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Modalities for the adoption of e-exams for UTME in Nigeria: Suggesting a model/platform for viable implementation

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ABSTRACT

The Joint Admission and Matriculation Board (JAMB) is making a frantic effort in stamping out widespread examination malpractices, which has threatened its credibility for many years. To this the board is considering introducing e-exams for the Unified Tertiary Matriculation Examination (UTME) in Nigeria amidst a low level of computer literacy, Information Technology (IT) infrastructure and epileptic power supply in Nigeria. This research sets out to examine the modalities and viability of this venture, thereby suggesting a workable platform; a means of achieving this implementation.

Introduction

Examination malpractice has remained one of the major societal ills, eating deeper into the fabrics of the nation's education sector. It cuts across every level of the academic cadre, from the primary to the tertiary. The menace however manifests much more during public examinations, which attracts a higher number of candidates. The first public examination malpractice was recorded in Nigeria during the West African Examination Council (WAEC), West African School Certificate Examination of 1977. In that period, the country recorded widespread cheating as question papers leaked days before the actual exam. It was also told of how some market women used the question papers to wrap crayfish before the exams were sat by candidates. As the years went by, candidates became more daring in their quest to pass examinations, albeit fraudulent means. Leakage of papers became old-fashioned. Candidates became more desperate as to buy machineries to impersonate for them for the purpose of the exams. Some also did double registrations. This allowed him/her hire another person to write the same exam with one registration number, while he/she wrote with another with the same name and identification, thereby giving him/her an edge over others. There are a lot of other antics, ranging from connivance with invigilators/examination officers, use of electronic gadgets such as mobile phones, calculators, among others. Stakeholders have expressed concern about the continued incidence of malpractices in public examinations, which has led to convening of a national summit on examination in 2010, by the minister of education, Prof. Ruqayyatu Ahmed Rufa'i. The situation became so embarrassing that the various examination bodies, including the Joint Admission and Matriculation Board (JAMB), National Examination Council (NECO) and West African Examinations Council (WAEC), were summoned to put heads together to suggest ways of improving on the conduct of examinations.

JAMB, as an agency, had tried several methods of curbing the widespread malpractice in its examinations, all to no avail. It had witnessed one of the most organised cheating; hence the high incidence withheld results and sometimes outright cancellation of centres, where malpractices are reportedly widespread. These method include arranging question papers in sets, by planning the subjects in such a way that people who don't have exactly the same set cannot exchange or communicate in the hall. JAMB also barred the use of mobile phones, and calculators and any other objects capable of aiding candidates in malpractices. The exam body had also gone ahead to provide writing materials, including pencils, erasers, calculators just to ensure unwanted materials do not penetrate into the exam halls. But the agency is not done yet with devising means of stamping out, completely, the menace. In February 2011, JAMB launched an electronic means of capturing candidates' biometric data. This, the registrar and chief executive of JAMB, Prof. Dibu Ojerinde said is another milestone in cutting down on the rate of impersonation and other forms of malpractices witnessed during the Unified Tertiary Matriculation Examination (UTME), that JAMB conducts. The new registration method was designed to electronically capture the biometric data of each candidate and their centres through thumb-printing. Speaking on the innovation, Prof. Ojerinde said the Biometric Capturing System for registration of candidates would be effective for the 2011 Unified Tertiary Matriculation Examination (UTME).(Stella 2011)

On how the new method would work he said: "it is designed to separate the candidates on the basis of centres and therefore candidates are expected to be captured in their various centres and not any other place. The JAMB thumb printing procedure captures the unique data in your body and when you thumbprint, your picture will appear instantly showing the real person. The system has already been test-run in two pilot schools in Bwari to ensure its validity and reliability. Thumb printing done during registration would be repeated at all examination centres before candidates are allowed into examination halls. Candidates must ensure their thumbs are not rough or dented in any way to make the computer reject it. The toes could also be used in place of

