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ICT AND ADMINISTRATIVE EFFECTIVENESS OF UNIVERSITY IN NIGERIA: A CONNECT BETWEEN LEADERSHIP AND KNOWLEDGE

AJAH, IFEYINWA A.
Department of Computer Science, Faculty of Science,
Ebonyi State University, Abakaliki, Nigeria.
Ifyajah@ebsu.edu.ng +2348066618032

CHIGOZIE-OKWUM, CHIOMA C.
Department of computer science,
Spiritan University, Nneochi, Abia State.
chiomaokwum@gmail.com,

ABSTRACT

The increasing demand for University education and continuous creation of new faculties to meet admission demand without corresponding increase in infrastructural and human resources to manage University affair bring complexity to the system. In addition, various dimensions of academic corruption are common in tertiary institutions especially in developing countries where Information and Communication Technology (ICT) is not sufficiently and effectively deployed to check mate behavioral excesses of staff and students. This paper therefore presented how ICT connects University leadership and academics (knowledge) for administrative effectiveness of Nigerian University based on secondary data material collected online from related articles, educational forum and data directly gathered from education administrators in Tertiary institution and students' experiences about education administration. It presents various Education ICT tools used in Information administration and learning. Some common corrupt practises that undermine University administration are highlighted and the

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combat strategy using a simple Digital Nervous System (DNS) was proposed to showcase a simple but innovative ICT- enabled interaction among the management, the students and the staff for the efficiency, effectiveness and productivity of administration in Nigerian Tertiary Education. This work will serve as an excellent guide to stakeholders, and University administrators towards improved administrative performance. It will foster the foundation for establishing a viable and sustainable ICT inspired learning.

Key Words: Administration, Corruption, Digital Nervous System (DNS), Information and Communication Technology (ICT), University

BACKGROUND AND RELATED WORKS

Information and Communication Technologies (ICT) is a general term used to describe information technology (IT) (such as computer hardware and software) and telecommunications (including the internet, mobile and landline phones). Education ICT refers to all the technology such as computer, Internet, mobile phones, Videos, content management systems, learning management systems such as Moodle and network used to handle teaching, learning and day to day management of educational institution. Globally, ICT changes the society dynamically. It is influencing all sectors of life including education sector. In the early days, computer is used in an instructional capacity, effectively playing the role of the teacher transferring knowledge to an individual. Nowadays, more collaborative, interactive and online elements is involved. Over the years, ICT stands out by their rapid evolution and revolution, continuously changing the modes of engagement with them. A long-time infusion of computers, and more recently ICT, has demonstrated effective impacts on teaching, learning, research and administrative purposes by lecturers, staff and management team. It provides students and teachers with more opportunities in adapting learning, teaching and managing the individual needs. It enables students to work together and to receive quicker feedback from instructors in a classroom setting and outside of the classroom to maintain interaction with classmates and access to external educational resources. It assists school administrators in improving the functional effectiveness of school system. In general, it provides newer and more effective ways of mitigating some of the challenges being faced by the educational system of a nation (Ahsan, Shuvankar, and Mostafa 2017, Barineme 2015, António and Delfina 2014, Subrata K. D., Sobhan M. A., 2008).

In the current information age, ICT plays a crucial role in improving, teaching, learning, research and administrative processes (Nwankwoala 2015, Ajshola and Olusina 2013, Simin et al. 2013, Krishnaveni and Meenakumari 2010, Adamu 2004). The use of ICT tools in governance/ administration can be referred to as e- governance/ e-administration. With emergence of technology and growing demand of the society, e–administration is widely applied by the developed nations with no chance of a stopping

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point in the near future to better serve their citizens through efficient and effective services, with accountability and transparency. In developing countries, the adoption of ICT tools in Education is happening at a slow pace. Its use in administration is nothing to write home about. This has many reasons, from missing infrastructure to security concerns to teachers not being familiar enough with using ICT in regular classes. Most institutions are still running paper-based Administration while others have deployed shallow automation of their administrative transactions. When appropriately applied, e–administration can effectively ensure the well-being of a university for improved and effective education and administration service delivery, conforming to regulations as per the university statutes and acts. Good deployment and sustainability of ICT in educational institution requires staff and students to be computer literate. The ICT-centre is responsible for the smooth running and management of the ICT facilities. Countries must establish the right policy interventions, resource investments, appropriate networks (partnerships) and enabling environment for the application of ICT for Education to thrive. This work will serve as an excellent guide to stakeholders, University administrators and the foundation for establishing a viable and sustainable ICT inspired learning and resource management. A successful implementation of ICT enabled University administration will deliver information services 24 by 7 that strengthens University's drive towards effective administration, increased transparency, and better management of resources.

METHODOLOGY

The objective of this work is to provide a systematic narrative review of the application of ICT in Nigeria higher education, challenges and combat strategy. The review was based on PRISMA guidelines for systematic reviews (PRISMA, 2009) and was limited to carefully selected peer-reviewed articles published in English between 2001 and 2018, with an abstract available online. The starting date of the search was selected for two reasons: (1) the Nigerian Information Technology Policy which was approved in 2001 and the appearance of the National Information Technology Development Agency made Nigeria an ICT-capable country. (2) there have been improvements in the use ICT in the areas of education, since 2001.

