

The copyright © of this thesis belongs to its rightful author and/or other copyright owner. Copies can be accessed and downloaded for non-commercial or learning purposes without any charge and permission. The thesis cannot be reproduced or quoted as a whole without the permission from its rightful owner. No alteration or changes in format is allowed without permission from its rightful owner.



**THE INTENTION TO ADOPT MODEL OF INFRASTRUCTURE
AS A SERVICE-BASED E-LEARNING IN HIGHER EDUCATION
INSTITUTIONS IN NIGERIA**

ABUBAKAR MAGIRA TOM



**DOCTOR OF PHILOSOPHY
UNIVERSITI UTARA MALAYSIA**

2022



Awang Had Salleh
Graduate School
of Arts And Sciences

Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

ABUBAKAR MAGIRA TOM

calon untuk Ijazah
(candidate for the degree of)

PhD

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

**“THE INTENTION TO ADOPT MODEL OF INFRASTRUCTURE AS A SERVICE-BASED E-LEARNING
IN HIGHER EDUCATION INSTITUTIONS IN NIGERIA”**

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada : **09 November 2020.**

*That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on:
November 09, 2020.*

Pengerusi Viva:
(Chairman for VIVA)

Prof. Dr. Zulhairi Md Dahalin

Tandatangan
(Signature)

Pemeriksa Luar:
(External Examiner)

Prof. Dr. Zainuddin Hassan

Tandatangan
(Signature)

Pemeriksa Dalam:
(Internal Examiner)

Assoc. Prof. Dr. Muhammad Shahbani Abu Bakar

Tandatangan
(Signature)

Nama Penyelia/Penyelia-penyelia:
(Name of Supervisor/Supervisors)

Prof. Dr. Wan Rozaini Sheik Osman

Tandatangan
(Signature)

Nama Penyelia/Penyelia-penyelia:
(Name of Supervisor/Supervisors)

Dr. Wiwied Virgiyanti

Tandatangan
(Signature)

Tarikh:

(Date) **November 09, 2020**

Permission to Use

In presenting this thesis in fulfilment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the University's Library may make it freely available for inspection. I further agree that permission for the copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or, in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addressed to:



Dean of Awang Had Salleh Graduate School of Arts and Sciences

UUM College of Arts and Sciences

Universiti Utara Malaysia

06010 UUM Sintok

Abstrak

Permintaan global bagi penyediaan pendidikan kepada semua dalam konteks Institusi Pengajian Tinggi di Nigerian menunjukkan keperluan mendesak bagi kaedah penyampaian kandungan e-pembelajaran yang berkesan dan cekap. Pada masa kini, negara membangun menggunakan e-pembelajaran berasaskan awan (cloud-based e-learning) untuk pengurangan kos, keselamatan, kebolehskalaan, serta ketersediaan kandungan e-pembelajaran 24/7. Namun, kekurangan penggunaan Prasarana sebagai perkhidmatan berasaskan e-pembelajaran menimbulkan ancaman adanya dan kelestarian e-pembelajaran di Nigeria. Maka, kekurangan kajian menunjukkan penggunaannya adalah terhad. Oleh demikian, kajian ini bertujuan menyiasat faktor yang mempengaruhi niat untuk menggunakan IaaS/BEL dari perspektif pengarah pengurusan atasan ICT. PLS-SEM digunakan untuk menganalisis data daripada soal selidik, manakala data temu bual dianalisis menggunakan pendekatan tematik. Keputusan statistik menunjukkan bahawa Kelebihan Relatif, Penjimatan Kos, Sokongan Pembekal Perkhidmatan, dan Sokongan Kerajaan adalah disokong secara signifikan manakala Keserasian, Kepercayaan, Keselamatan, Sokongan Pengurusan Atasan, dan Tekanan Daya Saing tidak disokong. Keputusan statistik pemboleh ubah penyederhanaan (Sokongan Kerajaan) menunjukkan Kelebihan Relatif disokong secara positif sementara Penjimatan Kos dan Kepercayaan disokong secara negatif. Dapatan kajian ini selanjutnya menunjukkan kepentingan pemboleh ubah yang digunakan mampu untuk mempengaruhi tanggapan niat pengarah pengurusan atasan ICT untuk menggunakan model IaaS/BEL berdasarkan teori TOE dan DOI, dengan pemboleh ubah luaran tambahan yang lain. Walau bagaimanapun, kajian ini memperlihatkan beberapa batasan berkenaan prasarana ICT dan dasar dalam mencapai pendidikan untuk semua di Nigeria walaupun terdapat kekangan jantina, kewangan dan lokasi. Kajian seterusnya menyumbang kepada teori dan amalan IS serta cadangan kepada pembuat dasar dan vendor awan. Selain itu, e-pembelajaran yang berkesan akan disediakan untuk kakitangan dan pelajar ke arah mengurangkan kekangan belanjawan, justeru, memberi kesan kepada masyarakat.

Kata kunci: Pengkomputeran Awan, Penggunaan E-pembelajaran, Direktorat ICT, Teori TOE dan DOI, Kaedah Campuran.

Abstract

The global demand for providing education for all in the context of Nigerian Higher Education Institutions signifies the urgent need for an effective and efficient method of delivering e-learning content. Presently, the developed countries are adopting Cloud-Based e-learning for its cost reduction, security, scalability, and the availability of e-learning content 24/7. However, the lack of adoption of the Infrastructure as-a-Service-Based E-learning faces a threat to the availability and sustainability of e-learning in Nigeria. Thus, the limited studies on its adoption further demonstrate this. Therefore, this study aims to investigate the factors that influence the Intention to adopt IaaSBEL from the perspective of the ICT directorates top managers. PLS-SEM was used to analyse the data generated from the questionnaire, while interview data were analysed using a thematic approach. The statistical results demonstrated that Relative Advantage, Cost Savings, Service Provider Support, and Government Support were significantly supported while Compatibility, Trust, Security, Top Management Support, and Competitive Pressure were not supported. The moderating variable (Government Support) statistical results show that Relative Advantage was positively supported while Cost Savings and Trust were negatively supported. The findings of this study further demonstrated the significance of the adopted variables as capable of influencing the perception of ICT directorates' top managers' Intention to adopt the IaaSBEL model based on the TOE and DOI theories, with the addition of other external variables. However, the study observed some limitations with regards to the ICT infrastructure and policies in attaining education for all in Nigeria despite gender, financial, and location constraints. The study further contributes to the theory and practice of IS as well as recommendations to policy makers and cloud vendors. Also, effective e-learning would be available to staff and students towards reducing the budgetary constraints, hence, impacting the society.

Keywords: Cloud Computing, E-learning Adoption, ICT Directorates, TOE and DOI Theory, Mixed-Method.

Acknowledgement

In the name of ALLAH, Most Gracious, Most Merciful. All praise is due to Allah (SWT), the lord of the universe, who gave me the strength and courage to complete my thesis. May peace be upon our prophet Muhammad (PBUH), his household, companions, and followers. The completion of this thesis would not have been possible without the support, encouragement and advice of many individuals who have provided me throughout my doctoral study.

Above all, I wish to express my most profound appreciation to my supervisors, Professor Dr Wan Rozaini Sheik Osman and Dr Wiwied Virgiyanti, who had assisted, supervised, and guided me throughout this beautiful journey. I am greatly indebted. Thank you. My special thanks are extended to the Director of the Institute for Advanced and Smart Digital Opportunities (IASDO), Associate Prof. Dr Azizah Ahmad, the Dean of School of Computing (SOC), Professor Dr Huda Ibrahim, all lecturers and SOC staff for providing the enabling environment for PhD students.

My special gratitude is dedicated to my father, who sponsored my education. May Allah bless you and Mom for your endless support, sacrifice, and prayers. My lovely wife, Kaltuma Adam Ibrahim, has also shown immense love, caring, patience, and kindness during the PhD Journey. Our lovely daughters, Fatima, Yusra, and my son, Magira, always receive me with open arms and a wide smile whenever she sees me after a day's work. Finally, I would like to thank my brothers, Mohammed Magira Tom, Tom Magira Tom, Moh'd Shitta Magira Tom, Ajjid Magira Tom Ibrahim Magira Tom, Allawan Magira Tom and Saleh Scorer, all the family members for their constant support and prayers. May Allah's Rahma and Blessings be with you always. Ameen

Table of Contents

Permission to Use.....	ii
Abstrak.....	iii
Abstract.....	iv
Acknowledgement.....	v
Table of Contents.....	vi
List of Tables.....	xiii
List of Figures.....	xv
List of Appendices.....	xvii
List of Abbreviations.....	xviii
CHAPTER ONE INTRODUCTION.....	1
1.1 Overview.....	1
1.2 Introduction.....	1
1.3 Background of The Study.....	2
1.4 Problem Statement.....	5
1.5 Research Questions.....	11
1.6 Research Objectives.....	12
1.7 Purpose Statement.....	13
1.8 Significance of the study.....	13
1.9 Scope of The Research.....	14
1.10 Research Motivation.....	16
1.11 Operational Definitions of Key Terms.....	17
1.12 Organization of Chapters.....	18
1.13 Summary.....	20
Chapter 2 Literature Review.....	21
2.1 Overview.....	21
2.2 Education in Nigeria.....	21
2.3 Challenges of Education in Developing Countries.....	22

2.3.1 Education Challenges in Nigeria	25
2.4 Impact and Challenges of ICT In Nigerian Education.....	26
2.5 E-learning.....	28
2.5.1 Types of E-learning.....	29
2.5.2 Benefits of E-learning.....	32
2.6 Challenges of E-learning in developing countries.....	34
2.7 Challenges of e-learning in Nigeria	41
2.8 Cloud Computing	46
2.8.1 Actors in Cloud Computing Infrastructure	47
2.8.2 On-Premises Offerings vs Cloud Offerings.....	51
2.8.3 Cloud Computing Features	53
2.8.4 Cloud Computing Service Models.....	53
2.8.4.2 Platform as-a-Service	55
2.8.4.3 Infrastructure-as-a-Service.....	56
2.8.5 Cloud Deployment Models	57
2.9 Justification of using Public Cloud in Nigerian HEIs.....	60
2.10 Justification of using IaaS Cloud in Nigerian HEIs.....	62
2.11 Infrastructure as-a Service Based E-learning	65
2.11.1 Virtualization in E-learning Environment.....	66
2.11.2 Types of Virtualization	69
2.12 Cloud-Based E-learning in developing countries	70
2.12.1 Cloud-Based E-learning in Asian Countries.....	71
2.12.2 Cloud-Based E-learning in Africa, and Nigeria.....	78
2.12.3 Advantages of Cloud-Based E-learning in Developing Countries HEIs..	
.....	85
2.12.4 E-learning vs Cloud-Based E-learning.....	86
2.13 TOE, DOI and IaaSBEL Model	89
2.14 Gap Analysis.....	91
2.15 Summary.....	92
CHAPTER THREE CONCEPTUAL MODEL.....	93
3.1 Introduction.....	93
3.2 Theoretical Background	93

3.2.1 Technology Acceptance Model	94
3.2.2 Technology Acceptance Model 2	96
3.2.3 Theory of Reasoned Action	98
3.2.4 Theory of Planned Behavior	100
3.2.5 Unified Theory of Acceptance and Use of Technology	101
3.2.6 Unified Theory of Acceptance and Use of Technology 2	103
3.2.7 Diffusion of Innovation	105
3.2.8 Technology, Organisation, Environment	108
3.3 Theoretical Framework	110
3.3.1 Selected Underpinning Theories.....	112
3.3.2 Justification of Using Technology Organization Environment.....	112
3.3.3 Justification of Using Diffusion of Innovation	114
3.3.4 Justifications of Combining TOE and DOI.....	115
3.4 Conceptual Model.....	118
3.4.1 Justification of Using Intention to Adopt IaaS/BEL.....	119
3.5 Operational Definitions of Constructs.....	120
3.6 Exogenous Variables	120
3.6.1 Relative Advantage.....	120
3.6.2 Compatibility	121
3.6.3 Trust.....	122
3.6.4 Security.....	123
3.6.5 Top Management Commitment.....	123
3.6.6 Cost Savings	124
3.6.7 Competitive Pressure.....	125
3.6.8 Service Provider Support.....	125
3.7 The Role of Government support as the Moderator	125
3.8 Hypotheses.....	126
3.9 Main Hypotheses.....	128
3.9.1 Relative Advantage.....	128
3.9.2 Compatibility	128
3.9.3 Trust.....	129
3.9.4 Security.....	130
3.9.5 Top Management Commitment.....	130

3.9.6 Cost Savings	131
3.9.7 Competitive Pressure	131
3.9.8 Service Provider Support.....	132
3.10 Hypothesis for Moderating Variables.....	132
3.10.1 Moderating Effects of Government Support on The Relationship Between Relative Advantage and IaaS BEL	133
3.10.2 The Moderating Effects of Government Support on the Relationship Between Trust and IaaS BEL	133
3.10.3 The Moderating Effects of Government Support on the Relationship Between Cost Savings and IaaS BEL	134
3.11 Summary	135

CHAPTER FOUR RESEARCH METHODOLOGY 136

4.1 Introduction.....	136
4.2 Research Approach.....	136
4.2.1 Research Process.....	140
4.2.2 Variables/Factors Selection.....	144
4.3 Research Instrument Development.....	145
4.3.1 Construct Measurement.....	146
4.3.2 Face Validity.....	146
4.3.3 Content Validity.....	147
4.4 Pilot Study.....	147
4.4.1 Normality of the Pilot Data.....	149
4.4.2 Factor Analysis	150
4.4.3 Reliability	152
4.5 Data Collection Procedure.....	154
4.5.1 Sampling Procedure.....	154
4.5.2 Unit of Analysis.....	155
4.5.3 Target Population	155
4.5.4 Sampling Frame	157
4.5.5 Sampling Size and Power Analysis	158
4.6 Data Analysis Procedure.....	161
4.7 Model Validation.....	162

4.8 Summary.....	162
CHAPTER FIVE DATA ANALYSIS.....	163
5.1 Introduction.....	163
5.2 Data Coding.....	163
5.3 Response Rate.....	164
5.4 Descriptive Statistics of Respondents	165
5.5 Data Screening and Preparation.....	167
5.5.1 Missing Value Analysis	167
5.5.2 Assessment of Outliers.....	169
5.5.3 Normality.....	169
5.5.4 Homoscedasticity	171
5.5.5 Multicollinearity Test.....	173
5.5.6 Non-Response Bias	174
5.5.7 Common Method Variance Test.....	176
5.6 Structural Equation Modelling.....	177
5.6.1 Assessment of PLS-SEM Model	178
5.6.2 Assessment of Measurement Model.....	179
5.7 Assessment of Significance of the Structural Model.....	185
5.7.1 Assessment of Variance Explained in the Endogenous Latent Variables..	
.....	187
5.7.2 Assessment of Effect Size.....	188
5.7.3 Assessment of Blindfolding and Predictive Relevance (Q^2).....	189
5.7.4 Testing Moderating Effects.....	190
5.7.5 Determining the Strength of the Moderating Effects	193
5.8 Summary.....	194
CHAPTER SIX QUALITATIVE DATA ANALYSIS	195
6.1 Introduction.....	195
6.2 Sampling Procedure.....	195
6.2.1 Purposive Sampling Procedure.....	195
6.3 Interview Protocols.....	197
6.4 Data Analysis.....	198

6.4.1 Pre-interview.....	198
6.4.2 Informant Consent.....	198
6.4.3 Interview and Data Management.....	199
6.4.4 Coding Procedure.....	201
6.4.5 Reporting.....	202
6.5 Demographic Profile.....	203
6.5.1 Thematic Analysis.....	203
6.6 Intention to Adopt IaaSBEL in the developing countries Higher Education Institutions	205
6.6.1 Theme 1: Compatibility	207
6.6.2 Theme 2: Competitive Pressure.....	212
6.6.3 Theme 3: Government Support Moderates Relative Advantage and Trust	217
6.6.4 Theme 4: Top Management Support.....	226
6.6.5 Theme 5: Trust and Security.....	243
6.7 Qualitative Trustworthiness.....	252
6.7.1 Member Checking.....	252
6.7.2 Peer Debriefing/Review.....	254
6.8 Mixing Quan-qual Result.....	255
6.9 Summary.....	257

CHAPTER SEVEN DISCUSSION AND CONCLUSION 258

7.1 Overview.....	258
7.2 Discussion of the Study's Findings.....	258
7.3 Main Effect Hypotheses.....	261
7.3.1 The Relationships between H ₁ , H ₂ , H ₃ , H ₄ and the Intention to Adopt IaaSBEL	261
7.3.2 The Relationships between H ₅ , H ₆ , and the Intention to Adopt IaaSBEL	264
7.3.3 The Relationships between H ₇ , H ₈ , and the Intention to Adopt IaaSBEL	266
7.3.4 The Relationships between H ₉ and the Intention to Adopt IaaSBEL	268
7.3.5 Moderating effect of Government Support.....	269

7.4 Mixing the Quantitative and qualitative Data.....	273
7.5 Contributions of The Study.....	274
7.5.1 Theoretical Contribution.....	275
7.5.2 Practical Contributions.....	278
7.6 Limitations and Directions for Future Research.....	280
7.7 Conclusion.....	281
References.....	283
Appendices.....	320



List of Tables

Table 1. 1	Tabular Summary of Research Scope.....	15
Table 2. 1	The impact and Challenges of ICT in Nigerian Educational Institutions.....	26
Table 2. 2	Tabular Summary of Traditional Classroom Vs E-learning.....	33
Table 2. 3	A summary of factors affecting of E-learning in developing countries ..	36
Table 2. 4	A tabular summary of factors affecting of E-learning in developing countries.....	44
Table 2. 5	On-premises vs Cloud Computing.....	51
Table 2. 6	Benefits and Drawbacks of Private cloud.....	57
Table 2. 7	Pros and Cons of Public cloud.....	58
Table 2. 8	Pros and Cons of Community cloud	59
Table 2. 9	Benefits and drawbacks of Hybrid cloud	60
Table 2. 10	Literature Table of Cloud Computing Adoption in Developing Countries HEIs.....	73
Table 2. 11	Literature Table of Cloud Computing Adoption in Developing countries HEIs	80
Table 2. 12	E-learning On-premises vs Cloud-Based E-learning.....	87
Table 2. 13	TAM constructs and their definitions.....	96
Table 2. 14	Extended TAM2 definition of constructs	97
Table 2. 15	The TRA definitions of constructs.....	99
Table 2. 16	The TPB definition of constructs.....	101
Table 2. 17	UTAUT definitions of Constructs.....	103
Table 2.18	UTAUT 2 definitions of Constructs.....	104
Table 4. 1	The Demographic of Respondents for The Pilot Study	148
Table 4. 2	Skewness and Kurtosis Values for Pilot Data.....	150
Table 4. 3	Summary of Results for EFA	151
Table 4. 4	Results of Reliability Analysis	153
Table 4. 5	Summary of Sample Size.....	160
Table 5.1	Construct Coding.....	164
Table 5. 2	Response Rate of Questionnaire.....	165
Table 5. 3	The Demographic Profile of Respondents.....	166

Table 5. 4	Percentage of Missing Values	168
Table 5. 5	Normality Test using Statistical Methods.....	170
Table 5. 6	Multicollinearity Analysis.....	174
Table 5. 7	Independent -Samples T-test for Non-response Bias	175
Table 5. 8	Correlation Matrix of the Exogenous Latent Constructs	177
Table 5. 9	Factor Load, composite reliability, and the Average Variance Extracted	181
Table 5. 10	Cross-Loadings Analysis.....	183
Table 5.11	Heterotrait-Monotrait Ratio.....	184
Table 5. 12	Analysis of Fornel-Lacker Criterion	185
Table 5. 13	Structural Model Assessment of Model A, B	186
Table 5. 14	Analysis of Predictive Accuracy in Model A	188
Table 5. 15	Analysis of f2 effect size.....	189
Table 5. 16	Construct Cross-Validated Redundancy	190
Table 5. 17	Structural Model Assessment of Model B.....	192
Table 5. 18	Strength of the Moderating Effects Based on Cohen’s (1988) and Henseler and Fassott’s (2010) Guidelines	194
Table 6. 1	Category of selected informants.....	196
Table 6. 2	The general profile of the informants.....	202
Table 6. 3	Summary of the theme and sub-theme.....	204
Table 6. 4	General profile of the informants.....	331
Table 7. 1	Summary of the Hypotheses testing results of Objective Two (Technology Perspective).....	264
Table 7. 2	Summary of the Hypothesis Testing for Objective Two (Organization Perspective).....	266
Table 7. 3	Summary of the Hypothesis testing Results for Objective Two (Environment perspective)	267
Table 7. 4	Summary of Hypothesis Testing Results for Objective Two.....	268
Table 7. 5	Summary of Government Support Moderating Relative Advantage	271
Table 7. 6	Summary of Government Support Moderating Cost Savings	271
Table 7. 7	Summary of Government Support Moderating Cost Savings	273

List of Figures

Figure 1. 1: Organization of Chapters.....	19
Figure 2. 1: Education in Nigerian Education.....	22
Figure 2. 2: E-learning challenges in developing countries HEIs	23
Figure 2. 3: E-learning Technology	29
Figure 2. 4: Synchronous Learning.....	30
Figure 2. 5: Asynchronous Learning.....	31
Figure 2. 6: Blended Learning.....	32
Figure 2. 7: Cloud Computing Reference Architecture	46
Figure 2. 8: Cloud Computing services available to Cloud User	48
Figure 2. 9: CSPs and their activities.....	49
Figure 2. 10: Software-as-a-Service Model.....	54
Figure 2. 11: Platform as a Service.....	55
Figure 2. 12: Infrastructure as-a Service	56
Figure 2. 13: On-premises Infrastructure Vs Infrastructure-as-a-Service	64
Figure 2. 14: IaaS in E-learning.....	66
Figure 2. 15: Technology Acceptance Model.....	95
Figure 2. 16: The Extended Technology Acceptance Model 2	97
Figure 2. 17: Theory of Reasoned Action (TRA)	99
Figure 2. 18: Theory of Planned Behavior (TPB).....	100
Figure 2. 19: Unified Theory of Acceptance and Use of Technology (UTAUT)...	102
Figure 2. 20: Unified Theory of Acceptance and Use of Technology 2	104
Figure 3. 1: Diffusion of Innovation	106
Figure 3. 2: Refined DOI by Moore and Benbasat (1991).....	107
Figure 3. 3: The Technology Organization and Environment framework	109
Figure 3. 4: The Conceptual Model of the Study.....	118
Figure 3. 5: The Hypotheses of the Study	127
Figure 4. 1: Explanatory Sequential Design	138
Figure 4. 2: Research Process Adapted from Kumar (2014).....	141
Figure 4. 3: Federal and State Universities in Northern Region of Nigeria	157
Figure 4. 4: The output of a Priori Power Analysis.....	158
Figure 5. 1: The Analysis of Homoscedasticity	172

Figure 5. 2: A Dual-Step Process of PLS Path Model Assessment.....	178
Figure 5. 3: Measurement Model.....	179
Figure 5. 4: Structural Model with Moderator (Full Mode).....	186
Figure 5. 5: The Moderating Role of Government Support in Model B.....	191
Figure 6. 1: Interview process and Data Management	200
Figure 6. 2: Model of all themes and sub-themes	206
Figure 6. 3: Theme 1, Model of Compatibility of IaaSBEL in Nigerian HEIs.....	207
Figure 6. 4: Model of Interoperability issues.....	208
Figure 6. 5: Model of Staff Training.....	210
Figure 6. 6: Theme 2, Model of Competitive Pressure.....	212
Figure 6. 7: Model of Culture and behavior	213
Figure 6. 8: Model of Traditional Method of Teaching and Learning.....	216
Figure 6. 9: Model of Government support, Relative Advantage, and Trust.....	218
Figure 6. 10: Model of Corruption/Personal Interest.....	219
Figure 6. 11: Model of Lack of Support/Maintenance	221
Figure 6. 12: Model of Lack of Policy	224
Figure 6. 13: Model of Top Management Support.....	226
Figure 6. 14: Model of Assessing CSPs Reliability, Cost, and Security.....	227
Figure 6. 15: Model of Lack of Awareness.....	229
Figure 6. 16: Model of Fear of Losing Job.....	233
Figure 6. 17: Model of ICT Limit Fraud.....	235
Figure 6. 18: Model of Lack of Management Support	240
Figure 6. 19: Model of Trust and Security	244
Figure 6. 20: Model of Data Location Issues.....	245
Figure 6. 21: Model of Lack of Trust.....	248
Figure 6. 22: The Process of Mixing Qual-qual Results.....	256

List of Appendices

Appendix A: Questionnaire.....	320
Appendix B: Preliminary Analysis and Factors Confirmation: Qualitative Study .	325
Appendix C: Preliminary Analysis and Factors Confirmation: Interview Questions sample.....	326
Appendix D: Qualitative Findings	331
Appendix E: Interview Transcription.....	336
Appendix F: Consent Form.....	343
Appendix G: Quantitative Practitioners Validation.....	345
Appendix H: Data Collection Form.....	354
Appendix I: Pilot Study	355
Appendix J: Questionnaire (Item Validation).....	356
Appendix K: Operational Definition Confirmation.....	369
Appendix L: Qualitative Interview Questions Validation	373
Appendix M: Qualitative Interview Questions: Qual Phase	374
Appendix N: Trustworthiness: Peer Debriefing.....	380
Appendix O: Member Checking.....	382
Appendix P: Population and Sampling	391
Appendix Q: Recommendations and Expert Comments	404
Appendix R: Recommendation Expert Comments	412
Appendix S: Ministry of Education Circular on Stopping Education in Nigeria....	415

List of Abbreviations

CC	Cloud Computing
OS	Operating System
IV	Independent Variable
DV	Dependent Variable
MV	Moderating Variable
RA	Relative Advantage
TR	Trust
IS	Information System
IT	Information Technology
VM	Virtual Machine
IaaS	Infrastructure as-a Service
PaaS	Platform as-a Service
SaaS	Software as-a Service
LMS	Learning Management System
CSP	Cloud Service Provider
TOE	Technology, Organization, Environment
DOI	Diffusion of Innovation
ICT	Information Communication Technology
COM	Compatibility
HEI	Higher Education Institutions
SEC	Security
TMC	Top Management Commitment
OLS	Ordinary Least Square
NUC	National Universities Commission
IaaSBEL	Infrastructure as-a Service-Based E-learning
PLS-SEM	Partial Least Squares-Structural Equation Modelling
UNESCO	United Nations Educational, Scientific, and Cultural Organization
NIST	The National Institute of Standards and Technology

NITDA	National Information Technology Development Agency
NUC	National Universities Commission
q^2	Effect Size
Q^2	Predictive Relevance
R^2	Coefficient of Determination
SD	Standard Deviation
β	Path Coefficient
X^2	Chi-Square
z-score	Standardize Score
α	Cronbach's Alpha
\sqrt{AVE}	Square-Root of AVE



CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter comprises the research questions, objectives, and the statement of the problem. It further concentrates on the motivation, extraction of the research gaps with research questions. The scope, limitations of the expected contributions, and the summary of the chapter were further elaborated.

1.2 Introduction

Cloud Computing (CC) model is a virtualized type of computing where resources are scaled via the internet as a service (Sabi et al., 2018). The CC's trend is expected to reshape Information Technology (IT) process (Nguyen et al., 2014). Thus, it is perceived as one of the easiest ways of economic independence, solving the day's social and political conundrums (Brown & Duguid, 2017). In particular, IT helps provide services, effectiveness, and efficiency in providing and improving teaching and learning processes. The ongoing advancement of IT ideas, for example, e-learning and CC, has secured critical consideration from different businesses and governmental agencies (Buyya et al., 2009).

E-learning, as defined by Horton (2011), refers to the “use of electronic technologies for creating learning experiences” (p. 5). The learning encounters here may allude to a wide range of transmission of e-learning, instructing, and learning experience (Wahab, 2016). Thus, e-learning is a vital aspect of “Higher Education Institutions (HEIs)” in emerging nations, as it proffers easy access to e-learning contents and mitigates education needs. Hence, perceived by the majority as a way of financial stability and a source of standard education for all (Hvorecký, 2004; Macleod, 2005).

Furthermore, e-learning and CC are the inexorable shift in ICT (Nguyen et al., 2014). Thus, the growth of ICT concepts such as CC has gained significant attention as they consistently prove to be efficient in cost reduction without upfront commitment in a pay-per-use approach (Buyya et al., 2009; Mell & Grance, 2012; Ghazali et al., 2017). The CC is defined by the “National Institute of Standards and Technology (NIST)” as a model that allows abundant, suitable, and on-demand network access to a mutual pool of configurable computational (Mell & Grance, 2012). It further allows services like the network, servers, data storage, and software applications to be quickly delivered. The CC for e-learning is an emerging area that could provide “education as-a-service” to the emerging nations at a cheaper cost.

1.3 Background of The Study

ICT helps developing countries in attaining a better standard of living (Brown & Duguid, 2017). Thus, it is a way of deciphering societal, financial, and political conundrums of the day (Brown & Duguid, 2017). In Nigeria, ICT also provides efficient and effective services to improve teaching and learning processes (Lawrence & Tar, 2018). The swift step of globalization, coupled with the revolution in ICT, has inspired governments worldwide to continuously grasp e-services to convey statutory responsibilities in the public domain (Abdullahi, 2019).

The ICT revolution has brought a drastic and effective use of educational ICT initiatives to lessen tedious paper works, disorganization, inefficiency, and the bureaucratic bottleneck in several divisions of authority, predominantly in HEIs. The use of ICT in e-learning conveys abundant advantages to the HEIs in developing countries at a reduced cost, eases the availability of learning materials and resources to meet student needs. Notwithstanding its advantages, “developing countries are challenged with poverty, inadequate infrastructure, inadequate infusion and use of ICT, lack of learning facilities,

and lack of trained personnel” (Segooa & Kalema, 2015). This, probably due to the ineffective education policies and the harsh economic reality (Aworanti, 2016; (Abdullahi, 2019).

In developing countries, HEIs are challenged with numerous problems transiting from their former education system to the new e-learning system due to economic, social, cultural, political, and lack of skilled experts (Farid et al., 2015). Besides, e-learning difficulties are further ascribed to poor e-learning infrastructure and strategies, economic curtailment, absence of cheap and satisfactory internet bandwidth, and shortage of technical skills (Tarus et al., 2015). Equally, the challenges of e-learning incorporate; insufficient funding, poor infrastructure, instructional materials, provision of course materials, and human resources (Anaekwe & Nnaka, 2017).

Particularly in Nigeria, the “Nigerian National Bureau of Statistics (NBS) and the Joint Admissions and Matriculation Board (JAMB)” outline that between 2010 to 2015, out of the 10,000,000 candidates that sort admission into the HEIs, only a meagre 26% gained admission (JAMB, as cited in Kazeem, 2017). In fact, In 2017 alone, the aggregate number of students applying to the 40 federal universities in Nigeria is 1,212,818 (Amakvitaa, 2017). Nigerian universities cannot cater to all these students yearly. As a result, the Nigerian Government opted for “Open and Distance Learning (ODL)” (Tom, Virgiyanti, & Rozaini, 2019). The ODL is flexible and cost-effective to implement. Nonetheless, one of the challenges of the ODL is the complications in accessing and utilising ICT, ineffective response, and unavailability of study resources (Musingafi et al., 2015).

Furthermore, "The global scale and speed of the current educational disruption are unparalleled and, if prolonged, could threaten the right to education, UNESCO Director-General Audrey Azoulay". Besides, the “World Bank (WB)” and the “International Monetary Fund (IMF)”, "add to call for the G20 of whom China is the biggest lender to

Africa to ease pressure on countries struggling to cope" (Nyabiage, 2019). Thus, due to the COVID-19 pandemic, countries are grounded, which aggravates the economic shock and suffering, especially in emerging economies. "The global economic prospects remain subdued and very uncertain due to the coronavirus outbreak" (Organization for Economic Co-operation and Development [OECD], 2020). In 2016, due to unreliable economic policies over the decade, coupled with the recent recession and escalating security issues in the North East and the delta areas, Nigeria's economy slide into recession (African Economic Outlook [AEO], n.d.).

Furthermore, Nigeria's economy first slipped into recession in decades, with the "Gross Domestic Product (GDP)" growth for 2016 is evaluated at -1.5% (African Economic Outlook [AEO], n.d.). Besides, according to the African Development Bank (ADB), Nigeria's GDP growth was estimated at 2.3% in 2019, higher than 1.9% in 2018 (African Development Bank [ADB], 2020). The growth attained was mainly in the transport, oil sector, as well as ICT. Nonetheless, poverty is still general in Nigeria, with over half of the 36 states above the 69% average. Hence, high poverty rates translate into rising joblessness (ADB, 2020). According to Adegoke (2020), the main problem facing African countries is debt; following a decade of cheap credit, numerous African countries have piled on debt to address various issues, ranging from infrastructure, health, and education. The Nigerian budget on education is merely 7.05% of the overall budget. This Shows the need for utilizing ICT for education, especially CC, to reduce cost and advance the efficiency of e-learning.

Likewise, the developed countries are opting for Cloud-based e-learning solutions like the "Infrastructure as a Service-Based E-learning (IaaSBEL)". For example, Hokkaido University in Japan implemented Cloud-based e-learning to lessen the cost, security issues, course development time from 6 hours to 2 hours, and data storage issues using the Microsoft Azure Cloud (Kobayashi, 2018). Likewise, the Instituto de Empresa (IE) business school in Spain used Blackboard and Adobe Connect to provide its students with an online classroom environment (Amazon Web Service [AWS], 2018). In the same vein,

Staffordshire University went all-in on Microsoft Azure for digital transformation (Donnelly, 2017). Given the lesson learned from the developed countries, the IaaSBEL technology might be useful to the Nigerian HEIs in terms of; cost savings, standardized and up-to-date software, security, scalability, and availability of e-learning services. The growing influx of students seeking admission into the Nigerian HEIs is only compounding the existing access to education. So, utilizing IaaSBEL could help provide access to education for all in a timely and cost-effective manner. Therefore, despite the apparent potentials of CC for e-learning, IaaSBEL adoption concerning how it affects the Nigerian HEIs only began to be researched and understood.

1.4 Problem Statement

Mell and Grance (2012) refer to CC as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud-Based E-learning is the subdivision of CC in the education field for e-learning systems; it is the future of e-learning technology and infrastructure (Nguyen et al., 2014). Cloud-Based e-learning is comprised of the hardware, software resources to enhance the traditional e-learning infrastructure. The Infrastructure-as-a-Service (IaaS) deployment model provides the Cloud subscriber's capability to provision processing, storage, networks, and other fundamental computing resources where the Cloud subscriber can deploy and run arbitrary software. This includes OS and applications, through the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere (Mell & Grance, 2012; Tom, Virgiyanti, & Rozaini, 2019).

Furthermore, e-learning seems to be a viable option to ameliorate the Nigerian Higher Education Institutions (HEIs). E-learning in this study refers to "the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, exchange and collaboration anytime and anywhere" (Alonso, Lopez, Manrique, & Vines, 2005, p. 218). Utilizing the e-learning system is effective when compared to the traditional learning method. Nevertheless, e-learning is confronted with numerous challenges in Nigerian Universities, especially during the COVID-19 pandemic, since it was the only medium of teaching and learning (Adeoye et al., 2020). Higher education or learning is one of the instruments for social, political, and economic development (Tom et al., 2019). Thus, higher education contributes to national development via relevant knowledge and skills towards problem-solving. Providing an effective and efficient higher learning experience is the responsibility of every nation, as suggested by the UN resolution on education (United Nations [UN], 1948).

In Addition, the advancement in technology is evolving at an alarming pace that is challenging to match, forcing HEIs to innovate. The current traditional education system in Nigerian is not sustainable and unsalvageable due to the numerous issues, which include power disruption, deficit infrastructure, inadequate availability of software and hardware, technical skills, lack of affordable Internet, dwindling power supply, lack of sufficient funds, and insufficient Technological support (Oloyede et al., 2017; Edokpolor & Egbri, 2017; Edomwonyi & Osarumwense, 2017; Anagwo et al., 2019; Tens, 2019; Tom, Virgiyanti, & Osman, 2019). Hence, due to the above-listed issues, the Nigerian Government opted for Open and Distance Learning (ODL) to lessen education's dilapidated system (Bisanda, 2009; Tom et al., 2019). Nonetheless, ODL is hard to maintain.

Furthermore, despite the numerous advantages of e-learning, developing countries' HEIs are still challenged with: insufficient investment in infrastructure, regardless of open or commercial e-learning application, equipment needs, support services, and insufficient

technological support (Kashif & Shaikh, 2016; Turban et al., 2018). Hence, many HEIs in Nigeria cannot afford it (Muhammad & Abdulrahman, 2015). Institutions with low budgets will undoubtedly find it challenging to implement e-learning (Tom et al., 2019). Nevertheless, some universities are ready to remould their educational e-learning system; however, the old traditional system is still used (Kashif & Shaikh, 2016). Hence, this is factual considering Nigeria's proposed 2018 budget on education as only 7% of the total budget (Adedigba, 2017), which is less than the "15-20% recommended by the United Nations Educational, Scientific and Cultural Organization (UNESCO)." The Nigerian education budget from 2017 to 2018 ranges between 550 (7.38) and 605.8 (7.03%) Billion Naira (Adedigba, 2017). Astonishingly, there is no significant difference in the education budgetary from 2019-2020 620.5B (7.25%), and 671.07B (6.7%) Naira (Amoo, 2019; National Bureau of Statistics [NBS], 2020). Based on the above statistics, it is pertinent for the Nigerian Government to search for other affordable education methods for all. Therefore, CC is suggested by the extant literature as the solutions to the present e-learning challenges in developing countries in general and Nigeria in specific (Sabi et al., 2017, 2018; Tom et al., 2019; Abur, 2019; Hiran & Henten, 2020).

Higher education in developing countries in general and Nigeria in specific is bedevilled with numerous problems that include power disruption, lack of technical know-how or skills, poor infrastructure, lack of bund, insufficient technological support, inadequate storage, and inadequate resources to support research, teaching and collaboration (Meegama et al., 2015; Naresh & Reddy, 2015; Tarus et al., 2015; Farid et al., 2015; Kashif & Shaikh, 2016; Anaekwe & Nnaka, 2017; Turban et al., 2018; Tom et al., 2019). Besides, Oyediran et al. (2020) opined on the problems of e-learning in Nigeria: poor electricity supply, high cost and poor quality of e-learning facilities, and poor technical know-how of e-learning, poor internet connectivity, lack of telecommunication infrastructure, and lack of training support by the institutions. Also, the challenges of e-learning in Nigeria, according to Adeoye et al. (2020), include epileptic power supply, high cost of data, and cost of hardware (e.g., PCs and laptops). Thus, inadequate funding, lack of infrastructures, inadequate teaching, and learning facilities, the problem of an

access road to the institutions, insecurity, limited vacancies or slots for admission known as carrying capacity, very high student-lecturer ratio due to lack of lecturers or instructors are among the encountered e-learning issues in Nigeria. Besides, there is a limited number of tertiary institutions in Nigeria (Ekwonwune & Oparah, 2020). Similarly, Ifijeh and Yusuf (2020) listed the challenges of libraries using ICT to include inadequate funding, poor technological infrastructure, and lack of skilled personnel.

The location independence of cloud-based e-learning can help both staff and students in Nigeria's HEIs access dependable and elevated performance like the ones utilized in developed countries' HEIs; Due to the minimal empirical research on exploring the relevant factors combined, the dearth infrastructure impacts the viewpoint towards CC adoption and usage by university staff. Again, its little or lack of adoption in developing countries was further postulated by Sabi et al. (2017). Besides, numerous authors agree to the lack of cloud-based e-learning (IaaSBEL) adoption in developing countries (Almazroi et al., 2016, 2019; Ariwa & Ariwa, 2017; Sabi et al., 2017; Adam et al., 2019; Tom, Virgiyanti, & Rozaini, 2019; Hiran & Henten, 2020). Still, in the context of Nigeria, no studies have explored the usage and adoption of CC in HEIs (Abur, 2019; Tom, Virgiyanti, & Rozaini, 2019). Also, Ariwa and Ariwa (2017) and Njenga et al. (2019) have emphasized the scarcity of research in developing countries' HEIs.

The lack of adoption of IaaSBEL in Nigerian HEIs is the main problem. Nonetheless, there are studies on CC adoption in HEIs; however, the studies are abstract without rigorous analysis and empirical evidence. With the high percentage of out of school children, 76% of students seeking admission were rejected due to the limited infrastructure, in-effective e-learning, insufficient education budget, lack of available infrastructure, and security challenges merged education for the citizens (see section 2.8.2, for more details). This study tries to fill this gap by looking at the factors that will influence the Intention to adopt the IaaSBEL in Nigerian HEIs.

In the same vein, CC for e-learning is argued by numerous authors as the solution to the on-premise e-learning challenges (Aremu et al., 2015; Wahsh & Dhillon, 2015; Almazroi et al., 2016; Al-Badi et al., 2017; Amron et al., 2017). Thus, it will help in providing education for all in a cost-effective manner (Nguyen et al., 2014; Sharma et al., 2016; Kayali et al., 2016; Al-Badi et al., 2017; Karim & Rampersad, 2017; Palos-Sanchez et al., 2017; Shana & Abulibdeh, 2017). However, cloud-based e-learning studies have been explored to a limited degree in developing countries (Karim & Rampersad, 2017; Sabi et al., 2018; Abur, 2019; Adam et al., 2019; Almazroi et al., 2019; Njenga et al., 2019; Tom, Virgiyanti, & Rozaini, 2019). Besides, CC for e-learning adoption in Nigeria is lacking (Abur, 2019; Oyoyo & Rehema, Baguma, 2019; Tom, Virgiyanti, & Rozaini, 2019). Thus, it is due to the limited available empirical studies on IaaSBEL adoption in developing countries, specifically Nigeria. This study tries to fill the gap by conducting an empirical study on the factors influencing the Intention to adopt IaaSBEL model using sequential explanatory research design.

Likewise, the need for an empirical study on factors that impact CC for e-learning adoption in emerging nations HEIs was emphasized by Almazroi et al. (2016), Kayali et al. (2016), Shana and Abulibdeh (2017), and Sabi et al. (2017, 2018). Thus, fewer studies have investigated the influencing factors in Nigeria. So, CC for e-learning is still in its infancy stage (Nguyen et al., 2014; Karim & Rampersad, 2017), and more studies are needed (Kayali et al., 2016; Sabi et al., 2018; Tom, Virgiyanti, & Rozaini, 2019). This study is significant in developing countries, and specifically Nigeria. There is, however, limited empirical studies on the influencing factors of IaaSBEL adoption. In the same vein, empirical studies revealed that previous studies on CC for e-learning adoption in Nigeria are mainly theoretical studies only, without rigorous analysis (Abur, 2019). Specifically, IaaSBEL in Nigerian HEIs focuses on the advantages, disadvantages without empirical studies on its adoption. Thus, establishing a clear opportunity to conduct further study on the Intention to adopt IaaSBEL in Nigerian HEIs from the ICT directorates'

perspective. The ICT directorates oversee all ICT implementation and maintenance in Nigerian universities (Okai et al., 2014; Tom et al., 2019).

Furthermore, preceding studies were reviewed to identify the factors that influence the Intention to adopt IaaSBEL in Nigeria, and the Technology Organization and Environment theory (Tornatzky & Fleischer, 1990) and Diffusion of Innovation (Rogers, 1995) theory were adapted. The factors are categorized into Technological, Organization, and Environment perspective. The Technology factors comprise Relative Advantage, Compatibility, Trust, and Security. Thus, the Technology factors comprise Relative Advantage, Compatibility, Trust, and Security. The organizational factors include the Top Management Commitment, Cost Savings, and the Environmental factors include Competitive Pressure and Service Provider Support. Hence, all the Technological, Organizational, and Environmental factors were found to influence institution Intention to adopt CC (Nguyen et al., 2014; Alhammedi et al., 2015; Almazroi et al., 2016; Al Isma'ili et al., 2016; Workineh et al., 2017).

