DEVELOPMENT OF A COMPUTER-BASED TESTING SOFTWARE FOR EFFECTIVE EXAMINATIONS ASSESSMENT AT OSUN STATE COLLEGE OF TECHNOLOGY, ESA-OKE.

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ABSTRACT

In recent years, there have been a lot of innovative approaches by tertiary institutions to ease the conduct of examinations as well as their assessments. One of the approaches is an application of Computer Based Testing software application package. This has been so helpful in so many ways such as instant delivery of results, reduction in the cost of printing test or examination scripts, time management, increase in accuracy and elimination of redundancies. This research work presents the design and implementation of Computer Based Testing software package using clients-server architecture with high level degree of security and identification systems. The software was developed with HTML5, Java Script and CSS3for client side and PHP (Hypertext Pre-Processor) programming language with Maria DB database) as relational database system. The application was tested with assessment of students in Osun State College of Technology Esa-Oke and found to produce expected results. The results revealed that there is efficiency in time management, auto-submission on the expiration of allotted time, auto-marking and reporting. The study concludes that the developed CBT application will ensure fairness, transparency and equality in the assessment and evaluation of students in examinations.

Keyword: Assessments, Clients-Server, Evaluation, Results, Stand-alone.

1. INTRODUCTION

Computer based testing software has been in existence for about four decades with different scopes and features. Recently, modern Information and Communication Technology (ICT) tools and techniques have made its application and operation scalable, flexible, interactive and secured with data rich results (Onyibe1, Nwachi-Ikpor and Abdulhakim, 2015). Computer applications have helped greatly in the day-to-day activities and delivery of qualitative services in commercial world, public administrations and educational institutions.

The specific objectives for developing this software are to ensure fairness, transparency and equality in the conduct of the examinations; eliminations of the delay in submission of examination results; and, to obtain effective marking and recording of the scores for thorough assessment of the students.

2. LITERATURE REVIEW

As technology advances, it brings about improvement to numerous systems, work flow and processes in all aspects of life including learning establishments (Benitez, 2016). Examination has been the preferred methods of evaluating student's understanding of courses being taught. There have been various methods used for assessing students such as projects, pencil-written examination, presentations, assignments and oral examinations. Traditional Examination refers to a formal examination administered through question papers to which students respond in the form of written answers to a limited choice of previously unseen examination questions, set in advance and answered in examination centres where invigilators (examination supervisors) prevent communication between students and prohibit the use of notes or other revision aids (Ajinaj, 2017). The first supplement to traditional examination administering methodology was Information-based CBT software. Educational assessment in Nigeria institutions has grown in recent years using Computer Based Test (CBT) methods. CBT approach has numerous benefits over the standard paper-and-pencil (De Angelis, 2000). These benefits ranged from the automation of marking and subsequent reduction in marking workload to provide students with immediate feedback on their performance. Notwithstanding these benefits, previous works by researchers suggested that CBTs have been viewed as unsatisfactory in terms of efficiency. In 2015, the former JAMB Executive Registrar, Professor Dibu Ojerinde, stated the objective of electronic testing (CBT): to ensure 100 percent elimination of all forms of examination malpractice that had been a major challenge in the conduct of public examinations in the country. The objective was marred by different form of examination malpractices such as bringing in unauthorised materials; writing on currency notes and identity cards; spying of other candidates in examination hail; substitution of answer sheets

and change of examination scores or grades. Others include, impersonation, leakage of questions to students before the examination, conniving with supervisors and school authorities to cheat, writing on body or tattoo in which students especially females write on hidden parts of their bodies (Abubakar and Adebayo, 2014). Researches have been carried out on the Computer based test and many systems developed on it,(Singh and Tiwari, 2016) designed and proposed an online examination system that could be administered at different places around the world. (Ayo et al, 2007) proposed a model for electronic examination in Nigeria which enforces all applicants to be subjected to online entrance examination as a way of curbing the irregularities as in the Joint Admissions Matriculation Board (JAMB) examinations. The model was designed and tested in Covenant University, Ota Nigeria. Findings revealed that the system has the potential to eliminate some of the problems that are associated with the traditional methods of examination such as impersonation and other forms of examination malpractices.

