

# Design and Implementation of Web-based Examination System for the University

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**Abstract** - *Online examination system is an information and communication solution to the paper-based examination system. It is resourceful, time-saving and efficient. The system is designed to enhance the examination process in schools and is capable of conducting any type of examination questions such as multiple-choice questions or theory-based question format. In this paper, we developed a system that provides an equitable level of security and veracity on the conduct of the examination. The aim of this application is to meet students requirements where they are expected to take their examination online through internet or intranet. The system was developed using Hypertext Preprocessor, Hypertext Markup Languages, Cascading Style Sheet, Javascript and My Structured Query Language as the database backend which are used in web-based applications. These guarantee that the application is cheap, robust, and is able to run on multiple platforms. The application can be enhanced using integrated biometric systems such as fingerprint or face to improve its effectiveness and security.*

**Keywords:** *web-design, records, examination, paper-based, multiple platforms.*

## I. INTRODUCTION

In Nigeria, for over the last decades, paper-based examination has almost been the only mode of conducting examination which has been effective but

has a lot of limitations especially nowadays where there are many people seating for a particular examination such as UTME (Unified Tertiary Matriculation Examination) or even general courses in the universities. Online examination is an effective solution for mass educational evaluations. The system is designed for schools, banking, government and even organizations for enrollment purposes. Most web-designed examination applications usually have some limitations such as inaccurate results, logging off the users on termination period allocated automatically as well as non randomization of questions and security. Today many organizations are conducting online examinations successfully and produce the results online [1]. Online examination is a process of conducting examination questions posted online, the candidate attempts the questions and forward the answers simultaneously through either internet or intranet. The results are usually analyzed automatically which can be viewed or printed out.

Online examination is very beneficial to test the student's knowledge using advanced computer technology without any drawbacks compared with the traditional examinations of the use of papers, pens and examination invigilators. It can increase the standards of student's examination, whereas the traditional examination system using the paper and pen requires extra efforts on the students and the invigilators. It is widely considered as an important source for university examinations. Thus, the university and other tertiary institution's students can benefit from these services;

With the aid of web development technology, questions can be in form of multiple choices which allows the students to select only one answer from the options available. The bulky question papers used in conventional paper-based examination system, is a great burden for both students and lecturers [2, 3]. [4] explained the problems of Paper-Based Test (PBT) or Paper and Pencil Test (PPT) including transportation risks by the candidates and examination officials to the examination halls, loss of results, result manipulations, delayed in the results release, high cost of examination materials and other logistics. Furthermore, the paper-based examination system can also lead to wastage of resources, time consumption and series of errors. In the banking industry, the use of paper for transactions are stressful and fraudulent.

Examination in educational institutions is intended in ascertaining a learner's skills and intellectual competence of knowledge imparted after a given certain period [5]. It has been reported that several developing countries are yet to adopt information and communication technology (ICT) as an avenue for improving their socio-economic status. Some educational institutions however, are currently aware of the importance of ICT in the educational and industrial sectors [6]. [7] developed a web-based application where students can learn the course 'Economics' and also conduct its examination online. The aim of this application is to enable students to study all the concepts of Economics through the tutorial application available and then take an examination all on the same application. [8] developed an examination automation system for a Java-sustained browser that can be easily accessed through any platforms. Both teachers and students will be able to access this web-based system. [9] designed an intranet-based examination system that is limited only for staff and students within the Covenant University, Nigeria. This web application runs on the Microsoft.net framework which depends exclusively on Microsoft technologies with the likes of ASP (Active Server Page).NET as the web server. Microsoft SQL (Structured Query Language) is employed for the interactive database, while ADO (ActiveX Data Objects).NET for interacting with the database.

Reference [10] also designs a web examination application with the use of several open source technologies such as *Hypertext Markup Languages* (HTML) which is used for the design interface of the system, Hypertext Preprocessor (PHP) as the server-side scripting language and My Structure Query Language (MySQL) as the database engine. The system is capable of conducting examinations, collation and marking of answers and produce results. It also accommodate different types of examination including fill in the blanks and multiple choice questions using auto-grading module. [11] designed a web based examination system in a format of multiple choice questions through online, and the results displayed immediately. This application was designed and implemented using HTML and ASP.NET for the Graphics User Interface. ASP is a page of HTML showing scripts of small embedded programs

which can be processed on server of the Microsoft Web prior to the page being forwarded to the end user. C# operates as the server-side, while Microsoft Structured Query Language (SQL) with ADO.NET control the database back end of the system. [12, 13] explained examination malpractice as any unlawful way of obtaining undeserved marks or grades singly or in collaboration with others such as invigilators, fellow students, parents, supervisors and teachers before, during or after the commencement of the examination. [14] evolved a system to secure and improve online examination using DMZ (Demilitarized Zone) concept in firewall technology and also discussed the performance of firewall in an online examination. The goal of a DMZ application is to include another layer of security onto the local area network (LAN) of an organization. The institutions and the learners adopting such online examination will be able to include video in the questions, randomization of questions and time allocation for each question [15, 16]. It is also beneficial in terms of cost and speed. [17] claimed that education system will later depended on wireless environments and advanced mobile devices in the future. However, incompatible operating systems, data security and small screen sizes, and some of the demerits of using mobile devices [18]. This studies was conducted with the objective of designing and implementatiing online examination systems for university using wed-based technology.

