



ICT Utilisation and Associated barriers in Teaching among Middle-level Academics in Nigerian Universities

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Abstract

This article seeks to understand the barriers to information and communications technology (ICT) utilisation among middle-level academics in Nigerian universities. It makes use of a cross-sectional survey and key informant interviews to interrogate the problem. A total of 1,325 middle-level lecturers drawn from 12 South-western Nigerian universities took part in the study. Because of the nature and character of the Nigerian state and the historical contexts of its higher education, the political economy approach was adopted along with ICT utilisation resistance theory to explain barriers to ICT utilisation in Nigerian universities. The article finds that there is a significant relationship between the availability, utilisation and quality of teaching in Nigerian universities. Specifically, it finds that in universities where lecturers had tablets they were 1.5 times more likely to deliver quality teaching. It also finds that in universities where lecturers used multimedia projectors, students were 2.7 times more likely to receive quality teaching. On the barriers to ICT utilisation, the article finds that lack of funding, lack of strong institutional policy and support infrastructure such as broadband internet connectivity and constant electricity supply are among the major constraints to ICT-based higher education. It therefore suggests the development of a comprehensive policy on ICT-based education and massive investment in university education in Nigeria.

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Résumé

Cet article cherche à comprendre les obstacles à l'utilisation des technologies de l'information et de la communication (TIC) chez les enseignants de niveau intermédiaire dans les universités nigérianes. Il fait appel à une enquête transversale et à des entretiens avec des informateurs clés pour examiner le problème. Au total, 1.325 enseignants de niveau intermédiaire issus de 12 universités du sud-ouest du Nigeria ont participé à l'étude. En raison de la nature et du caractère de l'État nigérian et des contextes historiques de son enseignement supérieur, l'approche de l'économie politique a été adoptée, ainsi que la théorie de la résistance à l'utilisation des TIC pour expliquer les obstacles à l'utilisation des TIC dans les universités nigérianes. L'article montre qu'il existe une relation significative entre la disponibilité, l'utilisation et la qualité de l'enseignement dans les universités nigérianes. Plus précisément, l'étude révèle que dans les universités où les enseignants disposent de tablettes, ils sont 1,5 fois plus susceptibles de dispenser un enseignement de qualité. Il constate également que dans les universités où les enseignants utilisent des projecteurs multimédias, les étudiants sont 2,7 fois plus susceptibles de recevoir un enseignement de qualité. En ce qui concerne les obstacles à l'utilisation des TIC, l'étude révèle que le manque de financement, l'absence de politique institutionnelle forte et d'infrastructures d'appui, telles que la connectivité Internet à large bande et l'alimentation électrique constante, sont parmi les principales contraintes à l'enseignement supérieur basé sur les TIC. Il suggère donc le développement d'une politique globale sur l'enseignement basé sur les TIC et un investissement massif dans l'enseignement universitaire au Nigeria.

Introduction

The creation and development of the internet is one of the major breakthroughs in human attempts to explore their world, transform their society and expand the way knowledge is transmitted (Barakabitze et al. 2019;). While the business community has made significant strides in the use of information and communications technology (ICT) in facilitating commerce and business transactions, the spread of digital culture to higher education has been comparatively slow in many parts of the world, particularly in developing countries (Adam 2003; Barakabitze et al. 2019; Commonwealth of Learning 2017). Increasingly, there have been debates around 'digital dividends' and whether digital technologies are distributed to different parts of the world at the same pace (World Bank 2016). Within these debates are concerns regarding whether African higher education is benefitting from this revolution to transform its teaching and learning (Adam 2003; Teferra and Altbach 2004).

In this age of globalisation, ICT constitutes an important aspect of education. It help schools disseminate knowledge through open and distance

learning (ODL) and is a significant tool to deconstruct learning and make education learner-centred. At the same time, it opens up an opportunity for learners to engage in critical thinking. It reinterprets the role of the teacher as a facilitator rather than a leader, and incentivizes learning to be self-reliant, creative, innovative and efficient. But the extent to which people put the technologies to use will determine the extent they are able to maximise the benefits of digital technologies for development (Voogt et al. 2013;).

Towards the end of the twentieth century, Nigeria and many other African countries, including South Africa, Kenya, Ghana, Uganda, and Senegal, keyed into the global reform of the public and the private sectors driven by ICT. As the Cold War came to a close, new technologies flooded capitalist markets and spread to Africa at a remarkable pace. Although it was initially believed new technologies would help liberalise African economies and reform the public sector, attention later shifted to using ICT to fight corruption, end poverty and increase access to education on the continent. A number of African states, including Nigeria, soon began to integrate ICT into teaching, learning and research. While it was easy for some countries, such as South Africa, to facilitate ICT-based education through National Research and Education Networks (NRENS), the majority of African countries have not succeeded in creating conducive policy and institutional environments for ICT-based learning in higher education. There have been efforts to liberalise access to higher education through ODL, but the constraints faced in the funding and deployment of support infrastructure for ICT utilisation remain a challenge for many countries (Aramide et al. 2015; Fuchs and Horak 2008; Yelland 2001).

Nigeria is not an exception in this regard. The Nigerian government acknowledges the importance of ICT in advancing knowledge and skills necessary for effective functioning in the modern world, including the need to integrate ICT into education (Nwankwoala 2015). The revised National Policy on Education (FRN 2004: 53) specifically states in section 11 sub-sections 102 (d) that 'Government shall provide facilities and necessary infrastructure for the promotion of information and communication Technology at all levels of education'. Unfortunately, Nigeria does not yet have a separate ICT policy for higher or university education (Commonwealth of Learning 2017). In addition, the country's policy decisions hover around the National Policy on Education and subsequent reviews, which have not radically taken into consideration the need to use public-private partnerships to bolster digital tertiary education (World Bank 2016). This lack of clear-cut policy framework limits the capacity of university leadership in integrating ICT into teaching, learning and

