CORRELATES OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) UTILIZATION IN COLLEGES OF EDUCATION IN KANO STATE

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Abstract

The study evaluated the determinants of Information and Communication Technology (ICT) utilization among staff members of Colleges of Education in Kano state. Survey research design was adopted and two Federal Colleges of Education in the state were selected for the study. A structured questionnaire, administered on a sample of 150 respondents, was the only research instrument employed for data collection. Data analysis was accomplished by using descriptive and inferential statistics. It was thus revealed that staff members of Colleges of Education in Kano state do not only have high level of awareness of ICT benefits but have in fact, adopted the use of ICT facilities. Consequently, socio-economic variables (or individual characteristics) such as educational qualification, educational discipline/orientation, income and access to technology were found to have significant influence on the level of ICT utilization. Thus, it was recommended that technological friendly environment should be created and sustained by school administrators.

In educational institutions, the place of Information and Communication Technology (ICT) as medium for providing information to researchers and scholars is obvious. Educational institutions are 'information dissemination and exchange centres' and the crucial role of ICT in this direction has come to stay with all members of these institutions. Interestingly and more recently, the availability of e-mail and Internet facilities in academic libraries offers a wide range of access to information globally without geographical barriers. For instance, academicians and other library users in Nigeria now send e-mail or browse websites on the Internet (Omoniwa, 2001). Through ICT, every member of an organization now has unlimited access to all facets of information, but awareness and knowledge of IT usages place limit on one's access to information and information is knowledge! Then, if Information Technology (IT) is sine qua non to the existence of an organization (educational institutions inclusive), its adoption by organizational members is of no little significance.

It is believed that variables namely, awareness, technology ownership and adopters' characteristics have enduring impacts on the adoption of new technologies (Rogers, 1995 and Li, 2003). Therefore, in this study, these variables were taken into consideration in examining the utilization of ICT by staff members of colleges of education in Kano state.

In Nigeria, the evolution, development and advances in ICT have brought in a dramatic and an unprecedented revolution in information management and services, especially as it affects teaching and research activities in tertiary educational institutions. It is in recognition of this that tertiary educational institutions in Nigeria have begun to develop ICT and information system strategies to deal with the need to respond to rapid changes in information technology which affect content of nearly every course curriculum. However, the rate and extent of ICT utilization by staff members of colleges of education in Nigeria and Kano state in

particular has not been empirically established and this is the gap that this study would fill.

Again, few studies have been carried out to investigate the state of ICT in Africa and Nigeria in particular. Oketunji, Daniel, Okojie and Abdulsalam (2002) in their study were concerned with determining the state and future of ICT in libraries and information services in Nigeria. Ani, Esin and Edem (2006) surveyed the adoption of ICT in Nigerian academic libraries and reported that only six libraries are fully computerized. Omoniwa (2001) has posited that in the twenty-first century, globalization of information and quick and early adoption of information and communication technology will be the hallmark of great educational institutions. In Nigeria, not all staff members of tertiary educational institutions are aware of the place of ICT in teaching and learning. Access to technology and influence of personal characteristics on ICT utilization are other concerns. Hence, this study delved into these and many more similarly related issues.

Objectives of the Study

The primary objective of this study is to assess and explain the patterns and extent of Information and Communication Technology utilization by staff members of colleges of education in Kano state. The specific objectives are to:

(i) determine the staff members' level of ICT awareness and utilization
(ii) examine if socio-economic variables and/or individual characteristics have influenced IT adoption and utilization.

Research Questions

For the purpose of this study, the following research questions are raised:

(i) What is the level of staff members' awareness of the benefits of Information and Communication Technology (IT)?
(ii) To what extent are members of tertiary educational institutions IT literate and how often do they use Information Technology?
(iii) What is the effect, if any, of socio-economic variables and individual characteristics on the level of ICT adoption/utilization by members of colleges of education?

