Design and Implementation of Open-Access Web-Based Education Useful for E-Learning in Nigeria

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Abstract

The current condition of our learning environment is in a deplorable state which is hardly conducive to normal study. The huge increase in student numbers in several institutions in Nigeria exceed the available seats in the lecture theatres coupled with inadequate public-address systems. The traditional learning method is not flexible as it does not permit access to educational resource at any time or place feasible. Additionally, most students possess personal computers which they use for social purposes instead of academic purposes.

In this paper, a web-based education useful for e-learning was designed and implemented to increase the scope and the effectiveness of traditional learning methods. It is also aimed to improve students-lecturers and students-students interaction academically, using an open source platform which will be more flexible, and cost effective due to free licensing. The programming languages used are VB.NET and Macromedia Dream Weaver MX2010 which are quite powerful and flexible for further developments.

The designed website was tested for usability, reliability, supportability, performance and functionality after linking the interfaces to the database and hosted using internet information server (iis). It was observed to have service requirements of online activities. Also, the system is flexible and allows for the integration of various tools and technologies.

Keywords: Web-based education; e-learning; system algorithm

1.0   Introduction

It would be of great importance to address and solve the current situation and condition of our academic or teaching environment which inadvertently is in a deplorable state. The noisy surroundings of our lecture theatres are hardly conducive to concentrated study and learning. This circumstance could affect the students academically, thus making them intellectually unbalanced.

The number of students admitted into the system is increasing year after year making it impossible for the available seats in the lecture theatres to accommodate them. Also, it is not in all cases that there are public-address systems, so at times students might find it difficult to hear and comprehend what is been taught in the lecture theatres.

The traditional or conventional method of teaching is prevalent in our society or educational system, that is the converging or face-to-face meeting of students and lecturer in a classroom at specified times. This could also be a major challenge in the sense that it is not flexible as it does not permit access to educational resource at any time or place.

Additionally, most students possess personal computers that would have been useful for academic purposes but instead they use them for social purposes such as watching movies, playing games and music.

The use of IT in education at all levels has sky rocketed in recent years. The government is actively promoting the use of IT in schools, and higher education institutions are embracing learning technology. This is partly in response to the huge increases in student numbers in further and higher education, which has not necessarily been matched by corresponding increases in academic staff levels. E-learning can be a very useful way of providing quality independent learning opportunities and bridging this gap.

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This is where the issue of web-based education comes into play, which is one of the important components of higher learning, a type of open or flexible learning, the new method of teaching and learning in which the instructor and student are separated by space or time where the gap between the two is bridged through the use of online technologies. It also supports academic interaction between teacher-student and student-student, facilitates the access of greater numbers of people and improves student learning outcomes and has the potential to contribute to their lifelong development and their well-being which is the ultimate purpose of education.

2.0   Literature

With the recent improvement in modern information and communication technologies (ICTs), distance learning has emerged as an inevitable and phenomenal form of education in the history of educational developments internationally. While the formal system of education continues to be the mainstream of educational transaction, it has inherent limitations with regard to expansion, provision of access and equity and cost effectiveness. With the emergence of modern ICTs, it is now possible to adopt flexible, constructivist, learner-friendly and multi-perspective approaches to teaching-learning, so essential for nurturing creativity, leadership, scholarship and integrated development of human personality [1].

Tim Barners-Lee and Cailliau started the World Wide Web also known as WWW or Web. The Web authors submitted a proposal at CERN (the European Laboratory for Particle Physics, in Geneva) where they worked, at the computer science department. Particle physics research often involves collaborations between institutes from all over the world. Barners-Lee had the idea of enabling researchers from remote sites right across the world to organize and pool information together. But far from simply making available a large number of research documents as files which could be downloaded, he suggested that they could be linked in the text files themselves. This way, reading one research paper, could quickly display part of another paper which held directly relevant text or diagrams. Documentation of a scientific and mathematical nature would thus be represented as a "web" of information held in electronic form on computers across the world [2].

The Web is a large scale distributed hypermedia network based on a client-server model, with a wide range of services and standards. It can be seen as a global information system. The organization that coordinates all the standardization efforts, formed in October 1994, is the World Wide Consortium (http://www.w3.org/Consortium/), headed by Tim Barners-Lee. Since 1990 until now, the Web is gaining world-wide acceptance and every day more people in the world use, publish and work with this information system [2].

