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E-Learning Adoption among University Lecturers in North-Eastern Nigeria: A Comparative Study

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Abstract: The use of technologies, such as the internet, social networks and mobile phones, influence the development of education at university level. Technology have an important impact on education, by providing means of effective communication through implementation of the newest forms of information systems that are useful towards teaching and learning. It becomes imperative for tertiary institutes to be involved with provisions of technologies in other to benefit from its trend of new ideas and information systems. These can be achieved by encouraging a systemic approach which will support individual learning, collaborative learning, learning content management, learning activity management, formal learning, informal learning, and workplace learning on a global scale. This study aims to discover the different uses of information and communication technology (ICT) between faculty members in north-eastern Nigeria with regards to their demographic factors, such as; technology readiness (TR), facilitating conditions (FC), technology self-efficacy (TSE), perceived enjoyment (PE), subjective norms (SN), job relevance (JR), perceived usefulness (PU), perceived ease of use (PEU), attitude towards use (ATT), behavioral intention (BI) and e-learning usage (EU).The study also envisaged the robustness of the learning model developed for the study to make clear the e-learning usage. A total of 312 samples size was taken from the overall population of 1381 (by adopting the Cochran formula), where 264 respondent was finally used for the survey conducted among the academicians from six universities. The data was analyzed by Structural Equation Modeling (SEM) to test the relationship between the factors of the proposed model. Analysis of the study reveals that the university lecturers ought to be more acquainted with new web engines, along with virtual and online joint effort platforms, by owning pc, cells phones, and tablets or i-pads that are fit for furnishing them and their students with open educational materials from anyplace, anywhere and whenever needed. Hence, it is very pertinent for lecturers to have proper understanding of operational working terms with e-learning system use.

KEY WORDS: *E-learning; Demographic Factor; Lecturers; Nigeria; AND Structural Equation Modelling (SEM).*

1. Introduction:

Information and Communication Technology (ICT) have become a key tool in educational training methodology and curriculum delivery globally (Button et al., 2014). It has been identified as an indispensable instrument for the development of quality teaching and learning in the education system (Sarkar, 2012; Ayub *et al*., 2012; Baleghi-Zadeh *et al.,* 2017). ICT also facilitates collaborations, innovation and creativity among individuals and organizations (Bhuasiri et al., 2012). Although often used as an extension of other teaching tools, the use of ICT has the potential to open opportunities and new pathways of doing things, thus developing creativity in learning (Pérez-Mateo et al., 2011). The use of ICT is very important for the development of public policy on educational matters (Khan et al., 2012). The application of ICT in education has given rise to new sets of vocabularies used to describe new approaches in learning and curriculum delivery (Chai et al., 2011;). Such terms include e-teaching and e-learning which are facilitated via the internet (Kaur, 2015; Assareh and Bidokht, 2011; Ghadirian *et al*., 2017; Kamalimoghaddam *et al*., 2016; Isiyaku *et al.,* 2015; Ayub et al., 2015). E-learning can help remove barriers to academic achievement, by providing new and creative ways of motivating and engaging learners of all capabilities, enabling and inspiring everyone to attain their educational potential (Muntean, 2011). Hence, e-learning is a large and growing concept with great potential in higher education (Rennie and Morrison, 2013).

The potentials of an e-learning system cannot be maximized if both the lecturers and students do not use it concurrently (Lai *et al*., 2012; Pituch and Lee, 2006; Tarhini *et al*., 2014). Yet institutional faculties and departmental members are reported to be reluctant to embrace ideas of different forms when it comes to online teaching. The acceptance and usage of the e-learning system among university lecturers are shallow due to fear of change and concerns about the reliability of the technology. These are factors inherent for the reluctance of adoption by institutional faculties and departmental members (Bacow *et al*., 2012; Betts and Heaston, 2014). While promising industrial nations such as Europe, America, Australia and parts of Asia are getting it right. These regions are witnessing significant headways in e-learning technology integration in teaching. African Nations, Nigeria, in particular, is still at the back stage in terms of technology acceptance and integration as regards online teaching (Asogwa et al., 2015; David, 2012; Ololube *et al.,* 2015; Prasad *et al.,* 2015). Despite the global-wide approval of e-learning systems, only a few Nigerian higher education institutions have embraced it. David, (2012) and Yakubu/Dasuki, (2018) concurred that the failure of technology usage among university lecturers/instructors have devolved into immeasurable worry in Nigeria. Thus, the need to investigate factors that influence lecturers' technology usage. Critical factors that affects e-learning acceptance and usage are enormous and are worth investigating (Al-Gahtani, 2016; Kanwal et al., 2017; King and Boyatt, 2015; Odunaike et al., 2013; Al-Rahmi et al., 2018; Baleghi-Zadeh et al., 2014; Lee et al., 2011; Nawaz et al., 2011; Sharma et al., 2015). Past and recent studies considered several variable predictors that were investigated and tested on educational technologies for the aim of expanding the use of technology. The studies were meticulous on criterion variables and prospects among e-learning users in higher educational institutions. The outcomes of the studies revealed that factors are branded as influential to acceptance of e-learning being integrated to institutional communications, employees/lecturers attitudes and skills, and perceived student prospect.

For this reason, it is important to identify the factors that influence lecturers' use of e-learning, this will enable an effective teaching and learning process in the higher educational system (Sharma and Chandel, 2013).

More so, understanding the reasons that people accept or reject new technology has been one of the most challenging issues in the study of e-learning acceptance and usage model (Davis, 1989; Venkatesh and Bala, 2008; Cheok et al., 2015; Uyouko et al., 2015). In Nigeria, there are still difficulties in accepting the use of technology for classroom activities due to obvious and certain factors responsible for scepticism to acceptance of technology integration in teaching and learning process (Ajiboye et al., 2012; Obara and Abulokwe, 2012). Despite putting integration of technology as a main strategy aimed at enhancing teaching and learning by the government of Nigeria, yet accepting e-learning system integration is still a problem (Kpolovie and Awusaku, 2016; Osuafor and Emeji, 2015; Ololube, 2014; Asogwa et al., 2015; David, 2012). Although the acceptance and usage of technology in teaching is limited in Nigerian higher institutions, it remains advantageous for lecturers to make use of it, because having the experience will enhance their professional development.

However, to investigate factors that influence technology use, it is important to adopt one of the popular and credible models. Considered as imperative in this study is the Technology Acceptance Model (TAM). TAM is widely used in the investigation of factors that influence the utilization of technology in the domain of information systems (Davis, 1989; Venkatesh and Bala, 2008). In the domain of education, the lecturer have to be familiar with the perceived use and ease of new technology in supporting his/her job in the classroom towards achieving academic objectives and excellence. After a deep and thorough literature review concerning external factors that influence technology adoption with regards to e-learning in Nigerian universities, to the best of the researcher's knowledge, no studies have been considered to address technology readiness to fit in an external variable for e-learning usage model at the higher education institutions in Nigeria. In fact, due to the role of technology in the advancement of society in general and educational sector in particular, effective technology integration into teaching and learning has become the focus of many educators. However, there is a problem of developing a comprehensive e-learning model for university lecturers in Nigeria (Eke, 2011).

The proposed model will be of enormous assistance to Nigerian universities administrators, curriculum developers and lecturers in filling up the research gap that exists in e-learning usage among lecturers in north-eastern Nigeria. Most of the studies conducted on e-learning usage in Nigeria had focused more on descriptive survey design technique and little on theoretical and inferential methods of data analysis. This study will play a vital role in filling the methodological gap. Overall, this study developed a model which have been used to explain university lecturers' interest in e-learning usage in North-eastern Nigeria (Byrne, 2013; Osuafor and Emeji, 2015; Awang, 2015; Hair, Gabriel, and Patel, 2014; Kamba, 2009).

2. Research methodology:

To develop a model that will predict and explain e-learning utilization among lecturers in higher education institutions in north-eastern Nigeria, figure 1, summarizes the steps that have been utilised.

Figure 1. Research steps for e-learning study

A research framework was designed as a guideline in evaluating the proven hypothesis (H1-H17) to achieve the research objective. As in figure 2, the research framework explains the demographic factors influencing e-learning use.

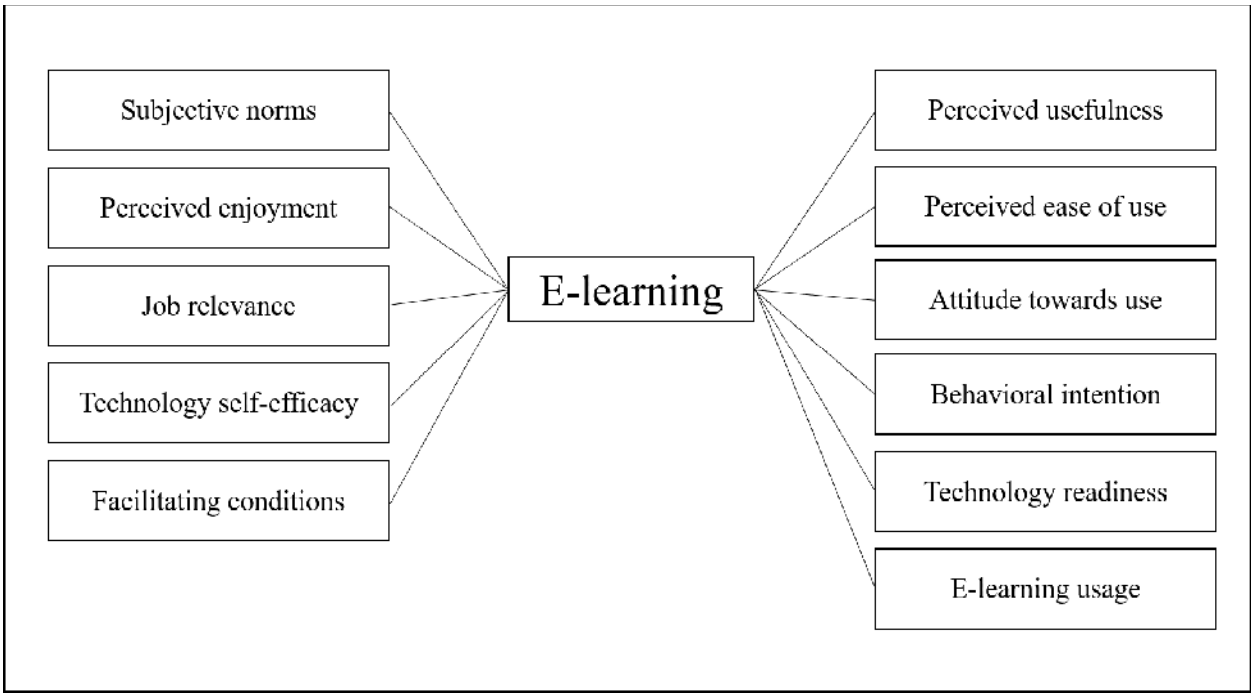


Figure 2. Research framework of this study

The 17 hypotheses (H) were obtained according to figure 2, as illustrated on table 1.