## II. METHODOLOGY

The design methodology deployed for this study is the Waterfall Software Development Life cycle (SDLC) model. The SDLC is a methodology for building, designing, and maintenance of computer software, information and industrial systems. It can also be referred to as Linear Sequential Life Cycle model. It is a very popular software development architecture. This model is very simple to understand and best used for smaller projects where there requirements are well known. It consists of sequence of stages where the output of each stage leads to the input for the next stage. At the requirement stage, the end users (students and lecturers) were interviewed to determine their perceptions and prospect of the application. On the design stage, system design and the architecture were developed to meet end users needs such as context diagrams data flow diagram and use case diagrams. However, the graphical user interface of the system was developed using HTML, Bootstrap Cascading Style Sheet (CSS), JavaScript and PHP on and MySQL server as the database in the implementation stage.. In the testing phase, after testing the workability of each unit developed in the implementation phase, all the units were integrated into a system. Lastly, there is a room for maintaining the system after future deployment.

## III. CONCEPTUAL DESIGN

Conceptual design of the system gives an outline of the design that was carried out using cases and data flow diagram.

### A. Data flow diagram

Data flow diagram illustrates the association in the various entities of the system (Fig. 1). The “Administrator” entity is responsible for inserting students and lecturer’s details to the system. The “Student” entity can take examination after the student has been given access to the system. The “Lecturer” entity can upload questions to be answered by student into the database using any preferred question format, set the examination instructions and configure the correct options or set of options for the questions.

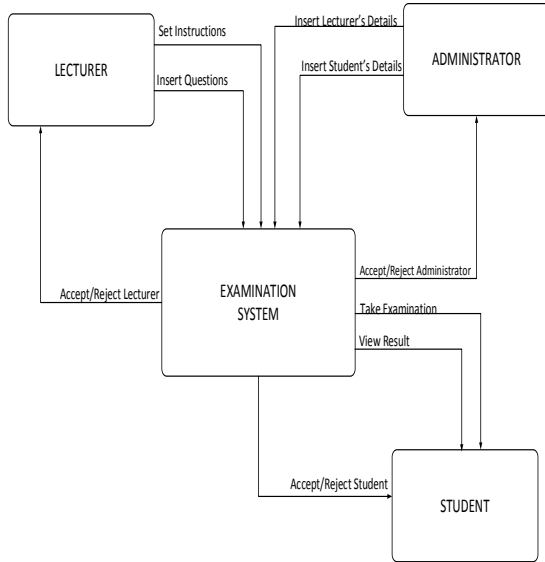


Fig. 1. Data Flow Diagram of the System.

### B. Use Case Diagrams

In this section, three actors on the case diagrams are the student, lecturer and administrator. Fig. 2 demonstrates administrator activities on the application such as initiating new user either the lecturer or student, modifying existing user, adding new course to the system, modifying existing course, viewing examination questions and the results about the system.

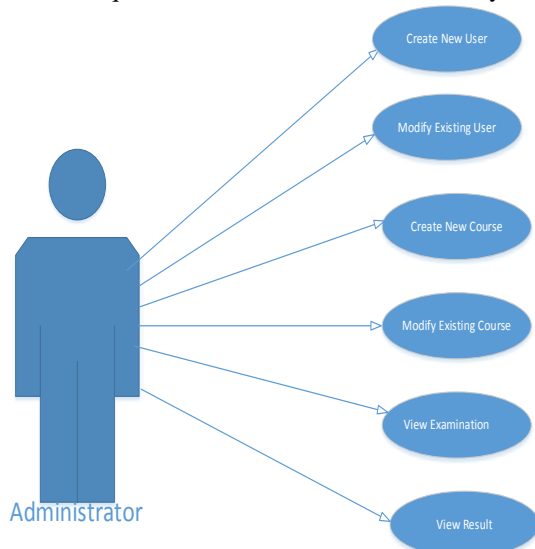


Fig. 2. Administrator Use Case Diagram.

Fig. 3 shows the activities of setting examination instructions and questions, moderate the questions, and changing passwords.

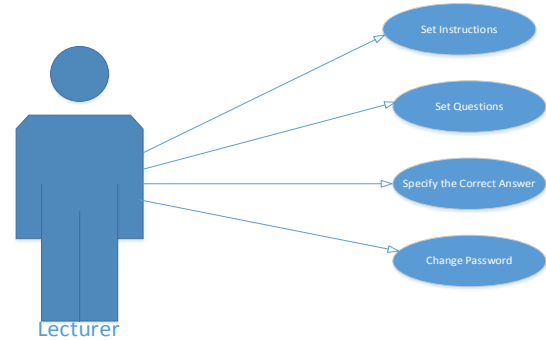


Fig. 3. Lecturer Use Case Diagram.