Research Hypothesis

As additional guide to this study, the following null hypothesis was tested:

H1: Socio-economic variables or individual characteristics do not impact significantly on the level of ICT adoption/utilization by staff members in colleges of education.

Literature Review

Research on ICT diffusion and utilization has long converged on a core set of theoretical models that seek to explain target adopter attitudes and their innovation-related behaviour (Gallivan, 2001). The core models are: stages of innovation adoption (Becker and Whisler, 1967), the theory of reasoned action (Ajzen and Fishbein, 1980), diffusion of innovations (Rogers, 1983), the theory of planned behaviour (Ajzen, 1985), the technology acceptance model (Davis, 1989), the ICT innovation adoption research model (Agarwal and Prasad, 1998) and innovation adoption and implementation (Gallivan, 2001).

The ICT adoption model presented by Becker and Whisler (1967) is based on four stages of the innovation process: stimulus, conception, proposal and adoption. Based on this model, the stimulus to the individual/organization to take the lead in the use of new idea is mediated through individual action, guided by the conception of what is good for the organization. In the third stage, a formal

proposal is made for the approval of others in the organization. The final stage is that of adoption (or rejection) – within the context of an organisation - is a group process. Becker and Whisler (1967) noted that the factors that may enhance the level of activity in the first three stages might discourage the rate of adoption. In the same vein, the theory of reasoned action proposed by Ajzen and Fishbein (1980) posited that external variables such as individual differences will have an effect on behaviour only to the extent that they influence the determinants of that behaviour.

Diffusion of innovation, a theory applied mostly directly to communications studies by Rogers is the acknowledged starting place for studies attempting to describe implementation and use of new technology. Although originally based on the study of agricultural innovation, Rogers diffusion theory has been the starting point for research within the fields of software and IT (Kautz and Larsen, 2000). The theory has been successfully used to explain problems concerning the diffusion and introduction of software development methods. As Rogers puts it, diffusion process is largely a communication process – an information seeking and processing activity. Rogers' diffusion theory consists of two processes – diffusion process and adoption process (see section 2.4 for detailed discussion). According to the theory of diffusion of innovation advanced by Rogers, three sets of variables namely, technology ownership, adopter's characteristics and innovation attributes have enduring impacts on the adoption of new technologies.

Among the prominent IT adoption theories, Technology Acceptance Model (TAM) proposed by Davis (1989) was the only one specifically developed with technology adoption in mind. TAM posits that the adoption behaviours are determined by the intention to use a particular system, which is based on two key beliefs of (i) perceived usefulness and (ii) perceived ease of use. By perceived usefulness, a person believes that using a particular technology would help increase his performance whereas, perceived ease of use focuses on if a person believes the technology is easy to use and useful to him.

Another ICT innovation adoption research model was developed by Agarwal and Prasad (1998) where they posited that ICT innovation adoption comprises three stages: awareness, perception and adoption. They consequently proposed that awareness and perception are influenced by channel type on one hand, while perception and adoption are influenced by personal innovativeness on the other hand. Hence, it is obvious from this model that awareness is a key issue in the innovation adoption process.

By synthesizing various stages of innovation adoption process proposed by previous authors, Darmawan (2001) presented a four phase conceptual model of innovation adoption and implementation process. These four phase innovation adoption processes consist of initiation phase, adoption phase, implementation phase and evaluation phase. This four-phase innovation adoption process can also be observed at both the individual and organizational levels. The first level of adoption, organizational level adoption, starts when an organization begins to realise the need for strategic change (awareness) and decides to incorporate IT. It thus ends with acquisition of the technology. The second level of adoption, individual level adoption, commences with the acquisition of the technology, and finishes when the technology is utilized by the individual. These two levels fall within the purview of this study.

