**CHAPTER TWO**

**LITERATURE REVIEW**

**2.1 INTRODUCTION**

A number of researches have reported that whilst the delivery of online courses enhance student learning in some respects, they also caution against the technology without adequate regard for the learning outcome being sought (Buckley, 2003; Lawther and Walker, 2001; Willet, 2002). There remain a number of researchers who warn that the teaching should drive the technology and not vice versa (Petrides, 2002). Smith and Ferguson (2002) argued that much can be gained from online delivery; the encouragement of deeper levels of discussion, the ability to consider responses due to the asynchronous nature of the medium, and the minimization (if not elimination) of the power differential between student and teacher. Because courses given entirely or in part online have such obvious advantages with respect to student access and potential cost savings, their development and use has exploded over the last several years.

Although little is now known about online learning for example, how the students respond subjectively to it and what strategies have proven desirable from their point of view (Hiltz et al. 2000; Kearsley, 2000; Sener, 2001; Wenger et al. 1999; Clark, 1993; Reeves, 1997; Song, Singleton, Hill, and Koh, 2004), little is still known about how online courses deliver compares to conventional course delivery with respect to objective measures of student learning. Some have reported no significant differences in learning outcomes between delivery modes (Barry and Runyane 1995; Carey 2001; Caywood and Duckett 2003; Cheng, Lehman and Armstrong, 1991; Hiltz, 1993; Russell, Sankaran and Bui 2000), some have shown that online students fared worse (Brown and Liedholm, 2001; Wang and Newlin 2000), some have found that online students fare better (Derouza and Fleming, 2003; Maki, Maki, Patterson and Whittaker, 2000; Maki and Maki, 2002), but few have compared entire courses and still fewer have managed to overcome the many methodical obstacle to rigorous contrasts (Phipps et al.1999; Carey, 2001; IHEP 1999).

However Smith and Ferguson (2002) also warned that with these benefits come a number of disadvantages including the potential technology failures, the lack of conventional face to face teaching and therefore interpersonal cues, and from the instructors viewpoint ,a great deal of time and effort in converting text based content to information suitable for online delivery. Overall it is suggested that even though online delivery offers new challenges, it is viewed as worthwhile by those on both sides i.e. the learners and the facilitators (Smith and Ferguson, 2002).

**2.2 ELECTRONIC LEARNING (E LEARNING)**

E-learning is a general term used to refer to form of learning in which the instruction and student are separated are separated by space or time where the gap between the two is bridged by the use of online technologies. E-learning is used interchangeably in a wide variety of contexts. In companies it is referred to the strategies that use the company network to deliver training courses to employees. In distance education Universities it is defined as a planned teaching/learning experiences that uses a wide spectrum of technologies mainly internet to reach learners at a distance. Lately in most universities, e-learning is used to define a specific mode to attend a course or programs of study where the student rarely, if ever, attend face-to-face or for on campus access to education facilities, because they study online (Guenaneche and Radigales, 2008).

**2.2.1 ADVANTAGES AND DISADVANTAGES OF E-LEARNING**

There are a number of advantages to offering courses completely online, these may includes

1. Access to courses/programs outside of students’ geographical region with possibility of decreased educational cost, as well as allowing the student to cater to their environmental learning preferences.
2. Online education also allows students to personalize their education so that it is tailored to their unique learning style.
3. Many students appreciate the conveniences of online courses (Coombs-Richardson, 2007; Leisure, Davis & Thievon, 2000; Sampson, 2003; Yazon, Mayer-Smith & Redfield, 2002). While assignments, quizzes and discussions in online classes are still expected to be completed by their assigned due date, students are usually not require to log on at set times and are able to complete learning activities at a time that is convenient for them (Parise, 2000; Roblyer, 1999; Yazon; Mayer-Smith & Redfield, 2002). This allows students with children the opportunity to work around their children’s schedules, and reduces time students spend commuting to campus (Roblyer, 1999).
4. Online courses provide global interaction. Students from all over the world are able to log on to the same courses and share ideas and experiences.
5. It is either to hold students accountable in online courses as all of their transactions are traceable (praise,2000; tang and byrne,2007), some online learning management system allows instructors to monitor which course component students have used and how long they have spent using each component. For example, instructors have the ability to create windows in which a student must complete a task in a given amount of time, monitor who is currently online and record the time and date assignments are received.

