self contained program or component, written in a language such as C++ or Visual Basic. When added to a Web page, it provides a specific piece of client side functionality, such as a bar chart, timer, client authentication, or database access. ActiveX controls are added to HTML pages via the <objects> tag, which is now part of the HTML standard. Active X controls can be executed by the browser when they are embedded in a Web page. ActiveX controls were developed by Microsoft, and despite being compatible with the HTML standard, they are not supported on any Netscape browser prior to version 6 which, at the time of writing, was still in beta without an ActiveX plug-in. Without this, they will only function on Internet Explorer. Also, unlike VBScript, ActiveX is able to manipulate items on the user's machine such as the files or Windows registry. For this reason it is very often considered a security risk and is not even allowed through firewalls. Consequently, ActiveX controls still can't really be considered either a common or a cross-platform way of making our pages dynamic and are falling out of use (Cornes et al, 2001).

4.5.2.4 Java Applets

Java is a cross-platform language for developing applications. When Java first hit the Web in the mid-1990s, it created a tremendous stir. The idea is to use Java code in the form of applets, which are essentially Java components that can be easily inserted

into Web pages with the aid of the <applet> tag. Java enjoys better functionality than scripting languages, offering better capabilities in areas such as graphic functions and file handling. Java is able to provide these powerful features without compromising security because the applets run in what is known as a sandbox, which prevents a malicious program download from the Web from doing damage to our system. Java also boasts strong database support through JDBC. Microsoft and Netscape browsers both have a built in Java support via something known as the Java Virtual Machine (JVM), and there are several standard <object> and non-standard <applet> tags that are used to add Java applets to a Web page. These tags tell the browser to download a Java file from a server and execute it with the Java Virtual Machine built into the browser. Of course, this extra step in the Web page building phase means that Java applets can take a little while to download, and can take even longer to process once on the browser. So, while smaller Java applets that provide features such as drop-down menus and animations are very popular on the Web, larger ones are still not as widespread as scripted pages (Cornes et al, 2001).

4.5.2.5 Curl

A very recent innovation comes from a company partly set up by Tim Berners-Lee who is the innovator behind the Web and the HTML language. Curl is another programming language like Java, but unlike Java where a second file or more has to be downloaded with the HTML file, it completely replaces the HTML source and the Java files. It relies on a Curl plug-in having been installed on our browser first, and currently only works on very recent browsers. The advantages are that the download time is faster than Java, and also we don't have to worry about integrating different languages into the page, as Curl is capable of providing the same features as both

Java and JavaScript. Curl is still in the very early stages of development, although the first version has been released (Cornes et al, 2001).

4.5.3 Server Side Software

Each of these technologies relies on a modular attachment added onto the Web server rather than the browser. Consequently, only HTML, and any client side script, is sent back to the browser by the Web server. In other words, none of the server side code is sent back. Server side technologies have a more consistent look and feel than client side ones, and there are as follow (Cornes et al, 2001):

1) CGI,
2) ASP,
3) JSP,
4) ColdFusion, and
5) PHP.

4.5.3.1 CGI

The Common Gateway Interface (CGI) is a mechanism for creating scripts on the server, which can then be used to create dynamic Web applications. CGI is a module that is added to the Web server. It has been around for quite a bit longer than even ASP, and right now, a large proportion of dynamically created Web pages are created using CGI and a scripting language. However, it's incorrect to assume that CGI does the same job as ASP. Rather, CGI allows the user to invoke another program such as a Perl script on the Web server to create the dynamic Web page, and the role of CGI is to pass the user supplied data to the this program for processing. However, it does

provide the same end result as dynamic Web application. We should be aware that CGI has some severe shortcomings such as (Cornes et al, 2001):

- It is not easy for a beginner to learn how to program such modules.
- CGI requires a lot of server resources, especially in a multi-user situation.
- It adds an extra step to our server side model of creating dynamic content: namely, it's necessary to run a CGI program to create the dynamic page, before the page is processed on the server.

The format in which CGI receives and transmits data means that the data is not easily manipulated by many programming languages, so we need one with good facility for manipulating text and communicating to other software. The able programming languages that can work on any operating system for doing this are C, C++ and Perl. While they can adequately do the job for us, they are some of the more complex languages to learn. Visual Basic doesn't offer adequate text handling facilities, and is therefore rarely use with CGI (Cornes et al, 2001).

4.5.3.2 ASP

Active Server Pages (ASP) is now dubbed "Classic ASP" and it is used to describe ASP and not ASP.NET. ASP commonly relied on either of the JavaScript or VBScript scripting languages to create dynamic Web pages, although it was also possible to use any scripting language installed on Windows, such as PerlScript. ASP is a module (the asp.dll file) that are attach to the Web server, and it then processes the JavaScript or VBScript on the Web server, and turns it into HTML, before sending it into the server, rather than doing it on the browser. ASP lets us use practically any of the functionality provided by Windows, such as database access, e-

mailing, graphics, networking, and system functions, and all from within a typical ASP page. However, ASP's shortcomings are that it is very, very slow performance wise. It is also restricted to using only scripting languages. It can't do all the things that a fully-fledged programming language can. Secondly the scripting languages, being like "junior" versions of full programming languages, took a lot of shortcuts to make the language smaller. Some of these shortcuts make their program longer and more complicated than is other wise necessary. However, ASP.NET rectifies a lot of this by making code more structured, easier to understand, and shorter (Cornes et al, 2001).

4.5.3.3 JSP

JavaServer Pages (JSP) is a technology that allows us to combine markup such as HTML or XML with Java code to dynamically generate Web pages. The JSP specifications is implemented by several Web servers, as opposed to ASP which is only supported under IIS, and plug-ins are available that allow us to use JSP with IIS 4.0/5.x. one of the main advantages of JSP is the portability of code between different server. JSP is also very powerful, faster than ASP, and instantly familiar to Java programmers. It allows the Java program to leverage the aspects of Java 2 platform such as JavaBeans, and Java 2 libraries. JavaServer Pages isn't directly related ASP, but it does boast the ability to embed Java code in to Web pages using server side tags (Cornes et al, 2001).

4.5.3.4 ColdFusion

ColdFusion also enables servers to access data as the server build an HTML page. ColdFusion is a module installed on to web server. Like ASP, ColdFusion pages are

readable by any browser. ColdFusion also utilizes a proprietary set of tags, which are processed by the ColdFusion Server software. This server software can run on multiple platforms, including IIS, Netscape Enterprise Server, and Unix/Apache. ColdFusion utilizes HTML like tags, which encapsulate functionality. A drawback is that the ColdFusion software doesn't come for free and indeed we have to pay thousand dollars for the privilege of running ColdFusion on our Web server (Cornes et al, 2001).

4.5.3.5 PHP

PHP (originally Personal Home Pages, but more recently PHP HyperText Processor) is another scripting language for creating dynamic Web pages. When a visitor opens the page, the server processes the PHP commands and then sends the results to the visitor's browser, just as ColdFusion. Unlike the ColdFusion, however, PHP is open source and cross platform. PHP runs on Windows NT and many Unix versions, and it can be build as and Apache module and as a binary that can be run as a CGI. When builds as an Apache module PHP is especially speedy. A down side is that we have to download separately and go through a series of quite complex steps to install it and get it working on our machine. PHPs language syntax is similar to C and Perl. This might proof a barrier to people with no prior programming experience, but if we have a background in either language than we might want to take a look. PHP also has some rudimentary object oriented features, providing a helpful way to organize and encapsulate our code (Cornes et al, 2001).

4.5.4 Database Software

Most of the systems are developed with database support to keep the systems data such as users' information, transaction details and other information's as well, depends to the systems type.

They are few databases that are available on the market and there are:

1) Microsoft Access 2000
2) Microsoft SQL Server 2000
3) Oracle 9i
4) Sybase

4.5.4.1 Database Considered for This System

There are two databasing software suit for developing this system and they are:

1) Microsoft Access 2000
2) Microsoft SQL Server 2000

4.5.4.1.1 Microsoft Access 2000

Microsoft offers a full family of database tools for the desktop, the server, and for open connectivity. For the desktop, Microsoft offers Microsoft Access 2000. The Microsoft Access 2000 is a full-featured multi-user relational database management system that designed for the Microsoft Windows operating systems (such as Windows 9x, Windows NT, Windows 2000). Microsoft Access 2000 is extremely visually oriented and easy to use. It makes extensive use of drag-and-drop and visual design for queries, forms, and reports. Microsoft Access 2000 comes with an integrated development environment (IDE), including incremental compilation, a

fully interactive visual debugger, breakpoints, and single step-through. These capabilities combine to make Microsoft Access an extremely powerful platform for developing client-server database solutions (Vartanyan, 2002).

There are general Microsoft Access 2000 characteristics which are as in Table 4.5.4.1.1 (Vartanyan, 2002):

Table 4.5.4.1.1: Microsoft Access 2000 Characteristics

Object	Maximum sizes/numbers
Database size	1 Gb
Number of characters in an object name	64
Number of characters in a password	14
Number of characters in a user name or group name	20
Number of concurrent users	255
Number of characters in a table name	64
Number of characters in a field name	64
Number of fields in a table	255
Number of characters in a Text field	255
Number of characters in a Memo field	65,535 / 1 Gb

Though the maximum database size is 1 Gb, the database can include linked tables in other files, and its total size is limited only by available storage capacity. Number of characters in a Memo field can be up to 65,535 characters when entering data through the user interface or can be up to 1 Gb when entering data programmatically. Access 2000 can lock on the row level in comparison with Access 97 page level's lock (Vartanyan, 2002).

4.5.4.1.2 Microsoft SQL Server 2000

For the server engine in client-server solutions Microsoft provides the Microsoft SQL Server 7.0/2000. There are no many differences in the internal architecture between SQL Server 7.0 and SQL Server 2000. SQL Server 2000 has the same features as SQL Server 7.0: auto grow features, new storage engine, and complete

row level locking and so on. So, the general characteristics of these versions are the same. There are general SQL Server 2000 characteristics (Vartanyan, 2002):

Table 4.5.4.1.2(a): Microsoft SQL Server 2000 Characteristics

Object	Maximum sizes/numbers
Batch size	65,536 * Network Packet Size
Bytes per short string column	8,000
Bytes per text, ntext, or image column	2 GB-2
Bytes per index	900
Bytes per foreign key	900
Bytes per primary key	900
Bytes per row	8,060
Bytes in source text of a stored procedure	Lesser of batch size or 250 MB
Clustered indexes per table	1
Columns per index	16
Columns per foreign key	16
Columns per primary key	16
Columns per base table	1,024
Columns per SELECT statement	4,096
Columns per INSERT statement	1,024
Connections per client	Maximum value of configured connections
Database size	1,048,516 TB
Databases per instance of SQL Server	32,767
File groups per database	256
Files per database	32,767
File size (data)	32 TB
Identifier length (in characters)	128
Locks per connection	Max. locks per server
Nested stored procedure levels	32
Nested sub queries	32
Nested trigger levels	32
No clustered indexes per table	249
Objects in a database	2,147,483,6474
Parameters per stored procedure	1,024
REFERENCES per table	253
Rows per table	Limited by available storage
Tables per database	Limited by number of objects in a database
Tables per SELECT statement	256
Triggers per table	Limited by number of objects in a database
UNIQUE indexes or constraints per table	249 nonclustered and 1 clustered

SQL Server 2000 Enterprise Edition on the Windows 2000 Datacenter can support up to 32 CPU and up to 64GB physical memory (RAM) on a computer (Vartanyan, 2002).

The table 4.5.4.1.2(b) shows the maximum amount of physical memory or RAM, that the database engine in each SQL Server 2000 edition can support (Microsoft, 2002).

Table 4.5.4.1.2(b): Maximum Amount of Physical Memory

Operating System	Enterprise Edition	Standard Edition	Personal Edition	Developer Edition	Desktop Engine	SQL Server CE	Enterprise Evaluation Edition
Microsoft Windows 2000 Datacenter	32	4	2	32	2	N/A	32
Windows 2000 Advanced Server	8	4	2	8	2	N/A	8
Windows 2000 Server	4	4	2	4	2	N/A	4
Windows 2000 Professional	N/A	N/A	2	2	2	N/A	2
Microsoft Windows NT® 4.0 Server, Enterprise Edition	8	8	2	8	2	N/A	8
Windows NT 4.0 Server	4	4	2	4	2	N/A	4
Windows NT 4.0 Workstation	N/A	N/A	2	2	2	N/A	2
Microsoft Windows 98	N/A	N/A	1	Use Desktop Engine	1	N/A	N/A
Microsoft Windows CE	N/A	N/A	N/A	N/A	N/A	1	

4.5.5 Software Chosen

Among the software's that had discussed, here are the lists of the chosen software's for develop this system:

1) Web Server Software – Microsoft Internet Information Server (IIS)
2) Client Side Software – VB.NET

3) Server Side Software – ASP.NET

4) Operating System Software – Microsoft Windows 2000 Server

5) Web Browser – Microsoft Internet Explorer 6.0

6) Database – Microsoft Access XP (2000 file format)

- MDAC 2.7 (Tools)

7) Framework - .NET Framework

8) Development Tools Software – Microsoft Visual Studio.NET

- Macromedia Dreamweaver MX

9) Documentation Tools – Microsoft Word XP

- Microsoft Excel XP

- Microsoft Power Point XP

CHAPTER 5: SYSTEM DESIGN

All the system must pass through the design process of the system. This systems' design process is shown in Data Flow Diagram (DFD), flow chart and the systems' user interface. This systems' DFD is shown in Figure 5(a) and 5(b). This systems' flow chart is shown in figure 5(c).

5.1 System User Interface

A system must come with a user interface to communicate with the user of the system. This systems' user interface are shown in Figure 5.1(a) and 5.1(b). Figure 5.1(a) is the login page of the system, where the user (students) have to login to the system before start to use it. After the user login, the next screen will be Figure 5.1(b). Figure 5.1(b) is the main page of the system. The user can choose what are they going to do from the four main sections in the system, that is:

