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Influence of ICT Adoption on Tertiary Education: Investigating ICT Usage in E-learning Context among Nigerian Students

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Abstract
Information and communication technologies (ICTs) have been employed in various fields of human endeavours, especially to engender socio-economic development. One key sub-sector in which the adoption of ICTs is increasingly becoming critical is the farm-based (agri-based) enterprises. This study was prompted by the urge to determine the critical factors that affect ICT usage in ***e***-learning by students of post-secondary schools. The concept of ***e***-learning, through the application of information and communication technology (ICT) has been increasingly attracting the attention of researchers. Recent studies found that there is quite a number of factors that affect students' adoption (usage) of ICT for learning purposes. However, students' expectation toward effort-free (easy-to-use) ICT hardware and software has been singled out as one of the major factors that becloud their perceptions of adopting ICT in their academic activity. In addition, the literature has highlighted that students' ICT adoption expectancies in ***e***-learning context is influenced by their prior experience and inexperience (e.g., anxiety). This study therefore, was prompted by the urge to determine the effect of ICT usage expectancies and prior usage experience (*via-a-vis* inexperience) on tertiary institutions students' ICT adoption in ***e***-learning context. The Unified Theory of Acceptance and Use of Technology (UTAUT) model was adopted and a pre-tested and validated questionnaire was administered to 400 students that were randomly selected in Yobe State University Damaturu, in Nigeria. The study found effort expectancy explains about 80% of the variance in ICT usage, and only prior experience moderated the relationship significantly and positively.
Keywords: Effort Expectancy, Experience, ***e***-Learning, Tertiary Institutions, ICT Usage, the UTAUT

1. Introduction

Information and communication technology (ICT) has gained increased focus in scholarly discourse in research as a way to enable learning that is time and place blind (Cullum & Jeffrey 2013). Copious studies have assessed how ICT can be harnessed to tap its potential benefits for educational development (Aubusson, Schuck & Burden, 2009; Callum & Jeffrey 2013; Churchill & Churchill 2008). Continuously the benefits of using ICT in learning are being revealed; hence, researchers need to understand the factors that influence the future use of ICT in learning.

However, the adoption and use of ICT for learning purposes will chiefly depend on whether students and instructors believe that using ICT in teaching and learning processes meets their particular academic needs. Studies have revealed that the decision to adopt a particular technology is a very complex phenomenon that requires holistic, empirical investigation to be understood (Abu Bakar, Abdul Razak & Abdullah 2013; Abdul Rahman, Jamaluddin & Mahmud 2011; Callum & Jeffrey 2013).

Many influencing factors are involved in the ICT adoption processes (Venkatesh, Morris, Davis & Davis 2013). Among those factors are the influences that students' ICT skills and experience have on their adoption/usage of ***e***-learning. Unfortunately, this has relatively received little research attention (Abu Bakar *et al*. 2013; Abdul Rahman *et al*. 2011; Callum & Jeffrey 2013). Interestingly however, those studies that have focused on that relationship have theorised ICT experience based on a broad construct (Callum & Jeffrey 2013; William 2009).

ICT has been defined as any device, system and facility that can be employed to collect, process, store and diffuse information (Njoh 2012). While ***e***-learning has been defined as "learning through electronic devices such as desktop/laptop computers, CD/DVD players, etc." (Nassuora 2013, p. 1). Nowadays ICTs are ubiquitous, and their significance continues to soar in virtually every aspect of human endeavour. Similarly, in education there is an increased use of ICTs both within and outside the classroom (Pynoo, Devolder, Tondeur, Braak, Duyk & Duyk 2011).

This study focused on measuring students' ICT usage in education. ICT usage in learning simply means the direct contact with and performing learning tasks using ICT (Gu, Zhu & Guo 2013; Pynoo *et al*. 2011). ICT usage for learning purposes has been there for a while (Eteokleous-Grigoriou 2009). However, despite its

immense benefits, it can pose daunting challenge to students of tertiary institutions (Pynoo *et al*. 2011). Considering the fast rate of ICT development nowadays, students constantly need to adapt to new ICTs and refine their skills in order to utilise their experience of ICT usage for learning (Pynoo *et al.* 2011). Moreover, experience is simply defined as the past usage of ICT (Venkatesh *et al*. 2003; Kijsanayotin, Pannarunothai & Speedle 2009).

One key contribution of the current study is to highlight the importance of inexperience as a moderator variable when considering the effects of experience on ***e***-learning. Concisely, the current study contributes to the field of ICT use in ***e***-learning by showing the expected and unexpected impact of both experience and inexperience as moderators on the usage of ICT in ***e***-learning. The researchers adopted the scale with some adjustments that are common to other ICT adoption studies from Venkatesh *et al* (2003) and Venkatesh, Morris and Ackerman (2000).

1.1 Research Framework

In this study, the researchers modelled inexperience by integrating it as another factor that indirectly moderates effort expectancy in the relationship with ICT usage in learning (see Figure 1). That is, experience directly influences ICT usage in ***e***-learning via effort expectancy. Experience was treated as a construct that moderates or changes the factors that lead to ***e***-learning adoption (usage).