However, the disadvantages of courses online include:

1. Online courses may not be appropriate for all students. Students in online courses are expected to engage in self-directed and autonomous learning while taking greater responsibility for the mastery of course content.
2. Also students in online courses need higher level of motivation and self discipline than students in lecture classes to be successful as argued by Coombs-Richardson (2007), Parise (2000) and Sampson (2003).
3. Computer literacy - students have different degrees of familiarity with the computer, internet and software programs. This can adversely affect their ability to participate to the fullest.
4. Limitation of technology - there are some things a computer simply cannot do such as real-life simulations, chemical laboratory experiment, and medical dissections. Visualizations are useful, but not as good as actually being there.

**2.3 INSTRUCTIONAL TECHNOLOGY AND DESIGN**

Maki and Maki (2003) pointed out that in comparisons that favor online delivery, “the design of the course (the instruction technology), and not the computerized delivery, produced the differences favoring the web-based courses”. They also pointed out, however, that online courses can more readily enforce deadlines, therefore encouraging more engagement with the course materials, they can offer students more immediate feedback, and they can make learning more active, all features of the educational experience that we know improve learning outcomes.

According to Scheines et al. (2001), experiments performed in 2000 and 2001 compared a conventional face-to-face lecture format to an online format, measuring learning outcomes and a variety of student’s behavior that might explain differences in learning outcomes. Differences were removed in the designs of the online and face-to-face lecture versions of the course except those that were essential to the delivery modes, for example the immediate feedback and comprehension checks that are only available in online learning. In support of Maki and Maki (2003), Scheines et al. (2001) found out that the immediate feedback and active learning clearly helped, but also found out that online students were less likely to attend recitation sections. Overall, even controlling for pre-test and recitation attendance, it was established that students in the online version of the course did slightly better than students in the conventional face-to-face lecture version of the course independent of their lecturer, teaching assistant, gender, or any other feature measured.

In actual fact, it was therefore established that online interactive courses result in better performance in student examinations than the conventional face-to-face teaching system. So far, the question remains; will it be effective to replace the conventional teaching methods (especially in courses with large contents) with online courseware without affecting objectively what students learn from the course?

In further attestation to the claim stated earlier, works carried out by Ozad and Barkan (2004) revealed that a number of students learning in the same place, at the same rate, and the same linear manner tend to perform individually different from each other as established by developments in cognitive psychology. This has proven that each person is different and has a different map of learning. Furthermore, one of the key problems in education reform is that conventional teaching fails because students have no use or interest in much of the materials presented, yet in order expands their understanding of a given course, they must become involved in the entire teaching process.

**2.4 ELEMENTS OF INSTRUCTIONAL DESIGN**

In conventional teaching methods, lecturers disseminate information at a slower rate, but with the development in IT, the rate at sharing the new information and expectation of the students from education has increased enormously. Thus, instructional design has become more complex. Due to this; there is a need for raising teacher’s awareness to instructional design. Understanding and mastering instructional design will enable teacher to produce better learning materials. Instructional design here is then defines as:

“*A process that comprises production and consumption. It involves all the political, strategic, technical and tactical activities used in solving pre-defined problems; planning, structuring, of the product and process of production*” (Barkan and Ozad, 2002).

