
MANAGERIAL, ORGANIZATIONAL AND TECHNOLOGICAL DETERMINANTS OF ICT ADOPTION: SURVEY OF ACADEMIC STAFF IN BAUCHI STATE

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ABSTRACT

Information and Communication Technology Adoption (ICTA) among academic staff is of paramount importance towards effective service delivery in Higher Education Institutions (HEIs). However, the poor ICTA by many academics in the teaching and learning process is of particular concern especially in Nigeria. Against this background the paper examines the influence of managerial (top management support), organizational (organizational competence and ICT Infrastructure) and technological (perceived usefulness and perceived ease of use) factors on ICTA. A total of 350 structured 5-point likert scale questionnaires were distributed using stratified sampling for the purpose of data collection. The reliability and validity of the questionnaire was tested using Cronbach's Alpha and factor loading while data was analyzed using multiple regression. The overall model account for 45% of ICTA, the result also revealed that technological factors are the most important driver followed by organizational factors. The research concludes with recommendations, implication and suggestion for research direction.

INTRODUCTION

The increasing importance of Information and Communications Technology (ICT) in improving the learning environment cannot be over-emphasised. Similarly, Higher Educational Institutions (HEIs) are increasingly playing crucial role as the engine for knowledge generation and the entire learning environment. ICT has become an essential part of everyday life and hence its integration in education is inevitable and effective (Tosun & Baris, 2011), partly because all the stakeholders (teachers, students and management team) use it for effective teaching-learning processes to achieve quality education and overall development of students or for administrative purposes (Ghavifekr, Afshari, Siraj & Seger, 2013). Likewise,

teachers commonly agree that ICT has the potential to improve student learning outcomes and effectiveness (Chang & Wu, 2012).

Unfortunately, Nigeria is not doing well for example, globally the USA led the way in incorporating ICT to its mainstream affairs, especially education and governance (Dyerson, Harindranath & Barnes, 2009). Today however, Singapore tops the Network Readiness Index (NRI) ranking, followed by Finland then Sweden, Nigeria ranked number 119 out of 148 (World Economic Forum and INSEAD, 2017) partly because many of the teachers are not ICT literate and not fully exposed to the use of ICT in the acquisition of skills and practical teaching (Thomas, Babatope & Jonathan, 2013). Similarly, where ICT is introduced alongside complicated educational

reforms, students and teachers lose focus on the essentials of ICT and become distracted by the rapidly changing technologies (Olofube, Eke, Uzorka, Ekpenyong, & Nte, 2009) making Top Management Support (TMS) a critical factor. Other factors for the dismal performance of Nigeria include Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) of the ICT by the teachers. Organizational Competence (OC) is another factor, as education infrastructure is visibly poor with dilapidated buildings, inadequate funding, partly due to negligence on the part of the top management (Thomas & Cronje, 2006). ICT Infrastructure (II) availability is equally a factor of interest, as most Nigerian universities do not have access to basic instructional technologies, making integration and delivery of quality education difficult (Olofube & Egbezor, 2009). It therefore becomes highly imperative for Nigerian academics to take advantage of ICT to keep abreast with global developments and be able to compete favorably with their counterparts in the advanced nations (Gbenu, 2012).

On a practical term 84% of journal articles and 97% of patents currently come from industrialized countries (Idowu & Esere, 2013). The authors therefore call for the use of ICT particularly the internet to conduct and publish research output and ease international collaborations. It is therefore important to understand the managerial (TMS), organizational (OC and II) and technological (PU and PEOU) determinants of ICT Adoption (ICTA) by academics in the country (Oye, Iahad & Ab.Rahim, 2012a). Against this background the research aims to investigate the determinants of ICTA among academics at HEIs in Bauchi state, Nigeria. Specific objectives include to: examine the relationships between TMS, II, OC, PU and PEOU towards ICTA. The study is significant in a number of ways, for example it will provide empirical support to assess the applicability of the key underpinning theory-Innovation Diffusion Theory (IDT), as well as providing the much-needed input about the critical success factors for ICTA in the HEIs environment from the

most important stakeholder-academics. This will consequently guide policy makers to formulate more efficient strategies capable of smooth deployment and adoption of ICT-based instructional technologies in HEIs across the country and beyond.