i. Information
ii. Notes
iii. Tutorial
iv. Test

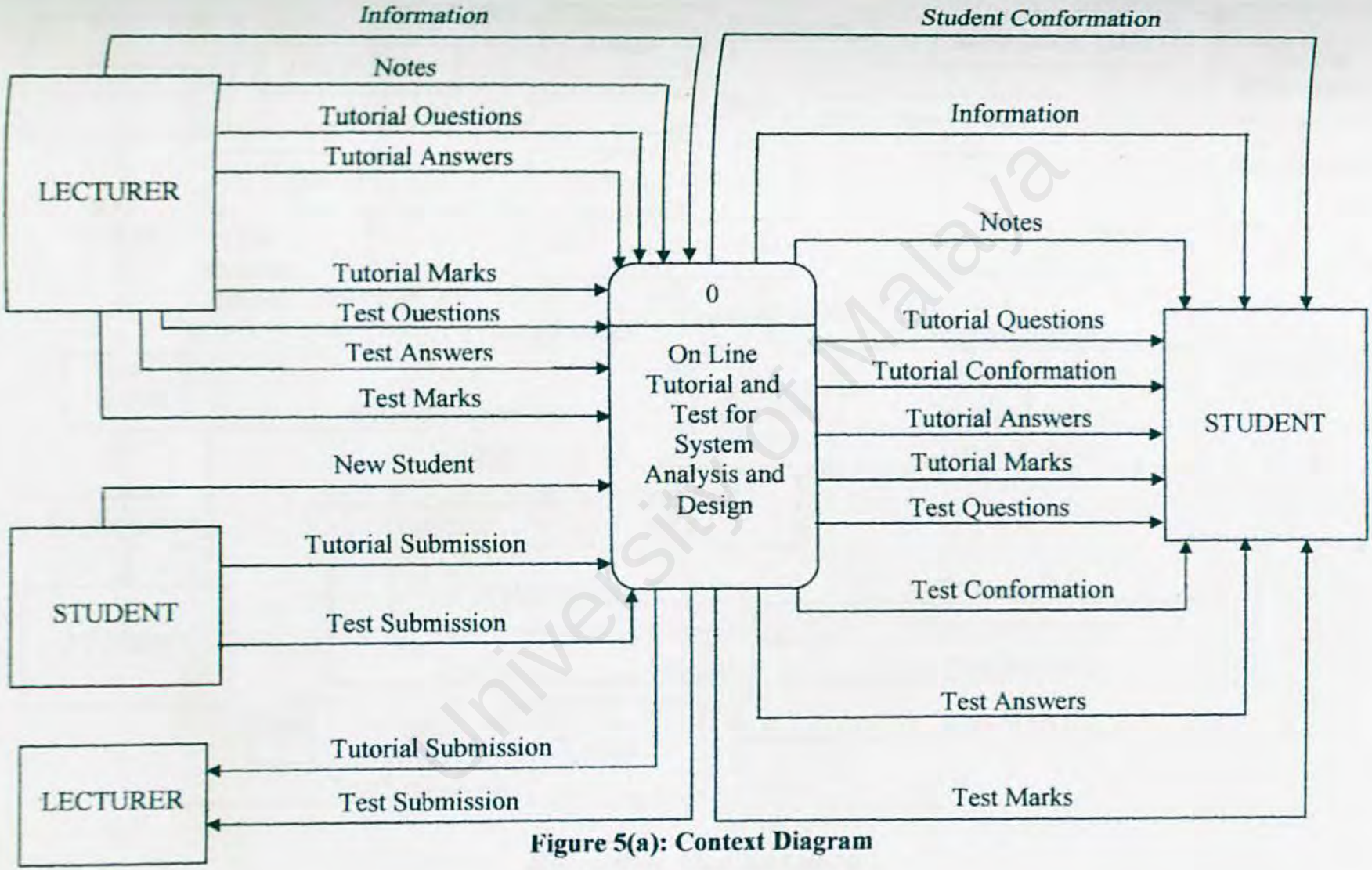

Figure 5(a): Context Diagram

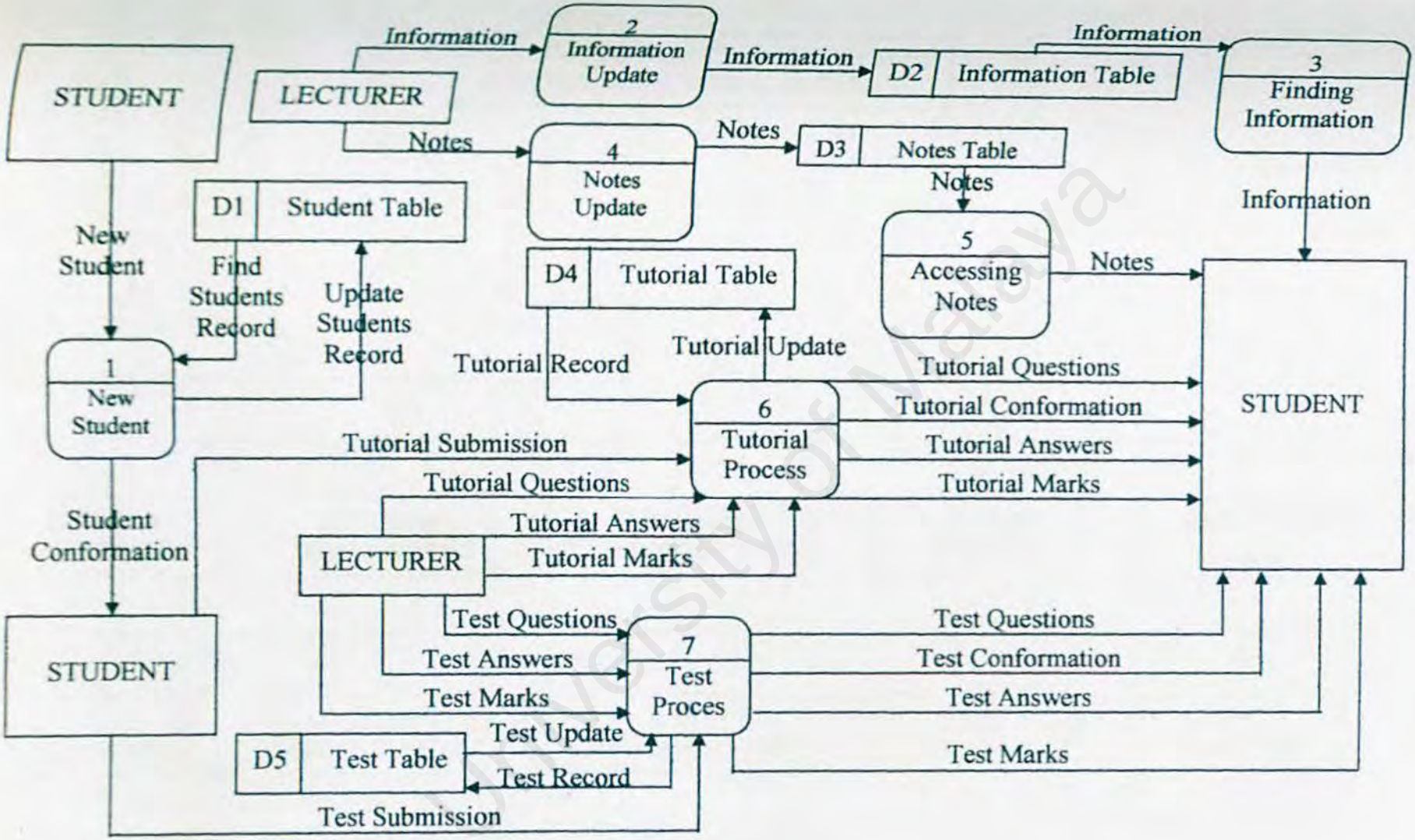

Figure 5(b): Diagram Level 0

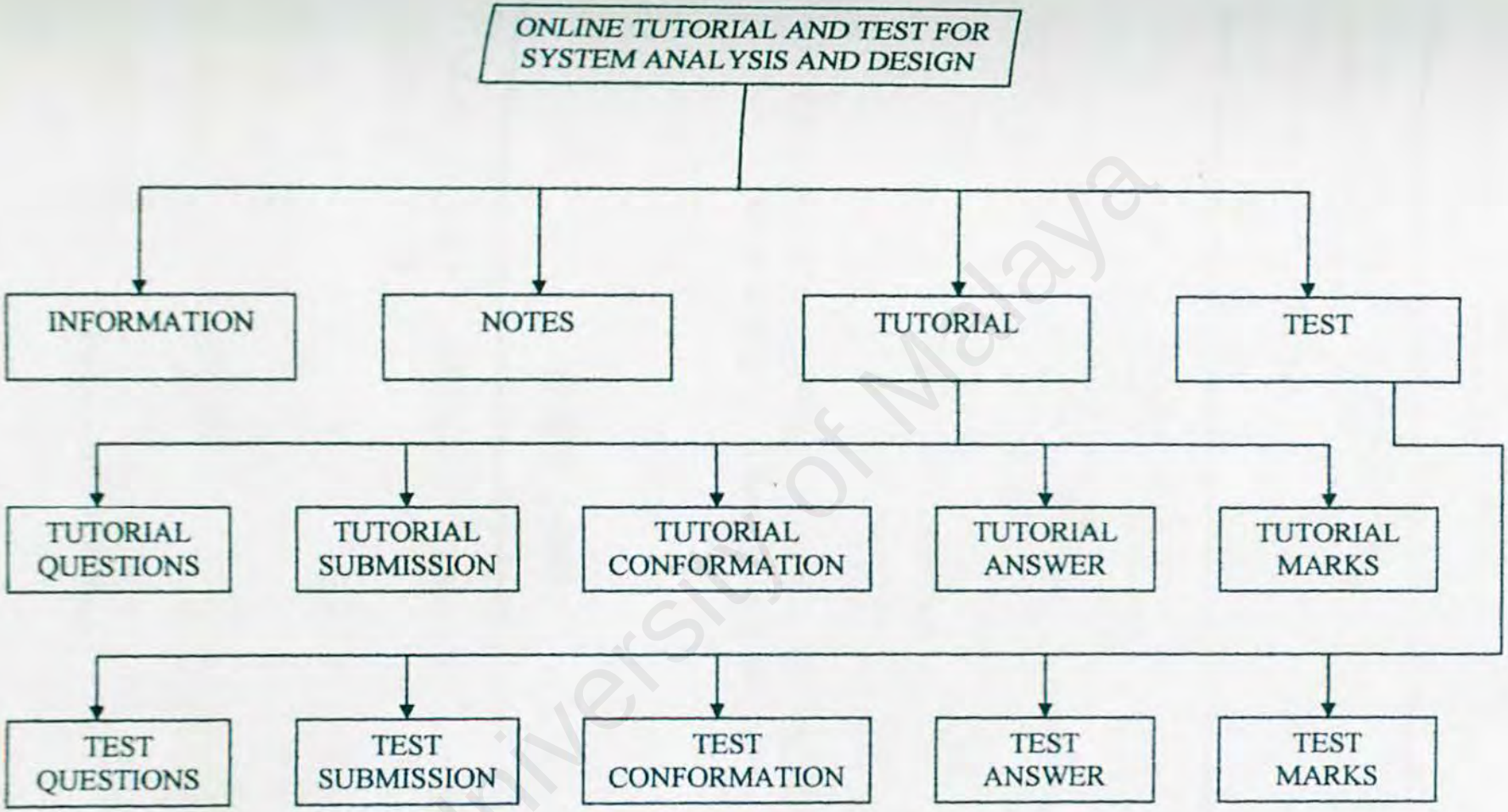

Figure 5(c): Flow Chart

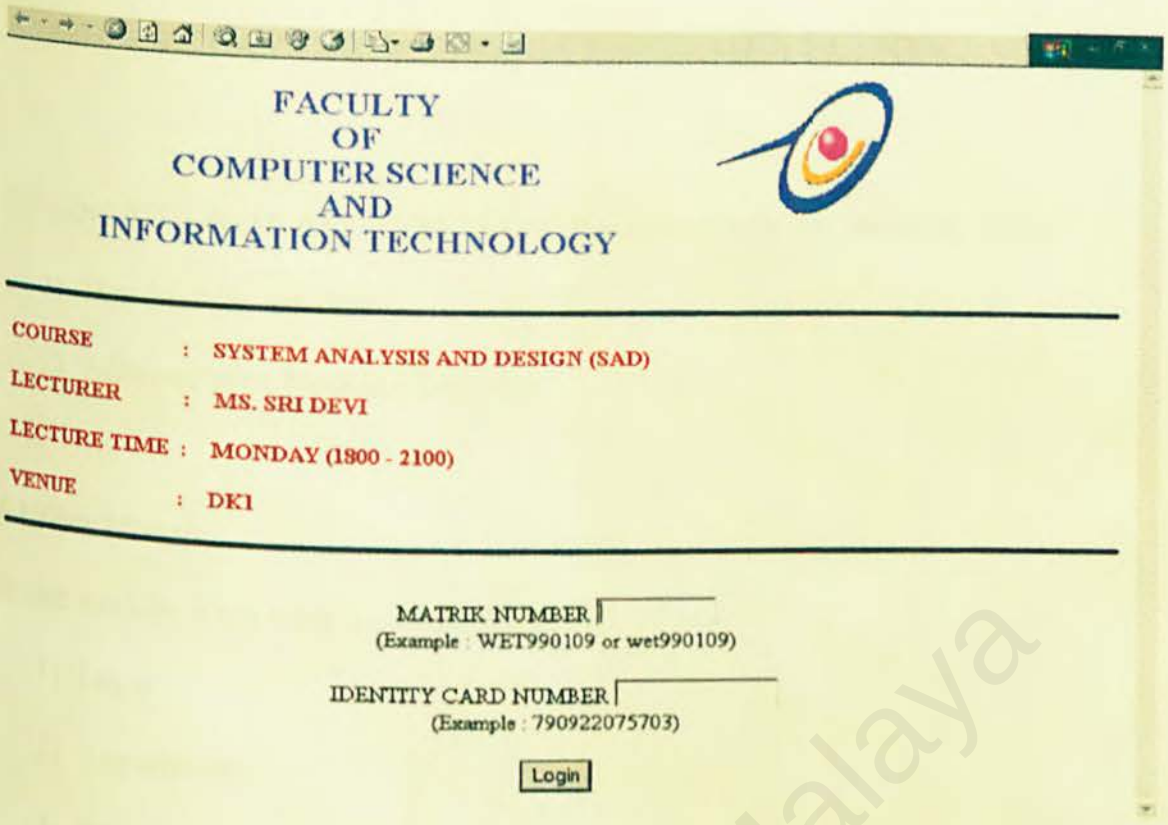

Figure 5.1(a): Login Page

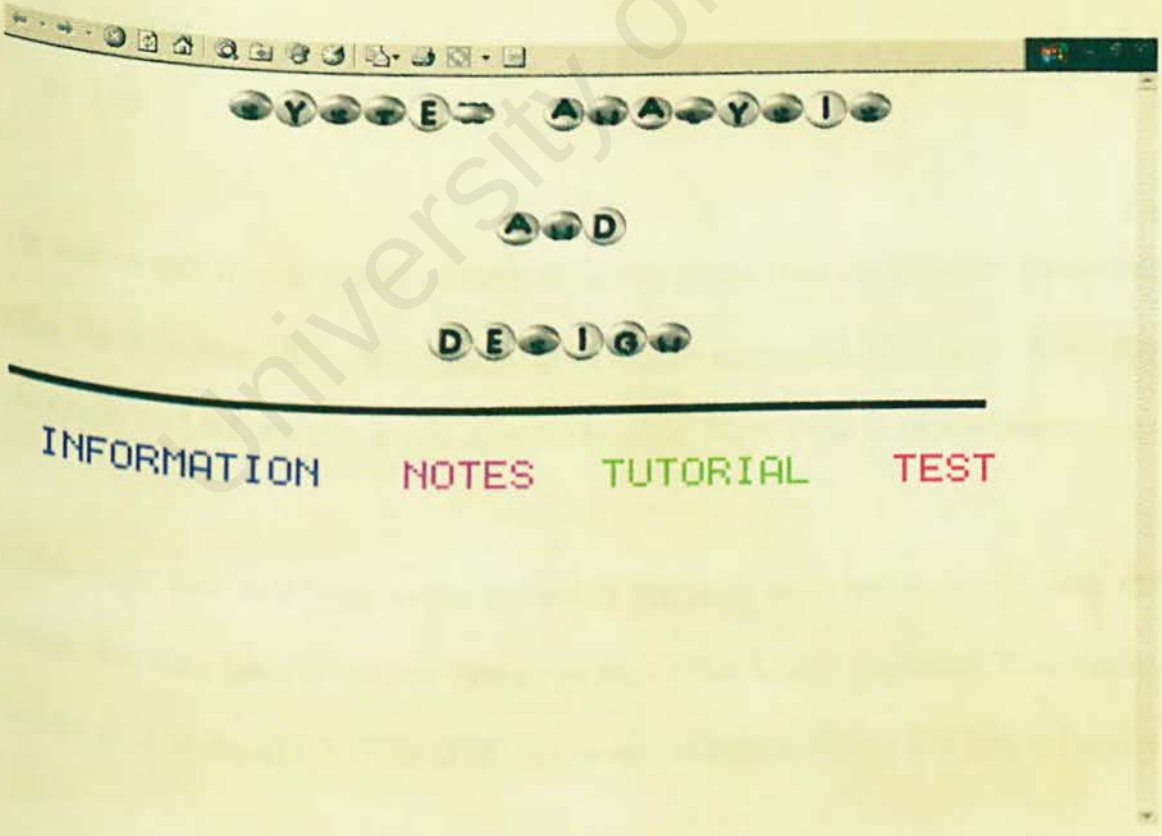

Figure 5.1(b): Main Page

CHAPTER 6: SYSTEM IMPLEMENTATION

"ONLINE TUTORIAL AND TEST (SAD)" is a system with two modules, that is:

1) User Module - Students
2) Administration Module – Lecturers

6.1 User Module

In user module, it has 6 sub modules, that is:

1) Login
2) Registration
3) Information
4) Notes
5) Tutorial
6) Test

The user module for this system consists of 22 web pages. User can access to the system using the following URL, http://thesis.fsktm.um.edu.my/mk/mk/Main.aspx. When the users enter the URL address, it will open the systems' **Main Page** as shown below.

In this page, user will login to the system. If the users have not registered with the system, the users have to register first to set their *Used Id* and *Password*. This can be done by click to the *REGISTERATION* link in the main page. *FCSIT* is a link to Faculty

of Computer Science and Information Technology web page and *UNIVERSITY OF MALAYA* is a link to University Malaya web page.

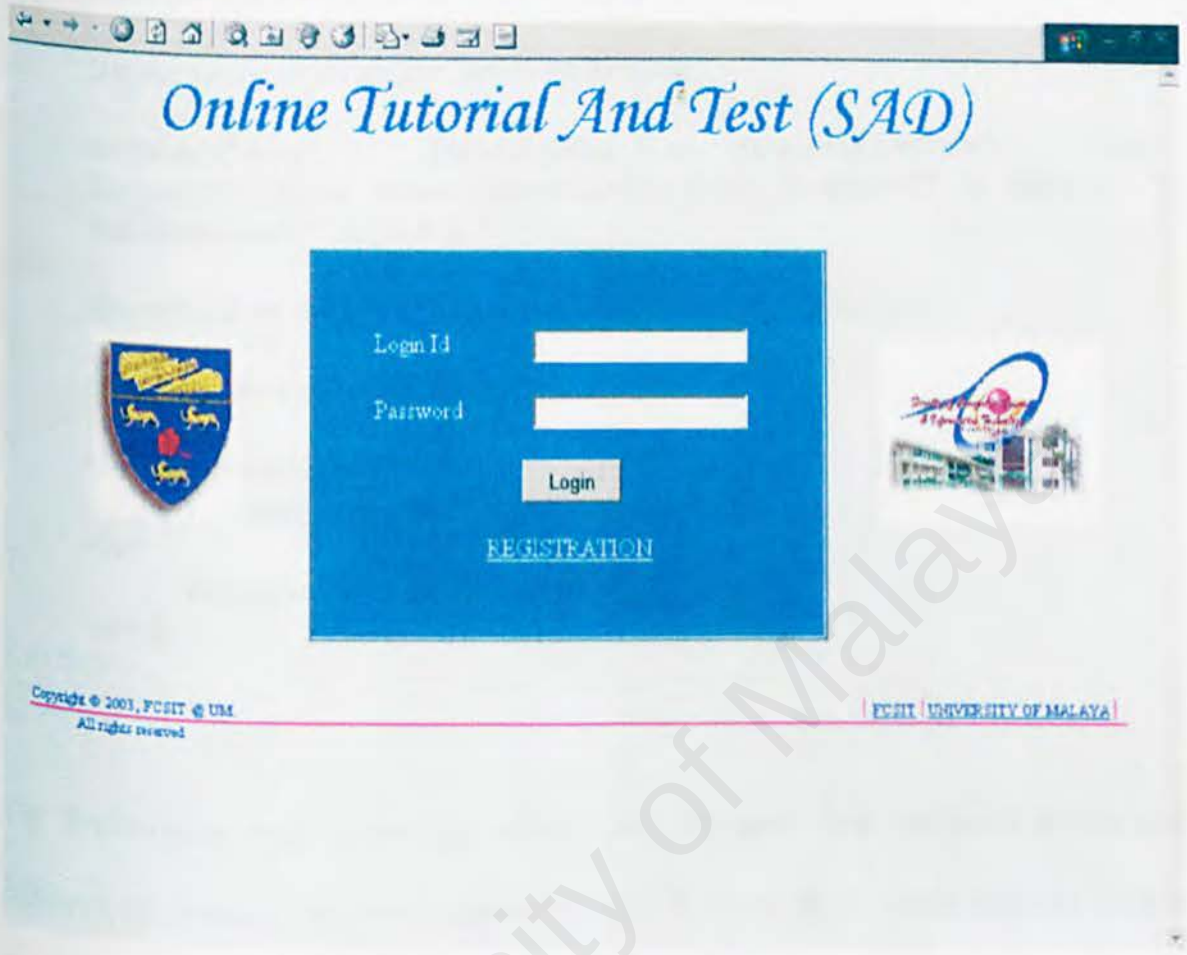

Figure 6.1(a): Main Page

The following code, shows the login connection of the main page.

```
Private Sub SubmitButton_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles SubmitButton.Click

    Dim login = Request("TextBox1")
    Dim pwd = Request("TextBox2")

    Dim objConnection As OleDbConnection
    Dim objCmd As OleDbCommand
    Dim strConnection As String
    Dim strSQL As String

    strConnection = "Provider=Microsoft.Jet.OLEDB.4.0;" & _
```

```
        "Data Source=E:\\Database\SADDB.mdb"

    objConnection = New OleDbConnection(strConnection)
    objConnection.Open()

    dim strquery as string,strrowcount as string

    strquery="select Identification_Card_Number,Password from
    RegisterationTable where Identification_Card_Number='" & login & "'
    and Password='" & pwd & "'"

    dim cmd as new OleDbCommand(strquery,objConnection)

    strrowcount=cmd.executescalar()

    if cStr(strrowcount)= 0 then
        response.redirect("LoginError.aspx")
    else
        response.redirect("Intro.aspx")
    end if
End Sub
```

The **Registration Page** is the page where user will enter their particular details and followed by creating their own password. This is the code to make sure the matrik number textbox is filled, if not, the Regular Field Validator will prompt "Please enter your Matrik Number" error message.

```
<asp:requiredfieldvalidator id="rfvMatrik_ID" Runat="server"
ErrorMessage="Please enter your Matrik Number" Display="Dynamic"
controltovalidate="Matrik_ID"></asp:requiredfieldvalidator>
```

This is the code of Regular Expression Validator, which required the matrik number to be in the "Wet990109" format. If not in the required format an error message saying "Not in matrik number format Wetxxxxxx / Wekxxxxxx, please try again." Will be prompt.