One very important application of the internet and World Wide Web is in the area of E-learning. Open and flexible learning (OFL) involves instructional education, which does not require teachers and students to be present in the same place. The concept of OFL is one that operates on the premise that by making education delivery flexible to the student and his/her needs, there would be an increase in the catchments of students enrolled in the educational programmes. Delivered in a variety of modalities including but not limited to videocassettes, audiocassettes, CD ROMs, online and traditional face to face tutoring, whatever the mode of delivery, the objective is to increase access to education to those who have difficulty accessing it within the mainstream.

The Internet and World Wide Web broaden the scope of conventional distance education to online learning or web based learning. New types of educational technologies are emerging at an ever-accelerating pace. The integration of new types of educational technologies allows flexible learning, increased potential for interaction and access to a wide clientele. The Web is not only the medium of course delivery, but much more important than that, the Web is the course content and the information sources for students in the field, both traditional and distance universities. This adds value of e-learning to the field of library and information science in higher education [3].

Distance learning has gained popularity all over the world as a means of extending continuing education to all people and it has benefited from the rapid advances in electronic telecommunications in the 1980s and early 1990s. New communication technologies enable learning to take place beyond the classroom. Many colleges, universities and institutions offer courses via the distance education system. Through the influence of Internet and the Web, distance learning gains its popularity and high status in the foreseeable future [3].

According to Jegede [4], the year 1983 marks a turning point in the history of open distance education (ODE) in Nigeria. From this date onwards, the educational history of Nigeria towards her strives to achieve Education For All (EFA) Nigerians received a surge. At the two world milestones of Basic Education, Jomtien and Dakar, world leaders reiterated on the deplorable and slow progress towards the achievement of the goals of EFA. In 2000, there were still on the best estimates 113 million out of school children [5]. The situation in Nigeria also looks bleak.

Various statistics indicate that majority of Nigerians are yet to be reached (the class of the poor, illiterate, women, marginalised and those living in remote areas) through one form of education or the other. When we therefore consider her population of 120 million, her poverty rate of 67.8% and her 70% rural population [4], what we visualize and the conclusion drawn is the tremendous need to meet the demands for education at all cost.

The date in the introductory paragraph above bear historical significance: The Open University Act, which subsist in the law of the Federation of Nigeria [6] Volume XVII consequently came into effect on July 22, 1983. Other events prior to this Act both singularly and jointly became a watershed for the establishment of Open University.

The 1977 National Policy on Education (NPE) for instance was unambiguous in its emphasis that 'maximum efforts will be made to enable those who can benefit from higher education to be given access to it. Such access may be through universities, or correspondence courses, or open universities, or part-time and work study programmes [6]. The policy equally states that "the Federal Government shall undertake to make life-long education the basis for the nation's educational policy'. In order to achieve this objective, the Government adopted a philosophy of education for Nigeria meant to ensure that 'at any stage of the educational process after primary education, an individual will be able to choose between continuing his full-time studies, combining work with study, or embarking on full-time employment without excluding the prospect of resuming studies later on'. The report equally in recognizing the importance of self-learning underlined the fact that, 'the education system will be structured to develop the practice of self-learning [6].

Dodds and Frank reported that distance education has been an increasingly important policy option for educational planers in developing countries since the early 1970's, and many of these countries have come to accept that this mode of educational provision can play a part in national development. The success of Open University in Britain from its inception in 1971 provided a model for distance education at university level and was emulated in the establishment of institutions such as the Sukkothai Thammathirat Open University in Thailand in 1978 and the Indira Ghandi National Open University in India in 1985. So many countries were to borrow a leaf in establishing distance education institutions to provide programmes at various levels, such as teacher training, secondary schooling, and adult basic education [7].

What follows will describe and evaluate the main events occurring in distance education with emphasis on the Open University in Nigeria with the purpose of providing a more comprehensive picture of the intricate distance education pattern that have evolved as a response to the yearning of Nigerians for higher education. The paper aims at revealing the demands and the challenges for the revitalizing of Open University in Nigeria [7].