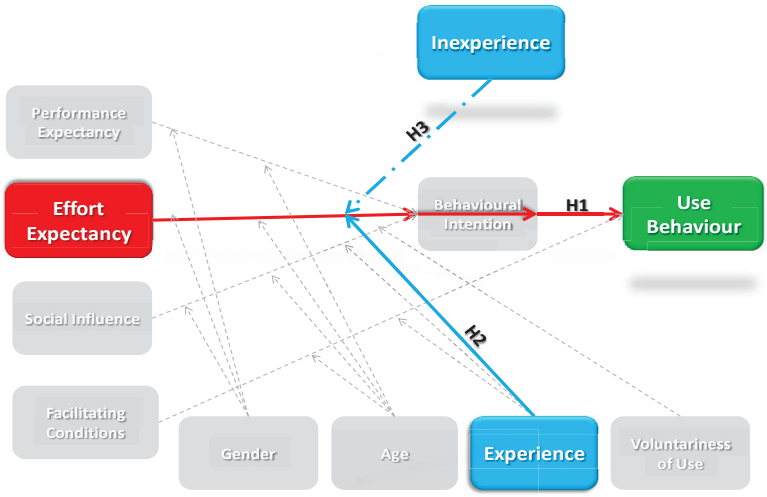

Fig. 1. The research model of this study, illustrating the relationship between the predicting and criterion variables as moderated by experience and inexperience

Note: Adapted with moderations from Venkatesh *et al*. (2003)

This study solely relied on the prior usage experience of the respondents, unlike Venkatesh *et al*. (2003) who investigated the respondents' experience based on a three-tier training session (T1-T3) the respondents had undergone. This study could not organise any pre-investigation training course for the respondents because of meagre resources and restricted study period. Chiefly however, the researchers deemed most students of tertiary institutions nowadays have some appreciable level of ICT usage.

The researchers tested only effort expectancy, which is one of the four predicting variables in the UATAUT model. The present study focused on effort expectancy because it is found to be more significant for individuals with less ICT experience (Venkatesh *et al*. 2003). In addition, the choice of that particular construct was to suit the nature of the environment in which the study was conducted and to attempt to explore new approaches of solving ICT adoption research problems.

1.2 Research Questions and Objectives of this Study

Tremendous development in ICTs coupled with the successful introduction of ***e***-learning in tertiary institutions has generated huge research interest (Clegg, Hudson & Steel 2003; Gu *et al*. 2013). The literature reveals that the technological expectancy factors in UTAUT (Venkatesh *et al*. 2003) namely, performance expectancy, effort expectancy, social influence and facilitating conditions (moderated by age, gender, experience and voluntary usage) predict students' ICT usage for learning purpose with mixed results.

However, regarding students' ICT usage in ***e***-learning in the developing societies, it is assumed that the degree of computer systems user-friendliness (from the perspective of the degree of effort required to operate the system) significantly affects usage level (Bhuasiri, Xaymoungkhoun, Zo, Rho & Ciganek 2012; Tella, Tella, Tayobo, Adika & Adeyinka 2007), hence it drives usage. Moreover, copious literature using the UTAUT

perspectives has also suggested that ICT users' experience positively influences their usage level (Abdul Rahman *et al*. 2011; Abu Bakar, *et al*. 2013), especially when the degree of the users' experience is high.

Although many studies have attempted to define ICT use experience that is appropriate for e-learning, minimal data is available on the effects of inexperience on ICT adoption in the academic activities of students of tertiary institutions. This study was conducted in order to investigate those issues raised, using the research questions and objectives listed below.

1.2.1 Research questions

1. What was the level of the students' ICT usage for academic performance?
2. What was the relationship between effort expectancy and the students' ICT usage for academic performance?
3. What was the moderating effect of experience in the relationship between effort expectancy and the students' ICT usage for academic performance?
4. What was the moderating effect of inexperience in the relationship between effort expectancy and the students' ICT usage for academic performance?

1.2.2 Research objectives

1. To determine the students' level of ICT usage for academic performance
2. To determine the relationship between effort expectancy and the students' ICT usage for academic performance
3. To determine the moderating effects of experience in the relationship between effort expectancy and the students' ICT usage for academic performance
4. To determine the moderating effects of inexperience in the relationship between effort expectancy and the students' ICT usage for academic performance

2. Literature Review

2.1. The UTAUT Model

One of the latest and most comprehensive models that focus on ICT adoption and usage is the UTATUT (Abu Bakar *et al*. 2013; Qinfei, Shaobo & Gang 2008). The theory integrates eight major ICT adoption models: the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behaviour (TPB), the Model of PC Utilisation (MPTU), the Innovation Diffusion Theory (IDT) and the Social Cognitive Theory (SCT). UTAUT aimed to achieve a unified view of ICT user acceptance (Abu Bakar *et al*. 2013; Abdul Rahman *et al*. 2011; Venkatesh *et al*. 2003).

The model consists of four major predictors of intention and usage of ICT, they are, performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC). The predictors are moderated by gender, age, experience and voluntariness of use. The present study examined only effort expectancy in relation to ICT usage. Effort expectancy is defined as the degree of ease associated with the use of any technological system (Abdul Rahman *et al*. 2011; Venkatesh *et al*. 2003). Copious studies have suggested that ICT usage experience has had a significant influence on ICT adoption (Gefen 2003; Klopping & McKinney 2006; Thompson, Higgins & Howell 1994).

2.2. Measuring the Moderating Effect

The third and fourth objectives of this study were to test the moderating effects of experience and inexperience in the relationship between the independent and the dependent variables. The researchers ran two tests to determine the presence of any moderating effect in the constructs and to assess the level of the moderating effects in the hypothesised paths.

The rule of thumb regarding tests of moderating effects is that if there is a significant change in the chi-square between the measurements of residuals model and the unconstrained model, the presence of moderating effects in the relationships between the constructs are determined (Garson, 2008; Dabholkar & Bagozzi 2002). The researcher used AMOS model to determine whether there was any significant difference between the structural parameters of the mediating variables, experience and inexperience.

2.3. Validity and Cronbach's Coefficient of the Scales

A pilot-tested five-section questionnaire was administered to the respondents. The scales were adapted from Venkatesh *et al*. (2003). The Cronbach alpha coefficient of the instrument indicates that the items had high internal consistency (refer to Table 1). Researchers are required to measure and report the Cronbach's alpha coefficient of their research instruments when using Likert Scale for its internal consistency reliability (Santos 1999).