<asp:regularexpressionvalidator id="revMatrik_ID" Runat="server" ErrorMessage="Not in matrik number format Wetxxxxxx / Wekxxxxxx, please try again." Display="Dynamic" ValidationExpression="(Wet|Wek)[0-9]{6}" ControlToValidate="Matrik_ID"></asp:regularexpressionvalidator>

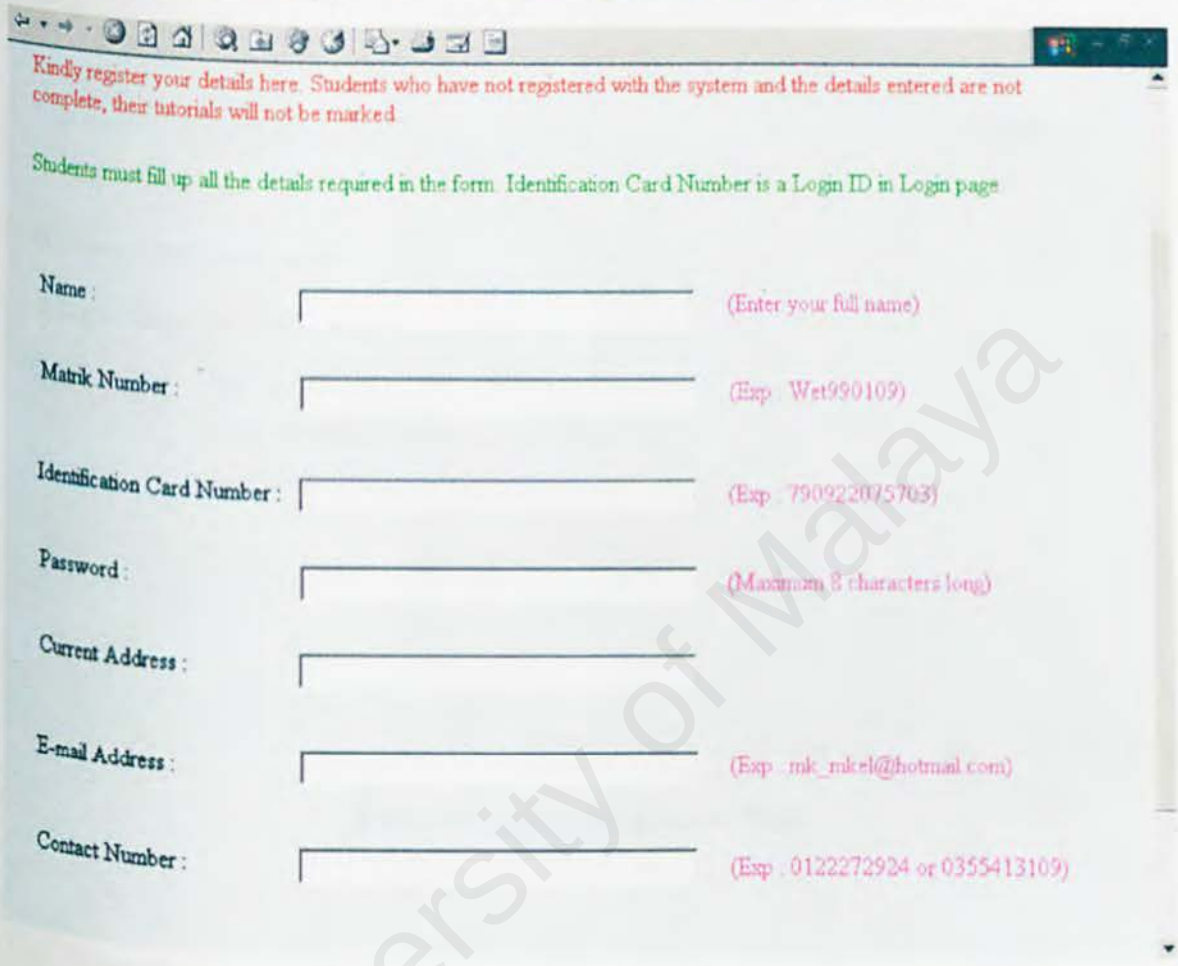

Figure 6.1(b): Registration Page

Information Page will display information to the students. The lecturer will do all kind of announcement in this page. This is the coding of a label, announcing the lecture is cancel.

<asp:Label id="Label2" runat="server" Height="10px" Width="233px" ForeColor="Black">1) Lecture on 7/1/2003 are cancelled.</asp:Label>

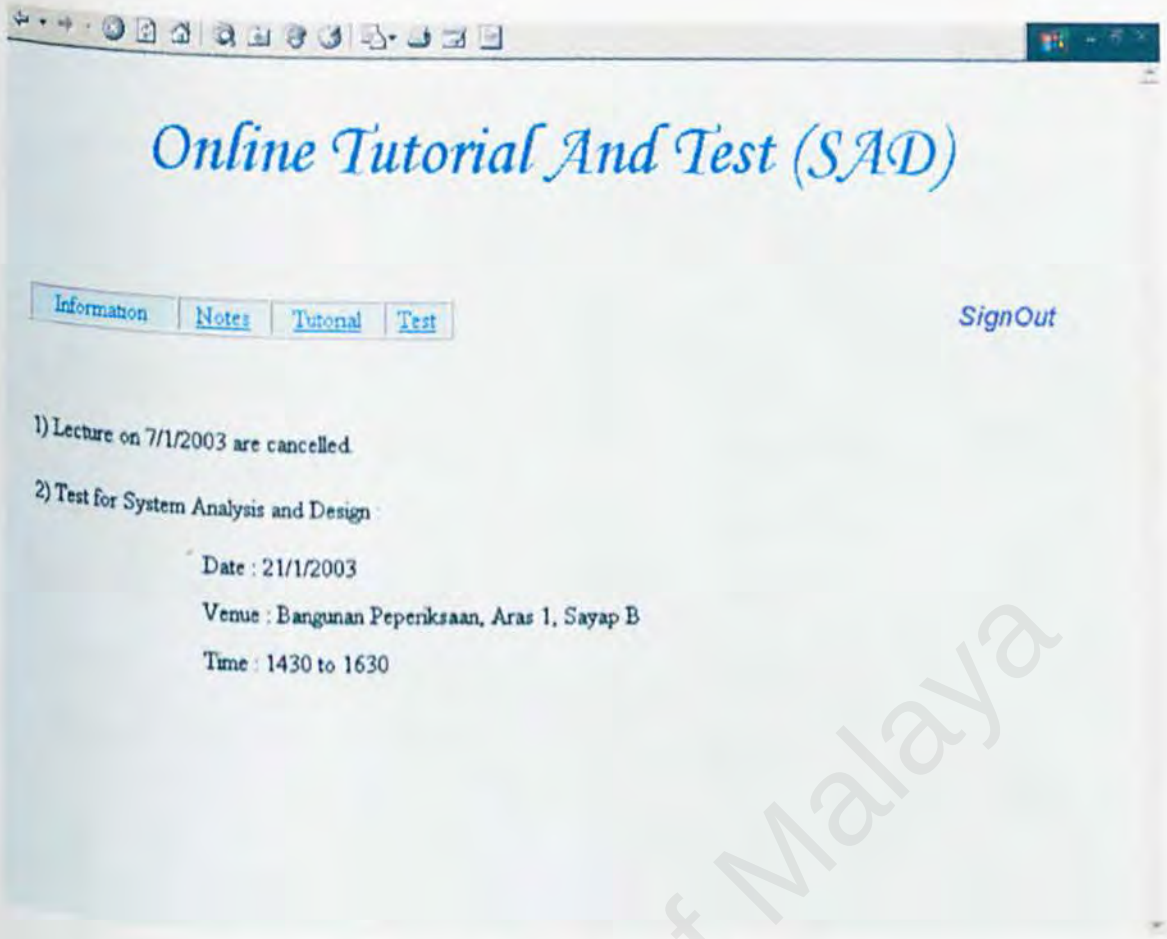

Figure 6.1(c): Information Page

The **Notes Page** shows the lecture notes according to the chapters. Students can download their notes by clicking to the chapters. This is the code showing the notes link.

```
<asp:hyperlink id="Hyperlink1" runat="server" ToolTip="Chapter 1"
NavigateUrl="Chapter01.ppt" ForeColor="Purple">Chapter 1</asp:hyperlink>

<asp:hyperlink id="Hyperlink2" runat="server" ToolTip="Chapter 2"
NavigateUrl="Chapter02.ppt" ForeColor="Purple">Chapter 2</asp:hyperlink>
```

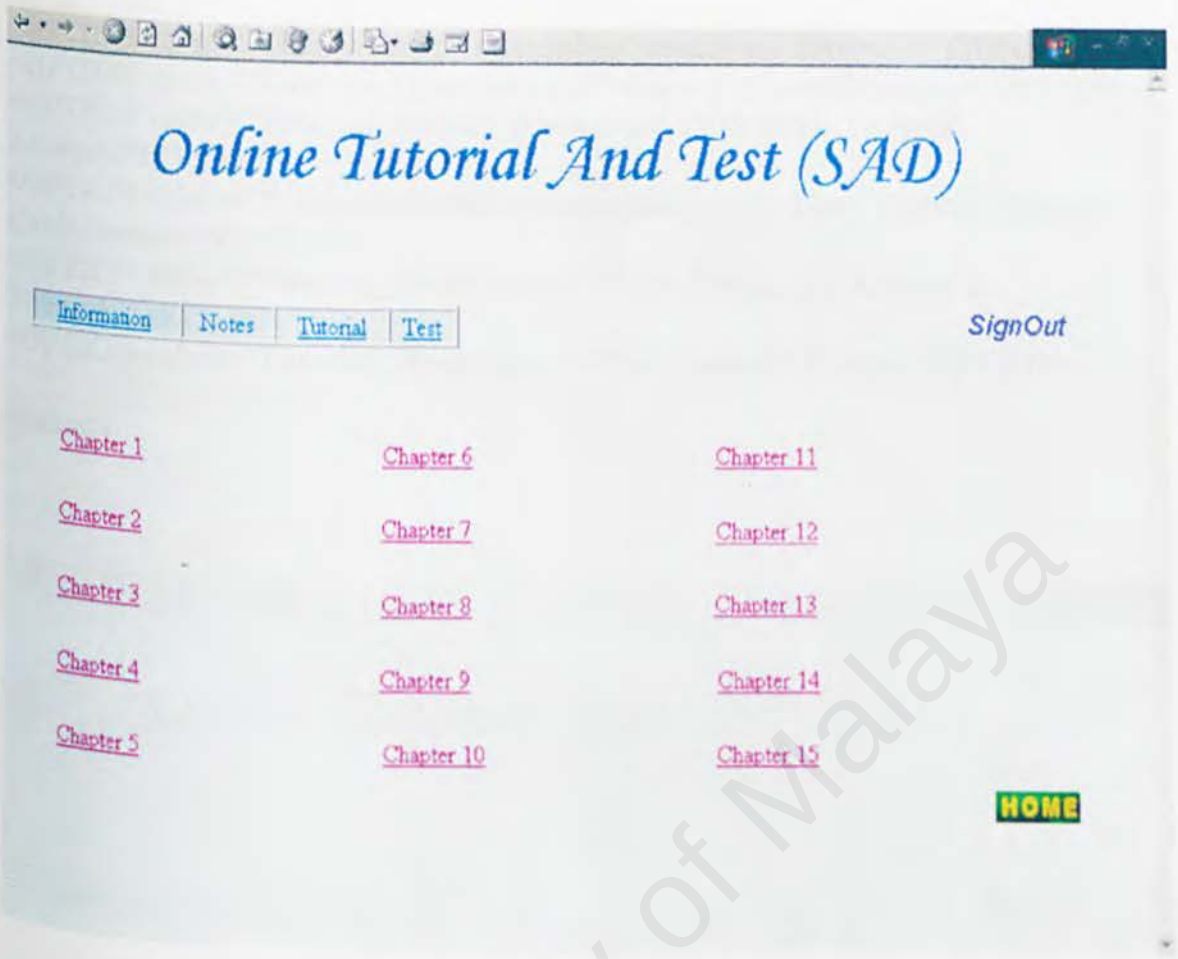

Figure 6.1(d): Notes Page

The **Tutorial Page** displays a dropdown list box with 5 actions to perform when the user clicks to it. This is the code for dropdown list box.

```
<script language="JavaScript" type="text/JavaScript">
<!--
function MM_jumpMenu(targ,selObj,restore){ //v3.0
  eval(targ+".location='"+selObj.options[selObj.selectedIndex].value+"'");
  if (restore) selObj.selectedIndex=0;
}
//-->
</script>
```

The code below have to type in Form.

```
<select style=onchange="MM_jumpMenu('parent',this,0)" name="menu1">
```

```
<OPTION value="Tutorial.aspx" selected>Choose from Here</OPTION>
<OPTION value="Tutorial_Question.aspx">View Tutorial Question</OPTION>
<OPTION value="Tutorial_Submit_Answer.aspx">Submit Tutorial
Answer</OPTION>
<OPTION value="TutorialSubmitConformation.aspx">View Tutorial Submit
Conformation</OPTION>
<OPTION value="Tutorial_Answer.aspx">View Lecturer's Answer for
Tutorial</OPTION>
<OPTION value="Tutorial_Marks.aspx">View Tutorial Marks</OPTION>

</select>
```

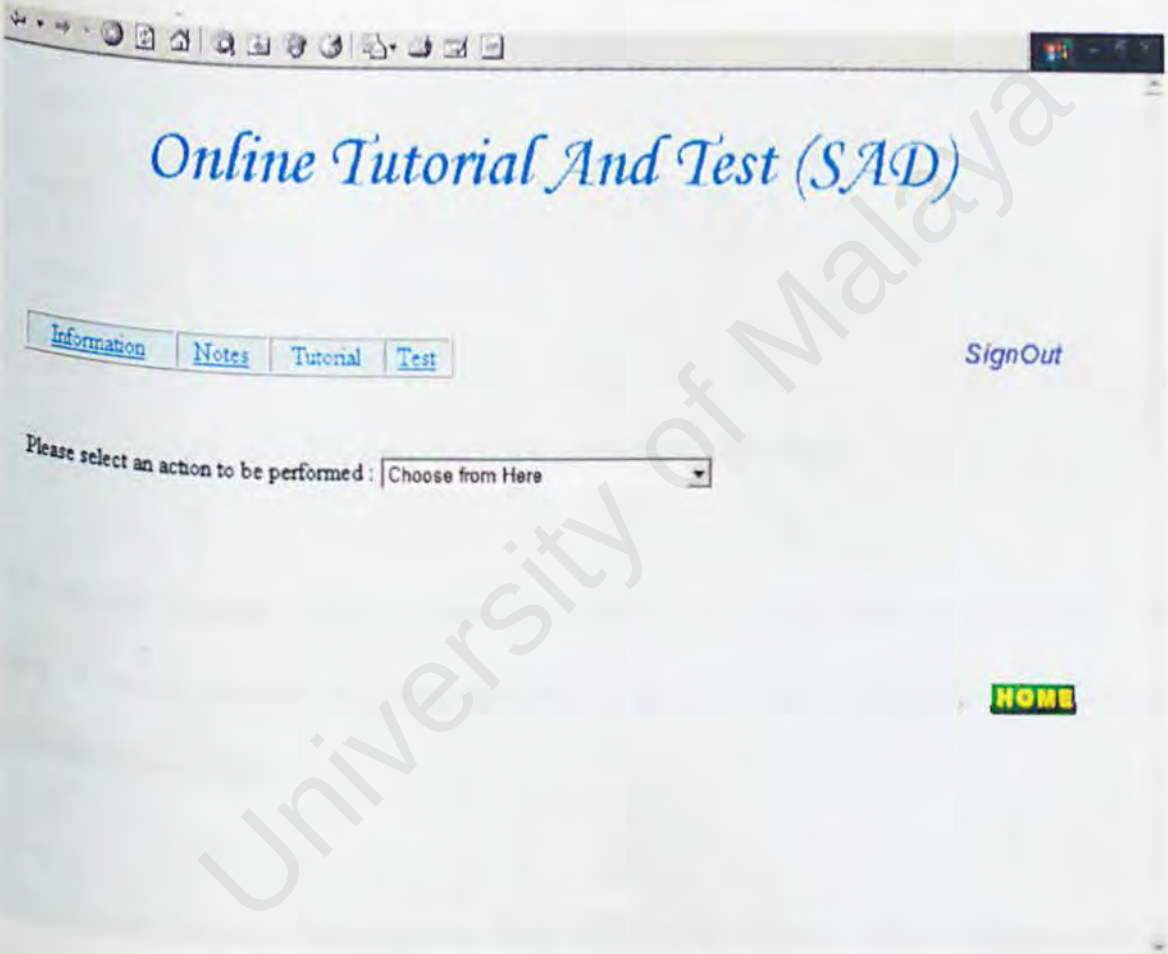

Figure 6.1(e): Tutorial Page

The **Tutorial Question Page** will display a list of tutorial questions and link them to tutorial question in word format (*.doc).

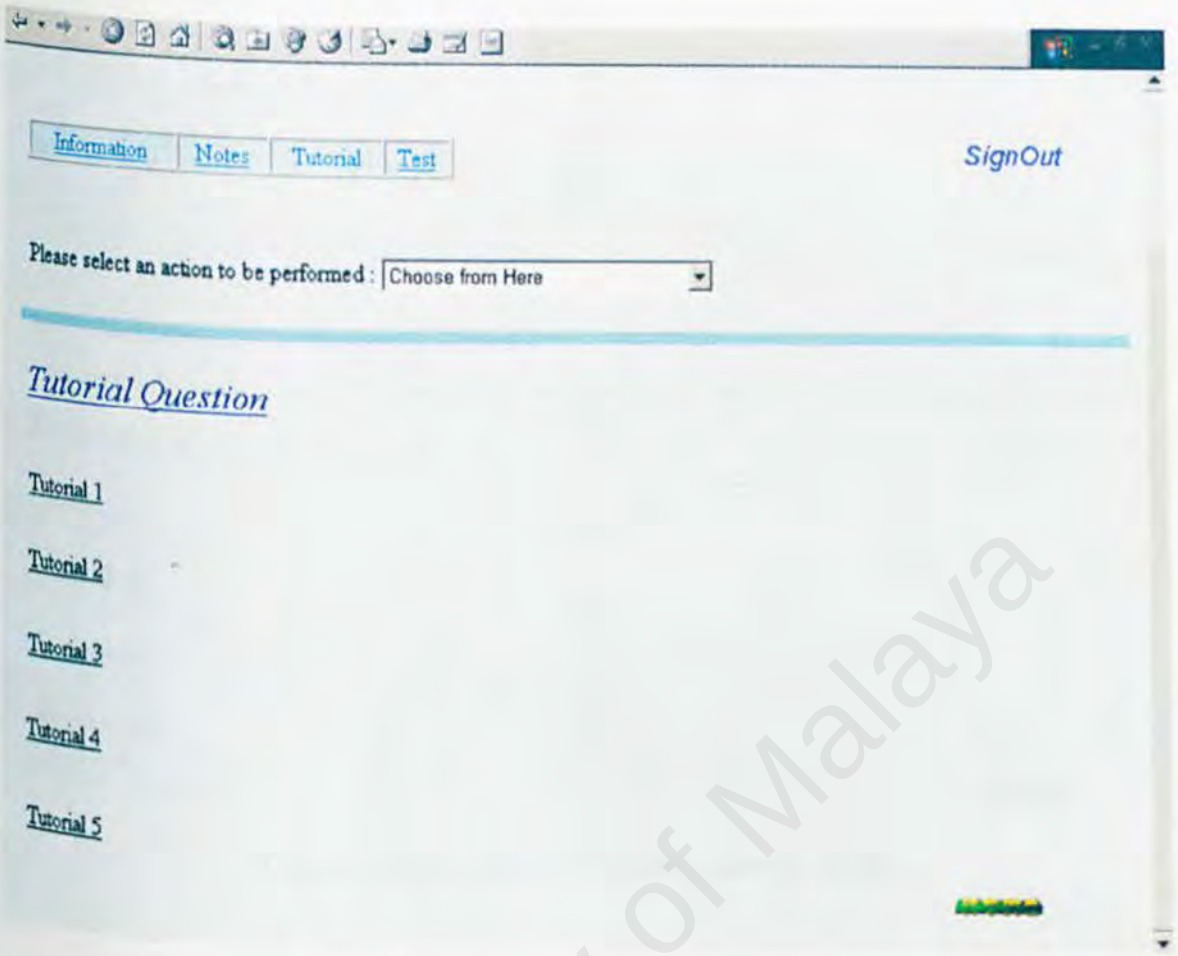

Figure 6.1(f): Tutorial Question Page

The **Submit Tutorial Answer Page** will display a list of tutorial questions and link them to tutorial question in web page file (*.aspx). Figure 6.1(g) shows the Submit Tutorial Answer Page.