Nonetheless, previous studies have shown inconsistency in the influencing factors such as the Relative Advantage, Trust, Cost Savings, and the Intention to adopt IaaSBEL. Thus, based on Baron and Kenny's (1986) submission, introducing a moderating variable (Government Support) is crucial as it will assess whether the relationship changes, strengthens, or weakens with its introduction. Moreover, as Chong et al. (2010) and (Hassan et al., 2017) indicated, Japan, Malaysia, and Singapore's technology adoption are high due to government investment in technology. Thus, in economies where the Government is the primary driver, there is a need for the Government to assume a vital role in encouraging technology adoption (Chong et al., 2010; Hassan et al., 2017). Likewise, if the Nigerian Government makes policies that support e-training usage, there is a likelihood of compliance (Zainab et al., 2015).

Moreover, preceding studies like Ramanathan et al. (2014) and Kousar et al. (2017) utilized Government Support to moderate their variables' association. Hence, their study focused on RFID and Green innovation adoption In Pakistan. However, it has not been used from the perspective of Nigerian HEIs. It is essential to comprehend the effect of Government Support on the relationship between the Relative Advantage, Trust, and Cost Savings toward the Intention to Adopt IaaSBEL. Given the research problems explicitly presented in the Nigerian context, none of the previous research utilized Government Support as a Moderating Variable.

In summary, there is a lack of adoption of IaaSBEL in Nigerian HEIs and scarce available evidence on the factors that influence the Intention to adopt IaaSBEL in Nigeria. These shortcomings have mired strategy development from improving the adoption as well as implementing IaaSBEL in Nigeria. One of the study's main contributions is to recognize and assess the factors that influence the Intention to adopt IaaSBEL to implement it based on the final model. Therefore, the adoption of IaaSBEL in Nigeria will serve as a stepping-stone towards efficient and effective e-learning. Hence, offering "education as-a-service" to all citizens at a subsidized rate.

1.5 Research Questions

This study addresses the following five (5) research questions:

RQ1: What factors influence the Intention to adopt a Public IaaSBEL Model in Nigerian HEIs?

RQ2: How can Relative Advantage, Compatibility, Trust, Security, Top Management Commitment, Cost Savings, Competitive Pressure, and Service Provider Support predict the Intention to adopt a Public IaaSBEL Model in Nigerian HEIs?

RQ3: Does Government Support moderate the relationship between Relative Advantage, Trust, Cost Saving, and the Intention to adopt a Public IaaS BEL Model in Nigerian HEIs?

RQ4: How to develop the Intention to adopt a Public IaaS BEL model for the Nigerian HEIs?

RQ5: Does the qualitative method validate the results from the initial quantitative method?

1.6 Research Objectives

In line with the research questions, this study's objective is to develop the Intention to adopt the IaaS BEL model for Nigerian HEIs. The sub-objectives are as follows:

RO1: To identify the factors that influence the Intention to adopt a Public IaaS BEL Model in Nigerian HEIs.

RO2: To determine the relationship between Relative Advantage, Compatibility, Trust, Security, Top Management Commitment, Cost Savings, Competitive Pressure, Service Provider Support, and the Intention to adopt a public IaaS BEL Model in Nigerian HEIs.

RO3: To assess the moderating effect of Government Support on the relationship between Relative Advantage, Trust, and Cost Savings on the Intention to adopt a Public IaaS BEL Model in Nigerian HEIs.

RO4: To validate the quantitative results using the qualitative method.

RO5: To develop and validate the implementation strategy based on the Intention to adopt IaaS BEL model.

1.7 Purpose Statement

This study's primary objective is to describe and understand the factors that influence HEIs Intention to adopt IaaS/BEL using the sequential explanatory research design method (Creswell, 2014). The first phase of the study is the quantitative exploration of ICT directorates top managers in Nigerian HEIs, for which statistical analysis was carried out. The findings generated from the quantitative study led to the development of the qualitative semi-structured interview questions, where informants elaborate on some unexpected results based on the statistical findings (Creswell & Creswell, 2018). Therefore, both phases' data were combined in the final analysis to provide a holistic view and understanding of the ICT director's Intention to adopt IaaS/BEL in Nigerian HEIs.

1.8 Significance of the study

The study provides empirical evidence on the Intention to adopt IaaS/BEL factors by the ICT directorates top managers in Nigerian HEIs. Thus, several studies have established substantial evidence regarding the importance of these variables in influencing the Intention to adopt IaaS/BEL, especially in developing countries HEIs (Abur, 2019; Almazroi et al., 2016, 2019; Tom, Virgiyanti, & Rozaini, 2019). Firstly, contemporary empirical studies have investigated numerous factors that influence the adoption of cloud-based e-learning; nonetheless, limited studies combined the Technology, Organization, and Environmental factors. Secondly, preceding studies focus on the general cloud service models or SaaS; hence, less attention is given to the IaaS service model. Thirdly, extant studies did not specify the type of cloud deployment model since CC is diverse, less study focused on the public cloud deployment model.

Fourthly, this study investigates the impact of Technology, Organization, and Environment factors towards the Intention to adopt IaaS/BEL in Nigerian HEIs, expressly, the Federal and State universities. The TOE and DOI theories were amalgamated with

other external variables contributed to the scarcity of empirical evidence on the issues not addressed in the literature. The theories contributed and expanded its applicability in evaluating IaaS/BEL adoption among ICT directorates top managers. Hence, incorporating Technology (Relative Advantage, Compatibility, Trust and Security), Organization (Top Management Commitment and Cost Savings), Environment (Service Provider Support and Competitive Pressure), with the introduction of a Government Support as a moderator in the relationship between Relative Advantage, Trust and Cost Savings concurrently.

Fifthly, the study's findings helped in grasping and understanding the essential requirements when adopting innovation in HEIs. It also helps develop strategies that will aid HEIs decision-makers, students, and staff in northern Nigeria and Nigeria at large. The study will serve as a guideline for the Cloud Service Providers (CSPs) to know which requirements are crucial since CC is bedevilled with security, trust, and data owners (Ghazali et al., 2017). Lastly, the study proposes recommendations on how to adopt IaaS/BEL technology to provide education for all as-a-Service, where universities can easily host their e-learning system in a subsidized manner.

1.9 Scope of The Research

This study aims to investigate the potential factors that influence the adoption of IaaS/BEL in Nigeria. CC is a diverse area, and it comprises three deployment models; IaaS, PaaS, SaaS, and four service models; Public, Private, Community, and Hybrid cloud. However, this study focuses on the Public IaaS model for e-learning since it requires less technical knowledge, and cloud subscribers can easily subscribe to the solutions based on a pay-per-use method to suit their required specifications.

Furthermore, this research's respondents are the ICT directorates top managers of all the Northern Nigerian universities, both Federal and State-owned. Thus, the respondents are the ICT Directorates, top managers. Secondly, the respondents are knowledgeable and experts in the field of Computer Science and e-learning. As for the underpinning theories, TOE and DOI will be blended and adapted. Moreover, a mixed-method approach was utilized to assess the factors that influence the Intention to adopt IaaSBEL in Nigeria. Data were generated via a questionnaire and semi-structured interviews, and the findings of the study shall be used to design the planning and management of the IaaSBEL adoption in Nigerian HEIs. Table 1.1 specifies the scope of the study.

Table 1. 1

Tabular Summary of Research Scope

Scope	Nigeria
Domain	E-learning and CC
Types of Study	IaaSBEL
Theory	TOE and DOI
Field of Study	All Public Universities in the North-East, North-West, and North-Central region of Nigeria.
Type of Field of Study	Federal and State Universities
Respondents	ICT Director, ICT-Deputy Director, Unit Head, Assistant Unit Head and Deans
Service model	Public cloud
Deployment Model	IaaS
Research Instrument	Questionnaire and Interview
Study Design	Mixed-Method (Sequential exploratory design)

Table 1.1 presents a summary of the scope of this research. The scope is summarized as the domain, types of study, theory, the field of study, and respondents.

1.10 Research Motivation

Today, Nigeria is faced with a critical shortage of appropriate teaching material, storage and maintenance, economic factor, and inadequate skills (Abur, 2019; Tom, Virgiyanti, & Rozaini, 2019). Hence, the challenges of e-learning are not related to technology only, but economic, social, and educational. Thus, Nigerian universities face a severe shortage of experienced ICT professionals supporting real e-learning implementation (Aboderin, 2015; Anaekwe & Nnaka, 2017). Going by the above submissions, the need for a cloud-based solution is of utmost significance for improved education in developing countries in general and Nigeria in specific.

In addition, the Gross Enrolment Rates (GER) in Africa remains the lowest in the world, despite facing the increasing population and demand for access to higher education (Oliveri & Wendler, 2020). Further aggravating the lack of sustainability of HEIs in Nigeria is due to inadequate funding (Filho et al., 2018). Inadequate funding has led to the deterioration of infrastructural facilities in the education sector (Oke et al., 2018). These issues subsequently led to the resurgence of the strike in the HEIs due to inadequate funding (Channy & Ogunniran, 2019). The education sector in Nigeria is underfunded compared to many other developing countries (Sabi et al., 2018; Uthman, 2018; Tom, Virgiyanti, & Osman, 2019). In Nigeria, the tertiary level of education is the most expensive among all other education levels, such as pre-primary, secondary, and adult education (Oralu & Oladele, 2016). The high cost of tertiary education needs to be addressed by the Government and all the relevant stakeholders not to defeat education.

1.11 Operational Definitions of Key Terms

For clarification and consistency purposes, the following terminologies in the context of the study are operationalized as follows:

- i. **Cloud Computing:** Mell and Grance (2011) refer to CC as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., Networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.
- ii. **Cloud-Based E-learning:** Cloud-Based E-learning is the subdivision of CC in the education field for e-learning systems; it is the future of e-learning technology and infrastructure (Nguyen et al., 2014). Cloud-Based E-learning is comprised of the hardware, software resources to enhance the traditional E-learning infrastructure.
- i. **E-learning:** There are many definitions of the term e-learning, and it is often used synonymously with the term online learning (Darking, 2004), Web-based learning (Chiu & Wang, 2008), Technology-mediated learning (Alavi & Leidner, 2001), technology-enhanced learning (Mayes & De Freitas, 2004). Thus, different authors define e-learning differently to suit their objectives. Hence e-learning in this study refers to "the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, exchange and collaboration anytime and anywhere" (Alonso, Lopez, Manrique, & Vines, 2005, p. 218).
- iii. **Intention to Adopt:** The extent of the Intention for future use, before the initial adoption of the IaaSBEL in developing countries HEIs (Almazroi et al., 2016; Mathieson, 1991; Nguyen et al., 2014; Teo, Su Luan, & Ching Sing, 2008; Tweel, 2012; Venkatesh, Thong, & Xu, 2012).
- iv. **IaaS:** The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer can deploy and run arbitrary software, which can include operating systems and applications (Mell & Grance, 2012).

- v. **Public Cloud:** The cloud infrastructure is provisioned for open use by the public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them (Mell & Grance, 2012).
- vi. **IaaSBEL:** IaaSBEL is the capability provided to the Cloud subscriber to provision processing, storage, networks, and other fundamental computing resources where the Cloud subscriber can deploy and run arbitrary software. This includes Operating Systems (OS) and applications, through the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere (Alonso et al., 2005; Mell & Grance, 2012).

1.12 Organization of Chapters

This study comprises seven chapters, each of which presents a piece of unique information. Chapter One gives the general introduction of the study, problem background, problem statement, objectives, research questions, purpose statement, research scope, research motivation, theoretical and practical contributions, and the definition of terms, respectively. Chapter Two presents the literature review, definitions of CC, e-learning, education challenges in developing countries, Cloud-based e-learning, and IaaSBEL. Chapter Three presents the conceptual framework, and Chapter Four comprises the research methodology. Chapter Five consists of quantitative data analysis. Chapter Six presents qualitative data analysis. Finally, Chapter Seven consists of findings, discussion, conclusion, and recommendations. This activity is illustrated in Figure 1.1 below.

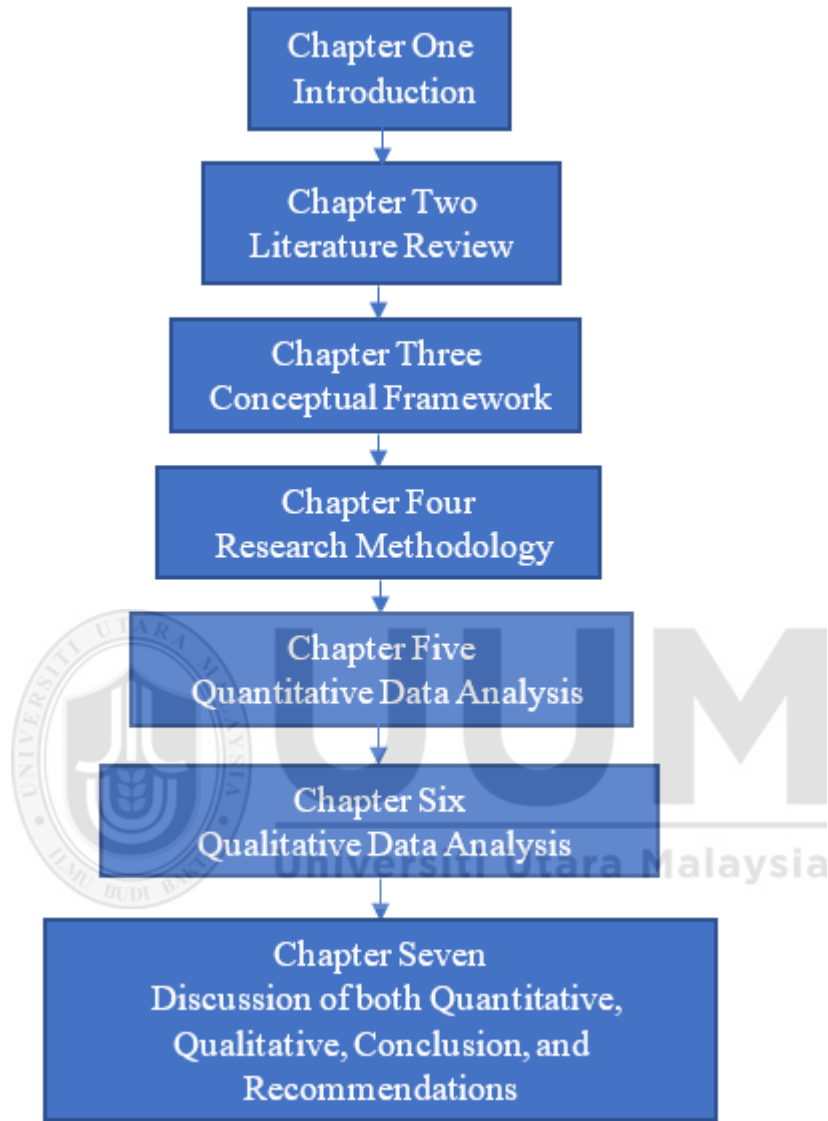


Figure 1. 1. Organization of Chapters

1.13 Summary

In this chapter, a summary of the study has been presented. It commences by highlighting the study background, which covered the role of ICT (e-learning) in education, followed by the introduction of CC and IaaS BEL. Additionally, the chapter also presented the problem statement that justifies the study, followed by the research questions and objectives. In the purpose statement and the scope section, the dimension (i.e., focus of research, location, population, sampling, theories, deployment model, and research design) was presented. The study's significance was, and the chapter was concluded by the definitions of terminologies utilized in the study. The next chapter presents the literature review.



Chapter 2

Literature Review

2.1 Overview

This chapter focuses on e-learning, and its types of challenges and benefits of e-learning are further elaborated. The evolution of CC, its characteristics, service, and deployment models of the CC infrastructure. The benefits and drawbacks of CC were also presented. Similarly, Cloud-Based e-learning (IaaSBEL), factors influencing IaaSBEL Intention to adopt model, theories, hypotheses, theoretical framework, justifications of selected theories and constructs are further presented in this chapter. Thus, this chapter paves the way for developing a Public IaaSBEL Intention to adopt Model for HEIs in Nigeria. Finally, the summary chapter will be discussed at the end of this chapter.

2.2 Education in Nigeria

Over the last 30 years, the education system in Nigeria has received a significant structural overhaul. The 6-3-3-4 (6 years primary, 3 years junior secondary, 3 years senior secondary school, 4 years of tertiary education) system of education was proposed in 1973 (Tens, 2019). Nigeria enacted the first National education policy in 1982 (Tens, 2019). Nigerian education is broken into “three (3): Primary education, Secondary education and Higher education”. Primary education commences at the age of six.

Nonetheless, three years old children may attend a pre-school popular called Nursery. Hence, students usually spend six years in primary school and graduate with a school leaving certificate. Upon completing primary school, students are enjoined to sit for Common Entrance Examination (CEE) to qualify into Federal and State Government schools. In the same vein, the Universal Basic Education (UBE) was developed to replace

Nigeria's primary education scheme of the 6-3-3-4 system (Wenr, 2019). The 9-3-4 system was designed in conformity with the Millennium Development Goals (MDGs) and the Education for All policy initiative (EFA) policy.

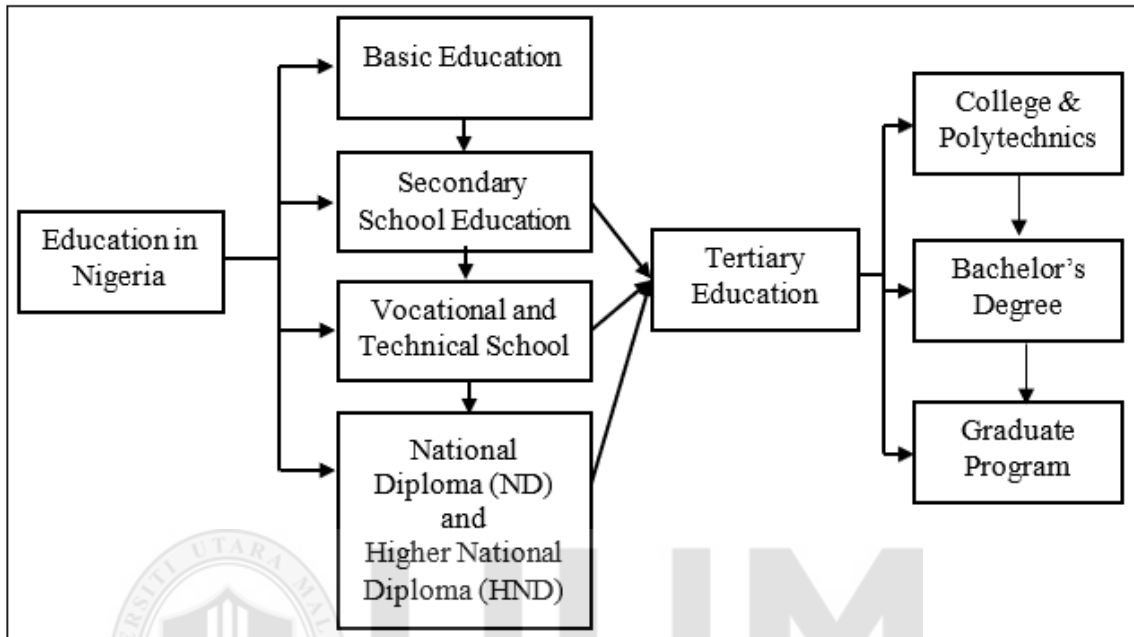


Figure 2. 1. Education in Nigerian Education

Figure 2.1 depicts Nigeria's educational structure, ranging from basic education, higher secondary education, tertiary education, colleges, polytechnics, and universities.

2.3 Challenges of Education in Developing Countries

One of the key drivers of improving prosperity and poverty elimination is education (World Bank [WB], 2013). Thus, the growth, development, and reduction of poverty hinge on students' knowledge and skills; nonetheless, the percentage of learning is frighteningly small in poverty-stricken countries (WB, 2013). Numerous scholars further support this; for instance, Sabi et al. (2018) listed the education problems in Uganda to include insufficient funds, poor infrastructure, inadequate technical resources to support

research, teaching and collaboration. Also, education in Kenya is challenged with poor e-learning infrastructure and strategies, economic limits, the absence of cheap and satisfactory Internet bandwidth, and scarcity of technical skills (Tarus et al., 2015). Further, preceding studies have shown similar and widespread crisis in the developing countries e-learning systems. This is mainly attributed to the scarcity of tangible education policies, infrastructural deficit, and the lack of enormous investment in the education sector poses an unlimited danger to the continent's learning and overall progress. Figure 2.2 illustrates the e-learning issues in developing countries.

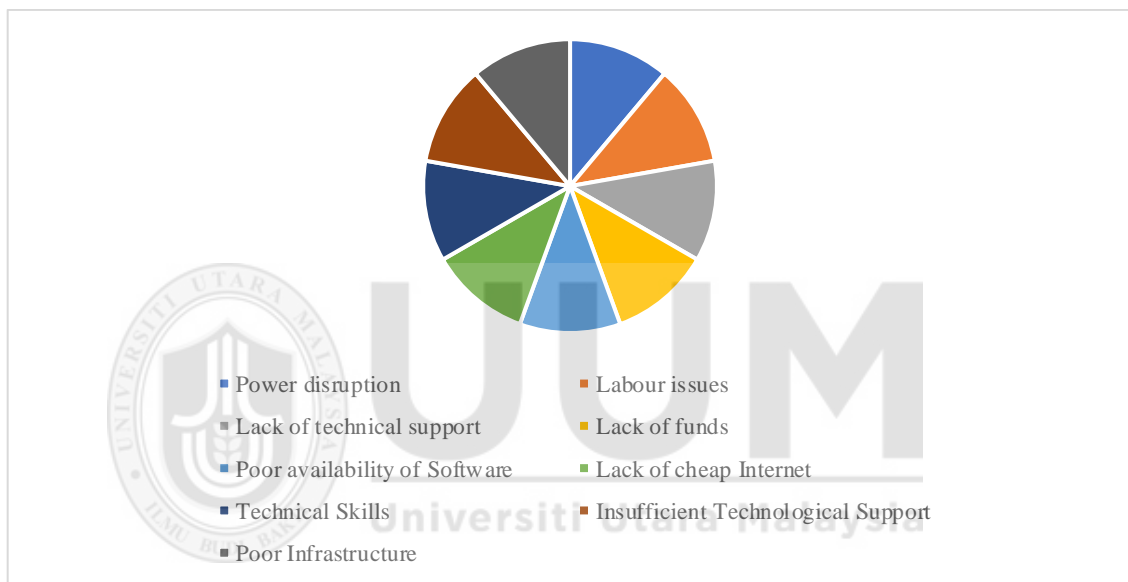


Figure 2. 2. E-learning challenges in developing countries HEIs
 Sources: (Adeyemi, 2011; Anaekwe & Nnaka, 2017; Farid et al., 2015; Kashif & Shaikh, 2016; Meegama et al., 2015a; Naresh & Reddy, 2015; Tarus et al., 2015; Turban et al., 2018)

Moreover, the inadequate provision of financial resources has been recognised as the greatest obstacle to education in Nigeria (Asiyai, 2013; Edomwonyi & Osarumwense, 2017; Tom, Virgiyanti, & Rozaini, 2019) However, in view of the contending demands for improving education, business education has found it challenging due to the inadequate provision of funds, qualified workforce, modern infrastructure, standardised and quality curriculum coupled with high unemployment and poverty in Nigeria

(Edomwonyi & Osarumwense, 2017). In addition, Iruonagbe et al. (2015) further submitted the Nigerian education problem as inadequate funding, inconsistent policies, infrastructural decay, insufficient budget allocation, outdated curricula, lack of research grants. According to Hashimi (2018), the major challenges of Nigerian education are the absence of suitable learning materials, lack of funds, and teachers' scarcity. In the same vein, technical and vocational education issues in Nigeria include lack of teacher motivation, inadequate facilities and funding, staff training and bribery, and corruption (Okoye & Arimonu, 2016).

Furthermore, The NBS and JAMB say that out of the 10,000,000 candidates that sort admission in the universities, only 26% gained admission (JAMB, as cited in Kazeem, 2017). In fact, In 2017 alone, the aggregate number of students applying to the 40 federal universities in Nigeria is 1,212,818 (Amakvitaa, 2017). In addition, “one in every five of the worlds out of school children is in Nigeria” (United Nations International Children’s Emergency Fund [UNICEF], 2020). Similarly, “the illiteracy population aged 15-24 account for 9,364,626, with male 3,509,338 and female 5,855,288 in 2018” (United Nations Educational Scientific and Cultural Organization [UNESCO], 2020). Nonetheless, the percentage of Nigerians seeking admission into tertiary education is alarming because, according to the NBS and JAMB, nearly 75% of college applications in Nigeria fail to get admission every year. Nonetheless, the NBS data also reveals a vast gap, such as the North-east region of Nigeria with the lowest literacy rates (Kazeem, 2017).

Therefore, it is clear from the above discussion that poor quality education is a serious problem in developing countries HEIs. An innovative method such as CC and e-learning system would reduce the problems of providing quality education in a subsidized manner. Hence, owing to the paucity of cloud-based e-learning adoption, providing effective and affordable e-learning proves to be complicated with numerous challenges. Hence, the adoption of IaaS BEL could be a solution to providing education for all at a subsidized

rate. Considering the stoppage of schools in Nigeria due to COVID-19, the adoption of IaaS BEL in the Nigerian HEIs would allow students to continued learning.

2.3.1 Education Challenges in Nigeria

The United Nations, in its article 26, stipulated that education is the right of every human (United Nations [UN], 1948). The Nigerian government enacted the first National Education Policy (NEP) in 1982 to give the populace education in line with the UN recommendation and emancipation from poverty (Tens, 2019). The 6-3-3-4 system is the current education framework adopted in Nigeria. The most crucial function of education is its ability to develop, equip citizens to emancipate themselves via creative thoughts and economic independence (Anagwo et al., 2019). Thus, despite the government's effort in providing education for all, it is still bedeviled with numerous issues ranging from curriculum content, intermittent Strike, Paucity of funds, scarcity of teachers, lack of study materials for students (Anagwo et al., 2019). Oloyede et al. (2017) opined that the challenges facing engineering education include too many enrolled students, inadequate facilities, poor expertise, poor infrastructure, teachers to student's ratio, lack of basic infrastructure, and poor access to the Internet.

Furthermore, Edomwonyi and Osarumwense (2017) suggested the issues facing business education in Nigeria to include in-adequate qualified workforce (human resources), lack of modern facility, quality curriculum/outdated curriculum, inadequate provision of infrastructural facilities. Nonetheless, inadequate financial resources have been identified as the greatest challenge facing education in Nigeria (Edokpolor & Egbri, 2017; Edomwonyi & Osarumwense, 2017; Tom, Virgiyanti, & Osman, 2019). Edokpolor and Egbri (2017) opined that this situation had devalued the image of business education both

n education and labor market. Therefore, based on the above-listed problems, the Nigerian government must look for standardized 4.0 solutions for e-learning.

Therefore, it is clear from the above discussion that there are numerous challenges in the Nigerian education system. According to the National Bureau of Statistics (NBS), the problem is yet to be addressed despite the meagre investment in education. The nation's numerous security challenges were followed by the outbreak of the covid-19 pandemic, which further aggravated and grounded the education in the Nigerian HEIs.

2.4 Impact and Challenges of ICT In Nigerian Education

ICT is broadly seen as a method for effecting changes in education processes. These processes, whenever used adequately, can mean improved training. The ICT serves as a pillar for remoulding educational systems, broadening pedagogy methods to swiftly adapt to variations in society. Hence, enhancing education efficiency, effectiveness, and productivity (Kim, 2009 as cited in Ukpe, 2013). Table 2.1 summarizes the impact and challenges of ICT in Nigerian Education.

Table 2. 1

The impact and Challenges of ICT in Nigerian Educational Institutions

S/No	Impact	Challenges	Source(s)
1	- Gender empowerment, transform the educational system, economy, expand access to education, facilitate learner-	- Unreliable power supply, inadequate and poor ICT infrastructure, limited connectivity, inadequate educational facilities, inadequate capacity	(Ukpe, 2013)

2	<ul style="list-style-type: none"> -It allows rapid development and participation in global research networks. - It will aid in overcoming staff scarcity, lack of textbooks and journals. - It provides easy access to learning contents 	<ul style="list-style-type: none"> - Resistance to change from traditional pedagogical methods to ICT-based learning. - Inadequate ICT infrastructure including - Lack of qualified ICT personnel - Lack of necessary infrastructural facilities to benefit from ICT. - Lack of funding, lack of skilled workforce to manage available systems 	(Idowu & Esere, 2013)
---	--	---	-----------------------

Table 2.1 Continued

S/No	Impact	Challenges	Source(s)
3	ICT allows the transformation of education in Nigeria	<ul style="list-style-type: none"> - Lack of ICT literacy among teachers - inadequate ICT training facilities - Inappropriate funding, 	(Aworanti, 2016)
4	<ul style="list-style-type: none"> - ICT reduces the high cost of acquisition, installation, and maintenance of software - ICT enhances education system and skill development 	<ul style="list-style-type: none"> - Lack of government interest in providing ICT skills - The high cost of acquiring, maintaining, and installing ICT - Lack of basic knowledge, - Epileptic power supply 	(Ifejiofor & Nwankwo, 2015)
5	ICT will aid in improving education in Nigeria	<ul style="list-style-type: none"> - Connectivity: limited or lack of connectivity - Equipment: computers, digital technology, and the internet are not readily available. - Software: The software is costly 	(Olutola & Olatoye, 2015)
6	ICT enables easy access to information via the internet.	Training: lack of students and staff training	(Olofin& Aniede, 2015)

Table 2.1 demonstrated the critical impact as well as the ICT challenges in Nigerian educational institutions. Thus, it can be noted that Nigerian HEIs are challenged with numerous issues which hinders the smooth diffusion of ICT. This could also be attributed to the Government inadequate investment in the education sector and other factors. Therefore, education has consistently been a basic venture for the future, for people, for economies and all social orders.

2.5 E-learning

Numerous authors define e-learning differently, and some authors limit e-learning teaching and learning via the web without the need for other learning resources. Horton (2011) refers to the learning experiences created using electronic means as e-learning. Nonetheless, Jeffrey (2001) refers to e-learning as enhancing traditional learning using internet technology to transmit a broad range of solutions for enhancing knowledge and performance via an instant update, data storage or retrieval, distribution and information sharing delivered via the internet. In this study, e-learning refers to "the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere" (Alonso et al., 2005, p. 218).

Furthermore, e-learning can be modelled to suit the individual learner's interest via an online or offline medium. Hence, it also supports a group of learners in a synchronous, asynchronous, or blended mode of learning. The e-learning concept can be focused on three (3) dimensions, users, technology and services (Aparicio et al., 2016). E-learning unites two main areas, learning and technology. Hence, e-learning comprises different forms, including "standalone courses, virtual-classroom courses, learning games and simulations, embedded e-learning, blended learning, mobile learning and knowledge management" (Horton, 2011). However, there is a significant difference between traditional teaching and learning and e-learning since it can be synchronous (students,

faculties simultaneously interact at a specific time) and asynchronous (students and faculty interact at different times placing coursework, tests, or messages). Figure 2.3 presents the e-learning mode of teaching and learning.

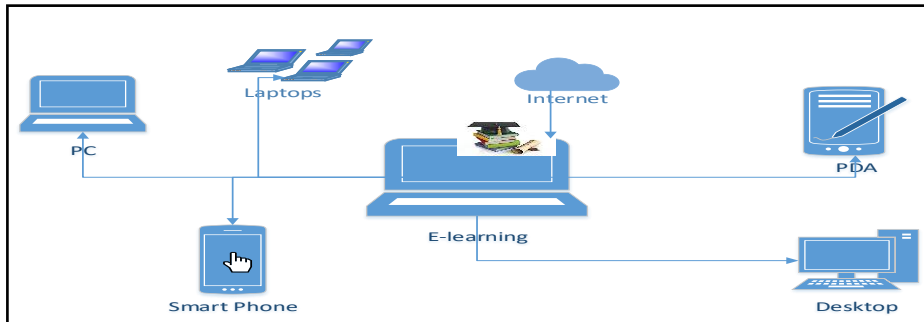


Figure 2. 3. E-learning Technology
Source: Bonthala (2016).

2.5.1 Types of E-learning

E-learning equips learners with access to education and educational content without any geographical constraints. Fundamentally, there are three (3) classifies of e-learning, Synchronous, Asynchronous learning, and Blended learning:

2.5.1.1 Synchronous Learning

Synchronous learning is real-time learning, set time or Internet classroom sessions (Yakaraju, 2018). The learners and the teachers are online and interact at the same time from different geographical location. Learning is delivered via mobile, video conference, Internet, chat, and forum. Thus, participants in this type of E-learning can share their knowledge and ideas during the session, get feedback and solutions. However, it has real-

time communication and not flexible (i.e., learners must meet at the same time). Figure 2.4 depicts synchronous learning.

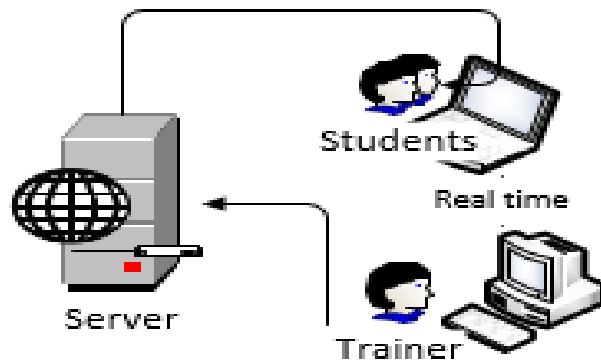


Figure 2. 4. Synchronous Learning

2.5.1.2 Asynchronous Learning

Asynchronous learning is student-directed and self-paced learning (Yakaraju, 2018). It is a pause and resumes learning at a user's pace. Asynchronous could use technologies like email, blog, discussion forums, e-books, CD. Asynchronous learning is self-paced online courses, discussion forums and groups, message boards. It does not support real-time communication; however, it is flexible (i.e., learners respond at a different time). Figure 2.5 depicts asynchronous learning.

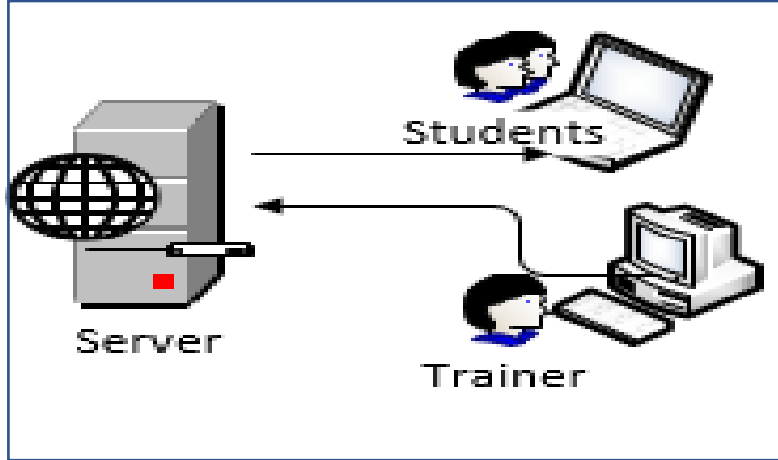


Figure 2. 5. Asynchronous Learning

2.5.1.3 Blended Learning

Blended learning models are used to define solutions that combine diverse conveyance strategies such as collaborative software, knowledge management practices, and web-based courses (Valiathan, 2002, p. 2). Blended learning is utilised to define learning which combines numerous events-based activities, encompassing synchronous and asynchronous learning. Figure 2.6 depicts blended learning.

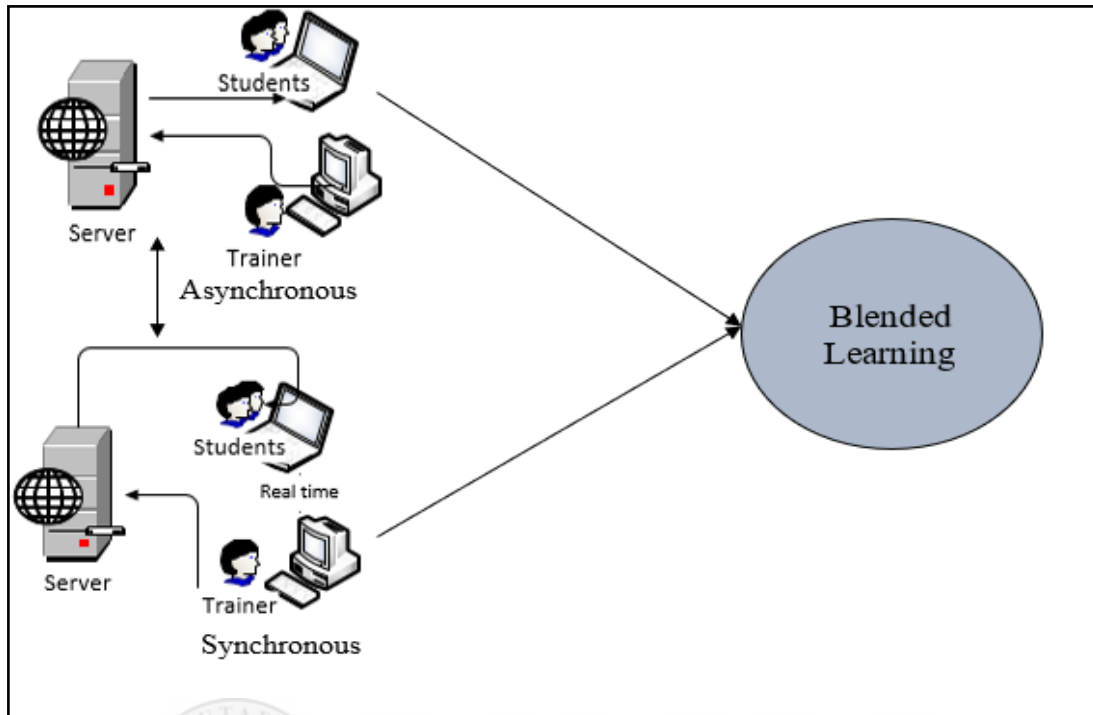


Figure 2. 6. Blended Learning



2.5.2 Benefits of E-learning

E-learning comes in numerous variations and often combine more than one method. Some of the variations include purely online asynchronous, synchronous, and blended learning. Hence, e-learning is becoming increasingly important in solving HEIs needs (Aremu et al., 2015). Table 2.2 presents the tabular summary of the e-learning Vs classroom learning method.

Table 2. 2

Tabular Summary of Traditional Classroom Vs E-learning

Characteristics	Traditional Classroom	E-learning	Reference
Classroom	- Physically limited in size and space - Face to face teaching and learning - Location constraints	- Unlimited space and size - Anywhere any time	(Masud & Huang, 2016)
Content	- PowerPoint presentation - Blackboard/Whiteboard - Video	- Multi-media - Web-browser - Computer-Based Training (CBT) - Synchronous and Asynchronous - On-demand	(Kashif & Shaikh, 2016; Masud & Huang, 2016)
Personalization	- One learning path	- Learning path and pace determined by the learner	(Masud & Huang, 2016)
Cost	- Cost of transportation - Cost of buying and printing textbooks/study materials	- Study anywhere at learners' discretion - Cost-saving	(Kashif & Shaikh, 2016)
Maintenance	- Huge capital expenditure to hire staff's 24/7	- Pay per use only.	(Kashif & Shaikh, 2016)
Standardization	No	Yes	(Kashif & Shaikh, 2016)
On-demand Availability	No	Yes	(Kashif & Shaikh, 2016)
Location dependency	Yes	No	(Kashif & Shaikh, 2016)

Table 2.2 presents the juxtaposition between traditional classroom teaching and the e-learning method. From the above analysis, e-learning will provide more advantage than the traditional classroom approach in terms of space, cost, geographical flexibility, convenience etc.

2.6 Challenges of E-learning in developing countries

E-learning is the use of technology for enhancing and providing access to education for all citizens in developing nations (Arinto, 2016). Hence, despite its ample benefits, it is still bedevilled with uncertainties and challenges such as; regular power failure, labour problems, and the server's improper maintenance (Meegama et al., 2015a). In the same vein, numerous researchers presented e-learning challenges to include; lack of financial support, lack of awareness, lack of technical support and unavailability of software (Bhuasiri et al., 2012; Farid et al., 2015; Musingafi et al., 2015; Naresh & Reddy, 2015; Segooa & Kalema, 2015; Tarus et al., 2015; Ajegbomogun et al., 2017; Anaekwe & Nnaka, 2017). It can be observed that all the authors agree that lack of funds is a significant constraint to e-learning implementation. Perhaps, these challenges could be attested to the lack of proper e-learning strategies, policies and Government Support towards actualizing e-learning benefits in emerging countries. So, emerging countries opted for ODL (Bisanda, 2009).

Furthermore, The ODL is a type of e-learning adopted by developing countries to ease the pressure of their conventional universities. Thus, the ODL is viable, cost-effective, provides quality and flexible education. Nonetheless, it is not free of challenges. In a study performed in Zimbabwe Open University (ZOU), insufficient study time, complications in accessing and the use of ICT, ineffective feedback mechanisms, lack of study material, financial constraints, a high percentage of students drop-out as well as late programme finishing time were found to be the main challenges in ZOU (Musingafi et al., 2015). Even though the above-listed problems are somewhat real, the authors did not empirically validate why the problem occurs in the first instance and see if the Government has initiated policies and support towards solving the problems. Secondly, the study does not look at the main stakeholders' perspective, such as universities Top management, to know what lead to the problems.

Arinto (2016) presented a study in the Philippines Open University (POU), and her findings indicated faculty indifference, lack of time, political issues, training, and pedagogical reorientation. The findings further reveal that development of policy and administrative changes essential to support innovative teaching practice over the institution. The study is restricted to a small percentage of cases and not directed towards the organizational perspective. Thus, even though the Philippines is a developing country, cost or economic factor is not a problem. Hence, the problems differ from country to country based on the infrastructure and the stakeholders involved.

Additionally, the National Open University of Nigeria (NOUN) challenges include student's attitudes, facilitators attitude, inadequate funding, erratic power supply, high cost of software and students, lack of access to e-learning facilities and tools affect the overall quality of the ODL (Ohioze et al., 2013; Aboderin, 2015; Ajegbomogun et al., 2017; Anaekwe & Nnaka, 2017). Consequently, in Nigeria, resources are limited, and tertiary education provision is inadequate. Hence, the government needs to overhaul and support the ODL initiative by providing good policies and funding for NOUN. In summary, the challenges of e-learning make it crucial for the HEIs and the Government to collaboratively come up with essential strategies implementation to meet the educational requirements of their countries. The summary e-learning challenges in developing countries are presented in Table 2.3.