Instructional design thus addresses the following issues:

1. Reasons for production?
2. What to produce?
3. How to produce?
4. Materials for production?

Instructional media designs are of five types: text, graphics, images, audio, and video. Text involves letters, numbers, punctuation, special characters etc. Graphics include lines, circles, boxes, shading and colors. Images are pictures like photographs or paintings. Audio is the sound aspect of media like music and voice. Video is the successive picture presented sufficiently and rapidly to give the appearance of smooth motion. All these elements are essential to the development of the web channel where students can receive online lectures and courseware. The web channel can be made available with the aid of the following;

1. Computer Hardware/ Operation system
2. The internet/WWW
3. Design Tools and Applications
4. Channel Hosting and Registration
5. Courseware Materials

**2.4.1 COMPUTER AND OPERATING SYSTEM**

To participate in online learning, students must have access to internet-enabled computers, which meet a minimum processor specification. Although this may be stating the obvious, it must still be mentioned as a relevant factor in online education. We cannot assume that every students has a home computer however; research has suggested that many university students may already have the computer and internet access necessary (Sinclair, 1999). Listed below are the hardware/software configurations of the computer systems needed by the developer or host and users

**Server machine:** is a machine that houses the database engine, web server and the application program. Server stores information and stores request from clients. This information includes all kinds of data; it also sends information to the client browser on how to display all this information. The server specification is as follows;

1. **CPU:** Intel Core 2 Duo
2. **Processor:** Processor speed up to 2GHZ
3. **Ram Size:** 3GB RAM
4. **Hard Disk:** 250GB HDD
5. **Operating System Software:** Windows XP/Vista Windows 7/8

**Server software pack:** WAMP server 2.0 (A pack for Window OS integrated with Apache HTTP server 2.2.8, MySQL server 5.0.51b, and PHP server interpretation 5.2.6). However, this is not required on the clients/students machine.

**Client/student machine:** the machine only provide interface for users to use the application through which users enter the required information as specified by the system before output can be displayed. This machine does not need much computer resources. The specification is as follows:

1. **CPU:** Intel Pentium 4 equivalent or higher.
2. **Processor:** processor speed (1GHZ)
3. **RAM Size:** 512MB RAM
4. **Hard Disk:** 60GB HDD
5. **Operating System Software:** Windows XP / Vista / 7 / 8
6. **Browser Application:** Internet Explorer 8 / Mozilla Firefox 27.0 / Google Chrome 32

The choice of the listed configuration is based on the available technology in this part of the world. Windows operating systems are readily available among the target population and will server as the platform for the e-learning design.

**2.4.2. THE INTERNET / WWW**

The internet, a global network of computers was developed almost four decades ago with funding supplied by the United States’ Department of Defense. Originally designed to connect about a dozen universities and research organization using the computer, the internet today is accessible by hundreds of millions of computers worldwide. With the introduction of the World Wide Web (WWW) which allows computer users to locate and view multimedia-based documents on almost any subject over the internet, the internet has exploded into one of the world's premier communication mechanism.

The internet and the World Wide Web are surely amongst mankind's most important and profound inventions. The internet by and large has created a web of enthusiasm and creativity, which is commonly employed to the development of newer kind of sophistication. It provides a unique avenue where online and real-time processing of information can be combined with newly developed device to generate desired results.

**2.4.3 DESIGN TOOLS AND APPLICATIONS**

Several application software have been employed in designing web pages but only few applications can allow web page editing with view options of design (WYSIWYG = drag and drop shorted for what you see is what you get) and codes. Some developers depend on writing the scripts or codes of their web pages using Notepad which does not support WYSIWYG viewing but have to preview it first in a browser before they have a feel of how their website looks. Adobe Dreamweaver is one of the few applications that allows a developer design web pages and at the same time preview the pages on the fly.

**2.4.4 CHANNEL HOSTING AND REGISTRATION**

The channel hosting and registration are the processes involved in securing a domain name for the e-learning platform. A suitable name for the website will be determined by the institution developing the application. This application will be developed with standard measures and procedures and thus will be made ready for any user to deploy.

The process of domain name registration involves application for domain name registration from a reliable and trustworthy host on the internet. Yahoo, GoDaddy, Bluehost, Web4Africa etc. are examples of companies offering different plans for domain hosting.

