A SURVEY OF E- EXAMS SYSTEM IN NIGERIAN UNIVERSITIES WITH EMPHASIS ON RESULT INTEGRITY

Adebayo, O. S. [1], Saliu, A. M. [2] & Shafi'i, M. A. [3]
Department of Cyber and Security Science[1],
Department of Computer Science[2],
Federal University of Technology Minna, Niger State, Nigeria[2].
E-Mail: (waleadebayo, shafii.abdulhamid)@futminna.edu.ng, salihu_adam@yahoo.co.uk)

Abstract

The recent employment and eventual widespread acceptance of electronic test in examining students and various classes in Nigeria has created a significant impact in the trends of educational history in the country. In this paper, we examined the impacts, associated challenges and security lapses of the existing electronic-examination system with the aim of ameliorating and developing a new acceptable e-Exam system that takes care of the existing system's challenges and security lapses. Six Universities that are already conducting e-Examination were selected across the country for this research work. Twenty (20) students that participated in the e-exams and five (5) members of staff were selected for interview and questionnaire. Based on the analysis of the interviews and study of the existing electronic examination system, some anomalies were discovered and recommendations were made in order to correct the anomalies.

Keywords: Electronic Examination (e-exams), e-learning, Biometric Fingerprint, Cryptography, Result Integrity

Introduction

Electronic examination has been highly interested and suitable in both educational and pedagogical aspects. Examination is one of the best methods of evaluating the knowledge and ability of an individual. To this end, various methods has been employed in examining the ability of an individual, starting from manual means of using paper and pencil to electronic, from oral to written, practical to theoretical and many others.

The present information technology means of examining students is the use of electronic systems in place of paper and pencil method which was characterized by massive examination leakages, impersonations, demand for gratification by teachers, bribe-taking by supervisors and invigilators of examinations.

The employers are conducting aptitude test for their job seekers through electronic means; the universities and other tertiary institutions are registering and conducting electronic examination for their students through the internet and other electronic and networking gadgets, various examination bodies in the country like the West Africa Examination Council (WAEC), National Examination Council (NECO), National Board for Technical Education

(NABTEB), National Teacher Institute (NTI) and so on. register their students through electronic means, recently electronic examination has been widely adopted by nearly all the Nigeria University for post Unified Tertiary and Matriculation Examination (Post-UTME) otherwise called pre-admission screening. With these aforementioned and many more educational bodies engaging in electronic examination and registration for testing the ability of their candidates, which determine the future o this country and her teeming youth, there is need for serious examination of the system which has great impacts on the populace.

Prospects

E-exams simply the process by which examinations are delivered, taken and scored electronically. It entails questions being deployed onto computer workstations (intranet and internet) and candidates answering the questions on to the computer. The process of writing exams is thus completely paperless. It is sometimes referred to as CBT (Computer-based testing) or CBA (Computer-Based Assessment). This testing method is now being extensively used in many parts of the world today. The use of e-exam simplifies the entire testing cycle, including generation, execution, evaluation, presentation and archiving. This simplification saves time and money while improving reliability. Advocates for the e-exams models argue that it not time-consuming but rather time saving, (McCormack and Jones 1998, Ryan et al 2000) and identify these advantages:

(i) Time saving; as assessments can be created using software tools and adapted and reused as needed. They can be distributed and collected using a web-based system which saves development and distribution time.

(ii) Reduces turnaround time; as the systems enables assessments to be corrected by computers. Reduces time further enables students to use the knowledge obtained from corrected assessments to address further assessments sooner.

(iii) Reduces resources needed by replacing human resources with computer resources.

(iv) Keeping records of results that can be stored centrally and assessed by interested parties, such as students and staff.

(v) A key element in computer-based testing is that fewer people are required to supervise each examination. This will result in considerable cost savings. While the thought of a computer-based assessment or electronic assessment may intimidate those who are unfamiliar with a computer, electronic tests require only minimal computer knowledge

and will offer a familiarity tutorial allowing the test-taker to get acquainted with how to move the mouse, answer questions and move through the test. With computer-based assessment comes the possibility of radically changing how assessments are implemented and improving the quality of the information they can yield.

(vi) Increasing ease with which data can be used as corrected assignments corrected and stored electronically can be analyzed easier and the data can be used in spreadsheets and other statistical packages.

(vii) Now-a- days institutes are organizing exams online. In this module a user can give online exam of a particular subject and get the results instantly through which the user can know his/her potential and how much more effort he/she needs to put in to get better marks. No time is spent on evaluation that means results are available instantly.