The study followed a two-step process in achieving the objectives. In the first step, titles and abstracts were reviewed for relevance to the topic and to see if they met inclusion criteria. Secondly, the studies were read and categorized by methodology, treatment goal, and focused on higher education process, challenges and combat strategy, ICT possibilities, and digital nervous systems. An extensive literature search using keywords within the study context was conducted in December, 2018. Related literatures were sourced from Google scholar, AJOL, online national dailies and Web of Science electronic databases. The search terms used were selected to broadly examine the potentials, role and impact of ICT in higher education administration. Both

randomized control trials (RCTs) and non-RCTs (e.g., feasibility studies, before-and-after studies, cross sectional studies,) were included. Titles, abstracts, and reference lists of the selected studies were also reviewed to check for other potentially relevant studies. The review was limited to studies of higher education process and administrative challenges, education ICT tools, the use of ICT for teaching, learning, research, and administration in tertiary institution, Corruption and education in Nigeria. There was no limitation on whether it is government on private owned tertiary education institution. Excluded from this review were articles that assessed the ICT potentials, roles and impact in areas of life other than education such as agriculture, health, commerce etc

The steps illustrating the literature search and article review process are shown in the PRISMA flowchart in. Figure 1. The initial search produced 1217 articles. An additional 30 articles were found by looking at the reference list of each article. After checking for duplicates as well as screening titles and abstracts for relevance to the topic, 32 potential full-text articles were obtained, with 14 articles ultimately meeting inclusion criteria after full-text review.

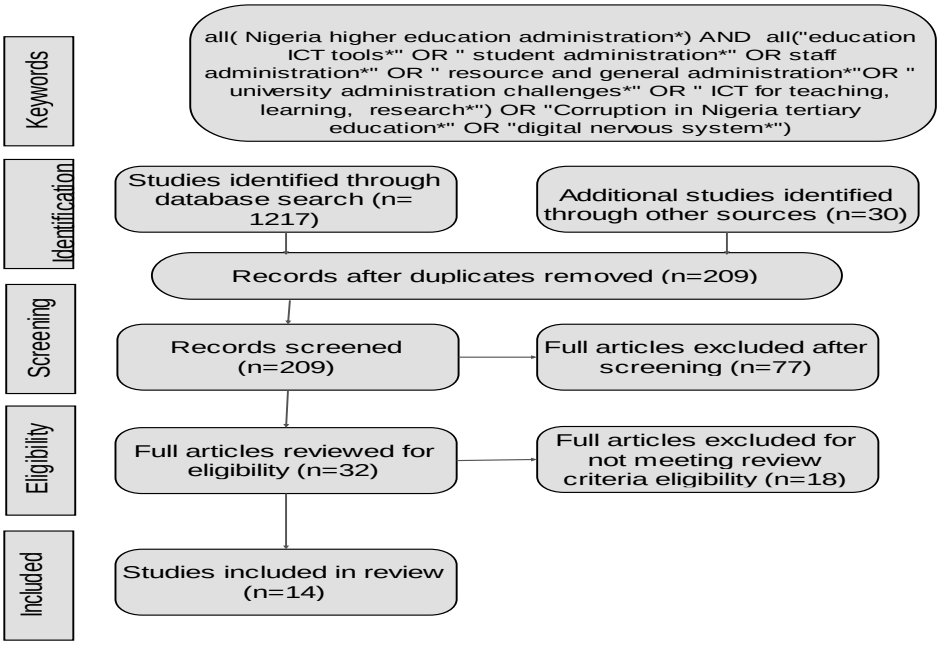

Figure 1: PRISMA Flowchart of Primary Study Selection.

ICT AND UNIVERSITY CONNECTION

University is an institution of higher learning and knowledge is the core business. Their contributions are key to national development. Its principal mission is the generation, dissemination, advancement and application of knowledge in the service of society at the local, regional and international levels. Universities are committed to life-long learning, research, and community service which made them key players in national development. For underdeveloped countries which appeared to be common in the African continent, they play a pioneering role in addressing problems of poverty, social disorganization, low production, unemployment, hunger, illiteracy, and diseases through research, information transfer, and technology development.

In their service to the community and the nation at large, universities are supposed to be of high ethical principles regarding quality and the training they impart and the research they undertake. Attainment of this expectation is made possible through ICT. The essential problems generally confronted by the Universities in developing countries like Nigeria are (a) the meagre resources (b) the growing enrolment compounded with the (c) lack of infrastructure and culturally appropriate ICT system to keep in balance these three. These problems had made University administration complex and had to manage. The resultant effect is poor quality education, misappropriation of fund, poor work attitude, poor and late attendance to lectures, exam malpractice, cultism, favouritism and hijack by politicians, moral hazards, staff exploitation and so on.

Universities in the developed world are adequately funded by the government, industries and wealthy individual and their operations are ICT enabled, which made their administration effective and efficient. Their excellent performance in quality and innovative education delivery attracts massive interest and migration of citizens to study abroad. The decision to travel abroad for quality education cut and cut is risky and unaffordable by the highly populated poor citizens of this country and instant with much patronage by the few wealthy citizens. The gap between the poor and the rich in accessing quality education in Nigeria is huge and requires urgent and serious attention. However, the rich also cries: The return of many rich people ward is disheartening and endowed with alcoholic induced behaviour. The other few that succeeded settle abroad and never think home due to our failed value system.