Table 2. 3

A summary of factors affecting of E-learning in developing countries

Author (s)	Problems	Purpose/ Question	Dimension	Method	Sample	Findings
Tarus et al. (2015)	- Inadequate ICT and E-learning Infrastructure	"To investigate the challenges hindering the implementation of E-learning."	Not Available	- Mixed method (Questionnaire, in-depth interviews & document analysis) - Purposive sampling - stratified proportionate sampling technique)	148 respondents from 3 universities	before it will be fully realized. Country: Kenya
Farid et al. (2015)	- Localized LOs in local language, lack of instructional	"Q1: What are the critical issues in E-learning? Q2: how issues impact E-learning? What issues are important and prioritized? Q4: which issues are important for promoting E-learning."	Dimension - Software - Technical - Institutional - Personal - Cultural	-Interview (Semi-structured interview)	Five years' experience Carried out: January 2014- March 2014	Sixteen (16) critical issues were found and are classified into five (5) dimensions Country: Pakistan

Table 2.3 Continued

Author (s)	Problems	Purpose/ Question	Dimension	Method	Sample	Findings
Arinto (2016)		Challenges ODL poses for the Philippines open university from the institution leading ODL practitioners	Not Available	-Interview Semi-structured interview (Purposive sampling technique)	- 10 participants - 45 to 90 minutes	Country: Philippines
Bhalalusesa et al. (2013)	<ul style="list-style-type: none"> - Unreliable Internet connectivity - Awareness of Moodle - Lack of training - Follow up on Moodle activity - Lack of learning material - Availability of academic staff - High cost & lack of funding - Interfaculty associations 	Problems encountered using ELMS (Moodle) "Challenges of using ELMS (Moodle) by academic staff of OUT."	Not Available	- Questionnaire	- 120 respondents - carried out: 2011	The study focused on issues that are critical to the use of ELMS at OUT. Country: Tanzania

Table 2.3 Continued

Author (s)	Problems	Purpose/ Question	Dimension	Method	Sample	Findings
Bhuasiri et al. (2012)	- Learner's characteristics	"Critical factors that influence EL systems in developing countries."	- Social cognitive theory - ISS success model - Motivation theory	- Questionnaire Prioritizing method: AHP and Delphi method	- 82 E-learning experts from 25 developing countries	Countries: Asia, Middle East, South America, Africa and Europe
Naresh and Reddy (2015)	<u>Developing countries</u> - Lack of IT awareness - Students are poor - Internet - Low computer literacy <u>Developed Countries</u> - Lack of technology - Lack of motivation - Lack of interest by students - High dropout ratio	Discusses E-learning environment in both developing and developed counties, approaches, practices, challenges and opportunities. "what are the challenges of E-learning in developing and developed countries."	Not Available	Literature Review	Review of research articles, journals etc.	The study presents the challenges and opportunities in developing and developed countries.

Table 2.3 Continued

Author (s)	Problems	Purpose/ Question	Dimension	Method	Sample	Findings
Ali et al. (2017)	- Technology - Individual - Pedagogy - Enabling Condition	A conceptual framework to consolidate existing E-learning research "What are the barriers to E-learning implementation."	Not Available <u>Dimension</u> - Technology - Individual - Pedagogy - Enabling Condition	In-depth Literature Review	Two hundred fifty-nine (259) papers were reviewed from 1990-2016.	68 barriers were identified and grouped into four: Technology, Individual, Pedagogy and Enabling condition Country: South Africa
Segooa and Kalema (2015)	- Lack of infrastructure - Poor network support - Embedded VLE policy - Continuous training and support - Lack of IT knowledge - Lack of organizational support		- Complexity - Technology - Organizational - Environment - Mindset	Popularity in developing countries (Questionnaire) - Regression Analysis (SPSS tool)	3 South African universities	

Table 2.3 presents the e-learning summary implementing challenges in emerging countries. It comprises of problems, the purpose of study, dimension, sample size and technique and findings from each article presented. The studies acknowledge that financial constraints, lack of infrastructure, and expertise are a lingering hindrance towards actualizing hit free e-learning delivery for students and staff alike in developing countries HEIs. Perhaps, Government policies and financial support could be

a solution to some of the e-learning challenges since all most all education institution consent that financial constraint is a deterrent to e-learning implementation in their institutions.



2.7 Challenges of e-learning in Nigeria

E-learning is confronted with numerous challenges in Nigerian Universities, especially during the COVID-19 pandemic, since it was the only medium of teaching and learning (Adeoye et al., 2020). Higher education or learning is one of the instruments for social, political, and economic development. Thus, higher education contributes to national development via relevant knowledge and skills towards problem-solving. Providing an effective and efficient higher learning experience is the responsibility of every nation, as suggested by the UN resolution on education. Higher education in developing countries in general and Nigeria in specific is bedevilled with numerous problems that include power disruption, lack of technical know-how/skills, poor infrastructure, lack of bund, insufficient technological support, and inadequate resources to support research, teaching and collaboration (Adeyemi, 2011; Meegama et al., 2015; Naresh & Reddy, 2015; Tarus et al., 2015; Farid et al., 2015; Kashif & Shaikh, 2016; Anaekwe & Nnaka, 2017; Turban et al., 2018; Tom et al., 2019).

Furthermore, Oyediran et al. (2020) opined on the problems of e-learning in Nigeria: poor electricity supply, high cost and poor quality of e-learning facilities, and poor technical know-how of e-learning, poor internet connectivity, lack of telecommunication infrastructure, and lack of training support by the institutions. Also, the challenges of e-learning in Nigeria, according to Adeoye et al. (2020), includes epileptic power supply, high cost of data, and cost of hardware (e.g. PCs and laptops). Thus, inadequate funding, lack of infrastructures, inadequate teaching and learning facilities, the problem of an access road to the institutions, insecurity, limited vacancies/slots for admission known as carrying capacity, very high student-lecturer ratio due to lack of lecturers/instructors are among the encountered e-learning issues in Nigeria. Besides, there is a limited number of tertiary institutions in Nigeria (Ekwonwune & Oparah, 2020). Similarly, Ifijeh and Yusuf (2020) listed the challenges of libraries using ICT to include inadequate funding, poor technological infrastructure, and lack of skilled personnel.

Likewise, e-learning is a vital aspect of “Higher Education Institutions (HEIs)” in emerging nations, as it proffers easy access to learning contents and mitigates

education needs. Hence, perceived by the majority as a way for financial stability and a source of standard education for all (Silva, 2017). E-learning in this study refers "the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, exchange and collaboration anytime and anywhere" (Alonso, Lopez, Manrique, & Vines, 2005, p. 218). Some of the empirical studies on the challenges of implementing e-learning in Nigeria are presented below.

Eze et al. (2018) examine the adoption and usage of e-learning facilities by lecturers in private universities in Nigeria. The finding shows that e-learning facilities are adequate and accessible to users, and the private school teachers are comfortable with e-learning than the public HEIs teachers. However, their findings indicated that users' attitudes, inadequate internet facilities, and inadequate user training hamper its adoption. The budget on education affects the internet facilities despite the Nigerian Research and Education Network (NgREN). Nonetheless, the study only uses one university, a limited sample size, and only a private university. This is the major shortcoming of the study. Also, Eze et al. (2020) explore factors influencing the use of e-learning by students in private universities in Nigeria using the TOE theory. Their findings indicated that technology, organization, and environmental factors influence student's adoption of e-learning facilities. Nonetheless, e-learning is challenged with poor and inadequate infrastructure, storage, lack of funds (Tom et al., 2019).

Furthermore, Oyediran et al. (2020) has studied the prospects and limitation of e-learning in private HEIs during the COVID-19 lockdown in Nigeria by investigating the compliance with e-learning during the pandemic to ascertain their socio-economic factors and the limitation encountered. Their findings indicated that age, educational attainment, and teaching experience influence e-learning compliance. Nonetheless, it was found that compliance with e-learning in universities is 59.1%. The major obstacle to e-learning includes lack of IT infrastructure (e.g., hardware), the poor exchange rate to a dollar (inflation) makes computing accessories unaffordable, limited ICT experts, low budget on education, and poorly equipped laboratories, libraries, and ICT units.

One of the weaknesses of the study is that it focuses on the south-west region of Nigeria, where education is advanced than in the Northern region of Nigeria, the data is collected from staffs, focusing on the ICT directorates will give more insight on the compliance of e-learning as well as the problems they encountered. These are the major shortcomings of the study. Table 2.4 below presents the summary of e-learning issues in Nigerian HEIs.



Table 2. 4

A tabular summary of factors affecting of E-learning in developing countries

Author (s)	Purpose/ Question	Theory/Dimension	Method	Sample	Findings	Recommendation or Future Work
Eze et al. (2018)	"To investigate the challenges hindering the implementation of E-learning."	Not Available	- Qualitative Method (Semi-structured interview) - Thematic Analysis	15 Informants	The findings indicated that attitude of users, inadequate internet facilities and inadequate training of users	- Mixed Methods - More data should be used - Students as informants
Eze et al. (2020)	"To explore the factors influencing e-learning usage"	Technology (Ease of Use, Speed Accessibility and Service Delivery), Organization (Training Support and Diversity), Environment (Attitudes of users), impact related factors (learning experience, skill development, academic performance, and degree of engagement	Qualitative method (Semi-structured interview) - Thematic analysis	15 students/ informants	The finding shows that TOE factors influence students' adoption of e-learning	- More data/sample and lecturers to be used as informants

Table 2.4 Continued

Author (s)	Purpose/ Question	Theory/Dimension	Method	Sample	Findings	Recommendation or Future Work
Oyediran et al. (2020)	“To investigate the compliance with e-learning during COVID-19 pandemic”	Variables: Socio-economic variables, Compliance, and Limitations	Quantitative Methods	180 Staffs	Results shows that age, educational attainment and teaching experience influence e-learning compliance.	Not Mentioned

The studies of e-learning issues in Nigerian HEIs listed in Table 2.4 above are just among the lingering compounding issues that need a holistic solution towards providing a practical and effective learning experience for students and staff. Thus, the lack of funds, poor internet, poor infrastructure, lack of computers, storage issues, and high cost of software, among others, as suggested by extant studies, need a solution. An IaaS model could help solve some of the problems mentioned earlier since, IaaS considers security, data storage, virtualization/Virtual Machines (VMs), where users can initiate numerous instances and shared among students.

2.8 Cloud Computing

The CC is a model that encompasses APIs, storage, network, and hardware and other resources transmitted via the Internet (Mell & Grance, 2012; Tom, Virgiyanti, & Osman, 2019). Thus, it is a rental or pay-per-use delivery as-a-service provisioned to the Cloud Users (CUs). The CC services include the service or software delivery, infrastructure and storage based on CUs demands. The CC resources include networks, servers, storage, applications etc. (Mell & Grance, 2012). Buyya et al. (2008) define CC as a system that comprises a pool of interrelated virtualized computers, which are provisioned dynamically via negotiations and agreements of the Service Level Agreements (SLAs) between the CSPs CUs. The cloud is computing on the Internet and not computing on a desktop (Hurwitz et al., 2010). Figure 2.7 presents the NIST CC reference architecture.

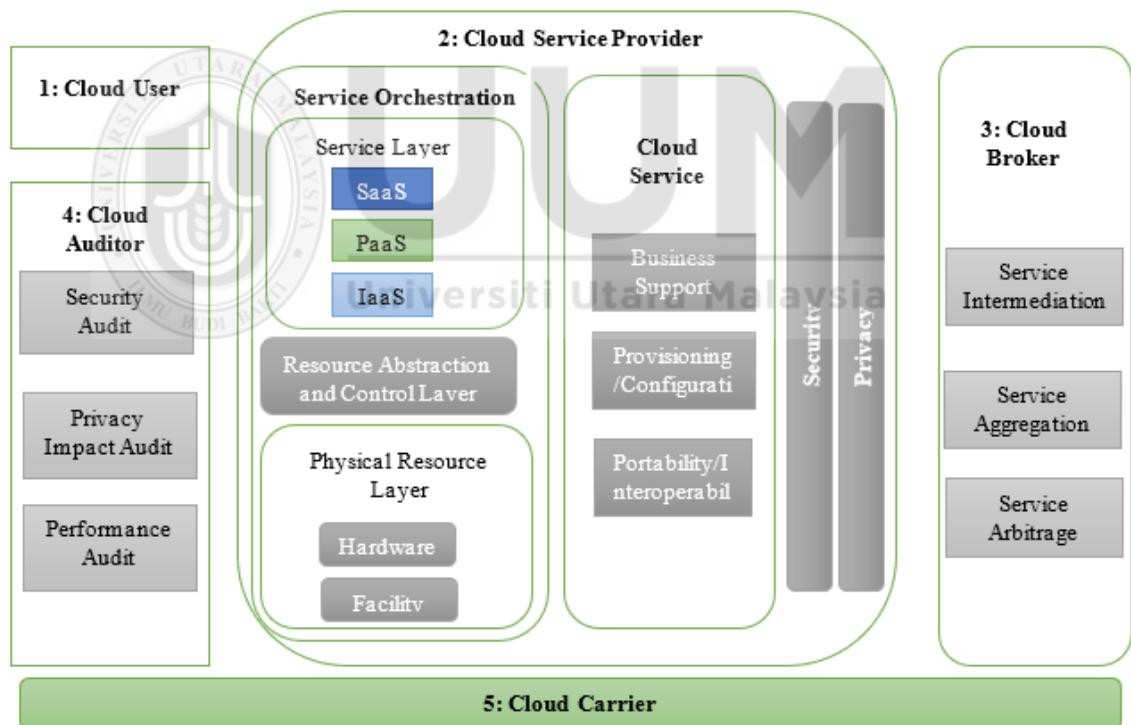


Figure 2. 7. Cloud Computing Reference Architecture
Source: Liu et al. (2011).

Figure 2.7 illustrates the cloud reference model, classification and the main actors, activities and functionalities in the CC infrastructure. The diagram portrays the high-level architecture and is scheduled to understand the features, advantages, and CC standards. Furthermore, the NIST CC reference model includes five (5) major actors: “Cloud Users (CUs) Cloud Service Providers (CSPs), Cloud Carrier (CC), Cloud Auditor (CA) and Cloud Broker (CB)”. Hence, each actor is an entity (e.g., organizations, university or a person) that interacts with the cloud-based services.

2.8.1 Actors in Cloud Computing Infrastructure

There are five CC actors: the CUs, CSPs, CC, CA, and CB, respectively. The subsequent sections shed light on the CC actors.

2.8.1.1 Cloud Users

The Cloud Users (CUs) are the primary stakeholder that subscribes to CC services. The CUs require the SLAs to specify computational performance specifications, Quality of Service (QoS), privacy, security and remedies for violations or unavailability of cloud services. Figure 2.8 depicts CUs and their functions.

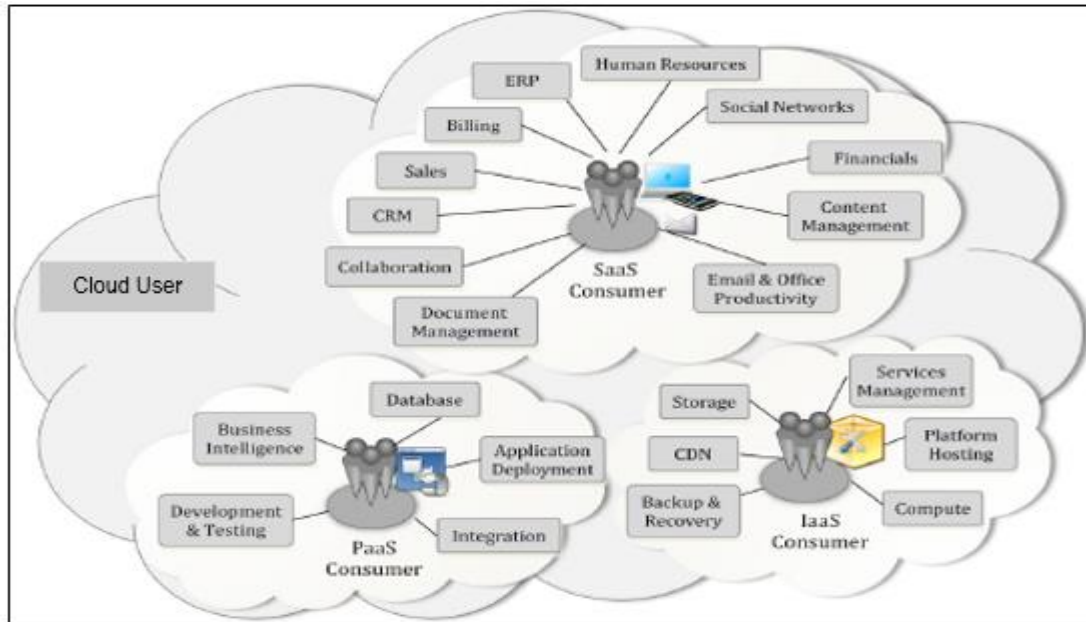


Figure 2. 8. Cloud Computing services available to Cloud User
 Source: Liu et al. (2011)

Figure 2.8 illustrates the services of CC to CUs. The Software as a Service (SaaS) provides services like content management, social network, sales, billing, document management, ERP, etc. The SaaS users are according to the user number, usage time, network bandwidth, amount of data space and the duration stored. The Platform-as-a-Service (PaaS) provides services such as business intelligence, deployment, testing and application development. The PaaS applications will be charged per processing storage (e.g., database) and the networking resources used by the PaaS applications. The IaaS provides services such as virtual machine (instance), storage, backup and recovery, network, storage, services management, etc. The users can be system administrators, system developers, and IT managers that will develop, install, manage, and monitor IT infrastructure operations. The charges are based on the resources consumed, e.g., CPU, data space, consumed network bandwidth and the IP addresses.

2.8.1.2 Cloud Service Providers

The CSP refers to any object (person, company, or organization) responsible for providing cloud-based services and resources to CUs in a pay per use manner. The CSPs acquire and manage the cloud resources based on the type of cloud deployment models. Figure 2.9 depicts the CSPs and their main activities.

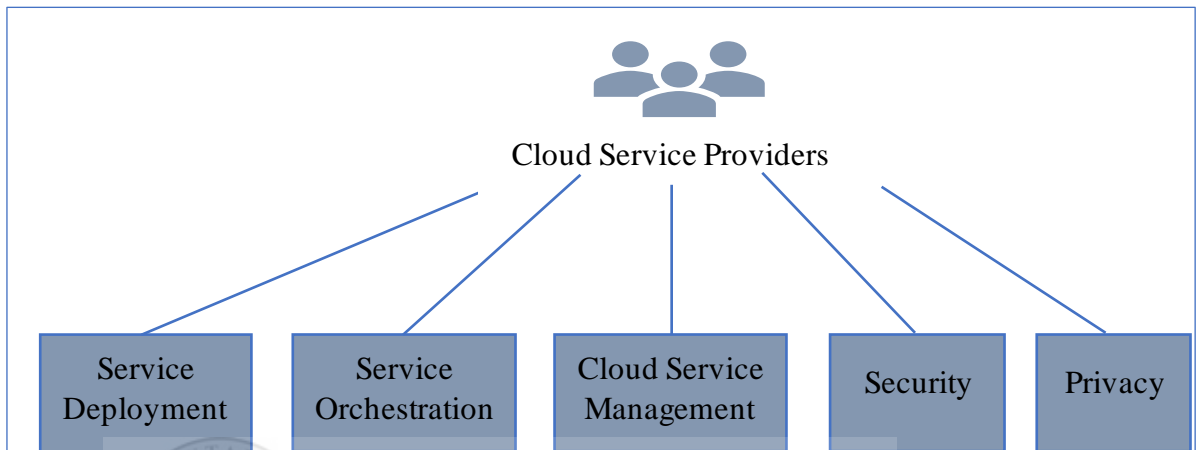


Figure 2. 9. CSPs and their activities
Source: Liu et al. (2011)

Figure 2.9 depicts the CSPs and their primary activities. The activities include service deployment, service orchestration, management of cloud services, security, and privacy, respectively. Hence, it is the responsibility of the CSPs to manage all the activities.

2.8.1.3 Cloud Carrier

The Cloud Carrier (CC) is an entity that acts as a linkage (middleware) that offers connection as well as the conveyance of cloud-based services between CUs and CSPs. Thus, the Cloud Carriers deliver access to services and resources to CUs via the network, telecommunications and access devices (Liu et al., 2011).

2.8.1.4 Cloud Auditor

The CA is an entity that performs an independent examination of CC services and provides opinion thereon. Thus, auditing aims to verify the conformance to Service Level Agreements (SLAs), security, privacy impact and monitoring performance. Thus, the CA ensures that security policy, security assessment, performance evaluation and monitoring confirm that operation is regular as specified by the CSPs in the SLAs.

2.8.1.5 Cloud Broker

The CB refers to an object that maintains the performance distribution of the cloud-based services, resources and negotiates the needs of CUs with the CSPs. The CB acts as an intermediary (middleman) between the CUs and CSPs. Gartner (2009) classified the CB services into three (3); service intermediation, service aggregation, and service attributes.

- **Service Intermediation:** Provides services by enhancing certain services distributed to one or more CUs. Thus, improved services can be identity management, management of access, performance reporting, and improved (updated) security.
- **Service Aggregation:** The CB integrate and combine several services into single or multiple services. The service aggregation ensures a more secure movement of data between CUs and several CSPs.
- **Cloud Service Arbitrage:** Service arbitrage is like cloud service aggregation. The main dissimilarity between service arbitrage and service aggregation is that the service arbitrage is not fixed. Thus, the advantages of service arbitrage are to provide flexibility and choices for the service aggregation.

2.8.2 On-Premises Offerings vs Cloud Offerings

Small and Medium Businesses (SMBs) are faced with the predicament to either go for hosting computing or on-premises solutions. It is a fundamental decision between security and cost optimization by organizations. The on-premises offerings are the traditional way of computing, such as installing and managing servers, operating systems, hardware, and IT resources' physical security. The CC offers services to customers as-a-service. Thus, the CUs only pay for cloud services and the resources they consume. The NIST established some of the features that make cloud-based services unique, including resource sharing (pooling), elasticity, cost savings, ease of managing IT resources, security etc. Table 2.5 elaborates more on the comparison of on-premises (traditional IT) and cloud-based services.

Table 2. 5

On-premises vs Cloud Computing

Features	On-Premises	Cloud Computing	Benefits	References
Expertise	Must have skilled personnel, expensive to manage	The CSPs perform all the necessary activities	Cloud	(Fernández et al., 2012; Mohammadi & Emdadi, 2014)
Support	It has better monitoring services and support 24/7	CSPs monitor service 24/7. But may not provide monitoring and notification promptly	On-premises	(Ghazali et al., 2017)
Scale	It is scalable, but more cost is involved	Resource pooling allows scalability at a pay-per-use manner	Cloud	(Aggarwal et al., 2017; Akin et al., 2015; Kobayashi, 2018; Joel Samson Mtebe & Raisamo, 2014)
Trust	More trustworthy because the organization	Trust is an issue in CC because CUs will hand over their data to CSPs	On-premises	(Ahmed, 2015; Ghazali et al., 2017)

	maintain its assets	will little or no control at all.		
Compliance	Institutions will worry about compliance with national and international regulations	CSPs will worry about compliance and not CUs.	Cloud	(Ghazali et al., 2017)
SLA	institutions are solely responsible for securing and backing up systems	The CSPs will duly compensate any downtime.	Cloud	(Ghazali et al., 2017)
Security	Organizations are responsible for handling security	Sophisticated security and costly to achieve and maintained 24/7.	On-Premises	(Akin et al., 2015; Kobayashi, 2018; Mohammadi & Emdadi, 2014)
Cost	All IT infrastructures must be purchased and maintained by an organization	The organization only pays for rendered services and maintenance is done by CSPs.	Cloud	(Fernández et al., 2012; El-Mhouti et al., 2017)

Table 2.5 explains the comparative analysis of traditional computing (on-premises) and the CC infrastructure. The comparison is based on the level of expertise required, scale, trust, compliance, SLAs, security, and costs of each model based on the information presented in Table 2.5. Therefore, CC provides more benefit than on-premises computing.

2.8.3 Cloud Computing Features

The NIST classifies CC characteristics into five, namely, “on-demand self-service, broad network access, resource pooling, rapid elasticity and measured service” (Mell & Grance, 2011, p. 2).

- **On-demand self-service:** CUs can access services and resources promptly, such as central processing time, network storage, etc.
- **Broad Network Access:** CC resources and services are distributed via the network (e.g., Internet) and used by different thin or thick clients such as smartphones and computers.
- **Resource pooling:** The service provider’s computational resources are shared to assist different CUs concurrently using a multi-tenant model or virtualized cloud infrastructure, with different resources assigned based on consumer demand.
- **Rapid elasticity:** Computing capabilities are rapidly utilized without upfront commitment and contracts as they are used wherever and whenever accessing cloud services arises. Rapid elasticity appears to be limitless as well as access at any given time.
- **Measured service:** Cloud services are systematically and automatically controlled, monitored, reported and provide transparency for CSPs and CUs of the utilized service.

2.8.4 Cloud Computing Service Models

The CC service models comprise of three, namely, “Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and the Infrastructure-as-a-Service (IaaS)” respectively.

2.8.4.1 Software-as-a-Service

The SaaS supports organizations evade capital expenditure and pay only for the functionality they require, such as; maintenance (Godse & Mulik, 2009). The SaaS model provides ample benefits when compared to traditional computing. SaaS permits the renting of software without possessing the ownership of the applications. It supports pay per use model and no control or maintenance required. The SaaS is built on the fundamental IaaS and PaaS stacks (Arinze & Anandarajan, 2013). Figure 2.10 depicts the SaaS model.

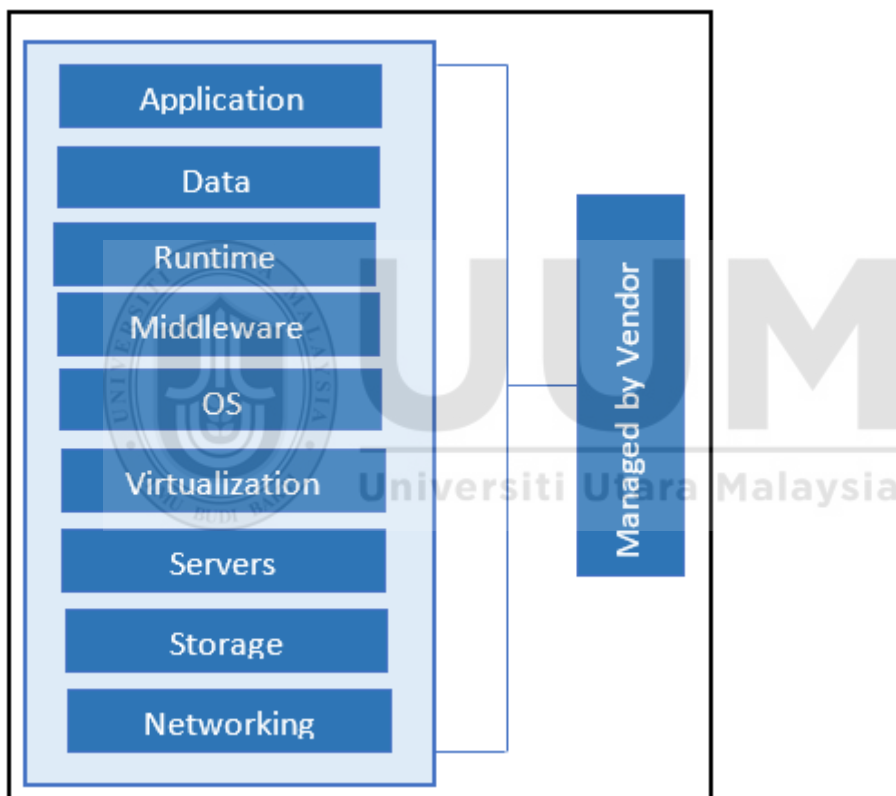


Figure 2. 10. Software-as-a-Service Model
Source: Liu et al. (2011)

Figure 2.10 presents the SaaS model. In the SaaS model, all cloud services are managed by the CSPs. The CSPs manage the applications, data, runtime environment, middleware, Operating System (OS), security, servers, virtualization, storage, and network. The CUs only pay for cloud services and resources. The SaaS supports the usage of CSPs application on a cloud infrastructure. The CSP host their application which various clients can easily access via the Internet, e.g., Browser, by application

users. The SaaS subscribers cannot manage the critical CC infrastructure such as OS, servers, network, storage, and application capabilities except for restricted use precise to applications and configurations. The customer's applications are organized (multi-tenancy) in a distinct logical setting on SaaS to attain cost and optimization such as; disaster recovery, high performance, security, availability, and maintenance (Dillon et al., 2010; Almazroi et al., 2016; Sabi et al., 2017). Salesforce.com, GoogleMail, and GoogleDocs are some SaaS applications.

2.8.4.2 Platform as-a-Service

The PaaS gives access to the API and the development of middleware, which allows the installation of the customized application by the CU in the CC settings (Gibson et al., 2012). The PaaS model resides on top of IaaS with the integration of layers, application development framework, middleware, functions, programming language and tools are supported by the stack (Arinze & Anandarajan, 2013). Figure 2.11 depicts the PaaS models and their activities.

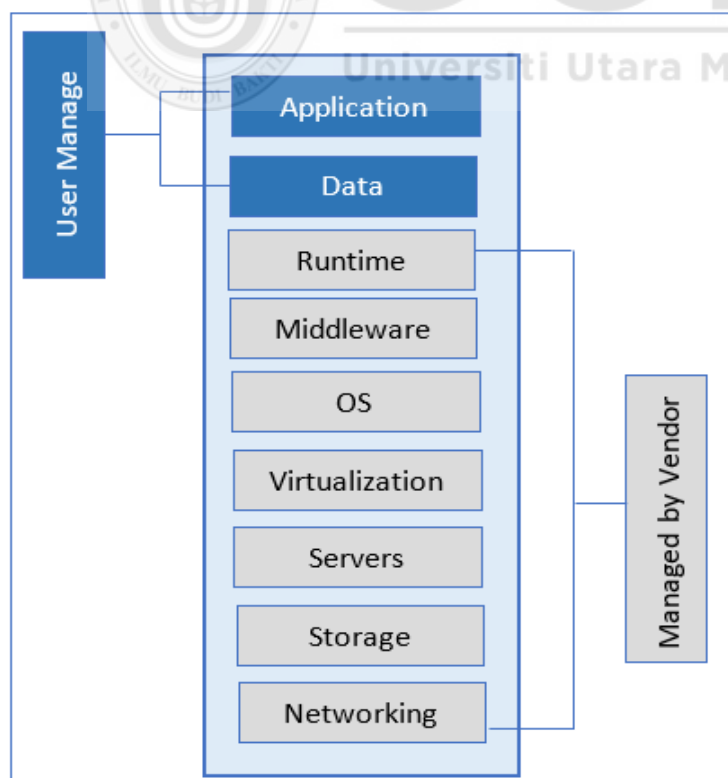


Figure 2. 11. Platform as a Service
Source: Liu et al. (2011)

Figure 2.11 depicts how the CSPs manage the essential cloud services such as; networks, servers, OS, and data storage, but the CU can manage the deployed applications and configuration settings. The organizations may gain access to the application-hosting environment for purposes like; application development and testing without complication and price of obtaining, deploying, and handling the infrastructure (Garrison et al., 2012; Almazroi et al., 2016, 2019).

2.8.4.3 Infrastructure-as-a-Service

The Infrastructure-as-a-Service (IaaS) model allows VMs creation, deployment, storage, and maintenance. IaaS subscribers are permitted to deploy OS, although the CUs strictly handle patches and updates compared to PaaS and SaaS infrastructures (Garrison et al., 2012; Almazroi et al., 2016, 2019). Figure 2.12 presents the IaaS model.

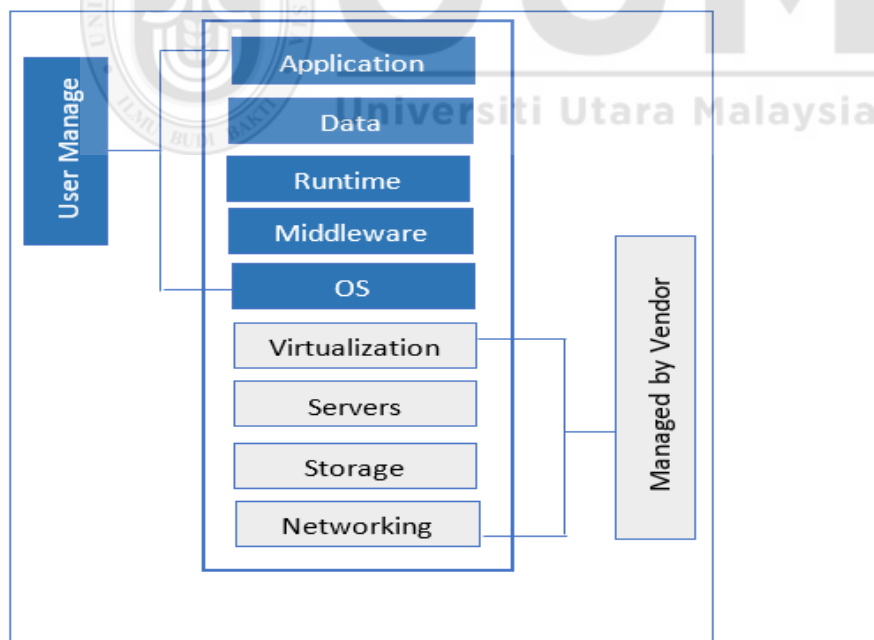


Figure 2. 12. Infrastructure as-a Service
Adapted from Liu et al. (2011).

Figure 2.12 depicts the functions performed by the CSPs and CUs in the IaaS infrastructure. The CSPs manages the servers, storage, networking, and virtualization. Hence, more control and provided to CU in IaaS when compared to the PaaS and SaaS models.

2.8.5 Cloud Deployment Models

There are four types of cloud deployment models: Private, Public, Community and Hybrid cloud. The section below elaborates more on the CC deployment models.

2.8.5.1 Private Cloud

The Private cloud resources are scaled, pooled, and shared by users and accessed via the private cloud's virtual application (Pachghare, 2015). The Private cloud is classified into two (2): 1- On-premises (when the cloud model is located as well as hosted and maintained by the organization using the facilities) 2- Private cloud and externally hosted (the cloud model is hosted by a third party and accessed by other organization). Table 2.6 elaborates on Private cloud benefits and drawbacks.

Table 2. 6

Benefits and Drawbacks of Private cloud

Benefits	Drawbacks
<ul style="list-style-type: none"> - Improved security and privacy since only one organization is managing security. - Data control and higher performance has been achieved since all resources distributed across multiple departments and can be easily managed by a single organization. - Compliance and consistency across services are easily achieved. 	<ul style="list-style-type: none"> - It is costly to maintain and manage. Underutilization of services, hence, optimization of resources may be a challenge. - Vendor lock-in may occur since hardware and software are outsourced, and migration to another cloud may be difficult.

Sources: Chandrasekaran (2014) and Knowledgenet (2017)

Table 2.6 presents the pros and cons of the Private cloud. As presented in Table 2.6, the Private cloud model has improved security compared to Public, Community or Hybrid cloud models.

2.8.5.2 Public Cloud

In the Public cloud, the services offered are owned and operated by the CSPs (Pachghare, 2015). The resources are dynamically selected for diverse applications in a pay-per-use fashion. Thus, CSPs owned the Public cloud, and the CUs do not know the data location. The cloud infrastructure, services as well as resources are provisioned for general use. Business, academic, and governmental organizations can own, control, and operate the Public cloud. Table 2.7 shows the benefits and drawbacks of the Public cloud model.

Table 2.7

Pros and Cons of Public cloud

Benefits	Drawbacks
<ul style="list-style-type: none"> - It is cost-effective and proves to be more efficient in resource sharing. - It is simple and easy to deploy and operate. - No maintenance is required, thereby saving time and costs. - No contract with CSPs since it is on a pay per use fashion. 	<ul style="list-style-type: none"> - Public cloud is more vulnerable to security issues when compared to the Private cloud. - Performance may be affected due to the high number of concurrent users. - Customization of resources and services may not be possible.

Sources: Chandrasekaran (2014) and Knowledgenet (2017)

Table 2.7 shows the pros and cons of the Public cloud model. As presented in Table 2.6, the Public cloud has a cost-saving advantage over Private, Hybrid or Community cloud. However, the Public cloud is more vulnerable to security issues since many CUs will share it.

2.8.5.3 Community Cloud

The Community cloud allows sharing of applications among cooperating organizations in a multi-tenant model for specific users in an organization. Hence, this is possible since users share similar requirements, policy consideration and security, privacy and performance requirements (Foster et al., 2008). The Community cloud infrastructure is shared and maintained by cooperating institutions and could be possessed and operated by numerous institutions. Table 2.8 elaborates on the pros and cons of the Community CC model.

Table 2. 8

Pros and Cons of Community cloud

Pros	Cons
<ul style="list-style-type: none">- It provides computing services and resources at low costs.- It delivers secure interoperability and sharing of resources between organizations.- It proves to be more secure than a public cloud.	<ul style="list-style-type: none">- Security and privacy are a significant concern.- Governance, costs, and compliance are a big concern.

Sources: Chandrasekaran (2014), Foster et al. (2008) and Knowledgenet (2017)

As depicted in Table 2.8, the Community cloud provides an effective cost-saving for the CUs and sharing resources easily between interconnected parties (e.g., Companies and organizations).

2.8.5.4 Hybrid Cloud

The Hybrid cloud is one in which part of the computing workload is carried by the Private cloud owned and operated by organizations, and the rest of the workload is transferred to a Public cloud via the Internet. Thus, by adopting a hybrid cloud, the organization will use on-demand and externally provisioned scalability. Combining one or more CC models like private, Community, and Public cloud allows data and application portability (Knowledgenet, 2017; Mell & Grance, 2012). Table 2.9 present the benefits and drawbacks of the hybrid cloud model.

Table 2. 9

Benefits and drawbacks of Hybrid cloud

Benefits	Drawbacks
<ul style="list-style-type: none"> - It leverages the scalability of Public and Private clouds. - It is cost-effective since it combines the features of Private and Public clouds. - Hybrid cloud provides enhanced security. 	<ul style="list-style-type: none"> - Efficient management of the network infrastructure of the Hybrid cloud is challenging. - Security and compliance policies are a significant concern. - Different data centers may have redundant data.

From Table 2.9, the Hybrid cloud model comprises more than one deployment models. Thus, the Hybrid cloud is costly, and data redundancy may be an issue in the long run.

2.9 Justification of using Public Cloud in Nigerian HEIs

The adoption of CC in educational institutions is accelerating as numerous education institutions migrate to it (Mtebe & Kissaka, 2015; Mtebe & Raisamo, 2014; Tom et al., 2019). The support and discount towards education by the cloud service providers such as the google education package (live@edu) helps to adopt CC. Hence, making CC attractive and affordable to HEIs globally (Mtebe & Kissaka, 2015). There are four (4) cloud deployment models; Private, Public, Community, and Hybrid. Nonetheless, the public cloud deployment model was adopted in this study. The public cloud is owned and operated by an organization, and its services are offered to the public (Mell & Grance, 2012; Helmi et al., 2018). It may be owned, provisioned, managed, and operated by academic, business or Government organization, hence, exists on the premises of the CSPs (Helmi et al., 2018). Thus, its suitability for HEIs is further supported by the National Institution of Standards and Technology (NIST) Mell and Grance (2012), where cost saving is significant.

Considering Nigeria's economic reality, a public cloud model is more suitable than a private (where a single organization exclusively uses cloud infrastructure); hence, the cost is high. Similarly, the public cloud is provisioned and open to the public. Therefore, maintenance and cost are drastically reduced for the HEIs in Nigeria. It is cost-effective and proves to be more efficient in resource sharing, simple and easy to deploy and operate, and no maintenance is required (Chandrasekaran, 2014; Knowledgenet, 2017).

Furthermore, in a study conducted by Mtebe and Raisamo (2014) and Mtebe and Kissaka (2015), their finding indicated that institutions would adopt the public cloud infrastructure. The selection of deployment option will vary from institution to institution depending on the cost constraints, security and privacy requirements (Mtebe & Kissaka, 2015). Accordingly, the public cloud is an option for small or new institutions with a limited budget (Mtebe & Kissaka, 2015). This is also true for Nigerian HEIs, seeing the meagre budget of 6.7% to 7.25% budget on education (Amoo, 2019; NBS, 2020), which is substantially less than the 15-20% as proposed by UNESCO. The companies that provide public cloud includes Microsoft, Google, IBM, Amazon, Salesforce.com, HP Cloud Computing. The cost of hosting e-learning services will go down once an exact number of hours is established as many cloud providers' costs are elastic. Nonetheless, security is still a concern in CC.

From the above discussion, this study selects the cloud's public cloud service model because of its simplicity and economic benefits. Considering developing countries' difficulty in channelling adequate investment in education as suggested by UNESCO (i.e., 15-20% budget), it could not be achieved. Therefore, utilizing the public cloud would help in cost savings.

2.10 Justification of using IaaS Cloud in Nigerian HEIs

There are three cloud service models, which include the SaaS, PaaS, and IaaS, respectively. IaaS refers to "the capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer can deploy and run arbitrary software, which can include operating systems and applications." (Mell & Grance, 2011, p. 3). Thus, the cloud users do not need to manage or control the fundamental cloud infrastructure but has control over the Operating System (OS), storage, deployed applications and limited control of some selected networking components (host firewalls) (Mell & Grance, 2012). IaaS aim is to deliver computing resources and storage via the network. Also, cloud users can install OS and software applications on IaaS VMs (Mwakisole et al., 2018). Besides, the IaaS model enables users to manage and configure cloud servers like ordinary physical servers. Hence, in the context of e-learning, for instance, the model will enable schools to configure e-learning systems into the cloud servers and pay per usage manner instead of hosting within the HEIs (Mwakisole et al., 2019). IaaS providers include Amazon Web Services, Windows Azure, Google Compute Engine, and Rackspace Open Cloud.

Furthermore, the major capabilities of IaaS include automated administrative tasks, dynamic scaling, platform virtualization, and internet connectivity. Also, IaaS allows hosting servers, storage and networking, billing, monitoring, log access, security, and load balancing (Mell & Grance, 2012). Besides, IaaS users provide storage adaptabilities such as backup, replication, and recovery (VMware, 2021). This feature will help many Nigerian HEIs reduce the numerous internal and external security challenges ranging from Boko-Haram, ISWAP, kidnappers and herdsmen in Nigeria's Northern region (Punch, 2017; Vanguard, 2018). Once logged into the IaaS platform, users can create a VM, OS installation in every VM and deploy databases. Hence, users can use the providers' services to track costs, monitor performance, balance network traffic, troubleshoot application issues and disaster recovery management (Scott, 2020). The IaaS provides virtualized computing resources via the Internet, and subscribers will not be worried about the underlying physical machine.

The IaaS model allows cloud users to get rid of purchasing new technology, maintenance, upgrading software, and software licenses (Mwakisole et al., 2019). According to Okai et al. (2014), the choice of delivery model depends on the university's needs. Nonetheless, all three models will be useful for a typical university as they all have their unique features relevant to the university's needs (Okai et al., 2014). In the IaaS layer, the IaaS also referred to as a service layer that provides essential computing resources, including servers, storage, hardware, and networking equipment. This layer delivers computing IaaS in a virtualized environment. It could also include the operating system, bandwidth, and virtualization technology needed to manage the resources. Also, it all depends on the need and negotiation with the CSPs.

Similarly, the IaaS offers everything as a service; it addresses limited learning resources and the e-learning scalability in the Nigerian HEIs. For example, one critical player in IaaS is the Amazon Elastic Compute Cloud (E2C) which reduces the time to boot new server to minutes, fast scaling back and forth and cost-effective to process extensive data (Mwakisole et al., 2019). Like any other technology, the CC is bedevilled with security and trust concerns (Sabi et al., 2017, 2018; Tom, Virgiyanti, & Rozaini, 2019). "This Infrastructure-as-a-Service (IaaS) layer of the cloud is arguably the most accessible to the enterprise as they could potentially migrate their systems to the cloud without having to change their applications (Khajeh-Hosseini et al., 2010).

