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A Study of E-Readiness Assessment: The Case of Three Universities in Nigeria

Samuel O. Eweni
seweni@suno.edu
Department of Science/Mathematics Education

Joseph Meyinsse
Joseph_meyinsse@subr.edu
Department of Science/Mathematics Education

Victor Mbarika
Victor_mbarika@subr.edu
Department of Management and Marketing

Simeon Okpechi
sokpechi@suno.edu
Department of Business and Public Administration

Southern University
New Orleans, Louisiana, 70126, USA

Abstract

This study investigated the readiness of three higher educational institutions in Nigeria in their attempt to introduce and maintain technology-driven services to students, faculty, and support staff. The prerequisites for participation in the digital, networked economy were investigated.

The sample consisted of 74 faculty members, 55 students, and 24 support staff from the three state universities. Self-administered and close-ended questionnaire was developed, pretested and after revision was used to collect primary data. Secondary data were collected from university catalogues, faculty and staff handbook, national and university-based newspapers. The data were analyzed using descriptive statistics, factor analysis and percentages. The findings reveal that three universities are active in seeking speedy adoption of digital technology and use of Information Communication Technology (ICT). The speed of adoption is slow because of some of the pre-conditions for digital technology are yet to be established. Furthermore, there are no national agency providing well-articulated strategies, financial distress and lack of national technological policy initiative or leadership. However there are a few areas of promise in which progress is being made such as: project management, use of spread sheets, use of E-mails for communication, between members.

Keywords: Diffusion; E-readiness; Information and Communication Technology; Network access

1. STATEMENT OF THE PROBLEM

The adoption of technology by the stakeholders (students, faculty, and support staff) at Nigerian higher education institutions is faced with a lot of challenges. Knowing the ICT barriers and finding possible solutions may assist educators to become successful in technology adoption in the future. The use of ICT in the classroom is very important for providing opportunities for students, faculty, and support staff. The major barriers identified in the literature are:

(1) Lack of ICT Infrastructure
(2) Lack of technicians
(3) Lack of education – Nigeria has a large population of uneducated people
(4) Lack of political will to set technology transfer policy and implementation
(5) Lack of establishment of research centers – regional and university centers
(6) Lack of sufficient number of computer hardware and software.

Purpose of the Study

The purpose of this study is to: (a) investigate the readiness of three higher educational Institutions in Nigeria in their attempt to acquire and maintain technology-driven services to its students, faculty and support staff. (b) the current state of ICT infrastructure and availability of Internet and ICT-related services, man power necessary to maintain the services in the nation's higher education sector. (c) evaluated the key barriers that are currently responsible for constraining a faster uptake of these technologies, and it also evaluates opportunities for improvement.

Significance of the Study

The findings of this research are expected to raise consciousness regarding the overall status of ICT development, help understanding of what needs to be done to improve the situation. The results may lead to serious discussions on policy implications on adoption and adaptation of appropriate technology and its human resource needs. It is hoped that the results will help in the design of appropriate technology training and adoption. Colleges and universities that have similar problems identified in this study will be able to learn from it and develop appropriate strategies and methods for implementing technology-driven services.

2. REVIEW OF THE LITERATURE

Overview

According to the study by Press, (2005), on Nigerian's ICT infrastructure, it was revealed that ICT infrastructure, accessibility and connectivity vary from area to area. The implication is that infrastructure in these three universities under study will vary, may be, significantly.

Eastman and Swift (2001) discuss several reasons why there is an increased emphasis on, and interest in, the use of technology in higher education. One of the main drivers of this trend is the escalating cost of education. In this situation, technology is seen as a means of reducing costs.

Hulme, D. (2003) contended that in a developing countries, a vast majority, due to poverty, lack of access or opportunities, poor infrastructure etc, are still very much excluded from the virtual opportunities provided by ICT.

