

## DEVELOPMENT OF PRE-ADMISSION EXAMINATION LEARNING AND PRACTICING SOFTWARE FOR PROSPECTIVE STUDENTS OF FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

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### ABSTRACT

*The undue anxiety of students towards examination being conducted using Computer Base Testing System (CBTS) has led to the introduction of computer base mock examination; a way of familiarizing students with CBT platform before attempting the main examination. The current system is plagued with applicants traveling from their various location to a Computer Base Testing Center to take part in a short-lived mock examination in order to familiarize them with the CBT platform; most of the applicants do not have access to the CBT software which is not available online; it has been argued also that a thirty-minute brief mock test is not enough to familiarize some of the candidates adequately for the use of the CBT. This paper is proposing the Development of Online Pre-admission Examination Learning and Practicing Software for the Prospective Students of Federal University of Technology Minna. The proposed system will be implemented using Microsoft Visual Studio. Net, Integrated Development Environment. The proposed web based application will be highly user-friendly and self-intuitive to help applicants in learning and practicing of computer based test questions from anywhere at any time.*

*Keywords: Computer Based Test (CBT), Post UTME, UPASE, Pre-admission Exam, ELPS, Pre-admission ELPS.*

### INTRODUCTION

Computer Based Test is the use of computer technology to conduct test. It is tests or assessments that are administered using computers in either stand-alone or dedicated network, or by other technology devices linked to the internet or World Wide Web most of them using multiple choice questions (Bolboacă & Jäntschi, 2007). Although not completely a new technology, the widespread usage and adoption of the system particularly in the education sector in Nigeria to conduct tests and examinations for students came few years after it was used by the Joint Admission and Matriculation Board (JAMB) to conduct the 2012/2013 University and Tertiary Matriculation Examination (UTME). The examination is being adopted due to the realization of its comparative advantages over the traditional pencil and paper method. The advantages of using computer technology in

conducting examination in a global sense have been identified to include lower administrative cost, time saving, less demand upon

teachers and examiners, and reduction in examination malpractices. CBT is not just an alternative method for conducting examinations; it represents an important qualitative shift away from traditional methods such as paper based tests (Jimoh, Shittu, & Kawu, 2012).

Despite these advantages available in computerized test administration, it has been shown that the use of CBT has brought to bear some notable challenges some of which have been argued to have adverse effect on the performance of students in examination. The students' perspectives of the CBT have been of mixed reactions. Previous research showed that more people anticipated problems with the computer assisted assessment than actually had with traditional Paper and Pencil (Clariana &

Wallace, 2002). Research also showed that despite fewer students being confident about CBT before completing the assessment more students stated a preference for CBT afterwards. Some studies however shows that the major challenge faced by students in the use of the CBT for taking assessment is increased anxiety amongst those who are unfamiliar with the use of computer and the CBT platform and as such students agreed that they are "technophobic" (Bodmann & Robinson, 2004).

The anxiety towards the use of CBT can directly be linked to the level of familiarities students acquired with regard to the system before questions were administered to them through the system. There is relatively low level of anxiety (if any) among students who are familiar with the platform compare to those who are completely new to the system (Jimoh et al., 2012).

In summary, the point of concern in this work is students' familiarity with the CBT platform and its contents before the conduct of the pre-admission screening examination so as to eliminate computer anxiety often exhibited by some students when taking examination through the CBT.

The next section of the paper explored the strength and weaknesses of the existing system, problem statement, the proposed CBT's system design and analysis that describes CBT's development life cycle, requirement analysis and definition. Also, functional requirement of CBT, system design, development tools, and results and discussion

## 1. Strength and Weaknesses of the Existing System

The currently existing system by which prospective candidates of the university are meant to practice the CBT before the conduct of conduct of the main examination is offline which requires prospective candidate to travel from their base to the university and take part in a one time, brief computer mock examination. The system is hosted by the University Information Services (ITS) and candidates accessed the application from the computer base testing center using customized browsers installed on several desktop computers running on Local Area Network (LAN). Sample Questions stored in the database which is hosted on the server are administered; the candidates practice the questions which are multiple choice typed questions having options labeled A to D for a limited time through the

customized web browsers. Because the system is offline and run on a local network, it cannot be accessed outside the environment. Some of the candidates even after mock examination still exercise fear towards the system because there was limited time to practice the sample questions and the Graphic User Interface does not offer tool tips on some of the controls found on it.