In this context, the rule of thumb is that the more the Cronbach's alpha is closer to 0.1, the greater the internal consistency of the items in the scale (Cronbach, 1951; Santos 1999). In addition, cited in Alkhunaizan and Love (2012), the lowest limit for adequate reliability is $(\alpha = .70)$ (Gliem & Gliem 2003). However, in some cases it may be accepted at a level of .60 (Alkhunaizan & Love 2012; Gliem & Gliem 2003). The high

Cronbach's alpha values for all the three scales of this study indicate that they are internally consistent and measure the same content of the constructs (Cronbach 1951; Streiner 2003).

2.4. Hypotheses of this Study

The introduction and use of ICTs for learning purposes has attracted a lot of research interest. Two main research perspectives can be identified: first, acceptance studies (Hu, Clark & Ma 2003; Pynoo *et al*. 2011; Teo 2009) and second, more educational research in which user attitude and the integration of ICT in the classroom are studied (Shapka & Ferrari 2003). This study was largely pegged on the second perspective of research.

To know how and why individuals adopt ICTs is the primary goal in information system (IS) research (Abdul Rahman *et al*. 2011; Abu Bakar *et al*. 2013). In the context of effort expectancy, while users may believe that ICTs are useful, they may be cumbersome to use. Thus, the performance benefits might be overweighed by the effort of using the technology (Teo, Luan & Sing 2008; Venkatesh *et al*. 2003). Furthermore, effort expectancy, explains the amount of effort required to use the technology. In other words, effort expectancy it is the belief that using a particular ICT system would be effortless (Venkatesh *et al*. 2003). Therefore, it is possible that a system with sophisticated ***e***-learning applications, but with a low level of effort expectancy "is more likely to induce positive attitudes" (Teo *et al*. 2008, p. 267).

In addition, the relationship between effort expectancy and ICT usage is that the level of effort expectancy of an ICT adoption determines the degree to which a user would be able to use the system (Moon & Kim 2001; Teo *et al*. 2008); and that experience moderates the relationship between the two variables (Venkatesh *et al*. 2003). In other words, while experience indirectly influences ICT usage (via effort expectancy), effort expectancy directly predicts ICT use behaviour (Venkatesh *et al*. 2003). Therefore, the present study proposed this hypothesis:

> H_1: There was a significant relationship between effort expectancy and students' ICT usage for academic activities.

Previous research has indicated that ICT usage has had a positive effect on ***e***-learning adoption (Lee, Yoon, & Lee 2009). One of the objectives of the present study was to evaluate if prior students' ICT usage in learning experience and inexperience are directly related to ICT usage in ***e***-learning. Students of tertiary institutions have nowadays developed the habit or routine of using ICT to study, and shall continue to do so with little reflection or rational analysis about their usage (Guri-Rosenblit 2006).

Experience has a direct effect on students who continue to use particular ICT in their learning activities (Liao & Lu 2008). The present study posits not only should experience increase the likelihood of students' ***e***-learning usage, but experienced ***e***-learning using students, like experienced experts and decision makers have reasoning, planning and classification advantages that should improve their level of ICT usage for learning purposes and usage decision, which could encourage continued ICT usage in learning activities. Hence, the present study hypothesised that:

> H_2: Experience (directly) moderated the relationship between effort expectancy and students' ICT usage for academic activities, such that the effect of effort expectancy decreased as experience increased.

Previous studies have documented that ICT usage in learning sometimes has unpleasant side effects such as the strong, negative emotional feelings that grip the users not only during, but even prior to interaction with the system (Beaudry & Pinsonneault 2010; Saade & Kira 2009). This usually occurs when the idea of having to interact with an unfamiliar technology arises (Beaudry & Pinsonneault 2010; Hikkinen 1994: Saade & Kira 2009).

Furthermore, anxiety, confusion and similar emotional states often affect inexperienced users (Beaudry & Pinsonneault 2010; Hikkinen 1994; Saade & Kira 2009); thus, they can negatively affect the ICT usage and the learning process of the affected individuals (Beaudry & Pinsonneault 2010; Hikkinen, 1994). Inexperience (or anxiety) in students' ICT usage for learning purposes is defined as a feeling of being fearful or apprehensive when using or considering the usage of ICT (Lesso & Peck 1992; Hikkinen 1994; Saade & Kira 2009).

Past studies have suggested that factors such as experience, self-efficacy and attitude towards ICT usage influence ICT usage anxiety (inexperience) (Brosnan 1998_a; Hikkinen 1994; Saade & Kira 2009). Quite a number of studies have provided evidence that support a direct relationship between ICT usage inexperience and ICT usage (Beaudry & Pinsonneault 2010; Saade & Kira 2009). The implication of that is that, for example, an inexperienced student majoring in a course that is compulsory to use ***e***-learning technologies will be significantly disadvantaged compared to his or her colleagues (Hikkinen 1994; Saade & Kira 2009).

Furthermore, alongside the direct moderating effects of experience, the current study proposed that inexperience would affect the students' ICT usage in learning activities indirectly. These indirect effects may be more important to the subsequent (future) usage of ICT in learning than the direct of effects of experience. Many studies have shown that experience exerts indirect effects on ICT adoption through perceived ease of use (effort expectancy) (Klopping & McKinney 2006; Venkatesh *et al*. 2003; Venkatesh *et al*. 2000). In other words, inexperience exerts indirect moderating effects on effort expectancy in the relationship between it and ICT usage

for learning.