Table 1. Shows the Demographic, and the relevant Hypotheses (all the hypotheses were analysed throughout using structural equation modelling).

H	Hypotheses	Statistical Analysis
	Demographic	**Descriptive Analysis**
H_1	Technology readiness has a significant relationship with e-learning usage.	SEM
H_2	Technology readiness has a significant relationship with perceived usefulness of e-learning usage.	SEM
H_3	Technology self-efficacy has a significant relationship with perceive usefulness of e-learning usage.	SEM
H_4	Technology self-efficacy has a significant relationship with perceived ease of use of e-learning usage.	SEM
H_5	Perceived enjoyment have a significant relationship with perceived	SEM

	usefulness of e-learning usage.	
H_6	Perceived enjoyment have a significant relationship with perceived ease of use of e-learning usage.	SEM
H_7	Job relevance have a significant relationship with perceived usefulness.	SEM
H_8	Job relevance has a significant relationship with perceived ease of use of e-learning usage.	SEM
H_9	Facilitating Conditions have a significant relationship with perceived ease of use to e-learning usage.	SEM
H_{10}	Subjective Norm has a significant relationship with the perceived usefulness.	SEM
H_{11}	Subjective Norm has a significant relationship with behavioral intention to use e-learning usage.	SEM
H_{12}	Perceived ease of use of e-learning has a significant relationship with perceived usefulness to e-learning usage.	SEM
H_{13}	Perceived usefulness of e-learning have a direct significant relationship with e-learning usage.	SEM
H_{14}	Perceived usefulness of e-learning has a significant relationship with attitudes towards e-learning usage.	SEM
H_{15}	Perceived ease of use of e-learning has a significant relationship with attitudes towards e-learning usage.	SEM
H_{16}	Attitudes towards utilization have a significant relationship with behavioral intentions of e-learning usage.	SEM
H_{17}	Behavioral intentions to use have a direct significant relationship with e-learning usage.	SEM

Population of study:

The study population is the set of respondents that the researcher investigated and generalize based on the results of the study (Fraenkel et al., 2012). Populations could be little or huge, it provides the choice to what aggregate to be considered (Guetterman et al., 2015). A study by Lubis et al (2018) considered the different use of ICT between faculty members in Medan, Indonesia with regards to their demographic factors namely: gender, age, teaching experiences, educational level, and department of origin. The total population

was 787 lecturers, which was the total number from the three universities adopted: UMSU = 368, UPPB = 208, and UMA = 211 lecturers.

Furthermore, Fraenkel et al. (2012) suggested that simple and random sampling may be the best method to obtain a representative sample of a population, especially for large samples. In this strategy, a table of random numbers were used to ensure every member have an equal and independent chance to be included (Creswell and Poth, 2017; Fraenkel et al., 2011; Hashemyolia et al., 2015; Md Khambari et al., 2014; Jalal et al., 2014a; Jalal et al., 2014b; Wong et al., 2013).

The population of this study comprises all academic lecturers in the faculty of education in the universities of the north-eastern geopolitical zone of Nigeria. The zone has six states with 13 universities. The present study intends to use six universities; one university from each state of the six states was selected using simple random sampling technique. The universities randomly selected are as shown on Table 2.

Table 2. Population of lecturers of Faculty of Education and Technology in the target Universities of the north- eastern geo-political zone of Nigeria

No.	Names of States	Names of Universities	Number of Lecturers in the faculty of education
1	Adamawa state	Madibo Adama University of Technology Yola	137
		Adamawa State University Mubi	77
		America University Yola	68
2	Bauchi state	Abubakar Tafawa Balewa University Bauchi	205
		Bauchi State University Gadau	78
3	Borno state	University of Maiduguri	246
4	Gombe state	Federal University Kasheri	90
		Gombe State University Dunduwada	106
5	Taraba state	Federal University Wukari	64
		Taraba State University Jalingo	95
		Kwarafa University Wukari	72
6	Yobe state	Federal University Gashua	67
		Yobe State University Damaturu	76

Total	13	1381

1381 lecturers in the faculty of education from 13 universities have been recorded in the north-eastern geo-political zone of Nigeria.

Sample of the study:

It is impracticable for the researcher to investigate a huge number of elements for data collection and to check or look at every element justifiably (Sekaran and Bougie, 2010; Ahrens and Zaščerinska, 2014; Bartlett 2001; Kotrlik and Higgins, 2001). The sample size of this study are lecturers selected from the total population of lecturers teaching in the faculty of education in the Universities of the north- eastern region (Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe states) of Nigeria. In order to employ a suitable data representative of the population of this study as recommended by Bartlett (2001) and Kotrlik/Higgins (2001), the sample size (n) was determined by equation (1) (William Gemmell Cochran, 1977) with 95% level of confidence and Raosoft software was used to estimate the sample size. Further minimum sample size (n_0) was calculated by equation (2).

$$n = \frac{n_0}{\left(1 + \frac{n_0}{N}\right)} \quad (1)$$

$$n_0 = \frac{t^2 * s^2}{d^2} \quad (2)$$

Where,

N = total population estimated for 1381 lecturers in the randomly selected six universities of north- eastern Nigeria.

t = 1.96, value for the selected alpha of 0.05 in each tail, (Bartlett, 2001)

s = estimate of standard deviation in the population for 5 point scale = 1.25. (Estimate of variance deviation for 5 point scale divided by 4).

d = margin of error (number of points on primary scale * acceptable margin of error; points on primary scale =5; acceptable margin of error = 0.03) as stated in (Bartlett 2001; Kotrlik and Higgins, 2001).

$$n_o = \frac{(1.96)^2 * (1.25)^2}{(5*0.03)^2} = 266.24$$

But:

$$n = 1 + \frac{266}{(1381)} = 223$$

As provided above, the minimum sample size required according to William, (1977) is 266.24. However, it had been postulated by Bartlett (2001) and Kotrlik/Higgins, (2001) that in instructive/educational and social research, it is about information gathering strategies that possess interesting techniques and the reaction rates are ordinarily well beneath 100%. Hence Bartlett (2001) and Kotrlik/Higgins, (2001) prescribed oversampling by 40% of which half to represent lost, non-reactions and uncooperative subjects. Therefore, the researcher has increased the sample size by 40% to ensure that sufficient respondents were utilized and the sample was adequately enough for minimizing associated errors (Daniel, 2011). Hence the sample size used was:

$n_2 = 223.04+40\% * 223 = 312.2$

However, Structural Equation Modeling (SEM) have been adopted to analyze data for this study; it becomes necessary to comply with the rules of thumb that exist in literature as regards the appropriate sample sizes to be used for analyzing data in educational research using SEM. According to Hair et al (2010), a least sample size of 150 is acceptable for using SEM. However, Hoe, (2008) emphasized that a minimum critical sample size of 200 should be generally acceptable for analysis of data using SEM in business, educational or social science research.

Instrument for Data Collection

In any study, the instrumentation is vital. Sets of instruments that can be applied for data collection includes questionnaires, observations, and interviews. This procedure helps the researcher to collect data easily and effectively. In this study, questionnaires have been found to be a favorable tool for data collection than other means, because it provides a simple way of gathering information especially numerical data.

The questionnaire describes the levels of responses by university lecturers on each of the constructs under investigation, such as; perceived usefulness (PU), perceived ease of use (PEU), facilitating conditions (FC), Job Relevance (JR), technology self-efficacy (TSE), technology readiness (TR), perceived enjoyment (PE), subjective norms (SN), attitude towards use (ATT), behavioral intentions (BI) and e-learning usage (EU). The participants responded according to the Likert scale which is from scale 1 to 5, with response options as follows: strongly disagree, disagree, not sure, agree and strongly agree. These constructs are measured with 89 items from which some items were adopted and modified from the existing literature and self-developed. Table 3 illustrated the research instrument.

Table 3. Research instrument

Part A	Part B	Items each of the construct
Demographic information	Technology Readiness	12
	Subjective Norms	6
	Technology self- efficacy	8
	Perceived Enjoyment	6
	Job Relevance	7

	Facilitating Conditions	8
	Perceived Usefulness	6
	Perceived Ease of Use	9
	Attitude towards Use	8
	Behavioral Intentions	7
	E-learning Utilization	12
Total	11	89

Reliability and validity of the instrument:

Validity and Reliability in a research refers to a description on how the research instrument reflects on the accuracy and trustworthiness of the measuring instrument of the study. The result of any research depends on the validity and reliableness of the adopted instruments (Fraenkel et al., 2011 & 2012; Haegele and Hodge, 2015).

