

Digital Inclusion in Higher Education during the COVID-19 Pandemic: A University Experience

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Abstract:

Higher education in Nigeria is already beset with several challenges. Existing multiple challenges include massive unemployment among graduates, security issues, incessant strikes and industrial actions by Academic Staff Union of Universities (ASUU) and gross underfunding of the education sector. With the onset of the unprecedented health crisis and the devastating repercussions of the COVID-19 pandemic in the world, this paper delineates a Nigerian Higher Institution's experience with navigating the onslaught of the pandemic through digital inclusion, proactive control, ICTs, Distance education and e-Learning. It further describes the University experience, its challenges and solutions to higher education through ICTs learning solutions. It particularly details the administration of the online examinations and the virtual graduation ceremonies conducted. This is with the objective of sharing good practices and recommendations for continuity of learning/training through ICTs and digital inclusion in education as well as ensuring the continuity of the effective strategies.

Keyword: ICT, Digital inclusion, COVID-19, e-Learning, Distance education

I. INTRODUCTION

The Novel Corona Virus Disease (COVID-19) which started in December 2019 like a viral outbreak originated from Wuhan city of central Hubei province of China and rapidly spread across borders, infecting people throughout the whole world. This phenomenon led to a massive public reaction with the media reporting continuously across regions to keep all citizens informed about the pandemic situation. A cluster of about 40 cases of pneumonia of unknown etiology was reported on some vendors and dealers in the

Huanan Seafood market. World Health Organization (WHO) along with Chinese authorities started working together and the etiological agent was established to be a new virus and was named Novel Corona Virus (2019-nCoV). Coronaviruses, so named due to the outer fringe of envelope proteins resembling crown ('corona' in Latin), are a family of enveloped RNA viruses [1]. They are generally pathogenic to mammals and birds and cause mild upper respiratory tract infections in humans. They occasionally can be transmitted to a larger human population and can cause severe

respiratory illnesses exemplified by Severe Acute Respiratory Syndrome (SARS) and Middle-East Respiratory Syndrome (MERS) in 2003 and 2012 respectively. Meanwhile, on 11 January, 2020, China announced its first COVID-19 related death of a 61-year-old man, exposed to the seafood market [2]. Over a period of few weeks, the outbreak of infection spread across the world in rapid successions [3], thus declaring it a Public Health Emergency of International Concern on 30th January 2020 [3; 4]. The first death reported on 11 February, 2020 outside China, was a Chinese man from Wuhan. This led WHO to declare COVID-19 a PANDEMIC on the 11th of March 2020 because, as at this time, more than 114 countries have been affected [4]. The first reported case in Nigeria was announced on the 28th of February 2020. Since then the country has followed other countries of the world in observing COVID-19 protocols and other relevant precautionary measures in lessening the burdens on economic, social, political and educational activities.

A few months after its discovery, the virus became a global pandemic affecting every country in the world with the global economy and sources of livelihoods being heavily impacted. Due to measures to contain the pandemic, many countries instituted a shutdown of their economies which led to the closure of primary, high school and tertiary institutions. Educational institutions all over the world were affected by the pandemic, with 94% of the world's school population impacted by school closures [5]. In Nigeria specifically, the school closures led to significant disruptions in the educational systems; especially learning modes (which used to be face-to-face) services, and access to school related services. More than 39,440,016 primary and secondary school learners across Nigeria were affected, including those in internally displaced camps and those in tertiary level education [6].

In response to this education emergency, the federal, state governments and private educational sectors instituted measures to cushion the effect of the school closures by implementing various learning interventions using technological platforms that are Internet and traditional media based related. While the challenges of quality education existed prior to the pandemic, school closures added to the pains and aspirations of the yearning populace for education. Schooling opportunity in Nigeria is associated with income level and access to quality education varies along the lines of socio-economic backgrounds of students. Those students whose parents or guardians are willing and able to pay more to access better learning resources are more likely to attend private schools than their counterparts who are from lower socio-economic households may be more likely to attend public education [7; 8 & 9]. With the disruption to education caused by the COVID-19 pandemic and the subsequent adoption of remote learning across Nigeria, learners from financially privileged households represent the demographic that have more access to quality learning opportunities from the comfort of their homes [10]. The main variance to this inequality of access to quality remote learning include demand-side factors such as limited or non-availability of digital devices and Internet services in most homes and supply-side issues that include the lack of financial and technical capacity to switch from on-site to (remote) on-line learning facilitation by many schools [10].