3.   METHODOLOGY

The solution was implemented using programming tools such as XAMP server, PHP, Maria DB database, JavaScript, Jquery library file, Hypertext Markup Language (HTML), Dreamweaver Cs 6 version and Cascading Style Sheet (CSS) as template design to facilitate the administration of examination and result processing

3.1   Development Life Cycle of the CBT System

The Waterfall System Development life cycle (SDLC) model was adopted for the development of the CBT system as presented by Fagbola et al. (2013). This is linear sequential life cycle model that views the process of software development in five stages. The activities in one stage will be completed before moving to the other. Stages involved in the Waterfall Model are:
 i.   Requirement Analysis
 ii. System and Software Design
 iii. Implementation and testing
 iv. System verification
 v.   Maintenance

3.2   Requirement Analysis and Definition:
In this stage, the users (students, lecturers and Heads of Departments) of the OSCOTECH, Esa-Oke were consulted in order to establish the objectives, requirements, and

services that the end-user requires and expects from the system.

3.3   Conceptual Design of the CBT System
Conceptual design is an early stage of design process, in which the broad outlines of function and form of software design are implemented. The design of the CBT software was carried out using the program flowchart.

3.4   Program flowchart for the CBT System
A program flowchart is a diagram that contains a set of standard graphical tools for analyzing processes, programs or systems. These tools are used to represent the sequence of coded instructions fed into computer system. The program flowchart for the developed CBT system is divided into:

a)   Public section: The section where a candidate is expected to interact with the system by using appropriate authentication information to login into the system.

The student is expected to login into the developed system with his/her matriculation number. This process in Fig.1 usher the students to the instruction section; and the picture/image of the student will be displayed automatically at the top right of the instruction page. After the student has read the instruction, he or she is expected to click start examination button to start the examinations. The countdown timer for the examination starts immediately once examination begins and log out the student after expiration of time. The system was designed to submit automatically; if the system logs the candidate off or allows the student to click submit button when if such student finishes before the time expires.
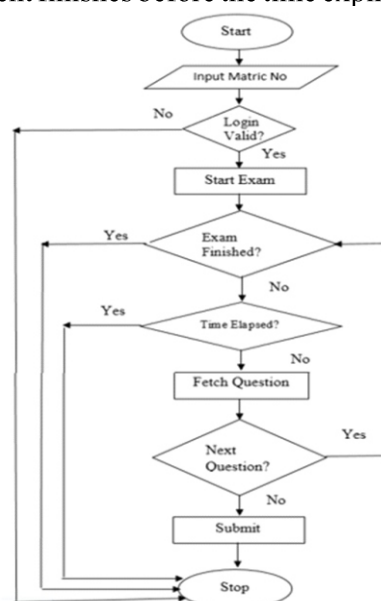

Fig.1: Flowchart for the Public Section of the CBT System (Developed by the Authors)

In a situation where there is obstruction during the examination due to power failure or malfunctioning of the computer system, such a candidate is free to login again. The system detects the presence of such candidate before, and resumes automatically to the last state the candidate was before the obstruction. The system displayed the navigation button at the footing area of the examination paper. The essence of this is to allow easy navigation of questions for the candidates during examination process.

a)   Private section: This section otherwise referred to as administrator section is restricted from public or candidate's access. It is the area where all administrative tasks are performed.
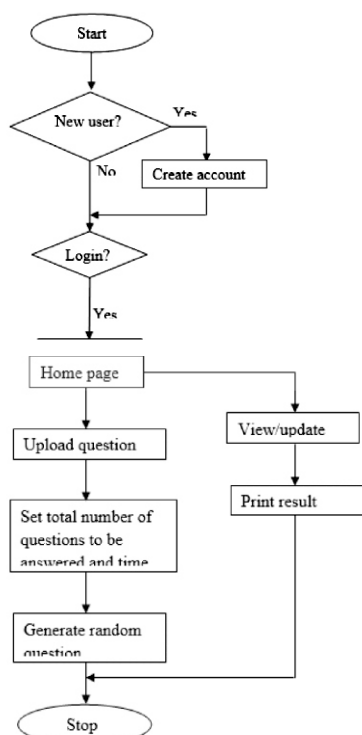