With registration secured, domain name (defined by user) is registered if available and domain control panel (Cpanel) password (also defined by user) is supplied to the user along with domain package. On the Cpanel’s administrator page, there are many website management tools which will assist the webmaster in effectively managing the website and the application deployed on the website. Some of these tools include mailing and mail management tools, upload and download tools, website editing tools, folder management tools, database management tools, site submission and other development tools useful for effectual management. The lecture delivery application is then deployed by uploading files to the website public \_html or httpdocs folder for online access.

**2.4.5 COURSEWARE MATERIALS**

Course materials needed for the project design include lecture notes, materials, textbooks, worked examples, past questions and solutions, and other necessary materials required for the purpose of online lecture delivery. These materials will be sourced for among lecturers, examination offices for past questions, libraries for textbooks, research works etc.

Lecture notes will be prepared in a standardized way so as to make necessary advantages of access and understanding available to the end users. These notes will also be prepared for download and printing purposes to enhance student's learning activities and abilities.

Other courseware materials will be standardized for the same purpose and will also be made available for assessment and comparison. Useful textbooks and research work will be prepared and necessary links will lead to materials not within reach of the developers.

**2.5 REVIEW OF RELATED WORKS**

A wide range of lecture delivery websites have been developed since the advent of internet technology in the early 90s. However, majority of these websites and their developers are faced with different kinds of challenges and limitations. While the bulk of their challenges have been resolved as newer technologies in information and communication evolved, newer challenges have faced these developers. Some of these lecture delivery websites are analyzed below.

**2.5.1 HyWeb - HYBRID WEB TEACHING SYSTEM**

HyWeb, shorted for hybrid web teaching system (HDS) initially designed for use within a first-year multimedia course, offered at Griffith University, Gold Coast, Australia (Cranitch et al, 2000). The program of study is delivered using combination of online and traditional methods hence the name hybrid web. This involves using the internet with a variety of other media, which is supplied on CD. When deployed, Vicki Jones and Greg Cranitch argued that the amount of traditional teaching becomes reduced and students realized an increase in flexibility. The introduction of the removable media (CD) was an improvement on the efficiency of the website as internet speed and bandwidth became the first major challenge of the website (Cranitch et.al, 2000).

**2.5.1.1 Technology Adopted In HyWeb**

Two major technologies incorporated in HyWeb are the CD-ROM and Web technologies

The Web Technology – lecture is delivered via internet in variety of ways; slideshows, videos, sound, animation and downloadable document files. The internet lectures or "web-Lectures" will also include voice-over and demo movies in QuickTime and Real Video streaming synchronized with the lecture slides (Cranitch et.al, 2000).

CD-ROM - The CD is designed for use in conjunction with the website. On the student's first visit to the web site the HyWeb system will search for the CD. This is a vital component of the HyWeb system. CDs can accommodate high volume files such as graphics, audio/video files, animation and movie files required for teaching, which otherwise slow down the transfer rates. The content of the CD files would, in all probability be "constant" for the duration of the course, and therefore making it unlikely to be retrieved and synchronized with the material from the main server when students access the web page. However, HyWeb allows the system to retrieve files from the server if necessary.

**2.5.1.2 Merits of HyWeb**

1. The systems allows for last minute changes by the lecturer.

2. The lecturer can control the input from his/her own computer.

3. It enables easy modifications and monitoring of the system.

**2.5.1.3 Demerits of HyWeb**

1. Time Factor: According to Cranitch, et al (2000), the process involved in the creation of course material is time consuming. This therefore can slow down the content development rate and thereby lead to users not obtaining required materials within time limits. The time required for various processes involved in the lecture delivery on the HyWeb project is highlighted below.

A). Academics/Lecturers (Teaching team) - preparation of lecture materials (text and images); shooting of video for the web-lecture; total time involved: approximately 70 hours/week.

B). Technicians - preparation of web materials using flash, "ASP" script language, Generator, maintenance and upkeep of server and programming software; total time involved: approximately 20 hours/week

C). Graphics Designers - preparation of web graphics primarily using flash, but other software as required; total time involved: approximately 10 hours /week.