The **Tutorial Submit Conformation Page** will display a list of student's name that has passed up their tutorials. Figure 6.1(h) shows the Tutorial Submit Conformation Page.

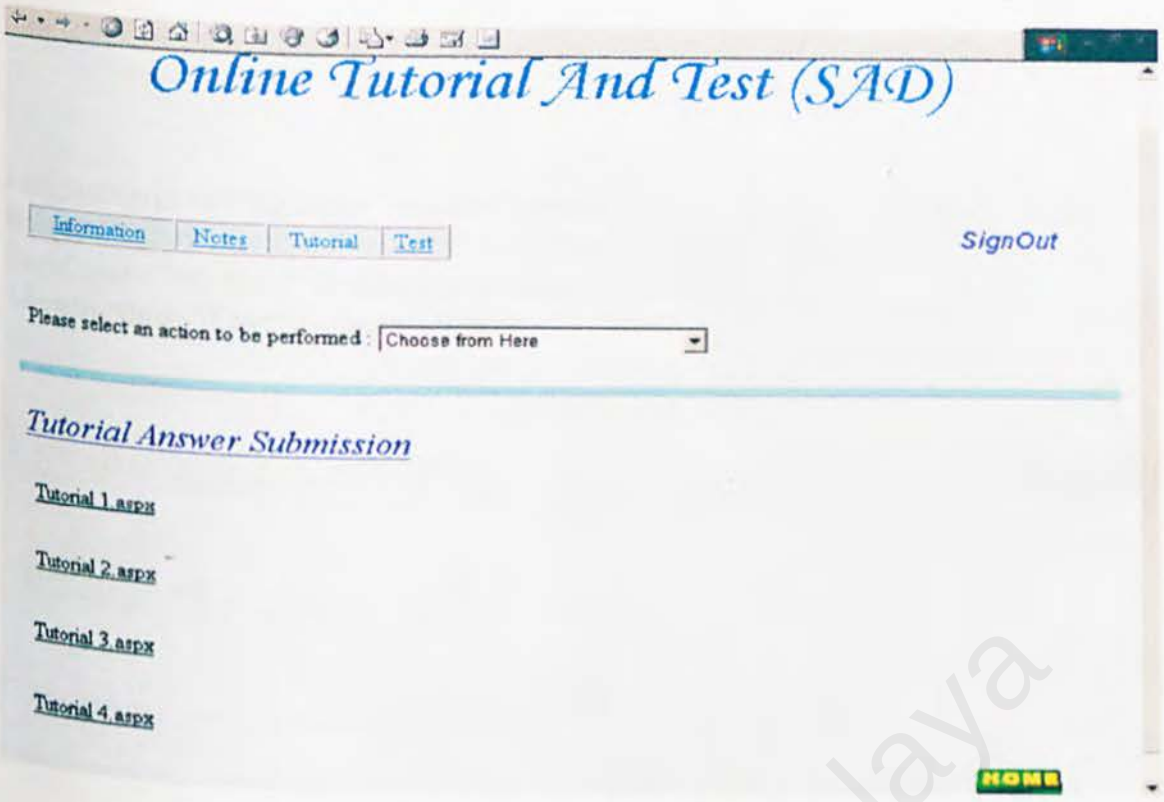

Figure 6.1(g): Submit Tutorial Answer Page

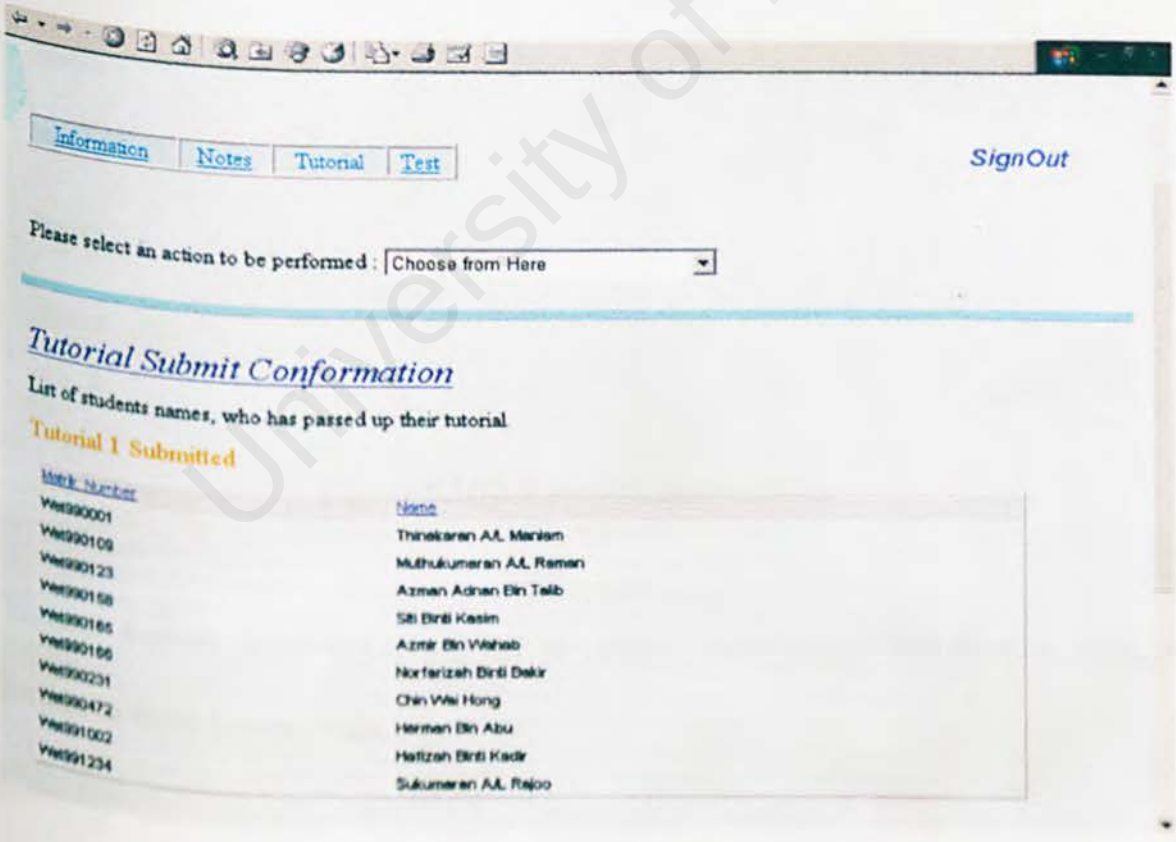

Figure 6.1(h): Tutorial Submit Conformation Page

This is the code for displaying the datagrid in Tutorial Submit Conformation Page.

```
<asp:datagrid id="dgEmps" runat="server" Font-Size="8pt" Width="671px"
Height="183px" CellPadding="3" Font-Name="arial" HeaderStyle-
BackColor="#dcdcdc" HeaderStyle-ForeColor="blue"
AllowSorting="True"></asp:datagrid>
```

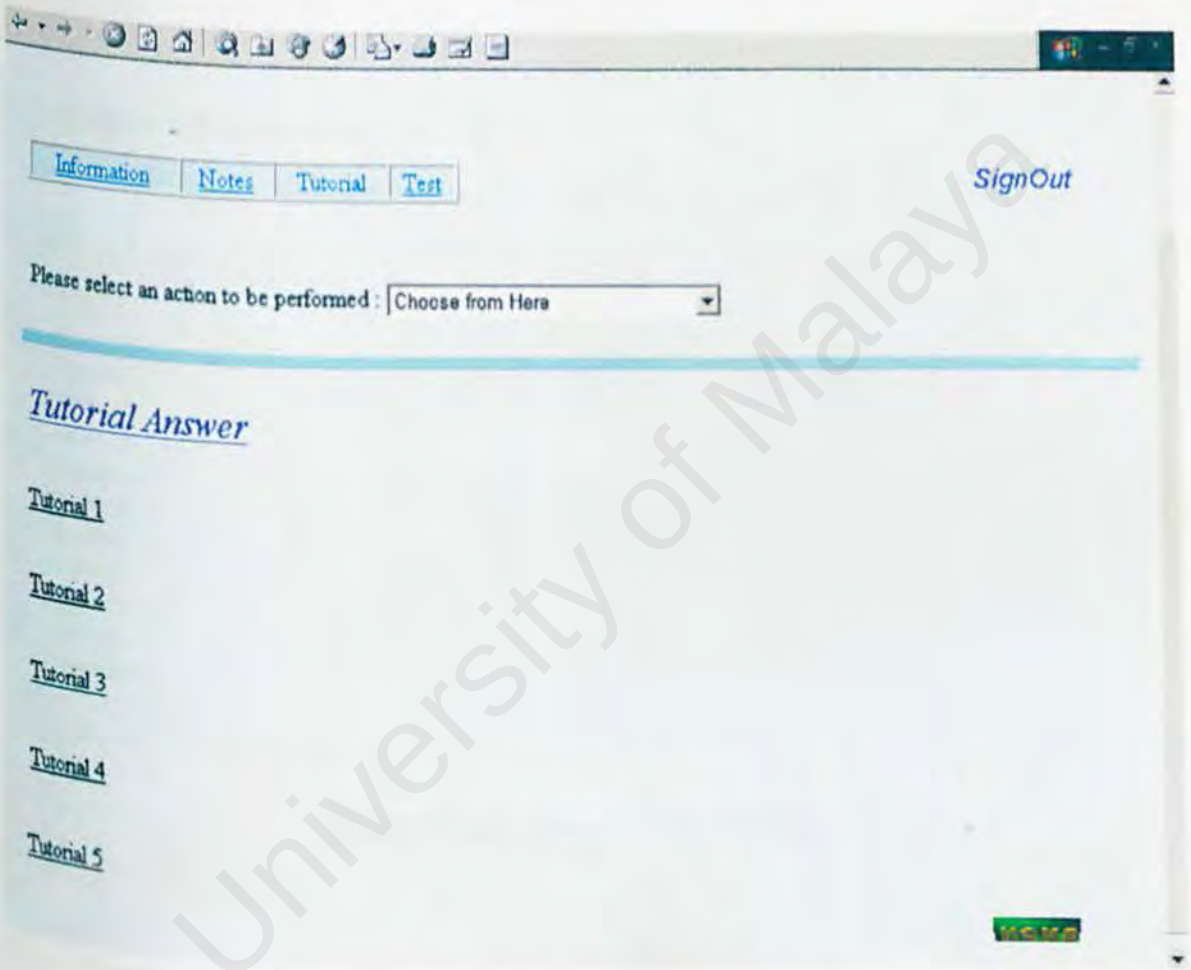

Figure 6.1(i): Tutorial Answer Page

Tutorial Answer Page displays a list of tutorial answers and link them to tutorial answers in word format (*.doc).

Tutorial Marks Page shows the tutorial marks in grade, for the students who have passed up their tutorials.

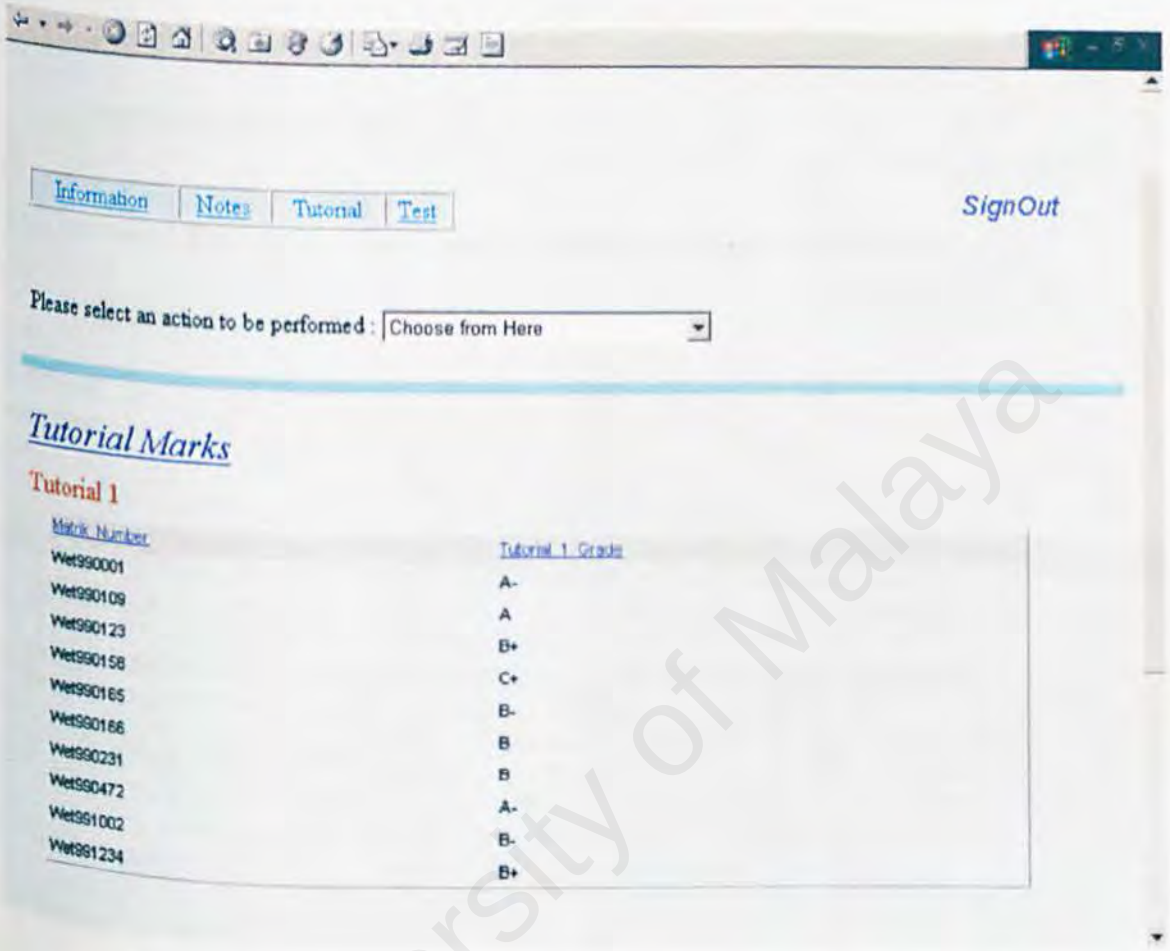

Figure 6.1(j): Tutorial Marks Page

This following code shows the connection to the database to access the Matrik Number and Tutorial Grade and displays them in the web page.

```
<script language="vb" runat="server">

Private Sub Page_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load

    dim strConnection as string = "Provider=Microsoft.Jet.OLEDB.4.0;"
```

```
        strConnection += "Data source=E:\Database\SADDB.mdb;"

        dim strSQL as string = "Select Matrik_Number, Tutorial_1_Grade from
Tutorial1GradeQuery;"

        dim objConnection as new OLEDBConnection(strConnection)
        dim objCommand as new OLEDBCommand(strSQL,objConnection)

        objConnection.Open()

        dgEmps.DataSource =
objCommand.ExecuteReader(CommandBehavior.CloseConnection)

        dgEmps.DataBind()

End sub
</script>
```

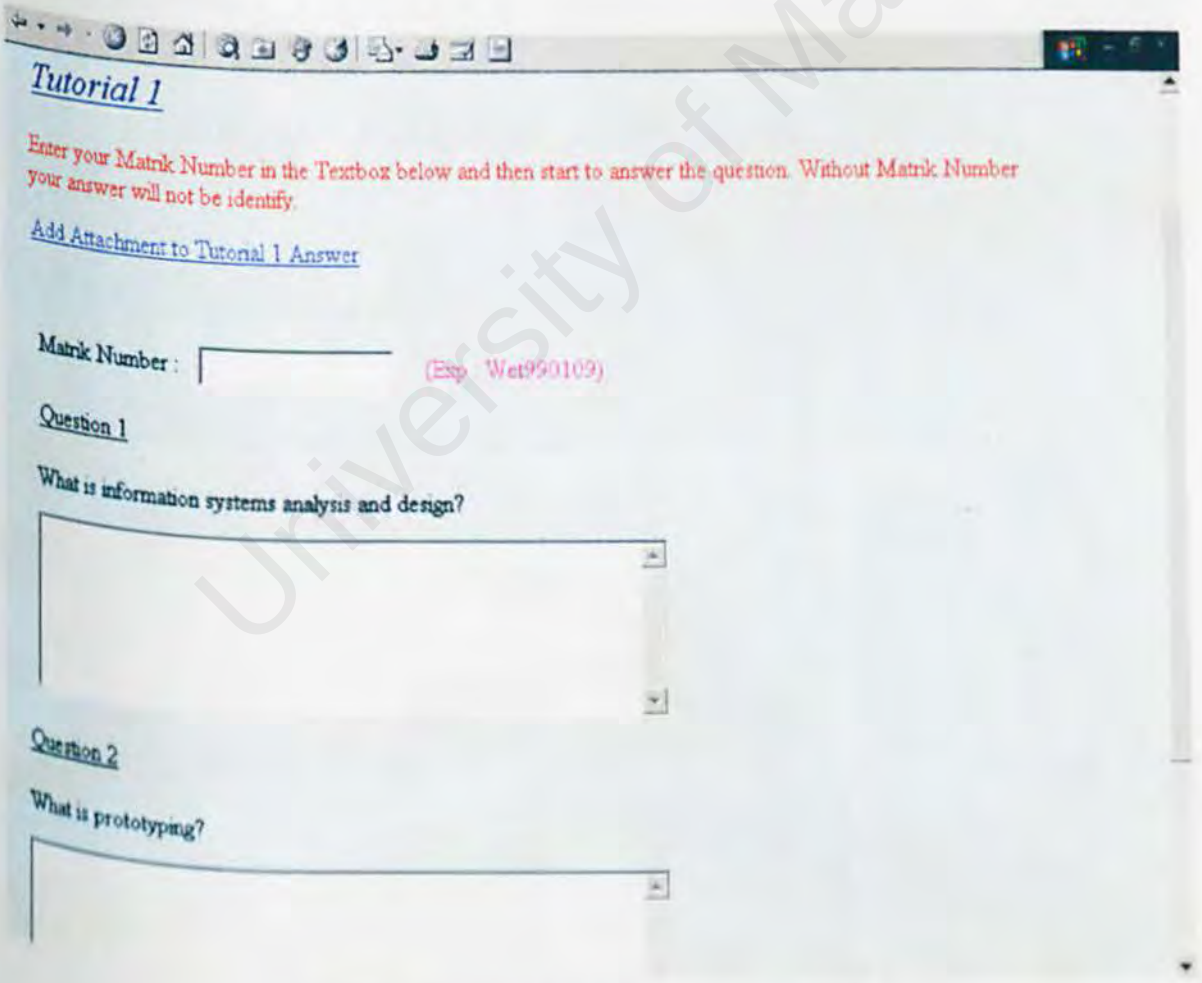

Figure 6.1(k): Tutorial 1 Page

Tutorial 1 Page displays a question for tutorial 1 in web page format. Students have to fill up the matrik number, answer for question 1 and 2, and then submit the page.