The weaknesses of the system can be outlined as follows;

- The System is offline and cannot be access through the internet
- The system requires the use of highly customized browsers
- Requires locally networked desktop computers.
- The System is not readily available everywhere to candidates at all time.
- Limited time allocated for students to practice the test samples.
- The system does not provide hints or tips on the various graphical users controls found on the GUI to candidates.

## 2. Problem Statement

Despite the notable comparative advantages of CBT over the traditional Pencil and Paper methods the system is faced with;

- The problem of causing undue anxiety for prospective students using the platform to take test. This situation is believed to have adverse effect on the performance of students in examination administered through the use of CBT.
- Research has shown that prior computer experience with the use of CBT software has a positive influence on the performance of students in computer-based testing. Most of the prospective students do not have access to the CBT software for learning and practicing when preparing for the examination in other to gain better understanding and familiarity with the system before the pre- admission test.
- The introduction of computer based mock test is a measure to familiarize prospective applicants with the CBT for the purpose of reducing the level of

anxiety often exhibited by applicants when taking Computer Base Test. However, it has been argued that a thirty-minute brief mock test is not enough to familiarize some of the candidates adequately for the use of the CBT, hence there is need for a better platform where students can practice and learn with the CBT from anywhere and at any time before they are meant to sit for the pre-admission screening test. Against this background, this project will seek to develop a web base application for the learning and practicing of computer base test in Federal University of Technology Minna.

### 3. The Proposed System

Pre-admission Examination Learning and Practicing Software is a web-based application for learning and practicing of computer based examination. The software is not just an ordinary CBT system often aimed at conducting test for students only. Apart from being distributed and readily available to users at all time from anywhere, the system was developed to be learning and practice oriented with features that makes it highly user-friendly and self- intuitive. The system provides users with the option of selecting what and how they want to practice with the CBT platform as well as reviewing their test scores. And these ensure that users become well familiar with the CBT as well as the test contents which are derived from the past questions papers for the entrance examination.

A Computer based testing system can be non-distributed, stand-alone application allowing one user at a time to use it after installation into their personal desktop or laptop computer.

A CBT software can also be distributed, web-based application that can support more than one users through Local Area Network (LAN) or the Internet via a web browser. A web browser is a web-based software that retrieves web pages from the Internet. The software incorporates executable instructions written in special scripting languages such as ASP.net, PHP, Java Script, VB Script, etc.

One of the considerations for designing and implementing a CBT application whether as a stand-alone desktop application or as a distributed web-based application is deciding on the choice or type of CBT system to be implemented (Ajinaja, 2017) pointed out two generally

recognized types of CBT system that can be implement in part or as a combination of the two types in one platform base on the performance of the students in the test. These are;

- Linear Test - This is the widely known type of CBT that involves a complete test where the computer selects different questions for candidates without considering their performance level.

Adaptive Test – In this type of CBT System, the computer selects the range of questions based on individuals' performance level. These questions are selected from a very large pool of possible questions classified by content and difficulty. In most cases, students a provided with a more difficult question if they answer the preceding question correctly and less difficult question if answered wrongly.

Another key requirement considered while developing CBT system is the type of questions that is expected to be administered through the platform. A CBT typed question can be objective multiple choice questions (MCQ), where an individual is require to select one or more answers from the list of given options labeled A to E to a question. The Joint Admission and Matriculation Board, which is the body responsible for the conduction of entrance examination into Nigeria Universities is currently employing this model of CBT in the University and Tertiary Matriculation Examination (Ajinaja, 2017).

CBT typed-questions can also be subjective, theory- based questions where individuals are meant to type in their responses to questions using the computer keyboard. Common scenarios often require an individual to fill-in a given gap by typing a phrase or sentence(s) that correctly answered a given questions. A hybrid version combining both the objective and subjective typed-question is also commonly in use by some universities to conduct assessment for students at the entry level (100level) where massive number of students from different departments are offering same or general course taking by one or two lecturers (Yuan, Zhang, & Zhan, 2003).

