Policies for computer and internet use: A roadmap for leveraging teaching in Nigeria higher institutions

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Abstract: Now that the readiness of students in Nigeria higher institutions regarding e-learning have been established in a previous work (Awoleye & Siyanbola, 2007) there is also a need for evaluation of teachers' skills vis-a-vis their preparedness towards online teaching. This work therefore measured both technical and attitudinal capacity (Pillay, et al., 2006) of the teachers across the institution types (the Universities, Polytechnics and Colleges of education). In the overall, intensity of computer access is better than Internet access in all the institution types and the intensity of Internet access is better than personal office connectivity. Although there are varied levels of access relative to institution types, Nigerian university teachers have better access to computer (98.4% of all respondents) and the Internet (94.8% of all respondents) than their counterparts in the polytechnics and colleges of education. Furthermore, computer access is better in the polytechnics (96.4%) than in the Colleges of Education (87.7%). Further measurement with bias for age on teachers' technical proficiencies revealed that there would be no threat for continuity if online teaching were to be adopted. The research further showed that after the passage (which may be due to retirement) of the teachers who are over 50 years old, there are teachers between 41-50 years who will take over, thereby removing the burden of succession. Based on a number of issues identified, the research suggests some useful policy directions, which will enhance the use of computer and the Internet to facilitate teaching and learning in the institutions.

Key words: teaching and learning; policy; education; institutions; teachers

1. Introduction

The Internet has revolutionized and transformed the world; many sectors have taken the advantage of its benefits and have profited (Awoleye, et al., 2008). Much empirical studies have been carried out on the precise ways in which Information and Communication Technologies (ICTs) have contributed to the process of knowledge accumulation (Oyelaran-Oyeyinka & Lal, 2006); and the results have been rich and largely unanimous. Several authors working independently (e.g. Becker, 1999; Awoleye & Siyanbola, 2008; CHEPS, 2000) have demonstrated empirically or through other methods that the use of ICTs to enhance teaching and learning has

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come to stay. Many countries in the world have been driven to re-think their educational system in order to be competitive (Agboola, A. K., 2006). In the educational sector, especially among students and lecturers in higher institutions in Nigeria it has been established that the use of Internet services have been tremendous. Without any gainsaying, ICTs have been established as important tools for enhancing pedagogy. Numerous benefits associated with the use of ICTs in education that have been highlighted by different authors. For instance, Chavez (1997) noted that Internet and computer usage has impacted positively on critical thinking, problem solving, prompt feedback and networking. In a two-country study, Oyelaran-Oyeyinka and Adeya (2004) also noted that the Internet has the potential to increase student access to education, improve curriculum and quality of instruction and increase productivity of academic publications. Similarly, Ramayah, et al (2003) reported that most students use internet because of the perceived effectiveness of the facility in information access on assignments and research projects.

In Nigeria, teachers and other educators in Higher Institutions have been involved in some form of informal online communication and discussion processes. Various forms of interactions have existed such as: peer-to-peer, student-to-teacher and teacher-to-students, this form of communication has been either synchronous or asynchronous (Webb, et al., 2004). All of these could be harnessed and used as strength towards leveraging the conventional process of teaching and learning in higher institutions in Nigeria (Tinio, 2003). This will create a computer and Internet mediated environment when learning and teaching work are augmented. A new pedagogical paradigm could emerge which will overcome most of the traditional challenges of teaching and learning. However, the resource and infrastructural constraints prevalent in developing countries like Nigeria (Oyelaran-Oyeyinka & Adeya, 2004; Oyelaran-Oyeyinka & Lal, 2006) makes it unnecessarily challenging for stakeholders to deploy ICTs for teaching and learning. It is within this context that a study of teachers' readiness to optimize this new ICT-driven pedagogical paradigm in Nigeria is well-placed. This will assist in satisfying the great demand for change by the government and the industry who are the key players in the labour market (Corkill, 2008). However, there is a need for a change in pedagogy because the target is to prepare the students for global competitiveness. The objectives of this work therefore are to: (1) Assess the e-readiness of higher institution teachers towards facilitating teaching and learning in higher institutions in Nigeria, (2) Identify peculiar online course delivery issues in Nigeria, and (3) suggest strategies that could facilitate successful implementation of online teaching and its sustainability.