Therefore, to guarantee decency of the measure of the adopted and modified items, reliability and validity tests were conducted on the data. The items adopted to quantify concept and ideas must be accurate in estimating the variable. Reliability estimates the soundness and consistency of the adopted estimation in estimating the concept (Hair et al., 2010; Jalal et al., 2014a; Jalal et al., 2014b; Wong et al., 2013). Like in few studies, Cronbach's alpha (α) was utilized in the pilot study and composite reliability was utilized in the principal analysis to decide the internal consistency of the estimation scale adopted.

A pilot study was conducted for this study, primarily to assess the reliability of the survey instrument with small respondents as a sample before the main research was carried out. This have been done to ensure that there is no possible problem that is consequential to the result of the main research (Khalid et al., 2012; Sekaran and Bougie, 2010a). As pilot study provides the researcher the knowledge of the instruments reliability and validity before actual fool proof research. For this study, the content and construct validity of the instrument was examined. The present instrument was prepared by the researcher as a self-report instrument modified from validated sources (Davis, 1989; Attuquayefio and Addo, 2014; Tarhini et al., 2014; Venkatesh and Davis, 2000; Taylor and Todd, 1995).

Common guidelines for conducting pilot study suggest that at least one-tenth of the sample of the proposed study should be sufficient (Feingold, 2015; Fraenkel et al., 2012; Hertzog, 2008). Therefore, the respondents of the study are lecturers from the selected six universities in north-eastern Nigeria. However, for the purpose of conducting a pilot study, the researcher selected respondents from two universities randomly. So, the pilot study consisted of 30 respondents organized to ensure reliability and validity of the instrument, the Cronbach's alpha (α) was obtained in SPSS version 22 at 0.81 which is reliable for the study. Results of the reliability tests for pilot and actual research are shown on table 3.

Table 3. Pilot and actual study reliability test

N	Constructs	No of Items	Cronbach's Alpha Pilot Study (n=30)	Cronbach's Alpha Actual Study (n=312)
1	Technology Readiness	12	0.80	0.80
2	Technology Self-efficacy	8	0.82	0.85
3	Subjective Norm	6	0.78	0.85
4	Job Relevance	7	0.83	0.85
5	Perceived Enjoyment	6	0.81	0.79
6	Facilitating Conditions	8	0.77	0.86
7	Perceived Usefulness	7	0.78	0.82
8	Perceived Ease of Use	9	0.75	0.85
9	Attitude towards use	8	0.81	0.84
10	Behavioural Intention	7	0.89	0.85
11	E-learning Utilization	12	0.85	0.84
	Total average	83	0.81	0.84

Limitation of the study

The limitations of the study is postulated to come from population of the study, which have been restricted to lecturers of selected universities in northeastern Nigeria. Another limitation is if lecturers do not believe that technology is useful or integral to instruction and learning of students. The opinion of the lecturers will be of paramount importance. The subjects of the research are lecturers that are permanent in academic activities of their respective higher education institutions whose academic background and experience is not the same with part-time lecturers or ad-hoc academic staff. Online and Multimedia technologies and the Internet in teaching-learning are of different types but the study is restricted to investigating e-learning utilization in the faculty of education in the selected public universities of Nigeria. The proposed study is determined to understand the interrelationships between factors that affect e-learning in educational background and did not consider measuring business organizations. Again, the study only focused on locations in Nigeria. Hence, an overview of the result may be limited to that extent. The six external variables in the discussion are not the only constructs for e-learning utilization, but because of limitations, the study did not consider many external variables that could have effects on e-learning system utilization in the selected universities of northeastern Nigeria.

3. Result and discussions:

SEM approach was adopted for data analysis. Once raw data were collected from the field, the whole usable questionnaires were coded and keyed-in. After that, the next process of data analysis was adopted to analyze the data. First, the data underwent screening and examinations to locate data entry errors, as frequency test was conducted for each variable to discover and correct the possible missing values using the individual mean values. Then, descriptive statistics were used to explain and contrast the demographics (Saunders et al., 2012). Finally, the SEM was adopted. SEM is an essential approach when it comes to investigating the cause and effect relationships between latent constructs (Hair et al., 2011).

SEM was used to evaluate the measurement model and the structural model in this study. According to Hair et al., (2014) and Sarstedt et al., (2014), SEM can be used to determine causal connections among constructs in theoretical models. Before conducting the SEM analysis, there is a need to configure the model in a way that it will be clearly understood. To do this, indicators were clarified to establish which indicators are formative and which are reflective. It is essential to note that model configuration is vital because the approach in testing reflective measurement model is quite different from the approach used in testing formative measurement model (Hair et al., 2014; Lowry and Gaskin, 2014).

In this study, all the indicators of latent variables are reflective. Specifically, the latent (unobserved) variables and the indicator (observed) variables are reflective rather than formative variables. Further, the analysis did not involve testing second-order structures that contain two layers of components. In other words, the study constructs in the inner model were treated as first-order constructs. In terms of the sequence and relationship among the constructs, the study has six exogenous latent variables which include TR, SN, JR, TSE, PE, and FC (exogenous) four mediating variables PU, PEU ATT and BI (endogenous).

In the proposed study, nine indices were selected: Model Chi-square/ degree of freedom, (X^2/df), goodness of fit (GFI), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), incremental fit indices (IFI), parsimony fit indices (PFI). Among these indices, RMSEA, Chi/DF, Chi-Square and SRMR are badness of fit while TLI, AGFI, CFI, and TLI are the goodness of fit indices. However, statistical experts propose some criteria for accepting the fit indices.

A study conducted by Schumacker and Lomax (2010), suggest that GFI should be close to 0.90 or higher. On the other hand, there are several studies in the domain of IS and technology acceptance model that considered a criterion higher than 0.80 for GFI. In this study, therefore, by allowing for the relevant literature in the domain of TAM and SEM (AMOS), the criteria for tolerant GFI was considered with a value higher than 0.80. Hence, the criteria for accepted indices are presented in table 4.

Table 4. Shows the criteria for accepted indices

Measure	Name	Description	Cut-off for good fit

X^2/df	Model Chi-square/ degree of freedom	Assess the overall fit and the discrepancy between the sample and fitted covariance matrices. Sensitive to sample size. H0: The model fits perfectly.	p-value> 0.05
(A) GFI/ IFI	(Adjusted) Goodness of Fit	GFI is the proportion of variance accounted for by the estimated population covariance. Analogous to R2. AGFI favors parsimony./ Incremental fit index.	GFI ≥ 0.95 AGFI ≥0.90
(N)NFI TLI	(Non) Normed Fit Index Tucker-Lewis index	An NFI of .95 indicates the model of interest improves the fit by 95% relative to the null model. NNFI is preferable for smaller samples. Sometimes the NNFI is called the Tucker-Lewis index (TLI)	NFI ≥ 0.95 NNFI ≥ 0.95
CFI	Comparative Fit Index	A revised form of NFI. Not very sensitive to sample size. Compares the fit of a target model to the fit of an independent, or null, model.	CFI ≥0.90
RMSEA	Root Mean Square Error of Approximation	A parsimony-adjusted index. Values closer to 0 represent a good fit.	RMSEA < 0.08
(S) RMR	(Standardized) Root Mean Square Residual	The square root of the difference between the residuals of the sample covariance matrix and the hypothesized model. If items vary in range (i.e. some items are 1-5, others 1-7) then RMR is hard to interpret, better to use SRMR.	SRMR < 0.08
AVE (CFA only)	Average Value Explained	The average of the R^2 s for items within a factor	AVE >0.5

Data Analysis:

The data analysis section describes the levels of responses by university lecturers on each of the constructs under investigation (perceived usefulness, perceived ease of use, facilitating conditions, technology self-efficacy, and technology readiness, perceived enjoyment, subjective norms, and attitude towards use, behavioural intentions and e-learning usage). A 5 point Likert scale ranging 1=strongly disagree to 5=strongly agree was used to measure all the constructs used in this study.

To describe the position of variables in the study, the variables were validated at the levels of their mean scores and standard deviations. The top mean score indicates higher inclinations towards technology readiness; this shows that university lecturers are technologically ready by means of e-learning in their classroom. They also consider e-learning to be highly perceived as useful to their jobs. Likewise, their high responses on job relevance and perceived enjoyment show that university lecturers find e-learning to be

relevant to their teaching jobs as well as perceived e-learning as enjoyable in performing their teaching duties.

Similarly, university lecturers' attitude towards e-learning is positive towards the use of e-learning in the classroom. Lecturers' behavior towards use of e-learning is moderately intended, while, subjective norm, perceived ease of use, and facilitating conditions are averagely positive as indicated by university lecturers.

3.1 Perceived Usefulness (PU)

Six items were used to measure PU. The initial model showed a poor model fit. Only GFI met the recommended value (GFI=0.904). Not all the other fit indices met the recommended values. Hence, the model was improved by deleting items with low factor loadings and referring to the Modification Index (MI). According to Awang, (2015), if the fit indices are not met and the factor loadings are above the recommended value, the next step is to check the MI for redundant items. Items with MI value above 15 are considered redundant and capable of causing the model to have a poor fit. From figure 3a, to improve the model fit for PU construct, Items PU6 and PU2 were deleted starting with the item with the lowest factor loading. In addition, free parameter estimate was set for items PU3 and PU5 as they were found redundant due to their high covariance as indicated by MI, hence the two items were constrained. Figure 3b, the remaining four items (PU1, PU3, PU4, and PU5) were found to be the most appropriate items measuring perceived usefulness. Meanwhile, the AVE model for PU was satisfactory at (0.506), while the CR was also satisfactory (0.801) indicating reliability of the PU construct.