Having explored the general information on the various features of CBT system particularly with regards to the Pre-Admission Examination exercise in Federal University of

Technology Minna, this work will be mainly on the development of a distributed, web-based application, for the learning and practicing of computer base test. The choice of this model for the application is due to the universally recognized relative benefits (such as global reach, availability, ease of access, support for multiple users, etc.) of distributed applications over standalone applications. Also the implementation will focused on the Linear Test version and Objective multiple Choice typed-question of CBT.

### 3.1 CBT System Design And Analysis

The CBT software proposed for development in this paper is based on the current implementation structures with an enhancement in the systems functionality to meet with online Learning and Practicing of sample test questions using a web browser. The Software Development Life Cycle (SDLC) waterfall model is being proposed for the development of the system. The system design was represented using; entity-relationship diagram, use case diagrams, architectural diagram and data flow diagram. The system design was based on the users and system requirements of the CBTS.

#### 3.1.1 CBTS Development Life Cycle

The waterfall model which supports a, sequential approach to software development that evolves at the system level and progresses through analysis, design, coding, testing, and support is adopted in this work. It is a classic process model which is widely known, understood and used. It has been proven over the years as a reliable model for designing software project. The CBTS SDLC waterfall model was divided into a number of independent steps as shown in Figure 1. These steps were carried out in sequence

one after the other. Each phase produces an output which is served as input to the next phase. Each stage is followed until its conclusion before the next stage is begun (Lim, Ong, Wilder-Smith, & Seet, 2006). The stages involved in the CBTS SDLC are:

- Requirements Analysis and Definition
- System and Software Design
- Implementation and Unit testing

- Integration and System testing
- Operation and Maintenance

#### 3.1.2 Requirements Analysis and Definition

This involves the task of writing clear reports, often in ordinary language, of what the system is expected to provide for its users. The deliverable from this phase of the system analysis is called the requirements specification (Lim et al., 2006). Requirements elicitation for this work will be derived from the observation of the already existing system and interaction with the pre-admission examination committee at FUTMinna. Students' perception of the CBT and review of related works also provides handful requirements for the development of the system.

#### 3.1.3 User and System requirements

This defines the end-users requirements for the system. The users of this system are prospective students (students) seeking for admission, the university pre-admission officers (Examiner) and an administrator. The Use Case Diagrams show the user requirements and a detailed system requirements for the CBTS system are also presented.

##### 3.1.3.1 The Student

Figure 1 shows the Student's Use case diagram indicating that student shall be able to:

- Log in to the system
- Practice Sample Test Questions
- Choose which Subject and Year to practice and in which mode (Quiz Mode, Exam Mode)
- View Previous and Current Assessments result
- View Frequently Asked Questions (FAQ) on CBTS and Answers.

##### 3.1.3.2 The Examiner

Figure 2 shows the use case diagram for the lecturer indicating that lecturer shall be able to:

- Log on to the system.
- Register student in the system.
- Set sample examination questions and instructions.
- Insert options to questions in the database.
- Specify the correct answers to the questions.

- Set the time for each test paper.
- View the scores of students

### 3.1.3.3 The Administrator

Figure 3 shows the Administrator's Use case diagram indicating that administrator shall be able to:

- Register Examiner in the system
- Create default password for the Examiners

#### 1) Functional requirements of the CBTS

Functional requirements are the statements of services the system should deliver, how the system reacts to particular inputs and how the system should behave in particular situations (Karadeniz, 2009). The CBTS should be able to:

- Authenticate both student and Examiners
- Create sessions for each students
- Allow students to select which subject and which year they want to practice the test