2. Research methods

Issues relating to teachers' access and competence in selected ICTs—the computer and Internet—were examined among teachers in three different categories of institutions: universities, polytechnics and colleges of education. Multistage sampling approach was used to select a representative sample. This involved clustering of institutions by geopolitical zones. Nigeria is made up of 6-geopolitical zones. Since the highest intensity of tertiary institutions in Nigeria is in the South western zone. The institutions considered in this study were purposively selected from that zonal cluster. Each state in the zone was represented by a type of institution, except for one of the states that the institution chosen was not in session at the time of data collection. About 760 questionnaires were distributed among the lecturers who were randomly selected across 24 faculties in the schools, 511 questionnaires were returned which represents a return rate of 67%. Table 1 give other sample characteristics such as: age, gender and academic qualifications. The research employed both inferential and descriptive statistics

to analyze the data.

Table 1   Sample characteristics

Age (n=511)	Percentages	Gender (n=504)	Percentage	Academic qualifications (n=481)	Percentage (%)
20-30	8.1	Male	74	HND, Degree and Masters	66.3
31-40	42.6	Female	26	Ph.D.	33.7
41-50	34.7				
50+	14.7				

3. Basic ICT access in the different categories of institutions

Access to ICT facilities especially computer and the Internet in the office and other places are found to be important; hence this metrics has been chosen to track the objectives of this paper. Age cohort for both computer and Internet skills acquisition was used; this assists in measuring the level of sustainability of the teacher's proficiency relative to creation of ICT mediated teaching and learning system. The results are contained in Table 2.

Table 2   Computer and Internet access

	Computer access (x^2=17.1; p<0.001)	Internet access (x^2=38.8; p<0.001)	Office Internet connectivity (x^2=258.8; p<0.001)
University	314 (98.4)	290 (94.8)	249 (82.5)
Polytechnic	137 (96.4)	93 (73.8)	9 (7.5)
College of education	57 (87.7)	51 (87.9)	9 (5.2)

A number of general trends are to be noticed in the results. In the first instance, intensity of computer access is better than Internet access in all the institution types and the intensity of Internet access is also better than personal office connectivity. This latter trend is expected because the proportion of computer users includes all those teachers that use the Internet; and the proportion of Internet users includes everyone that has access in their respective offices. Secondly, computer and Internet access is high in all institutions types, suggesting that the basic requirement of ICT-driven teaching and learning are largely available in all the institutions. However, it has to be caveated that our measurement of access did not take into consideration where and the amount of time teachers spend in the use of these tools. When these are considered it is not impossible that the figures will not be as impressive. For instance, Office Internet connectivity is seen to be poor in all institutions except the universities. Also, non-parametric statistical tests showed that a significant difference exists among the institutions with respect to basic ICT access, with the universities being ahead in all cases. Taken together, these findings indicate that e-readiness varies among Nigerian tertiary institutions depending on type of institution and the ICT involved.

As the figures in Table 2 indicate, Nigerian university teachers have better access to computer (98.4% of all respondents) and the Internet (94.8% of all respondents) than their counterparts in the polytechnics and colleges of education. Furthermore, computer access is better in the polytechnics (96.4%) than in the colleges of education (87.7%). It is then obvious that the colleges have more ground to cover in catching up with the universities in terms of computer access of the teachers if the online-mediated teaching is to be adopted. The relative superiority of the universities can be attributed to a number of factors. First, three out of the four universities sampled in this study are federal institutions which are relatively better funded than other type of institutions. Besides the higher

subventions from government, the universities relatively attracts additional funding from donor agencies like non-profit organizations, international foundations and research consortia. Secondly, relative to other institution types, research activities in Nigerian universities is more intense and usually necessitate that the personnel interact with the computer and the Internet. In such cases, even when these tools are not readily available, the teachers are compelled to source for them.