2. The CD Technology used on HyWeb lecture delivery platform is however associated with certain disadvantages which may include:

A). Loss or misplacement of CD: The website requires that the CD is inserted before students can use the website efficiently as it is vital component of the HyWeb system. However, this becomes disadvantageous if a student should misplace or loss the CD.

B). CD Health: The efficiency of the CDs depends on its health. This means that the CD must be protected from scratches and held under favourable conditions.

C). Lack of effective interaction between students-to-lecturer and student-to-student during the course of the online lectures.

**2.5.1.4 Shortcomings of HyWeb**

One major shortcoming of the website is the inability of the content providers (Lecturers and Tutors) to have control over the courseware content in editing and uploading as required once the contents have been published online. Another shortcoming is associated with the fact that students may not obtain the lecture materials at appropriate time due to time consumed in preparation of materials.

**2.5.2 JHSPH-IMPH**

John Hopkins School of Public Health Baltimore, Maryland, United States operates an e- learning environment. The website known as JHSPH-IMPH is used to deliver courses online. A research carried out on the JHSPH-IMPH program revealed that the online teaching procedure have been greatly affected by time constraints. Ward and Newlands (1998) argued that preparation of materials for course delivery on the website is relatively time consuming, while with respect to the limitations of learning and teaching technologies, real time simulations of interaction s for certain activities and courses have become nearly unrealistic (O’Leary, 1999; Johnson, 2000). The concerned faculty took an advantage of online technologies in response to the problems stated above the design powerful learning environments that ideally incorporates experiences from students’ expertise, and challenged them to solve problems through critical thinking activities (Jonassen, 1999). This was achieved by making available three basic types of interactions in the course; learner-content interaction, learner-instructor interaction, and learner-learner interaction. Instructors were also challenged to effectively manage the online environment by maintaining the pedagogic, social, managerial and technical roles (Berge, 1997). The overall result is an online course that engages and challenges the learners and at the same time avoids over-taxing the time and energy of the instructors and the learners (Gresh et.al, 2000).

**2.5.2.1 Technology Used In JHSPH-IMPH**

The JHSPH-IMPH website was developed using basic HTML technology. The web pages were created with adequate hyperlinks to different course materials and resources. However, the HTML technology allows the development of static HTML pages with some level of dynamism using XHTML. The resultant effect of the HTML technology is less website dynamism with a couple of interaction problems evident in the adoption of third party software to enhance student-student and student-instructor interaction. The adoption of Microsoft NetMeetingTM was to enhance interaction on the website but NetMeeting continually crashed and students would become frustrated and use the telephone or email.

Three other delivery models used include; content on screen with hyperlinks, streamed video, and streamed audio/Microsoft PowerPoint (Gresh et.al, 2000).

**2.5.2.2 Merits of JHSPH-IMPH**

The merits of the JHSPH-IMPH website include the engagement and challenge meted out to the learners but avoid over-taxing and taking the time and energy of the instructor. The system also incorporates video streams on CD-ROMS to facilitate the time factor in lecture delivery.

**2.5.2.3 Demerits of JHSPH-IMPH**

There are a few disadvantage associated with the JHSPH-IMPH, these include;

1. Requirement of a web developer each time course materials are updated. This means that lecturers may not have total control on the lecture materials they are to use on their courses.
2. The use of chunk HTML pages which reduces the level of dynamism of the website.
3. Video or teleconferencing slows down the rate at which lectures are being delivered online. However, CDs can improve the use the course delivery website but one wonders if there happens a damage or loss of the CD. This may lead to students not obtaining lectures at specified time coupled with the cost implication of providing extra copies of lecture video CDs.

**2.5.2.4 Failure of JHSPH-IMPH**

The only failure of the website as recorded by Gresh et.al (2000) is the crashing of NetMeeting interactive software employed by the institution to enhance interaction among students. As stated earlier, students would become frustrated and resolve to use the telephone or email for discussions.