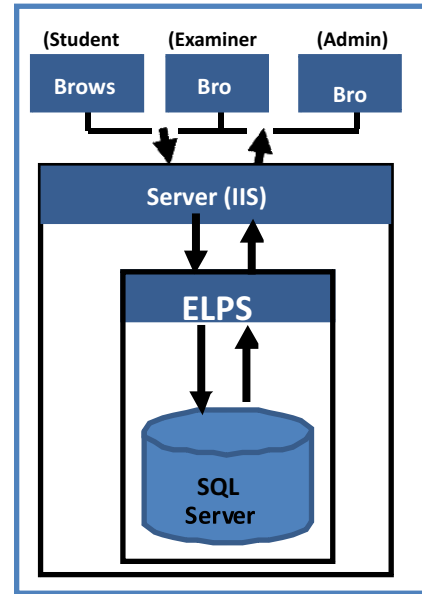


Figure 4. Architectural Diagram

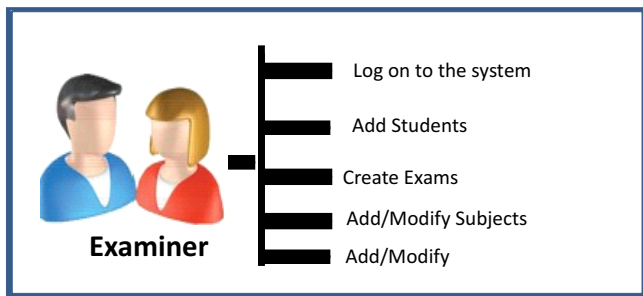


Figure 1. Use Case Diagram for Student

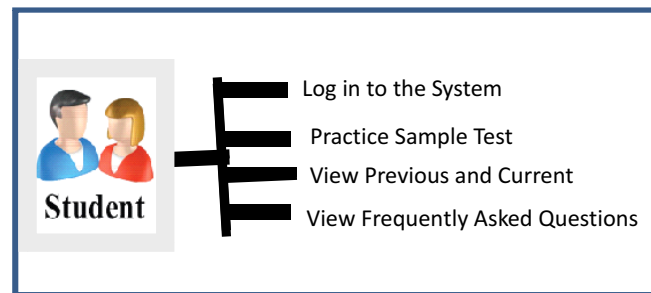


Figure 2. Use Case Diagram for Examinee



Figure 3. Use Case Diagram for Administrator

- Select which mode (Quiz /Exam Modes) to practice the test
- The student to make only one selection of the options to the questions
- Allow navigate back or forward to review or modify already answered questions
- Compute student's score at the end of the examination
- Automatically shows once student submit or once time elapses
- Save result of all assessments practiced

#### 1) Non-functional Requirements for the CBTS

These are the requirements that specify the criteria that can be used to judge the operation of a system, rather than specific behaviors.

The CBTS should:

- Possess low response time and increased speed in executing user request
- Be reliable, that is, should guarantee minimal rate of failure occurrence.
- Be user friendly, that is, the user interface should be easy to use.
- Be scalable, that is, should not collapse with additional resources or users.



- Possess a large memory size
- Be maintainable

## B. System Design

The CBTS was designed based on the requirements specification. The architectural design together with the Data flow diagram and Entity-Relationship Diagram are presented in Figures 4, 5 and 6.

## C. Development Tools

The CBTS will be developed using Visual Studio .Net as Integrated Development Environment with support for Internet Information Server 7.0 (IIS 7.0), Hypertext Markup Language (HTML), JavaScript, Cascading Style Sheet (CSS), Visual Basic.Net, (VB.Net), Active Server Page .Net (ASP.net) and SQL Server.

## 4. Results and Discussion

The Pre-Admission ELP system is composed of two main pages which are the Examiner page and Student page. The Examiner page contains a menu bar and the home screen. The home screen include most likely performed tasks like; Register User, Create Exam, Add Subjects, Add Questions, View Records, Update Records, while the menu bar comprises of the File Menu, Edit Menu and the View Menu all with submenus for navigating to other processes

### A. Student Login Page

The student login page is shown in Figure 7. The student enters the username and password to login in order to use the system. If enabled by the Examiner, the student can

