

# The deployment of ICT facilities in teaching and learning in Higher Education: a mixed method study of its impact on lecturers and students

## *A implantação de instalações de TIC no ensino e aprendizagem no Ensino Superior: um estudo de método misto de seu impacto sobre professores e alunos*

Nafisat Afolake Adedokun-Shittu

PhD candidate at the Institute of Education, International Islamic University Malaysia. Specializes in Instructional technology and research interest includes: ICT in teaching and learning and mixed methods research.

folaoia@gmail.com - Phone: +60122594098

Ismail Sheikh Ahmad

Associate Professor at the Institute of Education, International Islamic University Malaysia. His research interests include reading, literacy, qualitative and mixed methods research.

drismail@iium.edu.my - Phone: +60197834799

Joharry Othman

Assistant Professor at the Institute of Education, International Islamic University Malaysia. His research interests are assessment and measurement in education, statistics, research methods, Scale Theory including Rasch Models, Instructional Technology in education using Electronic Portfolios.

proff9@hotmail.com - Phone: +60122608890

Tunku Badariah Tunku Ahmad

Assistant Professor (a senior lecturer) at the Institute of Education, International Islamic University Malaysia.

She lectures in courses pertaining to ICT in Education, Diffusion of Innovation Theories.

Her research interests include ICT uptake and utilization, innovative techniques in teaching and learning, learning through inquiry, and science learning.

tunku206@yahoo.com - Phone: +60192639425

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**Abstract:** This study employed mixed method consisting qualitative and quantitative procedures to examine the impact of ICT in teaching and learning at a University in Nigeria. The survey data were drawn from 593 respondents (students and lecturers) and was analyzed using linear regression. For the qualitative part, one-on-one and focus group interviews were conducted among 7 students and 8 lecturers to seek their varying opinion on ICT impact on teaching and learning. Lecture-room observations were conducted across 3 classes to see how ICT is integrated. These multiple means findings were triangulated, compared and contrasted to validate the study. Predictors of ICT impact were found to be perception, integration, motivation and challenges. The qualitative interview and observation findings generated 4 similar themes as the quantitative result which was conceptualized as a model that serves as a framework for researchers on impact assessment.

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## SYNOPSIS OF THE STUDY

The study addressed in this chapter studies the impact of ICTs on teaching and learning in a higher institution of learning in Nigeria. Nigeria being a developing nation recognizes the relevance of ICTs in national development and particularly in education. Hence the deployment of ICT in Nigerian education generally and specifically in higher institutions has received considerable attention. The formulation of the National Policy on Computer Education in 1988 contained information on the application of computer at various levels of the country's education with issues related to basic objectives, hardware and software requirements (FEDERAL REPUBLIC OF NIGERIA, FRN, 1988 cited in Yusuf, 2005a). In line with the recommendations of the National policy on IT, the National Universities Commission (NUC), the government agency responsible for registering and regulating universities has prescribed a minimum level of PC ownership for universities as follows: one to every four students, one PC to every two lecturers below the grade of Lecturer 1, one PC to each Senior Lecturer, and one notebook to a Professor/Reader.

Many universities in Nigeria have thus achieved a significant ratio than the prescribed and some have taken steps ahead in building campus-wide area networking and developing elearning course deliveries. Even though ICT facilities have been deployed in many learning institutions; less or no impact studies have been conducted to determine ICTs effect on teaching and learning outcomes. This is due to the fact that technology integration in higher education in Nigeria is still at a preliminary stage (ADEGUN, 2007).

As such, this study looks into the impacts derived from employing ICTs in teaching and learning in a Nigerian University through a mixed method of both quantitative and qualitative approaches. Evaluation studies are better conducted employing mixed method approach because of its comprehensiveness and in order to achieve a valid and well-substantiated conclusion (STUFFLEBEAM, HAROLD & MCKEE, 2003; CRESSWELL, 2009). Similarly IEG, (2006) strongly recommend mixed method for impact study given the lack of credibility flaw identified against many existing

impact studies that focus mainly on quantitative method.

The survey instrument employed for both the students and the lecturers is a 58-item questionnaire that was each subdivided into seven parts. The first part (demographic variable) is a 14 item-question which contains choice and fill in questions. The next two parts perception (21 items) and integration (10 items) are based on the five-point Likert scale. Motivation (6 items) and constraints (5 items) are rated on a preference scale (1 - least preferred to 5 - most preferred). The problems (3 items) part of the instrument is rated on a frequency scale (1 - Never and 5 - Always). Constraints and problems were re-coded as challenges. The last part renamed as ICT rate (1 item) carries a value scale (1 - of no value to 5 - extremely valuable). Both the students' and lecturers' survey instrument display a high reliability (alpha coefficient: .836 and .894) respectively.