This is the codes for creating a label and textbox.

```
<asp:label id="Label2" runat="server" Width="104px" Height="3px">Matrik
Number : </asp:label>

<asp:textbox id="Matrik_ID" runat="server" Width="130px" Height="25px"
MaxLength="9"></asp:textbox>
```

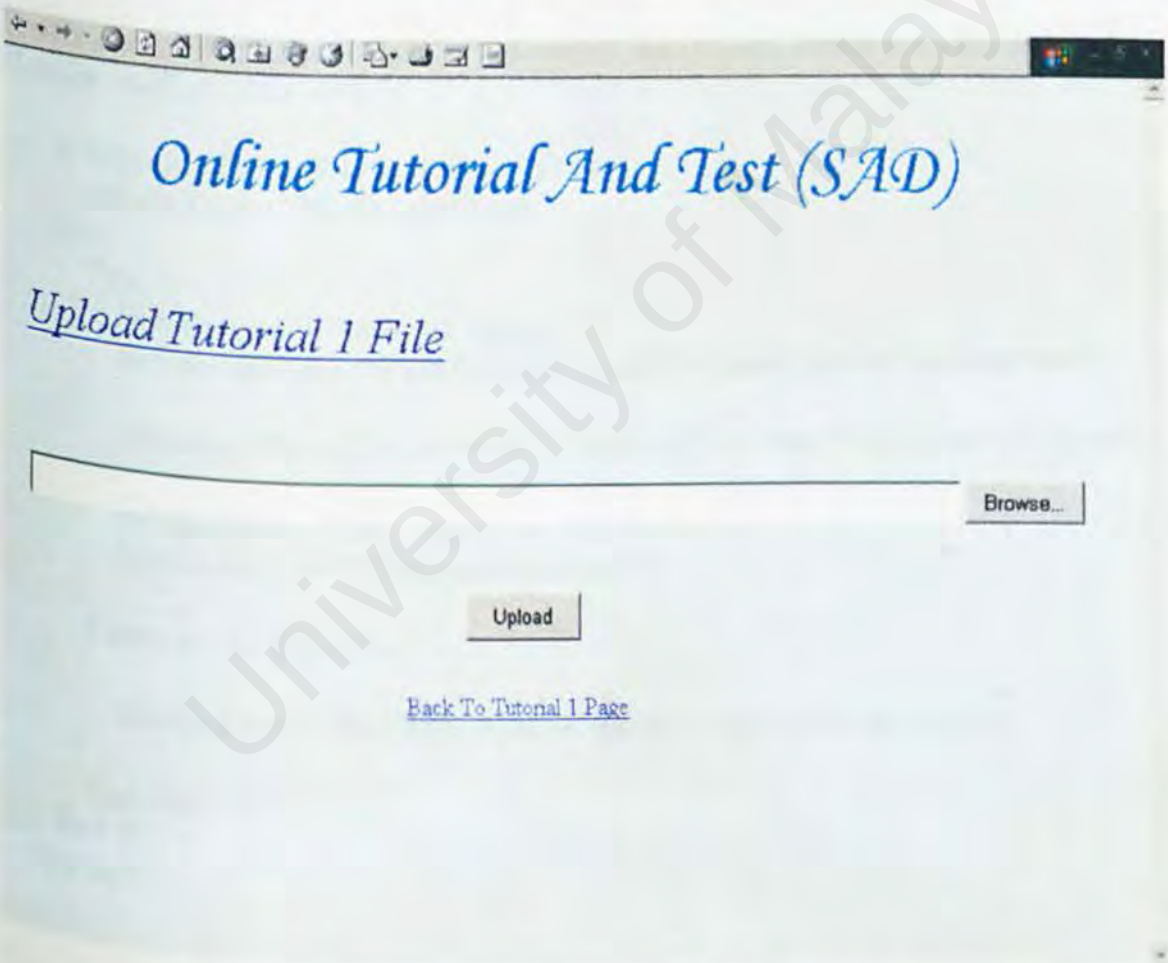

Figure 6.1(l): Upload Tutorial 1 Page

Upload Tutorial 1 Page uploads files to the lecturers' directory as was configured by the lecturer. Currently the size of a file must be less than 500kb, but this can be adjusted by the lecturer. The upload file can be in any format (Example: *.doc, *.xls, *.ppt, *.pdf, *.jpg, any many more).

```
<form id="Form1" method="post" encType="multipart/form-data"
runat="server">

<INPUT id="FileInput" type="file" size="101" name="File1" runat="server">

</form>
```

```
Private Sub cmdUpLoad_Click(ByVal sender As Object, ByVal e As EventArgs)
Handles cmdUpLoad.Click

    If FileInput.PostedFile Is Nothing Then
      lblInfo.Text = "No file specified."
    Else
      Try
        Dim ServerFileName As String
        ServerFileName = Path.GetFileName(FileInput.PostedFile.FileName)

        FileInput.PostedFile.SaveAs("E:\UploadTutorial1\" & ServerFileName)

        lblInfo.Text = "File " & ServerFileName
        lblInfo.Text &= " uploaded successfully."

      Catch err As Exception

        lblInfo.Text = "No file to upload, please attach a file to upload."

      End Try
    End If
  End Sub
```

The next module is the test module. The default page for the test module will be the **Test Page**. The **Test Page** displays a dropdown list box with 4 actions to perform when the user clicks to it. The codes for dropdown list box will same as for **Tutorial Page**.

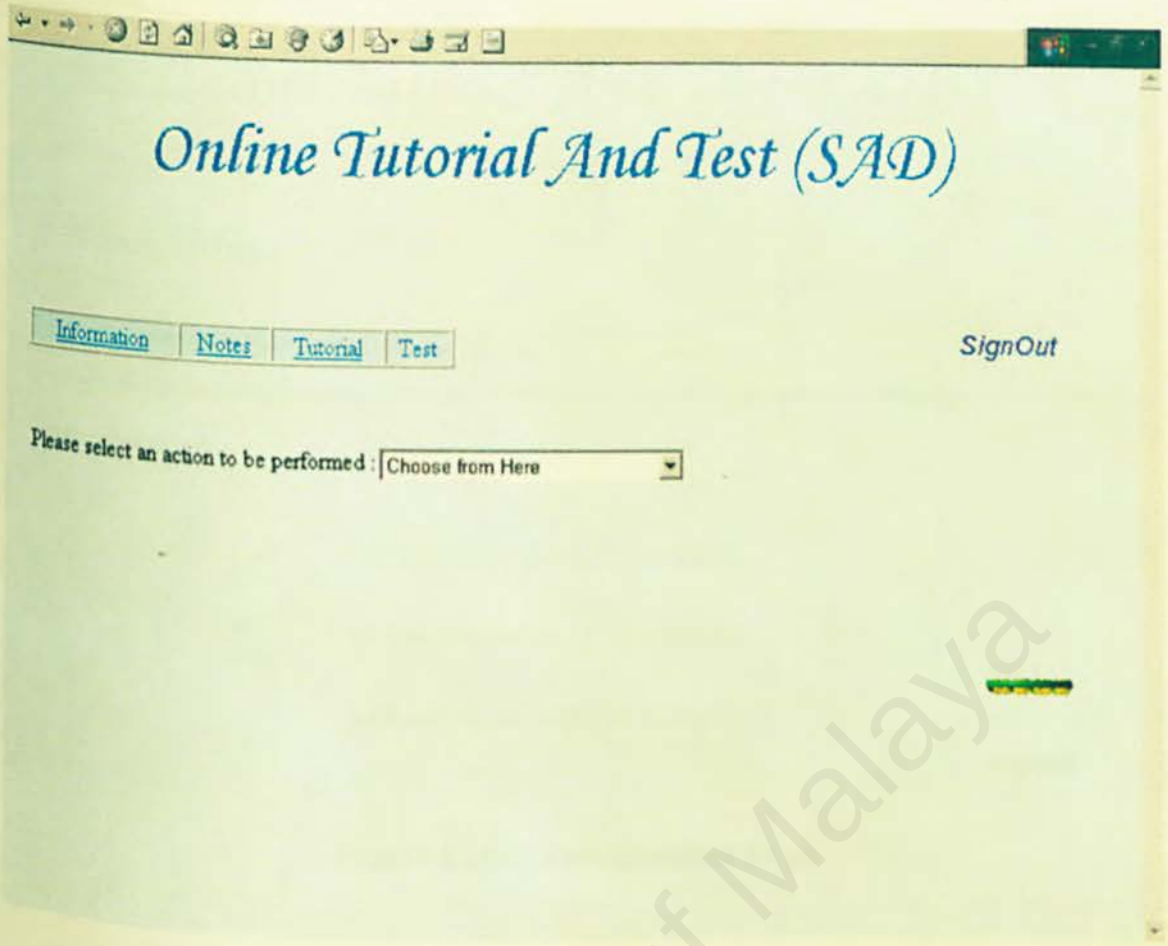

Figure 6.1(m): Test Page

The **Test Question Page** will display a list of test questions and link them to test question in web page file (*.aspx). Figure 6.1(n) shows the Test Question Page. The coding for this page will be same as **Submit Tutorial Answer Page**.

The **Test Submit Conformation Page** will display a list of student's name that has passed up their test. Figure 6.1(o) shows the Test Submit Conformation Page. The coding for this page will be same as **Tutorial Submit Conformation Page**.

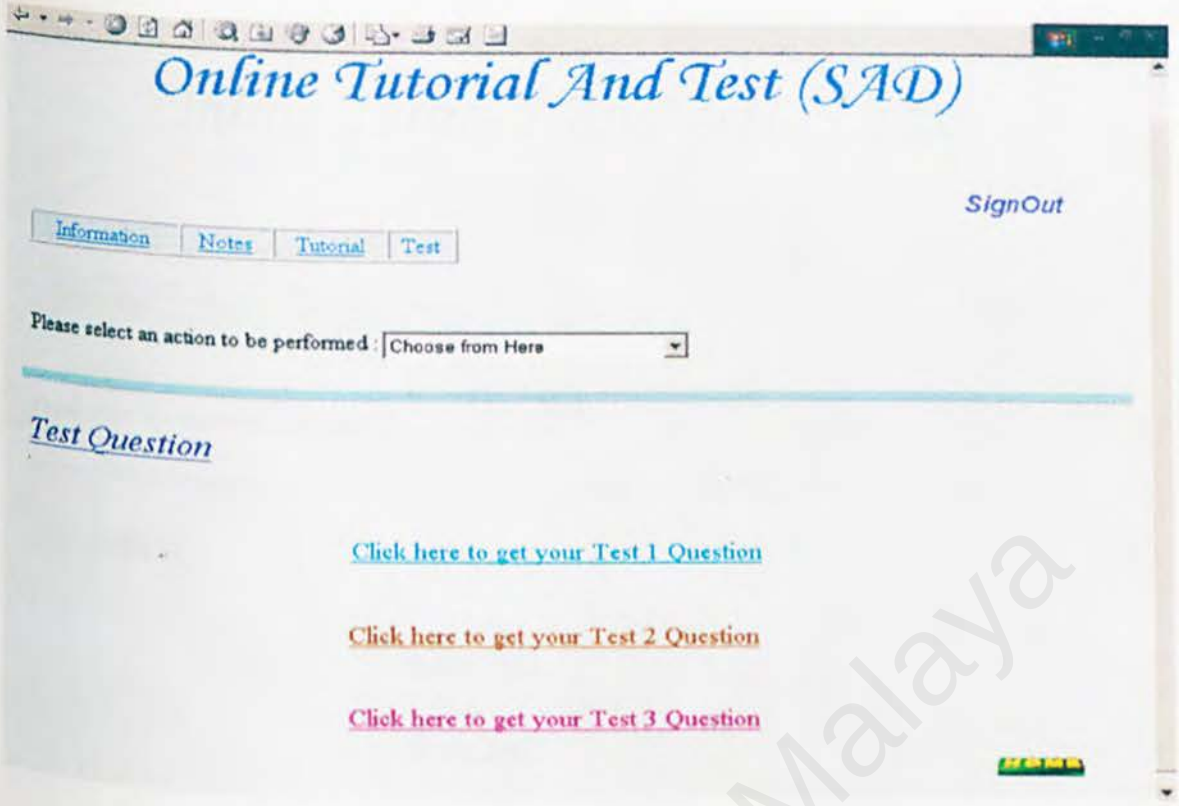

Figure 6.1(n): Test Question Page

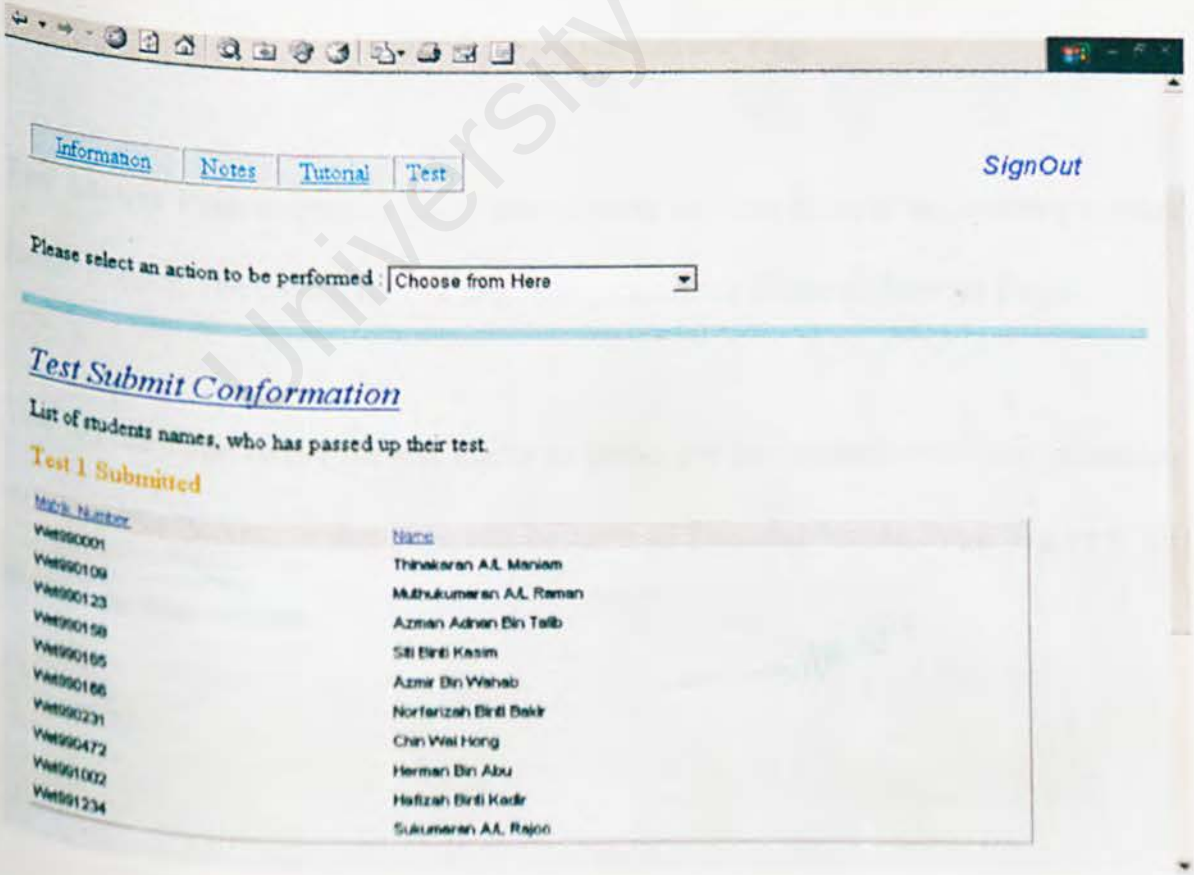

Figure 6.1(o): Test Submit Conformation Page

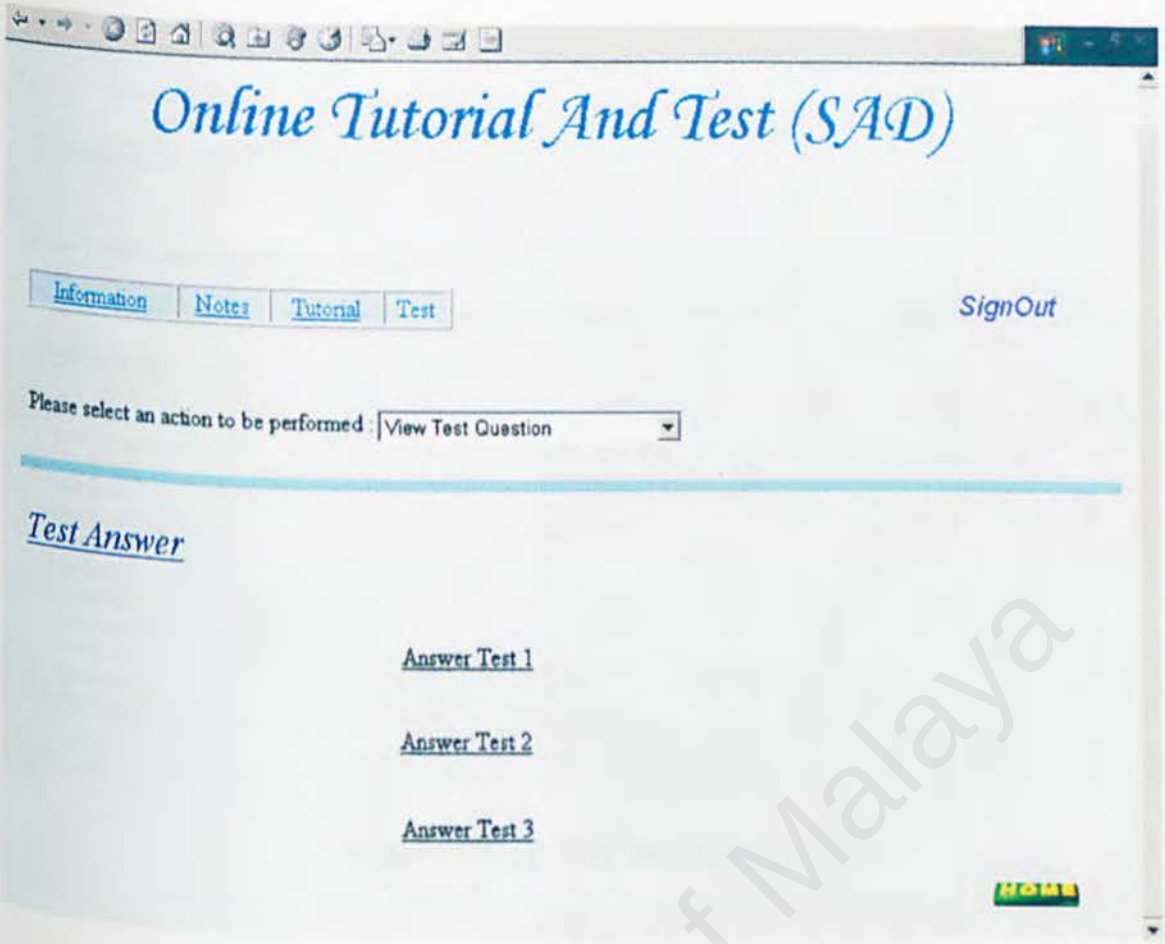

Figure 6.1(p): Test Answer Page

Test Answer Page displays a list of test answers and link them to test answers in word format (*.doc). The coding for this page will be same as **Tutorial Answer Page**.

Test Marks Page shows the test marks in grade, for the students who have passed up their test. The coding for this page will be same as **Tutorial Marks Page**. Figure 6.1(q) shows Test Marks Page.