Fig.2: Flowchart for the Private Section for the CBT System(Developed by the Authors)

The administrator section of the system is shown in Fig.2, it is the private section of the system that is restricted to authorized users only. The user is expected to login using the username and password. The system assigns different roles and privileges to the user based on hierarch. On a successful login, some activities that can be performed in the administration section are:

i.   Uploading of examination questions

ii.   Setting number of questions to be

answered and allotted time

iii.   Generation of Examination questions

iv.   Addition of new program/course

v.   Review of Examination result

vi.   Previewing and Printing of Candidates' result

3.5   System and Software Design: The requirement specifications from the first stage of the waterfall model were studied and a system design was prepared to help in specifying the hardware and software requirements. This includes the use of program flowchart diagrams.

3.6   Implementation and Testing: This stage involved the actual development of the system by developing the graphical user interface, implementing the model using PHP programming language and creating the system database using XAMP server. The functions of the tools used in the implementation are stated below:

i.   *HTML (HyperText Markup Language) is the most basic building block of the Web. It defines the meaning and structure of web content.*

ii.   *XAMP Server is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, Maria DB database, and interpreters for scripts written in the PHP and Perl programming languages.*

iii.   *PHP: Hypertext Preprocessor (earlier called, Personal Home Page) PHP is an HTML-embedded, server-side scripting language designed for web development.*

iv.   *Maria DB database is an Oracle-backed open-source relational database management system (RDBMS) based on Structured Query Language (SQL).*

v.   *jQuery is a JavaScript library designed to simplify HTML DOM tree traversal and manipulation, as well as event handling.*

vi.   *Dream weaver is a well-known web editor (a type of computer program) used by both experienced and novice webmasters to design websites. It uses what is known as a "WYSIWYG" interface (where "WYSIWYG" stands for "What You See Is What You Get"), meaning that you can create your*

website visually and see the results on your computer monitor as you work.

3.7 System Verification: Every module in the program was properly tested with some batches of HND I students in Testing Methods and Reliability from the Department of Electrical/Electronics Engineering of the College. They were tested for forty-five minutes (45min) with sixty (60) randomly distributed questions out of about 250 bulk question available at the question bank, while the private section was tested, from the load of the questions to the final output and printing of the results. The system was integrated as a complete system in order to ensure the system works in-line with the set objectives.

3.8 Maintenance: This is the final stage of development in which all necessary self-diagnostic processes were incorporated into the system. This is to ensure that future maintenance activities are carried out with minimal human efforts in order to see that the software continues to work even when there is a new modification on the program.

4. RESULT AND DISCUSSION

The CBT system has different functional pages such as the student login page, the examination instruction page, the examination question page, the admin login page, the admin homepage, question uploading page, question editing page, new program/course page, question/allotted time page, questions generation page and the result summary page.

The default public page of the system is the Homepage (Login Page) of the system that automatically loads after the URL has been requested for by a web browser on the client system. It contains the login section for the student to provide his or her details which is used to authenticate the student to gain access to the system. This page is depicted in Fig. 3a and 3b below. The student logs-in with the matriculation number.
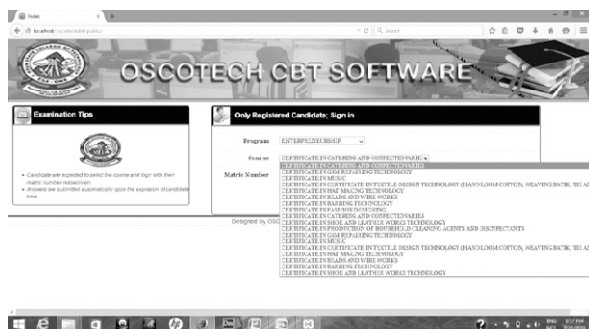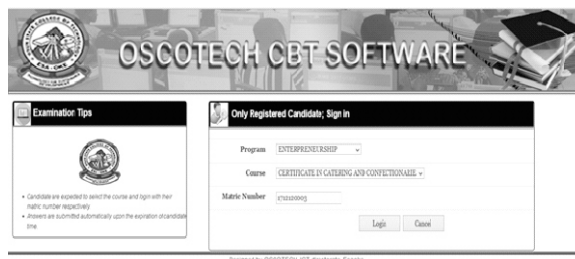