research. It has furthermore created a lacklustre attitude among lecturers, particularly among senior and middle-level lecturers who are supposed to provide the appropriate leadership in the university system (Commonwealth of Learning 2017). Government attitudes to the funding of education in Nigeria throughout the 2010s have been similarly lacklustre. This is evidenced by the shrinking budget for the education sector since 2015 . The Commonwealth of Learning (2017: 11) noted that, although, there has been a steady increase in internet connectivity between 2012 to 2016 (from 16.1 per cent to 25.67 per cent) and engagement in ODL, at best, access to the internet in most higher institutions of learning is still very poor. . This is happening at a time when the budget for the education sector in Nigeria hovered between 6 per cent in 2013 and 10.5 per cent in 2015. In 2016, the budget for education dropped to 7.9 per cent and by 2017, it further dropped to 6.24 per cent. The Nigerian government has attributed this to the dwindling nature of the economy, and there has not been a deliberate policy to rapidly use ICTs to change the face of teaching and learning in higher education in Nigeria (Commonwealth of Learning 2017).

Several studies have been conducted on ICT adoption, availability, accessibility, integration and policy support in higher institutions of learning in Nigeria (Achimugu et al. 2010; Ajayi 1996; Akpan 2014; Idowo et al. 2004; Okafor et al. 2011; UNESCO 2015). However, none of these studies have explored ICT utilisation among middle-level lecturers in Nigerian universities. This article seeks to fill this gap through an assessment of the institutional and individual barriers that inhibit effective adoption of ICT-supported pedagogies, and the effect of ICT on teaching quality in a sample of South-western Nigerian universities.

Research Questions

1. Does availability of ICT facilities influence quality of teaching?
2. Does utilisation of ICT facilities have any influence on quality of teaching?
3. What institutional barriers significantly influence quality of teaching?

Literature Review

Studies abound on ICT availability and utilisation in schools but much of this literature is concentrated on developed capitalist nations (Aristovnik 2012). Because many developing nations are just adapting digital technologies to their education systems, it is not uncommon to find more of the research

on ICT in higher education concentrating on availability and utilisation of information and communication technology (Apagu and Wakili 2015). A thematic approach to literature review was adopted to establish the state of knowledge on the core themes of availability, accessibility, predictors of use and barriers to ICT utilisation in higher education.

Availability and Accessibility of ICTs in Higher Education

Availability is key to ICT utilisation in a higher institution. As noted by the World Bank (2012), South Africa stands out among African countries as ICTs for education have been made available in abundance through mutually supportive policies and sustainable government commitment. However, Makura (2014) has noted that despite its availability, students perceive there to be a problem of underutilisation of ICTs by lecturers.

Makura's research was corroborated by a similar historical review of the evolution of South Africa's educational policies on ICT by Ng'ambi et al. (2018), who found that South Africa's use of ICTs in education has gone through four phases. The first phase occurred between 1996 and 2000 when technology was predominantly used for drilling and practice. This was followed by the second phase, between 2001 and 2005, when institutions shifted their attention to the building of ICT infrastructure and democratising access to modern technologies. The third phase (2006–10) saw the debates about using ICTs in teaching and deepening them in pedagogies. The last phase (2011–16) was the stage at which South Africa higher education moved towards the use of media technologies to make education learner-centred.

Kenya is also a comparatively successful African country in terms of the availability and accessibility of computers and the internet for faculty. However, Schaefer et al.'s (2016) research, which sampled agricultural scientists from the Kenya Agricultural Research Institute and a number of Kenyan universities, indicated that, as at 2010, proficient use of computers was still lacking. The study further established that university lecturers used the internet more for teaching and research than the scientists in the research institutes.

In Uganda, Burundi and Rwanda, access to the internet by students and faculty members are still low. In Mozambique, Muianga et al. (2013) found that despite a robust national policy on ICT that was launched in 2000, the country has not developed a policy that mandates the use of ICT in teaching and learning. They found that although access to the internet has improved through ICT for education, and that some universities make use of learning management systems and ODL, the majority of lecturers and students in the country do not own a computer.

Factors Predicting ICT Utilisation

ICT utilisation in higher education is very important in determining how students and lecturers maximise the benefits of the technology age. Because individuals in the education sector come from different backgrounds, their use of ICT facilities is more likely to be shaped and conditioned both by personal and institutional factors. In an attempt to account for these factors, Edumadze and Owusu (2013) conducted a study of 37 lecturers and 200 students at the University of Cape Coast. The study revealed that lecturers' prior knowledge and skills in ICT best predict their use of ICT in teaching and learning. The study revealed further that ICT-related courses sharpen the competencies of the students in applying ICT to their learning in school, as did similar training for their teachers. Similar findings were reported by Buabeng-Andoh and Yidana (2015), who examined teachers' ICT usage in second-cycle institutions in Ghana. The study found that teachers with good competencies, training and accessibility to ICT infrastructure perform better than their counterparts who lack ICT skills or are denied access.

Barriers to ICT's Utilisation in Teaching and Learning

The future of ICT in higher education will depend on the ability of government to identify and remove barriers to ICT availability and its utilisation in teaching and research. Adam (2003) and Alemneh and Hastings (2006) consider barriers as obstacles that inhibit or slow down the pace at which lecturers and students adopt ICT facilities in their e-learning contents or in the application of software for the resolution of societal problems. Furthermore, they regard barriers as those aspects of society that make it impossible for teachers and their students to take advantage of digital technologies for development. Though variation exists on the barriers to the use of digital technologies in higher education in Africa, Adam (2003) identified a number of problems that are impediments to ICT utilisation, such as underfunding of university education, inadequate broadband or lack of internet services, lack of or poor supply of ICT infrastructure, non-possession of technical skills by faculty, resistance to technology-assisted teaching and learning, lacklustre attitudes to the regulation of higher education and poor leadership in the management of meagre resources budgeted for African.