Likewise, the IaaS is where the CSPs hosts the infrastructure in the clouds, numerous data centres, and cloud users access it via the Internet. IaaS can be used to build, host web applications, store data, run business logic (Cloudflare, 2020). Hence, all the things that traditional on-premises infrastructure can do, but with more flexibility. The IaaS includes Virtual Servers (VSs), Virtual Machines (VMs), storage, and cloud security, all managed by the IaaS service providers. The following are some of the reasons for using IaaS:

- **Scalability:** It is easier to expand business with IaaS instead of buying, installing, maintaining a new server every time a business needs to scale-up. The servers can be added on demand.
- **Server Maintenance:** With the IaaS, the HEIs will essentially outsource server buying, maintenance, and updating to the IaaS service providers, thereby saving costs and time.
- **Time to Market:** The deployment and updated of IaaS is much faster since the CSPs will offer the infrastructure as the need arise. The diagram below shows the comparison of on-premises Vs IaaS.

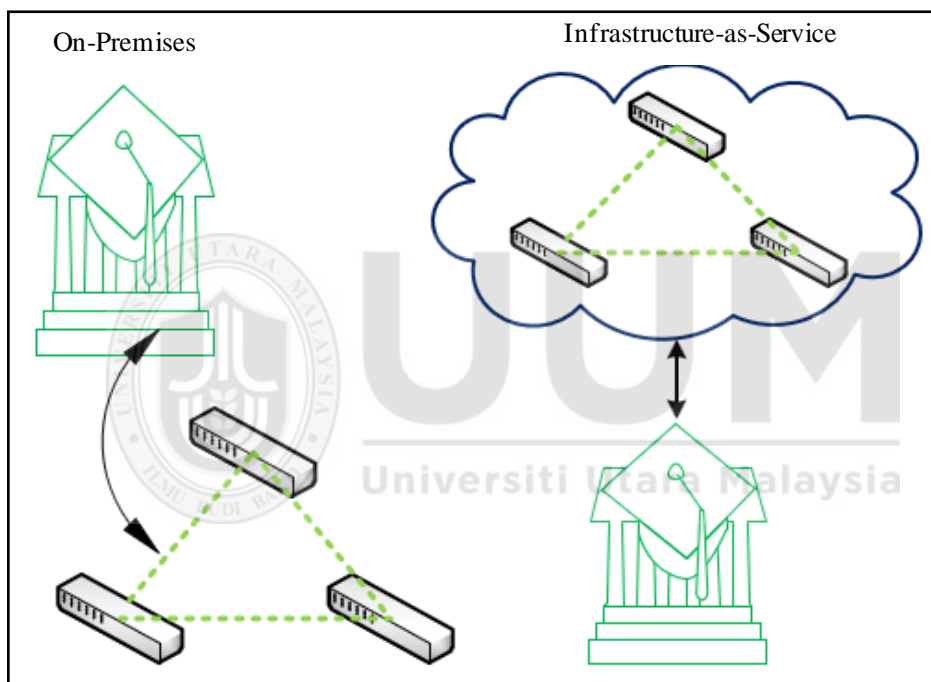


Figure 2. 13. On-premises Infrastructure Vs Infrastructure-as-a-Service

As shown in Figure 2.13, the cloud infrastructure is provisioned for open use by the public. It may be owned, managed, and operated by a business, academic, government organization, or some combination. It exists on the premises of the cloud provider (Mell & Grance, 2012). Some of the benefits of IaaS infrastructure, according to Fang et al. (2017), include:

- IaaS circumvents up-front investment of setting and maintaining an on-site datacenter.
- Hosting on IaaS provides much more flexibility than traditional web-hosting.

- Services hosted on IaaS are generally web-based. Therefore, they can be easily accessed through any smart device with an Internet connection.
- With IaaS, there is no need to worry about hardware failure, troubleshooting hardware problems or system updates.
- IaaS allows to decoupling and separation of the business service from the IT infrastructure.
- IaaS normally use Geo-distribution and ubiquitous network access, which eliminates a single point of failure.
- Resources can be allocated or de-allocate easily so service providers can acquire resources only as per current demand.
- IaaS hosting operationally efficient and allow more rapid deployment of new services, which eventually reduce cost.

In conclusion, this study is of the view that utilizing the IaaS deployment model in the cloud would help HEIs in the long run. Initially, the infrastructure, storage, networking, and other technical problems are drastically reduced by adopting the IaaS infrastructure. Besides, the IaaS gives more freedom and control to the cloud users (i.e., ICT directorate top managers) and students and staff to store their data and create VMs, and applications. The issue of control is among the most deterrent factor of CC adoption.

2.11 Infrastructure as-a Service Based E-learning

Infrastructure as a Service (IaaS) is a new trendsetter in CC, which recently emerged as a new archetype for hosting and delivering services on the internet (Fang et al., 2017). The IaaS started in the cloud as one of the service layers, including PaaS and SaaS. Thus, providing consumers with the capability to provision processing, storage, networks, and other fundamental computing resources where the consumer can deploy and run arbitrary software, including OS and applications. The cloud user does not manage or control the underlying cloud infrastructure but has control over OS, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls) (Mell & Grance, 2012). Cloud users use dashboards

and APIs to directly access their servers and storage (Avinetworks, 2021). IaaS users enjoy many advantages, such as accessing the same infrastructure technology services of a traditional data centre without investing as many resources as possible and higher scalability. It is a flexible CC model that allows for automated deployment of servers, processing power, storage, and networking.

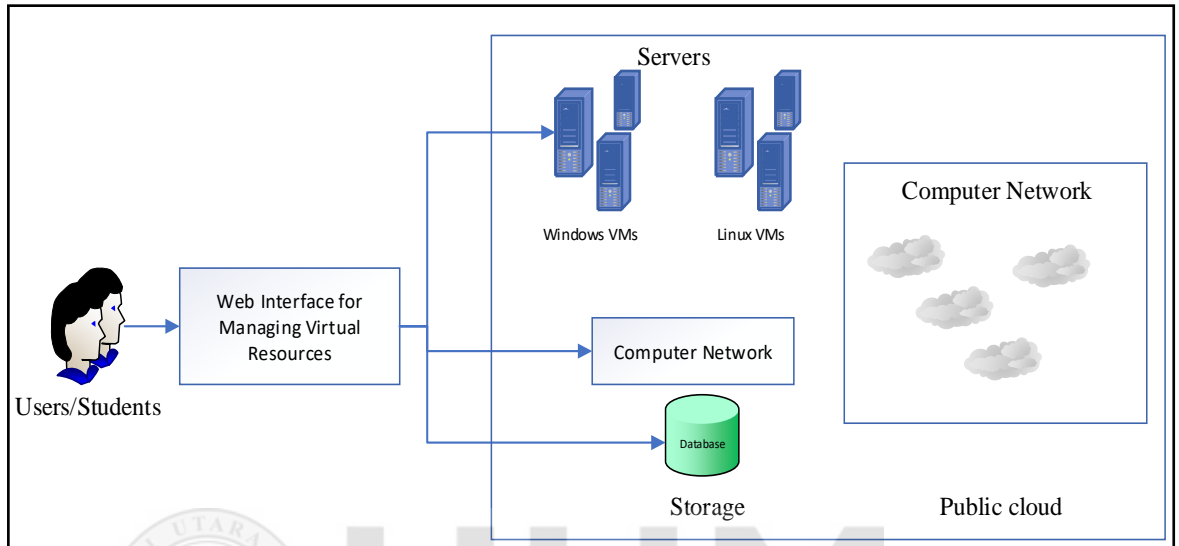


Figure 2. 14. IaaS in E-learning
Source: Vujin et al. (2014)

Figure 2.14 depicts how IaaS infrastructure is used in the e-learning domain generally. The IaaS allows the creation of numerous VMs that students share, especially Nigerian HEIs, where there is a deficit of infrastructure and computing resources. Besides, the storage (student record) issue can be resolved specifically in Nigeria's Northern region due to security challenges. The public cloud is cost-effective, making it suitable for the Nigerian HIEs (Mell & Grance, 2012; Tom, Virgiyanti, & Osman, 2019).

2.11.1 Virtualization in E-learning Environment

Virtualization provides a means to create several Virtual Machines (VMs) on one physical computer, hence, reducing the usage of physical computers. Students or staff can connect to virtual computers using a remote connection (Hautamaki et al., 2009). Virtualization is the "creation of a virtual (rather than actual) version of something, such as a server, desktop, a storage, an OS, and network resources" (Javatpoint, 2018).

It enables teachers to utilize the latest technology, such as OS, to provide an open learning environment for students and promote lifelong learning and equality among students without geographical constraints, gender, or religion (Tom et al., 2019). Virtualization allows multiple virtual machines to run on single physical machines and share the physical machine's resources (Ryan, 2012). For instance, transforming K-12 schools via virtualization enables a reduction in cost through consolidation and leverage cloud software to build a flexible virtual infrastructure, support access to data and application, and create affordable disaster recovery solution (Newman, 2012). The most substantial costs of procuring traditional desktops for students and staff is enormous, and for every dollar spent on hardware, an organization will spend three dollars on troubleshooting and patching (Newman, 2012).

Virtualization is good for small scale deployment where administrators can have hands-on experience. For instance, VMware gives the freedom to build and deploy modern applications, such as data centre, multiple clouds, and edge environments, and migrate seamlessly between environments where data and application security is ascertained (VMware, 2021). Hence, numerous universities in developed countries are transforming their education and research facilities IT department such as lab using cloud virtualization to save cost such California polytechnic state university and Northern Arizona University, embraces both desktop and server virtualization (Jones, 2015). The world of education and academia are under pressure to minimise IT costs from weighing down organizations; thus, many have turned to Virtual Desktop Infrastructure (VDI) (Jones, 2015). Virtualization was applied by numerous universities, for instance, JAMK university of applied sciences education, to minimize cost (Hautamaki et al., 2009).

Additionally, virtualization technology aids in the difficulties in teaching and learning and assessing student performance in Management Information System (computer network subjects) since it provides students with hands-on, improves teaching and learning effectiveness and improves students (Huang, 2019). In Nigeria's case, learning these limitations exist, learning outcome assessments would also become a problem; assignments, examinations, and evaluations would be difficult to administer.

Also, Chen et al. (2014) designed an integrated cloud information system for logistic management based on web server virtualization and SaaS architecture. Their findings show a rentable, scalable environment for enterprises, enabling enterprise customers to operate the system without installing any software. Hence, reducing the cost of hardware deployment improves operational efficiency. In recent years, the Nigerian government have been investing heavily in ICT infrastructure to implement e-learning systems to enhance and revitalize the decayed education system in the HEIs (Tom et al., 2019).

Nonetheless, most of the systems are implemented using a traditional web-based e-learning approach which required huge investment (Cost) and limits usage due to the lack of scalability and flexibility (Mwakisole et al., 2019). Mwakisole et al. (2019) conducted a study to determine web-server and cloud-based Moodle, thus, the cloud-based Moodle outperformed and had better performance metrics. Furthermore, Chrysikos et al. (2016) performed a feasibility study for providing IaaS in computing and library services in UK HEIs. The IaaS seems to benefit HEIs, despite the immaturity of its application. Also, the cloud services will enable HEIs transformation with confidence, agility, and efficiency, respectively. Fang et al. (2017) discuss the benefits of running IaaS virtual web-hosting in the same vein. Their findings indicated that IaaS based virtual web hosting system is more effective than the traditional web hosting systems because IaaS provides scalability, operational costs, resource allocation, power efficiency and network.

Therefore, from the above discussion, it can be noted that virtualization such as a server, desktop, data/storage, application, and network virtualization is increasingly becoming popular and adopted by HEIs around the globe. Besides, VMs are used in developed countries for the information system, business departments, others, improving learning, saving cost, and providing e-learning for all in a subsidized manner. In Nigeria's case, infrastructure deficits such as hardware (e.g., computers, servers), software, power, expertise, and other infrastructure hamper education quality in Nigeria, and the recent internal security challenges Covid-19 pandemic makes the current education system in HEIs obsolete. Hence, IaaSBEL could play a significant role in salvaging e-learning in Nigeria and developing countries.

2.11.2 Types of Virtualization

There are numerous types of Virtualization, which includes hardware virtualization, OS virtualization, Server virtualization, and storage virtualization:

- **Server Virtualization:** Physical servers are powerful machines with multiple processors that host files and applications on a computer network. For streamlining purposes, each physical server is typically dedicated to one specific application or task. Also, the Virtual Machine Manager (VMM) is directly installed on the server system, where a single physical server can be divided into multiple servers on the basis of balancing the load (Javatpoint, 2018). It simulates physical servers by changing their identity, numbers, processors, and OS (Eugene, 2017). Virtualizing the server can save more than 60% of the hardware costs (Chen et al., 2014).
- **Network Virtualization:** The computer network refers to a group of digitally connected nodes/computers that communicate and share resources in a single software-based network. This creates a virtual network that gives you administrative control/access over all the hardware and software resources available on the main network. Network virtualization allows the division of assigned bandwidth into separate channels that can be reassigned as needed (Netcov, 2020).
- **Desktop Virtualization:** Allows cloud users to create a virtual desktop that is typically hosted on a centralized data center. Thus, the cloud user can remotely access the virtual desktop without location constraints via a thin client (web browser).
- **Application Virtualization:** Traditional applications are run on the physical or existing OS and hardware resources. However, application virtualization encapsulates the application and separates it from the underlying OS (Netcov, 2020). The application can be accessed without installing it on the native device. IT administrators can install the application on the server where users with access can access it.

- **Storage Virtualization:** refers to abstracting multiple physical storage devices and compiling them into a single storage cluster managed from a central device (Netcov, 2020). Thus, these storage devices will then appear to the cloud user as a single storage device.

2.12 Cloud-Based E-learning in developing countries

There are ample benefits that developing countries could tap from the CC for e-learning, like the availability of e-learning services, scalability, security, and efficiency in delivering learning contents. Hence, all the services can be subscribed as-a-Service, thereby reducing the cost drastically. For instance, financial constraints and recession are among the key drivers of unattainable education in Nigeria. However, by utilising the CC for e-learning, even universities with less financial support could subscribe to the services and improve their e-learning systems.

Furthermore, studies on Cloud-based e-learning in Nigeria and IaaSBEL is limited. According to Galvan and Galvan (2017), "if you determine that there are no literature with a direct bearing on one or more aspects of your research topic, it is permissible to review peripheral research, but this should be done cautiously." (p. 61). For this reason, this study classifies literature into developing countries, Africa, and Nigeria. Thus, the flow and the literature will provide strong evidence on the factors used and methodology (data analysis, theories used, area of study, etc.). In a real sense, no two developing countries are the same (probably due to their cultural background, education level, and development level). Nonetheless, they are similar in some ways, such as economic and social. Therefore, this study classifies the studies on cloud-based e-learning into Asian and African countries, emphasising Nigeria.

Therefore, it can be noted from the above discussion that empirical studies on cloud-based e-learning in Nigeria are limited. Despite the ample benefits of the cloud in HEIs, as shown in developed countries such as the Hokkaido University of Japan, the Nigerian HEIs are yet to tap into this innovation towards solving the lingering problems of education in Nigeria. However, there are some studies on the advantages of cloud-based e-learning in Nigeria.

2.12.1 Cloud-Based E-learning in Asian Countries

The section presents Cloud-based e-learning studies in the context of Asian countries. Thus, Odeh et al. (2017) conducted a study on the enablers and barriers towards CC adoption in Jordan HEIs, using qualitative study. The study further integrated DOI theory with CC adoption in HEI. The findings show that academic and technical experts recommend the adoption of CC in HEIs. Similarly, Mokhtar (2016) performed a study on adopting CC in HEIs using the TOE theory. A quantitative research design was conducted in 140 HEIs in Malaysia. However, the paper is a conceptual paper without any empirical evidence.

Additionally, Yuvaraj (2016) examined CC adoption factors in the Indian academic library using DOI theory. Their findings indicated that “perceived ease of use, usefulness, and ubiquitous availability” are significant determinants. Similarly, attitude is significantly associated with the behavioural intention to adopt cloud services. Nonetheless, one of the biggest issues that affect the behavioural intention to adopt CC is security. Also, Bhatiasevi and Naglis (2015) investigate the adoption and the usage of CC in Thailand HEIs by employing the TAM model. The findings revealed that “perceived ease of use, perceived usefulness, intention to use, perceived convenience, trust, and software functionality” significantly affect the CC adoption. However, computer self-efficacy and subjective norms are not statistically significant in the adoption of CC in Thailand. Also, only students are used in the adoption of CC. Still, lectures and ICT decision-makers are not used in the analysis.

In Saudiya Arabia, the factors that influence university students to adopt cloud for e-learning, such as SaaS (Google Docs), is lacking (Almazroi et al., 2016). “Perceive use and perceived ease of use” are suggested to consider when dealing with CC services. The study utilises TAM 3, with the addition of Trust as an external variable. However, the study is restricted to SaaS and not the whole e-learning system hosted on the cloud. Al-Badi et al. (2017) conducted qualitative (interview) research for several CSPs, Experts in IT, and potential CC users. Their findings revealed that CC reduces cost and reduces the number of IT staff and low cost of testing and developing solutions. Nevertheless, their research only focusses on the financial incentives on the adoption of CC in HEIs. Also, how the CC for e-learning will be diffused in the HEIs from the management perspective is not discussed.

Furthermore, a study on the CC adoption influencing determinants was conducted in Pakistan using the TOE and DOI model by Tariq et al. (2017). The crucial factors identified include “security, technical, organizational challenges, environment, and external pressure”. Nevertheless, only students and not HEIs top management are considered because they play a crucial position in the assimilation of innovation. Besides, in UAC, the CC readiness and its adoption in HEIs using TAM were presented by Shana and Abulibdeh (2017). The study outcome indicated that “perceived ease of use” affects the intention to use the technology in the future. Similarly, “intention to use” was demonstrated by the actual use of teachers. There is a direct effect of intention to use and actual use on the CC adoption. Besides, there is a high correlation between “perceived ease of use and perceived usefulness”. However, only one university is used, and other important factors like organizational and environment are not considered. Security and trust are not included owing to the fact that they are crucial in CC adoption decisions.

Table 2. 10

Literature Table of Cloud Computing Adoption in Developing Countries HEIs

Authors	Journal Name & Impact Factor	IVs and DVs	Research Design & respondents' profile	Theories & Country	Unit of Analysis & Sampling	Findings	Limitations/ Gap	Recommendations/ Future Work
Odeh, Garcia-Perez and Warwick (2017)	International Journal of Information and Education Technology (Q4)	Barriers: Resistance to new technology, security, privacy, compatibility with in-house lack of management awareness Enablers: Cost effectiveness, ease to use, decentralization, management support	- Qualitative research design - Semi-structured interview - NVivo - HOD, Dean, senior lecturer, HOD, CTO, senior engineer, IT manager, and CEO	- DOI theory Country: Jordan Type of Cloud:	- Individual - Academic experts - Technical experts - 10 informants	- The findings suggest that the adoption of cc in HEI is recommended by academic and technical experts	NA	- Further study on the adoption of CC in developing countries

Table 2.10 Continued

Authors	Journal Name & Impact Factor	IVs and DVs	Research Design & respondents' profile	Theories & Country	Unit of Analysis & Sampling	Findings	Limitations/ Gap	Recommendations/Future Work
Mokhtar (2016)	International Conference on Information and Communication Technology (0.13)	IV: Technological: Relative advantage, complexity, compatibility Organizational: to management support, institution size, adoption plan Environment: service provider support, government support DV: CC adoption	- Quantitative research design, CIO, ICT managers, deputy ICT manager	- TOE theory Country: Malaysia Type of Cloud:	- Individual - 140 HEIs,	N/A	N/A	N/A
Yuvaraj (2016)	The Bottom Line	IV: scalability of Computing resources, ubiquitous availability of computing resources, perceived ease of use, perceived usefulness, return on time, security risks, privacy risks, DV: Attitude towards CC in libraries, Behavioral intention to adoption Vs non-adoption	- Quantitative research design - Deputy librarian, assistant librarian, and university librarian	DOI theory Country: India Type of Cloud:	- Individual - 28 universities	The findings indicated that perceived ease of use, usefulness, ubiquitous availability. Similarly, attitude is significantly correlated with the Behavioral Intention to adopt cloud services.	N/A	N/A

Table 2.10 Continued

Authors	Journal Name & Impact Factor	IVs and DVs	Research Design & respondents' profile	Theories & Country	Unit of Analysis & Sampling	Findings	Limitations/ Gap	Recommendations/ Future Work
Bhatiasevi and Naglis (2015)	Education and Information Technologies (Q2)		- Quantitative research design - 393 questionnaire	- TAM theory Country: Thailand	- Individual		The study on focus on students, hence, lecturers and IT decision Makers are not used in the study. Also, SaaS is the only type of CC used.	- Future work should attempt to investigate other factors with emphasis on PaaS and IaaS. - Other variables can be used in the adoption of CC.
Almazroi et al. (2016)	2016 IEEE International Conference on e-Business Engineering (0.13)	<u>Moderators:</u> Output quality, Internet, Experience	- Quantitative research design	- TAM 3 theory - 451 Undergraduate students <u>Tools:</u> SPSS V.22 AMOS (V.19) Country: Saudiya Arabia Type of Cloud: SaaS	- Individual cluster sampling technique	- Perceived usefulness and Perceived Ease of Use are the main determinants of Students Behavior Intention to adopt the CC service	- The result may not be generalizable - Academic measures are not measured to ascertain the adoption of CC.	- Analysis such as the goodness of fit for the measurement and structural models, more thorough hypothesis testing, and testing of the moderation effect. - Qualitative research design

Table 2.10 Continued

Authors	Journal Name & Impact Factor	IVs and DVs	Research Design & respondents' profile	Theories & Country	Unit of Analysis & Sampling	Findings	Limitations/ Gap	Recommendations/Future Work
Tariq, Tayyaba, Rasheed, and Ashraf (2017)	2017 International Conference on Communication, Computing and Digital Systems (0.14)	IV: Advantages DV: Cloud adoption in Higher Education	- Quantitative research design Questionnaire <i>Tools:</i> SPSS PLS-SEM	- TOE and DOI theory Country: Pakistan Type of Cloud: NA	- Individual	The factors that play, reduce cost, Unauthorized Access, Elastic Resource Capacity. Thus, the least influential factors are Socio-economic status, Location and device independence and Easy implementation	NA	NA
Shana and Abulibdeh (2017)	International Journal of Emerging Technologies in Learning (Q3)	IV: Perceived Ease of Use, Perceived Usefulness, DV: Behavior Intention to Use, Actual Use	- Quantitative research design Questionnaire <i>Tools:</i> SPSS V.15.0 AMOS (V.4.0)	- TAM theory Type of Cloud: SaaS Country: UAE	- Individual - 239 pre-service teachers Students (Undergraduate) - Pre-teachers	The findings reveal that Perceived Ease of Use, affects the intention to	- The research focuses only on one university in UAE. Also,	- future work should look at Dropbox and Google Docs in a academic environment

In summary, it can be noted that significant research on the CC adoption in HEIs is conducted in Asian countries, with few studies in African countries and Nigeria (Sabi et al., 2018; Tom, Virgiyanti, & Rozaini, 2019; Hiran & Henten, 2020). Similarly, a higher percentage

of studies on the adoption of CC are not specifying the type of cloud deployment method used because CC is a dynamic infrastructure (Tom, Virgiyanti, & Osman, 2019). The most used CC deployment method is SaaS, such as Google Docs, Microsoft Office 365, thereby neglecting the PaaS and IaaS cloud model. This study fills the gap by explicitly focusing on the IaaS aspect of the CC deployment model. Further, the respondents are not looking into the ICT directorates perspective since they are in charge of effecting CC services' adoption and recommendation.



2.12.2 Cloud-Based E-learning in Africa, and Nigeria

As stated in section 2.8, this section complements the findings of cloud-based e-learning in emerging countries, emphasising Africa in general and Nigeria in particular. A study was carried out by Sabi et al. (2017) on the factors that impact diffusion, adoption, and CC usage at universities in sub-Saharan Africa. Socio-cultural factors like result demonstrability, usefulness, and data security significantly impact their intention to adopt CC in the university. However, one of the weaknesses of this study is that it does not consider environmental factors, such as competitive pressure and service provider support since each country requires a different innovation diffusion process due to differences in communication and culture. Government Support plays a significant role, especially in Sub-Saharan Africa, due to financial limitations and the recent economic recession. Therefore, this is the significant shortcomings of their study.

In addition, Sabi et al. (2018) conducted a study on the CC adoption in Uganda HEIs utilising a qualitative research approach and DOI theory. The findings indicated that CC adoption, CC usage, observability, result demonstrability, socio-cultural, and trialability are significantly supported. However, the qualitative methodology should be used to get an in-depth understanding of the adoption of CC in higher education. Also, factors to be considered in the future study should include “income, ease of use, usefulness, and local availability of CC vendors”. The study limitation was its inability to cover many universities in Uganda. Also, the organizational perspective and decision-makers in a university are not used as the population. In the same vein, the study does not specify the type of CC to be adopted.

Furthermore, Akin et al. (2015) investigate the impact and challenges of CC in the southwestern region of Nigeria public universities. Their study's findings show that cost-effectiveness, enhanced availability, low environmental impact, reduced IT complexities, mobility, scalability, increased operability, and reduced investment in physical resources. Nonetheless, data insecurity, regulatory compliance, data lock-in, and privacy concerns are among the insignificant challenges of CC adoption. The

study did not mention any theory, and data was collected from only ten (10) universities and comprises numerous respondents. Ideally, the adoption of CC in Nigerian HEIs is done by the top managers.

Adam et al. (2019) conducted an empirical study on the adoption of CC in Somali HEIs. The study adopts a quantitative research design, using SPSS (v.20) for data analysis by combining the TOE and DOI theories. The findings indicated that the technology Organisation and Environment variables (See Table 2.10) are supported, whereas complexity, time savings, competencies of providers, incentives and professional cloud availability were the non-significant determinant of CC adoption. However, this study only uses simple linear regression. More thorough statistical analysis, as well as the introduction of a moderating variable, is absent.

Makoza (2016) findings show that CC could mitigate some of the challenges of the HEIs in Malawi. The findings indicated the concern of top management support, potential security risks and inadequate legal frameworks that may affect HEIs when adopting CC. Correspondingly, Ali (2019) conducted a systematic review of CC adoption determinants in developing countries HEIs. Their findings indicated the lack of studies concerning socio-technical concerns such as technical, organisational, personal, and environmental determinants. However, this is a review paper. Table 2.11 presents a summary of the CC for e-learning adoption.

Table 2. 11

Literature Table of Cloud Computing Adoption in Developing countries HEIs

Authors	Journal Name & Impact Factor	IVs and DVs	Research Design & respondents' profile	Theories & Country	Unit of Analysis & Sampling	Findings	Limitations/Gap	Recommendations/ Future Work
Sabiet al (2018)	Education and Information Technologies (Q2)	IV: Observability, results demonstrability, relative advantage, complexity, compatibility, ICT infrastructure, data security, risks, upfront cost DV: CC adoption decision, CC actual usage	- Quantitative: - SPSS and SmartPLS Respondents: Administrators, Dean, HOD, ICT Support, Lecturers and others	Diffusion of Innovation (DOI) theory Country: Uganda Type of Cloud:	- Individual - Simple random sampling - Purposive sampling - 251 respondents	- The findings indicated that CC adoption, CC usage, observability, result demonstrability, Socio-Cultural, and trialability are significantly supported	- Inability to cover many universities in Uganda.	- Organizational dimension using university technology decision makers as the study population. - Qualitative design should be used.
Dahiru et al (2014)	International Conference on Information Society, i-Society 2014 (h-index: 0.14)	NA	- Qualitative Research design Informants: - Finance, IT/ICT, education, hospitality, & manufacturing	Grounded Theory (GT) - Glasserian/classical approach Countries: Nigeria, and Ethiopia Type of Cloud:	- Snowball - 23 informants.	- Security, privacy, trust, cost savings, supports business growth, management support, cheaper and functional access to computing resources, government policy and regulations, flexibility and competitive advantage	- The inhibitors include internet connectivity problem, job loss and sabotage, lack of awareness, SLA, training and change management, lack of expertise, and loss of control.	NA

Table 2.11 Continued

Author s	Journal Name & Impact Factor	IVs and DVs	Research Design & respondent s' profile	Theorie s & Countr y	Unit of Analysis & Sampling	Findings	Limitations/G ap	Recommendatio ns/ Future Work
Almazroi et al. (2016)	2016 IEEE International Conference on e-Business Engineering (h-index: 0.13)	IV: Subjective norm, image, job relevance, output quality, result demonstrability, self-efficacy, perceptions of external control, anxiety, playfulness, perceived usefulness, perceived ease of use DV: Behavioral Intention	- Quantitative Research Design - Students - AMOS V.19 and SPSS V.22	Type of Cloud: SaaS	- Individual - Stratified - cluster sampling technique -527 questionnaires	- The result indicated that perceived usefulness and perceived ease of use are the main deterrence of the behavioral intention to CC	- Only Google Docs is used for SaaS the study does not look at gender and academic major on its influence on CC adoption.	- Goodness of fit, moderation effect and more hypotheses should be tested. - Qualitative analysis to validate quantitative result,
Akin et al. (2015)		NA	- Quantitative Research - IT staff, para-IT staff, Student -10 public universities	Country : Nigeria Type of Cloud: NA	N/A	- The findings revealed the major challenges of CC adoption are data insecurity, regulatory compliance concerns, lock-in and privacy concerns	NA	- Readiness assessment of adopting CC. - More study on the deterrent factors on CC adoption

Table 2.11 Continued

Authors	Journal Name & Impact Factor	IVs and DVs	Research Design & respondents' profile	Theories & Country	Unit of Analysis & Sampling	Findings	Limitations/ Gap	Recommendations/ Future Work
Adam et al. (2019)	European Journal of Computer Science and Information Technology	IV: Technology: Cost Savings, relative advantage, compatibility, complexity, security, scalability, time savings, dependent on external providers. Organizations: Size of HEIs, top management, cloud professional availability, Environment: SLAs of providers, competencies of providers, ministry of higher education support, competitive pressure, promotion and marketing by providers, trainings, incentives DV: CC adoption decision in HEIs	- Quantitative Research - Head / member of the institution, dean/member of faculty administrative staff, head/member of ICT department IT Lecturing staff - SPSS V.20	DOI and TOE theory Country: Somalia Type of Cloud: NA	- Individual -15 HEIs - Non-probability (purposive sampling - 150 questionnaires	- The findings indicated that TOE variables influence the adoption of CC in HEIs.	- Limited to only few universities, - Linear regression	NA

Table 2.11 Continued

Authors	Journal Name & Impact Factor	IVs and DVs	Research Design & respondents' profile	Theories & Country	Unit of Analysis & Sampling	Findings	Limitations/ Gap	Recommendations/ Future Work
Makoz (2016)	International Journal of Computing & ICT Research	IV: Technology: Relative advantage, complexity, compatibility Organization: Management support, organization size, technology readiness Environment: competition, pressure from partners, regulatory compliance DV:	- Qualitative and quantitative (case study approach: document analysis) - IT managers	- TOE theory Country: Malawi Type of Cloud:	- Purposeful sampling - 2 HEIs	- The findings indicated the concerns of top management support, potential security risks and inadequate legal frameworks that may affect HEIs when adopting CC.	NA	- Top managers awareness, awareness of the benefits and limitations of CC like security, promoting implementation of government ICT policies via policy makers awareness
Sabiet al. (2017)	Information Systems Frontiers (Q1)	IV: DOI factors: Complexity, Compatibility, Relative Advantage, Triability, Observability, Result Demonstrable Economic & Technological factors: Cost, Risk, Data Security Contextual Factors:	- Quantitative research design	- DOI - TAM Countries: Cameroon, Ghana, Nigeria, Uganda Type of Cloud: NA	- Individual <i>Tools:</i> SPSS Smart PLS 3.2.1	- Socio-cultural factors results demonstrability, usefulness, and data security significantly impact their intention to adopt CC in the university	- The study relied on individuals contacted via email to respond to the online survey from sources they did not know.	- Future work should focus on DOI theory factors when triangulated with constructs from TAM than to focus on TAM only

Awareness,
Socio-cultural,
Infrastructure
TAM factors:
Ease of Use,
Usefulness
Demographic
Factors:
University Age,
University Size,
University
Location,
Individual Age
DV: Intention to
adopt CC,
Actual Usage of
CC

Note: IV = Independent Variable, DV = Dependent Variable, NA = Not Available

Table 2.11 presents the summary of studies in African countries, the theories used, research design utilised, and the research findings. It can be noted that there is limited research on the adoption of Cloud-based e-learning in Africa in general and Nigeria in specific (Sabi et al., 2018; Tom, Virgiyanti, & Rozaini, 2019; Hiran & Henten, 2020). Nonetheless, this research only considers empirical papers. Similarly, most of the papers do not specify the cloud deployment model and not from the perspective of the ICT directorates top managers (Tom, Virgiyanti, & Rozaini, 2019). The study focuses on the IaaS cloud, using both Quan and qual (explanatory sequential research design) techniques to fill this gap. The rigorousness of Quan and qual data will shed more light on the study and provide strong evidence on the factors that influence the Intention to adopt IaaSBEL in the Nigerian HIEs by the decision-makers.

2.12.3 Advantages of Cloud-Based E-learning in Developing Countries HEIs

Despite the ample benefits of CC, it is not immune to security issues. Some of the advantages and uses of CC for e-learning in HEIs.

- CC for E-learning is suitable for delivering sound and elastic education in Nigeria since system deployment can be fast with minimal costs (Aremu et al., 2015).
- CC provides scalable, flexible, standardized software and flexibility to use up-to-date applications (Dhull, 2013).
- It further enables rapid development, deployment, eliminating financial burden (pay per use) and supporting multiple clients (Dhull, 2013).
- With the regular power disruptions and labor challenges, managing a server room for IT services to both lecturers and student remains a problem in HEIs (Meegama et al., 2015b).
- A cloud-based system will provide un-interrupted e-learning services to students, such as collaboration and research, library management, human resource management and students management in a cost-effective way (Meegama et al., 2015b).
- IT services relieve universities from maintaining backup generators, power supply, air condition (server), and IT technicians to manage IT infrastructure.
- The main advantage of CC is cost reduction (Karim & Rampersad, 2017). Organizations and especially HEI, does not have to set up IT infrastructure. Instead, they subscribe to the Cloud as a service.
- Most of the existing CC for e-learning intention to adopt models do not consider security in their model. They only focus on the advantages of the HEIs.

2.12.4 E-learning vs Cloud-Based E-learning

Web-based learning gives more benefits to traditional classroom-based learning (Fernández et al., 2012). However, an increase in the demand for e-learning initiates the need for cloud-based e-learning (Aggarwal et al., 2017). For instance, the Faculty of Engineering at Hokkaido University encourages students to study abroad and created a Moodle-based e-learning system to help them keep up with coursework back home. The University moved the system to Microsoft Azure to broaden student access, expand capacity, streamline course preparation and enhance security (Kobayashi, 2018).

"Our Azure-based E-learning system far better meets the needs of our students, who can access courses from PC, Android, IOS etc. This gives them a more enjoyable and convenient educational experience," Professor Kobayashi, Hokkaido University.

To remove the obstacle, the Faculty of Engineering at Hokkaido University created the Centre for Engineering Education Development (CEED) in 2006 and a Moodle-based e-learning system to facilitate distance learning. Students studying abroad can watch online videos of lectures back home remotely. However, CEED extended Moodle to accommodate videos, but it had capacity and scalability problems because their e-learning system ran on-premises. The e-learning system contains 2,383 hours of video which only met half of the Faculty's needs and could not accommodate more videos. It took two weeks to transcribe, subtitle, encode and prepare a single course for online consumption. Lastly, cybersecurity threats increased. In 2016, CEED decided to move its e-learning system to Microsoft Azure to solve these problems.

Furthermore, the cost of buying and maintaining ICT infrastructure is among the key factors that hinder HEIs in Sub-Saharan nations to adopt and implement e-learning technology (Joel Samson Mtebe & Raisamo, 2014). However, the adoption of CC in HEIs in Sub-Saharan Africa is shallow (Joel Samson Mtebe & Raisamo, 2014). Thus, cost-effectiveness is the critical factor that makes HEIs host E-learning on the cloud (Joel Samson Mtebe & Raisamo, 2014). The cost of e-learning hosting was compared in cloud and on-premises in Tanzanian HEIs. The findings indicated that the cost of e-learning

implementation in CC settings would significantly be reduced. Table 2.12 presents the summary of CC for e-learning on-premises e-learning.

Table 2. 12

E-learning On-premises vs Cloud-Based E-learning

Features	E-learning On-Premises	Sources	Cloud-based E-learning	Sources
Hardware costs	High Maintenance cost	(Aggarwal et al., 2017; Akin et al., 2015; El-Mhouti et al., 2017; Fernández et al., 2012; Mohammadi & Emdadi, 2014; Joel Samson Mtebe & Raisamo, 2014)	Low Maintenance cost	(Aggarwal et al., 2017; Akin et al., 2015; El-Mhouti et al., 2017; Fernández et al., 2012; Mohammadi & Emdadi, 2014; Joel Samson Mtebe & Raisamo, 2014)
Storage Capacity (Scalability)	Fixed/low capacity	(Aggarwal et al., 2017; Akin et al., 2015; Fernández et al., 2012; Kobayashi, 2018; Mohammadi & Emdadi, 2014; Joel Samson Mtebe & Raisamo, 2014)	Dynamic Capacity	(Aggarwal et al., 2017; Akin et al., 2015; Fernández et al., 2012; Kobayashi, 2018; Mohammadi & Emdadi, 2014; Joel Samson Mtebe & Raisamo, 2014)
Expert/Professionals	E-learning professionals	(Mohammadi & Emdadi, 2014) (Fernández et al., 2012)	Computer technician	(Mohammadi & Emdadi, 2014) (Fernández et al., 2012)
Software implementation and deployment	Longer Time	(Aggarwal et al., 2017; El-Mhouti et al., 2017; Fernández et al., 2012; Mohammadi & Emdadi, 2014; Joel Samson Mtebe & Raisamo, 2014)	Short time	(Aggarwal et al., 2017; El-Mhouti et al., 2017; Fernández et al., 2012; Mohammadi & Emdadi, 2014; Joel Samson Mtebe & Raisamo, 2014)
Processing Power	Initial and fixed	(Mohammadi & Emdadi, 2014)	On-demand basis	(Mohammadi & Emdadi, 2014)

Data Security, Trust, related issues	Internally maintained: less security and more trust	(Akin et al., 2015; Kobayashi, 2018; Mohammadi & Emdadi, 2014)	Externally maintained	(Akin et al., 2015; Kobayashi, 2018; Mohammadi & Emdadi, 2014)
Privacy, Regulatory compliance	High privacy and compliance	(Akin et al., 2015)	Low privacy and compliance	(Akin et al., 2015)
Overall cost	High Initial investment fixed and up	(Aggarwal et al., 2017; Akin et al., 2015; Fernández et al., 2012; Kobayashi, 2018; Mohammadi & Emdadi, 2014)	Low (Pay per use)	(Aggarwal et al., 2017; Akin et al., 2015; Fernández et al., 2012; Kobayashi, 2018; Mohammadi & Emdadi, 2014)
Maintenance	High cost	(Aggarwal et al., 2017; Kobayashi, 2018; Joel Samson Mtebe & Raisamo, 2014) (Fernández et al., 2012)	Low cost	(Aggarwal et al., 2017; Fernández et al., 2012; Kobayashi, 2018; Joel Samson Mtebe & Raisamo, 2014)
Lack of confidentiality	Low confidentiality	(Ahmed, 2015)	High confidentiality	(Ahmed, 2015)
Lack of trust in security and access control	Low trust	(Ahmed, 2015)	High trust	(Ahmed, 2015)
DoS attack	High	(Ahmed, 2015)	Low	(Ahmed, 2015)

As depicted in Table 2.12, the comparison of e-learning on-premises and CC for e-learning are summarised. Hence, it can be observed that CC for e-learning offers more advantages like cost savings, more flexible and scalable, and standardised software packages. In contrast, on-premises e-learning is lagging in the perspective of cost, security and scalability.

2.13 TOE, DOI and IaaSBEL Model

The Technology, Organization, and Environment (TOE) framework is an organizational theory that focuses on how organizations adapt/adopt technological innovation from the Technology and Organization and the Environmental viewpoints (Tom et al., 2019; Tornatzky & Fleischer, 1990). The technology perspectives comprise the internal and external expertise crucial in increasing the organization's operational efficiency. Thus, the internal variables associated with the technology's anticipated performance have been considered before the adoption (implementation) and the technology benefits. Liao et al. (2003) opined that an organization's experiences internally or externally encourage and positively look at how innovation affects them (Baker, 2012). The Organization perspective comprises the business rivals, size, scope, human resources and management structure (Tornatzky & Fleischer, 1990). The Environment perspective is "linked" to competition, business practice, government impact on the organization and globalization (Chau & Tam, 1997; Tornatzky & Fleischer, 1990).

Further, the TOE framework was utilized in this study because of its cognizance of the Environmental context compared to the Diffusion of Innovation (DOI) theory (Oliveira et al., 2014). The TOE is considered a generic theory that allows external variables (Tom, Virgiyanti, & Osman, 2019; Zhu & Kraemer, 2005). The suitability of TOE in this study because HEIs in Nigeria are corporate entities with structure (e.g., physical learning facilities), function (academic leadership, professional development, and general higher education), that could depict a wider range of factor that may influence the Intention to adopt IaaSBEL Infrastructure in Nigerian HEIs. The TOE theory has been applied in numerous studies, which include e-learning (Eze et al., 2020; Eze et al., 2018), Cloud Computing (Oliveira et al., 2014), cloud-based e-learning (Atcharyachanvanich et al., 2014; Noor, 2016; Tarhini et al., 2018; Tom, Virgiyanti, & Osman, 2019; Tom, Virgiyanti, & Rozaini, 2019), and library (Yuvaraj, 2016) among others.

The DOI is generally regarded as one of the prevalent innovation adoption theories applicable in numerous spheres or research domains (Sahin, 2006; Venkatesh et al., 2003). The DOI theory is utilized in numerous IS studies (Lyytinen & Damsgaard, 2001). The DOI is the “theory of how, why and at what rate new ideas, technology and process innovation spread via an organization, a society or country” (Rogers, 2003b). Hence, DOI describes how an innovation or new technology becomes diffused. Concerning the adoption of technology, the first two attributes (Relative Advantage and Compatibility) consistently influence innovation adoption and influence innovation adoption decisions (Alzougool & Kurnia, 2010; Jeyaraj et al., 2006). Therefore, this study amalgamates the TOE and DOI to complement the weakness of the DOI theory. Since the TOE is a generic theory that allows external variables such as Security, Trust and Cost Savings are incorporated into the theory (Zhu & Kraemer, 2005) (see **Section 3.3.1 for more details**).

The DOI and TOE theories have been applied to numerous technologies or innovations adoption decisions in organizations, as stated in **section 3.3.1**. The IaaSBEL model managers are classified into two where users (ICT directors, Students, and Staff) manage the application, data, runtime, middleware, and OS, whereas the Cloud Service Provider (CSPs) or vendor manages the virtualization, servers, storage, and networking. Nonetheless, the IaaSBEL provides some but with a certain degree of freedom (i.e., control) compared to the SaaS or PaaS cloud service model. The DOI and TOE theory has been applied in numerous technology (innovation) adoption decisions in the organization ranging from e-learning, CC, library management, and cloud-based e-learning, as shown above. Therefore, the TOE and DOI theories can support the IaaSBEL model despite cloud users' and CSPs' control levels. Hence, the IaaSBEL, like any technology, is the use or renting of the Infrastructure like the storage (e.g., backup, disaster recovery, management for learning system and the users), virtualization in the form of Virtual Machines (VMs) for HEIs with limited Infrastructure, load balancing for all learning systems, scaling management for VMs, and backup and restore for e-learning applications (Liang and Yang, 2011).

