COMPUTER-BASED TESTING IN NIGERIA'S UNIVERSITY ENTRANTS' MATRICULATION EXAMINATION: READINESS AND ACCEPTABILITY OF CRITICAL STAKE-HOLDERS

BY

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ABSTRACT

Entrants into universities in Nigeria are selected through a nation-wide paper-and-pencil Unified Tertiary Matriculation Examination administered by government-established body called Joint Admission and Matriculation Board (JAMB). In 2013, JAMB introduced computer-based testing (CBT) version of this selection examination, with the plan of making the CBT version the only one in the next few years. There were mixed reactions to this critical innovation in large-scale assessment in Nigeria. The purpose of this study was to determine the acceptability and readiness levels of critical stake-holders (students) to this innovation. The research design was survey. The sample for the study comprised 600 final year students in 10 secondary schools in Cross River State, Nigeria, using stratified random sampling to take care of gender, school location and school proprietorship variables. A structured questionnaire (with reliability of .81) was used to collect data, which were analyzed with percentage, mean, t-test and ANOVA. The results indicate that the level of readiness for CBT is high, but that of acceptability is moderate, with a relatively higher preference by students federal government owned and privately owned schools. It is concluded that Nigerian students are supportive of innovations that would ensure international best practices in the nation's school system.

(Keywords: e-assessment, computer-based testing, students' perception)

Introduction

Information and Communication Technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding it and mastering its basic skills and concepts as very crucial in education. This is because it adds value to the processes of learning and to the organization and administration of learning institutions. It encompasses different types of technologies, which are utilized for capturing, processing and transmitting data and information, using computer facilities. It is an umbrella term that includes communication device or application, encompassing radio, television, cellular phones, computers, network, hardware and software, satellite systems and so on, as well as the various services and applications associated with them (Kumar, 2006). Thus, ICT focuses specifically on the application of these new technologies in an educational context and environment, and serves as a tool for supporting the various components of education. Such components include, among others, teaching and learning, resources management (human, material, financial resources) and admission and examination processes also known as learning assessment. One specific form of ICT for assessment is the Computer-Based Testing (CBT), also known as Computer-Based Assessment or e-assessment/testing. It is a method of administering tests in which the responses are electronically recorded, assessed, or both. It is commonly available for several admissions tests throughout the developed countries.

Computer-based tests offer several benefits over traditional paper-and-pencil or paper-based tests. Technology based assessment provide opportunities to measure complex form of knowledge and reasoning that is not possible to engage and assess through traditional methods (Bodmann & Robinson, 2004). In Nigeria, employers now conduct aptitude test for 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. Similarly, different examination bodies in the country such as West Africa Examination Council (WAEC), National Examinations Council (NECO), National Business and Technical Examination Board (NABTEB), and National Teachers' Institute (NTI), among others register their students through electronic means (Olawale & Shafii, 2010). Computer 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 (Mubashrah, Tariq & Shami, 2012).

In Nigeria, the mandate to conduct entrance examination into tertiary educational institutions (Universities, Polytechnics, Colleges of Education & related/similar institutions) is vested in a body called Joint Admissions and Matriculation Board (JAMB). Thus, every year, JAMB conducts Unified Tertiary Matriculations Examination (UTME) and forwards the results to the candidates' institutions of choice for selection and admission. Over the years, the UTME by JAMB has been in a paper and pencil test (PPT) form, and has been characterized by a lot of fraudulent practices ranging from leakage of examination papers, use of machineries of all sorts by candidates, bride taking by examination officials, impersonation, use of unauthorized gadgets, and so on (Osuji, 2012). In order to eliminate or minimize incidence of the vices, and/or other reasons, JAMB in 2013 introduced the computer based testing (CBT) form of UTME and gave massive publicity and sensitization on it. JAMB gave the advantages of CBT to include increased delivery of test items that have been calibrated and delineated according to their pertinent item characteristics (instructional level objectives, difficulty level, discrimination level and functionality of distracters, efficient administration of examination and scoring of tests, reduced costs for many elements of the testing lifestyle and logistics, improved test security resulting from electronic transmission

and encryption for total eradication of breaches of examination security, unbiased test administration, reduction in the spate of examination security breaches, and improvement in the quality and standard of education in the long run.