Fig.3a: The Student Login Page

Fig.3b: The Student Login Page

The examination question page shown in Fig.4, displays the candidates details including their pictures at the top for the purpose of verifying student identity, followed by the examination questions and the navigation button a footing area of the page.
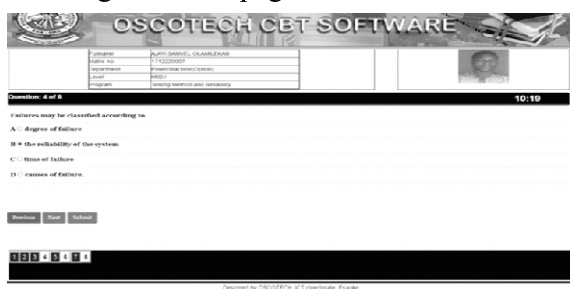

Fig.4: The Examination Question Page

The administrative login page for the developed CBT system as shown in Fig.5, is responsible for authenticating the user of the system. The user, majorly the lecturer of each course is expected to login into the system using their username and password.
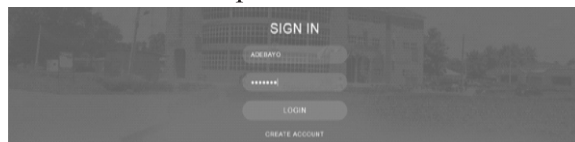

Fig.5: The Administrative Login Page

The administrative homepage contains navigation menu to different areas of the system. Fig.6 shows question upload interface. This is where administrator is expected to upload the bulk questions that have already been prepared in csv format.
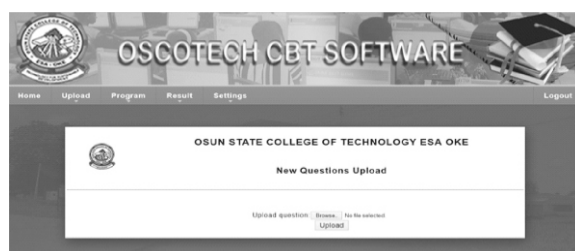

Fig.6: Administrative Page for Question Upload

Question editing or deletion page as shown in Fig.7, provides means to edit and delete already uploaded question.
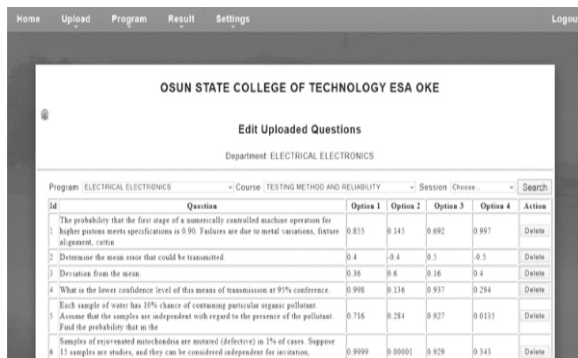
Fig.7: Question Editing/Deletion Page