Moreover, by including voluntariness of usage (which is denotative of habitual usage) as a moderating variable in the UTAUT model (Venkatesh *et al*. 2003), this study presumed that the indirect influences of inexperience could be more pronounced since habit could be directly influenced by experience (Abu Bakar *et al*. 2013; Klopping & McKinney 2006). Therefore, it follows that habit could be indirectly influenced by inexperience, such that the higher the level of the users' experience, the higher the moderating influences of voluntary usage and *vice versa*. Therefore, this study proposed the following hypothesis:

H_3: Inexperience (indirectly) moderated the relationship between effort expectancy and students' ICT usage for academic activities, such that the effect of effort expectancy decreased as experience increased.

3. Material and Methods

3.1. Material

Pre-tested five-section questionnaire, containing 45 items was administered to 400 undergraduate students in the Social Science faculty of University of Maiduguri, in Nigeria. With a 96.75% returned rate, 387 of the questionnaires were returned. The data collected were and analysed using SPSS and AMOS respectively. In addition, green indelible ink was used to tag the respondents who had participated in a previous day in order to avoid the mistake of re-surveying already surveyed participants.

3.2. Methods

Simple random sampling approach was employed to determine both the locale (Faculty of Social Sciences and University of Maiduguri) and the respondents of the study. The questionnaire was self-administered to the respondents in the premises of the faculty during class hours. Prior to administering the questionnaire, the researchers briefed the respondents about the aims of the study; the researchers also explained to the respondents how the questionnaire should be completed. Afterwards, the researchers only interacted with the respondents when the latter needed some clarifications regarding the questionnaire.

Data collection lasted for two days only. As the questionnaire required only about 15 minutes to be completed, on each day the researchers would gather the respondents into groups, then administer the instrument to them and wait while they fill it in. In few instances however, a few respondents were permitted to fill in the questionnaire and return them later. In order to ensure that no respondent was surveyed twice, the researchers tagged each of the respondents that participated on the first day by dying the tip of his or her right index finger with green indelible ink.

Inexperience as a construct was integrated into the research framework in order to provide the researcher with the convenience to test the presence of moderating effect of both constructs (experience and inexperience) as a group and categorically determine the variable that possessed the mediating influence on the relationship between the predictor and criterion variables (Nikerson 2000). There is quite a number of studies conducted on the influence of experience (and inexperience, e.g., anxiety and nervousness) on ICT adoption (see Chang & Chen 2008; Gupta & Kim 2007; Hernandez, Jimenez & Martin 2010). Experience and inexperience were measured using a 10-item scale for each. The items consisted of statements that sought to gauge the respondents' perceptions toward ICT adoption prior to and after the direct usage of the technology (see Venkatesh *et al*. 2003).

3.3. Reliability and Validity of the Scale

The Cronbach's alpha coefficients for both the pilot and actual studies are presented in Table 1. A reliability coefficient of 0.70 for Cronbach's alpha is considered as good (Streiner 2003).

Table 1: Reliability of the Scale for Pilot-test and Actual Data Collection

Scale	Number of Items	Cronbach Alpha Pilot Study (n = 40)	Cronbach Alpha Actual Study (n = 387)
Students' ICT Usage	10	0.86	0.90
Effort Expectancy	10	0.87	0.77
Experience	10	0.90	0.88
Inexperience	10	0.76	0.70

Note: n = Sample size

Furthermore, the researcher had sought the advice of experts in these research fields at the faculty about the validity of the instrument, which they affirmed valid.

4. Results

4.1 Demographic Data of the Respondents

Majority of the students (66.4%) were male. Almost half of them (49.5%) were youth, aged 18-23 years old (M

= 23.93, SD = 3.909). While respondents aged above 35 were only five, (1.3%). See Table 2.

Table 2: Respondents' Demographic Information

Demographic Variable		Frequency	Percentage
Gender	Male	257	66.4
	Female	130	33.6
Total		**387**	**100.0**
Age Group	18 – 23	193	49.5
	24 - 29	162	41.5
	30 – 35	27	7.7
	36 – 45	5	1.3
Total	M = 23.9	**387**	**100**
SD = 3.909			

Note: M = Mean; SD = Standard deviation

That shows majority of the respondents were young, and within the age brackets of high ICT users (Lenhart, Purcell, Smith & Zickhur 2010; Hargittal & Hinnant 2008; Adamkolo & Elmi-Nur in press).

4.2 Research question 1: What was the level of the students' ICT usage for academic performance?

The level of the students' ICT use for learning purposes was measured using Likert scale (1) Never, (2) Occasionally, and (3) Often as shown in Table 3.

Table 3: ICT Usage in Learning: Items with Percentage, Mean and Standard Deviation

	Items	Likert Scale Percentage			Descriptive Statistics	
		1	**2**	**3**	**Mean**	**SD**
1	I use ICT to receive instructions from my lecturers.	1.1	19.7	79.2	2.32	0.40
2	I use ICT to submit assignments/homework to my lecturers.	0.3	16.8	82.9	2.39	0.45
3	I use ICT to conduct peer review with my colleagues.	0.5	15.5	84.0	2.07	0.41
4	I use ICT to explore new learning areas related to my course of study.	0.5	14.9	84.5	2.40	0.54
5	I use ICT to print my learning materials.	0.3	12.0	87.7	2.27	0.46
6	I use ICT to photocopy learning materials.	0.8	9.3	89.9	2.25	0.55
7	I use audio-visual facilities, both online and offline to enhance my academic performance.	0.5	8.5	90.9	2.27	0.41
8	I use alarm service on ICT device(s) to remind me of activities related to my studies.	0.0	5.9	94.1	2.32	0.47
9	I use ICT to access online public (free) catalogues.	0.3	3.7	96.0	2.16	0.44
10	I use ICT to communicate with my colleagues about activities related to my learning.	0.0	4.0	96.0	2.27	0.45
Overall Mean					**2.30**	**0.46**

Note: (1) Never, (2) Occasionally and (3) Often; SD: Standard deviation; Adapted with moderations from Venkatesh *et al*. (2003)

A sample of the questions is "I use ICT to explore new learning areas related to my course of study". It scored the highest mean value of (M = 2.40, SD = 0.54). The overall mean value was (M = 2.30, SD = 0.46, which was high.