As expected with any innovation, there were apprehensions and public outcry in the citizenry, among various stakeholders in education generally, and stakeholders in JAMB's mandate. On-the-spot candidates, prospective candidates, parents and guardians, teachers, social critics and commentators, parliamentarians and a cross section of the society rose to the task of either scrutinizing, querying or attacking this innovation by JAMB. Some called for outright cancellation, some called for delayed implementation, some raised questions with genuine aim of understanding the innovation, while some actually supported the innovation and saw in it a means through which Nigeria will be seen as aligning with the rest of the technological world.

JAMB conducted the 2013 edition of the UTME with three test options, namely the traditional Paper and Pencil Test (PPT), Dual-Based Test (DBT), and Computer-Based Test (CBT). The DBT and CBT which were novel introduction were largely successful in spite of some challenges. JAMB has announced that from 2015, CBT will be used to conduct all UTME to achieve the objectives of ensuring 100 per cent elimination of all forms of examination malpractice that had been a major challenge in the conduct of public examinations in the country (Vanguard, 8th November, 2012). It is against these backdrops that this study is designed to determine the readiness and acceptability levels of critical stake-holders (students) to this innovation.

The problem

The apprehension about CBT form of UTME is perhaps understandable given the poor infrastructure in the public institutions of learning, particularly in the rural communities in Nigeria. UTME is primarily taken by students in the final year of secondary schools (senior secondary three - SSIII) and by a large army of such candidates who had failed it, or who had not secured admission, in the previous year(s). These sets of candidates are drawn from different sectors of Nigerian populace (e. g. geographical location, school proprietorship), and therefore possess varied background and varied levels of computer literacy and proficiency. Although JAMB's CBT has come to stay and has been tacitly supported by government, it is necessary to find and out how prepared or ready are these critical stakeholders in CBT, and the extent to which they accept this most recent innovation in Nigerian secondary/tertiary education system. The purpose of this study, therefore, was to determine the level of readiness for, and the level of acceptability of, CBT by senior secondary school students (who are the critical stakeholders in CBT) concerning the recently introduced and soon-to-be adopted way of examining potential entrants into Nigeria's tertiary education institutions, namely the CBT form of UTME. It is also to determine how variables of gender, school location and school proprietorship influence such levels of readiness and acceptability. Thus, five basic research questions guided this investigation, namely: (i) how is the preference of Nigerian secondary school students concerning CBT form of UTME? (ii) to what extent do senior secondary school students have access to computer facilities? (iii) to what extent do senior secondary school students have basic skills in computer operations to make them ready for CBT? (iv) to what extent have senior secondary school students accepted CBT? (v) how are the senior secondary school students' readiness for, and acceptability of, CBT influenced by gender, school location and school proprietorship? The hypotheses to be tested in this study are:

(i) The level of readiness for CBT by Nigerian senior secondary school students is not significantly influenced by the students' gender, school location, and school proprietorship.

(ii) The level of acceptability of CBT by Nigerian senior secondary school students is not significantly influenced by the students' gender, school location, and school proprietorship

Review of Literature

A large body of literature already exists on online assessment using computers and paper, and the attitude and preferences of stakeholders. Research outcomes have supported the fact that when students are motivated and testing conditions are equivalent, there are no differences between the scores obtained via CBT or PPT (Alabi, Issa & Oyekunle, 2012).

Lim, Ong, Wilder-Smith, and Seet (2006) examined medical students' attitude about CBT Vs PPT testing in Singapore. Through an online survey, 213 (53.5%) final-year MBBS students were tested, out of which 91 (79.8%) preferred CBT, 11 (9.6%) preferred PPT format and 12 (10.5%) were unsure. The study found that 42 liked CBT because of good quality of images and independent of assigned seating positions; 22 liked CBT because they could proceed at their own pace; one stated that CBT examinations was fun; 4 enjoyed the convenience of CBT and 6 cited "equality" as the reason they preferred CBT over PPT testing.