The Commonwealth of Learning (2017) has argued that Nigeria suffers from a combination of lack of comprehensive policy on ICT in higher education, poor supply of ICT infrastructure, poor power supply and lack of training for lecturers and students. According to Limb (2005), many of these sorts of problems are intertwined with issues related to globalisation

and the movement of digital technologies to non-Western societies. Because globalisation is driven by a market economy, nations whose economies have not been fully integrated into the global political economy or that are yet to liberalise are more likely to witness a slow pace of technological penetration. This is indeed one of the major problems confronting Africa, and arguably the majority of developing world (World Bank 2016).

Despite the number of studies acknowledging these broad and continent-wide barriers to ICT availability and utilisation, there are few studies that investigate institutional and individual barriers to ICT utilisation at local level. This paper seeks to fill this gap by documenting both institutional and individual barriers to ICT utilisation in the selected universities in Nigeria.

Theoretical Framework

This study explains the associated barriers to ICT utilisation in Nigerian universities within the context of a political economy approach and ICT utilisation resistance theory.

The Political Economy of Higher Education and ICT in Africa

The political economy approach situates ICT utilisation among middle-level lecturers and their students within the rubrics of Africa's political economy. The theory avers that for us to have a better understanding of the slow pace of the introduction, adoption and integration of ICTs into higher education in Africa, there is the need to interrogate the political economy of the post-colonial African state. The theory assumes that the African state, including its policies for higher education, is a child of colonialism and is thus designed to (re-)produce elites who will espouse European ideologies and values (Ekeh 1975). After independence, the philosophy of university education was modified to incorporate the interests of the indigenous people. The university system was therefore extended to citizens who had the requisite qualifications to attend the institutions. It also meant that governments would bear full funding of university education (Adam 2003; Teferra and Altbach 2004). The legacy continued until 1980s when many African countries realised that they could no longer bear the capital expenditure of university education because the number of students was increasing while funding was simultaneously decreasing (Aina 2002). Constrained and destabilised by the economic crises of the 1970s and 1980s, many African countries looked to the West and to the International Monetary Fund for foreign aid, but conditionalities dictated they liberalise their economies, reduce public service and commercialise university education. While many

states struggled with domestic resistance to liberalise higher education, reforms were introduced into the public sector, but public university education remained largely unchanged from early independence days (Ake 2000; Nnoli 1993).

In Nigeria, instead of strengthening the capacity of existing universities, the government at both the state and federal level increased the number of public universities. By the end of the 1990s, the university system was experiencing an infrastructural deficit (Ake 2000; Ilo 1994). By this time, neoliberal ideologies had come to dominate public sector management and university education (Dumbili 2014). Neoliberalism is an economic system that allows the market to dominate the allocation of resources. It believes that state interference in the economy must be limited so that individuals can maximise their potential. The development and expansion of ICT was therefore inextricably enmeshed with neoliberal economic policies and ideologies. Africa's higher education was caught up in this crisis of global capitalism (Ake 2000). Gradually, many African leaders began to reduce budgetary allocations to education. Because many of these institutions were cash-strapped, they could not invest in ICTs; and where the private sector was desirous of assisting to inject digital technologies, there was apprehension of systemic take-over by the neoliberals. As a result of lack of adequate attention to infrastructural development, universities have often lacked access to a stable power supply, which consequently constrained internet services for staff and students. ICT availability and utilisation in higher education in Nigeria, and indeed across much of Africa, is thus rooted in the management of the political economy of the post-colonial African state.

ICT Utilisation Resistance Theory and Higher Education in Nigeria

The ICT utilisation resistance theory (IURT) is a technology diffusion and integration theory. It explains why some people use ICT and why others do not or fail to efficiently maximise the benefits of the digital age. The theory assumes that every individual is desirous of using technology to enhance productivity, but that certain perceptions determine whether they accept or reject modern technology. As explained by Davis (1989), it is not modern technology that is the problem, it is the perception that people have about the usefulness and ease of use of the technology.

IURT assumes that certain social contexts determine whether people use ICT or do not. In these social contexts, the attitude of the government to the information age, the policy environment, the learners' instincts,

the teachers' perceptions of and attitudes to ICT in education, the policy of government on higher education and promotion of the welfare of faculty are all factors at play. Included also is the deliberate policy to resist the involvement of the private sector in the domestication of ICT in higher education. Whereas the private sector has been a significant engine of political and economic reforms in the developed world, the potentialities of the private sector in the liberalisation of higher education has not been fully realised because of lack of political will to translate policy to practice.

IURT enables a researcher to look at how resistant factors in developed and developing countries impinge on the application of ICT in higher education. The theory opines that, in Africa, there are certain deliberate policy structures within the university system that make it difficult for ICTs to effectively penetrate and drive higher education in the continent. One such structures is the culture of corruption in the public service of many African economies. Whether market-driven or non-market driven, corruption in higher education in Africa hurts the poor and diverts the government's meagre resources into private pockets. It ensures that funds budgeted for ICT infrastructure and ICT education do not trickle down to the beneficiaries. It ensures that cartels and cabals dominate public higher education, with the result that the children of the poor suffer from the poor policy environment. IURT encourages African governments to probe the funding of higher education and introduce reforms that are designed to sweep away resistant forces to ICT education in Africa.

The synthesis of the political economy of higher education and ICT utilisation resistance theory provides detailed information about both endogenous and exogenous barriers to ICT utilisation among middle-level lecturers in Nigeria, and provides possible means of addressing those barriers using indigenous innovative techniques that are properly designed for the individual lecturers as well as for the government and/or private owners of the universities.

Research Method

Design, Location and Population

The study adopted a cross-sectional survey design, which allows for physical contact and interaction. A mixed methods approach of data collection was adopted. The cross-sectional survey method was used to generate the quantitative data for the study, while the in-depth and key informant interview methods were utilised to elicit qualitative data that served to deepen discussions on the issues interrogated by the study.

The study was conducted in 12 universities across the six states in South-western Nigeria. Two universities were selected in each state, with four universities for each ownership type – federal government, state government and privately owned – were sampled to allow for comparison. Two different sets of study population were involved in the study. The first comprised middle-level lecturers, operationalised in the study as those who are designated as lecturer II, lecturer I and senior lecturers using the standard lecturing grades in Nigeria. Academics that fell outside these categories were not eligible for the study. The second study population comprised students in the same institutions who had been or are currently being taught by the lecturers in question (see Table 1 for the list of universities and sample size).