3.0   Design Methodology

A methodology is a collection of methods for solving a class of problems. It specifies which method should be used and the manner in which it is utilized. Software development methodologies decompose the process into activities. They provide methods for several activities.

Design pattern is a general re-usable solution to a commonly occurring problem in software design. A design pattern is not a finished design that can be transformed directly into code. It is a description or a template for solving a problem that is common among different situations. It typically shows relationships and interactions between classes or objects.

Being a web-based portal, first the web development platform is determined. Using an open source platform will be more flexible and have lower cost due to free licensing. The subjects considered during the development phase are as follows:

• Programming language: The web programming language used in the project is VB.NET. VB.NET is a widely used general-purpose scripting language that is especially suited for web development and can be embedded into HTML. It is a BASIC based language and therefore it has the power and flexibility of BASIC as well as it providing Object Oriented Programming methods.

• Development tools: Macromedia solutions are preferred in both web programming and content development purposes. For the design of the static and coding of the dynamic pages, Macromedia Dream weaver MX 2010 which is quite powerful in many aspects is used. For the content development, Macromedia Flash MX 2010 is used, because it is again a very powerful and wide spread program preferred for animations and web design purposes. Other than these, Microsoft Office 2007 is used for the documentation, presentation, and communication jobs. GlobalScape CuteFTP Professional that is benefited for the upload of web files on the server. Lastly, Adobe Photoshop CS, which is indispensable for image edition and web publishing, is preferred.

• Database selection: The database solution, Microsoft's SQL Server 2008 is selected, as it is an open source though quite efficient and effective solution for data storage and handling. This is a free-license database solution for web development and it has a serious impact on the cost of the portal.

• Web hosting: It would be an efficient solution although all the servers are located on one machine because a Microsoft server is used and there is limited number of domains on this server. Therefore, performance is not expected to be a problem for this system's solutions.

Hardware and Software Resources

We made use of some softwares during our system development such as: Windows 7, Windows Server Operating System, Microsoft office Excel, Microsoft office Word 2007, SQL Server database system, MS Visual Studio.Net, Macromedia Dream waver and Photo Shop.

System Design

The design goal of our system is to resolve some of the issues, specifically; it is to be made easily accessible. The system was designed as a web application requiring only a web browser administer and use. Hence, no additional software needs to be downloaded.

Database Design

Database is an important component in our system. Microsoft Structured Query Language Server is the database management system used for the system. The implementation of the database has been developed and modified to be applicable with the system requirement.

System Architecture

The web-based "education" system consists of three components which are the client, the server and the database management system (DBMS). The client side application is developed by web-based programming languages such as XHTML, ASP.NET and Macromedia Dream weaver. The server application is developed by Microsoft Visual Studio (ASP.NET and VB.NET) and acted as a gateway between the database and the clients.

Design Architecture

The system design was started by determining the database tables, appropriate interfaces and interaction diagrams to show the collaborations among the objects of the system to complete an action. The implementation phase was launched by implementing the functionalities of the system.

The startup page for users' login and registration is shown in Figure 1. For a user to login, he is expected to place a login Username and Password which he has used for registration. The registration form for students and lecturers is as shown in Figure 2. The corporate user can upload profile photo as shown in Figure 3.
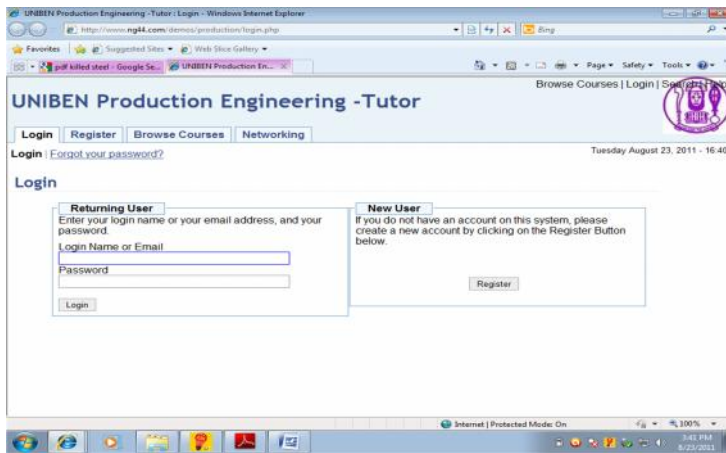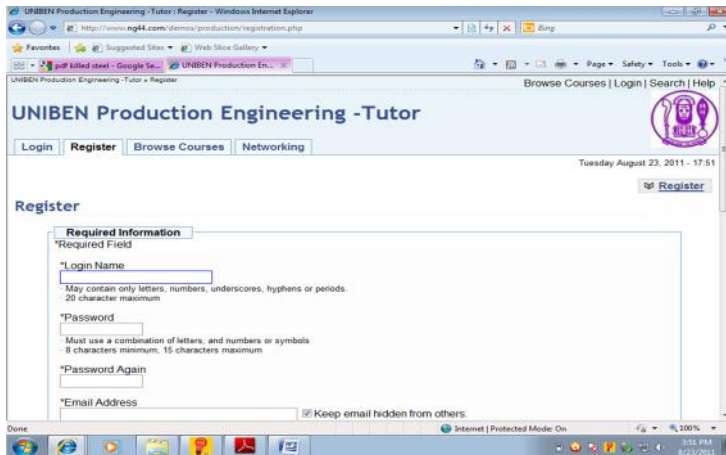