Karadeniz (2009) studied the impact of paper based, web based and mobile based assessment on students' achievement. The study revealed that students had positive attitude towards web based and mobile based assessment due to ease of use, and comprehensive and instant feedback. Moreover, most favoured tests were web based and the least favoured were paper based.

Clariana and Wallace (2002) investigated to confirm several key factors in CBT versus PPT assessment. The study used a post-test only design with one factor, test mode (Computer-based and Paper-based). Students' score on 100-item multiple choice items and students' self-report on a distance learning survey were treated as dependent variables. Results showed that CBT delivery impacted positively on students' scores as compared to PPT. The study found that the CBT group out-performed the PPT group. Gender, competiveness, and computer familiarity were not related to this performance difference, though content familiarity was.

A study by Ayo, Akinyemi, Adebiyi and Ekong (2007) on Nigerian University stated that 81.3% of the applicants were computer literate, while the remaining 18.7% were guided through the examination. The total number 1023 (75.7%) of respondents who participated in the e-examination conducted in Covenant University took electronic examination for the first time and as such found the examination easy, a few found it a little challenging but adjusted with time. The study revealed that only 327 (24.2%) of the applicants had not been involved in any form of electronic examination before, and found it difficult. Similarly, other studies have been carried out on computer-mediated examinations, students' perceptions, students' attitude and performance, and found out that students believed the traditional PPT enhanced their performance while CBT had a negative effect, and other varied results (Dermo & Eyre, 2008; George, 2011. Studies on gender influence on students' perception of e-assessment have been done by Kadel (2005), Bebetos and Antonio (2008) and Ayo, et al (2007). The literature has shown both positive attitude and high regard to e-assessment, with more positive perception by female students. Most of these studies used structured questionnaire as instrument. The reviewed studies provided direction for this study.

Methodology

The research designed used in conducting the study was descriptive survey. The target population for the study was the totality of final year (SS III) students in all Nigerian secondary (high) schools, which runs into hundreds of thousands. However, for reasons of feasibility, the sample was selected from secondary schools in Cross River State, one of the 36 States, and one of the six (6) States in the South-South geo-political Zone, in Nigeria. By stratified random sampling technique, ten (10) schools were selected from Southern Cross River State – five schools owned by Federal and state governments, and five schools owned by private/church organizations. A combination of stratified and simple random sampling techniques was utilized to selected equal number of students (150) from Federal government owned, State government owned, privately (individually) owned, and privately (church or Mission) owned schools, giving a total of 600 students in the sample (300 males & 300 females; 350 from urban and 250 from rural areas).

The instrument used for data collection was a structured questionnaire constructed by the researchers and scrutinized by their colleagues in the Research, Measurement and Evaluation units of their Universities. The questionnaire comprised three sections. Section A comprised seven (7) items that sought to verify respondents' access to computers. Section B comprised 12 items that sought to determine respondents' basic skills in computer operations, to establish their readiness for CBT form of UTME. Respondents were to rate their skills on a scale of 1 to 10 section. Section C comprised 12 items of the 4-point likert type that sought to determine the respondents' acceptability of the CBT form of UTME. The reliability estimates of the instrument sub-scales were .78, .82 and .80 for Sections A, B and C (Cronbach alpha).

Results

The results of data analyses are presented as per the research questions and hypotheses

(i) Preference for CBT

Item 1 on the research instrument sought to find out which of the two forms of UTME was preferred by the respondents. Analysis of the responses showed that 79% of them preferred PPT, and only 21% of them preferred CBT.

(ii) Access to computer facilities

Items 2 to 7 on the research instrument were used to verify respondents' access to computer facilities. Analyses of their responses are presented in Table 1.