4.3 Research question 2: What was the relationship between effort expectancy and the students' ICT usage for academic performance?

Table 4: Effort Expectancy: Items with Frequency, Percentage, Mean and Standard Deviation

	Items	The Likert Scale Percentage of Frequency					Descriptive Statistics	
		1	**2**	**3**	**4**	**5**	**Mean**	**SD**
1	It takes very little effort to use ICT facilities in my learning activities.	8 (2.1%)	14 (3.6%)	62 (16.0%)	100 (25.8%)	203 (52.5%)	2.12	3.98
2	It is easier for me to improve my learning through ICT usage.	14 (3.6%)	30 (7.8%)	117 (30.2%)	134 (34.6%)	92 (23.8%)	2.13	3.99
3	It is easy for me to obtain online learning materials using ICT facilities.	10 (2.6%)	44 (11.4%)	129 (33.3%)	127 (32.8%)	77 (19.9%)	2.82	2.94
4	I would find ICT facilities easy to use to boost my academic performance.	14 (3.6%)	42 (10.9%)	97 (25.1%)	121 (31.3%)	113 (29.2%)	2.70	3.75
5	It would be easy for me to be skilful at using ICT facilities in my learning activities.	7 (1.8%)	14 (3.6%)	93 (24.0%)	160 (41.3%)	113 (29.2%)	2.83	2.95
6	I would find ICT facilities flexible to use in my learning activities.	8 (2.1%)	24 (6.2%)	79 (20.4%)	153 (39.5%)	123 (31.8%)	2.57	3.72
7	I believe that it is easy to get ICT to do what I want it to do in relation to my learning activities.	13 (3.4%)	34 (8.8%)	109 (28.2%)	132 (32.1%)	99 (25.6%)	2.93	2.95
8	My interaction with ICT would be clear and understandable.	30 (7.8%)	26 (6.7%)	88 (22.7%)	121 (31.3%)	122 (31.5)	2.93	4.87
9	Using ICT involves less time doing mechanical operations, for example, data input.	4 (1.0%)	13 (3.4%)	82 (21.2%)	124 (32.0)	164 (42.4%)	2.93	3.87
10	Overall, I believe that ICT is easy to use in my learning activities.	7 (1.8%)	21 (5.4%)	69 (17.8%)	127 (32.8%)	163 (42.1%)	2.23	4.98
	Overall Mean						**2.33**	**3.80**

Note: SD = Standard deviation; Adapted with moderations from Venkatesh *et al*. (2003)

Table 4 (under sub-section 4.4) contains the descriptive statistics of the findings for the independent variable of the study, effort expectancy. All the 10 items measured high, with an overall mean (M = 2.33, SD = 3.80). Compared to the overall mean score (M = 4.04, SD = 3.90) of the positive moderating variable, experience, the mean score of the predictor variable has decreased.

4.3.1 Correlation between the predictor and criterion variables(Hypothesis H_1)

There is a strong and significant relationship between effort expectancy and students' ICT usage in learning (r = 0.787, p = 0.001) as shown in Table 5. Those results are consistent with Tan (2013).

Table 5: Correlation Matrix between the Independent and Dependent Variables

	Hypothesis Path	*R*	*P*
H_1:	EE ⇨ IU	0.787	0.001

There is a significant relationship between effort expectancy (EE) and students' ICT usage in academic activities.

4.4 Research question 3: What was the moderating effect of experience in the relationship between effort expectancy?

The respondents' experience was measured using their prior ICT usage experiences. The items which were adopted with some modifications from Venkatesh *et al*. (2003) and Venkatesh (2000), were suggestive of the period of time taken for the users to become familiar with ICT systems usage until, subsequently, they became skilful (Alawadhi & Morris 2008; Venkatesh, *et al*. 2003). Table 6 shows the total mean value for the scale (M = 4.04, SD = 3.90).

Table 6: Experience: Items with Frequency Percentage, Mean and Standard Deviation

	Items	Likert Scale			Descriptive Statistics	
		1	**2**	**3**	**Mean**	**SD**
1	I have been able to complete an academic task using ICT even if there was no one around to tell me what to do as I go.	7 (1.8%)	127 (32.8%)	163 (42.1%)	4.23	*3*.98
2	I have been able to complete an academic task using ICT even if I could not call someone for help if I got stuck.	4 (1.0%)	124 (32.0)	164 (42.4%)	3.67	*4*.03
3	I have been able to complete an academic task using ICT even if I did not have much time to complete an assignment for which the software was provided.	30 (7.8%)	121 (31.3%)	122 (31.5)	*4*.56	*3*.01
4	I have been able to complete an academic task using ICT even if just I did not have the built-in facility for assistance.	13 (3.4%)	132 (32.1%)	99 (25.6%)	3.72	*3*.11
5	I do not feel apprehensive about using ICT in my academic activities.	8 (2.1%)	153 (39.5%)	123 (31.8%)	3.93	3.91
6	It does not scare me to think that I could lose much data using ICT in my learning activities by clicking the wrong key.	14 (3.6%)	134 (34.6%)	92 (23.8%)	3.93	4.98
7	I do not hesitate to use ICT in my academic activities for fear of making mistakes that I could not correct.	8 (2.1%)	153 (39.5%)	123 (31.8%)	3.70	*4*.05
8	I believe using ICT in my academic activities is not formidable to me.	7 (1.8%)	160 (41.3%)	113 (29.2%)	3.72	*4*.02
9	I believe I have overcome the fears of uncertainty associated with ICT usage in my studies.	14 (3.6%)	121 (31.3%)	113 (29.2%)	4.11	3.82
10	Overall, I feel confident when I am using ICT to solve my academic problems.	8 (2.1%)	100 (25.8%)	203 (52.5%)	*4*.08	4.80
	Overall Mean				**4.04**	**3.90**