Linear regression was conducted to explain how the four scales of dimensions (perception, integration, motivation and challenges) predict the value of ICT in teaching and learning (ICTrate). The result of the regression (Table 1) indicated that 3 predictors explained 41.5% of the variance ( $R^2 = .41$ ,  $F(4, 477) = 24.8$ ,  $p < .001$ ). All the independent factors are significant and positive indicators of ICT impact except integration that is not statistically significant ( $p = .306$ ) and has a negative standardized beta value of (-.050). This is a function of the fact that some factors such as access hinder integration. Perception has the highest beta value of .276, while challenges have the lowest regression weight of .125. Perception leads among the four indicators of ICT impact generated in the regression analysis with a standardized beta value of .276 and a  $p$  value  $< 0.05$ . It indicates a positive and significant interaction with ICT impact.

Both students and lecturers of the university perceived ICT as having a positive impact on teaching and learning.

The qualitative analysis entails the range of interviews conducted with both lecturers and students and lecture rooms observation carried out to assess how ICT is integrated in teaching and learning in the university. The interviews are

**Table 1:** Statistical Test of the Indicators in the Regression Model

	Unstandardised Coefficients		Standardised coefficients		
	B	SE	Beta	T	Sig.
(Constant)	1.645	.246		6.674	.000
Perception	.018	.003	.276	5.641	.000
Integration	-.007	.007	-.050	-1.024	.306
Motivation	.031	.009	.174	2.835	.000
Challenges	.016	.006	.125	5.641	.005

analysed based on the themes generated across the interviews conducted ranging from students and lecturers’ one to one and focus group. Four themes were generated from the sets of interviews and are discussed from both students and lecturers’ point of view by elaborating on the main ideas that accrue from all respondents’ responses (see Table 2). It was found that ICT use in the university has positive effects on both students’ learning and lecturers’ teaching. Among these positive effects are: ease in teaching and learning, access to information and up to date resources, online interaction between staff and

students, establishing contact with the outside world through exchange of academic work, lecturers’ and students’ comfortability with ICT and its compatibility with their teaching and learning needs. Though, it was discovered that some challenges exist such as plagiarism, absenteeism and over reliance on ICT, power problem, technical problem and network problem, large students’ population, inadequate facilities and limited access in terms of working hour that minimize the positive impacts derived from ICT use in the university. However, if these challenges are properly addressed and better incentives in the form of adequate access, training and motivation are provided; more positive impacts and effective ICT integration in teaching and learning, assessment and across curriculum will be achieved. All these culminate into the four themes generated from the interview analysis (see Table 2).

**Table 2:** Interview themes

Themes	Issues
Positive effects	Benefits Students’ response Compatibility and comfortability with teaching and learning needs
Integration	ICT integration in teaching and learning ICT integration in curriculum ICT based assessment Traditional method vs ICT based teaching and learning
Incentives	Access Adequacy Training Motivating factors
Challenges	Problems Constraints Disadvantages Technical issue

Data gathered from the three classes observed are descriptively analysed and situated under the corresponding themes that emerge from the interview for validity purposes (see Table 3 for fieldnotes). The first two classes observed were ICT-based while the third class was traditional complemented by ICT. It was ultimately observed that ICT integration does not replace the traditional practice in the classrooms; it only improves teaching and learning practices. Among the positive effects observed in the classrooms were students and lecturers’ comfortability and high proficiency in ICT use in teaching and learning, formal and informal students and lecturer interaction. Slow internet connection, power outage, inadequacy of facilities and distraction by ICT are some of the challenges noticed. Availability of internet service, software and other facilities, good ICT skills of both students and lecturers, and students’ participation were recorded as part of the incentives available while blend of approaches (traditional and ICTbased) was the form of integration observed (see Table 3).

The quantitative results and qualitative findings absolutely complement each other. The quantitative linear regression found that the four independent variables (perception, challenges, motivation, integration) predict ICT impact (ICTrate) in teaching and learning. Similarly, the qualitative findings reported four themes (positive effects, challenges, incentives and integration) in ICT impact assessment.