Table 1
Percentage analysis of the respondents' access to computer facilities

S/N	Items	Yes		No		Can't say		Total	
		F	%	F	%	F	N	F	N
1.	Have you seen a computer before now?	596	99	4	1	0	0	600	100
2.	Have you touched a computer before now?	562	94	38	6	0	0	600	100
3.	Have you operated a computer before now?	516	96	78	13	6	1	600	100
4.	Are there computers in your school for practicals?	371	62	182	30	47	8	600	100
5.	Do you have computer facilities in your home	380	63	220	37	0	0	600	100
6.	If your answer to Q5 is "No", do you have access to computer anywhere at all?	178	81	42	19	0	0	220	100

From Table 1, it is seen that 99% of the respondents asserted that they had seen computer before now, while 94% asserted that they had touched computers before. While

86% agreed to having operated computers before, 62% confirmed that their schools had computers in the school laboratories). The table also shows that 65% of the respondents do have computer facilities in their homes. Out of the 37% who indicated that they do not have computer facilities in their homes, 81% of them asserted that they do have access to computer facilities anywhere. From these high percentages for the responses to the items in Table 1, it can be concluded that a substantial percentage of the respondents – the senior secondary school students in the sample do have access to computer facilities, and therefore the idea of CBT cannot be strange to them.

(iii) Basic skills in computer operations (Readiness for CBT)

Twelve (12) items of Section B on research instrument were presented to respondents to rate their basic skills in computer operations on a scale of 1 to 10. The analysis of their responses with means and standard deviations are presented in Table 2. A cut-off mean of 5.0 for each item and 60.00 for all the items put together were adopted for the comparison.

Table 2
Analysis of respondents' ratings of their basic skills in computer operations (readiness for CBT)

S/N	Items	Mean	SD
1.	Knowledge of basic terms used with computers	8.54	2.45
2.	Ability to put on (boot) a computer.	9.02	2.23
3.	Ability to shut down a computer.	9.15	2.16
4.	Ability to move the mouse/cursor of a computer.	8.94	2.17
5.	Knowledge of functions of different keys on the Keyboard of a computer.	7.60	2.82
6.	Ability to identify different external components of a computer.	8.19	2.57
7.	Ability to type an alphabet or word on the computer.	8.73	2.47
8.	Ability to read information on the computer screen.	9.19	1.83
9.	Ability to send information (e.g. mail) with a computer.	6.41	3.28
10.	Ability to receive information (e.g. mail) with a computer.	6.30	3.34
11.	Your **Experience** in using computer.	7.04	2.90
12	Your **Confidence** to write CBT form of UTME anytime it is brought.	5.93	3.13
	Overall on basic skill in computer operation (Readiness for CBT)	**95.04**	**21.76**

Analysis of responses to items in Table 2 has shown that the mean value for each of the twelve items is substantially higher than the cut off mean of 5.0 (that represents the average level). While the highest mean values were recorded for operations like ability to read information on the computer screen (9.19), ability to shut down a computer (9.15) and ability to boot a computer (9.05), lowest mean values were recorded for operations like ability to send information (e.g. e-mail) with a computer (6.30), and confidence to write CBT form of UTME anytime it is brought (5.93). From these substantially high mean values, it can be concluded that the respondents possess the relevant basic skills in computer operations to enable them take CBT. Thus, they are ready to a high extent to take CBT.

(iv) Acceptability of CBT

Twelve (12) items of Section C of the research instrument were presented to respondents to indicate their level of agreement/disagreement to each. Percentage analyses of their responses are presented in Table 3 ('strongly agree' and 'agree' were grouped into 'agree', and 'disagree' and 'strongly disagree' were grouped into 'disagree'.

Table 3

Percentage analysis of the acceptability of CBT among secondary school students

S/N	Items	Agree		Disagree		Total	
		F	%	F	%	F	N
1.	I see CBT form as a means of increasing failure rate in UTME	228	38	373	62	600	100
2.	I don't think my school has prepared her students well enough for CBT form.	308	51	292	49	600	100
3.	My fear is that electricity will go off when CBT form of UTME is going on.	308	51	292	49	600	100
4.	I fear that the computer may shut down or malfunction when CBT form is going on.	356	59	244	41	600	100
5.	I am worried that CBT form does not allow for "external help" when writing UTME	292	49	308	51	600	100
6.	I fear that I may not know what to do on the computer if I choose CBT form.	266	44	334	56	600	100
7.	I feel that the CBT form of UTME should wait for a few more years before we adopt it.	418	70	182	30	600	100
8.	I don't think I have received sufficient information about CBT form of UTME.	490	82	110	18	600	100
9.	I welcome wholly the application of computer-based testing (CBT) in UTME.	320	54	280	46	600	100
10.	I am excited at the speed of getting results from JAMB after taking CBT form of UTME.	456	75	150	25	600	100
11.	I see CBT form of UTME as making us flow with others in the technological world.	550	92	50	8	600	100
12.	I support the plan of JAMB to administer UTME only in the CBT form from 2015.	347	58	253	42	600	100