Therefore, it is shown that coming both the TOE and DOI theories gives a good predictive relevance or power in the Intention to adopt IaaS BEL model (Tom et al., 2019). Numerous studies have shown the performance/benefits of the TOE and DOI theory's performance/benefits in adopting CC in HEIs (Tom et al., 2019; Hiran & Henten, 2020). Both theories support the IaaS model of the cloud despite the CSPs' level of control and the cloud users.

2.14 Gap Analysis

The current study has identified several theoretical as well as practical gaps that require further exploration as follows:

- Majority of the existing studies on cloud-based e-learning, specifically in Nigeria focus mainly on the advantages (i.e., at an abstract level). However, minimal studies focus on the empirical aspect of the cloud-based e-learning.
- Most of the extant literature on cloud-based e-learning focuses on the SaaS deployment model. However, limited studies focus on the IaaS deployment model.
- Preceding studies on the relationship between Technology, Organization, and Environment variables are limited. However, the studies failed to use important variables such as security, trust, and cost savings as external variables. Also, the use of ICT directorates top managers, as respondents, is limited.
- Most of the past study does not focus on Government Support as a moderating variable for the Intention to adopt IaaS BEL Model. Government support plays a crucial role in innovation adoption in developing countries' HEIs.
- The amalgamation of the TOE and DOI is limited in the extant literature.
- The amalgamation of the TOE and DO theories in the IaaS BEL study is limited. Hence, this study combines the TOE, DOI and other external variables.
- The prior study only applied quantitative or qualitative research design independently. Nonetheless, this study utilizes a mixed-method (sequential explanatory) research design.

- The preceding studies does not propose any recommendation or strategy to adopt IaaS/BEL. However, this study proposed IaaS/BEL adoption recommendations (Refer to Appendix Q and R for more details).
- Only limited studies focus on the factors that influence the Intention to adopt IaaS/BEL in Nigerian HEIs.

2.15 Summary

This chapter elaborates on the numerous topics related to the study covered extensively in the literature. Thus, extant literature has demonstrated that empirical evidence abounds for the TOE and DOI theories with external variables in IaaS/BEL, especially the ICT directorates top managers in Nigerian HEIs. Besides, numerous issues concerning education in developing countries in general and Nigeria have shown that it is bedevilled with numerous challenges, which hampers the effective utilization of e-learning towards meeting the SDGs on education. Extant literature has suggested the e-learning problems, even though it is the future of education during this Covid-19 pandemic. CC and e-learning were looked at from both the cloud service providers and the users' perspectives to solve the problems mentioned earlier of the current e-learning systems used. As such, a need arises to empirically examine and identify the factors that will influence the intention to adopt IaaS/BEL in Nigerian HEIs. The next chapter presents the conceptual model of the study.

CHAPTER THREE

CONCEPTUAL MODEL

3.1 Introduction

The chapter intended to provide information on the Conceptual Model. The study aims to model and validate the influencing factors of IaaS/BEL adoption in Nigerian HEIs. The methods and pattern utilized in this study must provide an objective of the researcher's intention. The chapter proposes a conceptual model, formulates the hypotheses, as well as selected theories.

3.2 Theoretical Background

There are numerous information system (IS) adoption and usage theories, as proposed in the literature. Thus, some of the theories include the Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Adoption Model (TAM), Universal Theory of Acceptance and Use of Technology (UTAUT), Technology Adoption Model 2 (TAM2), Diffusion of Innovation (DOI), and Technology Organization Environment (TOE) theory as discussed in the earlier section of this chapter. Nonetheless, this study adopts the TOE and DOI theories with some external variables crucial in the study.

The TOE theory is generic (Zhu & Kraemer, 2005) that accepts external variables. According to Rogers (1995), there is consistency between the DOI and TOE theories. Besides, the Technology, Organisation, and Environment perspectives are theorized to influence technology adoption. This is further shown in numerous studies where TOE theory accommodates other external variables as seen in the extant literature (Segooa & Kalema, 2015; Tariq et al., 2017; Wahsh & Dhillon, 2015). Nonetheless, compared to DOI, the TOE has the edge over it due to its recognition of the Environmental perspectives (Alshamaila et al., 2013). Additionally, The TOE is applied in numerous technology

adoption research (Haag & Eckhardt, 2014; Tarmidi et al., 2014; Tashkandi & Al-Jabri, 2015).

Similarly, the TOE is a multi-perspective framework that was developed by Tornatzky and Fleischer (1990). The DOI is integrated with the TOE to complement DOI weakness (i.e., the Environment factors), which are crucial in this study. Notwithstanding, both the DOI and TOE have shown good predictive power in technology adoption decisions. Moreover, the variables were extracted from both the TOE, DOI, and some external constructs. The constructs are the “Relative Advantage, Compatibility, Trust, Security, Top Management Commitment, Cost Savings, Competitive Pressure, Service Provider Support, Government Support and the Intention to adopt IaaSBEL.”

Furthermore, future studies should integrate two or more theories to comprehend IT adoption decisions (Oliveira & Martins, 2011). Therefore, both DOI and TOE are significant in this study because they consider the TOE perspectives of IaaSBEL adoption in developing countries (Tom et al., 2019). The TOE and DOI were amalgamated in this study with TOE as the base theory. Security, Trust, and Cost Savings were incorporated as external variables to access the Intention to adopt IaaSBEL by the ICT directorates’ top managers. Also, Government Support is expected to moderate the relationships between “Relative Advantage, Trust, and Cost Savings.”

3.2.1 Technology Acceptance Model

The Technology Acceptance Model (TAM) is an IS theory that models how users accept and use technology. The model suggests that when users are presented with new technology, numerous factors influence their decision about how and when to use it. TAM is the extension of Ajzen and Fishbein (1975) Theory of Reasoned Action (TRA) (Davis

et al., 1989). Thus, as Davis et al. (1989) proposed, it is the most widely applied model of users' acceptance and usage of technology (Venkatesh & Fred, 2000). Hence, TAM is specifically meant to explain computer usage behavior (Davis et al., 1989). The model posits that two beliefs, "Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)," are the primary relevance for computer acceptance behavior. Figure 2.15 presents the TAM model and its constructs.

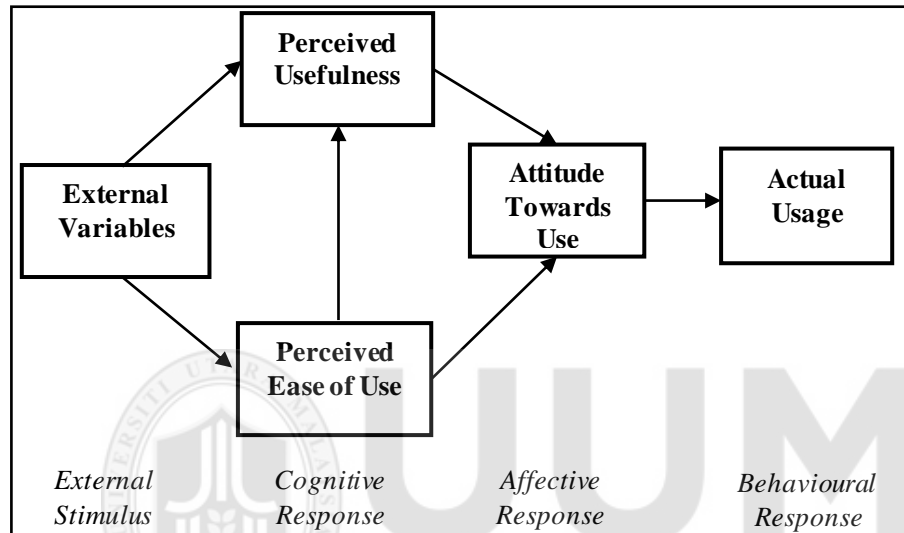


Figure 2.15. Technology Acceptance Model

Adopted from: (Davis, 1993)

TAM has some drawbacks; thus, studies using TAM have produced contradictory results and have led to misunderstandings over moderating and external variables (Chen & Tan, 2004). Also, it measures perception adoption and self-reports on future behavior rather than the measurement of the actual behavior of adopting new services or solutions (Wu, 2011b). Therefore, TAM has a limited possibility of explaining and predicting triviality and lack practical value (Garača, 2011). Table 2.13 presents the definition of TAM terms.

Table 2. 13

TAM constructs and their definitions.

Construct/Variables	Definition
Perceived Usefulness (PU)	“The degree to which a person believes that using a particular system would enhance his or her job performance” (Davis et al., 1989). “The as user’s subjective probability that using a specific application system will increase his or her job performance within the organizational context “(Davis et al., 1989).
Attitude Towards Use (ATW)	“The individual positive or negative feelings about performing the target behavior” (Ajzen & Fishbein, 1975; Davis et al., 1989).
Perceived Ease of Use (PEOU)	“The degree to which a person believes that using a particular system would be free of effort (Davis et al., 1989).

3.2.2 Technology Acceptance Model 2

Venkatesh and Davis (2000) modified the TAM in 2000 and came up with Technology Acceptance Model 2 (TAM 2). Thus, two processes, the “Social Influence processes (i.e., Subjective Norms, Voluntariness, and Image)” as well as the “Cognitive Instrumental process (Job Relevance, Output Quality, Result Demonstrability, and Perceived Usefulness),” were integrated into the TAM 2 model. Hence, the two processes were crucial to the study of user acceptance. The TAM 2 explains 60% of technology acceptance (Venkatesh & Davis, 2000). Figure 2.16 presents the extended TAM2 model.

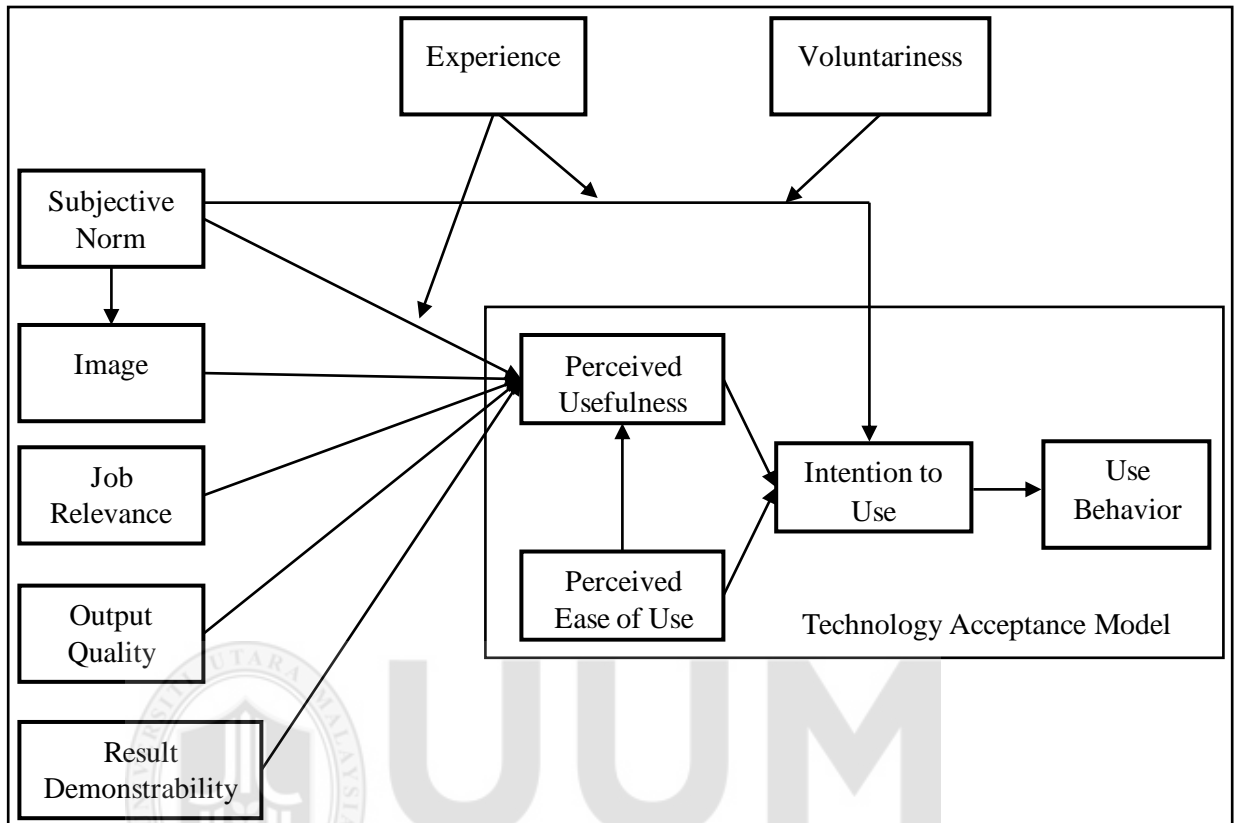


Figure 2. 16. The Extended Technology Acceptance Model 2
Adopted from: (Venkatesh & Davis, 2000).

Table 2. 14

Extended TAM2 definition of constructs

Construct/Variables	Definition
Subjective Norm (SN)	“Refers to the perceived social pressure to partake or not to partake a behavior” (Ajzen, 1991; Ajzen & Fishbein, 1975).
Voluntariness and Compliance with Social Influence	“Refers to the extent to which potential adopters perceive the adoption decision to be non-mandatory” (Venkatesh & Davis, 2000).
Image (I)	“Refers to the degree to which use of innovation is perceived to enhance one’s status in one’s social system” (Moore & Benbasat, 1991).
Job Relevance (JR)	“Refers to individual perception regarding the degree to which the target system is applicable to his or her job” (Venkatesh & Davis, 2000).

Output Quality (OQ)	“Refers to output measures perception of how well the system performs the job-related tasks” (Venkatesh & Davis, 2000).
Result Demonstrability (RD)	“Refers to the tangibility of the results of using the innovation”(Moore & Benbasat, 1991). Thus, individuals can be expected to form additional optimistic perceptions of the usefulness of a system.

Table 2.14 deliberates on the definition of constructs of the extended TAM 2 model. The constructs include the “Subjective Norm, Voluntariness and Compliance with Social Influence, Image, Job Relevance, Output Quality as well as Result Demonstrability.”

3.2.3 Theory of Reasoned Action

The Theory of Reasoned Action (TRA) is used in social psychology to forecast or predict users' usage and behavior (Ajzen & Fishbein, 1975). Thus, helping in predicting volitional behaviors as well as aid in understanding their psychological determinants. The TRA posits that behavioral intentions, which are immediate antecedents to behavior, are a function of salient information or beliefs about the likelihood that performing a particular behavior will lead to a specific outcome (Madden et al., 1992). The primary constructs are the “*Attitude* and *Subjective Norm*.” Thus, “TRA works well when applied to behaviors that are under a person’s volitional control.” Figure 2.17 presents the TRA model.

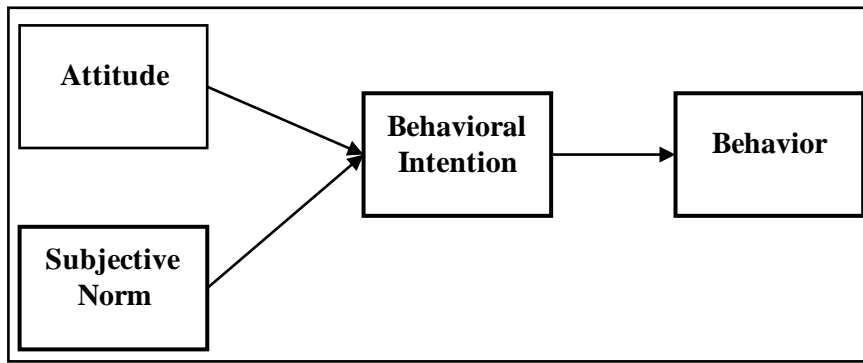


Figure 2. 17. Theory of Reasoned Action (TRA)

Adopted from: (Madden et al., 1992)

According to the TRA, a person’s intention is a function of two determinants; “personal in nature (individuals positive or negative evaluation of performing the behavior termed *Attitude towards the behavior*)” and the other reflecting “social influence (persons perception of social pressures put on him to perform or not to perform the behavior in question)” (Kuhl & Beckmann, 2012). The TRA is based on the assumption that human beings usually behave sensibly and considers the implication of their actions (Kuhl & Beckmann, 2012). However, Sheppard, Hartwick, and Warshaw (1988) found that TRA fails to predict behavior in the case of intent changes attributed by performance or the intention to measure does not match the behavioral requirements like action, context, time-frame, as well as specificity (Sheppard et al., 1988). Table 2.15 presents the definition of constructs of the TRA model.

Table 2. 15

The TRA definitions of constructs

Construct/Variables	Definition of Terms
Attitude (A)	“Is the sum of beliefs about a particular behavior weighted by evaluations of these beliefs” (Ajzen & Fishbein, 1975).
Subjective Norm (SN)	“Refers to the perceived social pressure to partake or not to partake a behavior” (Ajzen, 1991; Ajzen & Fishbein, 1975).
Behavioral Intention (BI)	“Function of both attitudes toward a behavior and subjective norms toward that behavior which has been found to predict actual behavior” (Ajzen & Fishbein, 1975).

Table 2.15 presents the definition of constructs, like the “Attitude, Subjective Norm and Behavioral Intention” of the TRA model.

3.2.4 Theory of Planned Behavior

“The Theory of Planned Behavior (TPB) was developed to predict behaviors in which individuals have incomplete volitional (determining or decision) control.” Ajzen (1985, 1991) proposed the TPB as a response to the TRA’s limitation in dealing with behaviors over which people have no control (incomplete) volitional control. The TPB extends the TRA by incorporating another construct or variable of “*Perceived Behavioral Control*” to explain the influence of resources towards the perceived ease of performing a particular behavior (Ajzen, 1991). The main difference between TRA and TPB is the addition of a third determinant of “Behavioral Intention, Perceived Behavioral Control.” Thus, the “Perceived Behavioral Control is also determined by two factors; Control Beliefs and Perceived Power.” Figure 2.18 presents the TPB model.

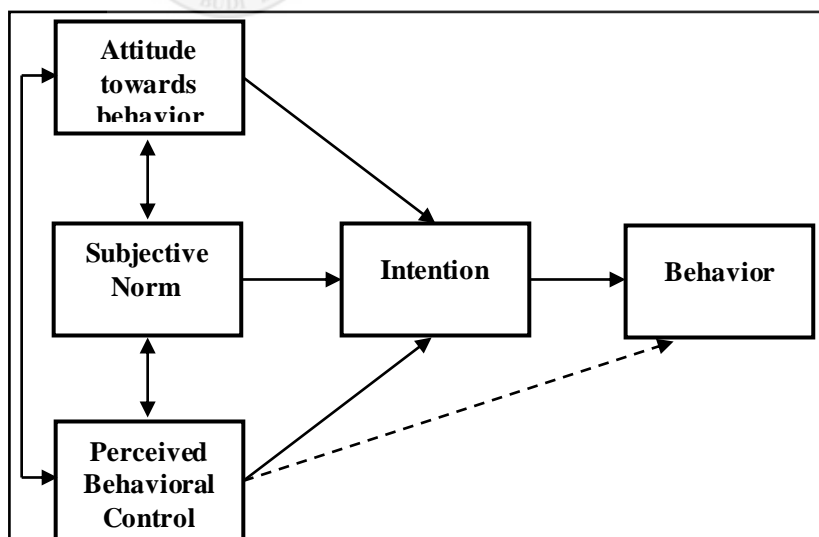


Figure 2. 18. Theory of Planned Behavior (TPB)
Adopted from: (Ajzen, 1991)

Intentions are assumed to capture the motivational factors that influence behavior. Thus, indicating how people are willing to attempt and how much effort they put into performing a behavior. Nevertheless, TPB has been criticized by researchers like Conner and Armitage (1998) “the consideration of volitional process that may influence the relationship of goal intention and goal influence. Taylor and Todd (1995a) “TRA requires individual motivation earlier to perform a certain behavior.” Table 2.16 presents the definition of constructs of the TPB model.

Table 2. 16

The TPB definition of constructs

Construct/Variables	Definition of Terms
Attitude Towards Behavior (ATB)	“Refers to the degree to which a person has a satisfactory or unsatisfactory of the behavior in action” (Ajzen, 1991).
Subjective Norms (SN)	“Refers to the perceived social pressure to partake or not to partake a behavior” (Ajzen, 1991).
Perceived Behavioral Control (PBC)	“Refers to the perceived ease or difficulty of performing the behavior and its assumed to reflect past experiences as well as anticipated impediments and obstacles” (Ajzen, 1991).
Intention (I)	“are assumed to capture the motivational factors that influence a behavior” (Ajzen, 1991).

Table 2.16 presents the definition of constructs like the “Attitude Towards Behavior, Subjective Norms, Perceived Behavioral Control and Intention” as proposed by Ajzen (1991).

3.2.5 Unified Theory of Acceptance and Use of Technology

However, the concerns for ease of use may become non-significant overextended The evolvement of TRA and TAM, as well as other models, has led to the development of numerous theories such as; the TPB by Ajzen (1991), DOI by Rogers (1995), Combined TAM and TPB Taylor and Todd (1995b), and TAM2 Venkatesh and Davis (2000) have evolved from the original TRA and TAM Davis et al. (1989). Venkatesh et al. (2003)

designed the UTAUT model to consolidate preceding TAM related issues. Thus, in the UTAUT model, “Performance Expectancy and Effort Expectancy were used to incorporate the variables or constructs of the perceived usefulness and ease of use in the main TAM model” (Marchewka & Kostiwa, 2007). Figure 2.19 UTAUT model.

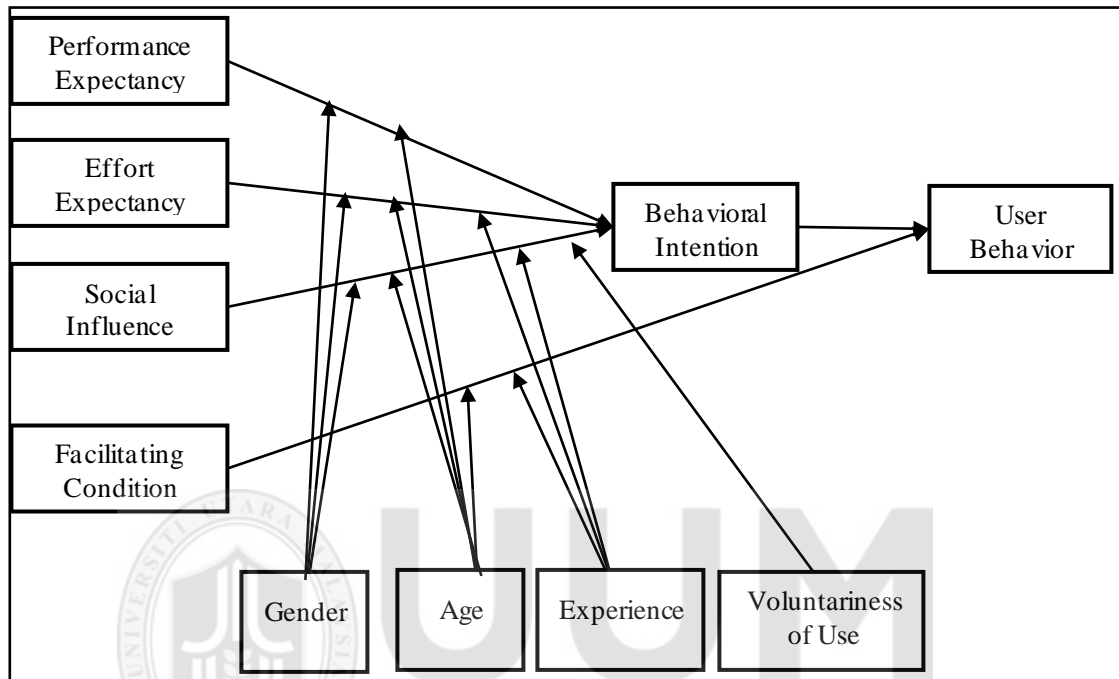


Figure 2. 19. Unified Theory of Acceptance and Use of Technology (UTAUT) Adopted from UTAUT (Venkatesh et al., 2003).

Similarly, the UTAUT model posits that the effort expectancy construct can be significant in determining IT user acceptance and sustained usage (Marchewka & Kostiwa, 2007). Hence, Perceived Ease of Use (PEOU) can be expected to more salient only in the early stages of using new technology or innovation, and it can have a positive effect on the perceived usefulness of the technology. Moreover, the UTAUT model tries to clarify how individual differences influence technology use. Therefore, the UTAUT model accounted for 70% of the usage intention variance, surpassing the TAM model (Marchewka & Kostiwa, 2007). Table 2.17 presents the definitions of the UTAUT constructs.

Table 2. 17

UTAUT definitions of Constructs

Construct/Variables	Definition of Terms
Performance Expectancy	“Refers to the degree to which an individual believes that using the system will help him/her to attain gains in job performance “ (Venkatesh et al., 2003).
Effort Expectancy	“Refers to the degree of ease associated with the use of the system” (Venkatesh et al., 2003).
Social Influence	“Refers to the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., 2003).
Facilitating Condition	“Are the defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh et al., 2003).

Table 2.17 presents the definition of the UTAUT construct. The constructs include the “Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Condition.”



3.2.6 Unified Theory of Acceptance and Use of Technology 2

Venkatesh, Thong, and Xu (2012) have presented the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) to study technology acceptance and usage in the customers' context. The UTAUT2 extended the UTAUT by incorporating three additional IV such as the “Hedonic Motivation, Price Value, and Habit”. At the same time, Voluntariness was dropped from the UTAUT2. Similarly, Venkatesh et al. (2012) argued that Price Value would influence Behavioral Intention to adopt innovation. In UTAUT 2, Age, Gender, and Experience are used as moderators to behavior intention and use. Figure 2.20 presents UTAUT 2.

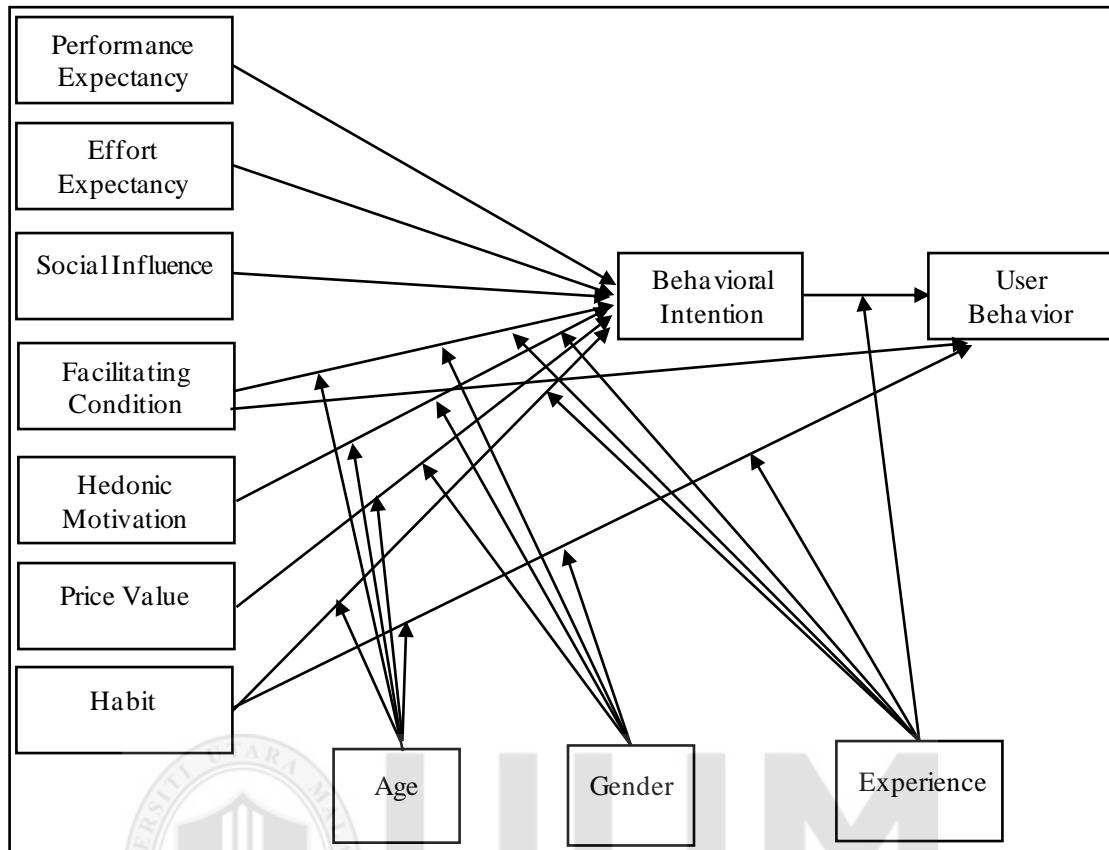


Figure 2.20. Unified Theory of Acceptance and Use of Technology 2 Adopted from (Venkatesh et al., 2012).

Figure 2.20 depicts the UTAUT2 model and its IVs and DVs. Table 2.18 presents UTAUT2 constructs definition.

Table 2.18

UTAUT 2 definitions of Constructs

Construct/Variables	Definitions of Terms
Performance Expectancy	“Refers to the degree to which an individual believes that using the system will help him/her to attain gains in job performance “ (Venkatesh et al., 2003).
Effort Expectancy	“Refers to the degree of ease associated with the use of the system” (Venkatesh et al., 2003).
Social Influence	“Refers to the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., 2003).
Facilitating Condition	“Are the defined as the degree to which an individual believes that an organizational and technical infrastructure

	exists to support use of the system” (Venkatesh et al., 2003).
Hedonic Motivation	Refers to the motivation, fun, or pleasure derived from using technology, play an essential role in determining technology acceptance and use (Brown and Venkstesh, 2005)
Price Value	Refers to customers cognitive tradeoff between the perceived benefits of the application and the monetary cost for using them (Dodds et al. 1991)
Habit	The experience reflects the opportunity to use a target technology.

Table 2.18 presents the definition of UTAUT 2 constructs. The UTAUT 2 constructs include “Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Condition, Hedonic Motivation, Price Value and Habit”.



3.2.7 Diffusion of Innovation

“Diffusion is the process by which an innovation is communicated via certain channels over time among the members of social system” (Rogers, 2003a, p. 5). Accordingly, it serves as a medium for communicating ideas. According to Rogers (2003a), “An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (p. 41). The DOI is viewed as one of the famous theory of adoption that focuses on how, why, and what rate innovation is dissimilated in organisations or state and is applied in various research orders (Rogers, 1995, 2003b).

The spreading of innovation refers to the procedure through which innovation is communicated over time among members of a social system (Rogers, 1995). The higher the perceived relative advantage translates to faster innovation adoption (Rogers, 1995, 2003b). Thus, Relative Advantage could be monetary or non-monetary and can be assessed in the perspective of economic, social status, conform, and preference (Dibra,

2015). Nevertheless, no rule of thumb is contingent upon whom to include, depending on the individual and the group involved (Robinson, 2009). Figure 3.1 depicts the DOI theory.

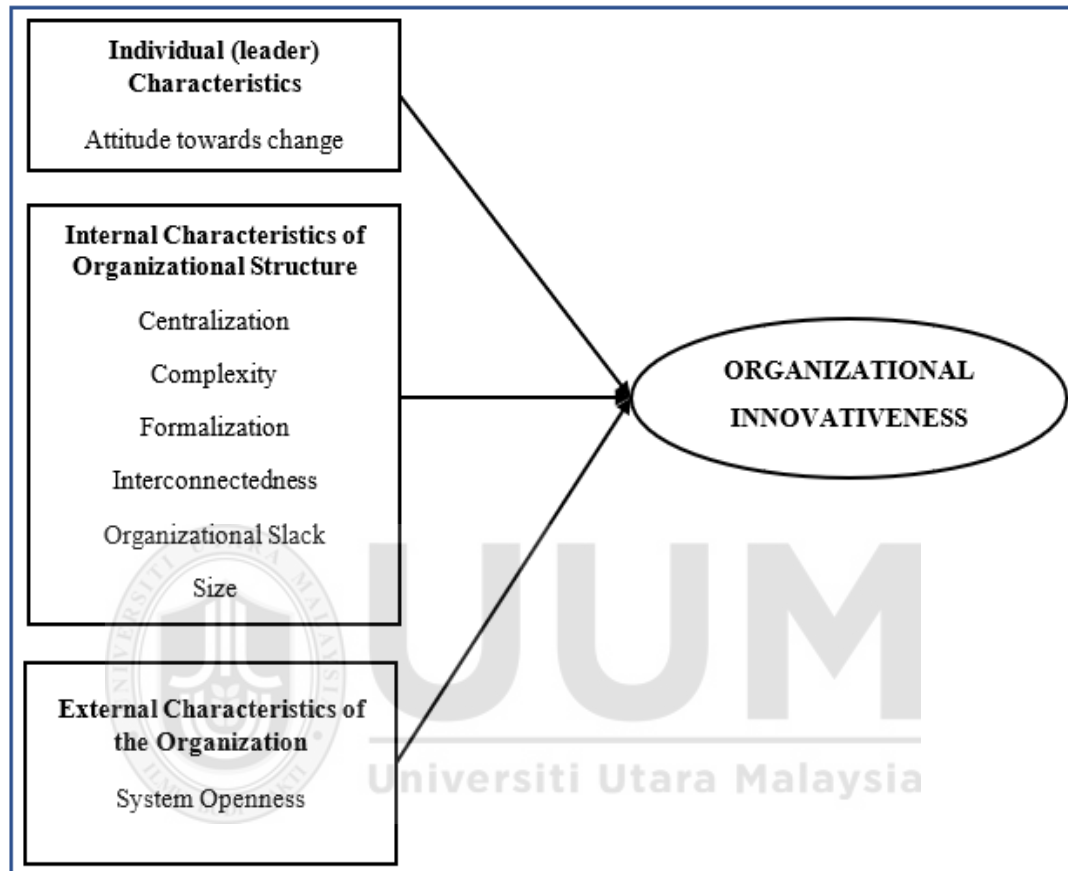


Figure 3. 1. Diffusion of Innovation
Adapted from: Rogers (1995).

Innovativeness is related to such IVs as “Individual (leader) Characteristics, Internal Organisational Structure Characteristics, and External Characteristics” of the organisation. The innovation process in an institution is intricate, involving several individuals, including those who accept and reject a new idea, that plays a crucial role in innovation decisions (Oliveira & Martins, 2011). The Individual Characteristics describes the attitude of the leaders towards change. The Internal characteristics of an institutional structure incorporate observations (Rogers, 1995).

Additionally, given Roger's DOI, Moore and Benbasat (1991) have theorized the refinement version, which includes seven IVs to assess technology adoption, namely, "Relative Advantage, Ease of Use, Image, Visibility, Compatibility, Result Demonstrability, and Voluntariness". Nonetheless, despite the tremendous utilization of DOI, some authors have identified limitations. For instance, Damanpour (1996) and Greenhalgh et al. (2004) also gusted that the DOI is challenging in measuring human characteristics and social networks' complexity. Thus, further exploration and improvements are essential. Figure 3.2 presents the DOI theory.

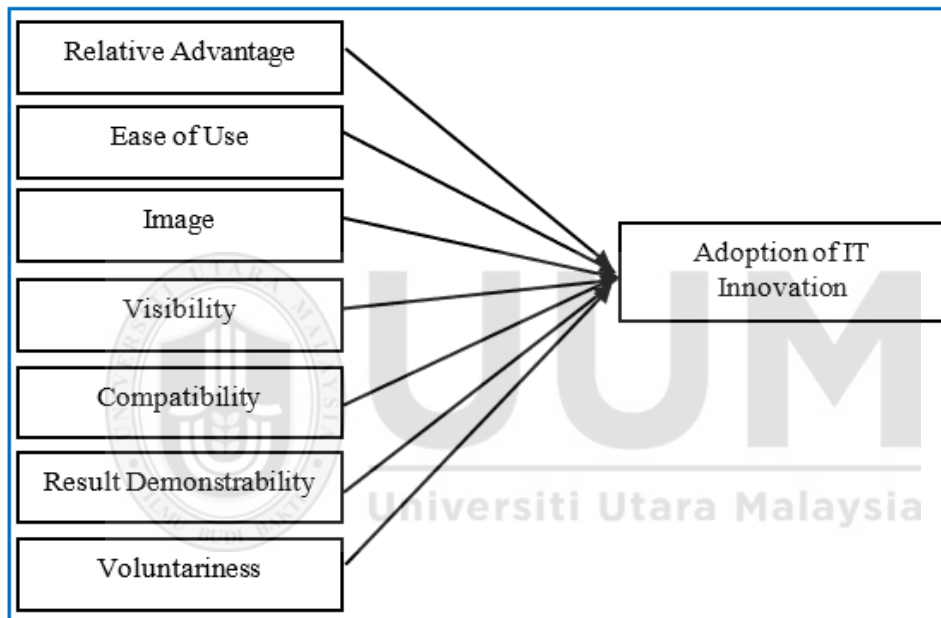


Figure 3. 2. Refined DOI by Moore and Benbasat (1991)
Illustration adapted from Tan (2013).

3.2.8 Technology, Organisation, Environment

Tornatzky and Fleischer (1990) designed the TOE theory, which recognizes an enterprise's aspects that impact innovation adoption, including Technology, Organisation, and Environment Perspective (Tornatzky & Fleischer, 1990).

Tornatzky and Fleischer (1990) designed the TOE theory, which recognizes an enterprise's aspects that impact innovation adoption, including Technology, Organization, and Environment Perspective (Tornatzky & Fleischer, 1990). Accordingly, the Technological perspective explains the inner and outer innovation pertinent to the institution, the Organisational perspective assesses the scope, size, and organizational structure, while the Environmental perspective looks at the industries, competitors, and governments (Tornatzky & Fleischer, 1990).

Thus, TOE has been utilized by numerous authors for innovation adoption since it shows a rigid theoretical basis, consonant empirical support as well as its application to the IS innovation domain via specific factors identified within the perspectives that may vary across different kinds of literature (Oliveira & Martins, 2011, p.12). “For the unit of analysis, decisions are being made by individuals, groups or even organizations” (Tornatzky & Fleischer, 1990, p.32-33). For the level of concentration, the hierarchical levels are proposed by Tornatzky and Fleischer (1990) as “individuals as individuals, individuals enacting social roles, social groups, organizations, inter-organizational links, aggregates of organizations and societies. Nonetheless, there is no uniquely "correct" level of concentration” (p. 33).

Furthermore, the theory recognizes three aspects of enterprise context that influence the process by which it adopts and implements a technological innovation; The TOE context (Oliveira & Martins, 2011). Thus, an enterprise's TOE perspective helps in innovation adoption (Oliveira & Martins, 2011). The TOE framework explains how the firm setting impacts the adoption and the implementation of innovation (Baker, 2012). Therefore, the TOE is among the organization-level theory, explaining how innovation is diffused in an organization using the three (3) perspectives. Figure 3.3 presents the diagrammatical expression of the TOE model.

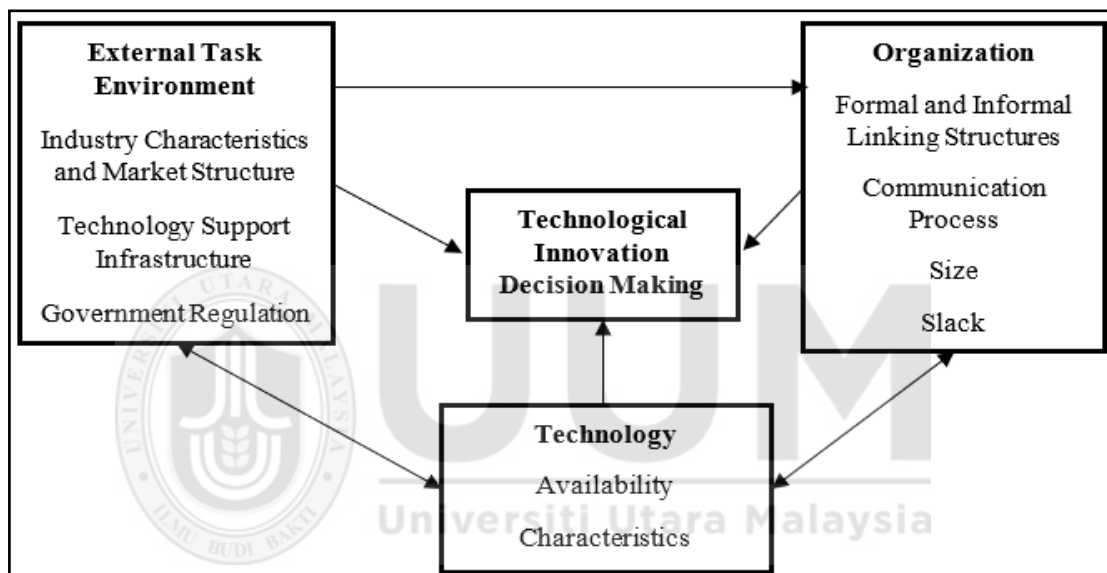


Figure 3. 3. The Technology Organization and Environment framework Adopted from Tornatzky and Fleischer (1990)

The TOE is a generic theory that permits other variables' introduction (Zhu & Kraemer, 2005). Hence, there is consistency between the TOE and DOI (Rogers, 1995). The Technological aspect comprises the technology in use in the organisation and those readily available in the market but not in use (Baker, 2012).

Organisation's existing technologies are crucial in the adoption process because they set an extensive (broad) limit on the scope and the pace of technological change the firm can undertake (Collins et al., 1988). The Environmental perspective refers to the structure of the “industry, availability or unavailability of the technology service provider as well as the regulatory environment”. The support infrastructure for technology also impacts innovation (Baker, 2012).

For instance, organisations with a high intensive cost for skilled personnel are frequently forced to innovate via labour and cost savings inventions (Globerman, 1975; Levin et al., 1987). Hence, organisations can gain a competitive advantage by effectively managing today’s challenges while simultaneously creating innovation for tomorrow. Nevertheless, as we have seen, success often breeds stagnation; in dominant companies, the challenge is to rekindle the innovative spirit that led to past success (Tushman & Nadler, 1986).



3.3 Theoretical Framework

The theoretical framework identifies and defines the crucial variables or factors relevant to the problem and subsequently describes and explains the interconnections among the variables (Uma Sekaran, 2006). The theoretical framework involves identifying the interconnected variables, and their relationships considered important to the study. Hence, this research employs and amalgamates the Technology, Organization, and Environment (TOE) theory and the Diffusion of Innovation (DOI) theory (Tornatzky & Fleischer, 1990; Rogers, 2003b). The TOE theory has been used in the extant literature for innovation adoption decisions since it shows a strong theoretical basis and consistently predicts innovation adoption in an organization (Tornatzky & Fleischer, 1990; Oliveira et al., 2014). Hence the TOE theory is consistent with the DOI theory (Rogers, 2003b).

Furthermore, the DOI theory is also one of the popular adoption theories in innovation adoption. The theory's main idea is how innovation, ideas, processes, and technologies are

communicated over time among the member system (Jeyaraj et al., 2006; Alzougool & Kurnia, 2010; Tom, Virgiyanti, & Osman, 2019). The first two variables of the DOI theory: Relative Advantage and Compatibility, consistently influence innovation or IaaS/BEL adoption decisions. For the TOE theory, Top Management Support, Competitive Pressure, Service Provider Support, and Government Support are retrieved from the TOE, while Trust, Security, and Cost Savings are derived from the literature and problem statements to suit the objective of the study.

Moreover, the TOE and DOI theory's amalgamation will stretch and fill the literature's theoretical gap. Thus, extant studies have combined both the theories to attain their objectives (Gangwar & Date, 2015; Tom, Virgiyanti, & Rozaini, 2019; Hiran & Henten, 2020; Sayginer & Ercan, 2020). Using one theory like the DOI is not enough because it did not look at the environment perspective since it plays a significant role in IaaS/BEL adoption (Rogers, 2003a). This is true also true for the Nigerian HEIs. The TOE is a generic theory where other variables can be inserted and consistent with the DOI theory (Rogers, 2003b; Zhu & Kraemer, 2005). Therefore, the combination of both TOE and DOI theory suites the study's objectives and complements the theories' weaknesses.

