

Factors Influencing ICT Adoption in Some Selected Secondary Schools in Ogun State, Nigeria

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Abstract—This paper addressed the factors affecting ICT adoption in a survey of 300 public and private secondary school students in Ogun state, Nigeria. Likert Scale self- designed questionnaire was the instrument of data collection. Data collected were analysed using frequency, scores, percentage scores, total weighted values and factor analysis. The ungrouped factors obtained using the mean weighted values were grouped into five dimensions using the factor analysis. The research showed that five factors are responsible for ICT adoption as perceived by the students. The factors are: assistance or support factors, availability factors, infrastructure factors, learning tools factors and cognitive factors. These factors can be studied in details and addressed to improve the level of ICT adoption in Nigeria.

Keywords—ICT, Academic performance, Likert Scale, Nigeria, KMO, School, Statistics.

1 Introduction

Information and Communication Technology (ICT) is a tool that can be applied to all aspects of human endeavour. ICT can be defined as computer-based tools and techniques for gathering and using information. The adoption of ICT in developing countries is often limited because of the cost implications of procurement of IT, lack of maintenance culture in managing ICT facilities, dearth of technical know-how and so on. Over the years, ICT adoption had greatly led to improvement in the workplace, optimization of scarce human and material resources and in achieving given tasks. Several sectors of the economy of Nigeria have adopted ICT as a tool for improving people, processes and procedures. Some are listed; road freight transport [1], construction industry [2], agricultural research [3], small and medium scale enterprises [4-5], accounting systems [6], advertising [7], tourism [8], libraries of tertiary institutions [9-10] and service industry [11]. Others are: school management [12], green technology and renewable energy [13], electronic commerce [14], marketing of pharmaceutical products [15] and effective governance, democracy and elections [16-18]. Other uses can be seen in [19-20].

Educational sector is one vital area that applies ICT in teaching and learning [21-22] and there is always a need to assess the impact of ICT as a tool for teaching and learning. This will aid the decision makers to assess the impact of ICT against the return on investment (ROI) and the effect of ICT adoption on the academic performance of students.

ICT has been noted to be a viable vehicle that drives economic development. There are uneven distribution of ICT adoption and implementation across Nigeria. The rural areas seem to lag behind the urban centres. In the urban centres, there is also a disparity between ICT adoption in privately and publicly funded schools. ICT adoption is often not viewed as important compared with the enormous problems faced in the educational system in Nigeria in general and secondary schools in particular. Some of the persistent constraints inherent in the educational systems include, but not limited to, the following: poor funding from government, outdated curriculum, red-tapism and official corruption, epileptic power supply, poor working conditions for the teachers, exploitation by private education owners, insecurity in some parts of Nigeria, brain drain, lack of laboratories for practical and cognitive problems [23-24]. All these have snowballed into a steady free fall of the educational sector.

Generally, adoption of ICT is in different phases, some are in the embryonic stage while some schools have successfully incorporated ICT into their curriculum for both privately or publicly funded secondary schools in Nigeria. A survey on ICT adoption on education in Nigeria showed that most research is on the tertiary education [25-27] and very few on secondary education. ICT adoption has shown to be very vital in information dissemination and can assist in quality lecture delivery, effective classroom management, enhanced interactivity and connectivity efficient cognitive testing and can facilitate learning [28-30]. It is also important to note that all the aforementioned benefits of ICT adoption are based on four inter lapping rationale. Firstly, ICT is a tool for getting the students aware of the existence and general use of computers, hardware and software. Secondly, ICT is used as a skill acquisition tool, to prepare the students for employment and entrepreneurship. Thirdly, ICT is adopted to help improve the learning process and lastly, ICT is a tool for improving learning and teaching and administrative processes thereby increasing efficiency and improved academic performance. However, there seems to be dispute on the extent on why ICT can help improve academic performance of students [31].

There is an appreciable improvement on ICT adoption in Nigeria but the success is glacier as some traditional method of chalk and talk are still prevalent in the schools and the effect have led to the students lagging dangerously behind in the trend of changes in the world [32]. Most of the teachers are ICT illiterate and have not received proper training to catch up with the trend of changes in the world.