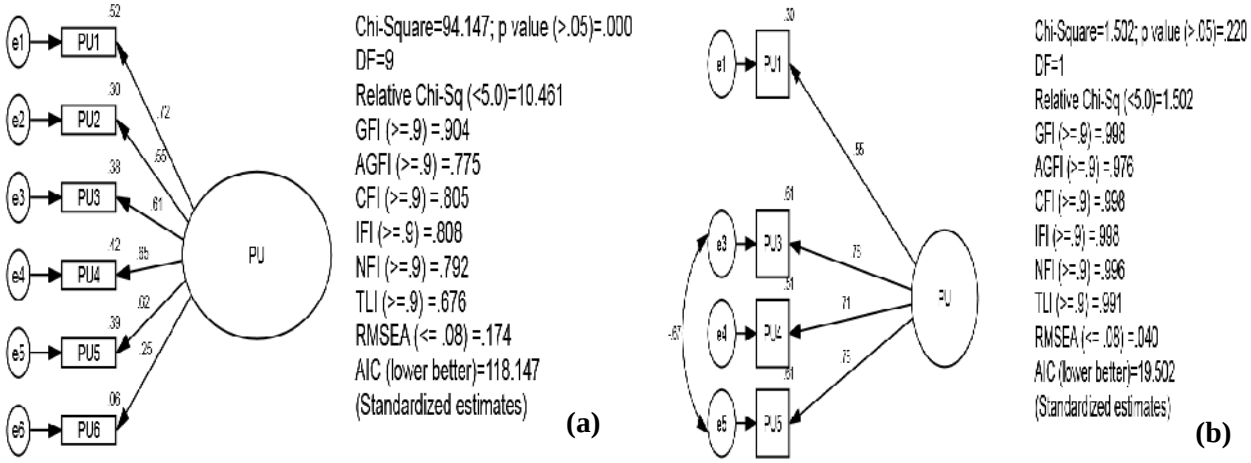


Figure 3. (a) Initial and modified (b) Perceived usefulness by CFA model

3.2 Perceived Ease of Use (PEU)

Nine items were used to measure the perceived usefulness of e-learning utilization. The initial model as shown in figure 4 (a) showed a poor model fit, none of the fit indices met the recommended values. Thus, the model was modified to improve the model fit. The factor loadings were observed and four items (PEU9, PEU4, PEU8, and PEU7) with low loadings (<0.50) were deleted one at a time. The revised model presented in figure 4 (b)

showed a good fit; relative χ^2 (1.727), RMSEA (0.048) and GFI, CFI, IFI were all >0.90. Additionally, the AVE value for PEU was satisfactory (AVE=0.535) indicating adequate convergence of the items measuring PEU. While the CR was .851.

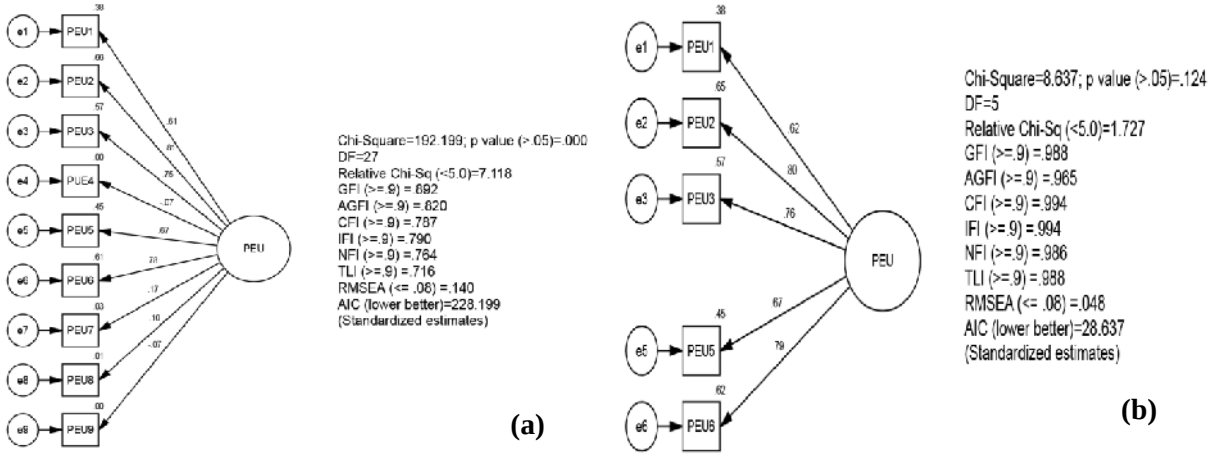


Figure 4. (a) Initial and modified (b) Perceived Ease of Use by CFA model

3.3 Subjective Norm (SN)

Six items were used in measuring subjective norm for utilizing e-learning. The initial model as shown in figure 5 (a) indicates a poor fit. To improve the model, items SN3 was deleted due to low factor loading. In addition, items, SN2, SN5, and SN4 were set as free parameter due to their high covariance as indicated by the MI. Sequel to the modification of the subjective norm model; all the fit indices met the recommended values as shown in figure 5 (b). Meanwhile, the AVE value for subjective norm is satisfactory (.558) indicating adequate convergence of the items measuring subjective norm. More so, the CR value at .857 indicates the adequate reliability of the subjective norm construct.

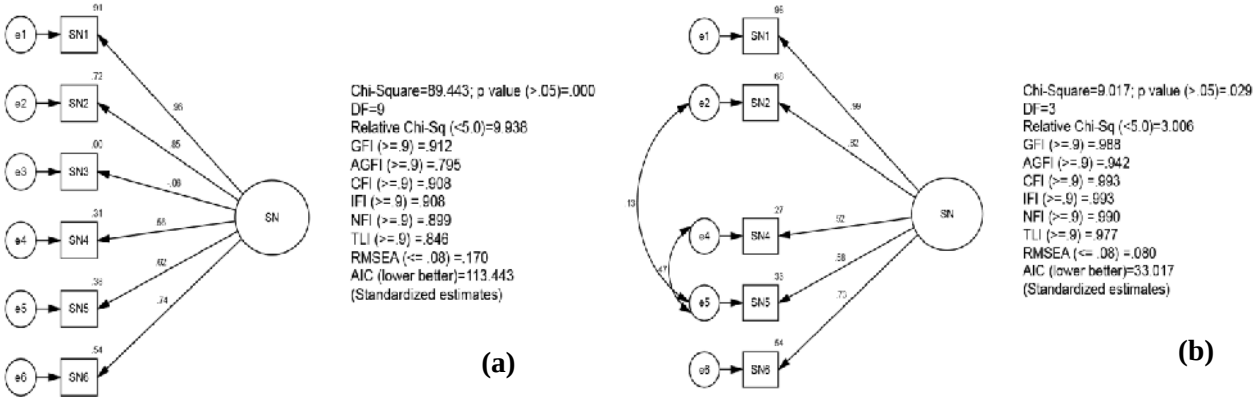


Figure 5. (a) Initial and modified (b) Subjective Norm by CFA model

3.4 Facilitating Conditions (FC)

Figure 6 (a) presents the initial CFA model for facilitating condition. The initial model comprises of eight items with a poor model fit. To improve the model fit, items FC8, FC7 and FC6 were deleted. Additionally, items FC4, FC3, and FC1 were set as free parameters

due to the high MI. The revised model as shown in figure 6 (b) suggests that all the recommended fit indices were satisfactory. More so, the AVE of (0.532) and the CR of 0.850, indicates adequate convergent validity and construct reliability.

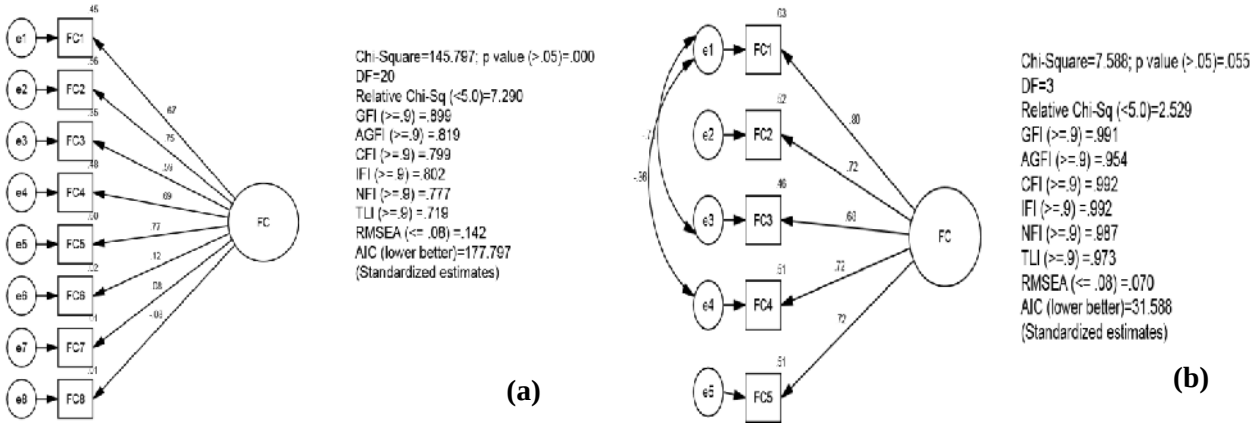


Figure 6. (a) Initial and modified Facilitating condition by CFA model

3.5 Technology Readiness (TR)

Technology Readiness for e-learning usage was measured by 12 items. The initial model as shown in figure 7 (a) showed a poor model fit as none of the fit indices met the recommended values. Thus, the model have been modified to improve the model fit. The factor loadings were observed and three items (TR10, TR11, TR12), with low loadings (<0.50), were deleted one at a time. Subsequently, (TR5, TR6, TR7, TR8, & TR9) was deleted due to their high MI value, hence, setting a free parameter that does not significantly improve the model. Again, a free parameter estimate was set between items TR1 and TR2 as they are found to be redundant as per their high covariance in MI. The revised model presented in Figure 7 (b) showed a good fit; relative $\chi 2$ was 2.052, RMSEA (.058) and GFI, CFI, IFI were all >0.90. Additionally, the AVE value for TR is satisfactory (AVE = 0.501) indicating adequate convergence of the items measuring TR. While the CR is 0.798.