Literature Review and Hypotheses Development

Theoretically the research is premised on IDT. The theory stressed the existence of different categories of adopters requiring different organizational support systems that include top management and peer support systems. The theory propounded by Rogers (1985) is generally regarded apt for researching the adoption of ICT in developing countries (Kyakulumbye, Muhenda & Namanya, 2012). Based on theoretical foundation of IDT various studies have classified factors influencing innovation adoption (Kim & Galliers, 2004). Tornatzky and Fleischer (1990) identified three different categories of factors organizational, technological, and environmental factors. Similarly, Kimberly and Evanisko (1981) identified three groups of predictors of innovation: characteristics of organizational leaders, characteristics of organization, and characteristics of environment. Based on the foregoing, there are four major factors driving adoption of innovation in literature: Managerial; Organizational; Technological; and Environmental. However, this study only concentrates on the first three as the last one i.e. environmental, deals with the impact of competitors and is largely applicable to profit making firms unlike the sample for this research that are all government-owned.

Drawing from literature, an integrated model of ICTA in Nigerian HEIs is proposed with following variables TMS (managerial), II and OC (organizational) as well as PU and PEOU (technological) in facilitating ICTA. The following hypotheses were developed in order to achieve the aim of the research:

Top Management Support (TMS)

Accordingly, adoption of innovation would be more likely if the political environment within an

organization has norms favoring the change (Tolbert & Zucker, 1983). Thus, ICTA will to a large extent depend on whether support from top management is available. TMS has been identified as crucial in the acquisition and diffusion of innovation (Orlikowski, 1993). Top management consists of individuals with power and authority to make strategic decisions; thus, they can develop a clear-cut ICT vision and strategy while at the same time sending signals to different parts of the organization about the importance of ICT. Given the limited nature of organizational resources and the many competing projects, TMS ensures that an ICT innovation project will get the required resources and capabilities. Empirically, Rai and Patnayakuni (1996) found TMS to have positive effect on adoption behavior in IS departments. Kyakulumbye et al. (2012) is one of the rare research to found on TMS significant relationship between TMS and ICTA. Perrlson and Sunders (2006), argue that top management needs to establish willingness on the part of the organizational members by creating a climate of cooperation, demonstrating the efficacy of the new system and its benefits over the old ways of doing things. In the context of ICTs, researchers who have adopted IDT consistently found that TMS is a strong determinant of ICTA (Al-Garbi & Al-Turki, 2001). Thus, the researcher proposed that: *H₁ TMS significantly influence ICTA*

ICT Infrastructure (II)

ICT infrastructure refers to all the hardware, software, data and network components that supports the flow and processing of information in an organization (Perrlson & Sunders, 2006). In a study in South Africa Miller, Naidoo and Chigona (2006), investigated factors that influence school level ICTA. They found a strong positive relationship between available II and ICT usage in schools. Adoption of ecommerce requires organizations to possess a set of ICT, related skills and knowledge (Turban, King, Lee, & Viehland, 2004) such as telecommunication knowledge, ICT security knowledge,

and Internet application environment. Thus, *H₂ // significantly influence ICTA*

Organizational Competence (OC)

OC refers to the availability of employees with adequate experience and exposure and other skills that are needed to adequately implement ICT projects (Molla & Licker, 2005). Peansupap and Walker (2005), asserts that learning and sharing knowledge among staff is important for innovation diffusion. In view of the fact ICT application development is frequently subject to change, Attewell (1992), argues that sharing tacit ICT knowledge among peers built from users' experience can improve ICTA within organizations. Syed and Mohammad (2009) findings clearly indicated that ICTA is positively related to user knowledge and skills. Thus, *H₃ OC significantly influence ICTA*

Perceived Usefulness (PU)

PU refer to the extent of prospective adopter's recognition of the relative advantage of adopting the innovation. PU is an important factor in adoption of new innovations, thus greater the perceived relative advantage of an innovation, the more rapid its rate of adoption (Rogers, 1995). Empirically, PU have been found to have a positive effect on the likelihood of EDI adoption (Iacovou, Benbasat & Dexter, 1995). Thus, *H₄ PU significantly influence ICTA*

Perceived Ease of Use (PEOU)

PEOU refers to the degree to which a person believes that using a particular system would be free of effort (Davis, 1989, p.320). In a research in Bangalore, Padashetty and Krishna (2013) found PEOU and PU are the highest ranked factors driving the adoption of technology. In another survey in education sector, it was also found that PEOU is an essential variable motivating the use of word processing technology (Davis, Bagozzi & Warshaw, 1989). Thus *H₅: PEOU significantly influence ICTA*