Fig. 1: Corporate user login.

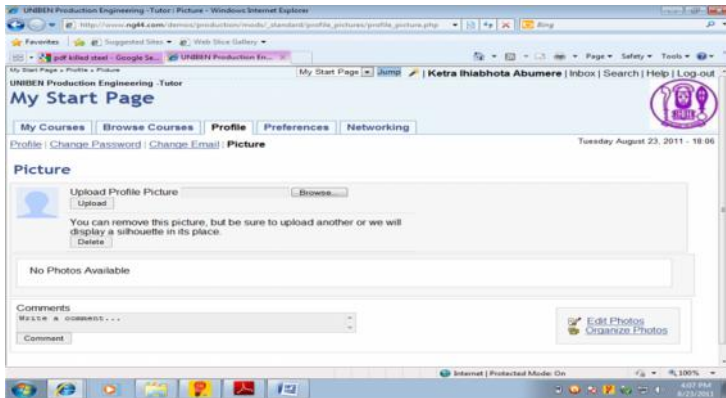**Fig. 2:** Registration form for student and lecturers.

Fig. 3: Photo Upload Interface

The school information, user's information, course materials, questions, reviews and lecture notes are stored on the website through the main page as shown in Figure 3 and managed using Microsoft SQL Server database. The database and the server applications will run on Microsoft Windows Server.

Fig. 4: Corporate user main page.

Figure 5 serves as the interactive link between student-lecturer and student-student interaction interface.
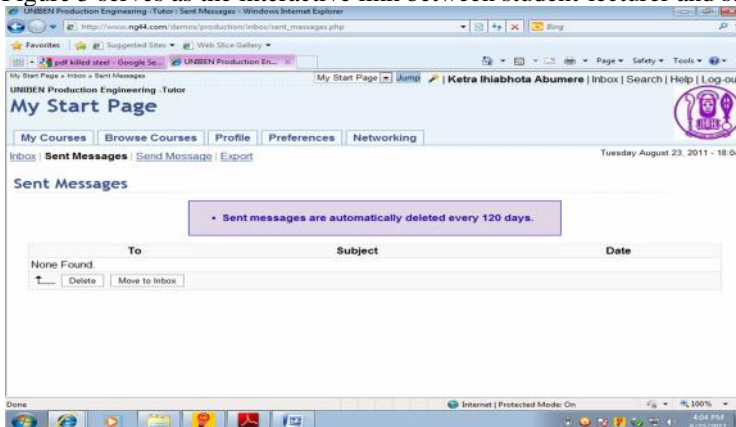

Fig. 5: Administrator sub-system.

