E-Assessment Systems For Universities In Developing Countries: A Nigerian Perspective

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ABSTRACT

Paper based examination systems seem to be the dominant method of student’s assessment in institutions of higher education in Nigeria. However this method of examination has been pointed to be challenging. These challenges include high cost of printing papers, shortage of manpower, examination malpractice, and human errors during marking, omission of students result, inadequate examination venues and invigilators. To address these issues, there has been a shift from paper based to computer based examination systems as a result of ICT inclusion in education policy across the globe. Nigeria has not been left behind and has adopted the use of computer based examination systems. However, these systems are limited to only admission and screening examinations. As such, this study proposes the use of computer based examination system as a method not only for admission process but also during regular term examinations. A prototype scalable software system was developed using Java and MySQL, as a database. The paper concludes with implication for practice.

Keywords: ICT, Examination, Nigeria, Universities, Developing Countries

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1. INTRODUCTION

It is generally recognized that examinations determine the extent to which educational objectives have been achieved as well as the extent to which educational institutions have served the needs of community and society at large [1]. [2] argues that examinations play a significant link in evaluating what goes on in the classroom in terms of what, and how teachers teach and students learn and can have impact on both teaching and learning. Thus, institutions of higher education have adopted various examination methods to evaluate the impact of academic programs. The most dominant examination methods include the paper based examinations.

However [3] noted that the current paper based examination process is cumbersome, tedious and inefficient because it requires more time and resources in preparing the examination papers, printing the papers, organizing the examination, and carrying out the checking and grading [4]. However, the advancement of ICTs has called for the shift from a paper based to a computer based system of examination [5]. According to [6], computer based examination is a method of assessing students using a computer as an alternative to paper delivery, storing of response, marking of response and providing a report of the results of the examination.

According to [7] computers and related technologies provide powerful tools to meet the new challenges of designing and implementing assessments methods that go beyond the conventional practices and facilitate to record a broader repertoire of cognitive skills and knowledge. Today, countries of developing countries having been adopting ICT policies in the education sector in order to achieve human capacity development. The inclusion of ICTs in the education sector has called for the reconsideration, rethink and re-modification of traditional exam methods [7]. Nigeria, is one of those countries that are reforming their education policies using ICT and adopting the computer based examination system in its institutions of higher education.

However, the computer based examination system in Nigeria tends to focus more on assessment to admit or screen students for entrance into Nigerian institutions [8]. Also the country is still yet to fully implement the computer based examination system in all aspect of the examination process by moving beyond admissions exams. In this study, we propose the use of computer based system as a method for assessing course examinations. A prototype scalable software system was developed using Java and MySQL, as a database. The paper concludes with implication for practice.
The following section discusses examination process in developing countries. This is followed by a section providing discussion on methodology. The system design and implementation is discussed in the subsequent section. The final section concludes the paper and demonstrates implications for research and practice.

2. EXAMINATION PROCESS IN INSTITUTIONS OF HIGHER EDUCATION IN NIGERIA

Based on the Nigeria education policy, institutions of higher education are required to conduct examinations for students in order to assess academic quality of the students and the institutions. The predominant method of examination in Nigeria as discussed earlier on is the paper based exam format. While it has been argued that the paper based examination system is resource and time consuming authors have argued that the paper based examination process in Nigeria is marred with problems. [9] referred to the process of examinations in institutions of higher education as a “contemporary shame”. This is due to phenomenon of examination malpractice that has become endemic in the educational system [10]. This include massive examination leakages, demand for gratification by teachers, bribe-taking by supervisors and invigilators of examinations have become a global phenomenon [11].

This menace has resulted to general fallen standards of education and Nigeria is no exception, particularly among developing nations [11]. As a result of this, institutions of higher education in Nigeria have resulted to conducting computer aided post-entrance “Post-JAMB” examination because of lack of confidence in the conduct of the entrance examinations. However, this system only solves the problems of exam malpractice during admission process. In Nigeria, the last two decades have witnessed an alarming rate of increase in incidents of examination misconduct during term examinations by staff and students [10]. Even though the institutions of higher education have made efforts to address examination malpractice during admission process, this study suggest the need for a system that will address malpractices also during regular term examinations.

3. METHODOLOGY

Qualitative data collection was done at Baze University Abuja, a private university established in 2011 offering British styled education. Data collection was done using interview methods with students and staff of the university between February and March, 2014. The selection of Baze as a case study was as a result of convenience in which the authors are members of the university. The authors examined the current examination process of Baze University and found that the existing system of conducting examination is paper based.

The working process of the existing system are given below:

- **Lecturer setting examination and dean approval is the first process.**
  After ten weeks of teaching a lecturer is required to come up with examination questions and submit the questions to the dean of the faculty, the dean reviews the question and makes modification when the need arises. The dean sends the questions back to the lecturer or approves the questions and forwards it to the exam officer.

- **Student attendance (75% to sit for an examination).**
  After eleven weeks of teaching, student’s attendance is calculated for each course, students with less than 75% attendance will not be registered to sit for the course exam and they will be notified on the notice board.

- **Students sitting for examination.**
  All students that are eligible to sit for an examination will go to the exam hall and sit waiting for the start time, question papers and answer sheets have been provided to students. Students start exam at specified time. After the examination, papers are collected and given to lecturers for assessment and grading. After about three weeks students get feedback as regard to the examination. In the case that a student feels he/she has not been graded fairly, he/she is required to pay a particular sum for a re-assessment.