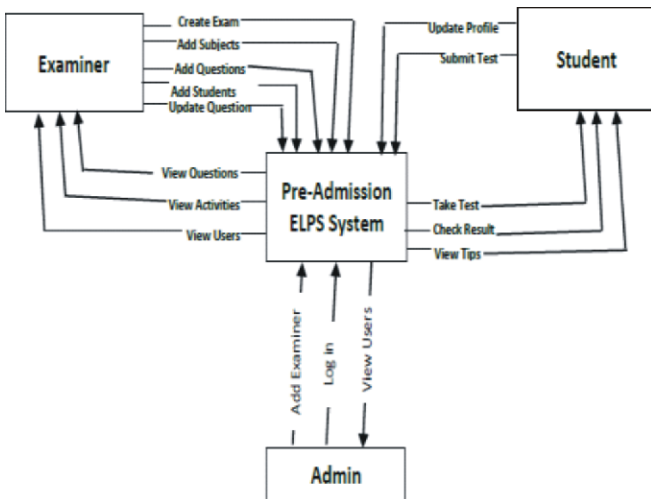


Figure 5. Data Flow Diagram

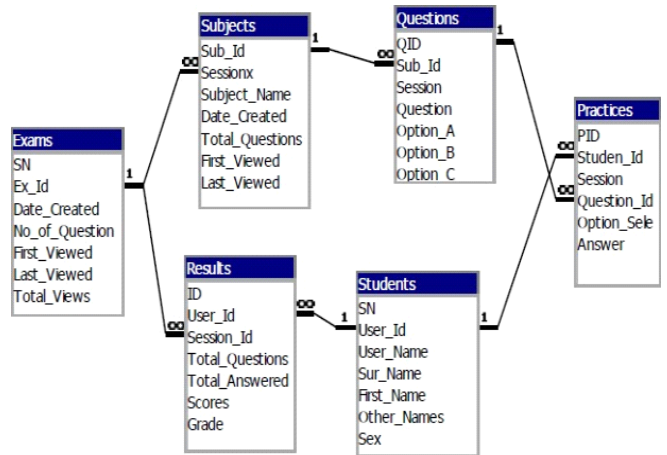


Figure 6. Entity Relationship Diagram

create account themselves in case they have not been registered by the examiner to use the system.

### B. Student Home Page

The student Home Page is shown in figure 8. This enable the student a-one-click access to start practicing test, view test results, view tips about computer based test, and browse

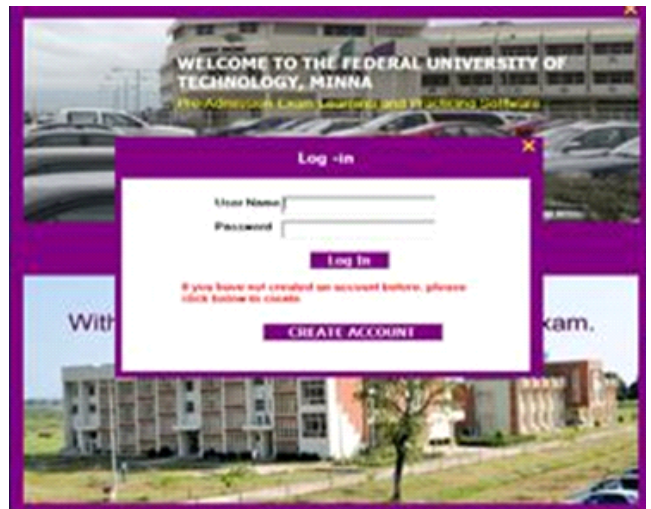


Figure 7. Student login page



Figure 8. Student Home Page

on general information on admission into the Federal University of Technology, Minna.

## A. Practice set up Page

The practice set up page is shown in Figure 9. This enables the students to select the question they want to practice and how they want to practice the questions. The pre-admission ELPS include two modes by which selected test question can be practice; the Quiz Mode enables the user to practice selected test sample in form of quiz where a user is notified on whether the selected option to a question is correct or not and test scores are updated frequently and displayed as user progressed with the practice. The Exam Mode unlike the quiz mode does not notified a user on whether the selected option to a question is correct or wrong; test results are generated and displayed only after the user submit the test or when the set time elapses in which case the test is automatically submitted and test result displayed immediately to user.

## B. Practice Area

The practice area is shown in Figure 10. This is the page where the user practice the questions. User can navigate linearly through questions by click the next button or by randomly clicking on the question number they want to answer.