Note: (1) Never, (2) Occasionally and (3) Often; adapted with moderations from Venkatesh *et al*. (2003)

Between 40 and 50% of the respondents believed that, either occasionally or often they could use ICT in learning confidently based on their prior experiences. Moreover, as the students' experience increased, effort expectancy significantly decreased as shown by the mean of the constructs (see Tables 4 and 6). This is consistent with Venkatesh *et al*. (2003).

4.3.2 Tests for moderating effect of experience (Hypothesis H_2)

The models in Table 7 shows a satisfactory fit indices based on the comparative fit index (CFI) and root mean square error of approximation (RMSEA) (Johnson & Wichern, 1992) for the two moderating variables, experience and inexperience. The results show the chi-square difference ($\Delta\chi^2$) between the models was 153.904, with degree of freedom difference (42 Δdf). The results were significant since the moderating variable recorded a significant change of χ^2 and *df* in the comparison of both constraint and unconstraint models. Also, see Tables 9 and 10 for the correlation results.

Table 7: Results of Moderation Effect of Experience and Inexperience

Model Characteristic	Unconstrained Group Model	Measurement Residuals Group Model	Model Differences
Model fit	0.000	0.000	-
***p* (sig)**			
Chi-square (χ^2)	335.775	489.679	153.904
Df	84	42	42
CFI	0.965	0.937	-
RMSEA	0.035	0.050	-

Therefore, the presence of moderating effects of experience on the relationships between the independent variable, effort expectancy and the dependent variable, ICT usage was confirmed.

4.4 Research question 4: What was the moderating effect of inexperience in the relationship between effort expectancy and the students' ICT usage?

The overall measurement for the indirect moderating effects of inexperience indicates about 90% of the

respondents did not believe that they could not use ICT in their learning activities confidently as indicated in Table 8.

Table 8: Inexperience: Items with Frequency Percentage, Mean and Standard Deviation

	Items	Likert Scale			Descriptive Statistics	
		1	2	3	Mean	SD
1	I am not been able to complete any academic task using ICT unless if there was someone around to tell me what to do as I go.	79.2	19.7	1.1	1.22	0.44
2	I am not been able to complete any academic task using ICT unless if I could call someone for help so that I am not stuck.	82.9	16.8	0.3	1.20	0.40
3	I am not been able to complete any academic task using ICT unless if I had much time to be guided by someone as I carry out an assignment for which the software was provided.	84.0	15.5	0.5	1.20	0.40
4	I am not been able to complete any academic task using ICT unless if just I had the built-in facility for assistance.	84.5	14.9	0.5	1.20	0.38
5	I feel apprehensive about using ICT in my academic activities.	87.7	12.0	0.3	1.13	0.34
6	It scares me to think that I could lose much data using ICT in my academic activities by clicking the wrong key.	89.9	9.3	0.8	1.11	.34
7	I hesitate to use ICT in my academic activities for fear of making mistakes that I cannot correct.	90.9	8.5	0.5	1.10	0.31
8	I feel using ICT in my learning activities is intimidating to me.	94.1	5.9	-	1.10	0.22
9	I believe I have not yet overcome the fears of uncertainty associated with ICT usage in my studies.	96.0	3.7	0.3	1.04	0.22
10	Overall, I feel uncomfortable when I am using ICT to solve my academic problems.	96.0	4.0	-	1.04	0.20
	Overall Mean				**1.13**	**0.34**

Note: (1) Never, (2) Occasionally and (3) Often; adapted with moderations from Venkatesh *et al*. (2003)

4.4.1 Test for moderating effect of inexperience (Hypothesis H_3)

A two-path coefficient was evaluated to verify the presence of moderating effects on each path. The tests indicate that experience was significant ($p = 0.003$*) at the ($p < 0.05$) level, while inexperience was insignificant ($p = 0.065$) at the ($p < 0.05$) level as shown in Table 9 (also, refer to Tables 7 and 10).

Table 9: Moderating Effect of Experience and Inexperience on the Relationship between Effort Expectancy and Students' ICT Usage in Learning

Hypothesis Path	B	β	$p < .05$
Effort Expectancy ⇨ ICT Usage			
Experience	0.402	0.750	0.003*
Inexperience	-0.301	-0.515	0.065

H_2: Experience (directly) moderated the relationship between effort expectancy and ICT usage, such that the effects of effort expectancy decreased as experience increased.

H_3: Inexperience (indirectly) moderated the relationships between effort expectancy and ICT usage, such that the effects of effort expectancy decreased as inexperience increased.

* Significant value

Table 10 and Figure 2 indicate the standardised regression weight for the positive moderating variable, experience was (β 0.750), and the effect was very significant (0.003) at the ($p < 0.05$) level. Because of the significant value, as suggested by Hair, Black, Babin, Anderson & Tatham (2006), as well as Johnson and Wichern (1992), the hypothesised path was moderated by experience. From the analysis, results for H_3 were insignificant, which suggests that inexperience did not moderate the relationship between the predictor and criterion variables. However, the results for H_2 were significant.