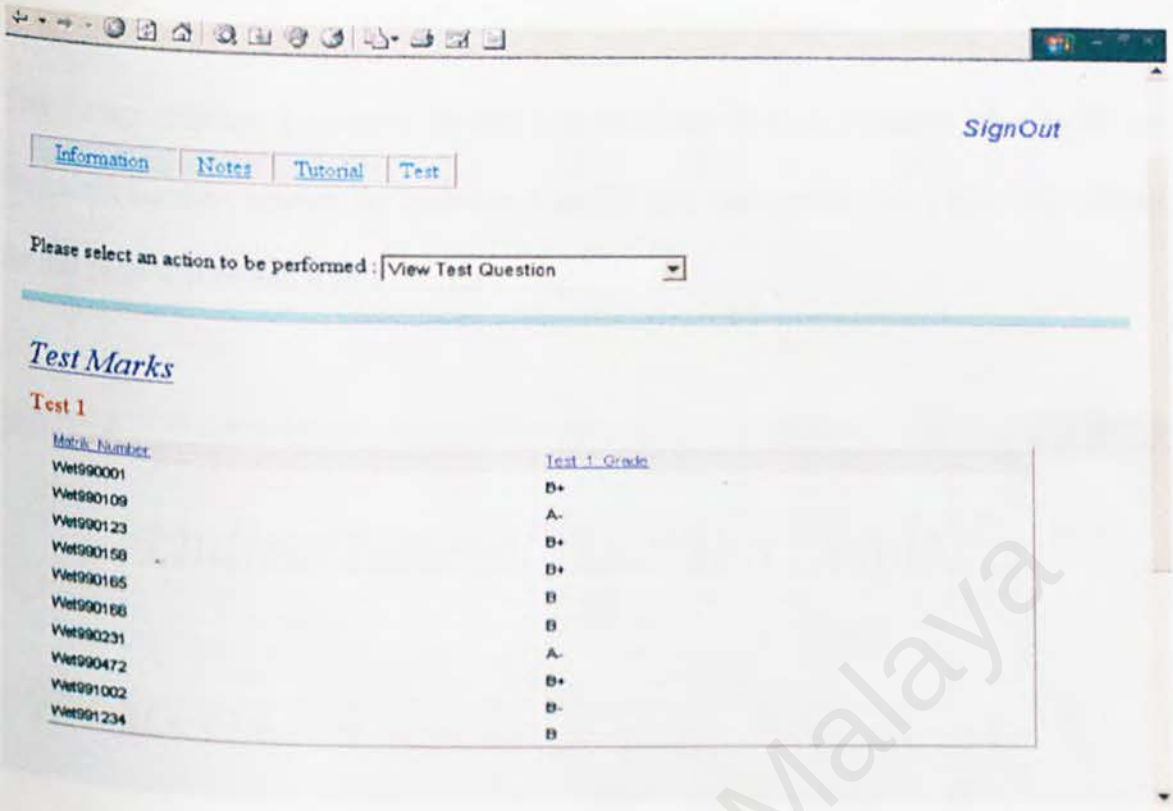

Figure 6.1(q): Test Marks Page

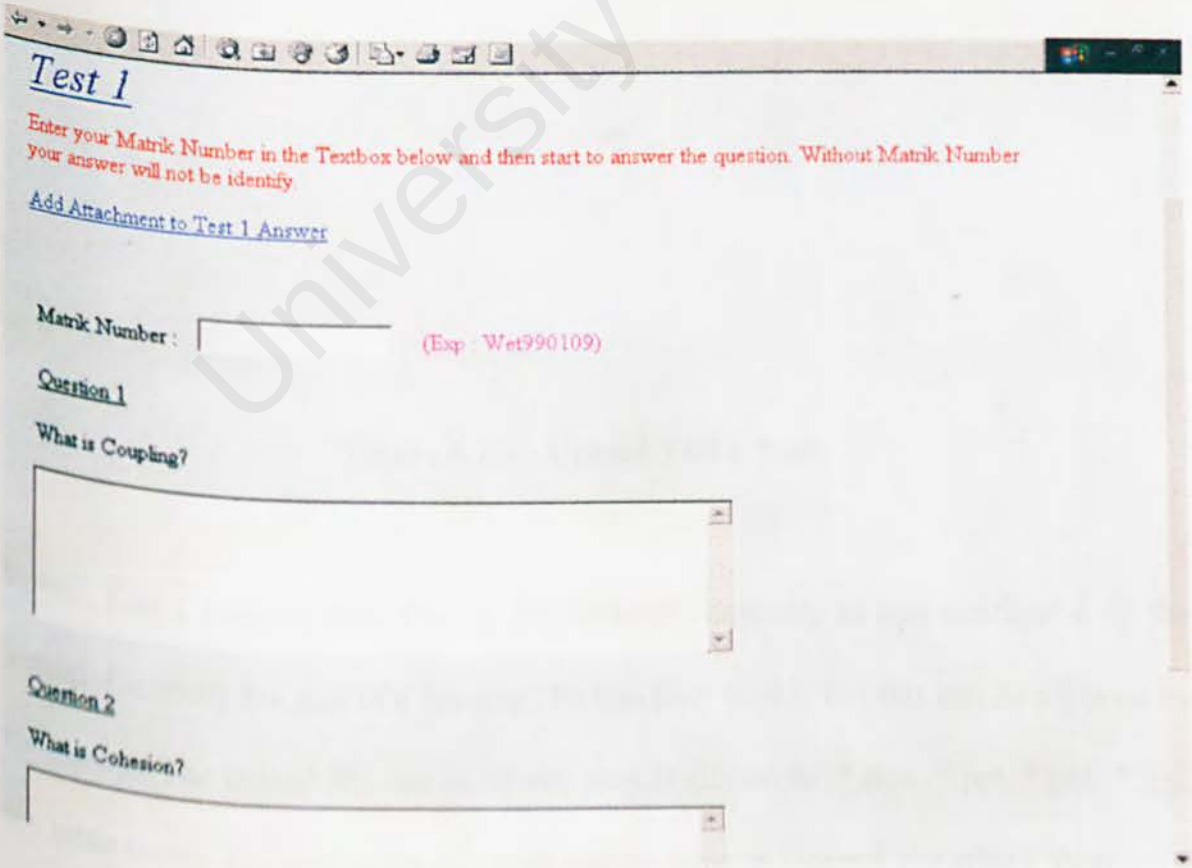

Figure 6.1(r): Test 1 Page

Test 1 Page displays a question for test 1 in web page format. Students have to fill up the matrik number, answer for question 1 and 2, and then submit the page. The coding for this page will be same as **Tutorial 1 Page**.

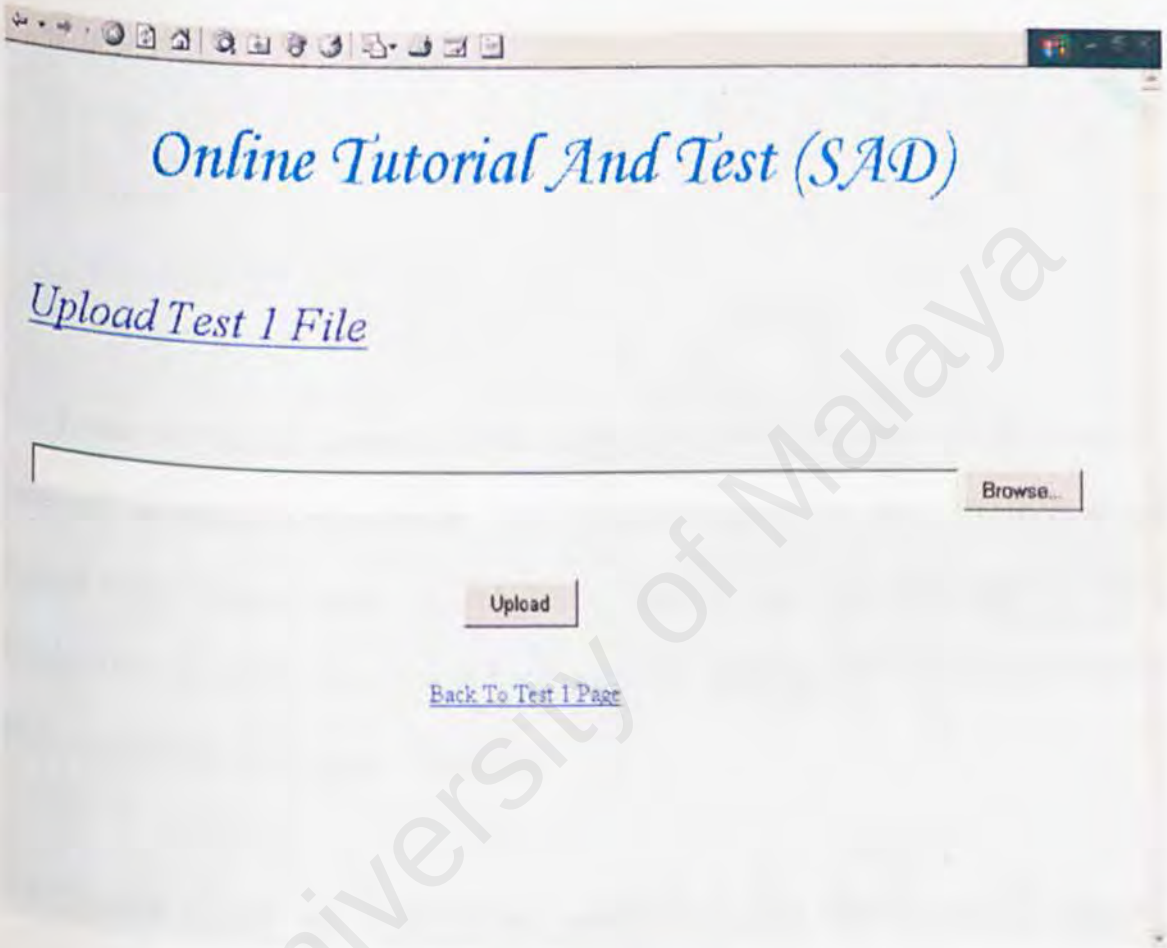

Figure 6.1(s): Upload Test 1 Page

Upload Test 1 Page uploads files to the lecturers' directory as was configured by the lecturer. Currently the size of a file must be less than 500kb, but this can be adjusted by the lecturer. The upload file can be in any format (Example: *.doc, *.ppt, *.pdf, *.jpg, any many more). The coding for this page will be same as **Upload Tutorial 1 Page**.

6.2 Administration Module

The administration module has 7 sub modules as follow:

1) Tables
2) Queries
3) Forms
4) Reports
5) Pages
6) Macros
7) Switchboard

The **Tables** module will have all kind of tables which need database storage in Access Database. For example, Registration Table, Students Answer Tutorial 1 Table, Students Answer Test 1 Table, Tutorial 1 Graph Table, Test 1 Graph Table, Modified Tutorial 1 Graph Table, Modified Test 1 Graph Table and other tables as well. Figure 6.2(a) shows the view of Registration Table in database.

The **Queries** module will have all the queries that have been created to simplify lecturers' work. For example, Matrik Number Query, Identification Card Number Query, Name Query and lots more. Figure 6.2(b) shows the Identification Card Number Query action. The lecturer must enter at least one number to display the search of query. In this case, assume the lecturer has entered number 79 and click ok. The result of the search can be view in Figure 6.2.(c).

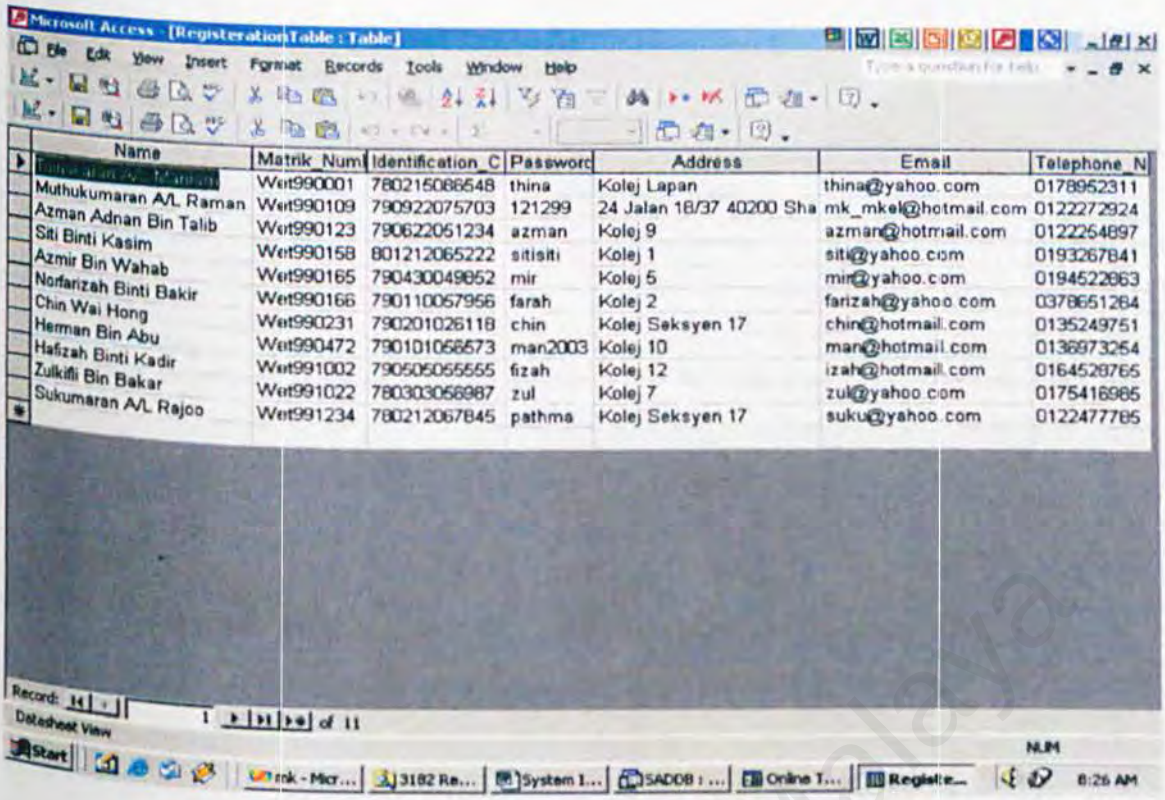

Figure 6.2(a): Registration Table

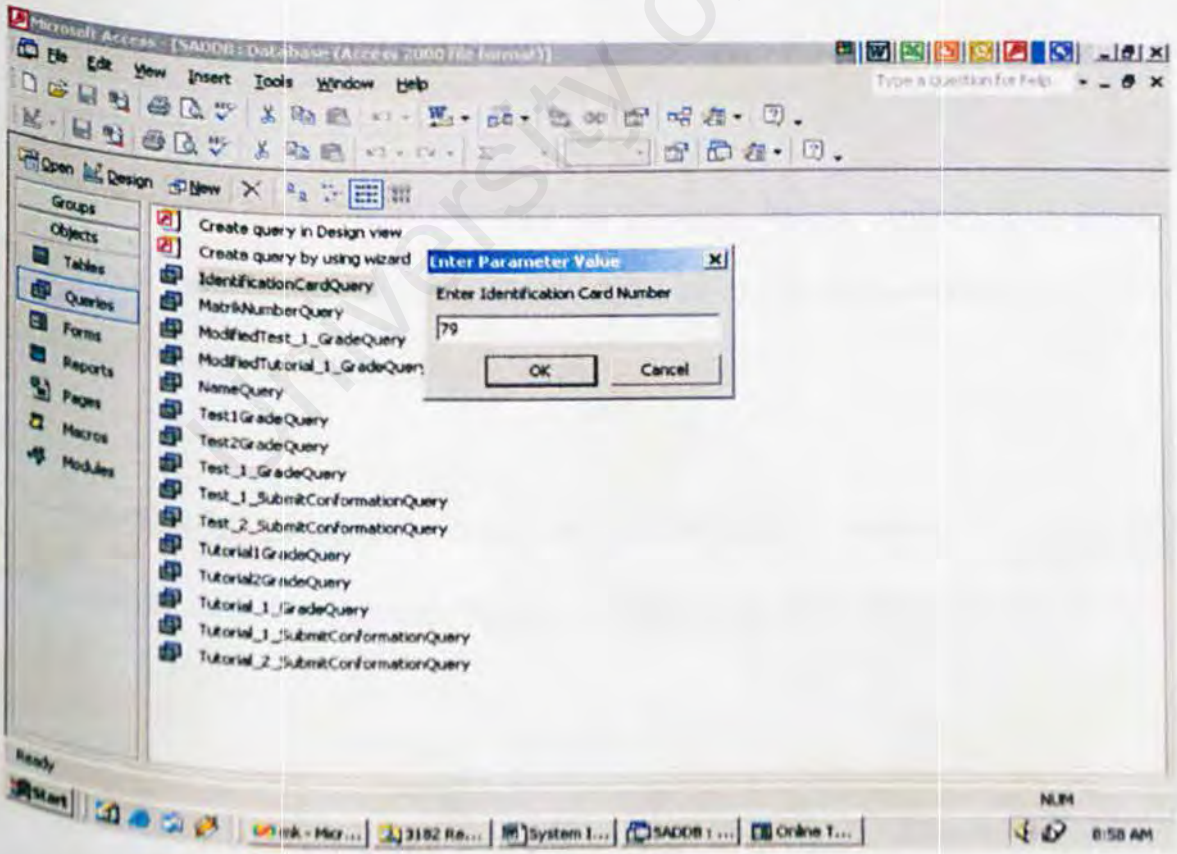

Figure 6.2(b): Identification Card Number Query (Part 1)

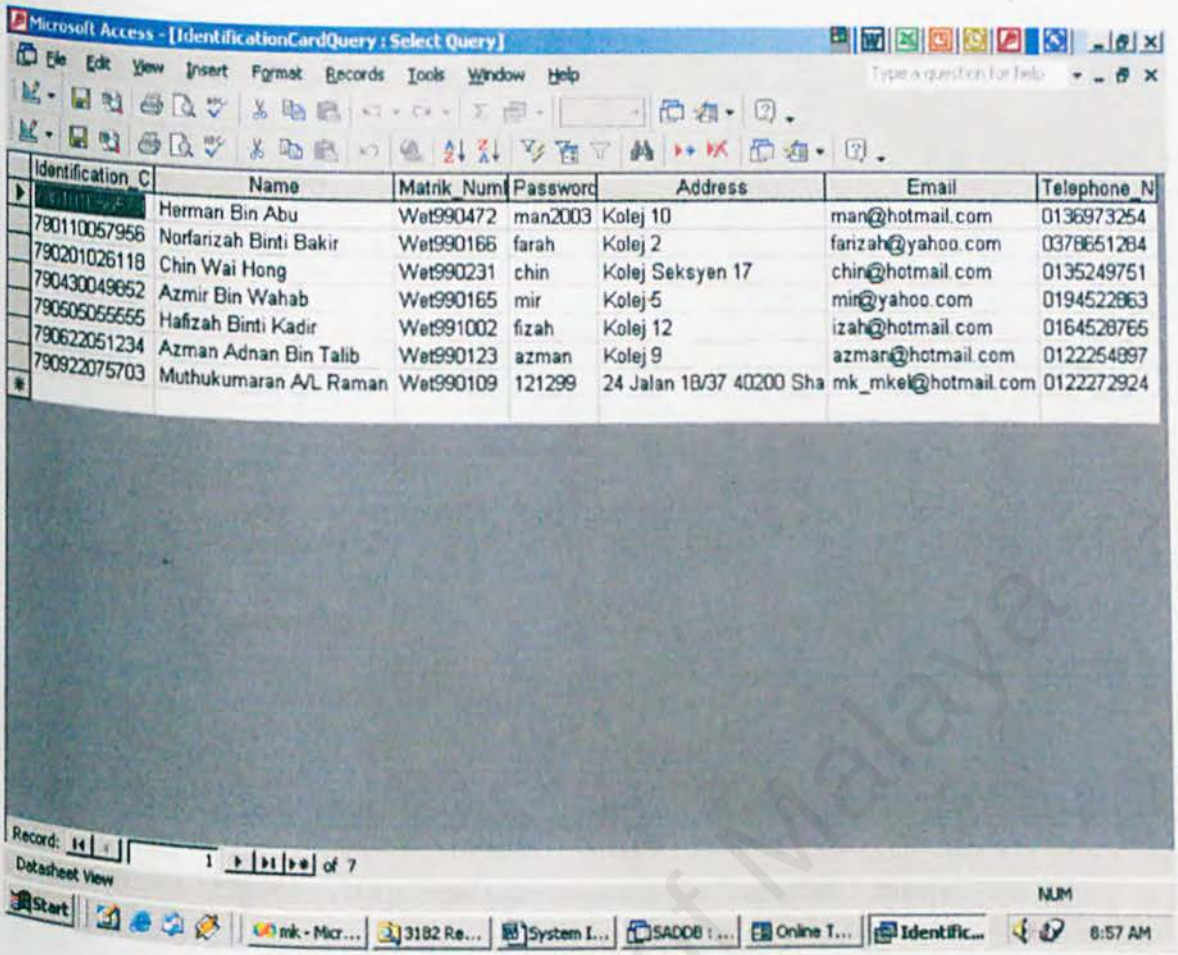

Figure 6.2(c): Identification Card Number Query (Part2)

The **Form** module has forms for all the tables in Tables Module. This form will simplify the lecturers' work of entering data in the database tables. The form for Students Answer for Tutorial 1 Table is shown in Figure 6.2(d).