A look at two papers that discussed about ICT adoption in secondary schools in Nigeria showed the following. The authors were unanimous on the causes of the low level of ICT adoption in secondary schools in Nigeria [33-34]. The causes are low level of interest of the students, lack of maintenance culture, inadequate software, dearth of infrastructural facilities to host and support ICT, power supply failure, non-implementation of national ICT policy and inadequate policy framework for integrating ICT into the curriculum, the secondary schools are limited in funding and cannot

attract highly skilled ICT experts, high cost of ICT and recurrent expenditure on their maintenance, poor management and lack of investment in education.

Finally, the two papers considered only publicly funded schools and their teachers, but this research considered both public and private secondary school students. Also, the two papers used mainly descriptive statistics while this paper used factor analysis.

2 Materials and Methods

2.1 Study area and Sampling method

The data were from a field survey aimed at assessing the factors (variables) influencing ICT adoption by students in four (4) selected secondary schools in Ogun State, Nigeria. The schools comprise of two private and two public schools. Each school have students in both junior and senior levels. The proximity between the schools was the reason for the purposive sampling while simple random sampling was used to recruit the respondents.

A total of 360 questionnaires were distributed and 300 representing 83.3% was returned and analysed. The data measures the general use of ICT and ICT as a tool for learning and teaching.

2.2 Questionnaire design

The questionnaire was divided into two parts, namely, part A and part B. Part A consists of the socio-demographic responses. Part B took contains the measure of the factors influencing the adoption of ICT by secondary school students divided into three parts, namely; general use of ICT, ICT as a tool for learning and ICT as a tool for teaching. Each part consists of five (5) questions which are the variables for measuring the adoption of ICT as a tool that influences academic performance of students in the surveyed schools in particular and Ogun state in general.

2.3 Statistical method

The 3-point Likert scale was adopted for proper extraction of the data. and the scores of the responses are presented in Table 1. Thereafter, statistical factor analysis was employed to analyse the data using SPSS 23.0.

Table 1. Likert scale coding for the responses

Responses	Key	Scores
Strongly agree	SA	3 points
Agree	A	2 points
Disagree	D	1 point
Strongly Disagree	SD	0 point

3 Results and Discussion

3.1 Sociodemographic analysis

Originally, 360 questionnaires were distributed and 60 were excluded because of nonresponse. The socio-demographic data of the respondents are presented in Tables 2, 3, 4 and 5 respectively. They are the age, type of school, gender and level of school of the respondents. It can be seen that 208 (69.3%) of the respondents are between the ages of 11 and 15, 89 (29.7%) are between the ages of 16 and 20 and 3 (1%) are 10 years or below. It can be seen that the respondents were equally drawn from private and public schools. Also, more female (56.3%) than male (43.7%) were the final respondents after the removal of the nonresponse data. 140 (46.7%) of the respondents are in the junior secondary category while 160 (53.3%) are in the senior secondary level.

Table 2. Age of respondents

Age	Frequency	Percent	Cumulative Percent
≤ 10	3	1.0	1.0
11-15	208	69.3	70.3
16-20	89	29.7	100.0
Total	300	100.0	

Table 3. The type of school of the respondents

School type	Frequency	Percent	Cumulative Percent
Public	150	50.0	50.0
Private	150	50.0	100.0
Total	300	100.0	

Table 4. Gender of the respondents

Gender	Frequency	Percent	Cumulative Percent
Male	131	43.7	43.7
Female	169	56.3	100.0
Total	300	100.0	

Table 5. The level of the respondents

Level of school	Frequency	Percent	Cumulative Percent
Junior	140	46.7	46.7
Senior	160	53.3	100.0
Total	300	100.0	

3.2 Factors responsible for the ICT adoption

The Likert scale was used to compute the factors influencing ICT adoption as it relates to the academic performance of the respondents. This is summarised as total

weighted values (TMV) and mean weighted values (MWV) as shown in **Table 6**. The data were arranged from the lowest to the highest MWV. Variables with higher MWV are the ones that most influence the ICT adoption and can be perceived as having greater effects on the use of ICT in teaching and learning which consequently affects their academic performance.