In light of the above, this study is aimed at examining the Digital Inclusion in Higher Education during the COVID 19 Pandemic: A University Experience in Nigeria, while the specific objectives are:

1. Identify the various innovative infrastructures available to support online education for the future successes of higher education systems

2. Identify the measures that should be adopted to bridge the digital divide to distance education in developing countries.

3. Determine the measures that should be adopted to meet the immense needs of students with respect to being equipped with the basic computer hardware and software tools essential for the operationalization of online courses in Nigeria without worsening issues of inequity both within countries and between countries on the African continent?

A. Digital divide as it affects learning in Nigeria

In the wake of the COVID-19 pandemic, educational systems transitioned into new methods of learning aided by the Internet but children in rural and network scarce areas in Nigeria were mainly left out of this digital transition [11]. According to the findings from [10], a sizeable proportion of (28%) of teachers reported that their students were not actively learning during the pandemic because of unavailability and inaccessibility of digital tools for learning which include both infrastructures and devices. This assertion was buttressed in [12], which study revealed that Internet penetration in Nigeria stands at 42%, implying that more than half of the population were not connected to the Internet. Contrary to this assertion, mobile adoption in Nigeria shows great potential, which can be harnessed for learning [13]. It is a well-known fact that children from poorer socio-economic backgrounds tend to have limited access to the Internet connectivity, computers, mobile phones, functional ICT skills and active parental support, not only in Nigeria, but all over the developing and underdeveloped countries than their richer socio-economic and urban backgrounds. Hence, the inequity in access to ICT-based learning has an adverse effect of further intensifying the existing disparities in learning outcomes along socio-economic and geographic (urban-

rural) lines [5; 11; 14 & 15]. In Nigeria, majority of the population with Internet access are from richer socio-economic and urban households who can afford private school education, thereby giving their children a learning advantage over their public-school counterparts [8]. Studies from other African countries corroborate these existing divides as depicted in [14; 16 & 17].

In view of the above discussion, it is pertinent to allude to objective one of this study that much have been learnt over the COVID-19 school closures in Nigeria, because the disruption to education and other socio-economic activities caused by the COVID-19 pandemic is enormously huge with adverse consequences. For instance, a study in [18], revealed that during this COVID-19 periods, it was not technically feasible to verify and validate a completed task from a remote location such as Internet of Things (IoT), application software, embedded software, robotics, and hardware projects because personnel lacked the capability to manage information and network security threats effectively and efficiently. However, learning and working remotely has its own advantages, but the disadvantages outweigh the advantages as it concerns education in general. Proper and good education is very important for all because it facilitates quality learning among people. The process of achieving knowledge, values, skills, beliefs, and moral habits may not be easily acquired remotely. There are also fewer opportunities for peer learning due to COVID-19 protocols in terms of distancing which allows non-availability of practical lessons or teaching of science and engineering, Nursing, Medical sciences among others. Lack of these practical courses reduce the quality of learning being impacted on students. Therefore, lessons learnt from the ongoing COVID-19 pandemic will help the public and private sectors adequately prepared against any devastating effects on socio-economic and learning activities that may arise because of

any future catastrophic pandemic occurrences. In addition, proper and adequate preparations in financial and resources should be provided by relevant agencies to guard against, and avoid disastrous calamities such as witnessed this time around.