Perception and positive effects in both analyses address the same issue of what ICT can do to

Table 3: Observation fieldnotes

Issues	Sub-Issues	1st Lecture Room	2nd Lecture Room	3rd Lecture Room	Theme
Lecture Room Description	Faculty	CIS – Professional Health workers MBA	Medicine - Physiotherapy	Law	
Subject	Topic	Computer Application in Health Analysis	Gastrointestinal Secretion	Seminar Presentation	
	Content	Budgeting with Excel Spreadsheet 2007, EPI info version 6, SPSS version 15.0	Process and phases of gastrointestinal secretion, graphical representation of the pancreas	Arbitrators' Confidentiality in Nigeria	
Instructional aids	Types	Laptop, projector, software, whiteboard as projection screen, flashdrive sized internet modem	laptop, LCD, software, PowerPoint, whiteboard, wireless internet	Textbook, laptop, Whiteboard, wireless internet	<b>Integration</b>
	Usage	70% ICT usage, 10% Setting up, 20% Teacher explanation	80% ICT usage, 20% Teacher explanation	95% oral presentation, 5% ICT usage,	
Lecturer	Teaching strategy	Blends ICT with traditional teaching, Time management strategy, <b>Emailing</b> for assignment submission, assessment, feedback <b>Yahogroup:</b> communication, material and info sharing	Blends ICT with traditional teaching, PPT presentation slides, <b>Moodle</b> for assignment submission, feedback and assessment. <b>Web Search</b> for supportive materials and references	Traditional aided by ICT	
	ICT skill	Good	Excellent	Good	<b>Incentives</b>
	Mastery of subject	Good	Good	Good	
Students	Attitude	Noisy but participatory	Attentive and participatory	Attentive, interactive & participatory	<b>Positive Effects</b>
	Attention	On the lecturer and the LCD as directed by the her	On the PPT presentation slide and back on lecturer during explanation	On presenters, reactors, and lecturer	
	Reaction	<b>To lecturer:</b> interactive <b>To content:</b> confused then understand after clarification <b>To ICT:</b> Normal to some, challenging to some, strange to some <b>To question:</b> responsive, Students ask questions	<b>To lecturer:</b> attentive, inquisitive <b>To content:</b> confused then understand after clarification <b>To ICT:</b> Normal, not strange <b>To questions:</b> responsive, challenging, interactive Students ask questions	<b>To presenter:</b> attentive <b>To content:</b> understand, reactive <b>To ICT:</b> not ascertained <b>To question:</b> responsive and challenging. Students and lecturer critique presentation	
Technical issues	Technical Problem	Yes – Initial setting up problem, slow internet connection	Yes – power failure	-	<b>Challenges</b>
	Technical Assistant	No	No	-	

teaching and learning or what can be achieved by students and teachers with the infusion of ICT in teaching and learning. Some of these perception and effects reported in both analyses include; better access to resourceful information, student/

lecturer collaboration, ease in teaching and learning, interaction with the outside world and many others. Challenges identified in both are combination of problems and constraints experienced in ICT use in teaching and learning.

Among these challenges are inadequate access to ICT facilities, inconsistent internet connection, epileptic power supply etc. The qualitative findings however found plagiarism, over-reliance on ICT, laziness and absenteeism as disadvantages of ICT in teaching and learning.

Motivation and incentives in quantitative and qualitative findings respectively both inform the factors that could induce proper ICT integration in teaching and learning. The common ones identified by both analyses are improved access to ICT facilities and training. These motivating factors could lead to better ICT integration as found in these analyses and other studies (WORLD BANK, 2003 and HADDAD, 2003). Integration reported in both analyses revolves round integrating ICT into teaching and learning, curriculum and assessment and a blend of ICT with the existing traditional teaching and learning approach.

**THE RESULTANT MODEL**

This study produces a model that is conceived as a conceptual framework for researchers on impact assessment and is made up of the generated themes and named ICT IMPACT ASSESSMENT MODEL comprising Positive effect, Integration, Incentives and Challenges. This model is represented in a cyclic form because the assessment process can start from any stage and the assessment could be done individually or holistically. This makes it useful for both formative and summative assessment of ICT integration in teaching and learning. The mixed method approach (survey, interviews and observations) used in the study that generated this model also supports its usefulness in any kind of evaluation (formative or summative) (Figure 1).