Data analysis results in Table 3 indicate that 62% of the respondents disagreed with the statement that CBT form is a means of increasing failure rate in UTME, while 67% agreed that their schools had not prepared them well for CBT, 51% and 59% of the respondents expressed fear that either electricity supply will go off or the computer system used for the CBT will malfunction during the CBT. The table shows that 49% of the respondents expressed worry over CBT as it may not allow for external help (cheating) when the examination is being taken. Only 42% of the respondents expressed fear that they may not know what to do when left alone on the computer to write CBT, and 70% of them opined that CBT form of UTME should wait for a few more years before policy driven adoption of it. As to receiving sufficient information about CBT form of UTME, 82% agreed that they had not. However, 54% of them welcomed wholly the application of CBT in UTME. The speed of getting results after taking CBT form of UTME excited 75% of the respondents, while 92% of them saw CBT as making Nigerians flow with others in the technological world. However 58% of them agreed that they do support the policy declaration that UTME will be only in CBT form from 2015.

From these percentages of agreement and disagreement attached to the responses in Table 3, it can be deduced that the respondents have highly accepted the innovation in CBT, and they are ready to support it; but they have their concerns, fears and reservations, given the typical Nigerian situation in infrastructural challenges.

(iv) Testing of hypotheses

Hypothesis 1

The level of readiness for CBT by Nigerian senior secondary school students is not significant influenced by students' gender, school location and school proprietorship.

A 3-way analysis of variance (ANOVA) was deployed to test this hypothesis, and the result of analysis is presented in Table 5. The result shows that of the three main effects (gender, location and proprietorship), only one (that of proprietorship) was significant at .05 level. One of the interaction effects (sex by proprietorship) was also significant. A cursory look at the group mean values (for proprietorship) and the post-hoc analysis (though not shown in this report) indicated that students from Federal Government owned schools had the highest mean of 100.71, followed by students from privately (mission) owned schools with mean of 98.4, and by students from privately (individually) owned schools with mean of 95.04. Students from the state government owned schools had the lowest mean of 86.01. It is to be noted that each of these mean values is substantially higher than the average/cut-off mean of 60.00. Thus, students' readiness for CBT is not significantly influenced by their gender or school location; it is however influenced by school proprietorship where students in Federal government owned schools are more ready than their counterparts from state government owned schools.

Table 5

Three-way analysis of variance of influence of students' gender, school and school proprietorship on students' readiness for CBT

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	32144.208[a]	14	2296.015	5.343	.000
Intercept	3835609.905	1	3835609.905	8925.419	.000
SEX	780.520	1	780.520	1.816	.178
GeoLoc	28.120	1	28.120	.065	.798
Propietor	12576.134	3	4192.045	9.755	.000
SEX * GeoLoc	505.352	1	505.352	1.176	.279
SEX * Propietor	3826.438	3	1275.479	2.968	.031
GeoLoc * Propietor	1546.115	3	515.372	1.199	.309
SEX * GeoLoc * Propietor	3497.863	2	1748.932	4.070	.018
Error	251397.911	585	429.740		
Total	5702913.000	600			
Corrected Total	283542.118	599			

a. R Squared = .113 (Adjusted R Squared = .092)

Hypothesis 2

The level of acceptability of CBT by Nigerian senior secondary school students is not significantly influenced by students' gender, school location and school proprietorship.