## A. Result Page

The result page is shown in Figure 11. Once test is submitted by the user or the set time for the practice elapses

the application stores the result in the database and then

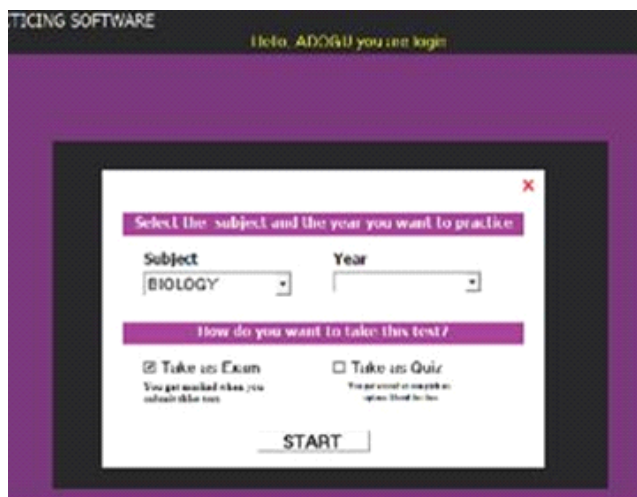


Figure 9. Practice set up Page

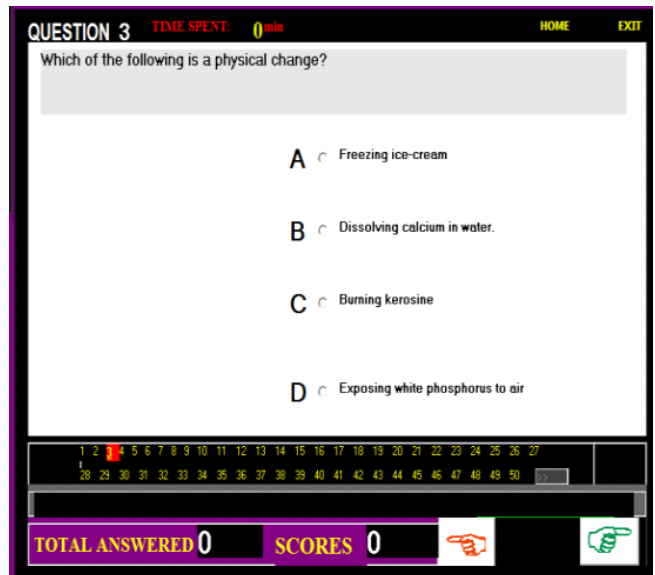


Figure 10. Practice Area (in quiz mode displayed)

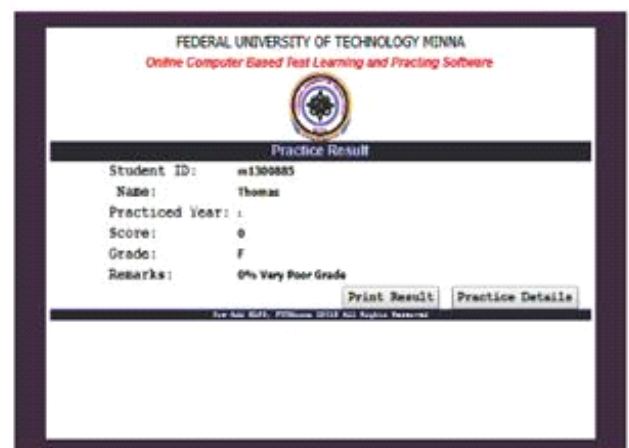


Figure 11. Result Page

automatically generate and display the result for the practice. The user can print the result

## Conclusion

Student's undue anxiety towards computer-based test resulting from inadequate training and familiarization with the CBT platform and its contents is a major challenge among prospective candidates, leading to poor performance in the University Pre-Admission Screening Examination (UPASE). So the need to adequately familiarized prospective applicants with the CBT platform used in the conduct of entrance examinations is important to lessen the level of anxiety towards the CBT system in order to improve the performance of candidates in the examination. Pre-admission Examination Learning and

Practicing Software is the suitable response to this need because it provides a system that is learning and practice driven which can be accessed from anywhere at any time and as many time by the prospective candidates. In this paper, we have proposed the development of a highly user friendly, self-intuitive and readily available web-based application for the learning and practicing of computer based testing system using the learner model, multiple choice questions (MCQ), we suggest therefore, that future research work should be carried out on theory-based questions as opposed to only the multiple-choice and learner question formats of the current system. Also, provision for adaptive test and the inclusion of audio and video-based CBT tutorial software can be investigated.

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