METHODOLOGY

The research focuses on the managerial, organizational and technological determinants of ICTA among the academics in HEIs, a cross-sectional survey research was adopted for the study. The study was carried out in eleven public HEIs in Bauchi state Nigeria, these include two universities, two polytechnics four

colleges and three Monotechnics. 350 structured 5-point likert scale questionnaires were distributed using stratified sampling for the purpose of data collection (see table 1). In total 283(81%) questionnaires were successfully returned. The questionnaire items were either adopted or adapted from relevant previous studies (see table 2)

Table 1: List of HEIs, Population and Sample

S/N	Name of HEI	Population	Sample
1	Abubakar Tafawa Balewa University Bauchi	850	110
2	Abubakar Tatari Ali Polytechnic Bauchi	263	34
3	Bauchi State College of Agriculture Bauchi	61	8
4	Colleges of Education Kangere	42	5
5	Bauchi State University Gadau	272	34
6	Aminu Saleh Collage of Education Azare	445	58
7	College for Legal and Islamic Studies Misau	187	24
8	College of Health Technology Ningi	56	7
9	Federal Polytechnic Bauchi	481	61
10	School of Nursing and Midwifery Bauchi	27	4
11	Social Development Institute Ningi	32	4
Total		2716	350

RESULT AND DISCUSSION

Out of the 283 returned questionnaires only 248 valid responses are considered fit for further analysis after dropping morbidity and substantially unfilled responses as well as data cleaning/screening and the subsequent deletion of both univariate and multivariate outliers. Majority of respondents are male 216(87.1%) while female 28(11.3%). 4(1.6%) did not disclose their gender. Similarly, majority of participants have been between the ages of 31-40 years, (48.0%), followed by 41-50 years (35.1%) while lowest participants 60- above (0.8%). With regard to education only 5(2.0%) have PhD, Masters and degree having the highest representation at 110 and 133 respectively. In terms of HEIs Abubakar Tafawa Balewa University Bauchi has the highest representation

at 31% while School of Nursing and Midwifery Bauchi and Social Development Institute Ningi both have 3(1.2%) with lowest representation.

After data entry, the data was subjected to cleaning and screening resulting to the detection and correction of some wrong entries. Having met the requirement for the factorability, Cronbach's Alpha and factor loading were used to evaluate the reliability and validity of the dataset respectively. As presented on Table 2 all the six variables of interest satisfied the reliability and validity tests.

Table 2: Constructs/Items/Cronbach's Alpha/Factor Loading

Constructs/Items/	Chronbach's Alpha	Items Source	Factor Loading
Top Management Support (TMS)	$\alpha=0.859$	Aghaunor (2006)	
TMS1 Management of our institution is interested in the use of ICT			0.756
TMS2 Management of our institution is supportive of the use of instructional ICT			0.747
TMS3 Management of our institution has a positive attitude towards assisting staff to become ICT compliant.			0.766
TMS4 Our management vision of ICT projects is widely communicated and understood throughout the institution			0.543
ICT Infrastructure (II)	$\alpha= 0.823$	Aghaunor (2006)	
II1 Our Institution is well computerized with LAN and WAN.			0.568
II2 We have high bandwidth connectivity to the Internet in our institution			0.701
II3 We have an established enterprise-wide IT infrastructure in our institution			0.513
II4 We have sufficient experience with network-based applications in our institution			0.621
II5 We have modern instructional technologies that aid us in imparting knowledge to our students			0.534
Organisational Competence (OC)	$\alpha=0.755$	Aghaunor (2006)	
OC1 Our institution has a good understanding of ICT business models that are applicable to our academic environ.			0.731
OC2 We have a good understanding of ICT application solutions that are applicable to our educational activities			0.723
OC3 Our institution has the necessary technical, managerial and other skills to implement ICT for inst. Purposes			0.573
Perceived Usefulness (PU)	$\alpha=0.949$	Davis (1989)	
PU1 Using ICT in our institution can reduce cost of our operations			0.752
PU2 Using ICT in our institution improves the way we service our students			0.868
PU3 Using ICT in our institution enable us to reap operational usefulness			0.894
PU4 Using ICT in our institution increases our ability to compete			0.898
PU5 Using ICT in our institution facilitate our institutions research collaboration with other institutions			0.756
Perceived Ease of Use (PEOU)	$\alpha=0.901$	Davis (1989)	
PEOU1 Learning to operate ICT in our institutions would be easy			0.716
PEOU2 The interaction with ICT is clear and understandable			0.792
PEOU3 It is easy to perform the steps required to use Instructional ICT in our institution			0.665
PEOU4 Using ICT makes the handling of imparting knowledge easier			0.762
PEOU5 It is easy for students to understand lectures using pictorial presentation of information electronically			0.672
ICT Adoption (ICTA)	$\alpha=0.812$	Lawrence (2010)	
ICTA1 Given the opportunity, I will use ICT for imparting knowledge			0.718
ICTA2 I am likely to use instructional ICT in the near future			0.770
ICTA3 I intend to use ICT when the opportunity arises			0.719