Table 1: List of sampled universities and sample size

State	School	Ownership	Proposed sample size		Achieved sample size	
			Lecturers	Students	Lecturers	Students
Lagos State	University of Lagos, Akoka	Federal government	150	150	122	122
	Lagos State University, Ojo	State government	100	100	86	86
Ekiti State	Ekiti State University, Ado-Ekiti	State government	175	175	140	140
	Afe Babalola University, Ado-Ekiti	Privately owned	75	75	86	86
Oyo State	University of Ibadan, Ibadan	Federal government	150	150	184	184
	Ladoke Akintola University, Ogbomosho	State government	100	100	35	35
Ondo State	Adekunle Ajasin University, Akungba	State government	175	175	162	162
	Joseph Ayo Babalola, University, Ikeji-Arakeji	Privately owned	75	75	74	74
Ogun State	Federal University of Agriculture, Abeokuta	Federal government	175	175	156	156
	Covenant University, Ota	Privately owned	75	75	60	60
Osun State	Obafemi Awolowo University, Ile-Ife	Federal government	175	175	156	156
	Redeemers University, Ede	Privately owned	75	75	64	64
			1,500	1,500	1,325	1,325

A sample of 1,500 was drawn from these respective study populations from the selected universities for the cross-sectional survey in a manner that ensured fair representation of all the faculties, schools and colleges in each university. However, only 1,325 copies of the questionnaire respectively were properly completed and returned by the lecturers and the students. For the qualitative data, six lecturers, one member of library staff and one member of ICT personnel were purposively selected in each university. The study was a one-time study conducted between June and October 2018, and the individual lecturer/student is the unit of analysis.

Research Instruments and Operationalisation of Variables

A structured questionnaire and an in-depth interview (IDI) guide were used to elicit information from respondents. These research instruments were administered concurrently on the field to complement each other. The questionnaire had different sections bordering on the socio-demographic profiles of respondents and the core research questions that the study set out to answer. The section on respondents' socio-demographic characteristics sought to elicit information about their sex, age, marital status, nationality, ethnic group, state of origin, level of education and current position, among others. The section on ICT availability and functionality required the respondents to indicate whether or not certain identified ICT facilities for teaching were available in their institutions, and whether or not these facilities were functional in the event that they were available. The identified teaching facilities included tablets, multimedia projectors, interactive boards, presentation clickers, microphones, speakers and digital tutors, among others. On proficiency, same facilities were listed in another section of the questionnaire and respondents were asked to indicate how good they were in using them. The options therein were 'very good', 'fairly good' and 'not good'.

Regarding utilisation of ICT facilities, students' reports were used as these were considered a more reliable measure than the self-report of the lecturers. Teaching-related ICT facilities were listed and students were asked to indicate how often the facilities were used by their lecturers in teaching. The options were 'always', 'often', 'sometimes', 'rarely' and 'never'. Barriers to ICT utilisation were measured at two levels. The first was the institutional level where respondents were asked questions about institutional capacity, funding, institutional commitment, corruption, support infrastructure and maintenance culture, among others. At the individual level, respondents were asked to indicate factors they considered as barriers to effective utilisation of ICT by both lecturers and students in their institutions. The options included lack of knowledge of ICT, inadequate training and lack of access to ICT staff, among others. Performance

of lecturers in teaching was measured using one item. After completion of the questionnaire by each lecturer, one student who had taken or is currently taking a course(s) taught by the lecturer was asked to complete the section meant for students. The courses that the lecturers indicated they taught were read to the students to ensure that the wrong students were not handed the questionnaire. The students were asked to rate the performance of their lecturers in teaching with the options 'good' and 'bad'. Respondents were also asked about availability and functionality of selected teaching-related ICT facilities, as well as possible barriers associated with the utilisation of the facilities.

Data Analysis

For the quantitative data, Statistical Package for Social Sciences (version 22) was used for data entry and analysis. Frequencies, means and percentages were used for descriptive univariate analysis. Since there was a single dependent variable with two outcomes: '0=bad' and '1=good', Chi-square test was used to show whether gender and nature of ownership were associated with performance in teaching. Binary logistic regression was used to test if availability, utilisation, proficiency and barriers are associated with lecturers' performance in teaching. Each of the independent variables had multiple predictor variables. The interviews were transcribed in Microsoft Office Word and analysed manually.

Ethical Considerations

Letters of notification were written to the Vice-Chancellors of the 12 universities to inform them about the study prior to commencement. The questionnaires contained a brief introduction and a letter of consent. In addition, respondents were verbally briefed about the study before their participation. No participant was coerced into participating in the study.

Results

Socio-demographic Characteristics of Lecturers and Students

The socio-demographic background of the lecturers showed that 46.6 per cent were from federal government-owned universities, 31.9 per cent from state government-owned universities. The remaining 21.5 per cent were from privately owned universities., the study indicated that 67.7 per cent of the respondents were male while only 32.3 per cent were female. From the data, it was found out that 80.5 per cent of the respondents were within

the age bracket of 30–49 years, 84.4 per cent were married and 10 per cent single. Adherents of Christianity made up 77.7 per cent with a small proportion of Muslims. Lecturer II constituted 35.3 per cent of the total sample, lecturer I 35.9 per cent and senior lecturers 28.8 per cent.

The study showed that 56.4 per cent of the students were male. The mean age was 22.2. The majority of them (95.5 per cent) were single, and 98 per cent of them were Nigerians. More than a quintile (22 per cent) of them were in their fourth year, 23.4 per cent were in their third year and 20.5 per cent were in their second year.