The study by Rangaswamg (2008) on Telecenters and Internet Cafes found that, a vast majority of private Internet users access the Internet through Internet cafes (or cybercafés as they are locally called), while others did through dial-up facilities. A small percentage made up of mostly corporate bodies and very few private individuals access through Very Small Aperture Terminal (VSAT) linkups provided by ISPs

For the universities to participate in the digital, networked economy and instructional technology, certain factors must be present such as: (a) technology when available must be affordable, (b) reliable electricity supply, (c) reliable and up-to-date infrastructure, and (d) connectivity.

Theories and Models of Technology Acceptance

Many researchers have published various theories that explain the adoption of information technology and innovations. Diffusion of innovation theory suggests how, why, and at what rate new ideas and technology spread through cultures. Rogers (1964) defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system". Rogers categorized the five stages of diffusion as: awareness, interest, evaluation, trial, and

adoption or absorption. Rogers gave five characteristics of diffusion innovation, and they include: (a) how an improved an innovation is over the previous generation; (b) compatibility that an innovation which has to be assimilated into an individual's life. (c) the degree of difficulty associated with innovation. If it is difficult to use, an individual or society will not likely adopt it. (d) is trialability, which determines how easily an innovation may be experimented with as it is being adopted. For example, if a user has a hard time using and trying an innovation, this individual will be less likely to adopt it. (e) is observability

Rogers found out three classes of adopters, early adopters, a large group of mainstream adopters, and a small percentage of late adopters. He grouped these individuals on the bases of commonalities in personality, socioeconomic situations, and communication behaviors. The result of groupings revealed that early adopters tended to have higher socioeconomic status, have broad access to communication methods, have higher upward mobility within their social culture, and are more likely to be literate, more intelligent, and have higher capacity for uncertainty for change.

Technology Acceptance Model (TAM)

The technology acceptance model is a model that targets users' acceptance behaviors towards an information system (IS). TAM model studies are used in the workplace to measure employees' acceptance of new technology or systems. TAM is "specifically meant to describe computer usage behavior ...across a broad range of end-user computing technologies and user populations" (Davis, et al., 1989). According to the model, when users are presented with a new technology, a number of factors influence their decision about how and when they will use it. Factors that influence their decision are: 1) Perceived Usefulness (PU) which Davis (1986), defined as "the degree to which a person believes that using a particular system would enhance his or her job performance,"2) Perceived Ease-Of-Use (PEOU) which he defined as "the degree to which a person believes that using a particular system would be free from effort." TAM has become one of the most widely applied models for explaining and predicting usage intentions and acceptance behaviors of information technologies (Venkatesh, 2000) This model is adopted for this study.

Concerns-Based Adoption Model (CBAM) has been used to understand change in terms of technology. The CBAM has been used to understand teacher change in curriculum change (Straub, 2009; Christou, Eliophotou-Menon, & Phillippou, 2004) and adoption of a consulting teacher model (Pedron & Evans, 1990) as well as technology change and adoption (N.E.Davis & Roblyer, 2005; Dobbs, 2004).

Lewin Change Theory

There are many change theories, and these theories serve as testimony to the fact that change is a real phenomenon. Lewin (1951) introduced the three-step change model which Lewin named described as: (a) unfreezing the existing situation or status quo, (b) movement, and (c) re-freezing. Lewin views behavior as a dynamic balance of force working in opposing directions. The first step of Lewin's change model is unfreezing, and according to him this calls for overcoming the strains of individual resistance and group conformity. He stated three methods of achieving unfreezing: first, to increase the driving forces that direct behavior away from the existing situation or status quo. Second is by decreasing the restraining forces that negatively affect the movement from the existing equilibrium. Third method calls for a combination of the two methods.

Second step of Lewin's change model is movement, and Lewin believes that it is necessary to move the target system to a new level of equilibrium. To achieve this, three actions are needed to assist in the movement. The actions consist of: (a) persuading employees to agree that the status quo is not beneficial to them and (b) encouraging them to view the problem from a fresh perspective, working; together on a quest for new, relevant information, and (c) connecting their views of the group to well-respected, powerful leaders that also support the change.