Interview findings after analysis shows that majority of staff find the examination process as time consuming and prone to exam misconduct. Hence, the authors proposed a new system to automate all the existing manual examination processes and address the aforementioned setbacks. The waterfall model was adopted in the design methodology of this study. The software development of the system started in June and was completed in July 2014. In the requirement phases, the system end-users which comprises of students and lecturers were approached for interview in order to ascertain their objectives, goals, requirements and expectations from the new system.

In the design phases, the system design and architecture was developed in order to capture the end user requirements. This include the use of activity diagrams, use case diagrams, entity relationship diagrams, context diagram and sequence diagram. In the implementation phase, the authors concentrated on the actual development of the system by producing the graphical user interface using Java programming language on the Netbeans 8.0 integrated development environment and MySQL server. In the testing phase, we applied unit testing in order to test the
individual units of the components source codes. Finally, the maintenance on carrying out activities to check on the sustainability of the software after future deployment was conducted.

3. CONCEPTUAL DESIGN OF THE WEB BASED EXAM SYSTEM

Conceptual design of the system gives a high level overview of the design and this was carried out using the use cases, activity diagram and entity-relationship diagram.

(i) Use Case Diagrams for the System

Use case diagram for the users of the system are presented in this section. The use cases diagram were provide for four actors of the system namely: Administrator, Dean, Lecturer and Student.

Figure 1 presents the administrator use case diagram; it shows the activities that the administrator is able to achieve using the system. It includes: creating new user, modifying existing user, viewing exam question, creating new course, modifying existing course, setting timetable, viewing result, changing password, reading about the system.

Figure 1. Administrator use case diagram

The Dean use case diagram is shown in figure 2; it presents the activities that the dean is able to achieve using the system. This includes: receiving exam questions, sending questions to admin, modifying exam questions, sending updates and changing password.

Figure 2. Dean use case diagram

The lecturer use case diagram is shown in figure 3; it presents the activities that the lecturer can achieve using the system it includes: setting exam questions, modifying exam questions, sending updates to dean, changing password.

Figure 3. Lecturer use case diagram

The student use case diagram is shown in figure 4; it presents the activities that the student can achieve using the system, it includes: taking exam and viewing result.

Figure 4. Student use case diagram
(ii) Activity Diagram for the System
Several activity diagrams have been created for the system but for the purpose of this paper a sample activity diagram is presented. Figure 10 presents the login activity diagram for the system which illustrates the activities that occur during process of logging into the system.

![Login Activity Diagram](image)

Figure 10. Login Activity Diagram

(iii) Entity-relationship diagram for the system
The entity-relationship diagram is a model that represents the data and information in a high level of abstraction. Figure 5 shows the entity-relationship diagram.

![Entity-relationship diagram](image)

Figure 5. Entity-relationship diagram

4. FUNCTIONAL PAGES OF THE SYSTEM
The section below provides the various functional pages of the system.

The Login Page
The login page is the default page of the system. This is where all the users are validated and redirected to their respective user interfaces, an id number and password field are provided as well as check boxes for every user. The academic staff is a combination of both the lecturer and dean, the system will automatically detect the role of the user using their id number. This page is depicted in figure 6.

![Login Page](image)

Figure 6. Login Page

The Administrator Home Page
The Administrator homepage is where the administrator has a list of options displayed for selection. The options range from creating a new user, deleting existing users, viewing and editing existing users, viewing examination questions, creating/deleting new courses, viewing and editing courses, setting examination timetable, viewing results, changing password and viewing information about the application. Figure 7 depicts the administrator home page.
Figure 7. Administrator Home Page

The Question Page
This page is used by the student to take examination. The page in figure 8 is the page that allows student to take examination, examination questions are randomly gotten from the question table in the database and displayed to the student. The student selects a radio button that corresponds to the appropriate answer. At the end of the exam, result is displayed to the student and stored in the database.

Figure 8. Question Page

The Result Page
The result page is presented in figure 9. This page enables the student to view exam result after they have taken the exam, it displays the students ID number, the course code of the exam taken, the date of the exam, and the marks obtained by the student.

Figure 9. Result Page

5. TESTING
The authors carried out unit testing to ensure the various modules of the system performed their specific task. By doing this, we were able to find errors in code and logic that are contained within the module. Below is a sample test table from our study.

<table>
<thead>
<tr>
<th>Test No</th>
<th>Testing Description</th>
<th>Input</th>
<th>Expected Result</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>R101</td>
<td>Select Administrator checkbox and input unknown Id number</td>
<td>Id number: bighghh</td>
<td>Display &quot;Please input a valid Id number and Password&quot;</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td>Password: byhy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R301</td>
<td>Select administrator checkbox and blank Id number when</td>
<td>Id number: (null)</td>
<td>Display &quot;Please input a valid Id number and Password&quot;</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td>logging in</td>
<td>Password: byhyg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 9. Test Table Page

6. CONCLUSION
In this paper, the authors have evaluated the existing examination process in Nigeria and proposed a web-based examination system for adoption in Nigeria universities. The current challenges facing the existing examination process in this study include high cost of printing papers, manpower examination malpractice, and human errors during marking, omission of students result, inadequate examination venues and invigilators. A web based examination system was designed and developed using Java and MySQL to address all these challenges.

However it should be also noted that the implementation of this system requires other social factors such as infrastructural support, electricity supply, and skilled ICT workers and so on for a successful implementation. Our system is limited to multiple choice based question and was developed under a severe resource constraint. Thus, there is scope for undergoing more studies that would take into account theory based questions.
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