Table 10: Summary of Hypotheses H_2 and H_3 Results

Hypotheses		Standard Regression Weight	Level of Significance	Findings
H_2:	Experience (directly) moderates the relationship between effort expectancy and students' ICT usage in academic activities, such that the effects of effort expectancy decrease as experience increases.	0.750	$p < 0.05$	Moderated
H_3:	Inexperience (indirectly) moderates the relationship between effort expectancy and students' ICT usage in academic activities, such that the effects of effort expectancy decrease as experience increases.	-0.515	Not Significant	Did not Moderate

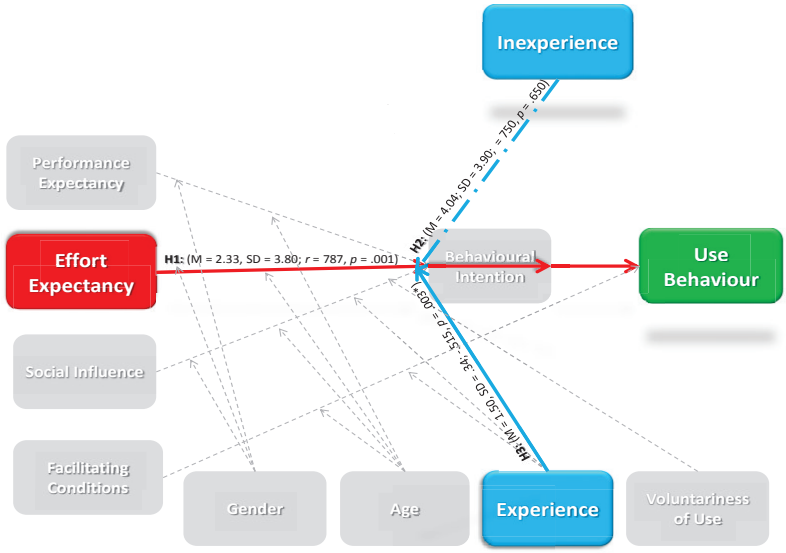

Fig. 2. Model of the hypothesised paths, indicating the results of the relationships between the various variables.

5. Discussion

The findings show the level of Internet usage among students of universities in Northeastern Nigeria is appreciably high, despite being the most educational disadvantage region in the country (Ukiwo 2007). Majority of the students (66.4%) were male. Almost half of them (49.5%) were youth, aged 18-23 years old (M = 23.93, SD = 3.909). Respondents aged above 35 were only 1.3% (refer to Table 2). This shows majority of the respondents were young, within the age brackets of high ICT users as found by (Lenhart, Purcell, Smith & Zickhur 2010; Hargittal & Hinnant 2008).

Almost 90% of the students (M = 2.30, SD = 0.70) that participated in the survey had used ICT to boost their academic performance often. This level of usage was quite high, considering the educationally disadvantaged region from which the students hailed. However, with the enormous access to Internet and other modern technologies to the millennial students, that rate of ICT usage could be described as normal (McMahon & Pospisil 2005). Furthermore, "IT[*sic*] are reshaping students' learning styles and new generations of students are developing 'neo-millennial learning styles through immersion in virtual environments and augmented realities" (Dede 2004, p. 422) cited in (McMahon & Pospisi 2005).

All the 10 items that were used to measure the independent variable recorded high mean values, with an overall mean value of M = 2.33, SD = 3.80. Compared with the overall mean score (M = 4.04, SD = 3.90) of the experience construct, the mean value of the independent variable (M = 2.33, SD = 3.80) was low. That is, as experience increases, effort expectancy decreases (Alawadhi & Morris 2008). Overall, Almost 50% of the respondents either agreed or strongly agreed that they believed that ICT usage in academic activities was effort-free to a great extent, while only less than 10% of them strongly disagreed. This clearly suggests that experience influences the relationship between effort expectancy and ICT usage. This result is supported by Abu Bakar *et al.* (2013).

Majority (84.5%) of the students indicated that they often used ICT to search for new areas of learning

online to improve their academic performance. For example, "I use ICT to explore new learning areas related to my course of study" was the item with the highest mean score (M = 2.40, SD = 0.54). Nowadays, students of tertiary institutions prefer to use ICTs like personal computers (PCs), laptops, smartphones and Internet (especially outside the classroom) to complement lectures, perform assignments and many other tasks related to their educational pursuit. This is attributable to the students' access to ample Internet services and relatively affordable ICT devices (Osang, Ngole & Tsuma 2013).

Generally, the level of students' ICT usage in tertiary education is low compared to their usage for other purposes (McMahon *et al*. 2005; Dede 2004). However, judging from the results of this study, it can be suggested that many students prefer to incorporate ICT in their studies, *inter alia*, because of unprecedented access and ease of usage (Edmund, Thorpe & Conole 2012; Selwyn 2009).

Nearly 50% of the students believed that ICT usage is less task-laden. The overall mean value of the effort expectancy construct was M = 2.33, SD = 3.80. This further shows the independent variable significantly predicted ICT usage (refer to Table 5 and Figure 2), and there was a strong and significant relationship between effort expectancy and students' ICT usage in academic activities, with a correlation coefficient (r = 0.787, p = 0.001).

Those results are consistent with Tan (2013), Attuquayefio and Addo (2014), as well as Avdic and Eklund (2010) who found that effort expectancy has a significant positive effect on ICT usage. In addition, this revealed that the effect of effort expectancy on the students' ICT usage in their learning activities was high. This corresponds with the higher level of their usage experience (refer to Tables 4 and 6). These findings are theoretically significant.

The overall mean value of experience (M = 4.04, SD = 3.90) was very high compared with that of effort expectancy (M = 2.33, SD = 3.80). Between 40% and 50% of the respondents either agreed or strongly agreed that they had greater experience in ICT usage for learning purposes. Moreover, it should be noted that as the students' experience increased, the effect of effort expectancy decreased, as indicated by the mean values of the constructs (refer to Tables 4 and 6). This is consistent with findings by Venkatesh *et al*. (2003); in addition, there is strong and significant relationship between the independent and dependent variables (r = 0.787, p = 0.001) (refer to Table 8 and Figure 2). Tan (2013) supports those findings.