The third step of Lewin's change model is refreezing, which takes place after the implementation of change. Refreezing entails reinforcing new patterns and institutionalizing them through formal and informal mechanisms through policies and procedures.

3. METHODOLOGY

The three universities for this case study are: Nnamdi Azikiwe University in Awka, Covenant University Ota in Ogu State, and Bells University

Ota in Ogun State. The research instrument distributed at the various locations was self-administered. It was collected after a reasonable period allowed for the completion.

The Sample

A total of two hundred instruments were distributed across academic disciplines and colleges within the three universities and across all levels of academic and faculty ranks. The sampling was not random rather it was based on convenient sampling. Thus, those lecturers who attended the conference received the questionnaire. In addition, the students, administrators and support staff were given questionnaire to complete in their various university campuses, e.g, Ogun-state: Nnamdi Azikiwe State University in Anambra State, Nigeria, Covenant University, Ota, Ogun-state, and Bells University Technology, Ogun-State in Nigeria. Students' population distributions of the University were:

Table 5: Students' population distributions of the University

Nnamdi Azikiwe University	25,000 students
Covenant University	9,150 students
Bells University	5,000 students

The sample size of this study is 155 drawn from the three universities. Of the total 149 returns received, 96% were analyzed and 6 were not usable.

Table 4: University Affiliated With (See Appendix)

Out of the three Universities (Federal, State, and Private Universities), 73 (47.1%) of the respondents came from Federal University in Nigeria; 13 (8.4%) came from State University in Nigeria; 32 (20.6%) came from Private University in Nigeria; 31 (20.0%) did not indicate which University they were affiliated with; and 6 (3.9%) were missing data.

Instrument

The closed-ended and structured questionnaire used is similar to Marcia J. Scherer. This type of questionnaire had been found to have high validity and reliability

Data Analysis

To identify the validity of returned samples, factor analysis method was used to delete the questions in high and low groups that had no significant difference. The Cronback's α value of each variable was calculated. Hypothesis Testing Summary was also used to draw conclusions about the population parameters and to determine whether the hypotheses could be reasonably supported or not.

Results from Factor Analysis of ICT Tools Usage

There are 12 items of frequency of ICT tools used by the faculty, student, and staff and they were subjected to principal component analysis (PCA) using SPSS Version 20.0. The suitability of data for factor analysis was assessed; found relevant and suitable. It shows many variables had coefficients of .3 and above. The Kaiser-Meyer-Oklin value was .840, and it exceeds the recommended value of .6 (Kaiser 1970, 1974) and Bartlett's Test of Spericity (Bartlett 1954).

The Principal components analysis reveals the presence of two components with eigenvalues exceeding 1 thus, explaining 45.8% and 11.5% of the variances, respectively. The, two-components showed a total of 57.2% of variance, with component 1 contributing about 45.77% and component 2 contributing about 11.47%. Oblimin rotation was performed resulting in the confirmation PANAS scale, with positive effect on items loading strongly on component 1 and negative items loading strongly on component 2. There was however a weak (r=-.443) negative correlations between the two factors.

Table 6: Component Correlation Matrix of ICT Tools Usage

Component Correlation Matrix

Component	1	2
1	1.000	-.443
2	-.443	1.000

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
Source: 2011 E-readiness Questionnaire, 2011

The correlation Matrix shows the strength of the relationship between the two factors (low value of -.443)

Table 7: KMO and Bartlett's Test on Use of ICT Tools (See Appendix)

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The suitability of the data set was verified for factor analysis, and the check shows that the KMO value is .825 and Bartlett's test is significant with (p=.000) above .6 minimum value for KMO and .05 or smaller for Sig. value. These tests support the factorability of the correlation matrix.