Questions in which the candidate will answer in the examination hall are performed in batching techniques; hence candidates are prevented from answering the same questions while sitting together in the examination hall. Result review page in Fig.8, shows the performance of the candidates that sat for the examination and in a scenario of mass failure; candidates grades can be upgraded using this page. The computation of these results is done automatically by the system.
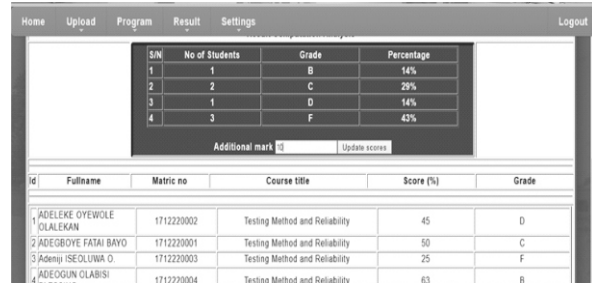

Fig.8: Result Review Page

Result Report as shown in Fig.9, shows a summary of 20 candidates results, and can be printed for record keeping and pasting.

OSUN STATE COLLEGE OF TECHNOLOGY ESA OKE

DEPARTMENT: ELECTRICAL ELECTRONICS   OPTION: Power/Machine(Option)   LEVEL: HND I   SESSION: 2017/2018

Id	Fullname	Matric no	Course title	Score (%)	Grade
1	ADELEKE OYEWOLE OLALEKAN	1712220002	Testing Method and Reliability	65	B
2	ADEGBOYE FATAI BAYO	1712220001	Testing Method and Reliability	70	A
3	Adeniji ISEOLUWA O.	1712220003	Testing Method and Reliability	45	D
4	ADEOGUN OLABISI BLESSING	1712220004	Testing Method and Reliability	83	A
5	ADEYEYE ANTHONY AJIBOLA	1712220005	Testing Method and Reliability	33	F
6	ADEYEYE ABDULKABIR OLUWATOBI	1712220006	Testing Method and Reliability	45	D
7	AJAYI SAMUEL OLAMILEKAN	1712220007	Testing Method and Reliability	70	A
8	AKINDOYIN MARUFDEEN IDOWU	1712220008	Testing Method and Reliability	45	D
9	ALAGBE SAMUEL OLUWASEYI	1712220009	Testing Method and Reliability	45	D
10	ALAMU SOJI PETER	1712220010	Testing Method and Reliability	58	C
11	ALAWODE SAMUEL BAYO	1712220011	Testing Method and Reliability	58	C
12	ALIMI ABUBAKRI OMOTAYO	1712220012	Testing Method and Reliability	58	C
13	Alimi Saheed Olaitan	1712220013	Testing Method and Reliability	70	A
14	AREOYE ADEBARE ADEBAYO	1712220014	Testing Method and Reliability	58	C
15	ARIYO OLUWANIYI SUNDAY	1712220015	Testing Method and Reliability	45	D
16	AYANLOWO ABIOLA AYINDE	1712220016	Testing Method and Reliability	45	D
17	FALODE SEYI TOSIN	1712220017	Testing Method and Reliability	33	F
18	FALOYE OLUWASEUN ABRAHAM	1712220018	Testing Method and Reliability	58	C
19	IGUNNU TAIWO OLUWAFEMI	1712220019	Testing Method and Reliability	20	F
20	JIMOH OPEOLUWA SAMUEL	1712220020	Testing Method and Reliability	45	D

Fig.9: Result Report

5. CONCLUSION AND RECOMMENDATION

The computer-based test system was developed, tested and demonstrated to ameliorate the laborious tasks of marking the examination papers by the examiners in a large class; to ensure prompt delivery of the result; ensure integrity and adequate quality assurance in the administration of examinations. It also helps in adequate documentation, security and total elimination of examination malpractices. The system helps the supervisor by comparing and matching the face on the screen with the candidate which is an added value for authentication against impersonation. The

objectives were met with this solution after subjected to quantitative and qualitative assessment.

The developed computer-based testing system is recommended for conduct of examinations in primary, secondary and higher institution for enhanced transparency, quick delivery and security in student's assessment. The system could be improved upon by adding biometric identification system employing fingerprint, iris or signature for authentication. Also, video and audio features could be added for some special students that are physically challenged. Large bank of questions will help for easy randomization and selection of question.

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