Quite unexpectedly, intensity of Internet access in the colleges of education (87.9%) surpassed that of polytechnics (73.8%). In fact, the colleges are further ahead of the polytechnics here than the polytechnics are ahead of them in computer access. The suggestion advanced by this figure is that there is an appreciable level of e-readiness among the teachers in colleges of education. The infrastructural and funding challenges faced by Nigerian tertiary institutions, which may not be so pronounced in universities for the reasons earlier stated, is evidenced again here. Personal office Internet connectivity is encouraging in the polytechnics and colleges of education. The need for appropriate interventions, especially in the polytechnics and colleges of education is therefore indicated.

3.1 Proficiency in computer applications

New competences are required as a major issue, especially when there are changes in educational technologies (Barkauskaite & Peciuliauskiene, 2007). It is in this context that the research assessed the proficiency of the teachers in and across the different categories of institutions. Few researchers believe that successful application of ICT in educational practice depend on didactical, ICT literacy and pedagogical competence amongst others

Given the peculiarity of each institution type, one would expect that the proficiency of teachers across and within each of these institutions would differ for each of the computer applications and Internet services that we assessed. In establishing the veracity of this supposition, a Kruskal-Wallis test procedure was carried out after the respondents were grouped by their institution types. The Kruskal-Wallis test is the non-parametric form of the one-way ANOVA which tests for equality of population medians among groups (Kruskal & Wallis, 1952). It is an extension of the Mann-Whitney U test to three or more groups and has been applied specifically in this case because our measurement levels are essentially ordinal and/or categorical. The results of the analyses are contained in Tables 3; the table presents the institutional comparisons of proficiency in common computer applications and selected Internet services. Virtually in all computer and Internet applications, the university teachers are more likely to report higher proficiency levels. Again, this is a pointer to the fact that ICT-driven teaching is more readily deployable in the universities, compared with other institution types.

3.2 Assessment of teachers' proficiency by age cohorts

Another dimension to the scenario is presented in the following discussion in Table 3. The research observed that there is no threat at all for replacement of skills when some of the teachers are overtaken by age thereby leading to retirement. The percentage of teachers that fall within the age category 50+ years with proficiency in the use of both the computer and the Internet are not too pronounced. For example, the research found 32.6%, for universities, 22.2% for polytechnics and 16.7% for colleges of education for computer skills. The following were also found for Internet skill, 31.7%, for universities, 7.1% for polytechnics and 15.4% for colleges of education. It is also worth noting here that the data presents successive replacement, this is peculiar for universities and polytechnics, but there is no clear picture yet for colleges of education, all of these are flagged in bold type in Table 3.

Table 3 **Computer and Internet proficiency of teachers by age cohort across institutions**

| Type of Institution	Age group	Rating of computer proficiency			Type of Institution	Age group	Rating of Internet proficiency		
		Low	*Medium*	*High*			*Low*	*Medium*	*High*
Rating of computer proficiency					Rating of Internet proficiency				
University, n=312 (x^2=41.28, p<0.001)	*20-30*	22.2	33.3	44.4	University (x^2=17.69, p<0.007)	20-30	11.1	22.2	66.7
	31-40	7.3	47.0	45.7		31-40	15.5	39.9	44.6
	41-50	14.0	38.0	48.0		41-50	23.5	31.6	44.9
	50+	46.5	20.9	32.6		50+	41.5	26.8	31.7
Poly. N=133 (x^2=4.68, p<0.585)	*20-30*	31.6	42.1	26.3	Poly. (x^2=12.48, p<0.052)	20-30	21.1	47.4	31.6
	31-40	22.0	48.8	29.3		31-40	26.3	26.3	47.4
	41-50	40.0	40.0	20.0		41-50	39.1	37.0	23.9
	50+	44.4	33.3	22.2		50+	57.1	35.7	7.1
CoE, n=57 (x^2=0.99, p<0.986)	*20-30*	50.0	50.0	0.0	CoE (x^2=5.67, p<0.461)	20-30	66.7	33.3	0.0
	31-40	47.6	38.1	14.3		31-40	42.9	33.3	23.8
	41-50	50.0	35.0	15.0		41-50	52.6	26.3	21.1
	50+	41.7	41.7	16.7		50+	23.1	61.5	15.4