Table 8: Communalities on Use of ICT Tools (See Appendix)

Communalities provide information about the extent of the variance that was found in each item. All the components showed Communality values that are above .3. In the Total Variance Explained Table, the eigenvalues of two components recorded eigenvalues of (5.602, 1.628 and 1.022) respectively. All are above 1. These two components explain a total of 57.236 per cent of the variance (see cumulative % column).

Table 9: Total Variance Explained on Use of ICT Tools (See Appendix)

Principal component analysis reveals that the percentage of variance explained by three-factor solution shown in the Total Variance Explained table, only 68.8 per cent of the variance is explained.

In the Figure 3 Screeplot (See Appendix), a change (or elbow) in the shape of the plot was displayed. Only the components above this point are retained.

Table 10: Component Matrix of Expertise Technology Use

Component Matrix[a]

	Component		
	1	2	3
Word processing	.752	.478	-.114
PowerPoint Usage	.743	.239	-.244
Spreadsheets	.741	.154	-.363
Graphics	.724	.145	-.127
Database management	.720	-.409	
Project Management	.701	-.394	.211
Computer Speaker	.688	-.322	.311
Programming	.675	-.440	
Statistical Tools	.655	-.117	-.507
E-mail Usage	.648	.546	.242
Web page design	.628	-.310	.237
Internet Browsing	.480	.520	.533

Extraction Method: Principal Component Analysis.
a. 3 components extracted.
Source: 2011 E-readiness Questionnaire, 2011

All the components in Factor 1 reveal strong loading. In Factor 2, Word processing, E-mail usage, and Internet Browsing also show strong loading. In Factor 3, Computer speaker and Internet Browsing reveal there is also a strong loading.

Table 11: Rotated Component Matrix of Expertise Technology Use

Rotated Component Matrix[a]

	Component		
	1	2	3
Project Management	.805	.196	
Computer Speaker	.784	.159	.184
Programming	.767	.243	
Database management	.752	.331	-.101
Web page design	.710	.166	.123
Word processing	.166	.792	.391
Spreadsheets	.283	.791	
PowerPoint Usage	.269	.758	.142
Statistical Tools	.350	.699	-.298
Graphics	.357	.637	.165
Internet Browsing	.173	.245	.833
E-mail Usage	.172	.542	.674

Extraction Method: Principal Component Analysis. Rotation Method: Quartimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.
Source: 2011 E-readiness Questionnaire, 2011

Rotated component matrix reveals that Factor 1 shows low loading in word processing, spreadsheets, PowerPoint usage, Internet Browsing, and e-mail usage. Factor 2 shows Project Management, computer speaker, programming, web page design, and Internet Browsing load low. Factor 3 shows that word processing, Internet Browsing, and e-mail usage load high.

Implications for Further Research

The findings in this research suggest that the three Nigerian High Educational Institutions are not quite e-ready, although they continue to use judiciously what they have with limited success. Users seen to be pleased with what they got. However, new technologies are being introduced and hoisted on outdated infrastructure. To join the digital age, new infrastructures and new technology will have to be invested in. A well-established infrastructure and technology in

Nigerian High Education Institutions will positively increase their e-readiness.

Further research using a larger sample size is needed to test the results obtained here. Therefore, further research study of state of ICT in Nigeria is much needed in universities located in North, South, East and West have to be included.

Different approaches (such as qualitative approach) can be used to give a comprehensive argumentation of the relationship between variables and the reasons for the relationship. The level of strategic adoption and usage of ICTs by different sectors need to be accelerated.

4. CONCLUSION

The result of three universities studied above reveal a steady progress in the area addressing the country's tele-density. However, connectivity is yet to be a country-wide phenomenon and electricity supply problems are yet to be seriously addressed. These obstacles hinder the full potential of adapting digital technology economic, education and social development.