(viii) The best available physical and data security techniques to protect the integrity of our tests and to ensure that each candidate takes the exam in a controlled environment. We are proposing stringent security policies and procedures to protect the content of all examinations, ensure that candidate taking the test is the person he/she is supposed to be, ensure that the candidate takes the test unaided and maintain security of data concerning the candidate and the testing session.

Literature Review

There is a growing body of research focused on developing better ways to manage e-exams systems and e-learning systems. Some of these researches focused on various sections of the system and these include:

Schramm (2008) looked at an e-learning web based system that could simply offer and grade mathematical questions with infinite patience. Therefore it needs the capability for in and output of mathematical formulas, the dynamic generation of plots and the generation of random expressions and numbers. Al-Bayati and Hussein (2008) presents an applied Generic Software of multiple kinds of e-exam package; this package of e-exam is oriented to Hearing Impaired (HI) persons. Therefore the exam material of this package is translated into language of HI persons like sign language and finger spelling. The idea of the Generic software is to present an empty templates to the teacher who would like to develop his required e-exam for the needful topic (mathematics, language, science, etc) and desired set of exam kinds (multiple choices, matching between words, fill in blanks and many others).

Web-based Examination System is an effective solution for mass education evaluation (Zhenming et al, 2003). They developed a novel online examination system based on a Browser/Server framework which carries out the examination and auto-grading for objective questions and operating questions, such as programming, operating Microsoft Windows, editing Microsoft Word, Excel and PowerPoint and so on. It has been successfully applied to the distance evaluation of basic operating skills of computer science, such as the course of computer skills in Universities and the nationwide examination for the high school graduates in Zhejiang Province, China. Another paper (He, 2006) presents a web-based educational assessment system by applying Bloom's taxonomy to evaluate student learning outcomes and teacher instructional practices in real time. The system performance is rather encouraging with experimentation in science and mathematics courses of two local high schools.

Another paper proposed web based online examination system (Rashad et al, 2010). The system carried out the examination and auto-grading for students exams. The system facilitates conducting exams, collection of answers, auto marking the submissions and production of reports for the test. It supports many kinds of questions. It was used via Internet and is therefore suitable for both local and remote examination. The system could help lecturers, instructors, teachers and others who are willing to create new exams or edit existing ones as well as students participating in the exams. The system was built using. various open source technologies AJAX, PHP, HTML and MYSQL database are used in this system. An auto-grading module was generalized to enable different exam and question types. The system was tested in the Mansoura university quality assurance center. The test proved the validity of using this kind of web based systems for evaluates students in the institutions with high rate of students.

An online website for tutoring and e-examination of economic course aimed to present a novel software tool can be used for online examination and tutorial application of the syllabus of economic course (Emary & Sondos, 2006). Also, among the main interests of the paper is to produce a software through it we make sure that students have studied all the concepts of economics. So, the proposed software is structured from two major modules: The first one was an online website to review and make self-test for all the material of economic course. The second part is an online examination using a large database bank of questions through which level of students can be evaluated immediately and some statistical evaluations can be obtained. The developed software offers the following features: 1) Instructors could add any

further questions to maximize the size of the bank of questions. 2) Different examinations for each student with randomly selected questions from the bank of questions can be done. 3) Different reports for the instructors, students, classes and so on can be obtained. 4) Several students can take their exams simultaneously without any problem inside and outside their campus. The proposed software has been designed to work base on the client server architecture.

Electronic exam is a difficult part of e-learning security (Huszti and Petho, 2008). The paper describes a cryptographic scheme that possesses security requirements, such that authenticity, anonymity, secrecy, robustness, correctness without the existence of a Trusted Third Party. The proposed protocol also provides students a receipt, a proof of a successful submission, and it is based on existence of anonymous return channels. Another research work proposed a theoretical approach that incorporates available fingerprint biometrics authentication technologies in conjunction with e-learning environments to curb unethical conduct during e-learning exam taking (Levy and Ramim, 2007). The proposed approach suggests practical solution that can incorporate a random fingerprint biometrics user authentication during exam taking in e-learning courses. Doing so is hypothesized to curb exam cheating in e-learning environments.

Ayo, Akinyemi, Adebiyi, & Ekong (2007) proposed a model for e-Examination in Nigeria where all applicants are subjected to online entrance examination as a way of curbing the irregularities as proposed by the Joint Admissions Matriculation Board (JAMB), the body saddled with the responsibility of conducting entrance examinations into all the Nigerian universities. This model was designed and tested in Covenant University, one of the private universities in Nigeria. Their findings revealed that the system has the potentials to eliminate some of the problems that are associated with the traditional methods of examination such as impersonation and other forms of examination malpractices. Based on the development of e-learning in the only Open University in Nigeria (Ipaye, 2009) discusses the process of establishing e-learning environment. Another paper seeks to solve a part of that problem by designing and developing a web application where tests in multiple choice formats will be taken online and graded immediately (Akinsanmi, Agbaji, & Soroyewun, 2010). The web application relies solely on Microsoft developed technologies. It runs on the Microsoft.net framework, uses the ASP.NET web server, C# as the intermediate language, ADO.NET to interact with the relational database and Microsoft SQL server as the relational database.