Key considerations to be addressed on what types of innovative schemes to recommend for the future successes of higher education systems, skilled instructors in Nigeria to avert academics protracted disruptions are suggested:

1. Present and Future Challenges of Higher Education in Nigeria

- a) **Inadequate funding:** Nigerian government at all levels including private sectors, should make adequate funding (in finance and resources) of schools a top priority because an uneducated society will remain perpetually poor, and under-developed perpetually which in turns will affect the socioeconomic wellbeing and development of a nation.
- b) **Lack of ICT facilities:** Nigeria as a country has the human, intellectual capacity and capability of being one of the best technologically advanced country in the world if only the leaderships pay much attention to developing ICT infrastructures and harnessed these potentials. It is hoped that the advent of the 5G technology will improve the ICT infrastructures in Nigeria if only the leaderships take a proactive part to bridging the gaps between the rural and urban developments as it concerns digital divide and other socioeconomics amenities.
- c) **Lack of Resources:** Most and if not all the schools, starting from the elementary to higher learning lack basic learning tools/infrastructures due to poor funding in the educational sector. Up-to-date learning materials resources such as; quality textbooks, equipped libraries and laboratories, conducive classrooms and environment, e-books and ICT infrastructures/equipment, are among those lacking in Nigerian education system. There is urgent need to address these issues now to forestall future calamities to the education system when other pandemic do occur again.
- d) **Frequent labour disputes and closure of universities:** Frequent labour disputes from the university unions (ASUU, NASU etc) which often paralyzed learning activities in Nigeria education system should be properly addressed and resolved by parties concerned once and for all. It is a well-known fact that the poor and the downtrodden of the society (those who cannot afford to pay high school fees in private institutions) are those most affected when this happens.
- e) **Brain drain:** This is another area that affect the education system in Nigeria. Majority of the country high caliber educational professionals that are supposed to contribute positively to the socio-economic and education system have left Nigeria for a greener pasture in other countries especially, in the health industry. This is because of lack of jobs and often well-paid jobs that commensurate with their qualification in Nigeria. The Nigerian government at all levels including the private sectors; need to work together in creating jobs for her teaming jobless population. When jobs are created in all sectors, more teachers that are professional and other arcticians will stay behind to contribute meaningfully to the socioeconomic activities including learning.

In reference to the third objective of this study which asked the question; What measures should be adopted to meet the immense needs of students with respect to being equipped with the basic computer hardware and software tools essential for the operationalization of online courses in Nigeria without worsening issues of inequity both within countries and between countries on the African continent?

It is worth noting that the issues raised in the above question have been partially addressed in section 1.1. Notwithstanding, more needs to be done within Nigeria and other African countries in bridging the digital divide gap between the have and have-not. It is a known fact all that over the African continents, the inequity in access to ICT-based learning has an adverse effect of further intensifying the existing disparities in learning outcomes along socio-economic and geographic (urban-rural) lines as ascertained in [5; 14; & 15]. Studies from other African countries corroborate these existing divides. Students in private or high-fee paying institutions in South Africa and Nigeria for instance are more proficient in the use of ICT in their learning than their counterparts in public institutions [16]. A study conducted by EdQual on the use of ICTs in Rwandan schools, revealed how ICT policy initiatives could tend to exclude those in rural areas. A study of Nigeria, Tanzania and Rwanda in [14; 17] showed that urban schools have more computers, Internets, electricity supply and ICT equipment than their rural counterparts. Definitely, students or young people from rural areas will be deprived of the Internet resources due to their low-level of education, low income and lack of ICT skills. Technological take-off in any country, including African Continent, depends critically on a number of factors, most of which are; adequate funding, resources and ICT infrastructures in which skill and training acquired in tertiary institutions are paramount. Therefore, the State of Educational Technological Infrastructure in African

countries needs to be collectively examined by the African Union (AU) on one hand for easy integration, and by each of the African countries within, in other to finding lasting solutions to the full technological take-off in the continent. African leaderships should ensure that her citizenry are not left behind in the scheme of ICT development in other not to be found wanting when another pandemic hits the world.