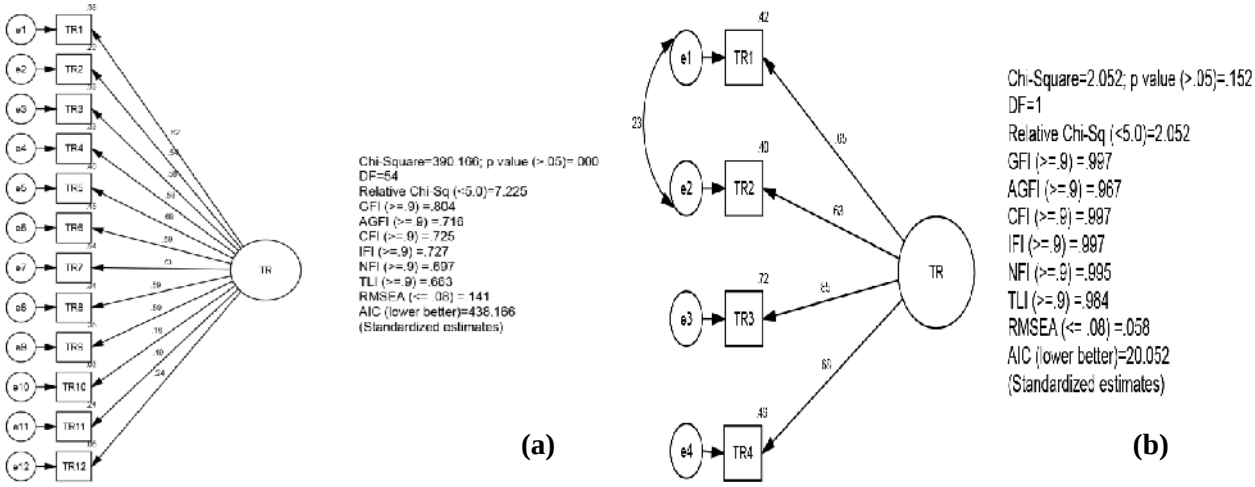


Figure 7. (a) Initial and modified (b) Technology Readiness by CFA model

3.6 Job Relevance (JR)

Seven items were used to measure job relevance. The initial model shown in figure 8 (a), provides a poor model fit as all the fit indices did not meet the recommended values even though all the factor loading were satisfactory. Hence, the model was improved by checking out redundant items. Items JR3 and JR7 were found redundant based on the high MI between the two items, JR7 was deleted due to its lower factor loading as compared to JR3. In addition, a free parameter estimate was set for items JR2 and JR3. Hence, the two items were constrained. Following the modifications, the revised model as shown in figure 8 (b) met the model fit. Meanwhile, the AVE model for JR was satisfactory at 0.555, while the CR was also satisfactory (0.862) indicating the adequate reliability of the JR construct.

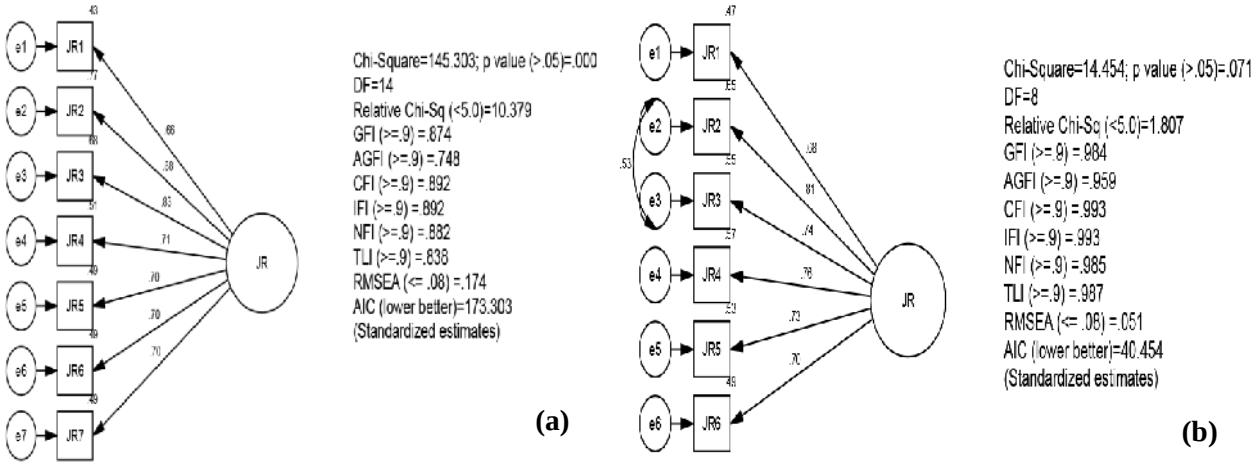


Figure 8. (a) Initial and modified (b) Job Relevance by CFA model

3.7 Perceived Enjoyment (PE)

Figure 9 (a) illustrates the initial model for perceived enjoyment (PE). The model, which is made of six items, was found to exhibit a poor model fit. To improve the model fit of the PE construct, item PE3 was deleted. After deletion, items PE1 and PE2 exhibited a free parameter but did not indicate improvement in the model. Thus, item PE1 was deleted as it has a low factor loading compared to PE2. Hence, after the modifications, the revised model as shown in Figure 9 (b) was found fit. Meanwhile, the AVE model for PE was satisfactory at 0.562, while the CR was also satisfactory (0.828) indicating the adequate reliability of the PE constructs.

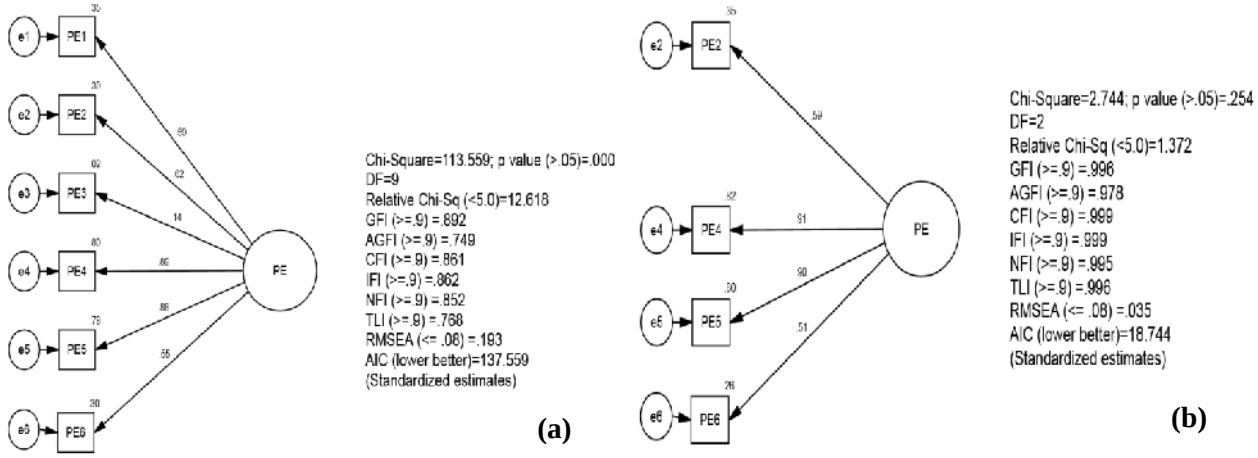


Figure 9. (a) Initial and modified (b) Perceived Enjoyment by CFA model

3.8 Attitude towards the use (ATT)

Figure 10 (a) illustrates the initial model for attitude towards use (ATT). The model is made of eight items, it is found to exhibit a poor model fit. To improve the model fit, items ATT1, ATT3, ATT5 and ATT6 were deleted consecutively. The revised model presented in Figure 10 (b) showed a good fit; relative χ^2 was 2.219, RMSEA (0.063) and GFI, CFI, IFI were all >0.90, though item ATT2 exhibits factor loading less than 0.05, however it was relevant since all the fit indices were met. The study suggested by Awang, (2015), deposited that once all the fit indices are met and factor loading is less than .05, it can be retained. Additionally, the AVE value for attitude towards use is satisfactory (AVE=0.606) indicating adequate convergence of the items measuring attitude. Meanwhile, CR at 0.850 indicates reliability of the attitude towards use of the construct.

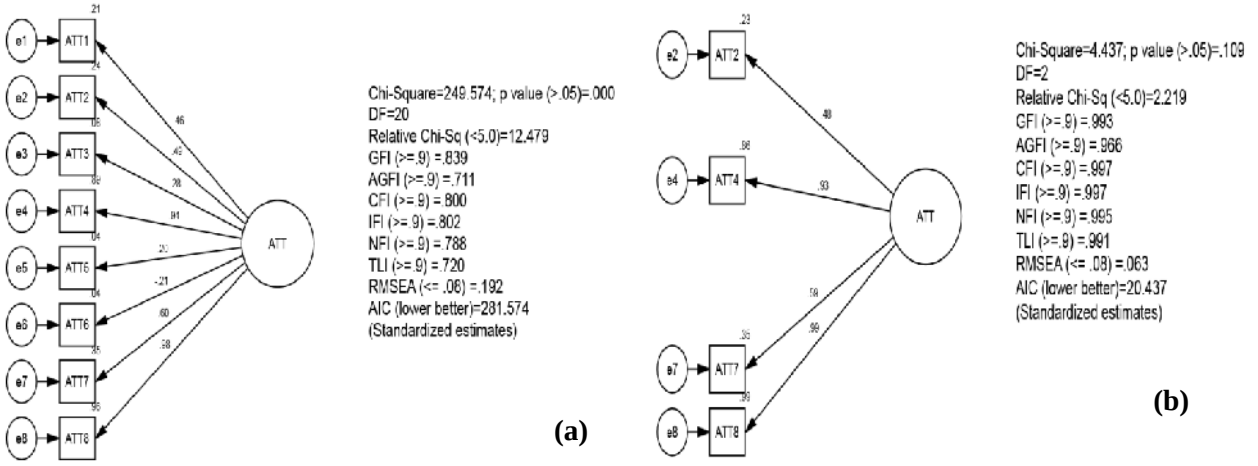


Figure 10. (a) Initial and modified (b) Attitude towards use by CFA model

3.9 Behavioral Intention to use (BI)

Seven items were used to measure behavioural intention to utilize e-learning. The initial model as shown in Figure 11 (a) provides a poor model fit as only GFI met the recommended values (GFI=0.983). Thus, the model was modified to improve the model fit. The factor loadings were observed and two items (BI2 and BI3) with low factor loadings (<0.50) were deleted one at a time. The revised model presented in Figure 11 (b) showed a good fit; relative χ^2 was 2.636, RMSEA (.073) and GFI, CFI, IFI were all >0.90. Additionally, the AVE value for the behavioural intention was satisfactory (AVE=0.513) indicating adequate convergence of the items measuring behavioural intention. While the CR at 0.840 indicates the reliability of the behavioural intention construct.