**2.5.3 MOODLE**

Moodle is a course management system (CMS); a free package designed using known pedagogical principle to help the educators to create effective online learning communities. It is provided freely as Open Source software under the GNU Public License. The word Moodle was originally an acronym for Modular Object-Oriented Dynamic Learning Environment, which is mostly useful to programmers and education theorists (Bri et. al, 2009).

It can be installed on any computer that run PHP, and can support a SQL type database (e.g. MySQL). It can run on windows and Mac operating systems and many distributions of Linux (e.g. RedHat or Debian GNU).

The main characteristics of the Moodle platform are;

1. Simple, lightweight, efficient, compatible, low-tech browser interface.
2. Easy to install on almost any platform that supports PHP.
3. Course listing shows descriptions for every course on the server, including an embedded WYSIWYG HTML editor.

Moodle has three types of management: site management, user management and course management, and it has several modules to improve interaction between users: lessons module, quiz module, resource module, survey module, wiki module and workshop module (Bri et. al, 2009).

**2.5.3.1 Merits**

1. It can be easily customized to suite users’ standard.
2. It is easy to use.
3. Comfortable handling of content through the HTML editor (Drewitz, 2009).

2.5.3.2 Demerits

1. Documentation is very extensive.

**2.5.4 SAKAI**

Sakai is a free and open source product that is built and maintained by the Sakai community. It is an online Collaboration and Learning Environment. Many users of Sakai deploy it to support teaching and learning, ad hoc group collaboration, support for portfolios and research collaboration. It is a set of software tools designed to help instructors, researchers, and students to create websites on the web, for coursework, Sakai provides features to supplement and enhance teaching and learning. For collaboration, Sakai has several tools to help to organize communications and collaborative work on campus and around the world. Using the web browser, users choose from Sakai’s tools to create a site that meets their needs. No knowledge of HTML is necessary to use Sakai.

The aim of the Sakai project is to create collaboration and learning environment to the higher education, so it can compete with its similar commercial platforms (BlackBoard or WebCT) or it can improve other open source solutions like Moodle (Bri et. al 2009).

The main characteristics of Sakai are;

1. Sakai offers features to support and simulate education and learning.
2. Suitable for carrying out team projects
3. The Sakai software has several option for communication among teachers and students, readers news RSS, distributing teaching content, to do exams, management of works, etc.
4. A set of generic collaboration tools forms the core of Sakai; announcements, drop box, email archive, resources, chatroom, forums, threaded discussions, message center, message of the day, news/RSS, preferences, presentations, profile/roster, repository, search, schedule, web content, webDAV, wiki and site setup.
   * + 1. **Merits**.
5. No knowledge of HTML is necessary.
6. It is easy to use
7. It is free hand and open source (Bri et. al 2009)
   * + 1. **Demerits**
8. It cannot be accessible through regular external image
9. Documentation is very extensive (Bri et. al 2009)
10. Requires that servers have JAVA virtual machine installed and running on them for any accessibility.
    * 1. **WebCT**

WebCT (course tools) is an online proprietary virtual learning environment which is sold to colleges and other institutions and is used in many campuses. Instructors could add to their WebCT courses tools such as discussion boards, mail system and life chats long with contents such as documents and web pages. It was originally developed at the University of British Columbia by a faculty member in computer science, Murray W. Goldberg. It was notable for being the first commercially successful virtual learning environment (Bri et. al 2009). It had long been criticized for being the most difficult of the course management system to use. This criticism partly reflected the flexibility and power of the system, where other system present a single way of organizing or adding course materials, WebCT offers several options with more of the structure left to the individual instructor.