According to Lakhanpal (1994), the nagging question which relates to the factors that influence an individual's use of Information Technologies and how these factors influence IT usage behaviour**,** remain critical. Lakhanpal (1994) reviewed the literature on innovations in organizations and developed a framework which indicates that the use of IT is influenced by individual factors. Though individual differences are important to an understanding of technology usage behaviour, IT adoption models such as technology acceptance model (Davis, 1989) have not paid sufficient attention to individual difference variables. As to how individual differences combine with perception to influence technology use, at least two research streams can be identified. The first stream (figure 2.2a) posits that individual differences influence technology use indirectly through perceptions (Davis, Bagozzi and Warshaw, 1989 and Agarwal and Prasad, 1999), and it is based on the theory of reasoned action (Ajzen and Fishbein 1980). The second research stream (figure 2.2b) argues that individual difference variables may moderate the relationships between perceptions and technology use (Venkatesh and Davis, 2000). Consistent with Agarwal and Prasad's (1999) IT Innovation Adoption Research Model, individual difference variables include demographic and situational variables that account for differences attributable to circumstances such as experience and training. Consequently, the following individual variables were identified in this study as variables of interest, i.e. age, income, educational qualification, educational discipline, place and time of training, working experience, access to technology and ownership of IT facilities.

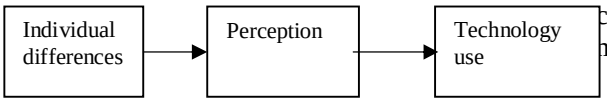

Figure 2.2a: First Research Stream and Conceptual Model I

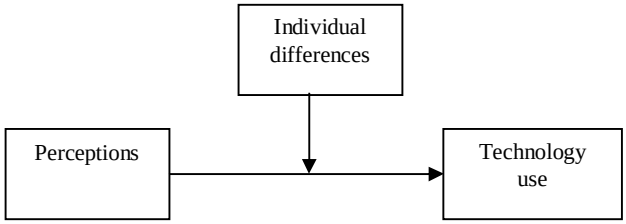

Figure 2.2b: Second Research Stream and Conceptual Model Ii

Source: Figures 2.2(a & b) were adapted from Yuandong, Zhan and Tung (2006), How Individual differences Influence Technology Usage behaviour toward an Integrated Framework", *Journal of Computer Information System*, Winter 2005-2006, p.52.

One interesting finding by Howcroft and Hamilton (2005) who carried out a study on "Customer Involvement and Interaction in Retail Banking", is that people who are both earning more income and highly educated are likely a demonstrate confidence when using financial services. In this present study therefore, it is theorized that age income, place and time of training and educational level may have profound influence on the characteristic of a person and hence level of ICT adoption (Howcroft and Hamilton, 2005)

Methodology

This study was focused on two selected Colleges of Education in Kano state. These are Federal College of Education, Kano and Federal College of Education (Technical) Bichi, Kano state. Staff members were taken to be both academic and non-academic staff members and consideration of ICT utilization by staff members was taken to be computer (PC and

Laptop) used for data/word processing and Internet related resources (services).

Descriptive survey design was adopted for the study and population of the study consisted of all staff members in the two selected institutions. In Federal College of Education, Kano there are one thousand and seventy-five (1,075) staff, consisting of four hundred and thirty-two (432) academic staff and six hundred and forty-three (643) non-academic staff. In Federal College of Education (Technical) Bichi, Kano state, there are seven hundred twenty-one (721) staff, consisting of four hundred and fifteen academic staff and three hundred and six (306) non-academic staff. A sample size of eight per cent (8%) was proportionally chosen from each college. In other words, 86 (1075 x 8%) was chosen from FCE Kano while 58 (721 x 8%) was chosen from FCE (T) Bichi, Kano state. Therefore, a sample of one hundred and forty-four (144) was chosen for the study.

In each of these colleges, random sampling technique was adopted to select those staff that made up the sample size and a structured questionnaire was served on these respondents. The instrument was personally administered by the researcher. Standard deviation, Standard scores (Z-scores) and Pearson correlation coefficient (r) were the statistical techniques used to answer the research questions and hypothesis respectively.