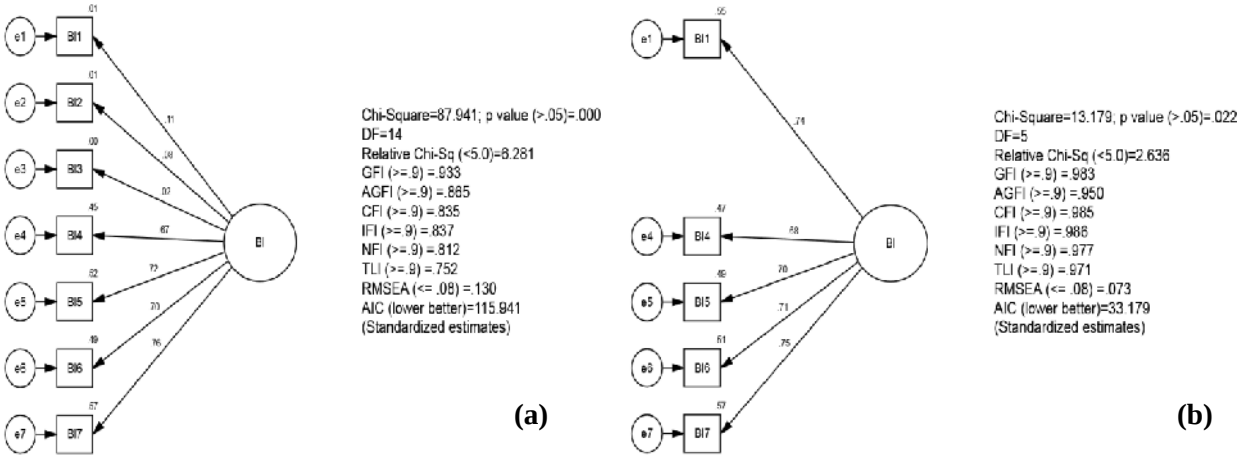


Figure 11. (a) Initial and modified (b) Behavioural Intention for CFA model

3.10 Technology Self-efficiency (TSE)

Figure 12 (a) illustrates the initial model for technology self-efficacy. The model is made of eight items, it is found to exhibit a poor model fit. To improve the model fit, items TSE1 and TSE2 were deleted consecutively due to low factor loadings. Equally, TSE4 and TSE5 were found to be redundant due to their high MI value. Hence, TSE4 were subsequently deleted due to low factor loading compared to TSE5. More so, TSE5 was deleted due to its factor loading dropped below 0.05 after the modification. The revised model presented in Figure 12 (b) showed a good fit; relative χ^2 was 1.222, RMSEA (0.027) and GFI, CFI, IFI were all >0.90. Additionally, the AVE value for technology self-efficacy is satisfactory (AVE= 0.592) indicating adequate convergence of the items measuring technology self-efficacy. Meanwhile, CR at 0.851 indicates the reliability of the construct.

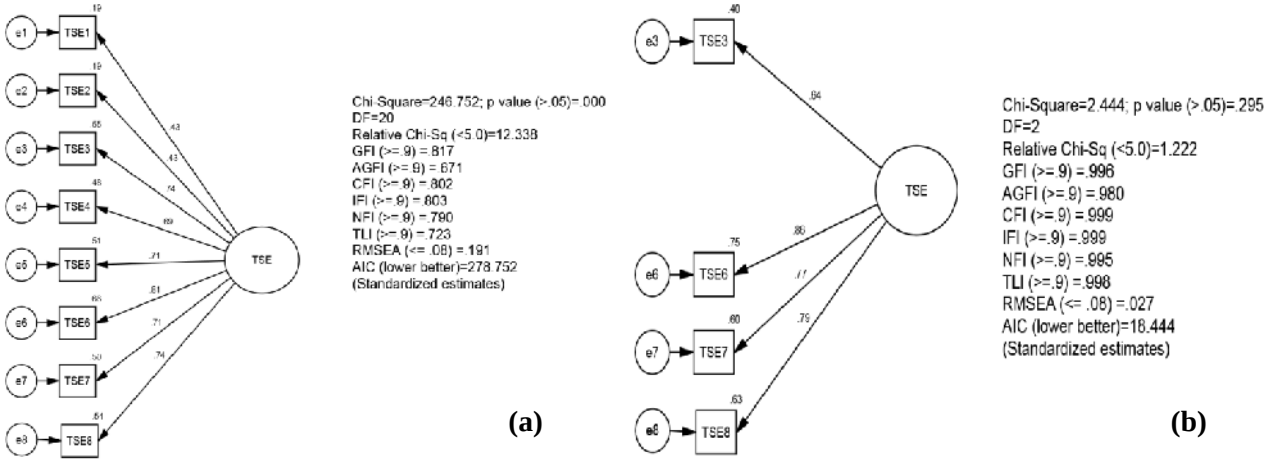


Figure 12. (a) Initial and modified (b) Technology Self-Efficacy by CFA model

3.11 e-Learning Utilization (EU)

Twelve items were used to assess e-learning utilization. The initial model as shown in Figure 13 (a), showed poor model fit as all the fit indices did not meet the recommended values. Thus, the model was modified to improve the model fit. The factor loadings were observed on seven items with low loadings (<0.50) and were deleted one at a time. Additionally, a free parameter estimate was set between items EU5 and EU7, and EU8 and EU11 as they were found to be redundant as per their high covariance based on MI. The revised model presented in Figure 13 (b) showed a good fit; relative χ^2 was 1.705, RMSEA (.048) and GFI, CFI, IFI were all >0.90. Additionally, the AVE value for EU is satisfactory (AVE=0.537) indicating adequate convergence of the items measuring EU, while the CR is 0.849.