A 3-way ANOVA was deployed to test this hypothesis, and the result of analysis is presented in Table 6. The result shows that of the three main effects (gender, location and proprietorship), only one (that of proprietorship) was significant at .05 level, and none of the interaction effects was significant. A cursory look at the group means (for proprietorship) and the post-hoc analysis (though not shown in this report) indicated that students from state government owned schools had the highest mean of 31.33, followed by students from privately (mission) owned schools with mean of 30.34, and by students from Federal government owned schools with mean of 30.08. Students from the privately (individually) owned schools had the lowest mean of 28.93. Thus, students' acceptability of CBT is not significant influenced by their gender or school location, but it is however influenced by school proprietorship where students from state government owned schools showed more acceptability of CBT than their counterparts from privately (individually) owned schools.

Table 6

Three-way analysis of variance of influence of students' gender, school location and school proprietorship on students' acceptability of CBT

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	771.266[a]	14	55.090	1.745	.044
Intercept	389911.400	1	389911.400	12352.297	.000
SEX	58.895	1	58.895	1.866	.172
GeoLoc	3.705	1	3.705	.117	.732
Propietor	399.375	3	133.125	4.217	.006
SEX * GeoLoc	4.450	1	4.450	.141	.707
SEX * Propietor	132.523	3	44.174	1.399	.242
GeoLoc * Propietor	67.682	3	22.561	.715	.543
SEX * GeoLoc * Propietor	90.793	2	45.396	1.438	.238
Error	18466.052	585	31.566		
Total	565435.000	600			
Corrected Total	19237.318	599			

a. R Squared = .040 (Adjusted R Squared = .017)

Discussion of Findings

One of the findings of this study was that sampled Nigerian final year secondary school students preferred taking PPT to CBT (79% of the sample) showed this preference). This is a little improvement from a report in the Nigerian daily that stated that only one out of 10 persons (i.e. 10%) expressed preference for CBT. The result is quite a reverse of what Lim et al (2006) found in their study, which was that 79.8% of their respondents preferred CBT, although their respondents were final year medical students in a University, unlike final year secondary (High) school students involved in the present study.

This study's findings show that Nigerian final year secondary school students are generally ready for CBT, having rated themselves as possessing the basic computer knowledge and operations to see them through in CBT. This finding is contrary to popular opinions among the public and the press in Nigeria that students lack of the necessary skills to face CBT form of UTME by JAMB, and that there are inadequate facilities in our schools, particularly in the rural communities to adequately prepare the candidates for CBT. The finding of this study shows that the critical stakeholders are quite ready, irrespective of their gender and school location (urban or rural). It is in agreement with the finding of Ayo's, et al (2007) that 81.3% of applicants into a Nigerian university were computer literate; and that of Karadeniz (2009) who found that students had positive attitude toward web-based and mobile-based assessment due to ease of use and comprehensive and instant feedback. The findings also confirm earlier findings of Kadel (2005), Bebetos and Antonio (2008), Dermo and Eyre (2008) and George (2011). The critical stakeholders in CBT in entrance examinations into Nigeria's tertiary educational institutions, the final year students and former graduates of our secondary schools are sufficiently exposed, perhaps through their use of sophisticated cell phones, to the basic skills required for writing CBT form of UTME. It is in the best interest of Nigeria as a leading country in Africa to take the lead in massive use of e-assessment facilities to enhance and maximize effective delivery in the education sector.

Conclusion and Recommendations

From the findings of this study, it is concluded that the introduction of CBT in entrance examination into Nigeria's tertiary educational institutions is very appropriate and timely as it will align Nigeria properly with the rest of the technological world. Such introduction and the planned adoption of CBT as the only form of UTME from 2015 will not jeopardize the interest and chances of prospective entrants into the tertiary educational institutions in Nigeria. In spite of the infrastructural challenges in some parts/communities of the of the nation, the youths, particularly the potential candidates of UTME have had reasonable exposure in technology use to enable them cope with the demands of CBT, which are quite minimal. It is recommended that concerted awareness campaign and advocacy be

mounted by JAMB and other stakeholders to douse off the fear associated with CBT, as most of them are unfounded. Also, JAMB and her accredited agents, educational and other institutions, and other business and interested organizations should intensify efforts in creating more ICT centres for the conduct of CBT, such that candidates do not have to travel far distances to take this examinations.

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