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fingers. The process is similar to the voter registration by Direct Data Capture machine." On why the board came up with this method, he explained: "it is a way of curbing examination malpractice, impersonation, lateness to examination halls, and to have a data base of all the candidates. Two schools participated in the pilot scheme and did well in the demonstration of biometric registration using the students. These are: Federal Government Girls School, Bwari, and Government Secondary School, Kaduna where 334 and 274 candidates registered respectively. Ojerinde however identified some of the challenges associated with the thumb-printing to include: thumbs that are dirty may not be captured, chopped off thumbs, and burnt thumbs. These challenges, associated with new things, he said were surmountable as over one million candidates have been registered so far. "We've done preliminary field work. Pranks are being played but we are trying to meet up with some peculiar traits. The Biometric System can forestall cheating and impersonation. Biometrics will tell us if you are late. Your examination will be cancelled for lateness because you may be looking for ways to cheat. There are body scanners used to detect handsets, wrist watches, spectacles etc in which answers can be hidden, although there have not been such cases", the JAMB boss said. Director, Information Technology Services (ITS), in JAMB, Mr. Olujide Adisa at a maiden training session for UTME coordinators and other stakeholders in the conduct of examinations recently, spoke with enthusiasm about the thumb-printing. According to him, "provisions have been made for some expected candidates who, because of their jobs or accident victims, could not be captured or verified as a proof of their genuineness. For instance a bricklayer cannot have his thumb verified, so before such persons would be allowed into examination centres, they must be able to prove to us, and then we flag their registration as exceptional candidates hence their data is captured manually, they would be allowed into examination centres with the use of registers.

On the persistent power outage in many parts of the country, Adisa explained that the "power pack that come with computers, which warehouse all data for the examination centres were stored, have a life span of six hours with another spare battery as back-up. With a three-second verification time per candidate, the life-time of the two batteries is more than adequate. There is also a back-up for every examination centre in all other systems within an examination town, that is, if you have ten centres in an examination town, we then have at least nine back-up systems to service each other. We have also introduced body scanners within a space between verification process and body scanning, so there will be no problem", he enthused. One of the features of biometrics is to capture the time a candidate is verified against his or her data, so only thirty minutes lateness would be allowed on the day of examination, hence someone who is not verified means absent, therefore- no result. JAMB said it is not stopping with the biometrics, as it planning to introduce electronic examination or what it called computer-based examination (Stella 2011). This implies that candidates not only have to register online, but would also write the exams online. The questions are marked instantly at the end of the exams. But there are pertinent questions that need to be addressed. One of which is the level of computer literacy among Nigerians. Apart from this, the country is still grappling with serious epileptic power supply. The depth of computer application, especially in rural areas would be major impediment to JAMB's e-examination dream.

Benefits Of Using E-Exams

1. All students will be treated equally
2. The system will be bought once, the running cost of papers, and photocopy is high.
3. The exams will be prepared in a high standard, all the same format.
4. No one will be able to cheat because the exam will be the same for all students but the questions are going to be displayed randomly.
5. The system support multiple choice questions, true or false and short answers questions.
6. The system will display the result immediately. So the system will save time of correcting the exams, and the results are going to be 100% accurate without any mistakes of the manual correction.
7. All the exams are going to be clear and using the same format, the students will be more comfortable answering computerized exams.
8. Detailed information can be displayed for the school administration or subject teachers like:

- Class average for a specific exam.
- Average for each question, so the teacher can determine if a certain question was not covered well.
- The Best and weak answers questions.
- Report for a specific students in all exams.
- Report about the average time for each exam.

9. Exam security using the activation key to make sure no one can view the exam.
10. Teachers or the IT dept. can prepare the exams from school, home or from any place online using the internet.
11. The system allows the administration to print the exam, the exam model answers or the exams and the answers for a specific student for a specific exam in specific date.

Computer Literacy Survey

In 1987, the Federal Government of Nigeria decided to introduce computer education in the secondary school system and inaugurated the National Committee on Computer Education whose function include planning for a dynamic policy on computer education and literacy in Nigeria as well as devising clear strategies and terminologies to be used by the Federal and State governments in introducing computer education. (Nigerian Tribune, April 11, 1988). The general objectives
of the policy include:

1. Bring about a computer literate society in Nigeria by the mid-1990s.
2. Enable present school children to appreciate and use the computer in various aspects of life and in future employment. (Report on National Committee on Computer Education, 1988).

According to the National Computer Policy (1988), the first objective is to ensure that the general populace appreciates the impact of information and computer technology on today's society, the importance of its effective use, and the technologies that process, manage, and communicate the information. The second general objective is to ensure that the people of Nigeria will know how to use and program computers, develop software packages, understand the structure and operation of computers and their history, and to appreciate the economic, social and psychological impact of the computer. The modalities and the strategies for achieving the stated objectives include:

- ✓ Training teachers and associated personnel
- ✓ Hardware facilities
- ✓ Curriculum development
- ✓ Software developments and evaluation
- ✓ Maintenance of hardware and peripherals

For us to ascertain our readiness to embark on e-examination at the Tertiary institution entry level, we must be able to answer the following questions:

- To what extent have the policy objectives been achieved in schools?
- Do we have the hardware/infrastructure necessary to kick-start this process?
- How many existing examination supervisors are computer literate?

To what extent have the policy objectives been achieved in schools?