II. EFFECTS OF THE PANDEMIC ON EDUCATIONAL SYSTEM IN NIGERIA

Postponement of examinations by West Africa Examination Council (WAEC) and National Examination council (NECO) led to:

1. Increased cost of instructional delivery and reception
2. Disruptions of school calendars
3. Increased cost of living

A. Containment Measures

1. From mid-March 2020, the rate of the infection of COVID-19 increased at a geometric rate leading to the total lockdown of the States in Nigeria
2. The implications of the lock down were so much on social activities, economic activities, spiritual activities among others
3. Quarantine.
4. Regular hand washing
5. Isolation
6. Face shield policy implementation
7. Travel ban
8. School resumption regulations
9. Decontamination of schools
10. Learners to resume with sanitizing kits

III. THE UNIVERSITY EXPERIENCE

In the event of the above discussions, the University sort out a way to survive and maintain a bit of her academic calendar and started an online learning/examination system. The procedures are explained in the following sub-section 3.1.

A. Architecture of the proposed system

The online Learning/Examination System (OES) is a web base application that establishes a link between an institutions and candidates or students in respective of locations. The institution has an administrator who keeps an eye on the overall functionalities of the system. The administrator administer questions as set and configured by the various departments in the examination platform, which is highly secured from intruders. The examiners displays these questions as an examination to target eligible students who met the criterion of the institutions in terms of learning-class attendance, payment of school fees and other approved rules. The answers entered by the students are then evaluated and their scores are transferred to the server as seen in Fig 1, while the students get an acknowledgment of a safe deposit of examination scores. These scores can then be accessed by the institution to determine the number of students that passes the examination and evaluate their performance. Online examinations are conducted through the Internet or Intranet (for remote testing within the Organization as seen in Fig. 1 (local server)).

For multiple-choice questions, the candidates are given a limited time based on the credit of the course to answer the questions and once the time is exhausted, the students are supposed to submit. There may be situation where students may want to cheat the system, the system disables the answer paper as well as the control buttons and the answer is automatically sent to the examiner through the distributive server as shown in Fig. 1.

Similarly, for the theory section, the teachers or their designees upload the questions. The students register and login remotely and choose their department and the expected courses for the hours assigned. They will click and view questions (they are not expected to download the questions

because of Internet connectivity, which is not usually predictable in developing countries like Nigeria). In addition, the time expected to revert the answer by uploading through the portal will be given. The candidates have the privilege of answering the questions on paper and thereafter scan as a single document back to the lecturer in charge for output on paper option. Mostly, this type of option may require output in diagrams form, mathematical functions and other complex illustrations that may not be visible on the word processing tools available for the examination. The second output option available for the students is a text based. This enable users to type directly into a text section provided and press the submit button to send the work directly to the lecturers whose email have been linked. The students are tested on plagiarism to ensure that they do not copy from the public domain or other sources into the text based section. One of the means of controlling plagiarism on this mode was the disabling of the paste button. Also, they cannot transfer questions among themselves because invisible codes were embedded to every viewed questions. Therefore, if they fail to view questions individually, they will not be able to submit answers.