Also in Table 3, the proficiency of higher institutions teachers was measured across the institutions by different age categories. Chi-square result showed that there is significance difference in computer proficiency within the universities among the different age groups. On the contrary, the research noted neither the polytechnics nor the colleges of education were found to be significant. In the universities between the ages of 20 and 30, 44.4% of them are highly proficient and about one out of every 3 teachers are found to be moderately proficient. The picture is better between 31-40 age categories, 45.7% of them are highly proficient and 47% are on the verge of been highly proficient. This could be achieved with appropriate capacity building programme. Majority (48%) of the teachers between the ages 41-50 have the highest proficiency ranking when compared with other age groups. Fewer proportions (38%) of them have moderate expertise in the use of computer, but if the skills are not further enhanced there is a likelihood that this little will fade away with time. Sustainability of the application of computer in the University will thereafter become a mirage; hence policy must be put in place to guide against this occurrence. In summary, it was found that about 46% of the teachers in the Universities with the highest proficiency were found to concentrate between the ages of 20 and 50 years. There were not many aged teachers (above 50yrs) found within the high proficiency class, about 32.6% of them were represented. Furthermore, at both Polytechnics and Colleges of education as reported earlier age cohort will not be a critical factor since it is not significant at 95% level of confidence. Although in polytechnic, the highest percentage of those with high proficiency are between the ages of 31 and 40 which is just 29.3% and about 17% in the category of over 50yrs in the colleges of education. Among these institutions, there is still a need for a further training for the teachers in these institutions before successful application of computer can be fully deployed.

In the Internet session on Table 3, rating of Internet proficiency in the university among the lecturers is found to be significant with p<0.007, and close to be significant in the polytechnic at p<0.005 at 5% error level. The highest Internet services proficiency level is most between 20-30 age groups in the universities which represents about 66.7%. We also observed almost the same figure, about 45% each for the category of 31-40 and 41-50 of those that are highly proficient in the use of Internet services. The number of those that are highly proficient is reduced by 13% as the teachers cross the 50yr mark. This is an indication that the capability is concentrated

among the younger lecturers and hence transition (of application of ICT in education) will not be difficult within the university. In the polytechnics about 47% of the teachers who represent those that are highly proficient are in the 31-40 age group. The least represented among the highly proficient teachers in the polytechnic have crossed the 50yr mark, which stood at a paltry of 7%. This is also similar in trend to what obtains among the university lecturers as reported earlier, we then summarize here also that age cannot be barrier to successful deployment and use of ICT in education in the polytechnic. In the colleges of education, less than a quarter of those that represent the highly proficient are in the age range of 31-40, this shows that there is still more work to be done for the lecturers in colleges of education if they must not be left behind in the wave of using ICT in teaching and learning.

3.3 Surrounding issues of computer and internet use among teachers in institutions

A number of challenges and issues were identified by the lecturers as militating against their effective use of the computer and Internet facilities. As contained in Figure 1, slow access speed and excessive webpage loading time are the most cited challenges encountered in the use of the Internet. The two major challenges are hanging around insufficient bandwidth availability. These are pointers to the need for better ICT infrastructure to be provided within the country, especially within higher schools of learning. Other issues identified are incessant power failure, inefficiency of backup systems and poor quality of service due to incessant server failure.
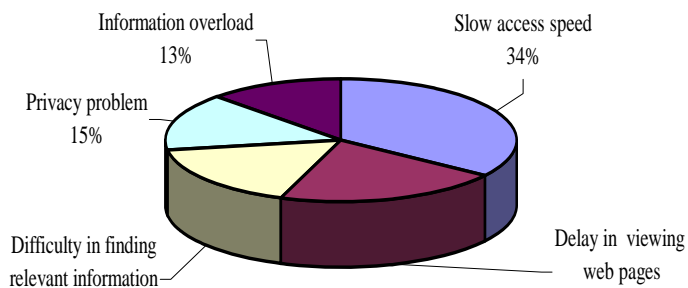
Figure 1   Challenges of information flow on the Internet