System Algorithm
The system algorithm of the designed web-based portal is as shown in Figure 6. A corporate user is signed in to the main page (home page) if the login username and password are correct, otherwise an alert message indicating incorrect username or password will be displayed hence access to the main page will be denied.
A corporate user can decide to exit after completing a particular task on any of the component of the main page. On the other hand, he can decide to return to the main page in order to perform another task on a preferential component if necessary.
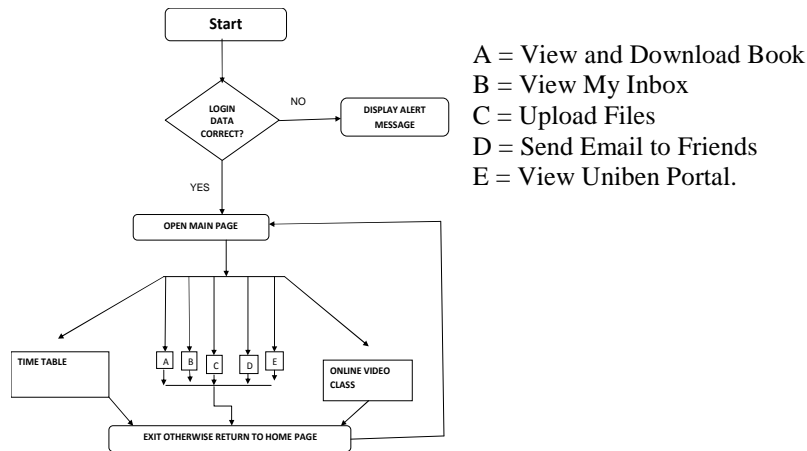
A = View and Download Book
B = View My Inbox
C = Upload Files
D = Send Email to Friends
E = View Uniben Portal.

Fig. 6: System algorithm.

4.0 Tests and Results

Performance and functional suitability tests are important for determining the quality assurance of the designed and implemented open-access web-based education useful for e-learning.

The designed website was tested for usability, reliability, supportability, performance and functionality after linking the interfaces to the database and hosted.

· **Usability:** The system provides a coherent user interface that is consistent with the organization interface. The system is easy to navigate.

· **Reliability:** The system performs and maintains its functions in routine circumstances.

· **Supportability:** The system can be easily modified or extended by more functions.

· **Performance:** Performance requirements are concerned with quantifiable attributes of the system, such as response time, throughput availability and accuracy.

System Implementation

The web-based "e-learning platform" system takes the advantage of the latest development technologies in its implementation. It is an ASP.NET web application that was used on the Internet and was written using Microsoft's Visual Basic.NET as the programming language in a development environment. Code that executes on the server to process event handlers for events such as button clicks is written in VB.NET. Microsoft's SQL Server 2008 is used for database operations, including the storage and retrieval of login information. Successfully logging into the system, users are taken to an action page that dynamically presents options to them based on their privileges.

Database Implementation

The database is designed to have the following main tables: Level, Course, Review File, Questions, timetable, and information, Student, Teacher and Administrator. The E-Learning Platform sub-systems during the development of the system, data for the testing of different functionalities was needed to be imported into the database tables. The tables in the database are filled using two different ways. The first way is to fill the tables by importing the data from an MS Excel sheet that contains the basic data from the school's database. The second way is done during the run time of the system.

System Requirements Implementation

To prove the functionality of the "E-Learning Platform" system, we have implemented several web-based applications as components of the system. The e-learning platform system is divided into three subsystems, the administrator, the teacher and the student subsystem.

Login

Before users are granted access to the "E-Learning Platform" system, they must successfully login to the system. The user's accounts are associated with different levels of privileges. Username and password is the most common authentication method, used to access the system, as shown in Fig.1. Login information is verified by comparing the entered username and password with the stored ones in the database. The authentication program on the Web server opens a database connection and retrieves the user record. If the user input data matches a database record, the user is granted to access the system services. Otherwise, an "invalid login" message is displayed and the login page is displayed again.