To see the consistency of this new model with grounded models on evaluation and assessment, this author has come up with a link model with Kirkpatrick’s successive four-level model of evaluation and Daniel Stufflebeam’s CIPP evaluation model and illustrated in the Figure 2. This new model (Adedokun-Shittu) combines as positive effect, the reaction/impact and learning/effectiveness of both Kirkpatrick and CIPP model. Behaviour and transportability in the blend model

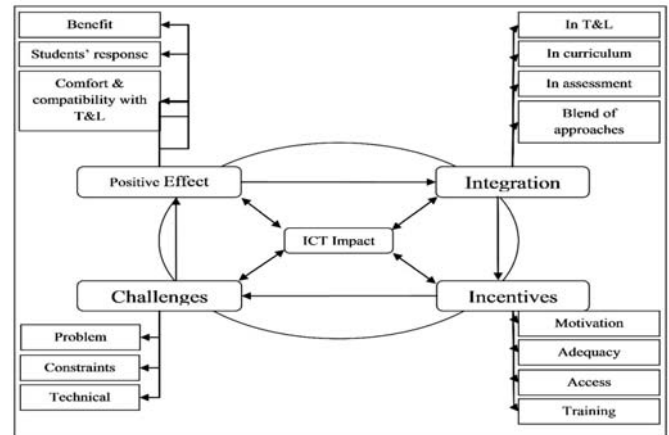


Figure 1: Adedokun-Shittu ICT Impact Assessment Model.

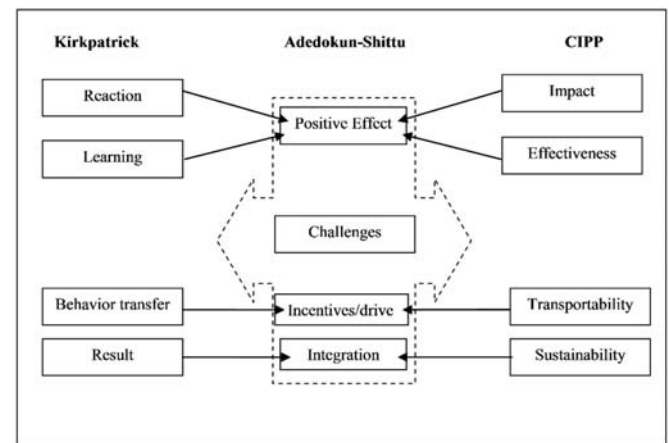


Figure 2: The Link Model

are translated as incentives that drive both teachers and learners to integrate ICT in teaching and learning. Integration in the new model explains result and sustainability in the blend

model since the result of deployment of ICT in teaching and learning is expected to be successful and sustainable integration in the education system. However there exist a gap that was left behind in both Kirkpatrick and CIPP models and this new model has provided a filler to occupy it.

Challenges is a part of this new model that is missing in the previous models, no matter how perfect an implementation is, it will definitely have some loopholes that need to be observed to achieve optimal benefit. Likewise the essence of assessment or evaluation (formative or summative) is to examine if an implementation is achieving its desired goals. Thus to determine this, it is essential to foresee any immediate or future

challenges to the successful implementation of the program. Specifically since this new model is on ICT impact assessment and ICT is an ever evolving subject; it is appropriate to from time to time assess the challenges, gap and update needed to meet up with the developing nature of ICT required in the education system.

A confirmation on this could be made through the concluding words of Wright, Stanford, and Beedle, (2007) in a study assessing how blended model improves teacher's delivery of education curriculum. Concluding on the problems encountered by both teachers and students in the blended model, they resolved through Murphy's Law dictum thus; "... *'Anything that can go wrong will!' certainly applies to technology.... These issues of access and connection speed continue to present challenges.*" P. 59

This model however does not present itself as a proven framework for ICT impact assessment because it has not been tested or established as an

assessment tool. Rather it is a research outcome that submits itself for scrutiny and experimentation in this field before it can be accepted and recognized as a model for assessing ICT impact in education.

## CONCLUSION

The use of multiple research designs to get rich and diverse view of participants incorporated in this study help to generate solid findings on the impact assessment of technology in education.

The resultant model (ADEDOKUN-SHITTU 2011 ICT impact assessment model) generated through a mixed method research design has four components which are substitutable to CIPP and Kirkpatrick models. It also fills a crucial gap left by both models. Researchers should therefore put this new model to test in both formative and summative evaluation of ICT in education to see its usability in the field.

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