Table 6. Factors responsible for the ICT adoption as it affects the academic performance of secondary school students' using the total and mean weighted value

Factors	Responses				TWV	MWV
	0	1	2	3		
Computer Studies	4	20	94	182	754	2.51
Computer Lab	15	21	111	153	702	2.34
Communication	12	37	88	163	702	2.34
Learning	16	37	98	149	680	2.27
Practical	12	27	139	122	671	2.24
Google	20	32	112	136	664	2.21
Quality	19	44	114	124	641	2.14
Retention	19	44	128	109	627	2.09
Understanding	18	57	105	120	627	2.09
Performance	18	39	142	101	626	2.09
Internet	17	56	118	109	619	2.06
Teaching Aid	40	62	114	84	542	1.81
Frequency	34	80	97	89	541	1.8
Usage	35	72	116	77	535	1.78
Ability	121	86	49	44	316	1.05

The top five ungrouped factors are given as:

- ICT as a tool that aid in the understanding of computer studies
- equipped computer laboratory helps to enhance learning
- ICT helps in communication
- ICT helps in the learning process
- ICT helps students to practise what they are taught in school

On the other hand, the following five factors least affect ICT adoption as perceived by the respondents.

- The internet does not really help. This is not surprising as the chalk and talk method is the traditional norm in this part of the world.
- ICT has not been fully adopted as a teaching aid in Nigeria as seen from the responses from the students.
- The students seem not to be frequent users of ICT in their schools since as the factors mentioned in the introduction section helps explain the reasons why the students are not using ICT more frequently as they ought to.
- ICT usage is still very low.
- Most of the students have not been trained and equipped with the necessary ICT skills that will enable them to be able to use them effectively.

4 Factor Analysis

Before factor analysis is applied, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity was conducted to determine the applicability of the factor analysis of the raw data. The outcome of the analysis revealed the K.M.O value of 0.822 with Bartlett's test significance level of 0.000 and Chi-square value of 999.409, which is shown in Table 7. This result shows that the survey data is suitable for factor analysis.

Factor analysis was carried out in order to determine the factors that influence ICT adoption as it affects the academic performance of students in secondary schools in Ogun State, Nigeria. Furthermore, the KMO test indicated that the correlation matrix is an identity matrix. Table 8 shows the communality of the variables. The highest and lowest communalities are teaching aids (76.6 %) and ability (39.1%) respectively. The extraction method used is the principal component analysis (PCA) and the total variation explained by the model is shown in Table 9. It can be seen that all factors that are with Eigenvalues above 1 were extracted and represented under the column extraction sums of square loadings. The results revealed 5 unconfirmed factors and also suggested that there was a cumulative total of 56.74% with variances of 6.81% and 8.00% on and after extraction which was confirmed after rotational extraction. Table 10 is the rotated component matrix of factors influencing ICT adoption, obtained using varimax with Kaiser Normalization after 6 iterations. Table 11 is the component transformation matrix and was obtained using PCA as extraction method and varimax with Kaiser Normalization, as rotational method.

KMO and Bartlett's tests of factors influencing ICT adoption in selected secondary schools in Ogun State, Nigeria.

Table 7. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.822
Bartlett's Test of Sphericity	Approx. Chi-Square	999.409
	Degrees of freedom	105
	Significance	0.000

Table 8. Communalities of factors influencing ICT adoption in selected secondary schools in Ogun State, Nigeria

Communalities		
Factor	Initial	Extraction
Teaching Aid	1.000	0.766
Understanding	1.000	0.710
Learning	1.000	0.658
Frequency	1.000	0.648
Performance	1.000	0.636
Practical	1.000	0.635
Computer Lab	1.000	0.623
Usage	1.000	0.597

Retention	1.000	0.593
Quality	1.000	0.574
Computer Studies	1.000	0.542
Internet	1.000	0.539
Google search	1.000	0.529
Communication	1.000	0.519
Ability	1.000	0.391

Extraction Method: Principal Component Analysis.