Back home, the skilled graduates get underemployed and the less skilled remain unemployable by few recruiting organisations. The population that could not find a place in the University end up in kidnapping, robbery related crime and other social vices leaving the immediate society poorer and unsafe. Overall national development by this way come to stagnation and socio-economic activities is greatly crippled. Full implementation of ICT educational tool can bridge the gap between the poor and the rich in accessing quality and culturally balanced education by equipping University administrators with appropriate tools that provides real time information about the

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happenings in the school as well as shorten response time to student, staff and general administration matters. The inter connectivity of different operational units in the University can be perfected using Digital Nervous System (DNS) approach. The ICT enabled university education will assure innovative teaching and excellent learning environment for dissemination of knowledge. It plays a vital role in nurturing/developing intellects that contributes to the economy. Many researches reveal that the integration of ICT helps to reduce the complexity and enhance the overall administration of higher education.

ICT DEPLOYMENT SITUATION IN NIGERIA UNIVERSITY

With the intervention of ICT in university administration, possibilities are endless. Staff, student and general administration is simplified. A scenario where a newly admitted student walk to student help desk to get admission transactions completed in just 5-10 minutes, have school programme and lecture timetable handy, proceed to lecture room in the next minute for classes, from his hostel or accommodation in the town access school portal for lecture material and additional learning resources, interact with his lecturers for further clarification on misunderstood concepts, engage in a healthy academic and social interaction with other students in the university and so on is one possible promise of ICT.

E-administration is yet to find its place in the administration of Nigerian Universities. The development stage is slow compared to that in developed countries. With proper funding from government, industries, private individual, void of corrupt attitude, the development step can be expedited. In Nigeria, the ICT deployment in university business is partial. The staff, management, and student are poorly interconnected and service delivery is slow. The usage level ranges from basic automation level, where the use of standalone ICT tools is mainly for data entry to school portal with limited functionality basically for used for partial registrations and information sharing. There are medium and gigantic ICT centres springing up in many national universities, commendable in the in-house services they provide to a manageable extent but on the other hand seem to be more interested in personalised external contracts that is not channelled to inward development but personalised pocket enrichment. Many challenges faced by the country such as student admissions and tracking, financial management, data distribution, teaching, learning and research, staff appraisals, general administration, security, etc. are expected to be addressed by e-administration. A functional and result assurance deployment requires spider web connected culturally-appropriate system for effective Administrative management. Therefore, to help move the nation foreword through quality education, the full implementation of information and communication technologies should be encouraged and practiced in Nigerian universities

Within a university context, applications of e–administration include services for all stakeholders by means of exchanging information and/or transacting fund. These services differ according to the University vision and mission and ICT capacity of the university. This diversity has given rise to the development of different e–administration applications. To ensure excellent education service delivery in Nigeria, the development of culturally- appropriate administration application should be encouraged towards achieving balanced education that promotes African norms and values.

Many universities took advantage of ICT to improve their activities in teaching, learning, research and development, administration, etc. Significant developments have been made in online teaching and learning. Still, the demand for ICT based services are increasing. Cost-effective technology combined with the flexibility in learning and administrative activities is essential to enhance efficiency. Information administration is one part of overall administration of education institutions which mainly covers general and day-to-day operational activities. Hence, Information administration cycle includes three major components namely, Student administration, Staff administration, Resource administration and General administration. They can be introduced in the following ways:

i. ***Student Administration*** is an important and integral part of information administration. This involves various activities commencing from the admission process to learning activities till processing of results and performance analysis. The integration of ICT into this process enhances the overall admission activities of higher education institutions by making it more accessible to many. Based on the literature review, the important items identified under this category relates to the use of computers and website/portal for admission advertisement and processing. Activities done through this medium include admission enquiry, applying for admissions, registration/enrolment using computers, course registration, availability of information like timetable/class schedule, and attendance monitoring /maintenance. It also includes the various communications relating to transport, hostel accommodation and other communication to guardians/parents. The integration also helps in expansion of the geographical boundaries for student intake, thus facilitating cross-border higher education.

ii. ***Staff Administration*** include staff recruitment and work allotment of faculty and staff in the institution, staff attendance and leave management, and performance appraisal. This also includes relevant communication to and from the institutions and among peers. Staff administration done through ICT helps in the processing of voluminous records in a quick, thorough, and efficient manner thereby making data retrieval easier. It fosters good and effective

communication in higher education system by providing timely information to all concerned. Communication could be for internal and external information acquisition and dissemination. It includes communication between the important stakeholders of the system such as sending e-circulars to students, faculty and staff.

iii. ***Resource and General Administration***: This is a very important part of information administration in higher education institutions that concerns various day-to-day activities of the entire system. The integration of ICT into general administration will lead to increased efficiency and optimal resource utilization. Here, appropriate ICT tools (hardware and software) can be used for personnel records and maintenance, pay roll management, fees payment and financial accounting, inventory management, result processing and transcript, library management and catalogue system, lesson plan and delivery, medical service delivery, and data distribution and management.