Availability and Functionality of Teaching-related ICT Facilities

The study examined the availability, functionality and nature of ownership of ICT facilities in the selected universities – the results are presented in Table 2 and Figure 1. The study found that availability and functionality of ICT facilities were quite low in most of the universities investigated. For instance, no ICT teaching-related facility had up to two-thirds availability, and none had up to 50 per cent functionality. Available teaching-related ICT facilities were mostly officially owned by the institutions except for tablets, which majority of the lecturers owned personally. The study also showed that the most available facility was a multimedia projector at 63.5 per cent, followed by microphones and speakers at 57.8 per cent, and tablets at 55 per cent. These three facilities had at least a 15 per cent deficit in terms of functionality.

Table 2: Availability and functionality of teaching-related ICT facilities

ICT Facilities	Availability (per cent)	Functionality (per cent)	Official ownership where facility is available (per cent)
Tablet	55.0	38.5	22.3
Multimedia projector	63.5	46.3	85.3
Interactive board	41.3	27.8	87.1
Presentation clicker	26.2	19.2	73.1
Microphone and speaker	57.8	40.0	87.1
Tele/video conferencing	12.7	9.4	89.4
Radio broadcast	10.0	6.5	89.1
Television broadcast	9.1	7.2	86.2
Digital tutors	12.0	7.8	80.8

Source: authors’ fieldwork, 2018

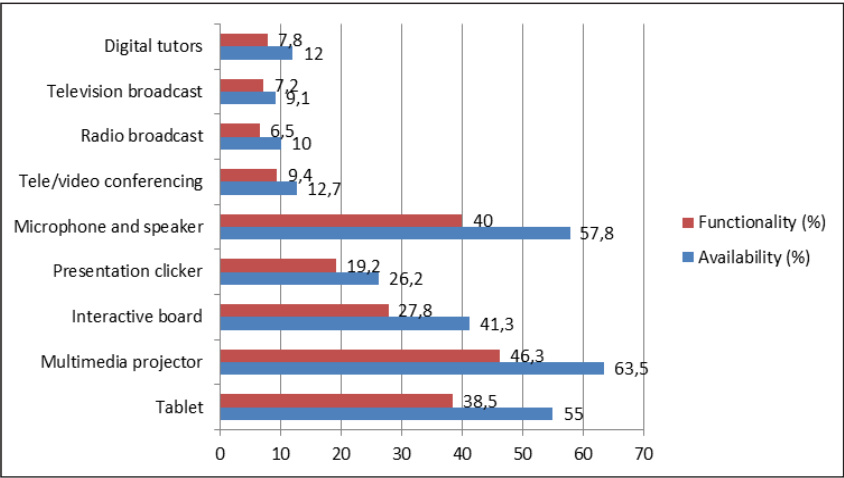


Figure 1: Availability and functionality of ICT facilities

Lecturers’ Utilisation of ICT Facilities in Teaching (Students’ Report)

As presented in Table 3, the students reported that multimedia projectors were the most commonly used ICT facility by the lecturers in teaching, followed by microphones and speakers and interactive boards. The least used were broadcasts, digital tutors and teleconferencing.

Table 3: Lecturers’ utilisation of ICT facilities in teaching (students’ report)

ICT Facilities	Always	Often	Sometimes	Rarely	Never
Multimedia projector	16.8	12.1	27.2	14.9	29.1
Interactive board	12.8	15.0	19.8	8.9	43.4
Presentation clicker	5.4	5.5	16.5	14.6	58.0
Microphone and speaker	15.7	14.8	27.0	12.1	30.4
Telecommunication facilities	4.4	4.4	14.8	15.1	61.3
Digital tutors	2.6	3.9	7.3	12.1	74.0
Teleconferencing	2.9	4.1	8.1	11.1	73.8
Radio broadcast	2.4	2.3	6.0	10.1	79.2
Television broadcast	2.6	2.3	6.0	9.7	79.3

Source: authors’ fieldwork, 2018

While students from government universities reported high use of microphones and speakers (43.5 per cent in federal and 36.9 per cent in state universities), interactive boards and teleconferencing appear not to be readily available in these schools. Facilities such as interactive boards (49.5 per cent), e-mail communication (27.8 per cent) and tele/video conferencing (9.1 per cent) were more available in private institutions than in government ones. This is likely due to there being fewer students in private universities, whereas the teacher to student ratio in government-owned schools is high, thereby necessitating the use of microphones and speakers. This point was reiterated by one of the respondents from the government-owned universities:

We use projectors, microphones and speakers when we have general courses like GST. The class is very big...Imagine teaching over 1,000 students, many students will sit at the back, so you will need to use speaker and project something for the students to see (IDI, male, lecturer).

Reporting about availability, a respondent in a public university said:

Laptops are owned by lecturers, the school did not buy laptop for lecturers, we bought it by ourselves but I think there are desktop computers installed for the students.... There is printer only at the departmental level.... Multimedia projectors, public address systems and presentation clickers are available at the faculty level, but not at the department. Any department that wants to use them will apply to the faculty....We don't have broadcasting and tele-teaching facilities (IDI, male, lecturer).

In some private universities, teaching facilities such as projectors are used. It is in fact mandatory for students to take courses related to ICT until they graduate so that they are regularly updated with new technologies. A female student noted that:

We do have ICT facilities, we offer compulsory ICT courses every semester from year 1 until we graduate, there are different specialties, but I am doing web design. Then, we make use of the projectors very well...we have research room mainly for economics students, we go there for economics research (IDI, female, student).

Variations between public and private universities in the use of ICT for teaching may be explained by their differing goals and motivations. For instance, the profit drive of the private universities propels them to insist on standards that in turn guarantees higher demand and patronage. For the public universities, there is already an over subscription by students so they are not under any pressure to impress anybody by adopting innovative teaching techniques.

Institutional Barriers to ICT Utilisation

Generated data on barriers to ICT utilisation in Nigerian universities revealed that effective use of ICT in teaching in the universities is hampered by both institutional and individual barriers, as indicated in Figure 2 and Figure 3. The most common institutional barrier to ICT utilisation was poor support infrastructure at 71.4 per cent. This was followed by poor electricity (68.5 per cent), poor funding of ICT services (67.8 per cent), inadequate human capital to manage ICT (66.1 per cent) and poor maintenance culture (65.5 per cent). The barrier that had the lowest response rate was supply of fake and non-functioning ICT equipment at 54.9 per cent. Lack of commitment from university administrators and lack of ICT training support for staff were 57.7 per cent and 58.9 per cent respectively.