4. Conclusion

This paper has taken an empirical approach to the discussion of the readiness of Nigerian tertiary institution teachers to fit into the ICT-driven paradigm in teaching and learning, the findings are quite illuminating. Intensity of computer access is better than Internet access in all the institution types and the intensity of Internet access is also better than personal office connectivity. E-readiness varies among Nigerian tertiary institutions depending on type of institution and the ICT involved. Nigerian university teachers have better access to the computer and the Internet than their counterparts in the polytechnics and colleges of education although there is an appreciable level of e-readiness among the teachers in colleges of education. Personal office Internet connectivity is poor in the polytechnics and colleges of education. In virtually all computer and Internet applications, the university teachers are more proficient. However, with regards to the relatively more specialized computer and Internet applications, proficiency in all the institution types were found to be low.

Taken together, the results point towards several policy directions. The differentials observed in the apparent readiness of the teachers for effective deployment of ICT-driven teaching and learning calls for attention. While university teachers appear to be ready, polytechnic and college of education teachers are far from being so. Given the fact that each institution type has unique mandates, it is critical that teachers' capacity be built in the

application of ICTs to achieve their respective mandates. Improving the access of these teachers to the Internet in their offices would be a good starting point. Teacher-specific ICT centres, as are already being provided for students by several interventionist organizations, would also be greatly beneficial. Also, considering the differences in the apparent readiness of the institutions, it may be useful to initiate pilot e-learning schemes in the apparently readier institutions, that is, the universities. Besides the relative ease with which this would be done, it would allow more time for the other institution types to catch up, and the lessons learned from the pilot schemes will be very useful in deploying ICT-driven learning in the other institutions. To ensure sustainability of any schemes that might be implemented, it must be ensured that skill levels in more specialized computer applications and Internet services are developed among the teachers. Capacity must also be enhanced among the younger teachers who would then be readily available to ensure sustenance of the paradigm upon the exit of the older crop of teachers.

5. Other useful policy suggestions

The government could mandate minimum level of computer and Internet proficiency among tertiary education teachers in Nigeria with prescribed penalties for defaulting. This can be achieved by improving ICT use through capacity building programmes (training, seminars and workshops for staff). Alternate power supply systems, and dedicated power supply lines if possible, should be provided in tertiary institutions to guarantee regular supply of electricity to facilitate ICT usage. The government should provide adequate ICT equipment and infrastructure for enhanced ICT utilization in tertiary institutions. There should be a policy that all reports, publications, and papers coming out of tertiary institutions be aligned with defined ICT specifications. Financial assistance (rebates, discounts, etc.) should be provided for ICT training and procurements so as to stimulate ICT equipment acquisition and usage. A national coordination centre should be established for data collection and monitoring of e-readiness levels amongst Nigerian Educational Institutions, the centre will support policy development in ICT and e-readiness. Teachers and instructors in tertiary institutions should adopt a personal development habit aligned to ICT usage to enhance personal job performance towards e-readiness. Institutions must ensure adequate security of their network thereby guiding against any form of internal and external hacking into the system such as protection against pop-ups, viruses and worm attacks. Formation of MIS unit to co-ordinate Internet provisioning on campus network where they do not exist, also more commitment is solicited in this same unit where they already exist. School authorities are implored to make provisions for access to online journals, repositories for files and programs, electronic libraries both within and outside the campus since all of this are elements of leveraging traditional teaching and learning.

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