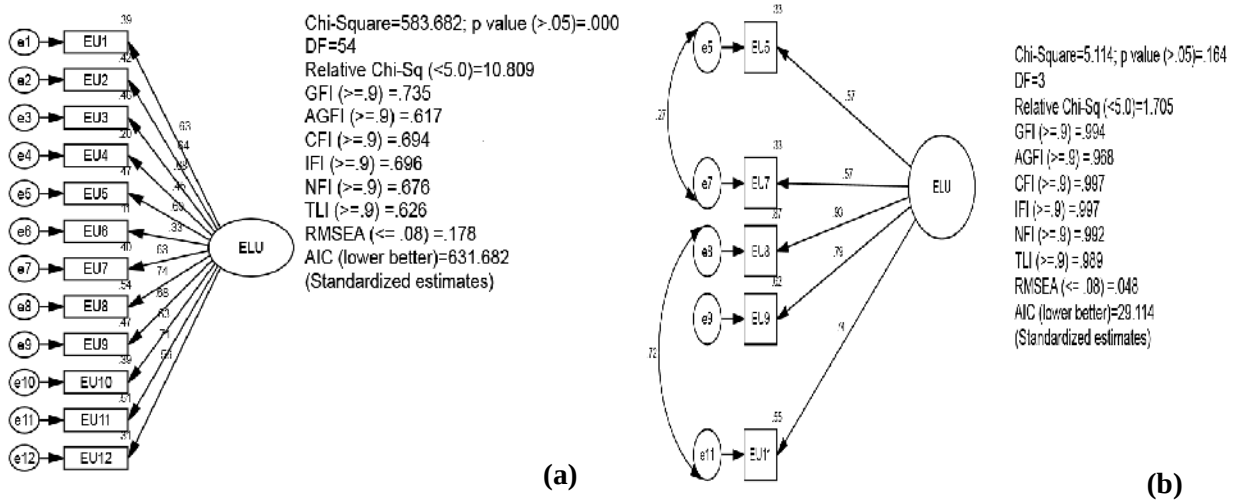


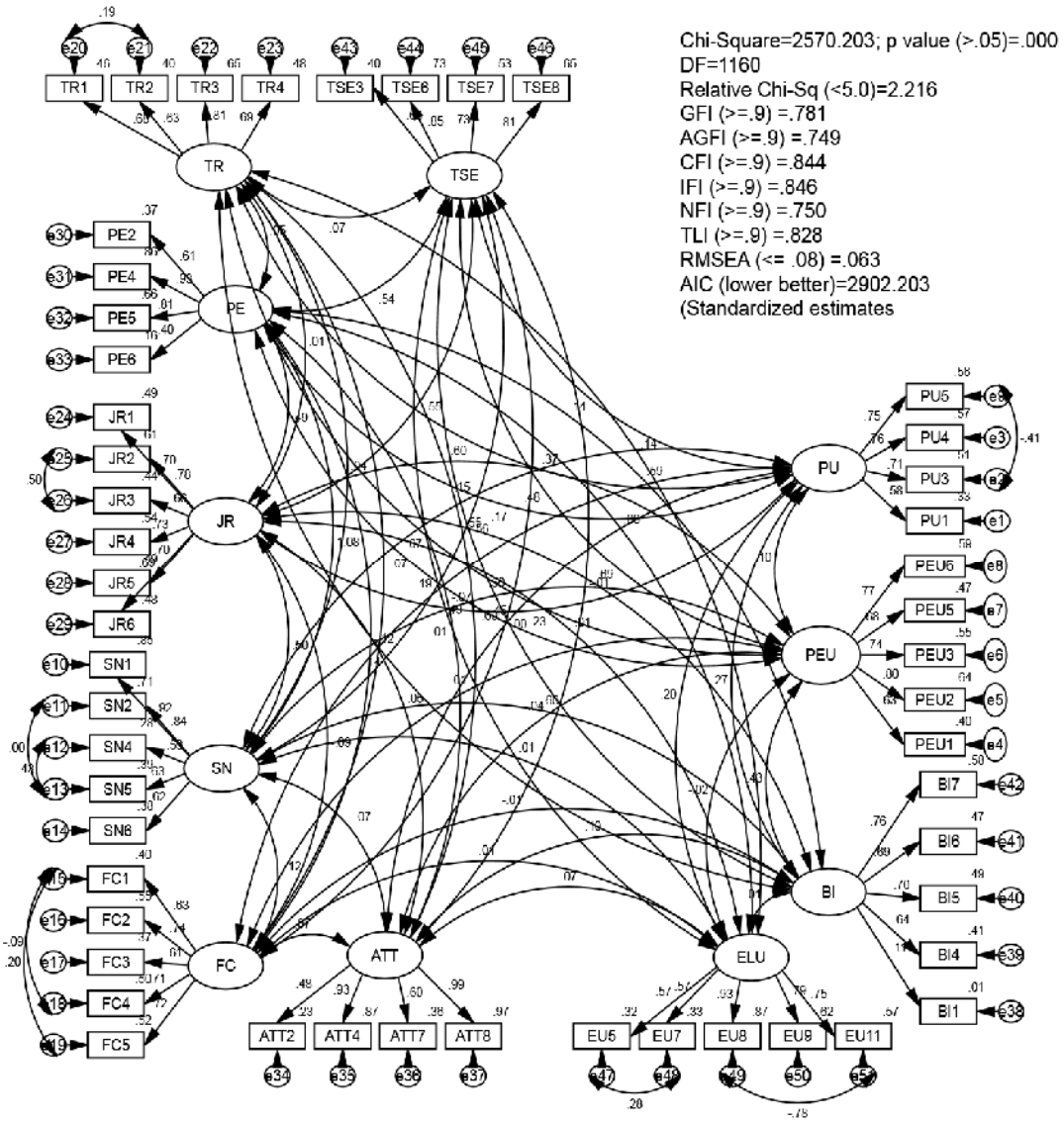
Figure 13. (a) Initial and modified (b) e-learning Usage by CFA model

Evaluation and justification of Measurement Model

After conducting the CFA for the individual constructs, the next step is the measurement model. The aim of the measurement model is to test for the overall model fit, a test of normality, an outlier, and test for discriminant validity (Hair et al., 2010 & 2014). Refer to the criteria table 4 to check for the model fit as reported for the CFA.

Test for model fit

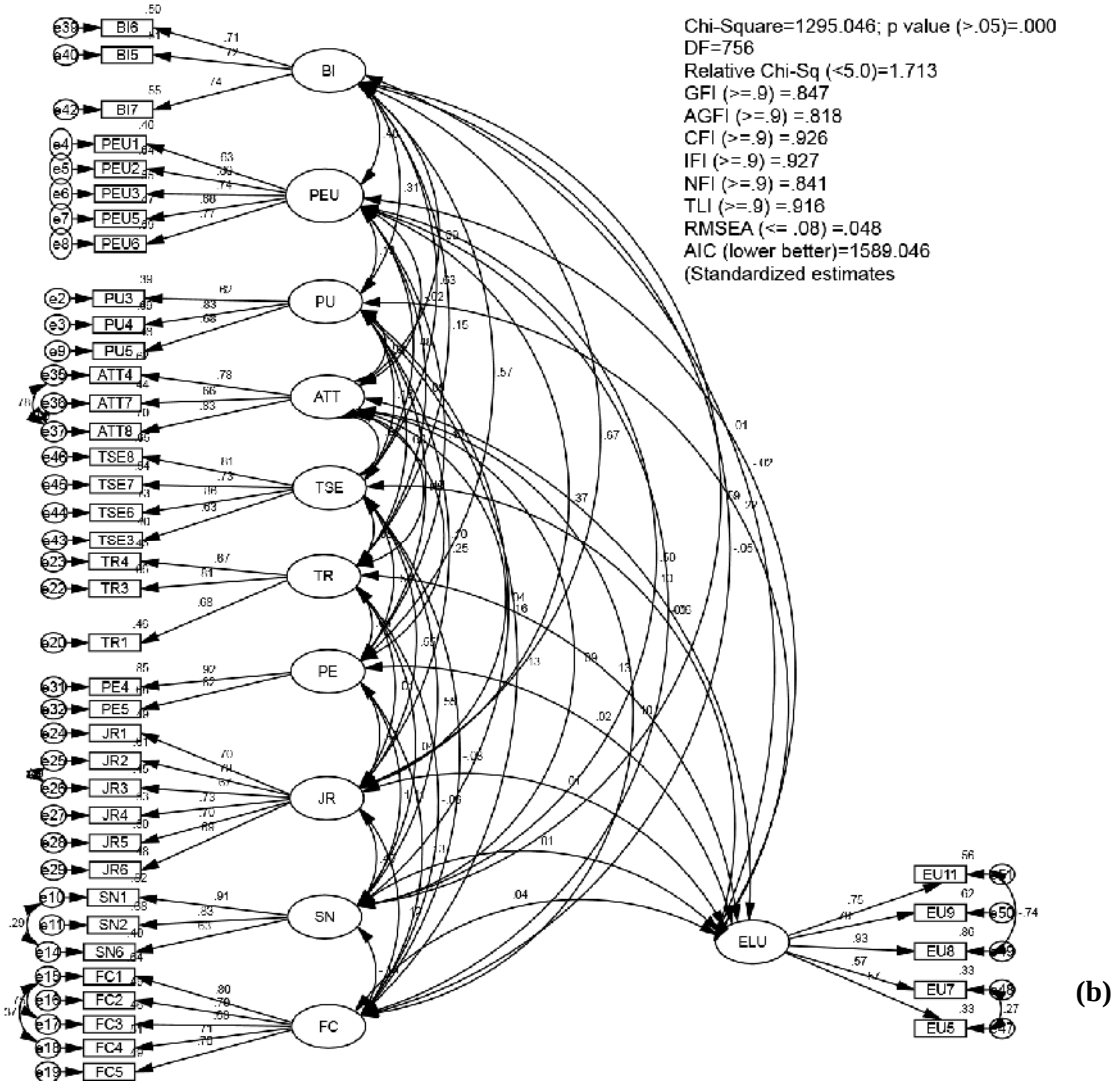
Once the normality and outlier were assessed, the next step is to assess the measurement model. In initial model as presented in Figure 14 (a) the relative χ^2 (2.216) and RMSEA (0.063) met the recommended value, however, GFI, CFI, and IFI did not meet the recommended value, as such the model was modified.



(a)

Figure 14 (a) Initial Measurement model

To improve the measurement model, all items with factor loading less than .50 were deleted. In a similar note, the MI was check and items with low factor loadings among the redundant items were further deleted because setting the redundant items as free parameters did not improve the model when compared to removing the items. Upon the removal of the items, the measurement model met the criteria for the model fitness as depicted in Figure 14 (b) Relative χ^2=1.713, RMSEA=0.048, GFI=0.847, CF1=0.926, and IFI=0.927.



(b)

Figure 14 (b) Revised measurement model

According to the criterion by Hair et al., (2010), the value accepted for valid construct reliability (CR) is when the value is ≥ 0.70.

Test for Discriminant Validity

After ascertaining the model fitness, the next stage of the measurement model is to test for discriminant validity. The discriminant validity is a subcategory of the construct validity and its purpose is to confirm that two constructs that are supposedly unrelated are actually not (Byrne, 2013a). Discriminant validity refers to the extent to which constructs used in a study are truly distinct from each other.

To show that constructs exhibit enough discriminant validity, the AVE for any two constructs must be greater than their r^2 (Byrne, 2013a; Byrne, 2001). Table 5 present the matrix of r^2 (off-diagonal) AVEs (diagonal) among the factors in the study. According to the convergent and discriminant validity of the model in table 5, the AVE for perceived ease of

use is less than, 50. It further shows that the AVE for SN is also less than 0.50. Similarly, TSE has AVE, which is also less than 0.50. Therefore, convergent validity is achieved. In addition, discriminant validity is also achieved considering the value of AVE and MSV under PE. It was found that the value of the AVE under PE is less than the value of MSV under PE. Discriminant validity was also found in SN where the AVE for SN is less than the value of MSV. This is also observed in TSE where the value of its AVE is less than the value of MSV. All values met the suggested set of laws, demonstrating that the convergent validity for the estimation items and factors in this study are sufficient. The output showed that discriminant validity was not violated, as all the values of the AVEs were greater than the r^2 between any two constructs.