DIGITAL NERVOUS SYSTEM (DNS) CONCEPT

DNS is not a program nor a hardware product, but a combination of ICT infrastructures, different software applications, Internet technology, Intranet mobile technology and the web, which enables the efficient exchange of information in an organizational network (Shelkh, Mohammed, and Rashid 2005). Technological development and business development are inseparable, as technology always answers the needs of businesses and businesses adapt to every technological development, such as the Digital Nervous System (DNS). Modelled on the human nervous system, which coordinates each separate system of the human body, the Digital Nervous System coordinates all the internal and external processes of an organization to easily and swiftly obtain information for intelligent decision making. DNS also revolutionized the traditional information flow and knowledge sharing between the employees and the organisation. Through the use of intranets (internal network), employees can access and easily share information on their own, anytime they need it. Personal computers entered the corporate world and lessened the need for manual paper-based procedures. During the 1970s, large corporations even used EDI (Electronic Data Interchange) as a different approach to send information on networks. Unfortunately, it proved too expensive for small organisations and not flexible enough for big organisations. Furthermore, it cannot efficiently handle some delicate business activities and transactions. Intranets and extranets have become the modern backbones of effective modern business management and of many e-commerce activities. In the "Digital Era", they constitute the "Digital Nervous System". Microsoft is one of the first companies that adopted DNS and greatly benefited from it. A Digital Nervous System-based Culturally-Appropriate Administrative Model for effective administrative management of Nigerian University is presented in section 5. It leverages intranet and web technology

for interconnecting resources in the institution. The system when built on this approach will provides education Stakeholders and Nigerian University Administrators greater opportunity to reduce corruption, increase productivity and turnaround time.

OVERVIEW OF EDUCATION ICT TOOLS

Information and Communication Technologies can be used extensively for education administration. They allow information to be transferred, stored, retrieved, and processed by almost all who work, study or interact with a given institution. Education ICT tools help educators create a more effective learning environment. The following are some of the ICT tools that can be used for effective educational administration.

C**omputers:** an electronic device which is capable of receiving (data) in a particular form and of performing a sequence of operations in accordance with a predetermined but variable set of procedural instructions (program) to produce a result in the form of information or signals

Internet is a global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols.

Email is short for 'electronic mail.' It is a method of exchanging messages between people using electronic devices via a network (Internet).

Scanner: Enable the digitisation of analogue content. Digital items can then be manipulated by software on the computer and stored.

Printers is a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper. Printers vary in size, speed, sophistication, and cost

Storage Devices (USB memory stick, CDs, External Hard drives)**:** Device for transferring electronic work between various devices and physical locations and to backup work, e.g. USB memory stick.

Software Based Storage Device (Google Drive, Dropbox etc): They are software-based storage device that that runs on the internet.

Closed-circuit Television (CCTV) is a TV system in which signals are not publicly distributed but are monitored, primarily for surveillance and security purposes. CCTV relies on strategic placement of cameras, and observation of the camera's input on monitors somewhere.

Websites/Portals: a collection of web pages built, designed, and maintained by or for a school. Many school websites share certain characteristics, and some educators have developed guidelines to help schools create the best and most useful websites. A portal is an online gateway where students can log into a school website to access important

program information. Student portals contain information on courses offered, transcripts, email programs, timetables, exam schedules and more. They may also offer links to useful Web resources, such as research tools and online journals.

Peer-to-peer Networking and Technologies: A network that allows two or more computers to share their resources, such as hard drives, CD-Rom drives and printers. They enable students and teachers to share files locally and internationally.

Electronic Attendance Register is an electronic device used for recording student attendance on a Student Management System (SMS). It is effective in raising school attendance figures, and helps reduce unauthorised absence levels and post registration truancy in class. If the register uses human biological features like fingerprint, iris, in recognizing an individual attendance, the device is referred to as Biometric Attendance Register.

Digital Cameras tore film digitally. Digital cameras can record microteaching sessions and different project works. This camera can be used by students to realize some project, some new ideas, which can be used in research. After recording the ideas, they can be produced by Movie Maker.

WEB-BASED TOOLS AND APPLICATIONS FOR MANAGING LEARNING AND TEACHING

Learning Management Systems: Internet based software that deploys, manages, tracks and reports on interaction between the learner and the content, and the learner and the instructor. They enable student registration, track learner progress, record test scores and indicate course completions. They also allow the instructor to assess student performance. Examples: WebCT, and Moodle

Student Management Systems may be used for financial, timetabling, student records and reporting. They may also enable parents to review their child's performance online Example: PowerSc.

Plagiarism Detection Systems: Examines digital text and by comparing nature and frequency of particular word strings, provides feedback to educator on the likelihood that a particular piece of work has been plagiarised. Example: Turnitin software.

Online Collaborative Workspaces: Online communication tools to enable collaboration. Examples: Bulletin board, email discussion list.

Virtual Classroom Software Systems: Deliver an interactive learning environment to students with a computer and Internet connection. The software presents the student with a screen consisting of an instructional area, bordered by items such as class location, message board etc.

e-Portfolios: Electronic (or digital) portfolio – digital storage to enable an individual to maintain an ongoing record of their work, achievements, awards and assessments.

SCHOOL MANAGEMENT TOOLS

SchoolTool: SchoolTool is a cloud-based open-source school administration software made for schools in the developing world. It provides educators gradebooks, skill assessment documents, class attendance sheets, and daily participation journals along with organization features including applications like Google Calendar, and a great report card generator. SchoolTool was made with Python, and is run on Linux Ubuntu. SchoolTool comes with its own web server and database. To make sure all the necessary components are installed correctly, it is distributed, through Ubuntu Linux. But there is a drawback for SchoolTool. It is far more a tool for teachers than it is for administrators. Website: http://schooltool.org/ (Can be downloaded from Ubuntu software center).