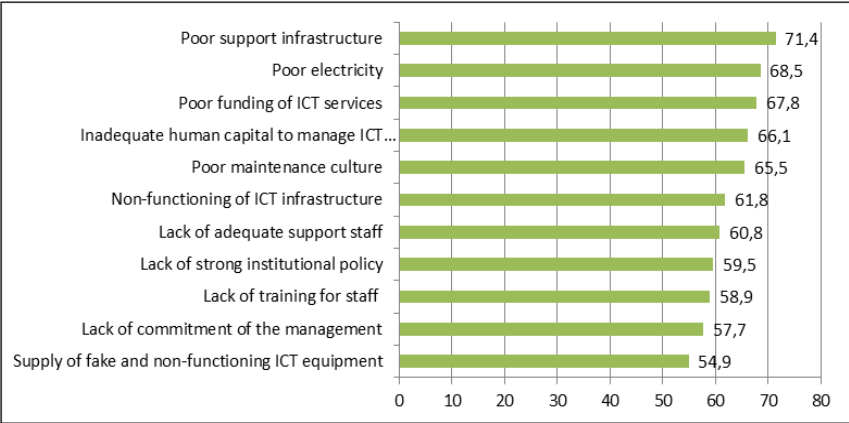


Figure 2: Institutional barriers to ICT utilisation

Individual Barriers to ICT Utilisation

At the individual level the most reported barrier was inadequate training of lecturers and students (70.4 per cent). This was followed by non-availability of regular capacity building (70.2 per cent) and lack of adequate understanding of the use of ICT in the conduct of online survey (68.2 per cent). The least reported individual barrier was non-availability of laptop and other personal computer gadgets at 48.9 per cent.

As with the quantitative data, the interviews also showed that electricity supply was a leading barrier to ICT utilisation. One of the respondents reinforced this when he stated that:

Light [electricity] is a major barrier we have in this institution; we have not been having public light regularly even though the effect of this is defrayed

sometimes by the use of private generating plants. We have the power generator that is attached to the library; what the management has done to help us is whether there is public light or not, once it is 10:00 am, the power generator is put to use till close of work, which is 4:00 pm. Yesterday, we had a problem with the power generator and when it happens like this, the central generating set of the school is extended to us if there is not much load. The library is prioritised by the handlers of the central generator whenever there is no power from PHCN [Power Holding Company of Nigeria]. Another barrier is that, once in a while, we do have problem with internet fluctuations; it gives us a lot of stress (IDI, male, lecturer).

Another respondent added thus:

Electricity is a serious barrier...another barrier is the server; when the server is down, there is nothing you can do...Funding is a problem also because funding is not as expected, it is underfunded. But at least we still have something to work with (IDI, male, lecturer).

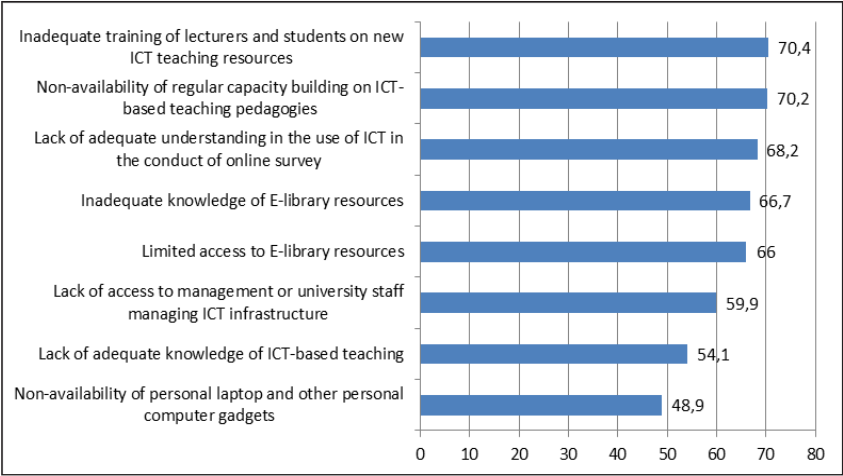


Figure 3: Individual barriers to ICT utilisation in the universities

Research Question 1: Does Availability of ICT Facilities Influence Quality of Teaching?

The study found that, overall, availability of teaching-related ICT facilities significantly predicted the quality of lecturers’ teaching, as shown in Table 4. The most important teaching facilities were multimedia projectors, tablets and digital tutors. The table shows that in universities where lecturers had tablets, they were 1.5 times more likely to deliver quality teaching than those in institutions where tablets were not available ($\beta=-.378$; $p=0.010$). Similarly, lecturers working in universities where multimedia projectors were available

were 1.8 times more likely to deliver quality teaching than those in universities where such is not available ($\beta=-.582$; $p=0.001$). In universities where digital tutors were available, lecturers were 2.2 times more likely to deliver quality teaching than in institutions where digital tutors were not available.

Table 4: Binary logistic regression model for availability of ICT facilities and quality of teaching by middle-level lecturers

ICT facilities	Beta	Standard Error	Wald	Exp(B)	95 per cent C.I. for Exp(B)	
					Lower	Upper
Tablets	-0.378	0.147	6.640	0.685**	0.514	0.913
Multimedia projector	-0.582	0.177	10.769	0.559***	0.395	0.791
Interactive board	-0.108	0.156	.479	0.898	0.662	1.218
Presentation clicker	0.460	0.186	6.109	1.584*	1.100	2.282
Microphone and speaker	0.291	0.170	2.929	1.338	0.959	1.867
Tele/video conferencing	-0.238	0.307	.597	0.788	0.432	1.441
Radio broadcast lecture	-0.389	0.396	.962	0.678	0.312	1.474
Television broadcast lecture	0.943	0.457	4.249	2.567*	1.047	6.293
Digital tutors	-0.807	0.354	5.204	0.446*	0.223	0.893
Constant	1.197	0.260	21.207	3.309***		

Model X^2 (p) = 30.617 (0.000)

Hosmer and Lemeshow's Test (p) = 5.512 (0.702)

*- $p \leq 0.05$; **- $p \leq 0.01$; *** - $p \leq 0.001$.