To determine moderating effect on the relationship, a test for satisfactory fit indices based on the comparative fit index (CFI) and root mean square error of approximation (RMSEA) was run as suggested by Hair *et al*. (2006), as well as Johnson and Wichern (1992) (refer to Table 8). The result of the test showed the chi-square difference ($\Delta\chi^2$) between the two models was 153.904, with a degree of freedom difference of 42 Δdf. Hence, the presence of moderating effect was determined. This was further confirmed since the independent variable recorded a significant change of χ^2 and df in the comparison of both the constraint and unconstraint models.

Since the moderating effect of experience on the overall structural model was determined, the individual hypothesis paths were tested. A two-path coefficient was tested in order to verify the presence of moderating effect on each path. The test indicated that experience was significant (p = 0.003*) at the ($p < 0.05$) level, while inexperience was not significant (p = 0.065) at the ($p < 0.05$) level (refer to Table 9 and Figure 2). This indicates that experience strongly and significantly moderated the relationship between the predictor and criterion variables.

The implication of these findings is that experience significantly and positively influences students' belief that ICT is easy to use in learning activities. This is consistent with findings of a study conducted by Abdul Rahman *et al*. (2011) who found that experience moderated between effort expectancy and students' intention to use ***e***-library.

The imported moderating variable, inexperience was measured using pre-tested (α 0.70) 10 items. All the items were adopted from Venkatesh *et al*. (2003) and Venkatesh (2000) after making the necessary modifications to suit the study context. The results of the effect of inexperience on the students' usage of ICT in academic activities was low (M = 1.13, SD = 0.34), which means the level of their experience was high (M = 4.04, SD = 3.90) (refer to Table 8).

Previous studies have also found that computer anxiety (fear, inexperience) influences how users perceive ease of use (effort expectancy) of ICT (Saade & Kira 2009), and that not many students lack usage experience and that previous exposure to computers (ICT experience) is a very significant determinant of ICT usage (Grefen & Straub 2003_a) among students (Link & Marz 2006). However, unlike the experience construct, the inexperience construct weakly moderated the relationship between the dependent and independent variables. These results are in unison with the CFI and RMSEA test values, which indicated the presence of moderating effect in both variables (refer to Table 7).

Furthermore, the results of the tests of the two-path hypotheses model indicated inexperience was insignificant (p = 0.065) at the $p < 0.5$ level, with a very weak standard regression weight value (β -0.515) (refer to Tables 9 and 10). Hence, the variable weakly moderated the relationship. However, the value of the

standardised regression weight (β) of the variable that moderated the relationship was 0.750. Hence, its effect was significant and strong (0.003*) at the ($p < 0.05$) level. Thus, the hypothesised path was moderated by experience, because it was significant (Hair *et al*. 2006; Johnson & Wichern, 1992). Therefore, H_2 was accepted. Thus, this study found that experience significantly and positively moderated the relationship between effort expectancy and ICT usage among students of tertiary institutions. Those outcomes are consistent with Venkatesh *et al*. (2003).

6. Conclusion

The strong and positive relationship between effort expectancy and level of students' ICT usage in learning re-underscores the significance of the need for integration of usability- and user-friendly ***e***-learning software and hardware in ICTs. The importance of ICT for both education and other needs cannot be underestimated. Since the level of using ICT in learning activities is appreciably rising among students of tertiary institutions, especially those in the developing world (Abu Bakar *et al*. 2013; Bhuasiri *et al*. 2012; Callum & Jeffrey 2013; Osang *et al*. 2013), it is imperative to incorporate more effort-free features and applications into computer systems right at the manufacture stage.

Furthermore, the literature reveals that majority of students in the developing countries use smartphones, tablets and similar mobile devices for learning purposes more than they use other technologies like PCs and laptops. It is recommended that ICTs makers should, by default, incorporate flexible and usability- and user-friendly ***e***-learning features and applications into technological systems.

The findings of this study have indicated that effort expectancy has predicted almost 90% of ICT usage. Furthermore, the integration of a negative moderator co-variable (inexperience) into the conceptual framework has yielded interesting results that experience (rather than inexperience) significantly influences the usage of ICT by students of tertiary institutions for learning purpose. However, inexperience (anxiety, fear, nervousness) only weakly influences students' ICT usage in relation to students' expectations of computer ease of usage.

Consistent with previous studies (see Abu Bakar *et al*. 2013; Venkatesh *et al*. 2003), the results of this study further show that the higher the level of users' experience, the lower the level of their effort expectancy. Thus, the study strongly suggests that ICT usage skill tests should be incorporated into academic curricula, especially at remedial/preliminary levels of tertiary education. In addition, to borrow Link and Marz's (2006) expression, "special measures should be taken to prevent students who lack computer [experience] from being disadvantaged or developing computer-hostile attitudes" (p. 1).

As weak as the moderating influence of inexperience on the relationship was, nonetheless, the empirical testing of the variable has provided some theoretical underpinning for defending the researchers' argument that inexperience, like experience is testable, and can be integrated into ICT adoption models as a moderator variable (Abu Bakar *et al*. 2013; Link and Marz 2006). That argument may be cogently appreciated when conducting a qualitative study involving groups that have low level, or are apprehensive of ICT adoption characteristically, e.g., farmers in remote rural communities, or local micro-entrepreneurs in developing countries.

Concisely, while the researchers did not declare this study as limitations-free, the methods that were adopted have yielded significant findings in purviews that have been well-researched but mostly using different conceptual frameworks, and ignoring the indirect (moderating) influence inexperience has on ICT adoption.

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