In Fig. 4 examination questions are attempted and the results can be viewed.

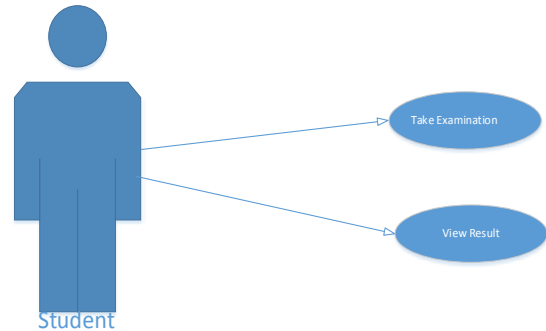


Fig. 4. Student Use Case Diagram.

## IV. SIMULATION AND RESULTS

The implementation was simulated on a local host using Apache server for testing the correctness and consistency of the system on a computer. In the screen shots below, various interfaces from the system are highlighted.

### A. The Login Page

Fig. 5 indicates the authentication page where the examinee enters Registration identity card (ID) and Password which will give the user access to the questions and the results page. The registration ID will be generated automatically by the system during the registration process.

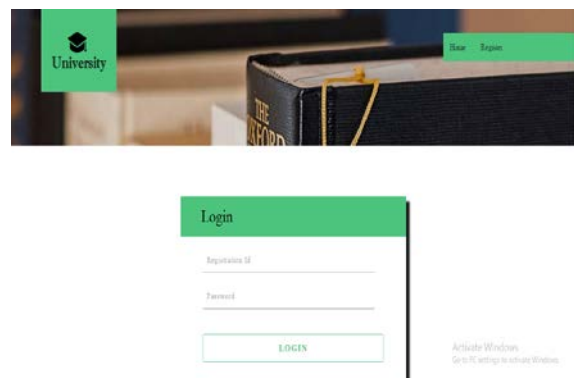


Fig. 5. Login page.

### B. The Home Page

Fig. 6 shows the page which loads whenever the domain name is entered. The candidate will click on the “Student Section” to take the examination via the authentication page, while the administrator will click on the “Administrator Section”.

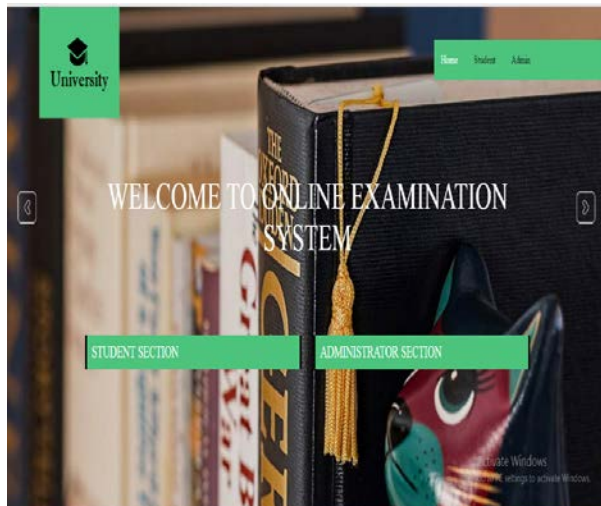


Fig. 6. Home page.

### C. The Administrator's Home Page

In Fig. 7 the page allows the administrator to insert new course, insert examination question, edit/ delete examination questions, viewing and editing courses, view all results and change account username and password.

### D. The Question Page

Fig. 8 demonstrates where students' examination can be conducted. The examination questions can be randomly set through the question table in the database, and viewed by the students. However, the student chooses a radio button which agrees with the suitable answer. The result is shown to the students and deposited in the database after the completion of the examination,



Fig. 7. Administrator Home Page.

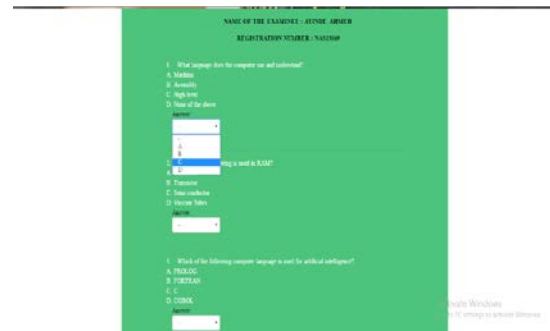


Fig. 8. Question page.

### E. The Result Page

Fig. 9 indicates the page for viewing examination results at the end of the examination. It also shows identity card numbers of the students, date of the examination, the course code and the marks which the students obtained.



Fig. 9. Result page.

## V. CONCLUSION

The system was developed using Hypertext Preprocessor, Hypertext Markup Languages, Cascading Style Sheet, Javascript and My Structured Query Language as the database backend which are used in web-based applications. These guarantee that the application is cheap, robust, and is able to run on multiple platforms. The application can be enhanced using integrated biometric systems such as fingerprint or face to improve its effectiveness and security.

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