As shown in table 3 the five independent variables in the model explain 45.0% of the dependent variable-ICTA. The adjusted R^2 is slightly lower at 44% of the variance in IIIU. Similarly, the ANOVA statistics also in

table 3 indicated the relationship is significant at 0.0000^b with an F-value 39.553. Meaning that, the predicting variables significantly facilitate ICTA among the academic staff. As shown in table 3, four out of the five independent

variables have significant contribution towards the prediction of the ICTA. Only TMS is not making any significant contribution toward predicting ICTA. Similarly, the column for standardized coefficients of Beta for each of the four independent variables shows the relative

contribution of each predictor. The standardized coefficient Beta value for the technological factors (PU 0.341 and PEOU 0.347), followed by Organisational factors (OC 0.168) and II 0.161). However, the only managerial factor (TMS) makes insignificant contribution 0.051.

Table 3: Multiple Regression

	F	Sig.	R	R ²	Adjusted R ²
Dependent Variable-ICT Adoption					
ANOVA ^b & Model Summary	39.553	.000 ^b	.671 ^a	.450	.438
Predictors	TMS	II	OC	PU	PEOU
Standardized Beta Coefficients	-.051	.161	.168	.341	.347
Beta Sig.	.440	.010	.003	.002	.000

Based on the foregoing hypothesis one is rejected while the other four hypotheses are accepted, as result for TMS reveals no significant relationship ICTA, this is quite surprising, although in most of the HEIs, top management often gives very little attention ICTA apart from lip service. Even though the finding is in line with Kyakulumbye et al. (2012) but it goes against vast majority of literature and conventional wisdom. Results for other factors are more predictable, for instance II and OC both have significant effect on ICTA, which is in line Kyakulumbye, et al., (2013) and Kyakulumbye, et al., (2012). Hence, the more HEIs possess II and OC capabilities the more the adoption. Likewise, the result shows that, PU also significantly affect ICTA consequently, the use of ICT is seen by academics as having a great benefit to their job requirements which is consistent with the finding of Oye, lahad and Ab.Rahim, (2012b). In the same vein PEOU also significantly influence ICTA which is also in tandem with previous aforementioned studies.

Finding of this study further reinforces the position of Idowu and Esere (2013) that despite the obvious possibilities, Nigeria is yet to take full advantage of the possibilities of ICT-driven education. In addition to adequate funding of ICT-driven initiatives in the education sector as suggested by Idowu and Esere (2013), it is clear

that for Nigeria to achieve the much-needed romance between ICT and HEIs TMS for ICT initiatives in HEIs should be concrete, logical, practical and sustained not merely disjointed and sporadic attempts. Even though environmental factors fall outside the scope of this research, however, it may seem some environmental factors are part of the reason militating against real and sustainable TMS, for example Ekundayo and Ajayi (2009) identified unsteady and inadequate electrical power supply as one of the key factors limiting the deployment of ICT in Nigeria.

CONCLUSION AND IMPLICATIONS

This research suggest technological and organizational factors are the most important determinant of ICTA in the context of HEIs in Bauchi State. Based on the findings, HEIs should also pay serious attention to both technological factors by clearly communicating the relative advantage and ease of use features of adopting ICT in the learning environment. Furthermore, HEIs should re-strengthen organizational factors giving their central role in driving ICTA. Finally, TMS was found to be insignificant, HEIs should revisit their policies and strategies with the aim offering concrete support not merely lip service.

From the perspective of theory, the findings of this study have validated the strength of the IDT in predicting the determining variables from the perspective of a developing country such as Nigeria. The findings also contribute significantly to the existing literature in the field of ICTA in Nigeria. Future studies should use different HEIs especially private and thus include environmental factors.

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