Upload Files

Lecturer can use this service to upload files, as shown in Figure 7. The students can select the subject name on the main page (as input) from the available list of values, the system search for the required file and displays all the stored reviews from the database, Figure 4, shows the implementation of the "main page", that is used for this service.
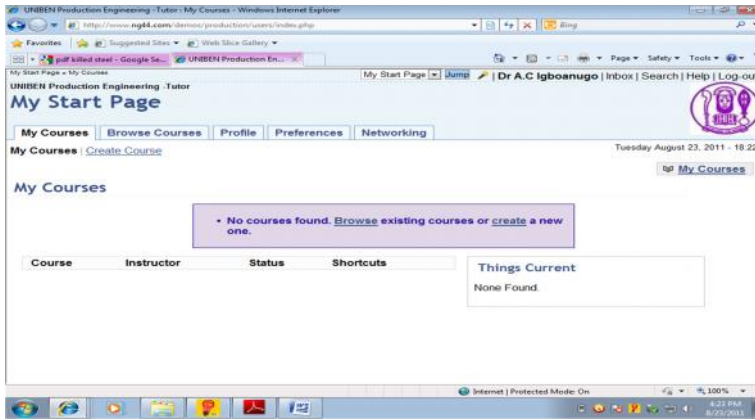
(a)
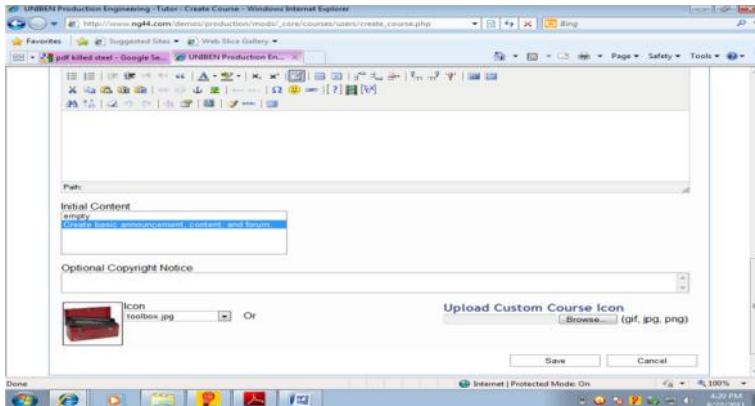
(b)

Fig.7 (a) Files upload interface;
     (b) Files upload interface.

Figure 8 is the interface showing the platform where students can view online lectures in the form of video.

Fig. 8: Online lecture video for students.

5.0   Discussion

The main result of the designed and implemented web-based educational system reported in this paper is the finding that the system can be very effective as a means of learning and teaching in further and higher education institutions.

The paper has shown the design and implementation of a web-based educational system for teaching and learning design courses (it can also be extended to other courses) in an effort to improve the quality of teaching and learning and to provide adapted responses to the students' needs in design courses. The web-based education integrates new principles and tools in the areas of e-learning.

Information Technology plays an important role in educational systems as it brings new media and technologies to the teaching world. Continuous changes in technology create major changes in Universities systems, and IT has to evolve to help teachers bring new teaching media and instructional strategies in the classroom to deliver the curriculum. Teachers have to learn these new media to enhance the teaching process. Young learners are brought up in a multimedia environment and they expect to find a similar learning environment when they come to institutes of higher education.

Technology is getting less and less expensive and we will find in every household a computer connected to the Internet. Web-based open learning prototypes with sound instructional technology will be multiplying every day, thus the learner will study anywhere at any time. Distance and time will no longer be constraints to the learning process.

6.0 Conclusion

E-learning is viewed as an important activity in the field of distance and continuing education. Web-based courses offer obvious advantages for learners by making access to educational resource at any time or place feasible.

E-learning is an attractive mode of flexible distance learning which a fully integrated instructional medium is. It enables individuals to learn by themselves and encourages self-directed learning, self reflection, learner-centered learning and just in time learning. Using e-learning to carry out modern education is not a new idea today. However it seems that more and more educational institutions and educators are likely to take e-learning as their teaching method.

In this paper the following positive effects are identified:
- Enhanced motivation and creativity when confronted by the new learning environments,
- A greater disposition to research and problem-solving focused on real social situations,
- More comprehensive assimilation of knowledge in the interdisciplinary ICT environment,
- Systematic encouragement of collaborative work between individuals and groups,
- Ability to generate knowledge, capacity to cope with rapidly changing, complex, and uncertain environments,
- New skills and abilities fostered through technological literacy.

This paper work is thoroughly researched, designed and executed to aid future researchers in this direction with the foundation they need to continue the exploration, adoption and implementation of synergies between pedagogical curriculum and media technology that will keep making UNIBEN a renowned millennium compliant e-learning institution.

7.0 Acknowledgement

8.0 References

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