Computer education is still limited to Federal Unity Secondary Schools. It is scarcely offered in any of the state secondary schools, which constitutes more than 80% of Nigerian schools. Though some private schools have introduced computer instruction into their school system, the number of schools that offered computer education is negligible compared to the general schools' population. From the questionnaires, the teaching of computer education in the federal government schools is limited to JSS levels only. However, very few private schools offered it at the SSS level. Almost 80% of the junior school students interviewed agreed that they could not operate computers. Therefore, the use of computers in education is rare in Nigerian schools. Also, the computer literate citizenry envisaged almost a decade ago is still a mirage. Very few school children have the opportunity to experience any type of computer instruction in the school.(Philip Olu J. et al, 2003)

Do we have the hardware/infrastructure necessary to kick-start this process?

Since no secondary school can boast of sufficient modern computers to become an examination centre, JAMB will need to use universities with sufficient IT infrastructure as examination centres. But combining all hardware infrastructure in all universities in Nigeria will not be sufficient to carry out e-examination by JAMB because 0.5 to 2 million candidates are expected to sit for the UTME each year.

How many existing examination invigilators/supervisors are computer literate?

For one to be qualified to supervise an e-examination, there have to be a minimum computer literacy capability that such a person must exhibit in addition to needed qualification. Therefore an e-examination supervisor of UTME needs to have some level of computer operational competence to function well. We know that most UTME invigilators are secondary school teachers and supervisors are lecturers in tertiary institution. Cross session of one hundred teachers drawn from thirty secondary schools, 10 federal government colleges and 10 private schools shows that 20% of the teachers are computer literate.

Challenges Of Conducting E-Examination For UTME

In examining the viability of making tertiary institution matriculation exams electronic, we have to highlight challenges that exist and weigh with suggested solutions in-order to determine the way forward. The following challenges exist:

- Prospective candidates are computer illiterate
- Engaging sufficient computer literate invigilators.
- We do not have hardware infrastructure required to organize e-examination for expected number of candidates.
- Bandwidth for centralized network administration.

Platform For Viable Implementation

In suggesting a platform of implementation, I am going to examine each challenge and suggest a survivable solution in our present context.

(a) Computer Literacy: There is a long-term and a short term solution of making sure that a candidate attains a required level of computer literacy before taking the examinations. It will not be fair for JAMB to organize a UTME e-examinations for candidate that their electronic operational competence is just being assumed because the examination is not on computer operation but on the subjects of the candidates choice. As provided in the secondary schools curriculum, all candidates at that stage should be able to read, write and communicate effectively in English Language. In the same light, candidates should be given a pre-trainning covering all the equipment operational requirements before the examination date. This will mean that the candidate will be charged a token in addition to the cost of entry/form sufficient for one week equipment operational training. This amount should be subsidized by the government at the pilot stage. The long term solution is to activate the report on National Committee on Computer Education(1988), with a view to implement based on the current technological trend on information technology. With this, Computer appreciation/education can be introduced as a subject in the Junior and Senior Secondary Schools, training and re-training of subject teachers such that sufficient manpower can be found in this regard. The government can partner with the Nigeria Computer Society to achieve this goal.

(b) Computer Hardware Infrastructure: Before e-examination of UTME is possible, sufficient computer hardware and infrastructure is needed to cover all the candidates that applied for the examination at a location accessible to the candidates. UTME exams are conducted in many locality so a candidate will not need to travel far from his residence to take the exam. It might not exactly be possible that e-exams can be conducted in all remote areas that the manual UTME exams have been taking place. JAMB will have to organize e-examination centres at least one in each geo-political zone of a state to promote proximity and spread. Each exam centre should have at least 200 networked computers.

In determining the number of computers required (to be deployed) in/to each state to form e-exam centres, we assume an estimate of 1.2 million candidates and divide by each state's population ratio to get table 1.1 below. Dividing by four shows that each centre can conduct the e-exam in four batch (candidates will be divided into four groups to save cost of hardware/maintenance). This can be done by banking equally weighted questions and making a random selection such that each of the four groups take different set of questions. Dividing by four gives us an idea of approximate number of candidates per batch. Taking an average of this gives us 8,000 approximately. It is therefore my solution that 8,000 computers should be targeted per state for effective e-examination administration.