Data Presentation

Although a total of 150 copies of the questionnaire were distributed, only 140 copies were eventually retrieved and all were found usable for data analysis.

A key issue in the study was the ascertainment of the respondents' level of awareness of the benefits of ICT. Hence, they were asked to indicate their level of awareness of each of the 16 listed benefits of ICT. The responses were scored on a 5 point Likert-type rating scale ranging from scale 5 for "very high level of awareness" to 1 for "no awareness". The responses were subsequently summarized using Standard deviation and Standard scores (see table 1 below).

Table 1: Awareness of the Benefits of ICT by Staff Members

ICT Benefits	Sample Mean	Sample S.D.	Z-score
Managing students/staff records/files	3.717	1.068	3.203
Student registration	2.642	1.102	2.552
Processing of exams results	2.809	1.093	4.011
Processing of office documents	2.795	1.010	3.921
Inventory management	2.376	1.091	0.218
Dissemination of information	2.855	1.062	4.415
Processing staff payroll	2.424	1.220	0.645
Composition of music	1.780	1.274	-4.768
Managing accounts receivable/payable	2.114	1.263	-1.851
Searching for research materials	3.017	0.956	5.828
Sending /receiving e-messages	3.052	1.016	6.143
Simulation of experiments	1.922	1.189	-3.534
Generation of product prototype	1.760	1134	-4.948
Instructional device (tutor)	2.193	1.166	-1.155
Health management	1.568	1.307	-6.631
As a robot in factory	1.381	1.265	-8.269
Population mean	**2.338**		
Population Std. deviation		**0.102**	

n = 140

Source: Field Survey (2011)

Analysis revealed high level of awareness (in decreasing order) of the use of ICT in 'sending/receiving e-messages' (z-score = 6.143), 'searching for research materials' (z-score = 5.828), 'dissemination of information' (z-score = 4.415), 'processing of exams results' (z-score = 4.011), 'processing of office documents' (z-score = 3,921), 'managing of students/staff records' (z-score = 3.203), 'student registration'

(z-score = 2.552), 'processing of staff payrolls' (z-score = 0.645), and 'inventory management' (z-score = 0.218). Similarly, there was a relatively low level of awareness of the use of ICT in: 'presenting educational instructions' (z-score = -1.155), 'managing accounts receivable/payable' (-1.851), 'simulating experiments' (z-score = -=3.534), 'composing music' (-4.768), 'generation of product prototype' (-4.948), 'health management' (-6.631) and 'as a robot in factory' (-8.269).

Further analysis revealed that majority of the respondents (86 or 61.43%) have high level of awareness of ICT benefits; 35 respondents or 25% have moderate level of awareness while only 19 respondents (13.57%) have low level of awareness of ICT benefits.

It was also considered pertinent to ascertain the ICT literacy level of the respondents. Hence, they were asked to indicate the extent of their ability to use computer to perform each one of the listed 17 functions/activities. The summary of their responses is presented in table 2 below.

Table 2: Respondents' ICT Literacy Level

ICT usage areas	Sample Mean	Sample S.D.	Z-score
Word processing	2.865	1.021	10.442
Data processing	2.543	1.063	6.330
typesetting of textbooks	1.965	1.258	-0.869
statistical analysis	1.912	1.135	-1.5451
instructional presentation	1.981	1.154	-0.6664
graphic designs	1.585	1.194	-5.7358
architectural drawings	1.202	1.230	-10.636
playing games/entertainment	2.139	1.179	1.154
managing students/ staff records	2.237	1.214	2.409
registration of students	2.107	1.304	0.7538
processing of exams results	2.168	1.256	1.5311
dissemination of information	2.429	1.209	4.8769
processing of staff payroll	1.469	1.320	-7.228
composition of music	1.260	1.253	-9.8927
searching for research materials	2.680	1.229	8.087
sending/receiving e-messages	2.814	1.143	9.8112
simulation of experiments	1.334	1.184	-0.0536
Population mean	**2.041**		
Population standard deviation		**0.0722**	

n = 140

Source: Field Survey (2011)