Analysis of the Existing Systems Used In Nigeria

In Nigeria, very few Universities have started using the e-exams system for their test/exams and these includes Federal University of Technology Minna, University of Ilorin, Covenant University Ota, Nigerian Open University of Nigeria (NOUN), to mention but a few. In all the six Universities visited in the course of this research, they are all operating almost in the same way. Only NOUN uses internet for the e-exams, while others uses intranet setup within the University environments. The intranet was setup in e-exams centers containing 50 to 200 computer systems and a server. Another observation made was that most of these centers are being managed by private company (Electronic Test Company Limited) which is not so good for the integrity of the results.

Architecture of the Existing System

Ayo et al (2007) and Akinsanmi (2010) presented a 3-tier architecture comprising the presentation tier, the logic tier and the database tier. The presentation tier offers an interface to the user, the logic tier serves as the middleware that is responsible for processing the user's requests, while the database tier serves as the repository of a pool of thousands of questions. It also consists of other modules for authentication (using User name/Registration Number and Password) and computing results. This is the architecture used by all the e-exams centers visited within Nigeria and it is also the same architecture that was used even in other countries with just little modifications. This type of architecture did not give security issues too much attention and impersonation is very likely.

Method of Preparing the Questions

The first step in preparing the e-examination questions is to ask the lecturer in-charge of the course to submit the questions to the administrator at the center via the faculty/school exams officer some days before the commencement of the actual exams. The second step is for the administrator (mostly private operator) to enter the pool of questions into the database. The last step is to set the timing for the exams. The implication here is that, when examination questions passes through so many hands it is likely that the questions may leak, especially when a private individual is involved.

The major aim of the research work is to determine the acceptability or otherwise of the existing electronic system of examining students in our tertiary institution and come out with a new design (Secured e-Examination) based on the deficiency of the existing system

E-Exams Result Presentation/Checking

In most of the centers visited in this research work, students don't get to see their results immediately after the exams. In some cases, the results may take weeks or even months before it is made available to the students. This violates one of the main essence of introducing e-exams (instant access to results). This may give room for alteration of students result. There is also no room for the users to see the correction of their tests if they so wish.

Methodology

Six Universities that have been engaging electronic examination were participated in this study across the country, where twenty (20) students (15 male, 5 female) were selected from each University for the interview and questionnaire purposes. Also five (5) Lecturers were selected from each University for the interview on the impacts of electronic examination on their students' performance. University of Ilorin, University of Lagos, University of Nigeria Nsuka, Covenant University Ota, Nigeria Open University of Nigeria and Federal University of Technology Minna.

Interviews and Questionnaire

The interview was conducted for the students that have undergone e-Examination for post-UTME and internal universities e-Examination. The questionnaires were also distributed to both students and staff members whose students had been evaluated using e-Examination. The questionnaire consisted of 4 essay questions and 20 scaled items concerning the examinees' acceptance of the Secured Electronic Examination (SEE), and its usability. A scale from 1 (total disagreement) to 5 (total agreement) was used.

The result of the interview was analyzed in the Table 1:

Table 1: Presentation of the questionnaire

University	Students				Lecturers			
	Good/ Acceptance	Fair	Rejection	Indifference	Good/ Acceptance	Fair	Rejection	Indifference
University of Ilorin	5	15	5		2	3	2	
FUT Minna	10	10	4		2	2	1	1
Convenant, University Otta	5	15	3		1	4	3	
University of Nigeria Nnsuka	5	13	4	2	1	4	2	
NOUN	5	14	2	1	2	3	1	
University of Lagos	5	15	2		3	2	1	
Total	40	77	20	3	11	18	10	1

Data Analysis and Interpretation

From the table above, it was discovered that out of 140 students that were interviewed, 40 students accept that the present e-Examination is good enough, 77 students attest that the existing system is fair but need to be improved, 20 students reject the use of existing system while only 7 students were indifferent to the interview. Also, out of 40 lecturers across the Universities participated in the interview, 11 lecturer attested that existing e-Examination is good enough, 18 lecturers has one or more complains about the system but agreed that it is fair but need an improvement while 10 lecturers reject the system and only one lecturer did not respond to the questions.