(c) Bandwidth for Centralized Network Administration: Bandwidth is the amount of data that can be transmitted through a communication media in one second. Bandwidth is normally measured in bits per second. In data communication bandwidth is a scarce resource that is not readily available because of the cost. Because of the dominance of satellite communication in Africa, the cost of bandwidth is particularly high for this medium unlike developed countries that use mostly optical fibre as their network backbone; hence the source of Internet. It is therefore of great importance to plan/manage Internet bandwidth where it concerns on-line-real-time communication of this nature (e-examination). The bandwidth will determine the number of computer systems (clients) that can communicate to a central point (server) at the same time. At times, many system (clients) hitting the same web site/server can collapse the entire system because the provided bandwidth at the web site end is insufficient to carry the number of connected clients. It is

therefore imperative to manage bandwidth in a carefully designed network. Two solutions will be provided to ensure effective on-line, real-time communication from entire Country:

[1] Network design

[2] Bandwidth Management

1. Network Design: For efficient bandwidth management, it is important that the entire network be segmented such that the number of computers accessing the central server real-time, online is reduced. In this way bandwidth is preserved. Eight regional servers are to directly access the central server. Each of the eight regional servers is providing communication to servers from five states of the country. In this way, the states server interacts and accesses the candidates then updates the regional server which in turn updates the central server. See Figure 1 below:

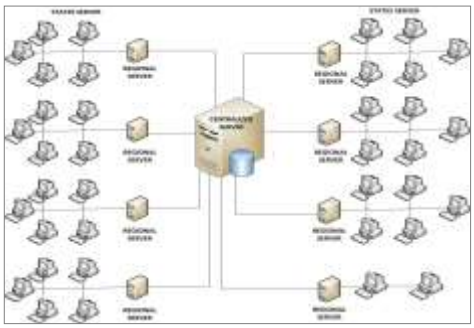


Figure 1: Network Design

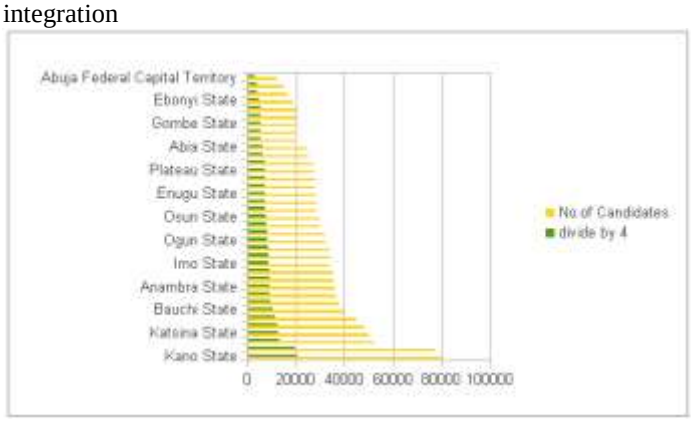
2. Bandwidth Management: Application of Server catching can be used in each of the servers, especially server within each state, to achieve more impact for limited bandwidth. A cache server is a dedicated network server or service acting as a server that saves Web pages or other Internet content locally. By placing previously requested information in temporary storage, or cache, a cache server both speeds up access to data and reduces demand on an enterprise's bandwidth. Cache servers also allow users to access content offline, including rich media-files or other documents. A cache server is almost always also a proxy server, which is a server that "represents" users by intercepting their Internet requests and managing them for users. Typically, this is because enterprise resources are being protected by a firewall server. That server allows outgoing requests to go out but screens all incoming traffic. A proxy server helps match incoming messages with outgoing requests. In doing so, it is in a position to also cache the files that are received for later recall by any user. To the user, the proxy and cache servers are invisible; all Internet requests and returned responses appear to be coming from the addressed place on the Internet. (The proxy is not quite invisible; its IP address has to be specified as a configuration option to the browser or other protocol program.)

Summary & Conclusion

There is a wide disparity between policy pronouncements and policy implementations in Nigeria (Jeter, 2002). The formulation of an information technology (IT) policy constituted only about 20% of the IT solution for the country, but the remaining 80% lies with implementation (Isoun, T.T. 2001). Even though a body was inaugurated to carry out the much larger task of implementation; the Federal Ministry of Education in Nigeria needed to follow suit and form a body that will regulate, monitor, evaluate and verify progress on an on-going basis. The Ministry should be mindful of the reality that educational policies of the past have failed due to poor implementation. The enthusiasm with which the policy was received did not produce the necessary actions (Odogwu, 2000). It seems as if the policy has disappeared with its formulators. Maduekwe (2003) offered a solution to this by calling for the emergence of a 'policy elite' that would act as an informed lobby group to the government, stressing the need for policy implementation. He stated that the emergence of such a policy leadership group would ensure that the policies of previous administrations would not be abandoned. This agrees with Braun, Cicioni and Ducste (2000) suggestions regarding policy implementation in developing countries.