FeKara: FeKara, is an all-round school admin software which cannot be treated as a free software completely. It covers modern school administration and management software option. It can be used to conduct exams, assignments, budgeting and internal messaging. Major drawback for FeKara is that it is meant for small schools only. Additional data storage and other features are available on payment basis. Website: http://fekara.com/

Time Software School (**TS School):** is a classic powerful tool that offers the basics for schools of all sizes. TS School is good for managing your workforce. TS School offers a student management system and an exam module. Again, like the SchoolTime and FeKara TS School also has a paid version which gives more features. Website: http://www.ts-school.com/

Fedena: Fedena or project Fedena is open-source school administration software that largely focuses on handling records. It is based on Ruby on Rails. It was initially developed by a team of developers at Foradian Technologies. The project was made open source by Foradian, and is now maintained by the open source community. Website: http://www.projectfedena.org/

Ascend SMS: Ascend SMS is an entirely free full-program school administration software made for Catholic and Independent schools. Ascend SMS offers a complete package. From offering a health management system for the school nurse to a mobile app for parents to a simple discipline reporting system. Even though Ascend SMS is free for many schools, to avail that facility school has to be listed in their system. Website: http://www.ascendsms.com/

MOBILE DELIVERY DEVICES: THE DIGITAL BACKPACK

Smart phones and Pads: allow communication via photos, video as well as text messaging. Due to the growing number of students owning smartphone, the relevance

of smartphone and tablet apps to be used in teaching increases. Android based device dominates other operating system like iOS and Windows. There are many Smart phones and Pads educative app designed for teaching and learning.

Personal Digital Assistants (PDAs): PDAs and PocketPCs allow input of data via a mini keyboard or equivalent. They usually include a calendar, organiser functions, basic software functions such as word processing, email, spreadsheets, data storage and wireless capacity.

Laptop: A mobile computer that is operated with a battery away from power sources. Newer versions are now wireless and can connect to the Internet in wireless hotspots.

TabletPCs: A small screen laptop PC in which data may be directly entered onto the screen with a special pen.

Assistive and Adaptive Technologies: Technology that supports students with disabilities, such as screen readers, and virtual pencils

Gaming Devices: Consist of a gaming console (e.g. Gameboy) and games or a content delivery method.

CONTENT DELIVERY METHODS

Blog: A web-based journal or log book. Logs are chronologically ordered web-postings by an author or group of authors. They may be personal, individual records, group collaborations or representative of an institution.

Voice over Internet Protocol (VoIP): Enables transmission of voice across the Internet. Example: Skype

Wikis: Wiki is a website (or other hypertext document collection) that allows users to add content, on an Internet forum, but also allows anyone to edit the content. It also refers the collaborative software used to create such a website

LEARNING AND TEACHING TOOLS

Interactive Whiteboard: A whiteboard surface that displays digital files from a computer via a data projector. It may function as a standard whiteboard, that is, teacher or student may write on it and then digitise the marked-up material.

Projectors: A digital projector is an electronic device that is capable of connecting to a computer or other device and projecting the video output onto a screen or wall. It can be either fixed onto the ceiling, placed on a stand or can even be portable. Digital projectors are used in situations such as office training or presentation sessions, and classroom teaching.

Personal communication: Digital communication, which enables individuals to talk to one person or more. E.g. web forums, Internet relay chat, SMS (short messaging service) on mobile phones.

ICT FOR CORRUPTION REDUCTION IN EDUCATION SECTOR

Corruption is one of the major problems that we are facing across the world and is quite high in the third world countries. Corruption in University education is broad and bold. Education Stakeholders have expressed disappointment over the depth of corruption among university graduates and staff (Fiyin 2017, Dimkpa, 2011, Ahsan, Shuvankar, and Mostafa Monowar 2017). Alleged corrupt practices include but are not limited to nepotism in admission processes, nepotism in appointments and promotion of staff, financial embezzlement, fraud in conduct of examinations, question paper leaks, sorting lecturers, student extortion, manipulation and falsification of academic records such as transcripts, ghost workers, sexual harassment and victimisation of students, syndicated plagiarism by students and staff, delay or non-payment of gratuities and pension, non-adherence to bidding processes in the award of contracts, and illegal accreditation processes. For instance, Nepotism occurs during students' admission and in the appointment of staff. Someone from higher authority or political class requests an educational institute's managing board to admit/recruit his/her favourite candidate or relative though he/she did not meet admission criteria/ lacks capacity to perform the task of the appointment. This way the qualified candidates miss their chances to get admission/job. Promotions are also affected by nepotism. In Nigeria, lecturers and other officials got promotion with nepotism. There are cases of question paper leakage before the examination in Universities. People concerned manage to leak these questions for favouritism and economic gain. Leaked question papers favour lazy students and discourage hard-work of talented students. As a result, the aim of true assessment of students is defeated. Some administrative staff mainly junior staff collect bribe to offer services which ought to be their primary job assignment or you get your file missing or unattended.

A good administrative system should be corruption free and be able to create transparency and promote anti-corruption within the institution. This is one key area ICT can be deployed to solve problems. It will help to enforce discipline and check behavioural excesses including corruption and unethical practices. There are numberless variations to solutions ICT can offer. Any approach used should be tailored to the University Mission and Vision objectives and the management information system that support it should be designed with the culture of the locality in mind. A good ICT model using Digital nervous system approach can be modelled to provide necessary information service to university leadership, when it is needed and where it is needed for intelligent decision making. This service should be able to extract knowledge from the multiple technological solutions deployed and available in schools

and intelligently cross and process it in order to provide school managers with valuable data that will help them improve schools' organizational processes and performance. Good implementation of technologies facilitates creation of large and complex institutions that could function with increased efficiency and user-friendliness. The performance or success of these tools can be measured by the extent of user satisfaction they offer. ICT fosters the dissemination of information and knowledge by separating content from its physical location.