Analysis revealed that there was good knowledge in the use of ICT to perform word processing (z-score = 10.442), to send/receive e-messages (z-score = 9.8112), to search for research materials (z-score = 8.087), to perform data processing (z-score = 6.330) and to disseminate information (z-score = 4.8769). This is consistent with the findings of Omoniwa (2001) that academicians and other library users in Nigeria now send e-mail or browse websites on the Internet. Next to this and also in decreasing order is: ability to use computer to manage students/staff records (z-score = 2.409); ability to use ICT to process exams results (z-score = 1.5311); to play games/entertainment' (z-score = 1.154); to conduct student registration (z-score = 0.7538); to conduct instructional presentation (z-score = -0.664) and to typeset textbooks (z-score = -0.869).

On the other hand, respondents have relatively no knowledge in using computer to generate architectural drawings (z-score = -10.636), compose music (z-score = -9.8927), process staff payroll (z-score = -7.228) and graphic design (z-score = -5.7358). On the whole, the respondents could use computer to perform 9 out of 17 tasks.

Further analysis equally showed that about 20% of the respondents have relatively low level of IT literacy, 48% have moderate level while 32% have a relatively high level of IT literacy.

It was also considered necessary to ascertain the frequency (usage rate) of ICT by staff members. Therefore, the respondents were

asked to indicate how frequent they use some classified packages. The summary of the results was presented in table 3 below.

Table 3: Respondents' ICT Usage Rate

Software category place of usage	Sample mean	Sample S.D.	Z-score
Data processing packages	3.2436	1.2805	0.7618
Word processing packages	3.6590	1.2923	5.6659
Graphic/presentation packages	2.3641	1.2129	-9.6214
Web browser	3.3769	1.3582	23360
IT usage in the office	3.4154	1.4203	2.7900
IT usage in the home	3.0154	1.4268	-1.9323
Population mean & Std. dev.	**3.1791**	**0.7618**	

n = 140

Source: Field Survey (2011)

From table 3 above, analysis revealed frequent usage of word processing packages (z-score = 5.6659), web browser (z-score = 2.3360) and data processing packages (z-score = 0.7618). Similarly, there was a relatively low usage rate of graphic/presentation packages (z-score = -9.6214). Also, data analysis revealed that there was a more frequent ICT usage in the office (z-score = 2.7900) than ICT usage in the home (z-score = -1.9323).

Further analysis equally revealed that 44% of the respondents belong to the high ICT usage rate category, 34% have moderate rate of IT usage while 22% registered a relatively low rate of IT usage.

The next concern is: what influenced the level of ICT adoption/utilization? Do socio-economic variables have any influence at all? In order to answer this question, an attempt was made to ascertain if any relationship exists between respondents' socio-economic characteristics and level of ICT adoption/utilization.

The only hypothesis of the study which states that "there is no relationship between respondents' socio-economic characteristics and level of ICT adoption/utilization" was tested using Pearson Correlation Coefficient. The result of correlation analysis is presented in table 4.

Table 4: Test of Statistical Independence Between Each of the Respondents' Socio-Economic Characteristics and Level of ICT Adoption/Utilization

Variable	Correlation coefficient	SIG. LEVEL	Comment
Age	-.087	.085	ns
Educational qualification	-.126	.014	s*
Educational discipline/orientation	.120	.017	s*
Income	-.172	.001	s**
Length of working experience	-.060	.237	ns
Place of training	-.042	.410	ns
Time of training	-.025	.630	ns
Ownership of IT facilities	-.055	.282	ns
Access to Technology	-.120	.017	s*

n = 140

Source: Field Survey (2011)

s* = significant at $p < .050$

s** = significant at $p < .010$

ns = not significant at $p > .050$

The above results showed that each of (i) age, (ii) length of working experience, (iii) place of training, (iv) time of training and ownership of IT facilities has no significant relationship with the level of ICT utilization. However, a significant relationship was found to exist between each of (a) educational qualification, (b) educational discipline, (c) income and (d) access to technology on one hand, and level of ICT utilization on the other at $p<.010$ and $p<.050$ respectively. Thus, the hypothesis of the study was partly supported.