Moreover, since the TOE theory was chosen as the base theory, all the variables are grouped into three, the Technology perspective, the Organization perspective, and the Environment perspective, respectively. Hence, the Technology factors comprise of the Relative Advantage, Compatibility, Trust, and Security. Whereas the Organization factors include the Cost Savings and Top Management Support, and finally, the Environment factor includes the Competitive Pressure and Service provider support. In the same vein, Government Support was used to moderate the relationship between Relative Advantage, Trust, and Cost Savings, as suggested by Baron and Kenny (1986). See sections 3.4, 3.5, and 3.6 for more information on the variables and their hypothesized relationships in this study.

3.3.1 Selected Underpinning Theories

The section below presents the underpinning theories adopted in this study and the justifications for its usage in IaaSBEL Intention settings to adopt in developing countries HEIs. The study's selected theories are the TOE proposed by Tornatzky and Fleischer (1990) and DOI, as proposed by Rogers (1995). The sections below present the justifications for selecting the DOI and TOE in the context of IaaSBEL in developing countries.

3.3.2 Justification of Using Technology Organization Environment

The Technology, Organization, Environment (TOE) is an institutional or organizational level theory (Baker, 2012; Alshamaila, Papagiannidis, & Li, 2013; Tashkandi & Al-Jabri, 2015), clarifies the three elements of a firms context that influence adoption decision. Thus, all three elements (i.e., Technology, Organization, Environment) are posited to influence technology or innovation adoption (Baker, 2012). The Environmental factor refers to the external factors to the institutions that encourage the adoption of CC (Tweel, 2012; Alshamaila et al., 2013). Thus, in the context of academics, it comprises HEIs ecosystems represented by other universities, colleges of education, and government rules and policies to regulate the CC market. Similarly, the environmental context refers to the area in which the institution performs its business, thus, related to the surroundings like the industry, competitors, and service provider technology (Alshamaila et al., 2013).

Furthermore, the Organizational perspective is associated with the resources and the features (characteristics) of the institutions, such as the Size, Managerial Structure, etc. The Technology perspective also represents the Internal and External technologies associated with the organization; both existing technologies are available, and the technology is readily available in the market (Alshamaila et al., 2013). Therefore, the “TOE framework is defined as a generic theory” (Zhu & Kraemer, 2005). It is generic

because several factors can be integrated into the TOE. Thus, the “TOE framework is consistent with the DOI” (Rogers, 1995). The TOE serves as a taxonomy for factors that simplify or prevent the adoption of innovations (Haag & Eckhardt, 2014). The TOE has an advantage over the DOI because it recognises the Environmental factors (Alshamaila et al., 2013; Oliveira & Martins, 2010). Tornatzky and Fleischer proposed the TOE on studying technology or innovation adoption (Tornatzky & Fleischer, 1990; Haag & Eckhardt, 2014). The TOE is widely used in studying technology adoption at the organization level (Gangwar & Date, 2016; Tom, Virgiyanti, & Osman, 2019).

The TOE has been applied in numerous technology adoption studies from TOE's perspective (Tarmidi, Rasid, Alrazi, & Roni, 2014; Tashkandi & Al-Jabri, 2015). So, the “TOE is a multi-perspective framework” developed by (Tornatzky & Fleischer, 1990). Thus, presenting one level of the innovation process, like how institutions (HEIs) influence the intention to adopt IaaS BEL. However, the weaknesses of the TOE framework may be twofold: (1) “it may not explicitly point out that what are the major constructs in the framework and the variables in each context, and (2) specific determinants identified within the three contexts may vary across different studies” (Wang, Wang, & Yang, 2010).

Therefore, Higher Education CC was tested and analyzed using the TOE framework in developed countries (Haag & Eckhardt, 2014). Notwithstanding, numerous studies have adopted the TOE theory for Technology or Innovation adoption. Hence, the TOE theory was used by many authors in diverse contexts, such as; CC (Haag & Eckhardt, 2014) and cloud-based e-learning (Hiran & Henten, 2020; Sabi et al., 2018; Tom, Virgiyanti, & Osman, 2019). Therefore, this study adapts the TOE theory for analyzing the intention to adopt CBEL in developing countries HEIs.

3.3.3 Justification of Using Diffusion of Innovation

The Diffusion of Innovation (DOI) is regarded as one of the most popular adoption theories from an organizational level perspective. Thus, DOI focuses on the spread of innovation such as ideas, processes, and technologies over time among the social system members (Rogers, 1995, 2003b). Rogers describes innovation as “an idea, practice or object that is perceived as new by an individual or other unit of adoption” (1995, p. 11). The Diffusion “is the process by which an innovation is communicated through certain channels over time among the members of a social system” (Rogers, 1995, p. 5). Also, the innovation-decision process is the "process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (Rogers, 1995, p. 20).

Similarly, (Rogers (1995) discussed five attributes that impact the rate of adoption: “Relative Advantage, Compatibility, Complexity, Trialability, and Observability”. The social system members are the adopters, such as individuals or organizations (Rogers, 1995). There are five categories of DOI adopters; “innovators, early adopters, early majority, late majority and laggard adopters” (Rogers, 1995). Additionally, the DOI theory is widely used to find the adoption predictors of IT diffusion in Organizations. Therefore, the DOI is the “theory of how, why and at what rate new ideas, technology and process innovation spread via an organization, a society or country” (Rogers, 2003b). In the same fashion, DOI has presented positive significances for the IS studies (Lyytinen & Damsgaard, 2001). The characteristics of innovation help clarify divergent levels of innovation adoption (Rogers, 1995, 2003b). The DOI adoption predictors like the Individual Leader Characteristics and Internal Characteristics of organization structure are comparable to the TOE Organizational context element (Baker, 2012).

Furthermore, DOI is one of the most supported and applied adoption theories in many disciplines (Tweel, 2012). Hence, DOI describes how an innovation or new technology becomes diffused. Concerning the adoption of technology, the first two attributes (Relative Advantage and Compatibility) consistently influence innovation adoption and influence innovation adoption decisions (Alzougool & Kurnia, 2010; Jeyaraj et al., 2006). However, previous research has indicated that Complexity, Observability, and Trialability did not emerge as distinct factors and is a less useful construct in innovation adoption (Pankratz et al., 2002). Likewise, Relative Advantage and Compatibility are significant constructs in determining technology adoption (Tweel, 2012). The construct of Relative Advantage and Complexity appears to be useful in assessing policy adoption (Pankratz et al., 2002). Therefore, this study includes the Relative Advantage and Compatibility constructs as indicators in the context of the Intention to adopt IaaSBEL in developing countries HEIs.

3.3.4 Justifications of Combining TOE and DOI

The amalgamation of IS research theories is common since it is proven to complement the theories' weaknesses. For instance, the DOI and TOE have been applied in numerous contexts to establish technology or innovation adoption, thereby making informed decisions. Similarly, numerous studies have used the combination of DOI and TOE theories in CC adoption (Gangwar et al., 2015; Tom et al., 2019; Hiran & Henten, 2019, 2020; Sayginer & Ercan, 2020). Therefore, this study amalgamates the DOI and TOE theories to complement the weakness of the DOI theory. It is expected from past antecedents that combining more than one theory will increase the predictive power of the IaaSBEL model in HEIs in developing countries (Tom et al., 2019). In the context of IaaSBEL in developing countries, studying the technological aspect is not enough. Thus, other factors, like the organization and environment factors, plays a crucial role in Nigerians HEIs adoption decisions.

Furthermore, the combination of TOE and DOI theory was researched in numerous subjects and CC adoption, as shown above. However, the limited study applied IaaS BEL in developing countries in general and Nigeria in specific. Also, all the variables were generated from the problem statement in section 1.4. The DOI theory variables utilized in this study include Relative Advantage, Compatibility, whereas Government Support, Competitive Pressure, and Service Provider Support were generated from the TOE theory. While Security, Trust, and Cost Savings were external variables crucial to the study. Since the TOE is the base theory, all the variables are grouped into the Technology, Organization, and Environment perspective.

The Relative Advantage associated with adopting IaaS BEL compared to the traditional method of teaching and learning. Some of the issues include inadequate availability of software and hardware, inadequate data storage capacity, and server failure (Oloyede et al., 2017; Edokpolor & Egbri, 2017; Edomwonyi & Osarumwense, 2017; Anagwo et al., 2019; Tens, 2019; Tom, Virgiyanti, & Osman, 2019). Also, the Compatibility of the IaaS BEL with the existing systems, databases, and configuration is another problem when technology like IaaS BEL is mentioned. Accordingly, based on the interview thematic analysis, the informants indicated that the infrastructure's compatibility with their existing systems is a crucial factor in IaaS BEL assimilation in Nigerian HEIs (Informant P1, P2, P3, and P4). Security and Trust are the main concerns of CC in general and specifically IaaS BEL (Tom et al., 2019); because the data of the cloud users are in the control of the cloud service providers, which raises both security (Sabi et al., 2017, 2018; Tom, Virgiyanti, & Rozaini, 2019) and trust issues (Almazroi et al., 2016, 2019; Ghazali et al., 2017).

Moreover, the Organization factor includes Top management Support and Cost Savings. The lack of support and commitment by the top managers hinders CC and IaaS BEL (Tom et al., 2019). With any technology, the top managers' commitment determines its assimilation in the Nigerian HEIs (Tom et al., 2019; 2019). As indicated by a UNESCO report, 15-20% budget on education is proposed, while Nigeria's education budget is 6-

7% of the total education budget (Amoo, 2019; NBS, 2020). Also, insufficient investment in education and hardware cost, software, storage, among others, are the reason IaaS for e-libraries was proposed in UAE (El Khatib & Opuencia, 2015), computing and library services in the UK (Chrysikos et al., 2016) and Nigeria (Tom et al., 2019; 2019).

Environment perspective variables include Competitive Pressure, Service Provider Support, and Government Support. According to the interview's thematic analysis, informants P1, P2, P3, and P4 indicated that competition among HEIs forces them to innovate. With IaaSBEL, research and collaboration would improve the e-learning systems and courses in Nigerian HEIs (Tom et al., 2019). Nonetheless, more control and flexibility of the IaaS makes it suitable for Nigerian HEIs since security and trust are among the issues of lack of adoption. Finally, the Government's support in terms of policies and incentives would make the assimilation of IaaSBEL faster, according to the thematic analysis findings (Informant P1, P2, P3, and P4) and Tom et al. (2019). As indicated in the extant literature, the TOE and DOI theories' combination addresses the aforementioned issues with good predictive power (Gangwar et al., 2015; Tom et al., 2019; Hiran & Henten, 2019; 2020; Sayginer & Ercan, 2020).

Furthermore, the IaaSBEL model managers are classified into two where users (ICT directors, Students, and Staff) manage the application, data, runtime, middleware, and OS, whereas the Cloud Service Provider (CSPs) or vendor manages the virtualization, servers, storage, and networking. Nonetheless, the IaaSBEL provides some but with a certain degree of freedom (i.e., control) compared to the SaaS or PaaS cloud service model. The DOI and TOE theory has been applied in numerous technology (innovation) adoption decisions in the organization ranging from e-learning, CC, library management, and cloud-based e-learning, as shown above. Hence, the TOE and DOI theories can support the IaaSBEL model despite cloud users' and CSPs' control levels. Therefore, it is clear from the above discussion that amalgamating both the TOE and DOI theories has shown strong predictive power and its ability to explain technology adoption in details.

3.4 Conceptual Model

The conceptual model describes how the concepts or variables in a model are related to each other (Sekaran & Bougie, 2016). A schematic diagram of the conceptual model helps understand and visualize the theorized relationships between variables. Thus, this study's conceptual model is developed by amalgamating the TOE and DOI theories, where the TOE serves as the base theory (i.e., where other variables are placed on it). Besides, Security, Trust, and Cost Savings are further used as external variables suitable to the study's context. Thus, it comprises eight (8) Independent Variables (IV), one Moderating Variable (MV), and one (1) Dependent Variable (DV). Hence, all these variables are theorized to influence the Intention to adopt IaaSBEL Model, as shown in Figure 3.4.

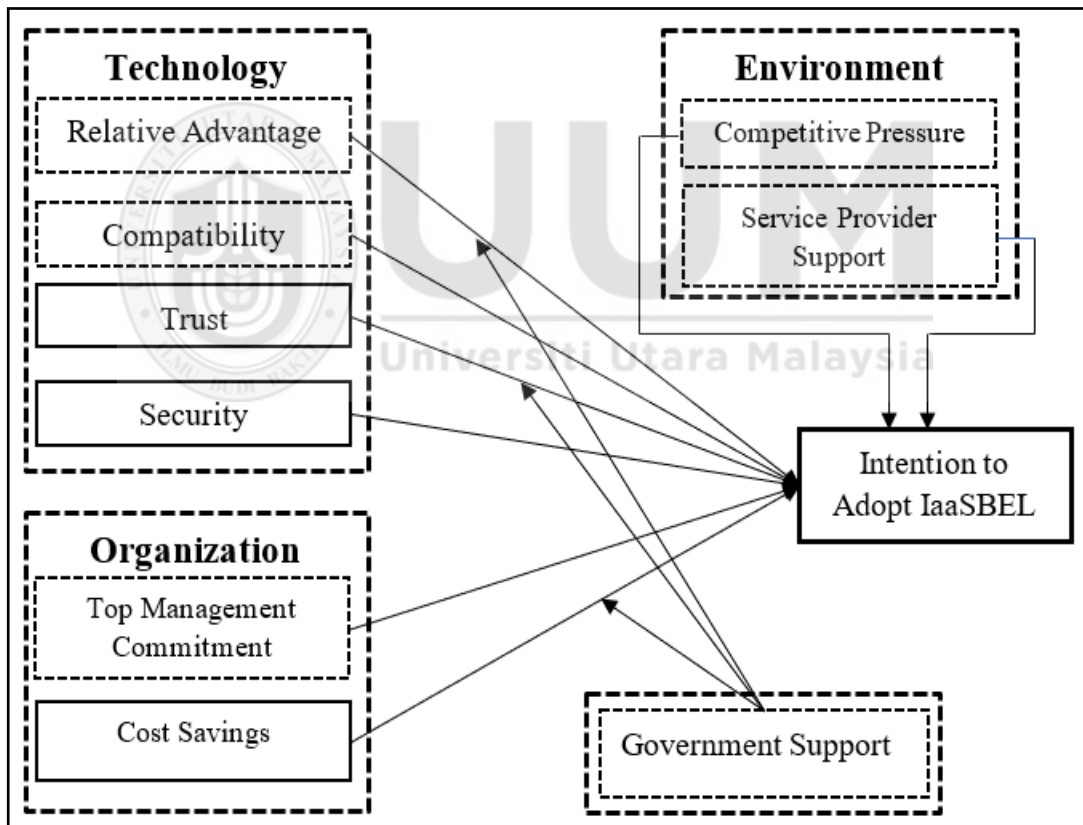


Figure 3. 4. The Conceptual Model of the Study

As shown in Figure 3.4, the conceptual model demonstrates how the Technology (Relative Advantage, Compatibility, Trust, and Security), Organization (Top Management Commitment, Cost Savings) and Environment (Competitive Pressure and Service Provider Support) perspectives with the addition of Government Support as an MV. These perspectives were joined with the DOI and other external variables (Trust, Security, and Cost savings). Also, Government Support will moderate the relationship between Relative Advantage, Trust, and Cost Savings.

3.4.1 Justification of Using Intention to Adopt IaaSBEL

A great deal of preceding research on IS focuses on understanding technology adoption's antecedents in different domains. Additionally, a vast percentage of literature has either adapted or adopted numerous IS models to measure or predict the Intention to adopt a technology. Roger's DOI is one of the most dominant theories in explaining and predicting the use of system and innovation adoption (Chen & Tan, 2004). Similarly, the TOE theory is one of the institutions level theories that consider both the technological perspective, organizational perspective, and the environmental perspective (Alshamaila et al., 2013; Tornatzky & Fleischer, 1990). All these perspectives are good determinants in predicting technology adoption, where a high number of IS research have used Intention to adopt as a DV (Malak, 2016; Alkhater et al., 2018; Tom, Virgiyanti, & Rozaini, 2019).

The DV of the study is the Intention to adopt IaaSBEL. Thus, the DV affects or is expected to be affected by the IV, also called the criterion or outcome variable (Fraenkel & Wallen, 2009). It is deemed more accurate to measure the respondent's Intention rather than actual use (Teo et al., 2008). Therefore, the study will use Intention to measure the respondent's acceptance of the CC for e-learning in the Nigerian HEIs.

3.5 Operational Definitions of Constructs

The operational definition of constructs presents insightful definitions of terms describing the relationships between the constructs. The study proposed nine (9) constructs, with a moderating variable to determine the Intention to adopt IaaS BEL in Nigerian HEIs. The constructs include “Relative Advantage, Compatibility, Trust, Security, Top Management Commitment, Competitive Pressure, Cost Savings, and Service Provider Support respectively”.

3.6 Exogenous Variables

The exogenous variables are generally accepted as the variables that will influence other variables (Fraenkel & Wallen, 2009). Thus, these variables are the main focus of the issues been investigated. There are eight (8) exogenous variables involved in this study that will be discussed in the upcoming sections. The TOE is generic by Zhu and Kraemer (2005) because several factors can be integrated into the TOE. The TOE assists as nomenclature for factors that simplify or prevent innovation adoption (Haag & Eckhardt, 2014). It has an advantage over the DOI because it recognizes the Environmental factors (Oliveira & Martins, 2010; Alshamaila et al., 2013; Tom et al., 2019). Therefore, appropriate measurements that suit the context of the study is adopted.

3.6.1 Relative Advantage

Relative Advantage (RA) is “the degree to which an innovation is perceived as being better than its predecessors” (Moore & Benbasat, 1991, p. 195; Rogers, 2003, p. 14). Thus, RA The extent to which IaaS BEL infrastructure is perceived as better than the other or existing systems (Moore & Benbasat, 1991). The RA is one of the DOI's fundamental variables (Rogers, 1995, 2003b). Hence, the more the IaaS BEL is perceived to be beneficial, the faster the adoption rate will be by the HEIs (Rogers, 1995, 2003b). The RA

is also argued as a crucial indicator of IaaSBEL adoption (Tom et al., 2019). The extent to which IaaSBEL infrastructure is perceived as being better than the other or existing systems.

Furthermore, CC (IaaSBEL) efficiency can be beneficial if utilized by HEIs (Almazroi et al., 2016; Ghazali et al., 2017). Despite the advantages of CC, its adoption is scarce. RA has been used and widely investigated by numerous authors (Alhammadi et al., 2015; Gangwar & Date, 2016; Hiran & Henten, 2019, 2020; Low et al., 2011; Oliveira et al., 2014; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015) Hence, RA positively impacts CC's adoption (Oliveira et al., 2014; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015). Some authors found it to be a non-significant determinant of CC Intention to adopt (Alhammadi et al., 2015; Gangwar & Date, 2016). Given the benefits that CC will offer, it would be expected of the emerging countries HEIs to perceive CC as advantageous.

3.6.2 Compatibility

Compatibility (COM) Refers to the “degree to which an innovation is perceived as being consistent with the existing values, needs as well as past experiences of potential adopters” (Moore & Benbasat, 1991, p.195). Hence, the COM of new technology with the organization's existing systems determines its adoption rate (Sallehudin et al., 2015). The COM of IaaSBEL infrastructure with the existing systems in terms of OS support, e-learning systems support and the ability of the HEIs to host or create their VMs effectively. The ease of use and data integration, such as the existing file formats, user interface, and other structured data (Hiran & Henten, 2020). Students, teachers, and administrators can access e-learning systems and VMs without installing a program. Besides, COM has been researched by numerous studies and found to positively impact CC adoption (Alhammadi et al., 2015; Hiran & Henten, 2019, 2020; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015; Tom et al., 2019). Therefore, COM will influence the adoption of IaaSBEL in HEIs in Nigeria.

3.6.3 Trust

The idea of Trust is incorporated into all innovation, and thus, different individuals perceive it differently. Huang and Nicol (2013) defines Trust as a “mental state comprising of expectancy: The trustors expects a specific behaviour from the trustees such as; providing valid information or effectively performing corporate actions; Belief: The trustor believes that the expected behaviour occurs, based on evidence of the trustee's competence, integrity, and goodwill, Willingness to take risk: The trustor is willing to take risk for that belief” (Huang & Nicol, 2013, p. 2). However, Pavlou (2003) defines Trust as "the belief that the other party will behave in a socially responsible manner, and by so doing, will fulfil the trusting party's expectations without taking advantage of its vulnerability” (p. 106). Therefore, when individuals are willing to take risks when the expected benefit supersede the risks (Deutsch, as cited in Wu, 2011b). In e-commerce adoption, Trust is a significant determinant (Wu, 2011b).

Furthermore, due to the influence of Trust, capital investment, cross-cultural marketing communication, learning, and numerous kinds of cooperation like the high tech development projects, governance, and cost were attained (Blomqvist, 1997). Hence, Trust in the internet is predominantly influenced by customers' perceived security regarding the handling of their private data (Flavián & Guinalú, 2006). Flavián and Guinalú (2006) findings show that loyalty to a website is interlinked to its Trust. This analogy could be applied to the CC since the CU will control their data to the CSP. Hence, Trust is a crucial element in CC adoption (Ghazali et al., 2017).

Wu (2011a) found Trust to positively affect the BI to adopt the technology. Also, Tarhini et al. (2017) found Trust to influence the intention to use CC significantly. Nonetheless, Trust does not support the intention to adopt Cloud-based e-learning (Almazroi et al., 2016). Therefore, there is a mixed finding, which calls for a moderating variable suggested

by Baron and Kenny (1986). Therefore, Trust in CC will increase the acceptability of IaaSBEL by HEIs in Nigeria.

3.6.4 Security

Security alludes to the degree to which an individual accepts that utilizing a particular system or application will be free of risks (Xu et al., 2003). As with any technology, security perception by users plays a significant role in its adoption. Nonetheless, the IaaS model has provided more security and control to cloud users (Mell & Grance, 2012; Tom et al., 2019). Security generally comprises Confidentiality, Integrity, Availability, Authentication, and Authorization (Da Silva, 2016). HEIs with mission-critical data will be sceptical of CC's adoption, seeing that the service providers are leaving beyond the state's control and could put the data at risk (Shin, 2013). Security in itself ensures the Confidentiality, Integrity, Availability, Authorization, and Authentication of the data is secured. HEIs must consider security risks and data ownership when uploading and hosting their data on the IaaSBEL infrastructure. Therefore, Ease of use and perceived usefulness is positively correlated with security. Also, security negatively influences the adoption of CC (Alhammedi et al., 2015).

3.6.5 Top Management Commitment

As indicated by Molla and Licker (2005), Top Management Commitment (TMC) alludes to the dedication and resources provided to support the adoption of innovation in organizations. TMC makes the diffusion of innovation faster. CC adoption could require structural change and the ways things are done (Low et al., 2011). As in the case of IaaSBEL, TMC will play a vital role in HEIs in developing countries in adopting IaaSBEL. Therefore, TMC will positively influence CC adoption (Lai et al., 2014; Oliveira et al., 2014; Alhammedi et al., 2015). In light of this, the current study postulates

that the TMC is vital in determining the successful adoption of IaaS/BEL in Nigeria HEIs. The TMC is in a critical position to influence the adoption of CC (Workineh et al., 2017). The positive relation of TMC towards technology CC is ascertained by numerous authors (Rockmann, 2014; Akande & Van Belle, 2014). In light of this, the current study postulates that TMC is vital in determining the successful adoption of IaaS/BEL in Nigeria.

3.6.6 Cost Savings

Cost Savings (CS) is a critical factor driving SMEs' transition to the CC (Gupta et al., 2013). The CC will reduce operation costs (Sabi et al., 2018; Tom, Virgiyanti, & Rozaini, 2019). With the emergence of CC, IT expenditure is drastically reduced (Sabi et al., 2018). According to Gupta et al. (2013) and Oliveira et al. (2014), the CS associated with CC adoption includes reducing procurement cost, energy usage, and low cost of maintenance. Hence, it is found to influence the RA of CC (Oliveira et al., 2014). Also, there is a positive correlation between CS on SMEs usage and CC adoption (Gupta et al., 2013).

In recent years, numerous authors have realized the tremendous benefits of CC for e-learning in HEIs, which can significantly influence CC adoption (Abba & Bakon, 2016; Almazroi et al., 2016). However, CS does not significantly impact the intention to adopt CC for e-learning (Nguyen et al., 2014). Therefore, in this study, CS is selected because it is essential for moving to the CC by HEIs.

3.6.7 Competitive Pressure

Competitive Pressure (CP) alludes to the pressure felt from other competing HEIS. (Oliveira & Martins, 2010). CP is an essential factor in IS innovation adoption (Tom, Virgiyanti, & Rozaini, 2019). However, organizations are usually forced by competitors to innovate, such as in the case of smartphones. This can also be true since CC offers cost savings as well as 24/7 uptime. Therefore, the HEIs that adopt CC will have the edge over non-adopters using an old-style learning system. Also, CP positively influences CC adoption (Low et al., 2011) and e-business (Ifinedo, 2011; Oliveira & Martins, 2011).

3.6.8 Service Provider Support

Service Provider Support (SPS) refers to the "availability of support for implementing and using information systems" (Premkumar & Roberts, 1999, p. 47). This shows how the CSPs can provide training 24/7 online support and help in adopting CC by SMEs (Al Isma'ili et al., 2016). SPS significantly influences CC adoption (Al Isma'ili et al., 2016). Hence, in the context of IaaS/BEL developing countries HEIs, the support could influence low-income countries to adopt it.

3.7 The Role of Government support as the Moderator

Government Support (GS) alludes to policies and financial support (Dahnil et al., 2014). The guidelines and rules allude to the Government's policies and awareness to make innovation adoption faster (Tornatzky & Fleischer, 1990; Tweel, 2012). The Government policy includes sustainable policies, sufficient financial aid, awareness, and training (Chang et al., 2006). Especially in developing countries, the Government's support is one of the easiest ways of innovation adoption in the enterprise (Lee et al., 2014). GS plays a crucial role in the adoption of broadband (Chiu et al., 2017). The GS in this context is the regulations, procedures, and initiatives that support the adoption of CC in HEIs

(Alhammadi et al., 2015). Therefore, GS is a determinant of innovation adoption (Zhu et al., 2006; Oliveira et al., 2014).

Additionally, GS and regulations impact the adoption of e-business in developing countries (Lai et al., 2014). In the same vein, GS influences the adoption of CC (Alhammadi et al., 2015; Chang et al., 2006). Whereas GS partially influences E-business adoption (Zhu et al., 2006). However, some studies discovered that GS is not a statistically significant factor in adopting CC (Ifinedo, 2011; Oliveira et al., 2014; Tashkandi & Al-Jabri, 2015).

Moreover, CC has not been widely adopted by education institutions (Tashkandi & Al-Jabri, 2015). This can be attested to the lack of proper Government regulations in Saudiya Arabia towards the use of CC. This is true since Government plays an essential role in the emerging countries in supporting the acceptance of new technologies in terms of initiatives and guidelines (Al-Ghamdi et al., 2012; AlGhamdi et al., 2012).

3.8 Hypotheses

Hypothesis alludes to the logical relationship's assessable statement of single or numerous variables (Sekaran, 2003). The hypothesis is a testable statement that predicts what you expect to find in your empirical data (Sekaran & Bougie, 2016). Usually, the hypotheses are derived from the theory on which the conceptual model is based and are often relational.

In line with the theoretical justifications and empirical studies (e.g., (Rogers, 1995; Tornatzky & Fleischer, 1990; Odeh, Yuvaraj 2016; Garcia-Perez and Warwick 2017; Tariq et al., 2017; Sabi, Uzoka, and Mlay 2018; Sabi et al., 2017), hypotheses for this study have been advanced for empirical testing and validation. This study employs the directional hypotheses because both the TOE and DOI theories and most extant studies employ the directional hypotheses. Therefore, eleven (11) hypotheses were tested in this study, as illustrated in Figure 3.5. Thus, the hypotheses are divided into two groups, the main hypotheses and the moderating variable's hypotheses.

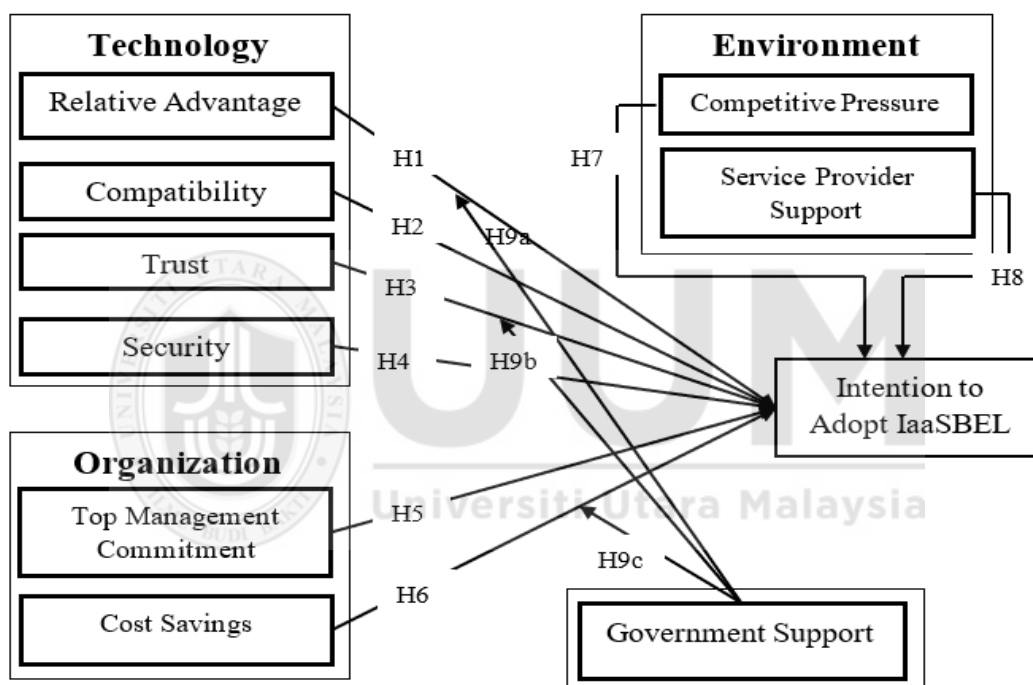


Figure 3. 5. The Hypotheses of the Study

As shown in Figure 3.5, the hypotheses depict the theorized relationships between the IVs, DVs, and MV variables, respectively. The TOE and DOI theories with the addition of some external variables are used. There are eight (8) hypotheses for direct relationship and three (3) hypotheses for the MV. Therefore, all the theorized relationships between IVs, MV, and DV are shown.

3.9 Main Hypotheses

Eleven (11) main Hypotheses were tested in this study, which consists of nine (9) IV and one (1) DV. The upcoming section will describe hypotheses development according to all the variables used in this study.

3.9.1 Relative Advantage

Relative Advantage (RA) "refers to the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003a, p. 14). The benefits of innovation are seen as having an edge over the systems in use. Innovation with a clear, unambiguous benefit in creating operation effects like reducing the operation cost has a greater incentive for adoption (Greenhalgh et al., 2004; Hiran & Henten, 2019, 2020). The CC frees organizations from managing IT infrastructure every year since it can be subscribed as-a-service. Shared resources are another advantage of CC for the HEIs. Therefore, this study posits the following hypotheses:

H1: There will be a positive relationship between Relative Advantage and the Intention to adopt IaaSBEL in Nigerian HEIs.

3.9.2 Compatibility

Compatibility (COM) "is the degree to which an innovation is perceived as being the same with the existing needs, values as well as past experiences of adopters" (Moore & Benbasat, 1991, p.195). Innovation will be quickly diffused when software compatibility, application, software, and servers exist between the existing systems and the new ones. Integrating existing applications to the cloud infrastructure could require expertise that may be lacking in Nigerian universities. Nonetheless, Cloud-based e-learning is perceived

to be aligned with the internet platform. The HEIs will be able to develop more capacity to exploit the benefits of CC. Hence, understanding whether the CC technology is compatible with the existing architecture and solutions of Nigerian HEIs. The integration and customization of application services should be readily available at the disposal of the HEIs by the Cloud Service Providers (CSPs). Therefore, Numerous studies have found COM to positively influence CC adoption (Alhammedi et al., 2015; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015). So, the following hypothesis is theorized:

H2: There will be a positive relationship between Compatibility and the Intention to adopt IaaS/BEL in Nigerian HEIs.

3.9.3 Trust

Trust (TR) is among the most crucial factor that hinders the adoption of CC. Thus, it is identified as a challenge facing CC's adoption by organizations (Ghazali et al., 2017). TR in CC is challenging since the Universities will upload their data to the CSPs data center. In the same vein, the data center may be in another country. Hence, it could be affected by the countries government policies. Therefore, TR in CC infrastructure and its CSPs can positively or negatively affect HEIs' Intention to adopt the IaaS/BEL. However, the absence of TR can deter the adoption of CC services. Numerous studies have established TR's substantial evidence to influence innovation's adoption (Huang & Nicol, 2010, 2013; Tarhini et al., 2017; Wu, 2011b). Hence, TR in the CC for e-learning, such as IaaS/BEL, will improve its acceptance in the Nigerian HEIs. Therefore, the following hypothesis is presented:

H3: There will be a positive relationship between Trust and the Intention to adopt IaaS/BEL in Nigerian HEIs.

3.9.4 Security

Security (SEC) refers to the extent to which an individual or group of individuals believes using a precise system or application is risk-free (Xu et al., 2003). Security concerns are generally related to confidentiality, integrity, and the availability of the data or information. The Security issues related to CC, CSPs resources, application security, and data transmission security are a massive hindrance to its adoption by an organization (Ghazali et al., 2017). This means third party access to data transmission and storage is a big concern for the HEIs. The adoption of IaaSBEL possesses a unique challenge such as; reliability, availability, privacy, and data ownership issues. There is a negative influence of Security on the adoption of CC (Alhammadi et al., 2015). This study posits:

H4: There will be a positive relationship between Security and the Intention to adopt IaaSBEL in Nigerian HEIs.



3.9.5 Top Management Commitment

The commitment of top managers in CC adoption is crucial since they provide the necessary resources for its adoption (Workineh et al., 2017). Preceding studies show that management support primarily helps adopt innovations in organizations (Akande & Van Belle, 2014; Lai et al., 2014; Madisha & Belle, 2011; Oliveira et al., 2014; Rockmann, 2014; Alhammadi et al., 2015;). This is because TMC will be an influencer in the process of technological adoption. Hence, when the top managers in Nigerian HEIs understand the significance of IaaSBEL.

Conversely, where management commitment is absent, technology adoption will last the organization's priority and eventually fail. Thus, it is theorized that:

H5: There will be a positive relationship between Top Management Commitment and the Intention to adopt IaaS BEL in Nigerian HEIs.

3.9.6 Cost Savings

Cost Savings (CS) is one of the main aims of adopting CC. This is because CC reduces operational cost, maintenance, etc. The IaaS BEL allows HEIs to concentrate on the main business than to be concerned about changes in technology. Thus, by adopting IaaS BEL in HEIs, time devoted to system upgrading and maintenance costs will be drastically reduced. Hence, as an enabler for the swift adoption of changing technologies, the CC presents cost-effective ways to transform business by re-creating how e-learning contents and services are provisioned. In the same vein, CS positively influences CC adoption (Gupta et al., 2013; Nguyen et al., 2014; Abba & Bakon, 2016; Almazroi et al., 2016). Therefore, this study postulates the following hypotheses.

H6: There will be a positive relationship between Cost Savings and the Intention to adopt IaaS BEL in Nigerian HEIs.

3.9.7 Competitive Pressure

Competitive Pressure (CP) refers to the institution's level of pressure from other institutions within the HEIs (Tom, Virgiyanti, & Rozaini, 2019). The intense CP can cause universities to vie for better and new ways of conducting business, including utilizing state-of-the-art technology to survive. Indeed, pressure from the competing universities could lead to environmental uncertainty that could skyrocket the rates of innovation adoption. The CP does influence the adoption of innovation and its drivers (Ifinedo, 2011;

Low et al., 2011; Oliveira & Martins, 2011). Hence, this study posits the following hypotheses.

H7: There will be a positive relationship between Competitive Pressure and the Intention to adopt IaaSBEL in Nigerian HEIs.

3.9.8 Service Provider Support

Service Provider Support (SPS) alluded to the CSPs' support and significantly influenced the adoption of CC adoption (Al Isma'ili et al., 2016). The SPS in CC is the support provided by the CSPs to influence CUs to adopt CC technology. This is crucial since the understanding of the CC architecture is limited and could be a barrier to adopting IaaSBEL in Nigerian HEIs. Therefore, this study theorizes:

H8: There will be a positive relationship between Service Provider Support and the Intention to adopt IaaSBEL in Nigerian HEIs.

3.10 Hypothesis for Moderating Variables

A moderator variable is assessed to understand the strength of the relationships between IVs and DV. In this study, the variables to be moderated are selected based on the submission of Baron and Kenny (1986). Therefore, three (3) hypotheses will be tested, which consists of “Advantage (RA), Trust (TR),” and Cost Savings (CS) moderated by Government Support.

3.10.1 Moderating Effects of Government Support on The Relationship Between Relative Advantage and IaaSBEL

The RA is among the influencing factors of technology adoption by organizations. Thus, it plays a vital role in innovation adoption (Alshamaila et al., 2013)(Hiran & Henten, 2019, 2020). Furthermore, numerous authors found RA to positively influence CC adoption (Oliveira et al., 2014; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015). Nevertheless, some authors found that RA does not influence the Intention to adopt CC (Alhammadi et al., 2015; Gangwar & Date, 2016). This is probably due to the organization's lack of awareness of the usage and perceived ease of use the CC brings.

In the same vein, no prior studies have used GS to moderate the relationship between RA and IaaSBEL in Nigeria.

Thus, GS has been proven in IS research to consistently influence organizations' adoption of technology by enacting policies and financial support towards technology adoption. In the case of CC for e-learning, the GS is crucial since most of the Universities in Nigeria do not have the financial capacity to vie for CC solutions. Given the benefits that CC will offer, it would be expected of the Nigerian HEIs to perceive CC as advantageous and would likely adopt it. Therefore,

H9a: Government Support has a moderating effect on the relationship between Relative Advantage and the Intention to adopt IaaSBEL.

3.10.2 The Moderating Effects of Government Support on the Relationship Between Trust and IaaSBEL

In e-learning, Trust is a crucial factor (Wu, 2011a). TR on the internet is predominantly influenced by the perceived security by customers regarding the handling of their private

data (Flavián & Guinalú, 2006). Hence, TR is a crucial element in CC adoption (Ghazali et al., 2017). TR has a negative effect on the BI to adopt the technology (Wu, 2011a). In contrast, TR has a significant impact on the Intention to use CC (Tarhini et al., 2017). However, Almazroi et al. (2016) found TR to be a non-significant factor in the Intention to adopt CBEL in Saudiya Arabia. This could probably be attested to the lack of Government Support and involvement in enacting policies that will improve the Tr in adopting and using CC for e-learning. For instance, the Nigerian Government could also have a significant role in certifying that all the HEIs adopt IaaSBEL by encouraging and providing the CC for e-learning as-a-Service. This way, the Trust could be improved since the Government is actively involved. Hence:

H9b: Government Support has a moderating effect on the relationship between Trust and the Intention to adopt IaaSBEL.



3.10.3 The Moderating Effects of Government Support on the Relationship Between Cost Savings and IaaSBEL

Cost Savings (CS) is one of the essential factors in adopting CC by SMEs (Gupta et al., 2013; Tom, Virgiyanti, & Rozaini, 2019) The CS associated with CC will allow universities in developing countries to save costs and improve their learning systems (Buyya et al., 2009; Ghazali et al., 2017; Low et al., 2011). There is a mixed finding on whether CS will influence CC adoption. A study conducted by Abba and Bakon (2016) and Almazroi et al. (2016) found that CS influences e-learning adoption significantly. On the contrary, Nguyen et al. (2014) findings do not support the above view. This may be due to the lack of awareness as well as an understanding of the CC technology.

Furthermore, the prior studies do not test GS to influence IaaSBEL in Nigerian HEIs. Despite the ample cost saving of CC, the Nigerian HEIs are yet to adopt it. The Government could develop reasonable policies and financial incentives (subsidies) to the HEIs in Nigeria to influence its adoption. Hence, providing the CC for e-learning as-a-Service to all the HEIs. Therefore, the following hypothesis is proposed:

H9c: Government Support has a moderating effect on the relationship between CS and IaaSBEL.

3.11 Summary

This chapter elaborates on the need for amalgamating the TOE and DOI theories as a theoretical framework in the study by further elaborating on the reasons for including Trust, Security, and Cost Savings in the conceptual model. The chapter also provides a detailed justification for adapting TOE and DOI theories. Similarly, the conceptual model describes how the study's concepts are related, and the operationalization of the variables is presented. Finally, the directional hypothesis between the IVs, DVs, MVs and the Intention to adopt IaaSBEL are further elaborated. The next chapter presents the research methodology. In the next chapter, the research methodology is described.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

The research process is illustrated in this chapter. Thus, describing the methodology that was used in exploring the relationship between IaaS BEL Intention to adopt factors. The research methodology will discuss, among other things, the research process, the conceptual framework, research design, data collection, population, sample size, as well as the sampling techniques used. Furthermore, the measures, instrument and data collection procedures were discussed. The reliability, validity, as well as methods of the data analysis is further elaborated. Therefore, each phase of the methodology was coherently elaborated with the matching activity phase to accomplish each study's singular objective.

4.2 Research Approach

The research approach refers to the procedures that involved the phases from general hypotheses to comprehensive procedures, including collecting data and analysis (Creswell, 2014). It is a series of actions, which are necessary for effective research work. Basically, the research approaches include quantitative, qualitative, and mixed-method (Creswell, 2014; Polttano et al., 2017). The Qualitative research method is used when data consists of words, not numbers; it normally looks for the What, How, and Why of some event (Field, 2013; Polttano et al., 2017). The Qualitative method might be the most useful initial approach to a new inquiry and research (Polttano et al., 2017). The qualitative inquiry may well be the best approach for identifying variables initially subjected to quantitative examination later. Thus, exploratory research, which is fundamentally inductive, emerges from the data collected from an empirical study as ideas and ideas. Hence, focusing on the What, How, Why some events or phenomenon, a more open-ended

approach (Gall et al., 2003). Hence, qualitative tends to be more inductive, while quantitative methods are deductive (Gall et al., 2003; Creswell, 2014). Inductive starts from broad generalization from specific observation; then, conclusions are drawn from the data.

Diversely, the quantitative approach is deductive in nature. Deductive reasoning starts from general theory to specific observation such that it starts with hypotheses, examines possibilities to reach a specific logical conclusion (Creswell, 2013). Thus, hypotheses must be correct. Quantitative research is typically associated with the process of enumerative induction. Its purpose is to infer relationship, which has been found to exist in the sample population (Brannen, 2017). Hence, it delineates how the findings can be generalized in a population.

Furthermore, mixed-method, on the other hand, is the combination of quantitative and qualitative reasoning. Johnson et al. (2007) define mixed-method research as the name suggests, is the amalgamation of qualitative and quantitative methods such as data collection, analysis as well as inferences techniques for the purpose of having an in-depth understanding and corroboration (p. 123). The use of both quantitative and qualitative approaches and technique to draw findings and mixing the results in a study is referred to as mixed-method (Tashakkori & Creswell, 2007, p.4). There are many types of mixed-method research design, as stated by Creswell and Creswell (2018) to include; explanatory sequential design, exploratory sequential design, and convergent design. This study adopts the explanatory sequential design.