The **Report** module contains the report from the tables or query module. This report will contain all the entry in the module. The report Registration is shown in Figure 6.2(e).

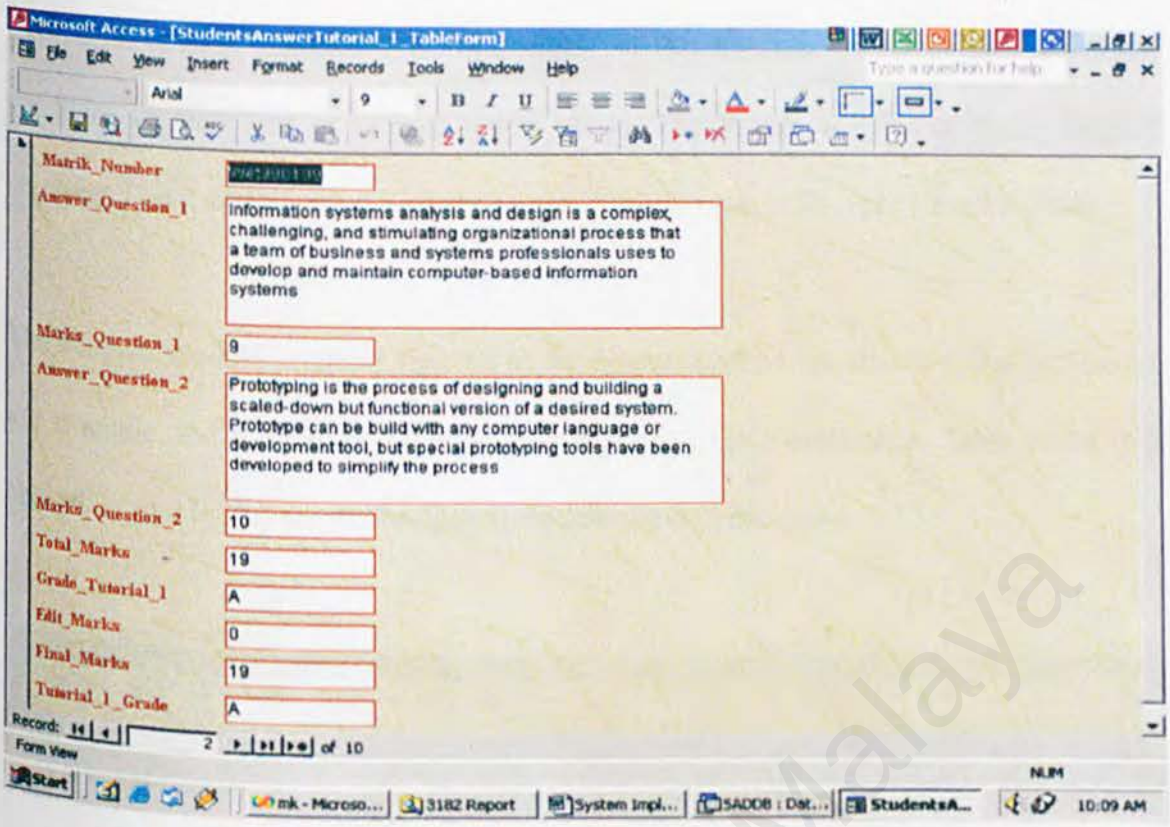

Figure 6.2(d): Students Answer for Tutorial 1 Form

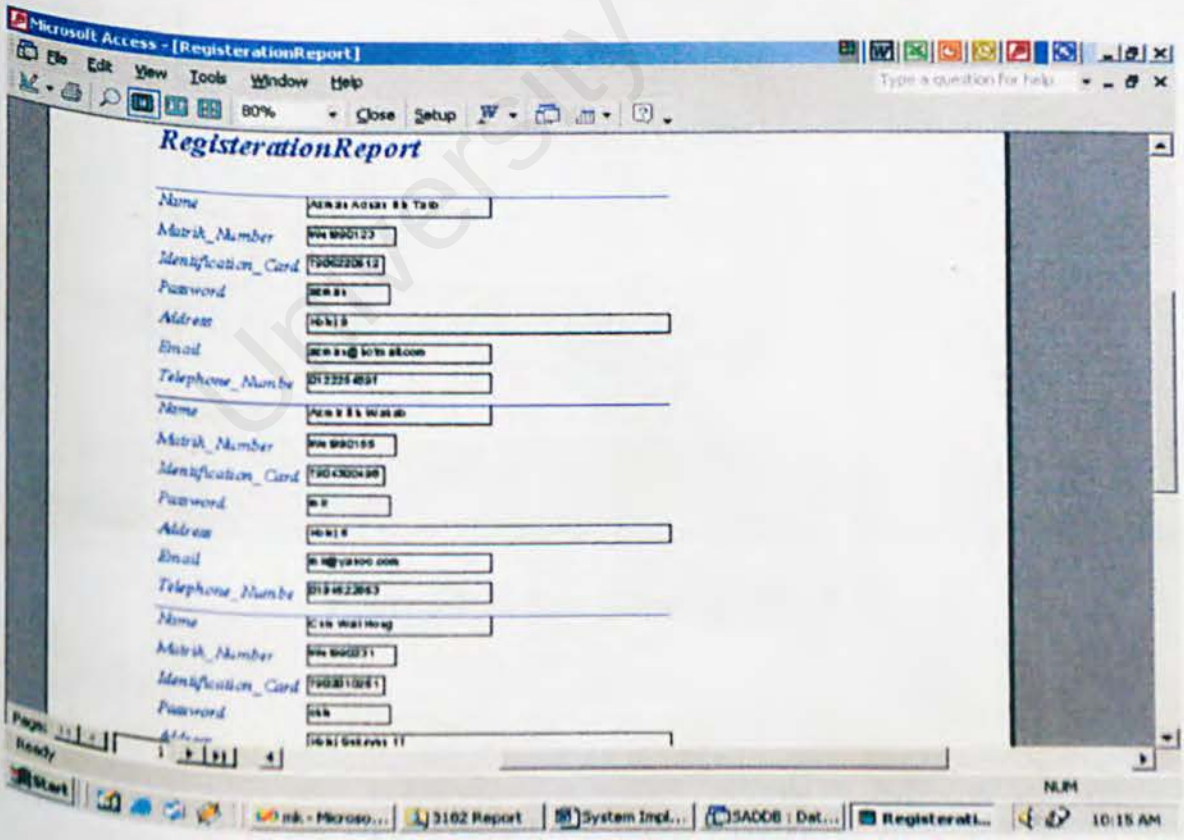

Figure 6.2(e): Registration Report

The **Pages** module contains the html pages. In this module lecturers' can create the graph for students test or tutorial marks grade. The Figure 6.2(f) shows the original graph for Test 1 and Figure 6.2(g) shows the modified graph for Test 1 marks grade.

The **Macros** module contains macros to be executed when the macro is called (click). For example, the RegistrationTableMacro will open the Registration Table when it is clicked. Figure 6.2(h) shows the Macro module view in database.

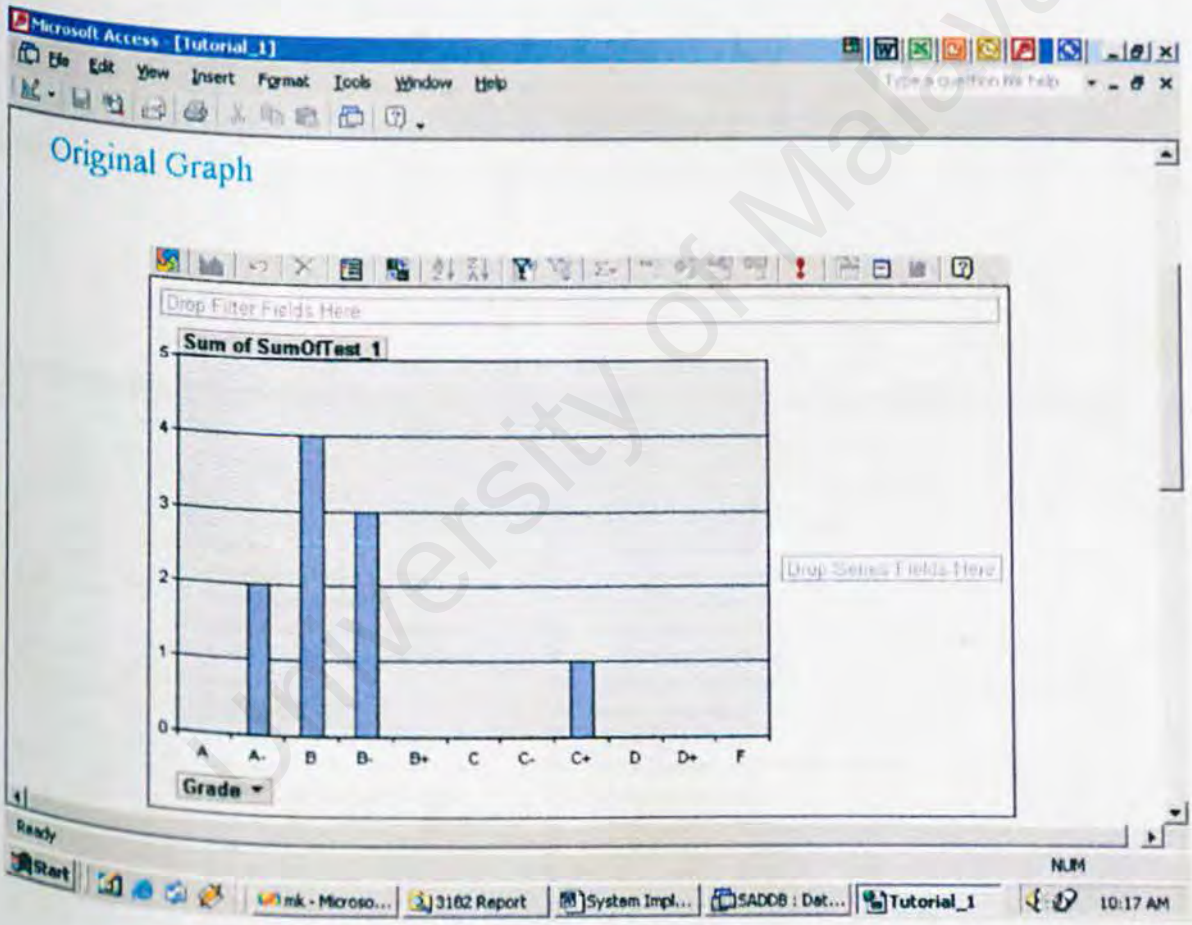

Figure 6.2(f): Test 1 Original Graph

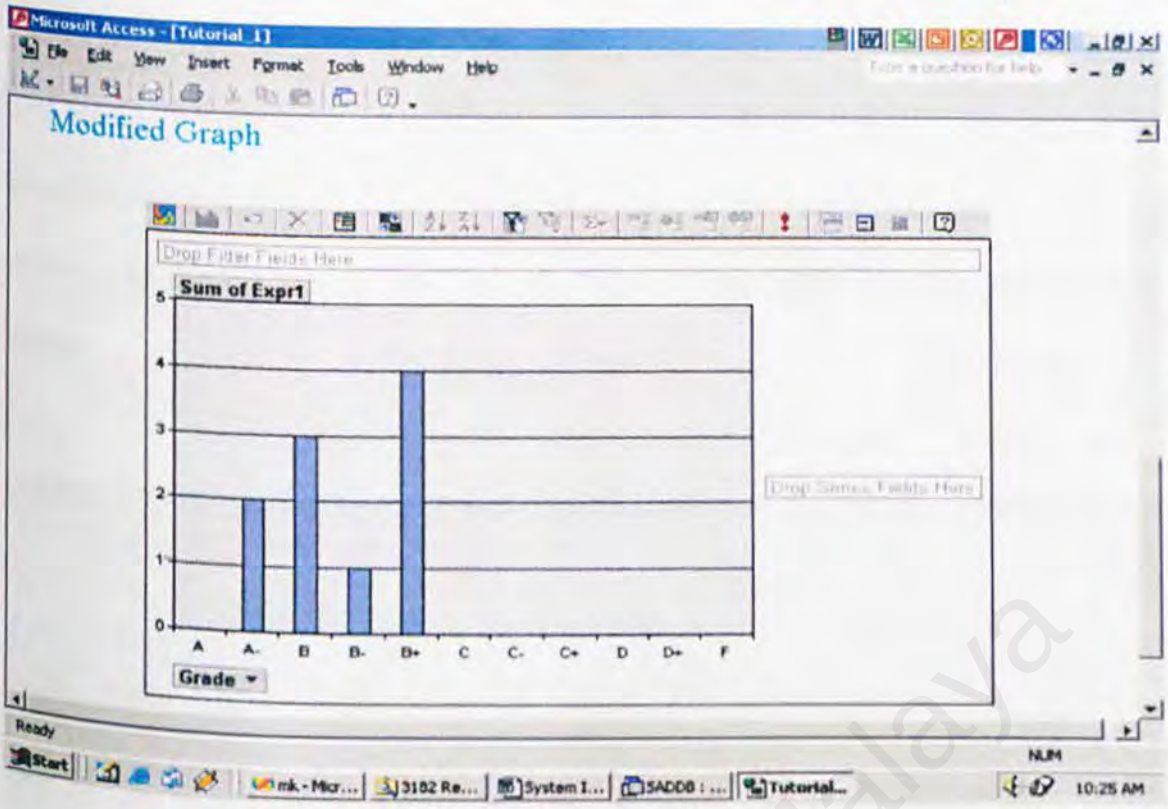

Figure 6.2(g): Test 1 Modified Graph

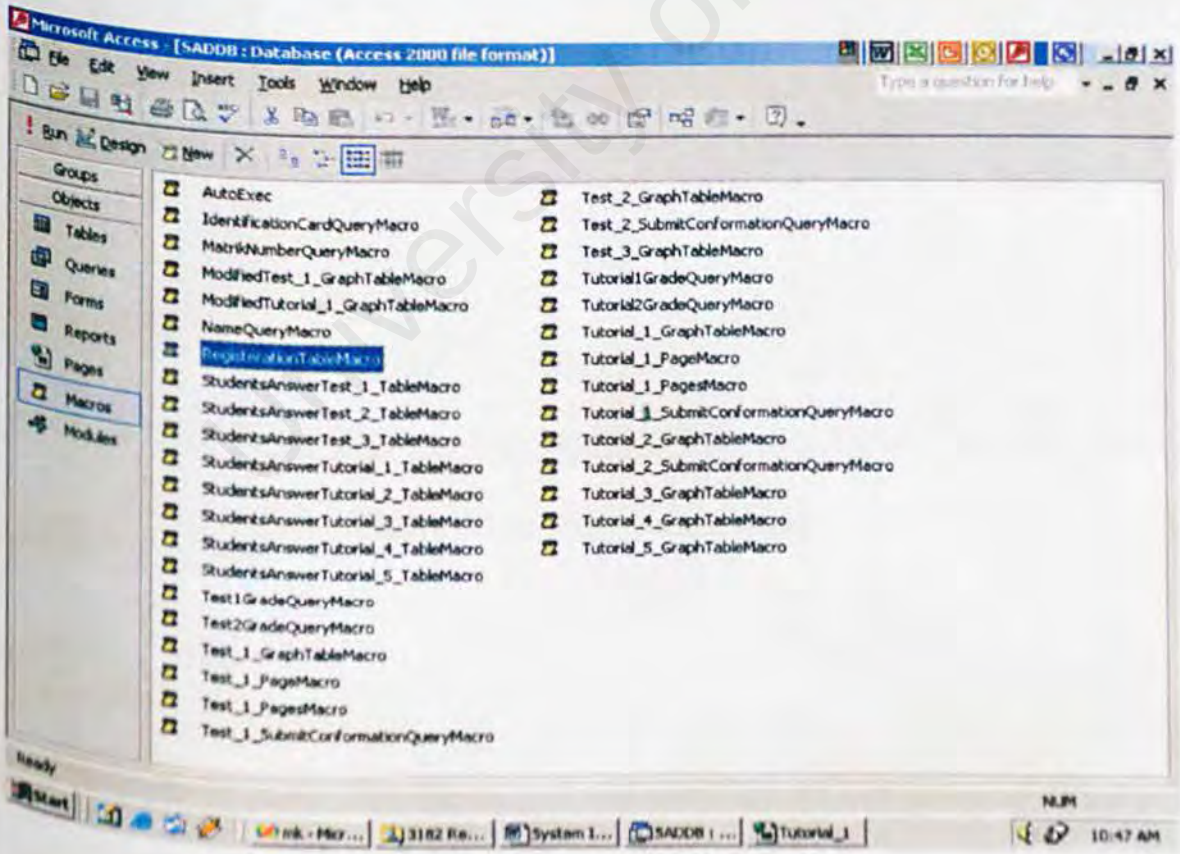

Figure 6.2(h): Macros Module in Database

The Switchboard module is used to simplify lecturers work on controlling the database. This module interface is well organized and easy to control. Figure 6.2(i) shows the main interface of the switchboard. When View Pages button is clicked, the Figure 6.2(j) will be seen and the lecturer can select the action to be performed from the available options.