The deduction from the table was that the majority of the students and staff prefer e-examination to manual methods of examining students but want improvement on the system

From the table above:

1. Good /Acceptance implies that the existing e-Exam is accepted
2. Fair implies that the existing e-Exam is partially accepted i.e require further improvement
3. Rejection implies non acceptance and requirement of total overhauling of the system
4. Indifference signifies non-responded to the questions

Recommendations

Based on the finding of the research, the following are highly recommended:

(i) The questions of the test should be sent online to the e-center and not through the human transmission.

(ii) That the questions should be encrypted and decrypted through the encryption algorithm in order to enhance the security of the question.

(iii) That the software of the question should be designed in such a way that the result should be release to the student immediately after the examination.

(iv) That there should data capture machine to monitor and reveal the activities of participant.

Conclusion

It was discovered during the survey that majority of students and staff in higher institution learning prefer e-exams to paper and pencil method of examination. It was also discovered that many stakeholder urge for an improvement in the present e-exams system in order to enhance security and integrity of the system and reduce the associated problems. These problems includes human interference, impersonation, bribe-taking by lecturers, invigilators and supervisors, too much paper work, examination leakages and also reduce the number of invigilators needed for invigilators. The security will be more effective through use of biometric fingerprint authentication, picture capture and data encryption and decryption.

Candidates screening should be online and real-time. The improved online system have the tendencies of increasing computer literacy, online learning and network security awareness. The result integrity could also be enhanced if the candidates have access to instant result checking. The new system should also allows the students to check the corrections at their own wish after the exams.

References

Akinsanmi, O., Agbaji, O. T., R. & Soroyewun, M. B. (2010). Development of an e-assessment platform for Nigerian universities. *Research Journal Applied Sciences, Engineering and Technology* 2(2), 170-175.

Andrea, H. & Attila, P. (2008). *A secure electronic exam system.* Informatika a: felsőoktatásban. (1-7).

Ayo, C. K., Akinyemi I. O., Adebiyi, A. A. & Ekong, U. O. (2007). The prospects of e-examination implementation in Nigeria. Department of Computer and Information Sciences, Covenant University, Ota, Nigeria. *Turkish Online Journal of Distance Education-TOJDE* 8(4) 125-135.

Babatunde, I. (2009). E-learning in a Nigerian open university. *National Open University of Nigeria*, page 1-11. bipaye@gmail.com

Ibrahiem, M. M., Emary, E. L & Jihad, A. A. & Abu, A. (2006). An online website for tutoring and e-examination of economic course. *American Journal of Applied Sciences* 3 (2), 1715-1718, ISSN 1546-9239.

Lei, H. (2006). *A novel web-based educational assessment system with Bloom's taxonomy, current developments in technology assisted education.* (1861-1865).

Magdi, Z. R., Mahmoud, S. K., Ahmed, E. H. & Mahmoud, A. Z. (2010), An Arabic web-based exam management system. *International Journal of Electrical & Computer Sciences IJECS-IJENS. 10 (01), 48-55.*

Maha, A. A., Karim, Q. H. (2008). *Generic software of e-exam package for hearing impaired persons (Mathematics As Case Study)*. 2nd Conference on Planning & Development of Education and Scientific Research in the Arab States, (955-962).

Martin, R. F., Veronka, K, Matthias, H., Franz, R. & Jana, J. (2005). *A modified electronic key feature examination for undergraduate medical students: Validation threats and ", medical teacher.*

McCormac, C. & Jones, D. (1998) *Building a web-based education system*. New York, USA: Wiley Computer Publishing.

Nur'Aini binti, A. R., Omar, B. M. & Chow, S. Y. (2002). *e-Learning management system for secondary school in Malaysia.* International Conference on The challenge of learning & teaching in a brave new world: Issues & opportunities in borderless education. The JB Hotel, Hatyai, Thailand, 1-10.

Ryan, S., Scott, B., Freeman, F. & Patel, D. (2000). The virtual university*: The Internet and resource-based learning*. London: Kogan Page.

Thomas, S. (2008). *E-assessments and e-exams for geomatics studies. Department of Geomatics Hafen City University Hamburg Hebebrandstraße* 1,22297 Hamburg, Germany. Retrieved from *http://www.hcu-hamburg.de/geomatik.*

Yair, L. & Michelle, M. R. (2007). *A theoretical approach for biometrics authentication of e-exams.* Nova Southeastern University, USA. (93-101).

Yuan, Z., Zhang, L. & Zhan, G. (2003). *A novel web-based online examination system for computer science education*. 33rd ASEE/IEEE Frontiers in Education Conference, S3F-7-S3F-10.