A SIMPLE DIGITAL NERVOUS SYSTEM (DNS) BASED MODEL FOR EFFECTIVE E-ADMINISTRATION

The occurrences of the aforementioned unethical practises can be drastically reduced using ICT. For example, nepotism that occurs during student admission and staff recruitment can be checked. A functional and result oriented ICT deployment requires a super spider web connection of the University environment. An ICT will provide strong network that interconnect the student, staff and management for a meaningful collaboration with different access level to available resources. Such good connection can be achieved using DNS approach. The DNS approach will leverage intranet and internet technology to meet the desired goal. The software applications that will support administrative transactions such as the Management Information System (MIS) and website should be indigenous for excellent service delivery and increased users' satisfaction. The software development should be handled by the Department of Computer Science who is familiar with the University structure and objectives. Many a time, Universities subscribe or utilize international ICT solution in the running the affairs of their institution. Powerful and efficient as they may, the solutions sometimes do not meet the requirements of the acceptable practices of the deployment environment. This is because their design did not focus on the environmental and cultural issues of Nigerian domain. Due to disparity in environmental setup and some cultural differences, these solutions do not perform as expected. For example, an online payment system that calculate fee in dollars is not culturally appropriate in Nigeria due to difference in currency and so will not deliver good performance when used in Nigerian Institution. Moreover, parents especially the uneducated will face the challenge of currency conversion. Compelling student to pay fee in dollars will bring undue exploitation on them because of the huge difference in exchange rate and unsteady rate. Equipping University administrators with indigenous culturally appropriate solutions will bring effectiveness and efficiency in administration. It will unconsciously bring about positive behavioural change in staff and student of the institution, making them more productive with their time. The design principle of a culturally appropriate MIS and website/portal that will run on DNS platform towards achieving efficient and effective services, with accountability, transparency and corrupt free University administration will consider the institution's mission and vision

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statement as well as the norms and values of the nation. A simple model of the DNS connected University environment is depicted in Figure 1 below.

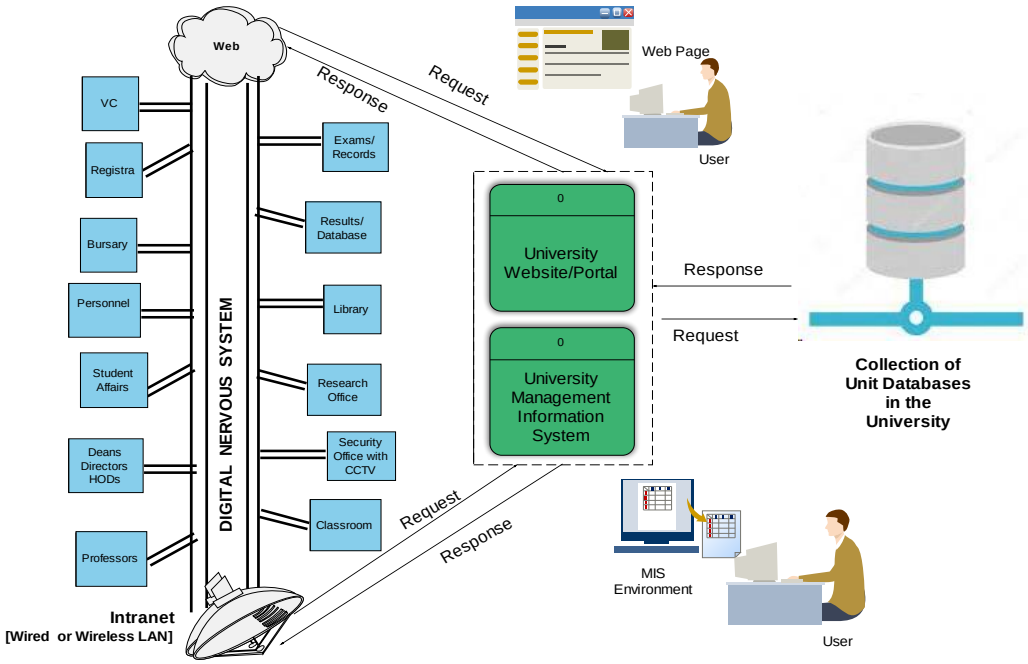

Figure 1: Digital Nervous System-Based Culturally- Appropriate Administrative Model for Effective Administrative Management

Students can get ample information like, course offerings, and admission fees about the University from a university website. The Student Admission department through the school portal can receive and verify new student credentials and certificates with the appropriate education agencies like WAEC, and JAMB. This helps eliminate use of fake identity and fake certificates in admission. With this method, student admission will purely base on merit. The Admission results may be also published online. The incidence of bribery to secure admission will be a history and nepotism will go to extinction. Successfully registered students can be equipped with micro-chipped student identity card which will be used to gain access to the university facilities like library and classroom.

A good catalogue library software can be developed to facilitate book reservation and borrowing in the library. In a similar way, books in the library can be bar-coded and bar code reader installed at the library exit to track stolen books. To reduce nepotism during staff recruitment, online based exam should be introduced. Result of the examination will be published online so that everyone can have a clear understanding about the result. This system will publish result and score of a candidate instantly. The

result can also be stored in the Database and be used in the future to track ghost workers or staff recruited without following the University recruitment procedures.