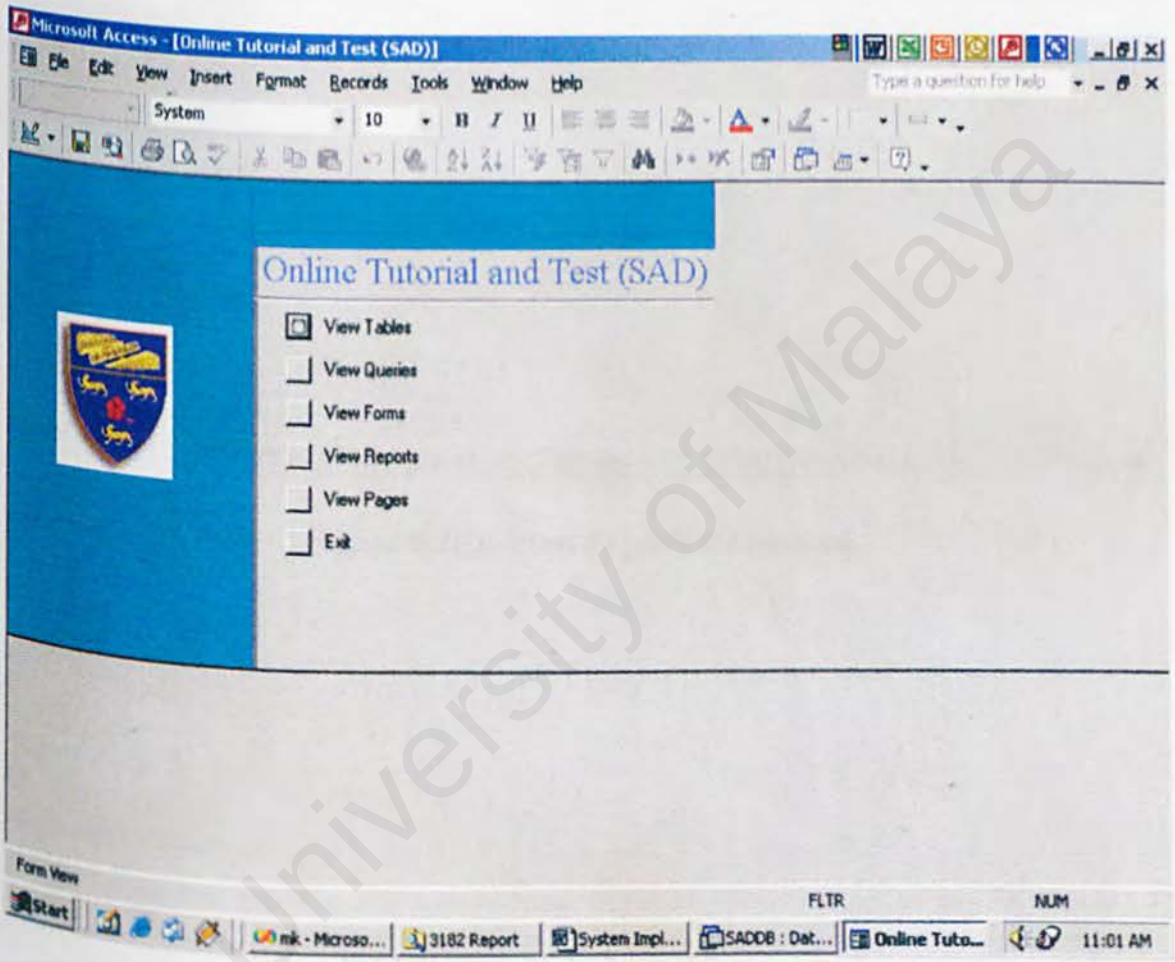

Figure 6.2(i): Main Switchboard

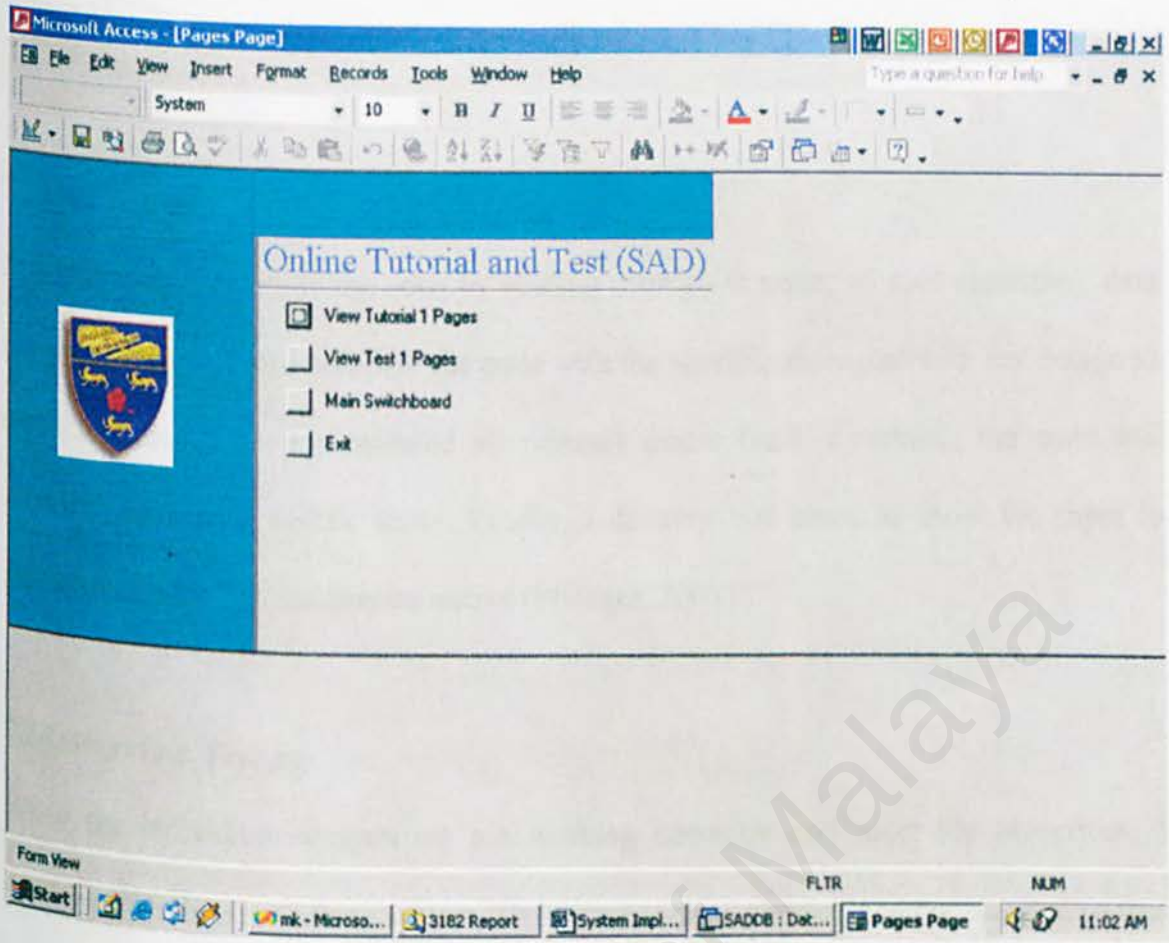

Figure 6.2(j): View Pages Switchboard

CHAPTER 7: SYSTEM TESTING

7.1 Unit Testing

In unit testing, I examine the code by reading through it, trying to spot algorithm, data and syntax faults. I also compare the code with the specifications and with my design to make sure that I have considered all relevant cases. Next, I compile the code and eliminate remaining syntax faults. Finally, I develop test cases to show the input is properly converted to the desired output (Pfleeger, 2001).

7.2 Integration Testing

When the individual components are working correctly and meet the objectives, I combine them into a working system. This integration is planned and coordinated so that when a failure occurs, I have some idea of what caused it. In addition, the order in which components are tested affects our choice of test cases and tools (Pfleeger, 2001).

The system is viewed as a hierarchy of components, where each component belongs to a layer of the design. Figure 7.2(a) shows the example of components hierarchy which will be used to explain integration testing that has been chosen. I have used the **Bottom-up Integration** to test the system (Pfleeger, 2001).

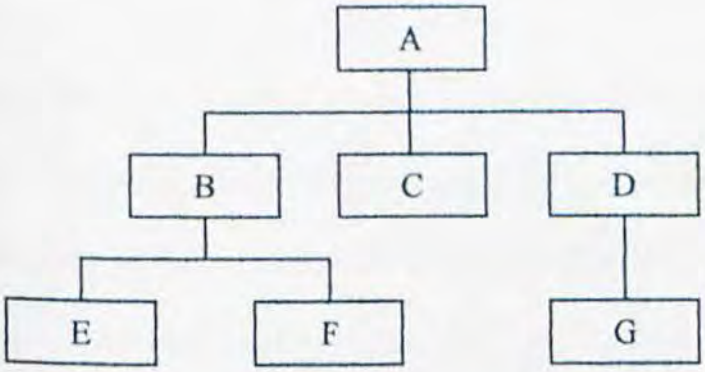

Figure 7.2(a): Example Components Hierarchy

7.2.1 Bottom-up Integration

In this method, each component at the lowest level of the system hierarchy is tested individually first. Then, the next components to be tested are those that call the previously tested ones. This step will be repeatedly until all the components are included in the testing (Pfleeger, 2001).

For example, consider the components and hierarchy in Figure 7.2(a). To test this system from the bottom up, I first test the lowest level E, F and G. Because I have no components ready to call these lowest-level programs, I write special code to aid the integration. A component driver is a routine that calls a particular component and passes a test case to it. The driver is not difficult to code, since it rarely requires complex processing. However, care is taken to be sure that the driver's interface with the test component is defined properly. Sometimes, test data can be supplied automatically in a special-purpose language that facilitates defining the data (Pfleeger, 2001).

In the example in Figure 7.2(a), I need a component driver for each of E, F and G. when I am satisfied that those three components work correctly, I move to the next higher level. Unlike the lowest-level components, the next-level components are not tested separately. Instead, they are combined with the components they call (which have already been tested). In this case, I test B, E and F together. If a problem occurs, I know that its cause is either B, or in the interface between B and E or B and F, since E and F functioned properly on their own. Had I tested B, E and F without having tested E and F separately, I might not have been able to isolate the problem's cause so easily (Pfleeger, 2001).

Similarly, I test D with G. Because C calls no other components, I test it by itself. Finally, I test all components together. Figure 7.2.1(a) shows the sequence of tests and their dependencies (Pfleeger, 2001).

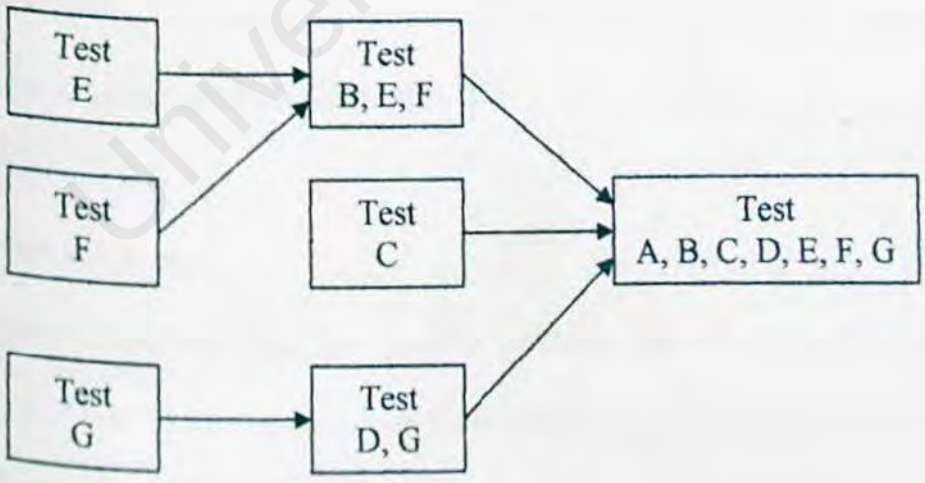

Figure 7.2.1(a): Bottom-up Testing

7.3 Function Testing

Each function can be associated with those system components that accomplish it. For some functions, the parts may comprise the entire system. The set of actions associated with a function is called a thread, so function testing is sometimes called thread testing (Pfleeger, 2001).

Logically, it should be easier to find the cause of a problem in a small set of components than in a large set. Thus, ease of testing calls for choosing carefully the order in which functions are tested. Functions may be defined in a nested manner, just as spins are defined in levels (Pfleeger, 2001).

Function testing is performed in a carefully controlled situation. Moreover, since I are testing one function at a time, function testing can actually begin before the entire system is constructed, if need be. Function testing compares the system's actual performance with its requirements, so the test cases for function testing are developed from the requirements document (Pfleeger, 2001).

7.4 Performance Tests

Once I have determined that the system performs the functions required by the requirements, I turn to the way in which those functions are performed. Thus, functional testing addresses the functional requirements and performance testing addresses the non functional requirements (Pfleeger, 2001).

The performance tests that have been used for my system is:

1) Security tests ensure that the security requirements are met. We test system characteristics related to availability, integrity and confidentiality of data and services (Pfleeger, 2001).
2) User testing to test the system from the user site and the administration site. Will be their views and comments about the system.

CHAPTER 8: DISCUSSION

8.1 Problem Faced

Before start to do this system, I have a lot of problem regarding, what this system is? What this system going to do? How I can create this system? What are the software must I used?

However, with my supervisor help and guide, finally I came to know, what this system is, and other related details about this system.

After that, I faced problem with the software's. I don't understand which software can I use to develop the system and what other software can go along (work together) with the software that I choose. To overcome this problem, I consult my supervisor and Mr. Ang Tan Fong. They told me the software that I can use to develop my system and the other software that can work together with the software that I can choose.

I also faced problem regarding what database that I can use for my system and how can I relate my database with the system that I going to create. Again I fall back to my supervisor and Mr. Ang to clarify the problem and to get better solutions. Besides that I also refer to my supervisor for verify my Data Flow Diagram (DFD), because I'm not very sure with the diagrams.

Other than that I also faced problem for my literature review. I don't know what I'm supposed to do, where am I suppose to refer for the information and what kind of information will be benefits to me. To overcome this problem I refer to my supervisor and my friends who are doing thesis 2 (WXES 3182) know for their help and guide.

Besides that, I also faced problem to complete this documentation on time and with efficiency. So I ask my friends and seniors who have better experience in this field to guide me to produce a better output. I also not forget to ask my supervisor for her advice and guides.

During the development process of my system, I was admitted in Klang General Hospital because of dengue fever. I was admitted for 5 days, and I have been in fever for 9 days including the admitted days. It takes me about 1 week to recover my self to back to normal because I was so tied and weak after discharged from the hospital. This problem stopped my developing process almost about 3 weeks.

During my Wxes 3182, that is when developing the system I face a lot of problem with the coding to try inserting data from the web page to the Microsoft SQL Server 2000. I tried to refer to as many books as I can and still I didn't get solutions for the problem. Finally, I consult my supervisor and decided to change the database to Microsoft Access Xp.

Besides all this, I have problem with my Visual Studio.Net tools and it cause me to reinstall windows for three times in my computer. This is because it was some problem

in the Visual Studio.Net class file and every time I start my computer the windows not starts. I have reformatted my hard disk after three times of reinstallation windows. Then I install all the applications and reconfigured my IIS settings and others as well. After that my computer was doing fine.

I find hard to get the example of the source code and application to be a guide to me in completing my project (system). I have bought two books title:

1) Beginning Asp.Net using Vb.Net (Wrox Press), Isbn: 1-861005-04-0
2) Asp.Net Bible (Hungry Minds), Isbn: 0-7645-4816-6

Although I have two books with me, but the books doesn't help me much on completing this project because the functions I need are not in the books. I find my way to MPH Book Store in Mega Mall and try to read almost all the books regarding Asp.Net, Vb.Net and SQL Server 2000 as well. The books from the MPH books store help me a lot in completing this system. I actually had referred to almost 10 to 15 books regarding Asp.Net title alone to complete this project.

8.2 Advantage and Disadvantage of This System

This system has its own advantages and disadvantages. The advantages or this system are as follow:

1) This system is user friendly
2) This system has important features which are easy to use

3) This system supports tutorial or test submission with text, drawing, graph and tables.

4) This system can confirm students submission for tutorial and test

5) This system can generate and modify students performance graph

6) This system will safe students and lecturers time

The system disadvantages are as follow:

1) This system comes with one language, that is English

2) This system cannot run in Netscape browsers

3) This system is created for one paper that is System Analysis and Design

4) This system is created for FCSIT students in University Malaya

5) This system doesn't support students answer more than 255 characters because the database Access 2000 field size is maximum 255 characters only.

8.3 Feature Enhancement

The feature enhancements for this system are as follow:

1) The systems' language will be add to Bahasa Malaysia

2) The system will be modified to support Netscape browsers

3) The system can support online discussion or news group

4) The system can be developed to support other papers too

5) Try to use SQL Server 2000 for the answer storage because the SQL server 2000 table field supports 8000 characters.

8.4 System Evaluation

To evaluate the system, a survey has been conducted by giving questionnaires to the user of the system (students) and administrator of the system (lecturers). The questionnaires are placed in Appendix.

8.4.1 User Testing

The questionnaire has been given to 10 students and has been collected successfully. The results of the questionnaires analysis are shown in table 8.4.1(a).

Table 8.4.1(a): User Analysis

Scale / Questions	Most Disagree [1]	Disagree [2]	Less Agree [3]	Agree [4]	Most Agree [5]
1) Is the interface of the system attractive?	0	0	0	10	0
2) Is the instruction in the system, understandable?	0	0	0	10	0
3) Is the system, user friendly to use?	0	0	8	2	0
4) Are the functions in the system useful?	0	0	0	0	10
5) In general, what you feel about the system?	0	0	0	10	0

From the student's analysis, all the students have chosen Agree for the question, **Is the interface of the system attractive?**, **Is the instructions in the system, understandable?** and **In general, what you feel about the system?** This is because the system has an attractive interface from the beginning till the end of the system. The instructions in the system also are very clear and can be seen in the page which will required more explanation. In general the students feel the system is good because they agree with the overall performance of the system. For the question **Is the system, user friendly to use?** 8 students have chosen Less Agree and 2 students chosen Agree. This show the student's feels difficulty to use the system. This problem can be solving with the help of the user manual. Finally, for the question, **Are the functions in the system useful?** All the students have chosen Most Agree. This show the functions in the system are very useful to them.

8.4.2 Administrator Testing

The questionnaire has been given to 4 lecturers and has been collected successfully. The results of the questionnaires analysis are shown in table 8.4.2(a).

Table 8.4.2(a): Administrator Analysis

Scale / Questions	Most Disagree [1]	Disagree [2]	Less Agree [3]	Agree [4]	Most Agree [5]
1) Is the interface of the system attractive?	0	0	1	3	0

2) Is the instruction in the system, understandable?	0	0	0	4	0
3) Is the system, user friendly to use?	0	0	3	1	0
4) Are the functions in the system useful?	0	0	0	1	3
5) In general, what you feel about the system?	0	0	0	4	0

From the administrator analysis for the question, **Is the interface of the system attractive?** Three of them Agree with it and 1 lecturer Less Agree. This is because the systems interface is attractive in the main page only and other pages are plain only. All the lecturers choose Agree for the question **Is the instruction in the system, understandable?** This is because the instructions are stated clearly wherever it is required. For the question **Is the system, user friendly to use?** 3 lecturers have chosen Less Agree and 1 lecturer chosen Agree. This show the lecturer's feels difficulty to use the system. This problem can be solving with the training and practice of using the system. Since the system is new and the development of the system is in ASP.NET, it will take a time period to get exploit to the system. The question, **Are the functions in the system useful?** Three lecturers have chosen Most Agree and 1 lecturer with Agree. The lecturers find the functions are useful and good to implement Finally, for the question, **In general, what you feel about the system?** All the lecturers have chosen Agree. This show the functions in the systems are useful.

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