Discussion of the Findings

The researcher sought to examine the extent of respondents' awareness of IT benefits and the finding generally revealed a high level of awareness. Specifically, data analysis has revealed that the respondents are aware of computer as a device for (a) sending/receiving e-messages, (b) sourcing research materials, (c) disseminating information and (d) processing examination results, among others. Findings also showed that respondents have rather little awareness of computer as a device for delivering of instructional materials, managing accounts receivable/payable, simulation of experiments and, composing music, among others. This high level of awareness underlines the recognition, by the respondents, of the central role of computer and information technology in the effective performance of human activities.

The finding also revealed a moderate level of IT literacy and that employees could use computer to reasonably perform 9 out of the listed 17 listed tasks. This means that IT adoption is still an ongoing activity and with much awareness and training opportunities, the adoption level would most likely increase.

Similarly, this study has revealed that employees of tertiary educational institutions in Kano state use word processing packages and web browser more frequently than data processing packages and graphics/presentation. This is apparently consistent with the findings of Omoniwa (2001) that academicians and other library users in Nigeria now (more than ever before) send e-mail or browse websites on the Internet.

Some socio-economic variables were found to have influence on the level of IT adoption. The nagging question is "which of the respondents' attributes is relatively more potent than the others?" The finding revealed that income exerts the most influence on the level of IT adoption. Though, each of educational qualification, educational discipline and access to technology was equally found to have some influence on the level of IT adoption but in varying degree (see table 4.8). Other variables of interest in this study – age, length of working experience, place of training, time of training and ownership of IT facilities do not seem to have any significant influence on the level of IT adoption. This finding partially supported Rogers' proposition that early adoption of technological innovation is a function of increasing education and socio-economic status. Remarkably, Rogers hypothesized that age does not have significant impact on the rate of adoption (Rogers, 1995). However, other researchers (Danko and MacLachlan, 1983 and Atkin, Jeffres and Neuendorf, 1998) have found that adopters of innovations tend to be younger.

Conclusion and Recommendation

The findings revealed that employees of colleges of education in Kano state have high level of awareness of ICT benefits. Similarly, it was revealed that the employees have moderate level of ICT literacy with good capability in using computer for word processing, sending/receiving e-messages, sourcing research materials and disseminating information. Interestingly, the study also revealed that the respondents have little or no capability in using computer to generate architectural drawings, compose music and process staff payroll.

Consistent with other findings was the fact that staff members use word processing packages and web browser more frequently. They equally use ICT more frequently in the offices. Hence, the study revealed a high rate of ICT usage among the respondents. Consequently, socio-economic variables (or individual characteristics) such as educational qualification, educational discipline/orientation, income and access to ICT facilities have significant influence on the level of ICT utilization.

Given that staff members use ICT more frequently in the offices, technological friendly environment should be created and sustained by school administrators. Employees' basic technology needs must be met and sufficient support provided for academics and non-academics to feel comfortable with using technology in their daily official work.

For a realistic and meaningful utilization of ICT, access to IT facilities is a prima facie necessity. Accessibility would be more meaningful and convenient if staff members are encouraged to possess their own personal desktop and laptop. Therefore, institutional heads should consider sales, training and maintenance agreement with hardware producers and software developers for the benefits of staff members. Implementation of such type of agreement should take into cognizance the notable socio-economic variables that influence ICT utilization.

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