Research Question 2: Does Utilisation of ICT Facilities have any Influence on Quality of Teaching?

As shown in Table 5, utilisation of teaching-related ICT facilities was significantly associated with performance in teaching (X^2 : 71.151; p : 0.000). In institutions where multimedia projectors were used, students reported that lecturers' teaching was 2.7 times higher in quality than universities where multimedia projectors were not used. Use of microphones and speakers was also associated with quality teaching ($\beta=-.158$; $p=0.007$). Similarly, utilisation of digital tutors and teleconferencing were significant predictors of teaching quality. Importantly, the use of emails in sending materials to students and receiving assignments and term papers was significantly associated with quality of teaching. Lecturers who share materials via email with their students were considered 1.4 times better in teaching than those who do not communicate via email with their students.

Table 5: Binary logistic regression model for utilisation of ICT facilities and quality of teaching by middle-level lecturers

ICT Facilities	Beta	Standard Error	Wald	Exp(B)	95 per cent C.I. for Exp(B)	
					Lower	Upper
Multimedia projector	-0.310	0.070	19.622	0.364***	0.389	0.565
Interactive board	0.008	0.060	0.019	1.008	0.897	1.134
Presentation clicker	0.154	0.079	3.812	1.166	0.999	1.361
Microphone and speaker	-0.158	0.058	7.349	0.854**	0.762	0.957
Telecommunications	0.217	0.095	5.241	1.242*	1.032	1.496
Digital tutors	-0.274	0.137	3.980	0.761*	0.581	0.995
Teleconferencing	-0.372	0.143	6.788	0.689**	0.521	0.912
Audio broadcast	0.013	0.175	0.005	1.013	0.718	1.428
Television broadcast	0.328	0.148	4.868	1.388*	1.037	1.856
Emails communication	-0.333	0.075	19.758	0.717***	0.619	0.830
Constant	1.711	0.462	13.721	5.532***		

Model X^2 (p) = 71.151 (0.000)
Hosmer and Lemeshow's Test = (p) 8.469 (0.389)
*- p ≤0.05; **- p ≤ 0.01; *** - p ≤0.001.

Research Question 3: What Institutional barriers significantly influence quality of teaching?

Table 6 shows the array of institutional barriers impeding the effective utilisation of ICT in teaching in universities. Among these are lack of strong institutional policy, poor funding of ICT services, lack of commitment of the management/leadership, poor support infrastructure, lack of ICT training for staff, supply of fake/non-functioning equipment and lack of adequate support staff. Overall, barriers to the use of ICT facilities were significantly associated with lecturers' performance in teaching ($X^2=36.009$; $P=0.000$). Where lack of strong institutional policy was reported, performance of lecturers in teaching using ICT facilities was 2.0 times lower ($\beta=-.716$; $p=0.000$), and where supply of fake/non-functioning equipment items was reported, performance of lecturers in teaching was 1.3 times lower. Surprisingly, performance was 1.8 times higher in universities where poor funding of ICT services was reported ($\beta=0.605$; $p=0.001$). This may be explained by the recourse to alternatives by individual lecturers.

Table 6: Binary logistic regression model for institutional barriers to use of ICT facilities and quality of teaching by middle-level lecturers

Barriers	Beta	Standard Error	Wald	Exp (B)	95 per cent C.I. for Exp (B)	
					Lower	Upper
Lack of strong institutional policy	-0.716	0.183	15.208	0.489***	0.341	0.701
Poor funding of ICT services	0.605	0.183	10.912	1.831***	1.279	2.621
Lack of commitment of the management	0.220	0.180	1.494	1.247	0.875	1.775
Poor support infrastructure	0.170	0.191	0.791	1.185	0.815	1.724
Lack of ICT training for staff	0.308	0.162	3.597	1.360	0.990	1.870
Fake/non-functioning equipment	-0.335	0.166	4.090	0.715*	0.517	0.990
Lack of adequate support staff	0.188	0.170	1.225	1.207	0.865	1.684
Constant	0.327	0.154	4.518	1.387*		

Model X^2 (p) = 36.009 (0.000)

Hosmer and Lemeshow's Test (p) = 18.853 (0.009)

*- p ≤ 0.05; **- p ≤ 0.01; *** - p ≤ 0.001.

Discussion of Findings

This study was designed to evaluate the impact of ICT on the performance of middle-level lecturers in teaching in Nigerian universities. This reason for this is hinged on the fact that middle-level lecturers are the leaders of tomorrow in the university system. It was also anticipated that to reform the nation's university system, faculty members will play a pivotal role in bridging the generational gap between the system's new entrants and the senior colleagues – professors – who are on their way out of the system.

The study revealed that the bulk of the lecturers were in lecturers I and II positions while the senior lecturers constituted just 28.8 per cent. With regard to the generational shift and the reform of ICT provision in Nigerian universities, the study showed that middle-level lecturers can serve as a powerful engine of inter-generational transfer of ICT knowledge, content and skills, provided they are well trained. The research corroborates the findings of Kpolovie and Awusaki (2016) and Ohiwerei and Onimawo (2016), who found that newly recruited faculty have more competencies and proficiency in the utilisation of ICTs than the older generation. It also

aligns with Castells (1996), Fuchs and Horak (2008) and Shrivastava and Shrivastava (2014), who have recommended that developing countries must embark on deliberate efforts to internalise ICT in the governance of affairs of their societies.