Furthermore, based on the problem statement and the objective stated in Chapter One, using exploratory sequential design. The design uses a qualitative approach to validate or explain the quantitative results (see Figure 4.1). In this case, the quantitative phase is the core of the study, where the hypotheses testing was performed. Further, the qualitative approach was applied during the validation of the “Intention to adopt Model of Cloud-

Based e-learning In Higher Education Institutions” developed based on the final revised model. Therefore, Figure 4.1 depicts the explanatory sequential design.

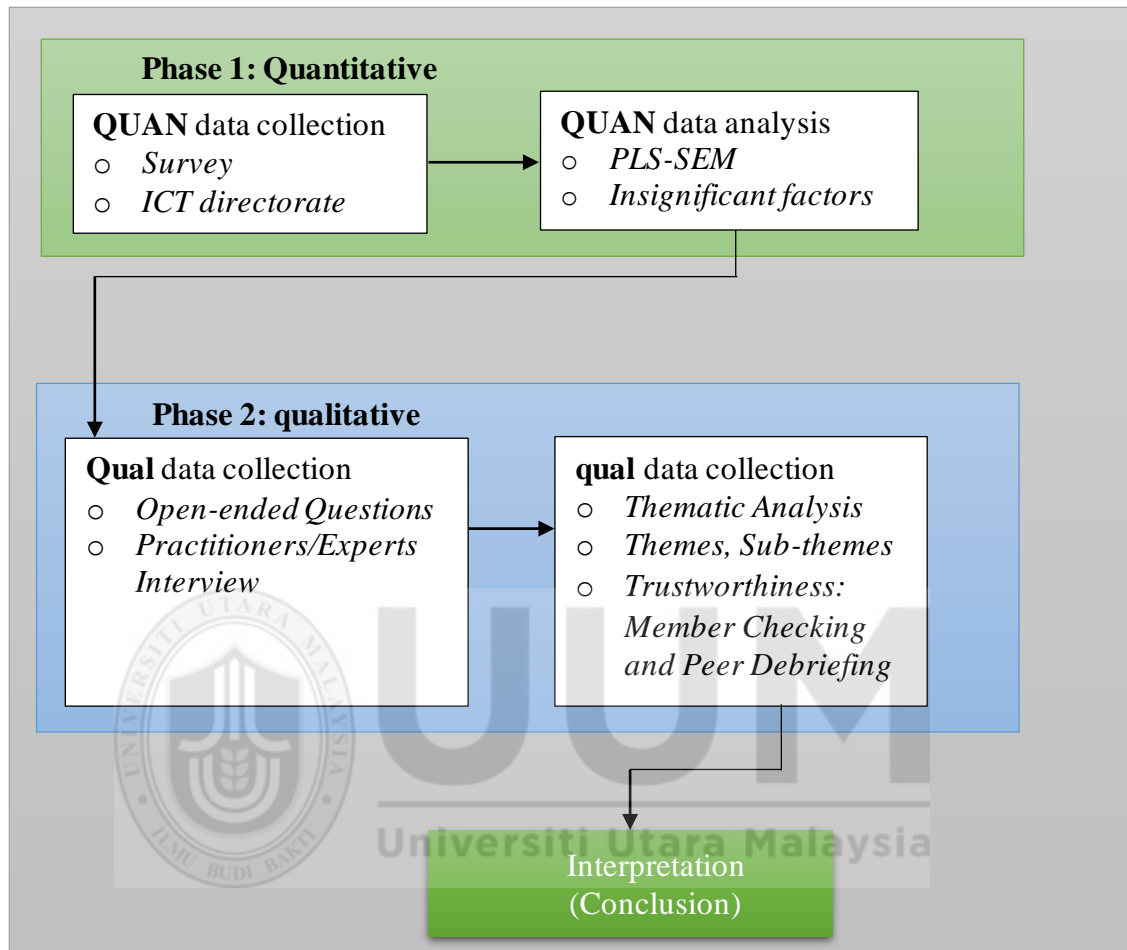


Figure 4. 1. Explanatory Sequential Design
Adapted from Creswell (2013), Creswell and Creswell (2007, 2018)

Figure 4.1 explains the explanatory sequential, which involves a dual-stage process where the Quan data is collected, using the Quan to develop the qual questions (Creswell, 2014). The research design helps in explaining the qualitative results. Furthermore, dual stages were used to collect the data with rigorous analysis in the quantitative stage and purposive sampling in the qualitative stage (Creswell, 2014). Hence, purposive sampling is a nonprobability sampling as it does not aim to draw statistical inferences. Thus, a technique used for qualitative investigations where subjects are selected based on their expertise

(Creswell, 2014). Therefore, informants must be selected in a way that will reflect the diversity of the population.

Similarly, Quan and qual data are analysed independently (Creswell, 2014). Thus, they are joined in how the interviews questions are generated based on the initial PLS-SEM model. The quantitative findings are further utilised to design the qualitative follow-up. According to Creswell (2014), the mixed-method interpretation should first report the Quan and then the qual. The mixed-method is the amalgamation of both qual and Quan research data in a research study. Hence, both open and close-ended questions (Creswell, 2014). Collecting a diverse data type provides a comprehensive understanding of a research problem than either qualitative or quantitative alone. This is the significant advantage of mixed-methods over the qual or Quan research design process. The idea behind mixed-method since each method has its weaknesses and bias; hence, utilising both will complement the weakness of each other (Creswell & Creswell, 2018).

Equally important, the design is the process by which problems are solved. Hence, the research design is a crucial part of the research process since it offers a clear structure and direction for researchers to undertake and come up with useful research outcomes (Daniel & Harland, 2017). The research design (discipline-specific) includes the statistical analysis technique and software interpretation and presentation (Polttano et al., 2017). According to Creswell (2014), there are two research designs: Experimental (true experimental and quasi-experimental) and nonexperimental. As for the quantitative research approach, Creswell (2012) suggested three research design mainly used in education research include experimental, correlational, and survey designs.

Further, this study will adopt a cross-sectional survey such that, the data will be gathered at once. A Field study is a nonexperimental inquiry used to understand the relationship between variables (Scandura & Williams, 2000). Secondly, it provides high accuracy because the instrument is developed to address the research questions specifically (Slater, 1995). Using a survey method is vital because it allows the generalization of findings and data collection from the sample (Creswell, 2014). For a study with a large sample size,

the survey is cost-effective and less time consuming to administer (Sekaran, 2003). When a researcher wants to get the feeling, opinion, as well as thought of respondents, a survey method is to be used (Shaughnessy et al., 2012). Still, survey methods as well have their share of disadvantages.

Despite the above-listed advantages of the survey methods; however, due to its dependency on self-report data, it is criticized by Spector (1992). Hence, it may not encourage providing honest and accurate answers (DeFranzo, 2012). Therefore, to reduce the drawbacks of the survey methods, the reliability and validity of the preceding validated instrument were used. Furthermore, the questionnaire will be distributed to experts to confirm factors (Research Objective 1).

This study has proposed eleven (11) hypotheses, which include a moderator to assess the relationship between the variables as well as explain the Intention to adopt IaaS in HEIs among the ICT directorate. Thus, such an approach is appropriate since quantitative studies typically investigate the relationship between variables and occasionally explain the causes of those relationships (Fraenkel & Wallen, 2009). In summary, the research question will identify the target of the research (people etc.), the target defines how the collection of data will be, the data collection will determine how the data will be analysed and finally, how the findings will be presented respectively.

4.2.1 Research Process

The research process is generally recognized as a procedure for answering the research question (Field, 2013; Polttano et al., 2017). In this study, three phases and eight steps model of the research process was adapted from Kumar (2014), as shown in Figure 4.2.

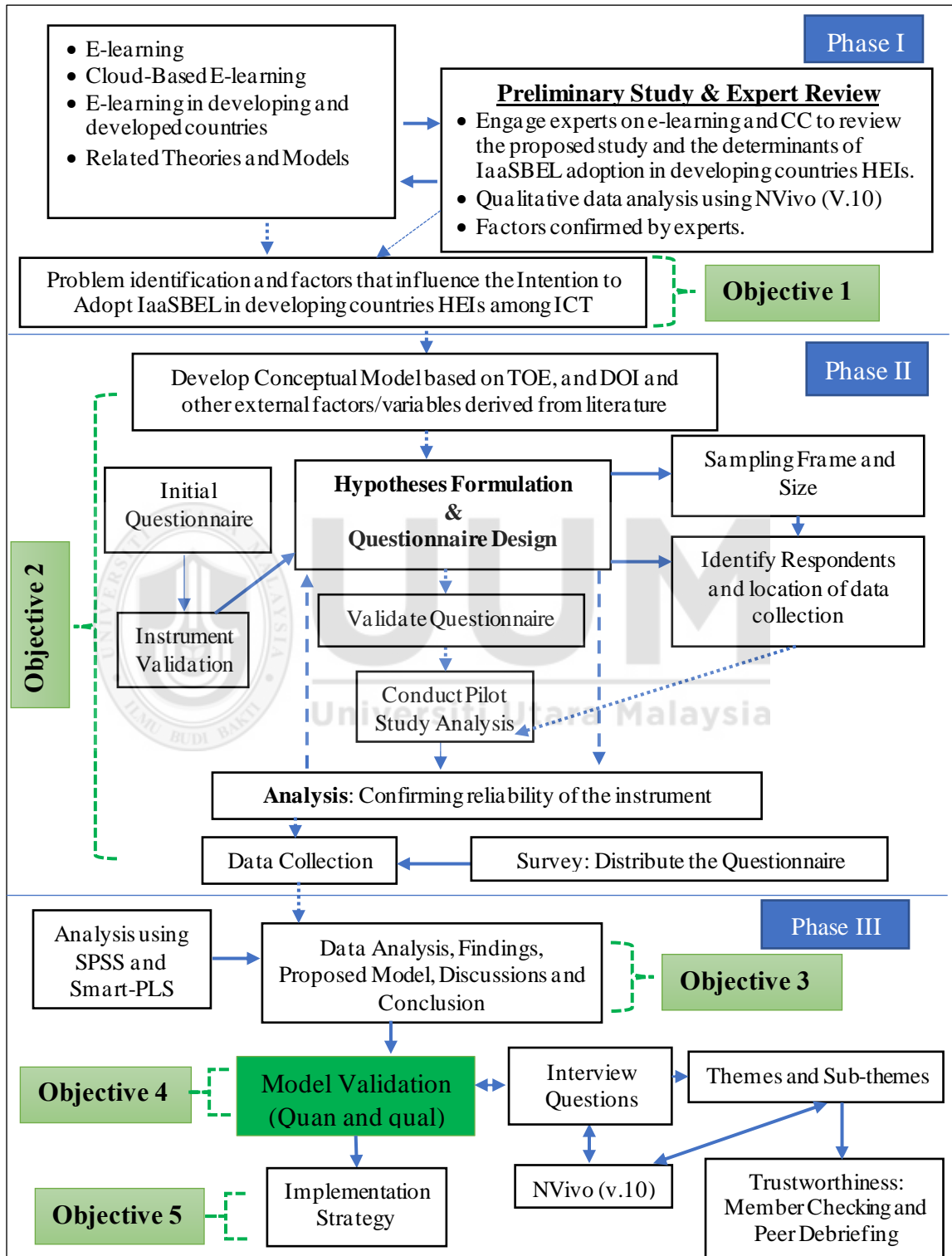


Figure 4. 2. Research Process
Adapted from Kumar (2014)

Figure 4.2 presents the research process, which comprises three (3) stages and eight steps. The first part is deciding what to research (i.e., formulating a research problem), the second stage; planning a research study (conceptualizing a research design, constructing an instrument for collection of data, and sample selection), and the last phase conducting a research study (data collection, analyzing and presenting data, writing a research report) (Kumar, 2014).

Phase I of this study involves formulating a research problem, sources of the research problems, formulating research questions, research objectives, and establishing the operational definitions of constructs. Thus, the research activity began with the literature review and the preliminary study, and the expert review (qualitative methods). The two (2) experts (former UUM IT director and a senior lecturer) with over eighteen (18) years of experience each were interviewed. The interview's main aim was to confirm the factors suitable for the study and other suggestions (refer to **Appendix B** for more details). The interview outcome shows that practitioners in Nigeria (from the ICT department) were then engaged further to confirm the suitability of the factors for the study.

Also, the study identifies numerous education challenges in developing countries' HEIs, especially Nigeria. Some of the challenges include the high number of students in conventional universities and the cost of establishing e-learning (economic factor), among others. Therefore, the Intention to adopt IaaS/BEL model's determinants are identified and reviewed rigorously and narrowed down to a more specific problem statement. Lastly, the research objectives and questions were developed in this stage.

In Phase II, the conceptual model, research design helps explain how the research questions are answered, data collection, instrument development for data collection, population and sampling, hypotheses development, and respondent identification. The conceptual model was developed by combining both the DOI and TOE theories (where TOE is the base theory), including external variables such as; Trust, Security, and Cost Savings, which were derived from the literature further approved by experts. Next, each

variable was operationalized. Additionally, eleven (11) hypotheses have been developed in this study.

Furthermore, this phase includes the quantitative research activity for the determinants of the IaaS/BEL adoption intention in HEIs of developing countries such as, the designing and validation of the survey instrument by academic experts (mainly from Universiti Utara Malaysia) whose expertise is crucial in this research. Three (3) years duration is the minimum year of experience that lecturers should have (Guasch et al., 2010). The pilot data was used to ascertain the reliability of the variables used in the study. After conducting the pilot study, revisions were made, and the study proceeded with the data collection (Creswell & Creswell, 2018). The pilot study or field-testing is essential in evaluating the items' internal consistency and improving questions, format, and instruction (Sekaran & Bougie, 2016b; Creswell & Creswell, 2018). The pilot study provides an opportunity to assess how long the study will take and how easy the questions are to the intended respondents.

Furthermore, the third phase comprises data collection, processing, and displaying data. Thus, this phase will be completed by analyzing the respondents' data, hypotheses testing, discussion and interpretation of the findings, and presenting the final research model. Thus, based on statistical findings, a semi-structured interview question was formulated and reviewed by a qualitative research design expert. After the validation of the interview questions, four informants were selected.

In concordance with Creswell and Clark (2017) and Creswell and Creswell (2018), the informant was selected from the same or subset sample. For example, in Data Science, the data is divided into 30% - 70%, 80% - 20% or 90% - 10% for training and testing. Furthermore, a qualitative study was carried out in this phase. A Purposeful sampling technique was used to select informants based on their area of expertise. Purposive sampling is a non-probability technique where the expertise of the informant is required. Also, expert sampling was selected in this study. In the case of this study, expertise in CC

and e-learning is of utmost significance. The mixing of the data or triangulation takes place in the same phase. The interview questions were designed based on the final model's statistical outcome (see **Appendix M** for more details). Also, themes and subthemes were generated. Based on the Quan and Qual findings, an implementation strategy was developed and validated by experts.

4.2.2 Variables/Factors Selection

The factors that influence the Intention to adopt IaaSBEL model in developing countries HEIs were selected. Thus, the preliminary studies' findings show the consensus among experts on the need for identifying the factors of IaaSBEL adoption in developing countries HEIs. Therefore, to realize the significant factors in the IaaSBEL Intention to adopt model decisions, three (3) methods were used to confirm the factors/variables. Initially, literature was reviewed to identify the factors, and then experts were contacted for interview sessions (see Appendix C and Appendix D). Besides, based on the outcome of the interview session, practitioners were further contacted to verify and validate the suitability of the factors in this study. For consistency and validity, experts are chosen based on the following criteria.

First, the experts or lecturers should have three (3) years of e-learning or CC experience as the minimum requirements (Guasch et al., 2010). Thus, the criterion will ascertain that experts are knowledgeable in the domain of e-learning and cl (IaaSBEL), especially in terms of the influencing determinants or factors. Additionally, the detailed information of experts reviewed for the preliminary study and the expert review was presented in Appendix G.

4.3 Research Instrument Development

The research instrument's development requires a good comprehension of the underlying assumption to formulate the right questions (Müller, 2012). A self-administered questionnaire was used, where the respondents are required to fill (Zikmundabi et al., 2010; Sekaran & Bougie, 2013). Thus, the structured questionnaires were used, which comprises statements that were adapted and reformulated to suit the present study. Also, the study will develop a questionnaire that will be in congruence with the research objectives. Hence, measurement is an integral part of any research work as without which no data can be collected (Sekaran & Bougie, 2013; Bryman & Bell, 2015).

Furthermore, the variables measured in this research instrument were developed from prior research and prior assessed for reliability. Modifications were made slightly to some questions to suit the aim of the study. A scale validation procedure was performed using Factor Analysis and Coefficient Alpha. Thus, to improve the reliability of the measurement, a 7-point Likert scale was used. A scale of 5 and 7 points are confirmed to be more reliable and accurate than lower or higher scales than a scale without a midpoint (Krosnick & Fabrigar, 1997). The 5 and 7 points scales are likely to produce more widely scale value than a five-point Likert scale, thus reducing the respondent's bias (Dwivedi et al., 2010). Similarly, Krosnick and Fabrigar (1997) argued that the absence of a mid-point would compel respondents to answer in a particular direction, which leads to an increase in measurement error.

In addition, Hair et al. (2010) defined measurement error as the difference between the observed values obtained by measurement and the representative value. The response options range on a scale of 1 to 7, “where 1 = strongly disagree and 7 = strongly agree” with all the variables. Therefore, a cover letter entailing the significance and purpose of the study was attached to the questionnaire. The anonymity of the respondent was spelt in the questionnaire and his rights to participate or reject it. Again, clear instructions were given regarding the completion of the specific items throughout the questionnaire.

4.3.1 Construct Measurement

The IVs are the selected variables that researchers use to assess their possible effect on one or more variables (Fraenkel et al., 1993; Fraenkel & Wallen, 2009). Thus, it is a variable that affects or presumed to affect the Dependent Variable (DV) under study so that its effect can be determined, also known as the experimental or treatment variable (Fraenkel & Wallen, 2009). There are eleven (11) IVs in this study, as discussed in the previous sections. The selection of measurements should be parallel to the objectives and empirical research context (Delone & McLean, 2003). Therefore, appropriate measurements that will suit the context of the study was utilised.

4.3.2 Face Validity

Validation, in general, involves determining the suitability of the questions or statements chosen to represent the constructs (Hair et al., 2009). Thus, one approach to assess scale validity involves examining content validity or face validity. Establishing the validity and reliability of the survey instrument is crucial before it could be used in the study to be free from bias and distortion. Reliability and validity are the two most frequently encountered concepts in measuring and evaluating constructs and are important for defining and measuring bias and distortion (Crocker & Algina, 1987; Thanasegaran, 2009). Validity is defined as the effect of an instrument in assessing the construct it is designed to measure and decide the correctness and trustfulness of the instrument and the results (Hair et al., 2010; Sekaran, 2014).

In this study, the face validation procedure was conducted by academic experts. Initially, a pool of items that were retrieved from literature was created. Three (3) Information System (IS) and e-learning experts examined the items' accuracy from the IS and education departments. Some of the questionnaires were presented face-to-face, while others were mailed to the experts for perusal and suggestions (see Appendix J for more details).

4.3.3 Content Validity

Content validity alludes to the degree to which the items in the instrument signify the overall possible questions to measure what they are designed to measure (Creswell, 2012). Sekaran and Bougie (2013, p.226) “stress that content validity guarantees that the measurement contains a decent and representative item to capture the concept”. The authors further mention that the instrument's content validity could be done via a panel of judges consisting of experts in the field of research. Hence, it serves as a process of consulting a small sample and or panel of experts to judge the suitability of the items selected to assess a construct (Hair, 2007; Sekaran & Bougie, 2010).

This study's content validation procedure commences by creating a vast pool of items, which were adapted from numerous sources (Netemeyer et al., 2003). The experts perused the items and operational definitions of the construct; however, they made suggestions regarding the structure of the items and that the author made adequate corrections. Therefore, the researcher presented the items to more than three IS experts, as Lynn (1986), specifically e-learning, in some Nigerian Universities and Universiti Utara Malaysia. Their feedback and suggestions were considered in arranging and designing the questionnaire (see Appendix J for more details).

4.4 Pilot Study

A small percentage of scale reflects the main study to check whether the selected procedure (questionnaire) will work as anticipated (Zikmund et al., 2010). Thus, changing the questionnaire based on the feedback from a small group of respondents (Creswell, 2012). Hence, the present study is piloted in several Universities in the North-east and North-West as a pre-requisite for the real study of the “Intention to adopt IaaSBEL in Higher Education Institutions”. Similarly, the pilot study sample size must be a minimum of 30 respondents (Hunt et al., 1982). The analysis of the pilot study was conducted in two

(2) phases, as described below. Therefore 70 questionnaires were distributed to the ICT directorates, representing the homogenous characters of the real study population. Out of this number, only thirty-eight (38) were usable after data cleaning, generating a 54.3% response rate. The pilot study features are shown in Table 4.3.

Furthermore, the instrument reliability test was conducted in the initial stage of the study. Thus, reliability refers to the stability and consistency of the instrument (Sekaran & Bougie, 2013). Internal consistency alludes to the degree of measurement items estimate the same feature, which is usually computed using Cronbach Alpha (α) (Field, 2009; Pallant, 2010). Furthermore, the α has been widely used to compute the internal consistency of the data. Numerous authors have suggested the range be between 0 to 1. Hence, a higher value shows a higher reliability level (Hair et al., 2013; Pallant, 2010). Additionally, Hair et al. (2013) suggested that the value of 0.6 to 0.7 is acceptable, while the value less than that is considered with a lack of internal consistency and reliability. The factor analysis was conducted in the second stage to examine the relationship between the items that will enable the researcher to classify them into smaller groups or factors (Hooper, 2012). Typically, the Exploratory Factor Analysis (EFA) will be undertaken in the pilot study phase as the foundation for the development of construct in identifying the underlying construct behind a set of measured variables (Suhr, 2006). Hence, the primary purpose of EFA is item reduction and classification based on the variables. Table 4.1 shows the demographics of the pilot data.

Table 4. 1

The Demographic of Respondents for The Pilot Study

	Characteristics/Value/Percentage	
Gender	Male: 73.7%	Female: 26.3
Education Level	Bachelor: 26.3%, Master: 63.2%, Doctorate: 10.5%	
University Position	Deputy Director: 10.5%, Unit Head: 26.3%, Assistant Unit Head: 50.0%, Dean: 13.2%	
Institution Type	State University: 44.7%, Federal University: 55.3%	
University Zone	North-East: 47.4%, North-West: 52.6%	
University Location	Borno: 15.8%, Yobe: 31.6%, Kano: 52.6%	

E-learning Experience	<= 1 year: 5.3%, 1-2 years: 31.6%, 2-3 years: 47.4%, 4-5 years: 15.8%
IaaS/BEL Familiarity	Microsoft Azure: 39.5%, Amazon Web Service: 50.0% Google GCP: 10.5%
Student Population	<5,000: 2.6%, 5,000 – 10,000: 39.5%, 20,000 – 30,000: 55.3% >30,000: 2.6%

4.4.1 Normality of the Pilot Data

Normality is usually evaluated by either statistical or graphical methods. Skewness and Kurtosis are used to test for normality. This study uses the Skewness and Kurtosis values to assess the distribution of normality for each variable. The values of Skewness and Kurtosis for the entire variables in this study fall between -2 and 2 (see Table 4.2), which are considered to be approximately normally distributed (Garson, 2012). Nevertheless, Tabachnick and Fidell (2013) argued that deviation from the normality of Skewness and Kurtosis does not make any substantial difference when the sample size is more than 200 in the analysis. Curran et al. (1996) argued that Skewness values should be less than 2, and Kurtosis value less than 7. In addition, Kline (2015) stated that the absolute value of Skewness greater than 3 and a Kurtosis value greater than 10 might indicate a problem, and values above 20 may suggest a more serious problem of non-normality. Therefore, based on these recommendations, the normality test result revealed that the data distribution is normal because the value, i.e., z-score of both Skewness and Kurtosis of all indicators/items, were within the satisfactory range of less than 2 and not greater than 7 respectively. The test for normality assumption in the pilot data is vital, especially to minimize the error during reliability analysis based on internal consistency (Sheng & Sheng, 2012).

Table 4. 2

Skewness and Kurtosis Values for Pilot Data

Variable	Skewness	Kurtosis
RA	0.678	-1.284
COM	0.982	-0.087
TR	0.334	-1.539
SEC	-0.832	-1.023
TMC	1.262	1.352
CS	-1.028	0.167
CP	1.173	0.376
SPS	0.728	-0.878
INT	-0.546	-0.084
GS	0.848	-0.966



UUM
Universiti Utara Malaysia

4.4.2 Factor Analysis

The factor analysis is performed to scrutinize the relationships between large numbers of items and classify them into smaller groups or factors (Hooper, 2012). Hence, the EFA is performed during the pilot study as the basis for construct development, particularly to identify the underlying construct behind a set of measured variables (Suhr, 2006). Thus, the EFA is suitable for pilot data as a foundation for the Confirmatory Factor Analysis (CFA) in the actual study data.

Furthermore, The EFA allows the researchers to ascertain the extracted factors' consistency from the real data and the theoretical standpoint (Hair et al., 2010). Hence, instead of running the EFA procedure to all the 49 items at once, this study runs it based on each construct. This is principally due to the items were selected from previous studies that measured the intended constructs. Hence, this study aims to prove the structure of

these items. Similarly, Hair et al. (2010) recommended the thresholds in performing the EFA; Bartlett Test < 0.5, Kaiser-Meyer-Olkin (KMO) > 0.8, Factor Loading ≥ 0.5 , Communalities ≥ 0.3 , as well as Eigenvalue ≥ 1.0 respectively. However, a KMO value greater than 0.5 is acceptable (Kaiser, 1970; Field, 2013). Table 4.3 presents the CFA analysis.

Table 4. 3

Summary of Results for EFA

VAR	KMO	Eigen Value	Bartlett Test	Item	Factor Loading	Communalities	Deleted Items
RA	0.691	4.055	0.000	RA1	0.823	0.762	Nil
				RA2	0.891	0.883	Nil
				RA3	0.934	0.873	Nil
				RA4	0.849	0.913	Nil
				RA5	0.951	0.904	Nil
				RA6	0.785	0.851	Nil
COM	0.624	2.502	0.000	COM1	0.771	0.611	Nil
				COM2	0.899	0.813	Nil
				COM3	0.744	0.829	Nil
				COM4	0.834	0.702	Nil
				COM5	0.520	0.719	Nil
				COM6	0.807	0.663	Nil
TR	0.692	2.115	0.000	TR1	0.832	0.692	Nil
				TR2	0.882	0.778	Nil
				TR3	0.803	0.645	Nil
SEC	0.621	2.119	0.000	SEC1	0.911	0.829	Nil
				SEC2	0.894	0.799	Nil
				SEC4	0.701	0.491	Nil
TMC	0.568	2.388	0.000	TMC1	0.926	0.867	Nil
				TMC2	0.843	0.748	Nil
				TMC3	0.850	0.750	Nil
				TMC4	0.799	0.798	Nil
				TMC5	0.729	0.799	Nil
				TMC6	0.911	0.873	Nil
CS	0.789	3.032	0.000	CS1	0.915	0.837	Nil
				CS2	0.870	0.756	Nil
				CS3	0.895	0.801	Nil
				CS4	0.798	0.638	Nil
CP	0.741	3.974	0.000	CP1	0.731	0.665	Nil
				CP2	0.761	0.923	Nil

				CP3	0.793	0.836	Nil
				CP4	0.943	0.897	Nil
				CP5	0.921	0.857	Nil
				CP6	0.803	0.753	Nil
				CP7	0.637	0.755	Nil
SPS	0.674	3.878	0.000	SPS1	0.851	0.727	Nil
				SPS2	0.556	0.386	Nil
				SPS3	0.844	0.803	Nil
				SPS4	0.903	0.817	Nil
				SPS5	0.938	0.881	Nil
				SPS6	0.580	0.522	Nil
				SPS7	0.907	0.838	Nil
INT	0.541	1.958	0.000	INT1	0.658	0.434	Nil
				INT2	0.916	0.838	Nil
				INT3	0.828	0.686	Nil
GS	0.790	3.283	0.000	GS1	0.817	0.667	Nil
				GS2	0.907	0.823	Nil
				GS3	0.965	0.931	Nil
				GS4	0.928	0.862	Nil

Note: RA = "Relative Advantage, COM = Compatibility, TR = Trust, SEC = Security, TMC = Top Management Commitment, CS = Cost Savings, CP = Compatibility, SPS = Service Provider Support, INT = Intention, GS = Government Support"

Table 4.3 shows all the thresholds of the Barlett Test, Kaiser-Meyer-Olkin (KMO), Factor Loadings, Communalities, and Eigenvalue. Therefore, all the items meet Hair and Kaiser's recommendations. Hence, no item was deleted during this procedure.

4.4.3 Reliability

Reliability alludes to the measuring device's level of internal consistency or stability over time (Borg & Gall, 1989; Wiersma & Jurs, 2005). It is also the consistent capability of an instrument to provide constant result repeatedly. Similarly, Cronbach's Coefficient Alpha was used to estimate the instrument's reliability (Churchill, 1979). Thus, the value indicates the reliability of the instrument. Commonly, the α of ≥ 0.80 is considered good, and α of at least 0.70 is considered satisfactory (Nunnally & Bernstein, 1994).

However, Hair et al. (2013) recommended that an α of 0.60 to below 0.70 is moderate and still acceptable and reliable. Furthermore, α is used to calculate the data internal consistency. Numerous authors have suggested the range be between 0 to 1. Hence, a higher value indicates a higher reliability level (Pallant, 2010; Hair et al., 2013). Additionally, Hair et al. (2013) further recommended that the value of 0.6 to 0.7 is acceptable, while the value less than that is considered with a lack of internal consistency and reliability. Hence, according to the rule of thumb for reliability analysis, any item that did not contribute to the increment of the α should be eliminated. Nonetheless, one item (SEC4) was deleted due it low α value. The pilot data shows the α value to be within the range of 0.641 to 0.927, indicating the high level of construct reliability, as shown in Table 4.4.

Table 4. 4

Results of Reliability Analysis

Construct	Initial Items	Initial α	Final Items	Final α	Deletion
RA	6	0.898	6	0.898	Nil
COM	6	0.641	6	0.641	Nil
TR	3	0.768	3	0.768	Nil
SEC	4	0.476	3	0.789	SEC3
TMC	6	0.662	6	0.662	Nil
CS	4	0.893	4	0.893	Nil
CP	7	0.841	7	0.841	Nil
SPS	7	0.832	7	0.832	Nil
INT	3	0.728	3	0.728	Nil
GS	4	0.927	4	0.927	Nil

4.5 Data Collection Procedure

Data collection is a means of sourcing data for research that involves substantial knowledge and expertise. Usually, the data collection commences after the research problem, and research plans are clearly defined and approved (Kothari, 2004). Hence, precautions need to be observed when planning the sampling procedure and conducting a pilot study before undergoing the actual data collection that will be employed for the analysis. The selected universities from the North-East, North-West, and North-Central region of Nigeria. The self-administered questionnaire is used in this study. The respondents will receive a copy of the questionnaire personally to have more response rate (Zikmund et al., 2013). Also, a cover letter will further portray a precise elucidation of the research purpose, assuring respondents' anonymity. The questionnaire will also use a letterheaded paper that stated any information recorded would be confidential and used for academic purposes only.

4.5.1 Sampling Procedure

Kumar (2011) defines sampling as the procedure of choosing a portion from a larger group to serve as a foundation to estimate an unknown portion of information, findings, or scenarios related to the bigger group. Furthermore, Creswell (2012) defines sampling as a subgroup of the intended population where researchers intend to examine and make generalisation of the target population. Similarly, Sekaran (2003) classified sampling into probability and non-probability sampling. Thus, the sample obtained from the population must be representative of the same population. This study will employ the probability sampling methods to decrease bias as well as increase the findings generalizability. In the same vein, a disproportionate stratified random sampling technique was adopted in this study. Furthermore, the sampling frame will be drawn from the North-East, North-West, and North-Central universities in Nigeria and the sample size is 552 (see Appendix P, for more details). Systematic sampling was used to draw the appropriate sample per strata in the population.

4.5.2 Unit of Analysis

The Unit of analysis of the present study is at the individual level, which involved the Number of ICT directorates presently serving in the northern Nigeria universities. However, this number is not definite due to the staff's transfer process beyond the present study's control.

4.5.3 Target Population

The population alludes to the set of entire individual units that the research questions seek to investigate (Sekaran & Bougie, 2013). It likewise alludes to the whole group of people or objects to which a researcher is interested in generalizing the findings drawn from the studies, usually with varying features (Cavana et al., 2001; Bryman & Bell, 2015). A total of 84 public universities in Nigeria are classified into Federal and State Universities (National Universities Commission [NUC], 2018). This study will only focus on the NE, NW, and NC region of Northern Nigeria. Thus, the universities in these zones are selected because they represent all the universities in Nigeria since they are all Federal and State Universities and follow the same curriculum and standards.

In addition, the NE, NW, and NC zones of Nigeria are the most unstable states in Nigeria due to insecurity, specifically, Boko Haram, herdsmen, and kidnapping. In 2018, Boko Haram attacked some of the Universities in the NE and NW zones of Nigeria (BBC, 2012; Vanguard, 2018). Similarly, these threats have made some universities close down, thereby affecting the populace's education in the zones (TheEagleOnline, 2018). In the same vein, 70 lecturers quit the University of Maiduguri due to Boko Haram attacks in the NE (Punch, 2017). Hence, this will compel the Government to look for ways to provide education for its citizens despite the zones' security situations.

Furthermore, the NE, NW, and the NC zones of Northern Nigeria have a cumulative number of 38 Federal and State Universities (National Universities Commission, 2018). Hence, to achieve organizational objectives, different management levels are involved with different degrees of power, authority, and responsibility (Tenah, 1986; Rezvani, 2017). Therefore, the ICT directorates, includes the “Directors, deputy directors, Unit Head, Assistant Unit Head, and Deans,” are the respondents of this study. The reason for selecting the above respondents is because they are responsible for ICT responsibilities in the Universities. Since the respondents are aware of CC, the university's diffusion of innovation will be faster and easier. Additionally, the ICT directorates responsibility to meet all students' needs and academic and administrative staff, whatever service is needed, is directed to the IT department. The department provides and manages students and staff email accounts handle installations and upgrades on PCs in the computer labs, cafes, and staff computers (Okai et al., 2014; Ume et al., 2012).

Figure 4.3 presents the ICT Directorates Management Levels in Nigerian Universities, which are suitable for this study. These managers were selected as the respondents in this study (for more information, refer to section 4.5.3). Figure 4.3 presents the number of universities in the Northern region of Nigeria.

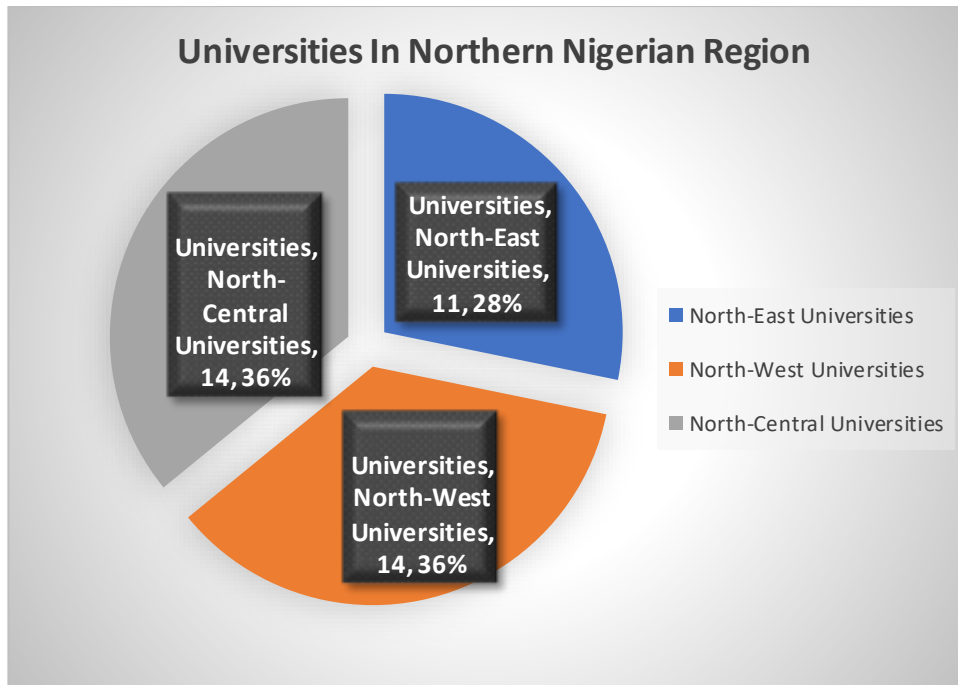


Figure 4. 3. Federal and State Universities in Northern Region of Nigeria



4.5.4 Sampling Frame

The sampling frame is the parameter features of a large population that consists of the list of the population elements from which a sample is to be drawn (Kothari, 2004; Sada & Maldonado, 2007). Additionally, these elements could be individuals or organisations (Creswell, 2012). In this study's perspective, the ICT Directorates of the Nigerian public Universities in NE, NW and NC are the respondents of this study, as they are involved in decision-making. However, the top management list is not readily available as an alternative. The universities websites were used to gather all the respondents' lists in this study (refer to Appendix P for summarising how the sampling is derived). The sampling frame for this study will also be the list of all Universities in the NE, NW and NC region of Nigeria.

4.5.5 Sampling Size and Power Analysis

In survey research, ascertaining a suitable sample size is vital (Kotrlík & Higgins, 2001). To lessen the sampling error cost, the statistical test needs to be considered to determine the appropriate sample size in a population. One method to ascertain the least sample size is G*Power. The power analysis is a statistical process for establishing a research sample size (UCLA, 2020). These parameters settings used were: “Power (1- β err prob; 0.95), alpha significant level (α err prob; 0.05), medium effect size f^2 (0.15)” and ten main predictors. The result shows that the least sample size of 172 is needed to test the regression model, as depicted in Figure 4.4.

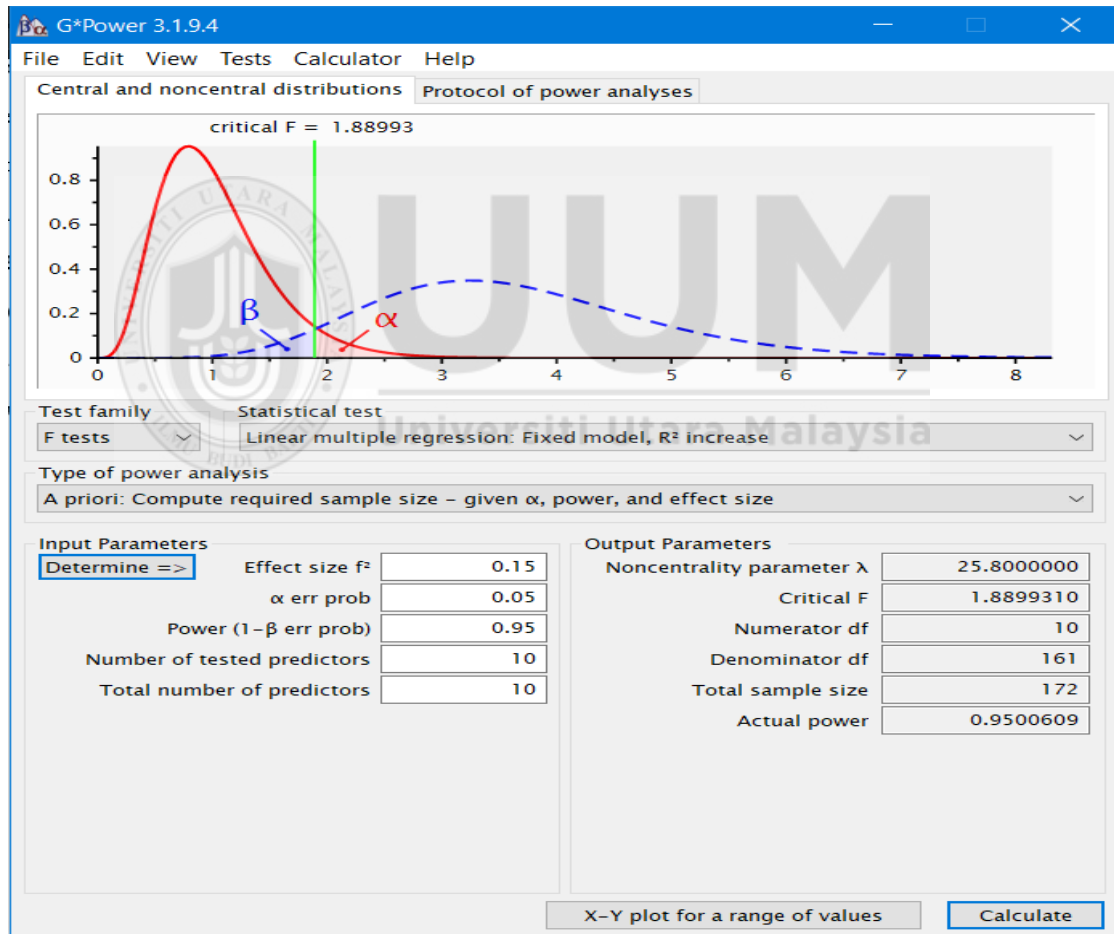


Figure 4. 4. The output of a Priori Power Analysis

While the output of the priori power analysis showed 172 samples as the least sample suitable for this study, the response rate in Nigeria is low (Mahmoud et al., 2018). Due to the poor response rate, the generated sample size of the G*Power is inadequate in this study. Therefore, it is pertinent to look for alternate measures for sample size. Krejcie and Morgan (1970) sampling method were used to determine the sample size in this study. This study's population has already been stratified into top managers, middle managers, and lower managers, respectively.

According to Sekara (2016) and Sekaran and Bougie (2010), after the population is stratified, member sample will be drawn from each stratum using a simple random or systematic random sampling technique. In proportionate stratified random, all strata will have an equal percentage of elements in the sample (Sekaran & Bougie, 2010; Sekaran, 2016). This means all management in the stratified proportionate random sampling procedure. However, this technique is not suitable for this type of study. Even though all the university management is essential, the top management's responses are of utmost significance. This is because the top management views are crucial, especially the ICT-Director and ICT-Deputy Director.

Similarly, in “disproportionate stratified random sampling, the number of subjects from each stratum would be altered, while keeping the sample size unchanged” (Sekaran & Bougie, 2010, p. 595; Sekaran, 2016 p. 345). Hence, the decision to use disproportionate sampling is when some strata are too big and some small, and easy and cost-effective to collect data from one or more strata than from others (Sekaran & Bougie, 2010; Sekaran, 2016). Furthermore, the appropriate sample size was selected using the sampling method of Krejcie and Morgan (1970).

Likewise, the study population is 552, and the sample size of 227 is therefore assumed for this study. Based on the sample size, a disproportionate stratified random sampling was utilized to determine the number required from each level and strata that formed the sample size of 224. To lessen the sampling error, nonresponse issues and response error,

it is pertinent to multiply the questionnaire twice (Blythe, 2005; Hair, Wolfinger, Ortinau, & Bush, 2009). However, the probability of having a high error with a small sample size (Alreck & Settle, 1995). Hence, doubling the sample size is consistent with research conducted in Nigeria to attain a minimum response of 50% of the distributed questionnaires (Ringim et al., 2013; Mahmoud et al., 2018). Therefore, the initial sample size of 227 will be multiplied by 2 (227×2) to give a total number of 454 questionnaires. Table 4.5 presents the summary of management categories and the sample size (See Appendix P for more details).