Table 5. Average variance extracted (on diagonal) and square correlation (Off-diagonal) between the variables

	PE	PU	PEU	SN	FC	TR	JR	ATT	BI	TSE	ELU
PE	**0.766**										
PU	0.030	**0.512**									
PEU	0.247	0.017	**0.530**								
SN	0.011	0.026	0.250	**0.635**							
FC	0.017	0.017	0.004	0.023	**0.517**						
TR	0.003	0.356	0.007	0.001	0.004	**0.527**					
JR	0.223	0.087	0.137	0.238	0.014	0.009	**0.509**				
ATT	0.011	0.266	0.005	0.008	0.011	0.423	0.002	**0.582**			
BI	0.326	0.088	0.157	0.350	0.002	0.023	0.454	0.008	**0.522**		
TSE	0.278	0.025	0.232	0.306	0.001	0.005	0.301	0.006	0.393	**0.579**	
ELU	0.002	0.049	0.002	0.005	0.002	0.017	0.006	0.009	0.002	0.006	**0.540**

Structural Model

The structural model is the core of this study as it is used to answer the hypothesis for the study. It assesses the direct and indirect interrelation between the dependent and the independent variables. Thus the structural model assesses the validity of the adopted model and the hypothesized theoretical path (Hair et al., 2010). For the present study, 17 hypotheses were proposed to predict the direct and indirect utilization of e-learning among selected university lectures in northeastern Nigeria. The test for model fit for the structural model followed the same criteria as that of the CFA and the measurement illustrated in Table 4. The analysis revealed that all the factors loading were within the recommended threshold (≥0.50 to 1.00). More so, the fit indices relative (χ^2=1.835, RMSEA= 0.052, GFI=0.834, CF1=0.911, and IFI=0.912) were within the recommended values. Thus, since the parameter stability among the indicators were established hence the need for model modification does not arise (Byrne, 2013b; Byrne, 2013a).

Table 6 presents the results of the standardized regression weight (β) with CR and their level of significance used to address hypothesis 1 to 17. The results revealed technology readiness to exhibit a significant relationship with e-learning utilization (β=0.570, p=0.000). Hence, H_1 is supported. This implies that university lecturers are optimistic about finding technology that is capable exploring the prospects of e-learning activities. It is the strongest predictor for e-learning usage. Similarly, technology self-efficacy has a positive significant relationship with perceived usefulness of e-learning utilization (β=0.725, p=0.000). Thus, H_2 is supported at <0.05 level of significance. As it implies that if a lecturer has the ability to use a certain technology, then he/she finds it useful to enhance his/her classroom activities. This outcome suggests that the capability and skill of a lecturer to utilize e-learning for classroom activities is significant and is perceived as useful in classroom activities. Technology self-efficacy was found to be positive with a significant relationship with perceived ease of use of e-learning (β=0.304, p=0.000), hence H_4 is supported at <0.05 level of significance. This outcome indicate that lecturers' ability to utilize e-learning for classroom activities is significantly perceived as easy and free-from effort or stress. It is a powerful predictor of e-learning utilization. Perceived enjoyment of using e-learning indicated a positive and significant relationship with perceived ease of use for e-learning (β=0.250, p=0.000). Hence H_6 is supported at <0.05 level of significance. University lecturers found using e-learning in the classroom so enjoyable and it is a significant predictor of e-learning usage in this study. Job relevance has a positive significant relationship with perceived usefulness of e-learning utilization (β=0.262, p=0.002). Thus, H_7 is supported at <.05 level of significance. This result shows that university lecturers find e-learning use as relevant to their classroom activities and it is of significant importance to their teaching job. Subjective norm indicated a positive and significant correlation with behavioural intention to use e-learning (β=0.520, p=0.000). Thus H_{11} is supported at <0.05 level of significance. This result indicated that university lecturers are influenced by important people around them to use e-learning, this in turn implies that expectations of people around a lecturer can influence his/her behaviour to use e-learning for classroom activities. Therefore, a powerful indicator that can predict e-learning utilization. Perceived usefulness of e-learning resources is found to have a positive and significant relationship with e-learning utilization (β=0.223, p=0.000). Thus H_{13} was supported at <0.05 level of significance. The study shows that lecturer's perceived use of e-learning is significant to their classroom activities. It is a strong predictor for e-learning use. PU of using e-learning is found to have a positive and significant relationship with the attitude towards e-learning utilization (β=0.660, p=0.000). Hence H_{14} is supported at <0.05 level of significance. In this study, PU is regarded as a strong predictor of lecturers' e-learning use for classroom activities.

Perceived ease of use of e-learning is found to have a positive and significant relationship with the attitude towards e-learning utilization (β=0.133, p=0.013). Thus H_{15} is supported at <0.05 level of significance. This shows that lecturers' perceives e-learning as easy to use and they are positive in using e-learning in the classroom. Hence, it is a significant predictor for e-learning use. Attitude towards e-learning utilization is found to have a positive and significant relationship with behavioural intention towards utilization of e-learning resources (β=0.177, p=0.008). Thus H_{16} is supported at <0.05 level of significance. The result shows that the lecturers approach to utilize e-learning is positive and therefore

it is a strong predictor for e-learning use. However, on the other hand, technology self-efficacy was found to demonstrate no significant correlation with perceived usefulness at p=0.805, which is greater than 0.05 level of significance. Thus, H_3 is not supported. Similarly perceived enjoyment is found to demonstrate no significant correlation with the perceived usefulness of e-learning (p=0.414). Thus, H_5 is not supported. Job relevance is found to demonstrate no significant relationship with the perceived ease of use of e-learning (p=0.260). Thus, H_8 is not supported. Facilitating condition demonstrated no significant connection with perceived ease of use of e-learning (p=0.800). Thus, H_9 is not supported. Subjective norm is found to demonstrate no significant relationship with the perceived usefulness of e-learning (p=0.417). Thus, H_{10} is not supported. Perceived ease of use is found to demonstrate no significant relationship with the perceived usefulness of e-learning (p=0.761). Thus, H_{12} is not supported. Behavioural intention is found to demonstrate no significant relationship with e-learning utilization (p=0.538). Thus, H_{17} is not supported.

The results of the structural model as summarized in Table 6 indicates that ten regression paths were supported at 5% level of significance, therefore supported hypotheses are H_1, H_2, H_4, H_6, H_7, H_{11}, H_{13} H_{14} H_{15}, and H_{16}. While on the other hand, the remaining seven regression paths were not significant at 5% level of significance. These includes: H_3, H_5, H_8, H_9, H_{10}, H_{12}, and H_{17}.

Table 6. Estimation of standardized regression weight of the final model

H		PATH		β	S.E	C.R.	P
H_1	ELU	<---	TR	.570	.125	4.560	***
H_2	PU	<---	TR	.725	.090	6.432	***
H_3	PU	<---	TSE	.020	.105	-.247	.805
H_4	PEU	<---	TSE	.304	.130	3.598	***
H_5	PU	<---	PE	.071	.067	-.817	.414
H_6	PEU	<---	PE	.250	.061	3.781	***
H_7	PU	<---	JR	.262	.081	3.078	.002
H_8	PEU	<---	JR	.086	.088	1.127	.260
H_9	PEU	<---	FC	.014	.040	-.254	.800
H_{10}	PU	<---	SN	.070	.069	.812	.417
H_{11}	BI	<---	SN	.520	.049	8.357	***
H_{12}	PU	<---	PEU	.029	.062	.384	.701
H_{13}	ELU	<---	PU	.223	.070	4.357	***
H_{14}	ATT	<---	PU	.660	.166	6.170	***

H_{15}	ATT	<---	PEU	.133	.082	-2.086	.037
H_{16}	BI	<---	ATT	.177	.043	2.646	.008
H_{17}	ELU	<---	BI	.041	.092	-.617	.538

S.E: standard error of regression weight; C.R: critical ratio for regression weight; p: Level of significance (***p<.001, **p< .005, *p<.05).

In a study by (Mahdizadeh et al., 2008) the factors that can explain teachers' use of e-learning environments in higher education adopted questionnaire with 178 teachers as respondents from a wide variety of departments at Wageningen University in the Netherlands. As a result, 43% of the total variance in teacher's use of e-learning environments demonstrated that web-based activities, computer-assisted learning (predictors) and the perceived added value of e-learning environments (mediating variable) were key factors to the success of e-learning adoption in educational institutes of higher learning.

4. Conclusion:

This study analyzed various lecturers' demographic factors and ICT usage of e-learning in north-eastern Nigeria. As a result, ten regression paths were supported at 5% level of significance. These are supported by hypotheses H_1, H_2, H_4, H_6, H_7, H_{11}, H_{13}, H_{14} H_{15}, and H_{16}. While on the other hand, the remaining seven regression paths were not significant at 5% level of significance. Thus, the study suggests that, it is expected that the university lecturers ought to be more acquainted with new web engines, virtual and online platforms. It is also important for lecturers to have access to pc, cells phones, and tablets or i-pads that are fit for furnishing them and their students with open educational materials from any place anywhere and whenever needed.

In suggesting for further research, it is necessary to consider the results and shortcomings of the present study so that the identified gaps can be filled by further or future researchers. Considering the fact that this study have based on university lecturers' that are considered full-time employees, it becomes imperative to recommend all staff for further research. This study was conducted in public universities and restricted to faculty of education. It is recommended that similar research be conducted by considering both public and private universities covering more than one faculty. Also, the location of this study was north-eastern Nigeria, and it was conducted only in selected universities of the region. Further studies can be conducted to consider the whole universities in the region using the same variables. Additionally, some countries have tried developing and testing e-learning models, however, in Nigeria not a great deal of such research exists on the development of e-learning models, especially for the rural and remote universities in the northern region. Therefore, it is recommended for future research to be replicated in similar demography. Furthermore, this study was a correlational design where it mainly deals with designing of the survey questionnaires as an instrument for data collection. It is suggested that this study be replicated using quantitative/qualitative approach where certain techniques could be involved like interviews. This study was conducted only in Universities. It is recommended to be replicated in other level of educational sector with the same factors and samples to compare the responses of the respondents. This will help

and serve as means of inference for further measurements and a repertoire for decision and policy makers of curriculum designs.

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