Financial embezzled and incidence of fake payment can be minimized through online payment using the school portal. When a transaction takes place, messaging services are enabled, school account is automatically updated and notifications are sent to appropriate units. This will discourage handling of cash and prevent intention to divert money meant for the school.

It is a common practise in Nigerian University to administer exams to students who achieve 75% attendance in the lectures. Some lecturers do not take attendance to lectures serious and students take advantage of this laxity. They are allowed to take exams without meeting attendance requirement. An electronic or biometric based attendance register can help lectures take attendance during lecture. The register will not only record attendance to class but will as well capture the time of arrival during lecture. Even lecturers' attendance to lectures will be registered. The attendance responses will be electronically signed by the lecture and submitted to the attendance datastore. From there, the exams and record unit can generate student attendance that will be used to determine who is qualified to write exams.

Exam malpractices such as impersonation, copying fellow student work or copying from sneaked-in notes, and taking exam without meeting lecture attendance requirement can be checked through Computer Based Test (CBT) or installation of CCTV in the examination hall. Student can be uniquely identified through biometric system interfaced with the CBT system. His/her data will be matched with the attendance and fee payment record in the database to determine his or her eligibility to take the exam. CCTV camera installed in the hall can monitor the conduct of examination and can be programmed to alert the security unit as well as notify the University Committee on exam malpractice about any undesirable behaviour captured during exam. Most interestingly, exam timing will be effectively managed and will not give room for copying. If students and exam supervisors know that they are being monitored by the surveillance system, their intension to cheat or violet exam rules will die. For non-CBT -based exams, question paper leakage is a possibility. This also can be checked by creating an examination control centre which distributes question paper through online and also provides Personal Identification Number (PIN) to a specific person to print the papers few minutes before the exam.

Through online result processing system (ORPS), lecturers can handle student result with ease. This reduces entry error, stress and error that occur due to manual result computation and mutilation seen in manually processed result. Once student score is entered, the application logic of the result processing system will do the necessary computation and submit result to result database as it is done in Ebonyi State University. The lecturer can view or print the final result for filling. The Students can see their

results through online. As a result, lecturers cannot pass students who have failed or have opportunity to extort money or mutilate results. This service discourages students' sorting for undeserved grade. Sexual harassment and other victimization approaches used against students can equally be controlled through integration of crime reporting module in the MIS. The student can through this means report any sort of victimization against them to the appropriate authority.

A plagiarism software like turnitin can be integrated in the MIS to help detect plagiarism in students and lecturers research work. This ensures quality in the research done by the institution. Messaging service module can be built in the school website to promote academic and social interaction among students in the University. Through this medium, a student can request help from other students on a topic discussion, sell or buy textbooks from other students. They can also interact with academic staff on academic matters and mentorship. Effective utilization of the education ICT tools defined in section 4 of this work will guaranty quality teaching, learning, research and excellent study environment that facilitate university administration in Nigeria. In summary, the promises an ICT-based solution towards achieving excellent university administration is inexhaustible.

CHALLENGES OF USING ICT AT SCHOOL AND COMBAT STRATEGY

There are several challenges that hinder the use of ICT tools in teaching, ranging from capacity to use to technology availability to meaningful educational engagement and legal issues. A guide by Lorenz and Karsten (2016) identified three key challenges faced by the teachers in the use of ICT tools to be, poor usage skill/ unfamiliar with the tool, lack of ICT infrastructure such as high speed internet, computers, and smartphone ban in class, other factors include security concern, lack of indigenous app that factor peoples culture and environment, issue of distraction from main task, students unfamiliarity with the tools and fear of overloading the module. Lack of hardware and software infrastructure is one factor hindering the general use of appropriate tools in class. Security concerns of the teachers as well as a general student smartphone ban in class are relevant issues as well. Based on these findings, attention should be given to.

(i) Empower teachers to use ICT tools

Teacher empowerment through training in using various tools on different IT platforms, and a better understanding of security and legal issues will not only make them become familiar with the tools themselves but will ensure effectiveness in training their students and delivering support. Their knowledge of the tool will facilitate the time spent in getting it run and increase learning time. This will also increase their motivation to use technology in teaching and bring about sustainability of ICT implementation in educational sector. The training will expose them to the possibilities (and limitations) of a tool and help them connect it to relevant tasks in teaching to improve learning.

Another reason that prevents teachers from using ICT tools is the uncertainty about security, legal issue and perceived distraction that could bring. In some schools the use of smartphones in class are banned. Regulations about the use of ICT tools vary greatly in different countries. For example, regulations differ in using Facebook for teaching and sharing tasks for homework is common. There are countries in which all tools that store or send data outside the own country are not allowed at school. This law denies students access to huge number of tools, including all major cloud storage providers. But this would withhold a huge learning opportunity from students and counteract any improvement regarding their media literacy. Providing teachers with the necessary background knowledge and giving them time in class to address these problems seems to be a much better way. Banning smartphones is the quick solution to reduce distraction – engaging students to make use of the technology at their hands and simultaneously training them to use it in a decent way and prioritize tasks would be much more helpful for their future. Security concerns are a broad field of challenges, from copyright issues to secure data storage in cloud space.