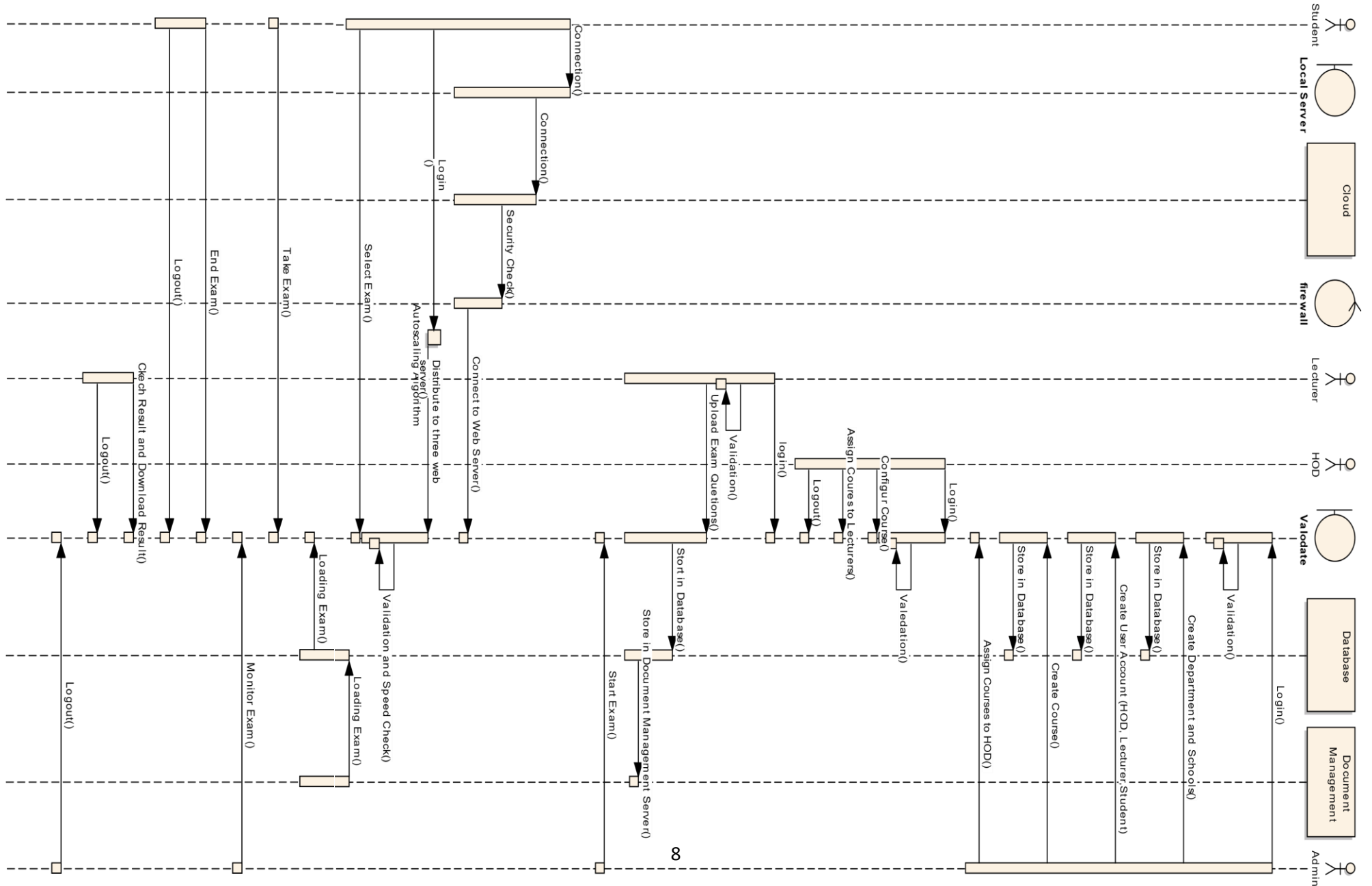


Fig. 1. Sequence Diagram of the online examination model

B. Virtual graduation

The University equally embarked on virtual graduation in 2020 to complete her session. This was the first University in Nigeria to practice such a commendable events. The full video can be watch in the YouTube link in bracket

(https://www.youtube.com/watch?v=sMzVmVjUQ_Q)

IV. CONCLUSION AND RECOMMENDATIONS

The paper has extensively discussed the impact of COVID-19 to the education sectors of Nigeria. It has equally explained the state of digital divide as it affects the distance education with respect to e-Learning and other technological features that may enhance distance education in developing countries. It further gave the architectural diagram of Online Education System as practiced in BU, which successfully established the proper handling of multiple-choice questions, and continuous/essay questions even though the essays would have to be marked manually. The authors will like to recommend for future researchers to look into the security of online examination and the possibility of having automated solutions/answers to continuous writing (essay) questions.

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