The study revealed that multimedia projectors (63.5 per cent) were the most commonly available digital technology in Nigerian universities, followed by microphones and speakers; these facilities remain a major tool of disseminating knowledge. Although the study revealed that Nigeria has improved significantly in the diffusion and adoption of ICT in university education, most Nigerian lecturers have not fully internalised it into their pedagogies, thereby limiting their capacity to engage their students using these facilities. . Comparatively, quite a large number of developing countries, including South Africa, have taken considerable steps in internalising ICT-based education in their schools (Shrivastava and Shrivastava 2014). The fact that none of the ICT facilities in our study had over two-thirds availability and up to half functionality is an indication that Nigerian universities need to improve their policies and programmes and to seriously integrate digital technologies into the higher education sector. Indeed, only a small proportion of the students reported ever encountering television broadcasts, teleconferencing and digital tutors in the course of their studies. This indicates that ICT utilisation in higher education has not progressed beyond preliminary stages (Archibong et al. 2010).

The binary logistic regression model on availability of ICT facilities and quality of teaching indicates that, overall, availability of teaching-related facilities significantly predicted the quality of lecturers' teaching. Specifically, the study found that in universities where lecturers stated that tablets were available, they are more likely to deliver quality teaching. Similarly, lecturers working in the universities that had multimedia projectors were also more likely to engage their students in ICT-based teaching and learning, delivering higher quality teaching than those institutions where they were not available. The results further indicated that institutions with digital tutors performed comparatively better.

The binary regression model on ICT utilisation and performance in teaching shows that, overall, ICT facilities are significantly associated with teaching ($\chi^2 = 71.151$; $p = 0.000$). This suggests that there is much enthusiasm among African students to apply digital technologies to learning, particularly following the rapid increase in mobile technologies in the continent (World Bank 2016). On the interest of students in ICT, the issue is evidently not one of acceptance of digital technologies, but rather of their availability and utilisation.

The logistic regression model on barriers to ICT utilisation and quality of teaching indicates that, overall, barriers were significantly associated with performance in teaching ($\chi^2 = 36.009$; $p = 0.000$). The study found that where a lack of strong institutional policy is reported, performance of lecturers in teaching was 2.0 times lower, and where the supply of fake/non-functioning equipment was reported, performance of lecturers in teaching was 1.3 times lower. As already noted, policy inconsistencies and poor strategic plans have been identified as some of the major problems to deepening ICT-based education in Africa (Adam 2003; Muianga et al. 2013; Sawyer 2004; World Bank 2016). The significance of mutually supportive policies is again reinforced in this study.

This study found that there are three major institutional barriers to ICT utilisation in teaching in higher education in Nigeria, namely: poor support infrastructure (71.4 per cent), poor electricity (68.5 per cent) and poor funding of ICT (67.8 per cent). Other problems that inhibit access to and utilisation of the ICT include lack of commitment of the management, supply of fake and non-functioning of ICT infrastructure to schools, shortage of ICT personnel and poor maintenance culture of university administration. As noted in the political economy approach and IURT, the problem of Nigeria's higher education is both structural and psychological. The structural aspect of the problem is explained by the nature and character of the post-colonial state in Africa and its treatment of development, including higher education; while the psychological aspect refers to the behaviour that poorly governed university environments impose on individual lecturers.

The Nigerian government's commitment to higher education has been abysmal and lacklustre (Okafor et al. 2011; World Bank 2012). Although lack of electricity supply is not ranked as one of the major barriers in this study, it constitutes one of the major obstacles to broader development. In a country where electricity supply diminishes day by day, insufficient electricity supply poses a grave danger to higher education because access to the internet is dependent on the amount of electricity supplied to each university (Teferra and Altbach 2004).

In addition to the issues of electricity supply and poor support infrastructure, Nigerian universities still need to contend with the problem of a lack of strong institutional policy. Since policies drive governmental decisions, the lack of strong or mutually supportive policies on the exchange and use of digital technologies has constituted a major barrier to ICT-based education across Africa. Muianga et al. (2013) specifically maintained that policy inconsistencies and lack of directional policy implementation are responsible for the slow

pace of ICT-based education in Mozambique. Therefore, a major lesson that comes with this study is that, apart from creating a conducive environment for the supply and funding of ICT infrastructure, policymakers must ensure that their policies converge with the aspirations of the stakeholders in the education sector (World Bank 2012).

Closely related is the issue of skills and human capital development in Africa's higher education, which has not received adequate attention. Lecturers and students require competencies and skills to bolster their performance in ICT-based teaching so they can compete favourably with their counterparts around the world (Akpan 2014; UNESCO 2015). Competencies are therefore central to the reform of ICT-based higher education anywhere in the world (Rae 2006).

Conclusion

In an era of increasing globalisation and digital technology, it has become clearer that no nation on the African continent can afford to be left behind in the use of ICT, particularly within the education sector. While individual countries have continued to make concerted efforts to deepen ICT utilisation in schools, there remain institutional and individual barriers to its effective utilisation. Considering the importance of tertiary education to development, this study sought to understand the constraints to ICT utilisation in Nigerian universities focusing on South-west Nigeria.

Contrary to previous literature on ICT-based higher education in Nigeria, Nigerian university lecturers are increasingly adopting ICTs in their teaching; however, the teacher-centred method remains common in many universities. This study found that there is a strong association between availability and utilisation of ICTs and quality of teaching. It therefore follows that greater access to ICT facilities should increase the quality of teaching and education. Expanding ICT utilisation beyond the current widespread use of microphones and multi-media projectors is necessary in order to improve student engagement and to close noticeable gaps in the digital divide between government-owned and private universities. It is also expected that private sector involvement in university education can help minimise the challenge of underfunding. This can be realised through public-private initiatives that take the interests of both the teachers and the students into consideration. If supported by mutually supportive policies, funding and support infrastructure, the incorporation of ICT into higher education pedagogies would help produce African students that can be constructive, critical, innovative and collaborative.

Acknowledgements

This is to acknowledge the Council for the Development of Social Sciences Research in Africa (CODESRIA) for giving us the grant to carry out this study in 2017 under the CODESRIA Meaning-Making Research Initiative (MRI) 2017 with grants No: MRI/CTR 14/2017.

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