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Appendix

Table 4: University Affiliated With

University Affiliated

	Observed N	Expected N	Residual
Federal University in Nigeria	73	37.3	35.8
State University in Nigeria	13	37.3	-24.3
Private University in Nigeria	32	37.3	-5.3
Other	31	37.3	-6.3
Total	149		

Source: 2011 E-readiness Questionnaire, 2011

Table 7: KMO and Bartlett's Test on Use of ICT Tools

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.825
Bartlett's Test of Sphericity	Approx. Chi-Square	623.320
	Df	66
	Sig.	.000

Source: 2011 E-readiness Questionnaire, 2011

Table 8: Communalities on Use of ICT Tools

Communalities

	Initial	Extraction
Word processing	1.000	.808
Spreadsheets	1.000	.705
PowerPoint Usage	1.000	.668
E-mail Usage	1.000	.777
Internet Browsing	1.000	.785
Statistical Tools	1.000	.700
Graphics	1.000	.561
Web page design	1.000	.546
Programming	1.000	.654
Database management	1.000	.685
Project Management	1.000	.690
Computer Speaker	1.000	.673

Extraction Method: Principal Component Analysis.

Source: 2011 E-readiness Questionnaire, 2011

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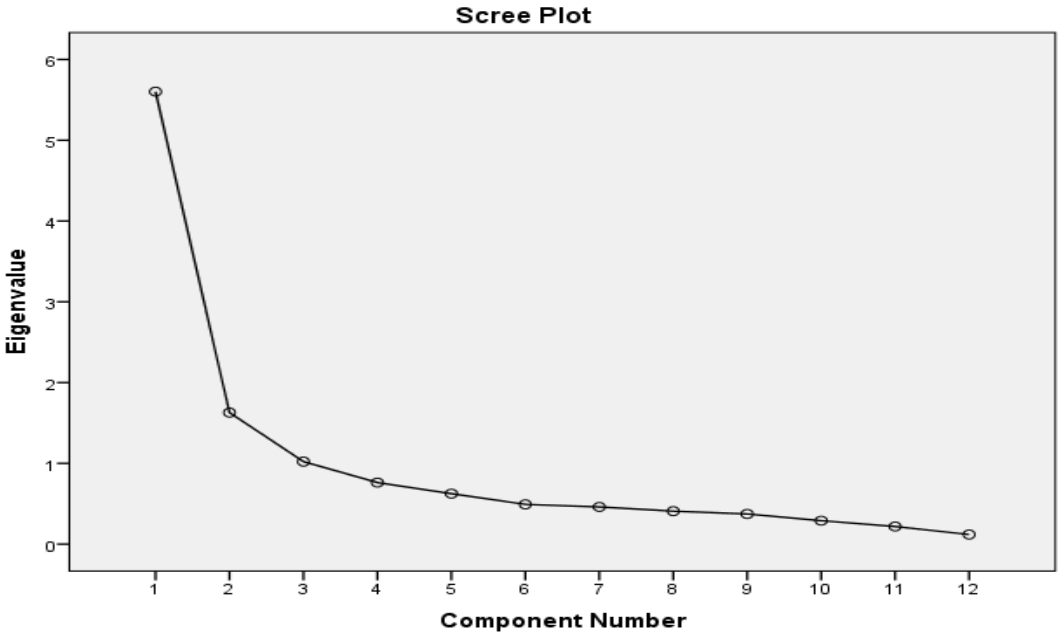
Table 9: Total Variance Explained on Use of ICT Tools

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.602	46.680	46.680	5.602	46.680	46.680	3.409	28.412	28.412
2	1.628	13.568	60.247	1.628	13.568	60.247	3.334	27.787	56.200
3	1.022	8.513	68.761	1.022	8.513	68.761	1.507	12.561	68.761
4	.762	6.353	75.114						
5	.625	5.206	80.319						
6	.492	4.100	84.419						
7	.460	3.835	88.254						
8	.408	3.403	91.657						
9	.374	3.113	94.770						
10	.290	2.420	97.190						
11	.218	1.817	99.008						
12	.119	.992	100.000						

Extraction Method: Principal Component Analysis.

Figure 3: Screen Plot of Expertise Technology Use



Source: 2011 E-readiness Questionnaire, 2011