* + - 1. **Merits**

1. Instructors can release content pages based on students’ quiz performance
2. Instructors can use automated tools to build glossary.
3. Users can receive announcements on log-in page
   * + 1. **Demerits**
4. Group members cannot have a private chat room.
5. It cannot be accessible through regular external email (Lewis et. al 2005).
6. It is commercially available which means that users must pay to obtain their copy.
7. It is structurally static that is it does not give room for modifications.
   * 1. **BlackBoard**

Blackboard was founded in 1997 as the leading provider of e-education enterprise software applications and services. Its main characteristics are; courses management, content creation, didactic unit, online teaching and learning tools, administration of personal information, board discussion, group project, book of qualifications and control panel (Guenaneche and Radigales, 2007). Blackboard develops and licenses software applications and related services to over 2200 education institutions in more than 60 countries. These institutions use blackboard software to manage e-learning, transaction processes and e-commerce, and online communities. Though blackboard software is closed source, the company provides an open architecture, called building blocks which can be used to extend the functionality of blackboard products. The blackboard vista and campus edition products are extensible through a technology called power links (Bri et. al 2009).

* + - 1. **MERITS**

1. Members can share files in group participation
2. Announcements from all courses can be displayed on login page (Lewis et.al 2005).
   * + 1. **DEMERITS**
3. Students cannot resume reading content at previous stopping point
4. Students cannot take self test created by the instructor.
   * 1. **ATUTOR**

ATUTOR is an open source web-based Learning Content Management System (LCMS) designed with accessibility and adaptability in mind. Administrators can install or update ATutor in minutes, develop custom themes to give ATutor a new look, and easily extend its functionality with features modules (Guenaneche and Radigales, 2007). The main features for both teachers and students are;

The features peculiar to students on the ATutor platform are;

1. Accessibility
2. Security
3. Inbox/messaging
4. Student profile
5. Adaptive navigation

The features of the instructors are;

1. SCORM Run-Time Environment
2. Course manage page
3. Work groups manager
4. Assignment drop box
5. Content editor

2.5.7.1 **MERITS**

1. Multimedia can be embedded with the course content
2. Allows online test with immediate evaluation
3. It is free

2.5.7.2 **DEMERITS**

1. It is not easy to use
2. It has no mathematical formula (Drewitz, 2009)
   1. **OVERVIEW OF AVAILABLE TECHNOLOGY**

**2.6.1 WEB SERVER TECHNOLOGY**

A web server is the server technology behind the World Wide Web. It listens for request from the client such as browser like Netscape or Microsoft’s internet Explorer. When it gets one, it processes that request and returns some data. This data usually takes a form of a formatted page with text and graphics. The browser then renders this data to the best of its ability and presents it to the user. Web servers are in concepts very simple programs. They wait for request and fulfill them when received. The web server is responsible for fetching information. Common web servers include Microsoft Internet Information Server, Microsoft Personal Web Server, Apache HTTP server etc.

**2.6.1.1 MICROSOFT INTERNET INFORMATION SERVER (MS IIS)**

The MS IIS web server is a product of the Microsoft enterprise. Although readily accessible in terms of availability but a wide range of server developers have shied away from its use due to the cost implications, user-friendly functionality and a variety of other reasons. With trends in development of IT, the Open Source Initiative (OSI) has come up with free sever software that performs better than the MS IIS and the most important thing being the software running on any operating system platform.

**2.6.1.2 APACHE HTTP**

The apache HTTP server, commonly referred to simply as Apache, is a web server notable for playing a key role in the initial growth of the World Wide Web and developed by an open community of developers. It is one of the leading open source web server and is the favored choice of internet service provider in terms of functionality, performance and availability for a variety of operating systems including Microsoft Windows and Linux (Sharma et.al 2009)

**2.6.2 DATABASE TECHNOLOGY**

Database is a fancy word describing an organizational model for storing data. Almost every application requires the storage and manipulation of some form of data. A database provides a mechanism for organizing this data so that it is easily accessed and stored (David and Christine, 2002).

One can envision several applications that use a database. A rolodex, financial accounting records, and file cabinets are examples of database. Any application in which you need access and possibly add, delete, or change data uses some form of a database. Considering the large number of application that require database, having a general model of designing and programming a database is extremely useful. Even more useful is a standard, general way of representing and assessing this data.