Again, disallowing students from using tools like student-developed (public) websites and cloud space is the simple solution – making students adhere to copyright regulations and finding ways to work with open content on their website or to discuss security issues when saving data on cloud space, such as finding solutions to encrypt these data as well as working with anonymous/fake accounts prepares students much better for their future. But this calls for teachers being highly qualified in using ICT, staying up-to-date during their teaching life, as well as investing some extra time in their lessons to address and discuss these challenges.

(ii) **Improvement of Infrastructure**

Many literatures and personal observations have revealed that many schools in the developing countries have a weak IT infrastructure. For a seamless integration of ICT tools in teaching, e.g. in form of an e-learning platform, permanent access to the tools is necessary. Here also poor internet connection is a problem. Many of the ICT tools need a good internet connection to work properly. Using standalone personal computers (PC) in a computer room or in the classroom is quite common, and even at that, the ratio of computers to number of student users is outrageous. Many a time, you see about ten or more students competing access to a single PC. Again, in many computer labs these PC are either not networked or poorly networked for resource sharing. Using student smartphones with a Wireless LAN connection at school is definitely not the standard yet. The approach of using students' smartphones requires a more comprehensive IT infrastructure than is available in many schools today. To remedy this, adequate funding of education institution by government, business organisations/ industries and well- to- do individual is a key to making an institution ICT compliant. The funds should be secured by monitoring body to guard against corrupt practices and

diversion. Being aware that creating a sound infrastructure at school is a long-term project, schools can temporarily get around this challenge by installing a temporary WLAN access point in the class allowing the use of students' smartphones and thus working with ICT tools. Another possible approach is the use of ICT infrastructure and support offered by a third party such as a science centre or student lab.

FACTORS DETERMINING A SATISFYING USE OF AN ICT TOOL IN TEACHING

The under listed factors that determine a good integration of an ICT tool in the teaching process are based on the finding of the (Lorenz and Karsten 2016). The project concerns the analysis of the integration of ICT tools in the different teaching modules, through the analysis of the best practice and discussion of the topic with education experts and teachers. Taking these factors into account when planning the use of ICT tools in teaching might help to keep the focus on the main task (teaching) without creating too much distraction. Details about a wide selection of ICT tools fitting very different purposes can be accessed at (Lorenz and Karsten 2016), In my personal opinion, development of an indigenous app is equally recommended where the suggested tool does not conform to the norms and values of an institution or a nation.

Tool

a. **Easy to use for teachers and students**: the tool should be easy to install/access and have clear user interface so the main functionality is directly approachable.

b. **Suitable for the purpose:** the tool should match the task it is intended for in teaching.

c. **Free:** using paid apps on student devices is not feasible (complicated payment processes, most often credit card needed).

d. **Problem with different operating systems:** When using smartphones most likely different operating systems are present in class. If working in groups, it is a good practise to ensure that each group has at least one student working with the app the teacher is familiar with.

Integration

a. **Analyze points in teaching phases where ICT integration is helpful**: When planning a teaching unit, find the spots where ICT tools support the progress and where enough time is available.

b. **Adding extra value:** if the task can be fulfilled in the same manner with standard (e.g. paper-pencil) tools, there's little use in complicating it with using ICT. Gathering data from different teams or collecting information to share and work with creates extra value.

c. **Collaboration is pro:** collaborative tools can support the group dynamic of a project and extend it over the lessons itself.

d. **Experience tool in class:** when introducing ICT tools, a tutorial is not enough. Testing it and starting to work with it are key issues for ongoing use by students.

e. **Problems with battery life:** the main purpose of students' own smartphone is their personal communication. Students might stop using the smartphone in class to safe battery for their afternoon chat. To avoid this, Students should be told in advance that there will be a 20-minute smartphone session in class, so that they could charge their phones or deliberately ration their battery time.

Environment

a. **Teacher ICT skills:** the teacher needs to feel comfortable with using the ICT tool for a proper integration. Before starting the teaching sequence in class, the teacher should have spent some time trying out each tool.

b. **Combine science and ICT classes:** the combination of the classes could strengthen the relevance and understanding for the students (e.g. learning the basics of the tools in ICT class and their use in science class).

c. **Students would prefer smart devices:** students would prefer smartphones and tablets, although the integration into a teaching unit is more demanding than for standard (e.g. PC-based) tools

d. **Awareness of using devices in classroom:** creating awareness of using ICT tools in class might animate colleagues to follow and thus gain a general ICT implementation at school.

CONCLUSION

The potential of ICT solutions in the administrative effectiveness of Nigerian University is enormous and inexhaustible. The educational successes achieved by many schools in the developed countries that deployed ICT in the school administration proved its effectiveness in school management. This work has demonstrated that ICT is a useful tool for reducing corruption and very effective tool in University administration. However, its adoption in Nigeria University is happening at a slow pace. This can be attributed to inadequate funding of the University by the government, inherent corruption in managing available fund and lack of IT skill to use and manage the technologies. The realisation of many different teaching and management environments that exploit the transformation potential of ICT may start with ICT facilities and resources but they quickly need people, especially effective school leaders if change is to be lasting. Summing up the analysis of the best practice in ICT deployment in education, the success of ICT tool integration in administration is defined by four main factors: (1) the right tool (easy to use, fitting the task etc.) (2) a

proper integration (adding extra value, collaborative etc.) and (3) the necessary infrastructure (important although not the only factor etc.) and - proper ICT skills of the staff and student (very important!) . This study serves as a base for education planers to deploy technology-based administration in higher education institutions.

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