To bridge the gap, both policy and practice need to be implemented. The current policy pronouncements are obsolete and need be updated within the dynamic world of computers. For example, hardware configurations of 16-bit microprocessor, 640 KB memory capacity and 80 - column printer stated in the policy are outdated. The updated policy must be popular and deliverable to all computer teachers in schools so that the teachers will be able to implement the philosophy and objectives of the computer instruction. Regular in-service training for teachers must be in place that includes basic computer operations, programming and teaching methodologies. The training should be made open to private schools as well to ensure uniform standards. In addition, most teachers need retraining in integrating IT techniques into instructional methods. Chen (1995) outlined what this training should include:

- Basic computing skills
- Up-to-date theories of learning and instruction
- Wide ranging applications of IT in education
- IT trends in education and common mistakes of computer use in education
- Software evaluation methods and classroom technology integration



This goes beyond the responsibility of the Federal Ministry of Education. State Ministries of Education within the country should offer training for school teachers and ally with various institutes of education in universities whose primary assignments are the professional development of teachers. This would involve adequate budgetary allocations for such programs.

Furthermore, deliberate effort should be made by the government to fund new hardware to at least meet the stipulated 8-1 student to computer ratios. Making hardware available is a governmental priority. Mozambique's IT priority has established 'Information Technology Access Mobile Units' in the form of buses carrying computers for use by interested people in those areas where infrastructure is not yet available. A similar arrangement can be put in place for schools. A single school computer laboratory can be fully equipped so that other schools within the same area can use it on a rotating basis. For private schools, compliance with the policy hardware provisions should form the basis of school accreditation.

Rank	State	Population	% of Population	No.of Candidates	Divide by 4
1	Kano State	9383682	6.70	80,430	20107
2	Lagos State	9013534	6.44	77,257	19314
3	Kaduna State	6066562	4.33	51,998	12999
4	Katsina State	5792578	4.14	49,649	12412
5	Oyo State	5591589	3.99	47,927	11982
6	Rivers State	5185400	3.70	44,445	11111
7	Bauchi State	4676465	3.34	40,083	10021
8	Jigawa State	4348649	3.11	37,273	9318
9	Benue State	4219244	3.01	36,164	9041
10	Anambra State	4182032	2.99	35,845	8961
11	Borno State	4151193	2.97	35,581	8895
12	Delta State	4098391	2.93	35,128	8782
13	Imo State	3934899	2.81	33,727	8432
14	Niger State	3950249	2.82	33,858	8465
15	Akwa Ibom State	3920208	2.80	33,601	8400
16	Ogun State	3728098	2.66	31,954	7989
17	Sokoto State	3696999	2.64	31,688	7922
18	Ondo State	3441024	2.46	29,494	7373
19	Osun State	3423535	2.45	29,344	7336
20	Kogi State	3278487	2.34	28,101	7025
21	Zamfara State	3259846	2.33	27,941	6985
22	Enugu State	3257298	2.33	27,919	6980
23	Kebbi State	3238628	2.31	27,759	6940
24	Edo State	3218332	2.30	27,585	6896
25	Plateau State	3178712	2.27	27,245	6811
26	Adamawa State	3168101	2.26	27,154	6789
27	Cross River State	2888966	2.06	24,762	6190
28	Abia State	2833999	2.02	24,291	6073
29	Ekiti State	2384212	1.70	20,436	5109
30	Kwara State	2371089	1.69	20,323	5081
31	Gombe State	2353879	1.68	20,176	5044
32	Yobe State	2321591	1.66	19,899	4975
33	Taraba State	2300736	1.64	19,720	4930
34	Ebonyi State	2173501	1.55	18,630	4657
35	Nasarawa State	1863275	1.33	15,971	3993
36	Bayelsa State	1703358	1.22	14,600	3650
37	Abuja Federal Capital Territory	1405201	1.00	12,044	3011

The shortage of teachers is a national problem but designated colleges of education and universities should be assisted in the formulation of successful computer education programs so that within a few years qualified computer teachers will be available to schools. It is difficult and expensive to service and repair computers using computer firms because schools are dispersed all over the nation and computing firms are located only in the cities. It may be necessary to employ computer technicians in state offices of the Federal Ministry of Education so that schools can share as the need arises. Private schools will only have the option of resorting to computer firms.

Above all, adding computer studies examinations in Junior School Certificate Examinations as well as Senior School Certificate Examinations will catalyze serious commitment. Cameroon, for example, has introduced computer education as an examinable subject at the General Certificate of Education Level (Onabanjo, 1997) which has increased computer awareness. Putting these types of practices in place will reduce; if not entirely close the gap between policy stipulations and school practice.

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