Table 9. Total Variance Explained of the factors influencing ICT adoption

Com ponent	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	4.287	28.582	28.582	4.287	28.582	28.582	2.588	17.255	17.255
2	1.388	9.255	37.837	1.388	9.255	37.837	1.965	13.098	30.352
3	1.163	7.752	45.589	1.163	7.752	45.589	1.803	12.020	42.372
4	1.102	7.345	52.933	1.102	7.345	52.933	1.405	9.368	51.740
5	1.021	6.807	59.740	1.021	6.807	59.740	1.200	8.000	59.740
6	0.912	6.081	65.821						
7	0.838	5.587	71.407						
8	0.744	4.963	76.371						
9	0.658	4.385	80.755						
10	0.599	3.996	84.752						
11	0.547	3.649	88.401						
12	0.492	3.282	91.683						
13	0.478	3.186	94.869						
14	0.417	2.780	97.649						
15	0.353	2.351	100.000						

Extraction Method: Principal Component Analysis.

Table 10. Rotated Component Matrix of Factors Influencing ICT adoption in Nigeria for secondary school students

Rotated Component Matrix ^a

	Component				
	1	2	3	4	5
Understanding	0.784				
Quality	0.683				
Internet	0.648				
Performance	0.636				
Google search	0.538				
Frequency		0.737			
Usage		0.726			
Communication		0.659			

Learning Computer Lab Computer Studies			0.748 0.715 0.453		
Teaching Aid Practical				0.858 0.634	
Retention Ability					0.634 0.571

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.^a
 a. Rotation converged in 6 iterations.

Table 11. Component transformation matrix of Factors Influencing Students’ Perception of Academic Performance

Component Transformation Matrix

Component	1	2	3	4	5
1	0.682	0.495	0.443	0.286	-0.110
2	0.155	-0.622	0.391	0.324	0.575
3	-0.340	0.121	0.752	-0.551	0.022
4	0.509	0.036	-0.278	-0.666	0.467
5	-0.368	0.593	-0.095	0.255	0.662

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

4.1 Variables explanation

The key summary of the factor analysis is Rotated Component Matrix (**Table 10**). It could be seen there that the 15 factors (variables) are divided into five major groups (dimensions). They are:

- **a) Assistance or Support factors:** These are factors that mostly motivate the students in the adoption of ICT. Here, the students believe that ICT helps them in understanding their assignments, improving the quality of their assignments/term papers/research, the use of internet helps them in their assignments, ICT helps them to improve their performance in school and google search engine helps or assist them in doing their assignments.
- **b) Availability factors:** These are factors that when improved can help the students. They include increasing the access to ICT so that students can use them frequently to communicate with their peers, colleagues and teachers.
- **c) Infrastructure factors:** These are factors that must be needed to host ICT such as computer laboratory, power supply and conducive environment for learning.
- **d) Learning tools factors:** These are factors that help effective learning to take place. These include teaching aids and practical to put to practice the lecture that was taught in the classroom.
- **e) Cognitive factors:** These are factors that help students to understand, assimilate, retain and apply the knowledge taught using the available ICT tools.

The five major factors are key determinants to effective ICT adoption in Nigeria that can facilitate effective learning [35-39]. However, government and top management of schools [40] are required to drive the ICT adoption by development of policies [41] and strategies for implementation [42-43].

5 Conclusion

The paper has identified five key factors that affect ICT adoption in the private and public secondary schools in Nigeria. The factors were obtained from the analysis of data using factor analysis. ICT adoption in Nigeria will be improved if the identified factors are studied deeply and addressed using appropriate policies, procedures and strategies. Nigerian schools cannot afford to continually lag behind other countries in areas of ICT and computer usage. The purposeful and continuous adoption of ICT in Nigeria will help to properly prepare the students for employment and entrepreneurship, thereby reducing unemployment and Fastrack the nation quest to achieve Millennium sustainable goals.

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