A little background on the evolution of database theory helps in understanding the working of SQL. Database system stores information in every conceivable business environment. From large tracking database such as airline reservation system to a child’s baseball card collation, database system store and distribute the data that we depend on. Until the last few years, large database system could run only on large mainframe computers. These machines have traditionally been expensive to design, purchase and maintain. However, today’s generation of powerful, inexpensive workstation computers enables programmers to design software that maintain and distributes data quickly and inexpensively (Khadare, 2004).

**2.6.2.1 MySQL**

MySQL is a multithreaded, multi-user Structural Query Language database management system. The basic program runs as a server providing multi-user access to a number of databases. MySQL is popular for web applications and acts as the database components of the ‘X’AMP platforms (Where X can be ‘L’ for Linux, ‘M’ for Mac, or ‘W’ for Window, while AMP stands for Apache, MySQL, PHP). Its popularity for use with web applications is closely tied to the popularity of PHP, which is often combined with MySQL (Sharma et.al, 2009). MySQL is the de facto standard language used to manipulate and retrieve data from the database. SQL enables a programmer or database administrator to modify a database or tables and query a database for information. For the conveniences of support on all OS platforms, ease of use, cost and other advantages, MySQL will be employed in database construct of this project.

**2.6.2.2 MICROSOFT SQL MS SQL**

The MS SQL is also a multithreaded, multi-user structural query languages database management system produced also by the Microsoft enterprise. Like the MS IIS server, the MS SQL server is also expensive in deploration and not much user friendly.

**2.6.3 SCRIPTS TECHNOLOGY**

**2.6.3.1 JAVASCRIPT**

JavaScript, which is completely distinct from the Java programming language, is normally used to dynamically generate HTML on the *client-side*, building parts of the web page as the browser loads the document. This is a useful capability and does not normally overlap with capabilities of Java Script Pages (JSP) which is *server-side*.

It is also possible to use JavaScript on the server, most notably on Sun ONE (formally iPlanet), IIS, and BroadVision servers. However, Java is more powerful, flexible, reliable, and portable.

**2.6.3.2 PHP (Hypertext Preprocessor)**

PHP is a reflective computer programming language originally designed for producing dynamic web pages through scripts which can be embedded in HTML. PHP is used mainly in server-side scripting, but can be used from a command line interface or in standalone graphical applications. It is a free software by the Free Software Foundation. PHP can be deployed on most servers and on almost every operating systems and platforms free of charge.

* 1. **SUMMARY**

With major technological infrastructures already in place for online management of content, many researchers are on their toes in the development of online lecture delivery software applications. A wide variety of these applications are available either as institutionally developed, commercially developed or can be community developed using the technologies described in this chapter. Although some of the developers or developers of e-learning platforms have employed chunk html pages as basis for their lecture delivery websites, a lot of them are embracing the much advanced lecture management systems (LMS) for effective management of their website. However, the best technology still remains the learning content management system (LCMS) which can incorporate synchronous lecturing system with asynchronous system of lecture delivery. This coupled with the powerful functions of monitoring users of the systems, administration control over flow of course materials within the system – an advantages over LMS, makes the LCMS a better e-learning technology. With much consideration on cost of development and deploring, the LCMS will therefore be adopted for the design of the e-learning platform - the major goal of the project.

Meanwhile, it is pertinent to consider the short comings of the e-learning system. Much focus have been placed on synchronization of lectures and making them online for students access but conventional lecturing system is actually divided into two sessions for certain courses. However, the problem of incorporating scientific laboratory experiments into the platform becomes critical. No e-learning website has been able to make available laboratory experiments to their users, though a handful have employed the use of scientific experiments video tutorials for their science student users in developed countries while research is ongoing to develop ways of incorporating laboratory technologies in e-learning. The major problem facing IT development in Nigeria remains the availability of fast and cheap internet facility which informs the problems associated with video streaming in Nigeria. Obviously, it becomes certain that e-learning may not replace conventional lecturing system but will certainly help to enhance students learning abilities and improve student’s interaction without affecting objectively what students learn from a course.