Table 4. 5

Summary of Sample Size

Categories of Management	Population per Strata	Systematic stratified sampling	Number selection per strata	Number of Shared Questionnaires (Disproportionate Sampling)
Top Managers				
ICT-Director	38	38	1	76
Middle Managers				
ICT-Deputy	38	38	1	70
Unit Head	219	65	3	130
Lower Managers				
Assistant Unit	219	65	3	112
Dean	38	21	2	60
Total	552			448

As pointed out in Table 4.5, the population per strata, and the number of shared questionnaires are disproportionately stratified. The director and deputy director have the highest percentage because they hold the highest position in their respective universities from the above table. Hence, their decisions are of the utmost significance. Since the method employed is the disproportionate sampling technique. Therefore, all respondents' percentage includes the top, middle and lower management, will be allocated arbitrarily.

4.6 Data Analysis Procedure

The data analysis process is a procedure in which the researcher evaluates, monitors, and analyses the data to answer the hypotheses and research questions. Thus, in this study, the data analysis is performed in two phases; in the first phase, SPSS was used for entering data, screening for outliers etc. In the second phase, PLS-SEM was utilized for testing the hypotheses and model. The Confirmatory Factor Analysis (CFA) was carried out at this stage to confirm the factor structure extracted previously during the Exploratory Factor Analysis (EFA). PLS-SEM refers to an important methodological approach to explore the cause as well as the effect relations between the latent constructs (Hair et al., 2010). Hence, enabling researchers to test interlinked variables and their items in a single run (Gefen et al., 2000). However, numerous assumptions must be met, including normality of data, outliers, linearity, and multicollinearity, which need to be considered before choosing any multivariate analysis (Tabachnick & Fidell, 2007). Therefore, this study uses the PLS-SEM approach.

Furthermore, this study aimed to predict the relationship between the variables and GS to moderate the relationship between RA, TR, CS, which is deducted as an exploratory study. For the above reason, PLS-SEM is more suitable to apply to this study, even though the data is normal (Hair et al., 2014). The normally distributed data will provide a more accurate result, even for non-parametric analysis like the PLS-SEM (Tabachnick & Fidell, 2007). However, the result of normality during the data cleaning process has revealed the normality of the data, which demands the usage of PLS-SEM.

4.7 Model Validation

This study's main objective is to develop an Intention to adopt the IaaSBEL model for HEIs, which would be of great significance for IS, CC and educational researchers, stakeholders, policymakers, NUC, and NITDA, respectively. Additionally, the model can also serve as a guideline for the stakeholder to provide education to all emerging nations despite their economic challenges, thereby attaining the Millennium Development Goals (MDGs) education goals. The model is validated using three methods: expert validation, statistical cross-validation, and practitioner's validation. Thus, for the practitioner's validation, open-ended questions were analyzed using a qualitative approach.

4.8 Summary

This chapter presented the holistic view of the research methodology that consists of the research process, instrument development, pilot study, and data collection procedure. Further, a mixed-method approach based on the explanatory sequential design proposed by Creswell (2007, 2012, 2013, 2014) was utilized in the study. A cross-sectional survey was used to assess the Intention to adopt IaaSBEL among the ICT directorate in Northern Nigerian HEIs. Also, SPSS and PLS-SEM were used to analyze the data. Lastly, the final model was evaluated and validated by experts using qualitative data analysis.

CHAPTER FIVE

DATA ANALYSIS

5.1 Introduction

The data collection and its statistical interpretations were performed using SPSS (v. 25). The chapter begins with data collection and survey response, discussion of the distribution of questionnaires, and retention followed by validity and reliability testing. After that, the mean and standard deviation, the demographic characteristics of respondents are further dissected. Data screening, which comprises missing value analysis, outlier treatment, normality test, multicollinearity, common method variance, and response bias, are expounded. Finally, SmartPLS (v. 3.2.8) is employed for the structural assessment model.

Correspondingly, the measurement model was assessed to determine the “individual item reliability, internal consistency, convergent validity, as well as discriminant validity”. The result of the structural model, which incorporates the impact of the path coefficients, postulated hypotheses, the level of the “ R^2 values, effect size (F^2), and predictive relevance (Q^2)” of the model are further presented. The last segment presents the result of the PLS-SEM results, which presents the analysis of the moderating effects of Government Support on the relationship between Relative Advantage, Trust, and Cost Savings on the structural model. The summary concludes the chapter.

5.2 Data Coding

As indicated by Churchill (1979), questions ought to be organised in concordance with the targeted construct/variables and coded with a number for easy identification and analysis. In line with this, the items were arranged accordingly in congruence with the construct is measured. Likewise, each item is provided with a unique code, as shown in Table 5.1.

Table 5.1

Construct Coding

No	Construct/Variable	Code	Number of Items
1	Relative Advantage	RA	6
2	Compatibility	COM	6
3	Trust	TR	3
4	Security	SEC	3
5	Top Management Support	TMS	6
6	Cost Savings	CS	4
7	Competitive Pressure	CP	7
8	Service Provider Support	SPS	7
9	Intention to Adopt	INT	3
10	Government Support	GS	4

5.3 Response Rate

In this study, a total of 454 questionnaires was disseminated to the ICT directorates in the public and state universities in the Northern Region of Nigeria between December 2018 and April 2019. In an endeavour to accomplish high response rates, many phone call reminders were made as suggested by Silva et al. (2002) and Traina et al. (2005). The outcomes of the questionnaires have yielded 248 returned out of the 454 questionnaires that were disseminated to the target respondents. The 248 questionnaires give a response rate of 54.6%. This exceeds the minimum survey response rate of 30%, as recommended by Sekaran (2003) and Sekaran and Bougie (2010).

From the 248 questionnaires, 38 were removed because it was not complete by the respondents. Fourteen (14) questionnaires were further removed due to lack of experience, ten (10) was removed during data cleaning, and 186 questionnaires were utilised for further analysis, which accounted for 40.9% valid responses, as shown in Table 5.2.

Table 5. 2

Response Rate of Questionnaire

Response (s)	Frequency/Rate
Number of distributed questionnaires	454
Returned questionnaires	248
Returned and usable questionnaires	210
Returned and excluded questionnaires	14
Deleted questionnaire during data cleaning	10
Questionnaires not returned	206
Usable Questionnaire	186
Response rate	54.6%
Valid response rate	40.9%

*Note: Response Rate = returned questionnaire/sent questionnaire*100*

Source: The Researcher



5.4 Descriptive Statistics of Respondents

The questionnaires were disseminated to the designated universities via walk-in (face to face). Out of the 454 disseminated questionnaires, 248 were returned, translating to a 54.6% response rate. Out of the respondents, 137 (73.7%) are males, and 49 (26.3%) are females. This percentage is valid since there is no sample size assumption for comparing two groups (Karen, 2017). Nonetheless, the majority of the respondents are Master's Degree holders with 119 (64.0%), while others with Bachelor's Degree 48 (25.8%), and Doctorate 19 (10.2%) responses respectively. This indicated that Nigerian ICT directorate managers are highly educated, competent and suitable to fill the questionnaire, as presented in Table 5.3.

Table 5. 3

The Demographic Profile of Respondents

Demographic Profile	Category	Frequency (N=186)	Percentage (%)
Gender	Male	137	73.7%
	Female	49	26.3%
Education Level	Diploma	-----	----
	Bachelor's Degree	48	25.8%
	Master's Degree	119	64.0%
	Doctorate	19	10.2%
University Position	Director	17	9.0%
	Deputy Director	17	9.0%
	Unit Head	47	24.9%
	Assistant Unit Head	83	43.9%
	Dean	25	13.2%
Institution Type	Federal University	108	57.1%
	State University	81	42.9%
Zone	North-East	45	23.8%
	North-West	86	45.5%
	North-Central	58	30.7%
University	AD (10; 5.4%); GM (5;2.7%); BC (6; 3.2%); TR (5; 2.7%); BN (6,3.2%); YB (12; 6.2%); JG (11, 5.9%); KD (13, 7.0%); KN (20, 10.8%); KT (13, 7.0%); KB (12, 6.5%); SK (11, 5.9%); ZF (6, 3.2%); AB (5,2.7%);BN (8,4.3%);KG (9,4.8%); KW (12, 6.5%); NS (8, 4.3%); NG (7, 3.8%); PL (7, 3.8%)		
e-learning experience	None	----	----
	≤ 1 Year	10	5.4%
	1-2 Years	54	29.0%
	2-3 Years	86	46.2%
	4-5 Years	32	17.2%
	> 5 Years	4	2.2%
Cloud-based e-learning Experience	Yes	189	100.0%
	No	----	----
Familiarity with Cloud-Based e-learning	Microsoft Azure	68	36.6%
	Amazon Web Service	96	51.6%
	Google GCP	22	11.8%
	Others (Specify)	----	----
	None	-----	-----
Student Population	< 5000	6	3.2%

5,000 – 10,000	65	34.0%
10,000 – 20,000	13	7.0%
20,000 – 30,000	88	47.3%
> 30,000	14	7.5%

“AD = Adamawa; GM = Gombe; BC = Bauchi; TR; Taraba; BN; Borno; YB = Yobe; JG = Jigawa; KD = Kaduna; KN = Kano; KT = Katsina; KB = Kebbi; SK = Sokoto; ZF = Zamfara; AB = Abuja; BN = Benue; KG = Kogi; KW = Kwara; NS = Nassarawa; NG = Niger; PL = Plateau”

5.5 Data Screening and Preparation

The data screening and pre-processing procedures are crucial as a pre-requisite stage for the multivariate data analysis. Generally, there are six main assumptions to be considered in the data cleaning stage, which includes; “missing data, outliers, normality, linearity, homoscedasticity and multicollinearity” (Tabachnick & Fidell, 2007). The study further examined the Common Method Variance (CMV) since it has been perceived as a crucial step, especially for cross-sectional studies (Chang et al., 2010). All the above presumptions were performed utilising SPSS (v. 26).

5.5.1 Missing Value Analysis

The most conventional method to deal with missing data is case deletion (Tabachnick & Fidell, 2007). Thus, deleting missing data is useful when the data is large. In particular, Relative Advantage had eight (8) missing values. In like manner, Cost Savings and Competitive Pressure had five (5) missing values. Also, TMS had two (2) missing values, and GS had three (3) missing values, while Compatibility and Intention had one (1) missing value each, respectively.

Nonetheless, there is no acceptable threshold (percentage) of missing data for making a valid statistical inference. However, Tabachnick and Fidell (2007) suggested that the missing value rate of $\leq 5\%$ is non-significant. Thus, one of the appropriate missing data analysis methods is mean substitution, if the percentage of missing data is $\leq 5\%$ (Tabachnick & Fidell, 2007). Therefore, this study adopts the mean substitution technique. Table 5.4 illustrates the missing value and their respective variables.

Table 5. 4

Percentage of Missing Values

Latent Variables	Number of Missing Values
RA	8 (RA1:3, RA2:1, RA3:2 RA6:2)
COM	1 (COM 4:1)
TR	0
SEC	0
TMS	2 (TMS6:2)
CS	5 (CS2:3, CS4:2)
SPS	0
CP	5 (CP1:2, CP5:1, CP6:1, CP7:1)
INT	1 (INT2: 1)
GS	3 (GS2:3)
Total	25 out of 9,261 data points
Percentage	0.26%

5.5.2 Assessment of Outliers

Outliers are defined “in a set of data to be an observation (or subset of observations) which appears to be inconsistent with the remainder of that set of the data” (Barnett & Lewis, 1978 p. 4). Thus, the availability of outliers in a data set will produce a distorted result and affect the regression coefficients' estimates (Verardi & Croux, 2008). Hence, all the continuous variables in this study were tested for outliers. The univariate and Multivariate are the two types of outliers.

This study identifies multivariate outlier's analysis using the Mahalanobis Distance method, a measure of the multivariate distance that can be evaluated using the Chi-square (X^2) table. The most common probability estimates for a case being an outlier is $p < 0.001$ for the X^2 value, appropriate with Mahalanobis Distance (Tabachnick & Fidell, 2007). Hence, the Chi-Square Table can also be used for the Mahalanobis based on the number of items. This study comprises of $49 - 1 = 48$ items with Chi-Square value of 65.17 ($p = 0.05$). Therefore, any Mahalanobis value greater than 65.17 is discarded from the dataset. Hence, no deletion was made because the lowest is 1.12, and the highest Mahalanobis distance is 40.21, which is less than 65.17 thresholds.

5.5.3 Normality

Screening continuous variables for normality is an essential early step in almost every multivariate analysis, although the normality of the variables is not always required for analysis. Thus, the normality of variables is assessed by either statistical or graphical methods (Tabachnick & Fidell, 2007). To check for normality, this study adopts the statistical technique (Tabachnick & Fidell, 2007). Field (2013) recommended that if the sample size is ≥ 200 , it is pertinent to use the graphical method. Field (2013) further adds that a large sample size reduces the standard error, which increases the kurtosis and

skewness values. However, since this study sample is less than 200, the statistical method (Skewness and Kurtosis) was adopted.

Additionally, this study used Skewness and Kurtosis to distribute the normality test, and the data is normally distributed in the range of -0.254 and 0.295, whereas Kurtosis range from -0.146 to 3.114, respectively. Hence, the normality of the collected data in the study calls for PLS-SEM use for the primary analysis as it can handle the standard error caused by the non-normality of the distribution (Hair, Ringle, & Sarstedt, 2011).. Table 5.5 depicts the Skewness and Kurtosis range of data.

Table 5. 5

Normality Test using Statistical Methods

Variable	Skewness	Kurtosis	z-score Skewness	z-score Kurtosis
RA	.295	.200	1.65	0.56
COM	-1.206	3.114	-6.73	8.77
TR	-.574	-.083	-3.20	-0.23
SEC	-.457	-.146	-2.55	-0.41
TMC	-1.300	2.987	-7.26	8.41
CS	-.726	.437	-4.07	1.23
CP	-1.300	1.934	-7.26	5.44
SPS	-.711	.187	-3.99	0.52
INT	-.254	-.417	-1.42	-1.17
GS	-1.335	1.350	-7.5	3.80

z-score: Kurtosis/std. error of kurtosis, likewise for skewness. Normality: For skewness and Kurtosis value to have a z-score value of +/- 1.96.

$$Z = \frac{\text{Skew value}}{SE_{\text{skewness}}}, Z = \frac{\text{Excess kurtosis}}{SE_{\text{excess kurtosis}}} \quad (5.1)$$

Similarly, a z-test is applied for the normality test using skewness and kurtosis. The formula for calculating the z-test is shown below.

5.5.4 Homoscedasticity

Homoscedasticity has been yet another kind of test undertaking concerning assumptions. Thus, it exists when a variable's residual exhibits consistent variance across different stages of the variable (Gaskin, 2017). Verification is made via scatter plots of regression, standardised residuals, and regression standardised predicted values. The random plot patterns indicate that the assumption relative to homoscedasticity is valid. Figure 5.1 depicts the scatter plot of all the exogenous and endogenous variables to assess the data's goodness characteristic.



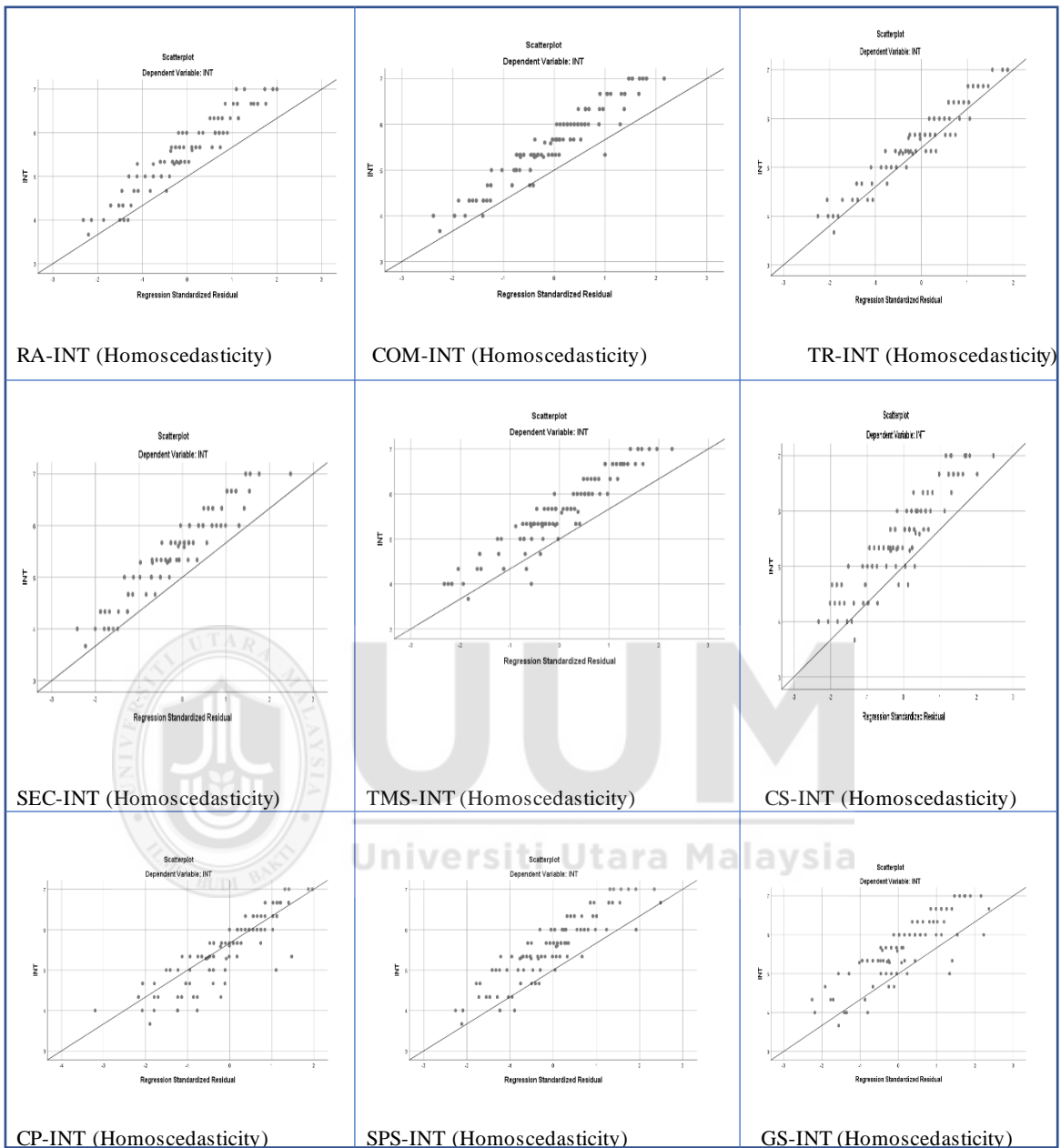


Figure 5. 1. The Analysis of Homoscedasticity

5.5.5 Multicollinearity Test

Multicollinearity alludes to a circumstance wherein or more exogenous latent constructs become highly correlated. It simply means the “extent to which a variable can be explained by the other variables in the analysis” (Hair et al., 2014, p. 2). Consequently, the presence of multicollinearity among the exogenous latent constructs can substantially contort the estimates of regression coefficients and their statistical significance tests (Chatterjee & Yilmaz, 1992; Hair et al., 2014). In particular, multicollinearity raises the standard errors of the coefficients, which makes the coefficient to be not significant (Tabachnick & Fidell, 2007). Additionally, to detect multicollinearity, two methods were adopted in this study, “tolerance and Variance Inflation Factor (VIF)” (Chatterjee & Yilmaz, 1992; Peng & Lai, 2012).

Firstly, the Tolerance value of > 0.10 and $VIF < 10$ are the threshold recommended by Field (2009). Secondly, following the correlation matrix results for the exogenous latent variables, the VIF and tolerance value were assessed to determine the multicollinearity problem. As shown in Table 5.7, the tolerance scores were > 0.10 , and VIF scores were < 10 . Secondly, the exogenous latent constructs correlation matrix was assessed, in concordance with the submission of Hair et al. (2010), where the correlation coefficient of ≥ 0.90 indicate multicollinearity issues, as shown in Table 5.6. Therefore, multicollinearity is not an issue in the present study.

Table 5. 6

Multicollinearity Analysis

Exogenous Variables	Collinearity	
	Tolerance	VIF
RA	.827	1.210
COM	.578	1.729
TR	.540	1.853
SEC	.600	1.667
TMC	.553	1.808
CS	.635	1.574
CP	.435	2.300
SPS	.607	1.647
GS	.513	1.949

5.5.6 Non-Response Bias

Non-response bias refers to “the differences in the answers between non-respondents and respondents” (Lambert & Harrington, 1990, p. 5). A time-trend method was proposed by Armstrong and Overton (1977) to estimate the non-response bias for the early and late response, and they share the same features. Additionally, a response rate of 50% was suggested by Lindner and Wingenbach (2002) to reduce the issue of non-response bias. In concordance with the above suggestions, the study classifies the respondent into 2 groups, early (within 30 days) and late (after 30 days). Therefore, an independent sample t-test was performed to detect any possible non-response bias in the main study, as shown in Table 5.7.

Table 5. 7

Independent -Samples T-test for Non-response Bias

Variables	Group	N	Mean	SD	Leven's Test for Equality of Variance	
					F	Sig.
RA	Early Response	129	5.67	.575	2.563	.111
	Late Response	57	5.64	.466		
COM	Early Response	129	5.54	.712	0.001	.982
	Late Response	57	5.50	.766		
TR	Early Response	129	5.61	.792	0.438	.509
	Late Response	57	5.68	.751		
SEC	Early Response	129	5.61	.720	0.162	.688
	Late Response	57	5.65	.775		
TMS	Early Response	129	5.68	.743	0.450	.503
	Late Response	57	5.60	.855		
CS	Early Response	129	5.61	.844	1.839	.177
	Late Response	57	5.67	.751		
CP	Early Response	129	5.56	.837	0.48	.826
	Late Response	57	5.52	.915		
SPS	Early Response	129	5.56	.798	0.072	.789
	Late Response	57	5.58	.798		
INT	Early Response	129	5.55	.816	0.495	.482
	Late Response	57	5.69	.798		
GS	Early Response	129	5.71	1.097	0.015	.901
	Late Response	57	5.75	1.174		

Source: The Researcher

5.5.7 Common Method Variance Test

The Common Method Variance (CMV) refers to the variance attributed to the measurement method rather than the construct of interest (Podsakoff et al., 2003). There is a consensus among researchers that agree CMV is a primary worry when a self-report survey is involved (Lindell & Whitney, 2001; Podsakoff et al., 2003; Spector, 2006). Meanwhile, the CMV occurs when the target respondents are alleged to have similar intentions of answering the same pattern for different latent constructs. One of the methods of detecting CMV is via the inter-construct correlation analysis. Hence, the CMV is expected to exist if the inter-construct correlation value is $>.90$ (Bagozzi, Yi, & Phillips, 1991; Podsakoff, MacKenzie, & Podsakoff, 2012; Tehseen, Ramayah, & Sajilan, 2017).

Furthermore, the present study adopted numerous remedies to lessen the effect of CMV (Bagozzi et al., 1991; Podsakoff et al., 2012; Tehseen et al., 2017). To lessen assessment anxiety, the respondents were told upfront that there are no correct or incorrect answers to the questionnaires as well as the assurance of their anonymity. Second, improving scale items and their definitions were used to reduce bias by avoiding vague concepts and providing short definitions in the questionnaires to improve comprehension. Lastly, all questions were written using simple and concise English language.

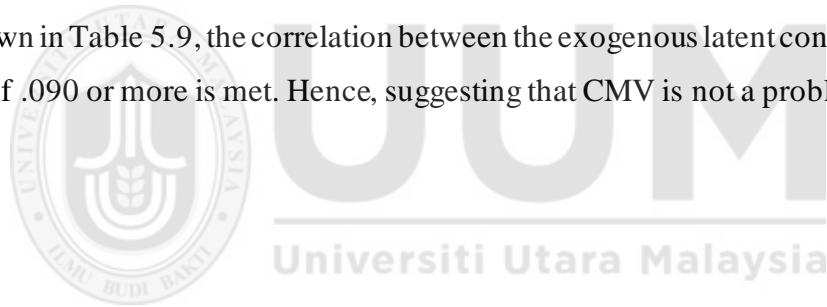
Additionally, the study further adopted Harman's single factor test proposed by Podsakoff and Organ (1986) to examine the CMV. Harman (1976) single-factor analysis assumption is that if a significant amount of CMV is present, a single factor may emerge, or one general factor would account for most of the covariance in the IVs and DVs (Podsakoff & Organ, 1986). Therefore, Principal Component Analysis (PCA) was used. Hence, the result of the analysis generated ten (10) factors, explaining a cumulative 41.73% of the variance. The result indicated that no single factor accounted for the majority of the variance. Therefore, this suggests that CMV is not a significant concern and is unlikely to inflate the relationships between variables.

Table 5. 8

Correlation Matrix of the Exogenous Latent Constructs

No.	Latent Constructs	1	2	3	4	5	6	7	8	9	10
1	Relative Advantage	1									
2	Compatibility	.058	1								
3	Trust	.036	.483	1							
4	Security	.227	.278	.446	1						
5	Top Management Support	.095	.443	.256	.465	1					
6	Cost Savings	.215	.310	.426	.264	.355	1				
7	Competitive Pressure	.122	.520	.361	.297	.513	.435	1			
8	Service Provider Support	.334	.315	.291	.367	.308	.514	.433	1		
9	Intention	.297	.295	.254	.285	.335	.412	.499	.450	1	
10	Government Support	-.046	.499	.440	.212	.420	.311	.626	.300	.533	1

As shown in Table 5.9, the correlation between the exogenous latent constructs thresholds value of .090 or more is met. Hence, suggesting that CMV is not a problem.



5.6 Structural Equation Modelling

The SEM is a statistical model that clarifies the relationship among several variables (Hair et al., 2014). Thus, SEM is a statistical methodology called the PLS-SEM and CB-SEM (Hair et al., 2010). The CB-SEM centres around assessing the strength of the theory, which is suitable for confirmatory studies. Nevertheless, this study will employ the PLS-SEM due to the following justifications as recommended by (Hair et al., 2014).

- This study is a predictive study where TOE and DOI models were modified with Government Support (GS) as a moderating variable.
- The distribution of the dataset is normal; hence, the need to use the non-parametric test.

- SEM supports both simple and complex models.

In light of this, PLS-SEM is adopted in this study.

5.6.1 Assessment of PLS-SEM Model

As indicated by Henseler and Sarstedt (2013), Goodness-of-Fit (GoF) index is not appropriate for validating the model. Hair et al. (2013) utilising PLS path models with simulated data shows that the GoF cannot differentiate between valid and invalid models. Be that as it may, the GoF can be useful to measure how well a PLS path model can explain different sets of data. Consequently, due to the inappropriateness of PLS path modelling in model validation, this study adopted a dual-step process to evaluate and report the PLS-SEM path results, as hypothesised by Henseler et al. (2009). The dual-step process adopted in this study comprises assessing a measurement model and assessing a structural model as depicted in Figure 5.2.

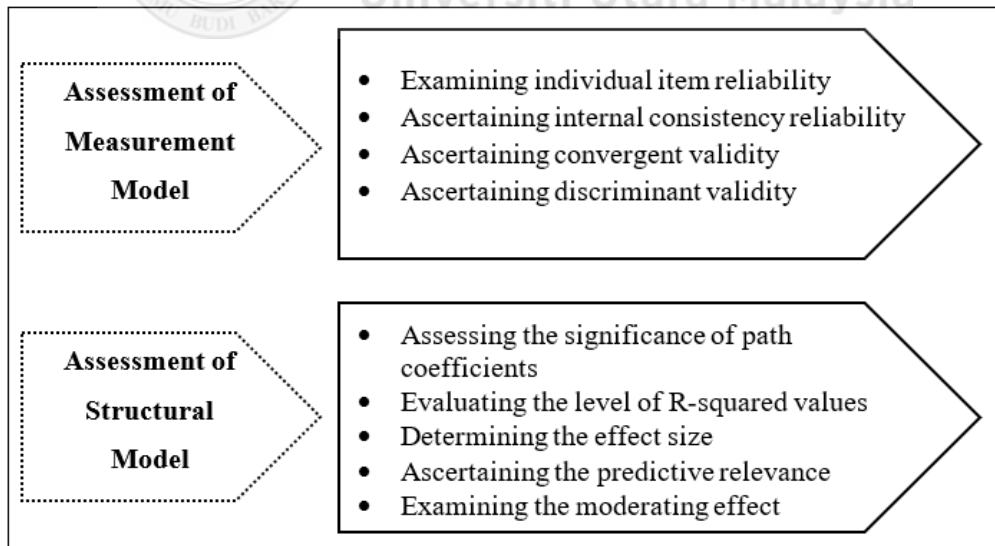


Figure 5. 2. A Dual-Step Process of PLS Path Model Assessment
Source: Henseler et al. (2009)

5.6.2 Assessment of Measurement Model

The assessment of a measurement model includes determining “individual item reliability, internal consistency reliability, content validity, convergent validity as well as discriminant validity” (Henseler et al., 2009; Hair et al., 2011; Hair et al., 2014). The measurement model is shown in Figure 5.3.

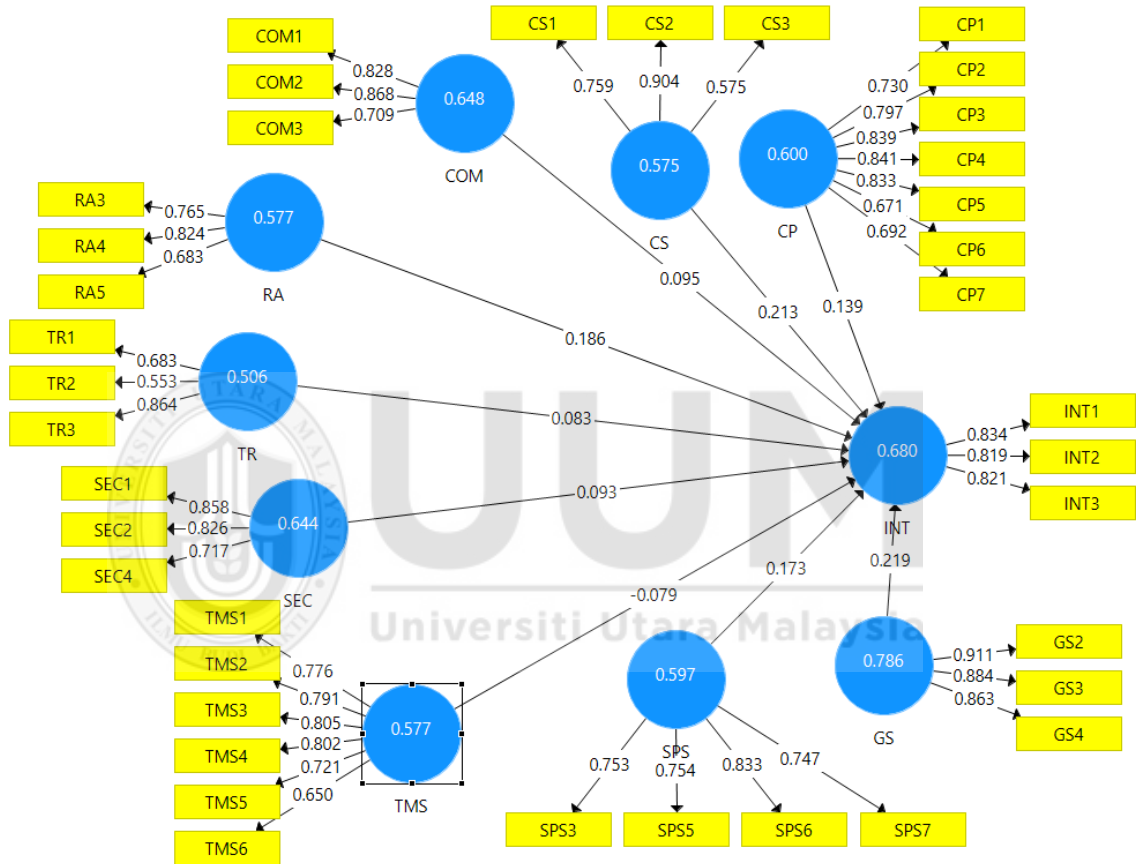


Figure 5. 3. Measurement Model

5.6.2.1 Individual Item Reliability

The individual item reliability was evaluated by inspecting each construct's outer loadings (Hair et al., 2012; Hair et al., 2014). Hair et al. (2014) suggest that items loadings between .40 and .70 should be retained. Hence, out of the 49 items, 10 items were deleted because they fall below the approved threshold of .40. Therefore, 41 items were maintained for further analysis. Nonetheless, some items have item loading of more than 0.5 but were omitted due to the items' internal consistency reliability and validity.

5.6.2.2 Internal Consistency Reliability

Internal consistency alludes to the degree to which all items on a specific scale assess the same concept (Bijttebier et al., 2000; Sun et al., 2007). Generally assessed by Cronbach α coefficient. In the same vein, the Cronbach's alpha coefficient and composite reliability coefficient are the most used estimators of an instrument's internal consistency reliability (Bacon et al., 1995; McCrae et al., 2011; Peterson & Kim, 2013). Subsequently, this study will adopt the composite reliability coefficient to determine the adopted measures' internal consistency reliability.

Furthermore, two principal reasons legitimised the utilisation of the composite reliability coefficient. First, it provides a less bias estimate of reliability than Cronbach's alpha coefficient because the latter assumes all items contribute equally to its constructs without considering the actual contribution of individual loadings (Thompson et al., 1995; Götz et al., 2010).

Secondly, the α “like the composite reliability is a measurement of reflective construct reliability, yet, includes the actual factor loading, whereas the latter uses equal weighting” (Götz et al., 2010). Nonetheless, the interpretation of the internal consistency reliability using the composite reliability coefficient was based on the rule of thumb as suggested by Bagozzi and Youjae (1988) and Hair et al. (2011) to be at least .70 or more. Table 5.9 shows the Composite Reliability (0.70), outer loadings (0.70), as well as the AVE (0.50) (Hair et al., 2014).

Table 5. 9

Factor Load, composite reliability, and the Average Variance Extracted

Latent Constructs	Standardized Loadings	Composite Reliability	Average Variance Extracted (AVE)
Relative Advantage:		0.803	0.577
RA3	0.765		
RA4	0.824		
RA5	0.683		
Compatibility:		0.846	0.648
COM1	0.828		
COM2	0.868		
COM3	0.709		
Trust:		0.749	0.506
TR1	0.683		
TR2	0.553		
TR3	0.864		
Security:		0.844	0.644
SEC1	0.858		
SEC2	0.826		
SEC4	0.717		
Top Management Support:		0.891	0.577
TMS1	0.776		
TMS2	0.791		
TMS3	0.805		
TMS4	0.802		
TMS5	0.721		
TMS6	0.650		
Cost Savings:		0.797	0.575
CS1	0.759		
CS2	0.904		
CS3	0.575		
Competitive Pressure:		0.913	0.600

CP1	0.730		
CP2	0.797		
CP3	0.839		
CP4	0.841		
CP5	0.833		
CP6	0.671		
CP7	0.692		
Service Provider Support:		0.855	0.597
SPS3	0.753		
SPS5	0.754		
SPS6	0.833		
SPS7	0.747		
Government Support:		0.917	0.786
GS2	0.911		
GS3	0.884		
GS4	0.863		
Intention:		0.864	0.680
INT1	0.834		
INT2	0.819		
INT3	0.821		

Source: The Researcher

5.6.2.3 Convergent Validity

Convergent validity alludes “to the degree to which two measures of the same concept are correlated” (Hair et al., 2010 p. 124). Thus, AVE was used to measure each construct's convergent validity (Fornell & Larcker, 1981). Thus, Chin (1998) suggests an AVE value of .5 or more. Table 5.10 presents the loadings and AVE of the constructs. Therefore, all the constructs meet the convergent validity requirements.

5.6.2.4 Discriminant Validity

The Discriminant Validity (DV) alludes to the “degree to which two conceptually similar concepts are distinct” (Hair et al., 2010 p. 124). In this study, the DV was accessed using AVE, as proposed by Fornell and Larcker (1981). Hence, accomplished by looking at and comparing the correlations among the latent construct with the square root of AVE Fornell and Larcker (1981). Furthermore, Chin (1998) criterion by comparing the indicator loadings (cross-loadings) with other reflective indicators in the cross-loading table. Fornell and Larcker (1981) further recommended that the square root of the AVE be higher than the correlations among the latent constructs to accomplish sufficient discriminant validity. As indicated in Table 5.10, the value of the AVE ranges between .5 and .7, respectively.

Table 5. 10

Cross-Loadings Analysis

	COM	CP	CS	GS	INT	RA	SEC	SPS	TMS	TR
COM1	0.828	0.331	0.233	0.189	0.266	0.234	0.251	0.468	0.337	-0.356
COM2	0.868	0.407	0.22	0.166	0.345	0.13	0.266	0.423	0.354	-0.33
COM3	0.709	0.353	0.41	0.302	0.304	0.142	0.186	0.348	0.184	-0.342
CP1	0.365	0.73	0.575	0.595	0.376	0.137	0.2	0.334	0.408	-0.312
CP2	0.501	0.797	0.52	0.332	0.519	0.303	0.394	0.348	0.487	-0.346
CP3	0.411	0.839	0.39	0.244	0.412	0.187	0.252	0.377	0.438	-0.305
CP4	0.389	0.841	0.462	0.394	0.455	0.295	0.288	0.432	0.53	-0.39
CP5	0.301	0.833	0.45	0.459	0.404	0.22	0.281	0.417	0.38	-0.297
CP6	0.258	0.671	0.502	0.484	0.311	0.197	0.236	0.401	0.276	-0.292
CP7	0.134	0.692	0.383	0.524	0.279	0.123	0.188	0.403	0.293	-0.295
CS1	0.191	0.467	0.759	0.37	0.316	0.315	0.286	0.324	0.397	-0.251
CS2	0.308	0.579	0.904	0.678	0.594	0.171	0.316	0.443	0.504	-0.363
CS3	0.335	0.261	0.575	0.187	0.26	0.21	0.248	0.364	0.265	-0.298
GS2	0.293	0.557	0.679	0.911	0.507	0.134	0.303	0.373	0.404	-0.417
GS3	0.27	0.366	0.44	0.884	0.392	0.131	0.153	0.224	0.187	-0.447
GS4	0.138	0.488	0.473	0.863	0.365	0.027	0.149	0.197	0.311	-0.289
INT1	0.341	0.567	0.502	0.484	0.834	0.315	0.256	0.441	0.377	-0.264
INT2	0.281	0.282	0.254	0.221	0.819	0.301	0.264	0.367	0.089	-0.203
INT3	0.316	0.394	0.568	0.435	0.821	0.345	0.314	0.44	0.344	-0.297
RA3	0.14	0.034	0.069	0.031	0.3	0.765	0.101	0.287	-0.001	-0.029
RA4	0.158	0.42	0.433	0.249	0.329	0.824	0.337	0.419	0.377	-0.244
RA5	0.172	0.16	0.092	-0.054	0.255	0.683	0.308	0.164	0.185	-0.169

SEC1	0.247	0.282	0.351	0.223	0.312	0.268	0.858	0.282	0.425	-0.428
SEC2	0.225	0.227	0.218	0.182	0.236	0.159	0.826	0.278	0.346	-0.455
SEC4	0.229	0.331	0.305	0.164	0.257	0.348	0.717	0.266	0.516	-0.251
SPS3	0.269	0.336	0.343	0.212	0.402	0.285	0.244	0.753	0.176	-0.192
SPS5	0.382	0.297	0.251	0.193	0.293	0.246	0.187	0.754	0.099	-0.265
SPS6	0.402	0.48	0.476	0.298	0.437	0.318	0.28	0.833	0.459	-0.399
SPS7	0.521	0.384	0.424	0.241	0.418	0.352	0.326	0.747	0.309	-0.252
TMS1	0.1	0.358	0.342	0.153	0.309	0.251	0.532	0.269	0.776	-0.139
TMS2	0.216	0.437	0.366	0.165	0.272	0.267	0.493	0.319	0.791	-0.25
TMS3	0.223	0.451	0.398	0.318	0.236	0.085	0.333	0.235	0.805	-0.25
TMS4	0.295	0.452	0.471	0.282	0.265	0.184	0.429	0.316	0.802	-0.202
TMS5	0.339	0.463	0.384	0.343	0.241	0.229	0.274	0.231	0.721	-0.328
TMS6	0.507	0.281	0.468	0.354	0.27	0.116	0.333	0.249	0.65	-0.225
TR1	-0.368	-0.319	-0.344	-0.255	-0.185	-0.151	-0.32	-0.267	-0.295	0.683
TR2	-0.259	-0.126	-0.166	-0.265	-0.088	-0.01	-0.221	-0.133	-0.136	0.553
TR3	-0.315	-0.366	-0.322	-0.398	-0.315	-0.186	-0.42	-0.32	-0.216	0.864

Note. RA = Relative Advantage, COM = Compatibility, CP = Competitive Pressure, CS = Cost Savings, GS = Government Support, INT = Intention, SEC = Security, SPS = Service Provider Support, TMS = Top Management Support, TR = Trust

As indicated in Table 5.11, Heterotrait-Monotrait Ratio (HTMT) results show that it is not a concern in this study since it is the new criterion to assess Discriminant Validity. No item was deleted during this stage.

Table 5.11

Heterotrait-Monotrait Ratio

	COM	CP	CS	GS	INT	RA	SEC	SPS	TMS	TR
COM										
CP	0.539									
CS	0.538	0.756								
GS	0.335	0.629	0.706							
INT	0.503	0.589	0.692	0.553						
RA	0.313	0.378	0.453	0.221	0.554					
SEC	0.403	0.423	0.535	0.286	0.447	0.488				
SPS	0.683	0.592	0.682	0.358	0.639	0.538	0.448			
TMS	0.475	0.6	0.691	0.403	0.41	0.369	0.67	0.415		
TR	0.659	0.512	0.615	0.578	0.384	0.356	0.673	0.478	0.437	

Table 5. 12

Analysis of Fornel-Lacker Criterion

	COM	CP	CS	GS	INT	RA	SEC	SPS	TMS	TR
COM	0.805									
CP	0.456	0.775								
CS	0.357	0.604	0.758							
GS	0.271	0.537	0.613	0.887						
INT	0.384	0.522	0.562	0.484	0.824					
RA	0.204	0.281	0.276	0.115	0.391	0.76				
SEC	0.292	0.35	0.37	0.239	0.339	0.326	0.803			
SPS	0.511	0.494	0.497	0.311	0.511	0.394	0.343	0.773		
TMS	0.364	0.533	0.533	0.348	0.354	0.253	0.536	0.358	0.760	
TR	-0.425	-0.414	-0.402	-0.438	-0.316	-0.196	-0.472	-0.362	-0.301	0.712

5.7 Assessment of Significance of the Structural Model

After the CFA that was performed during the measurement model analysis, the structural model was analysed. A few criteria were analyzed, including collinearity assessment, the “significance, and relevance of structural model's relationships, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2) and q^2 effect size”. The conceptual model of the current study consists of 11 hypotheses. The main hypotheses (model A) comprise of H_1 to H_9 . Similarly, the moderation hypotheses (Model B) comprise hypotheses H_{9a} , H_{9b} , and H_{9c} presented in the upcoming sub-section. The main hypotheses' classification into Model A and B is because the PLS-SEM analysis does not allow the recursive relationships between the latent variables (Hair et al., 2014).

Furthermore, the present study used the standard bootstrapping method with 5,000 samples to assess the path coefficient's significance (Hair et al., 2010; Hair et al., 2014; Hair et al., 2017). Figure 5.4 depicts the structural model with Government Support as the moderator variables.

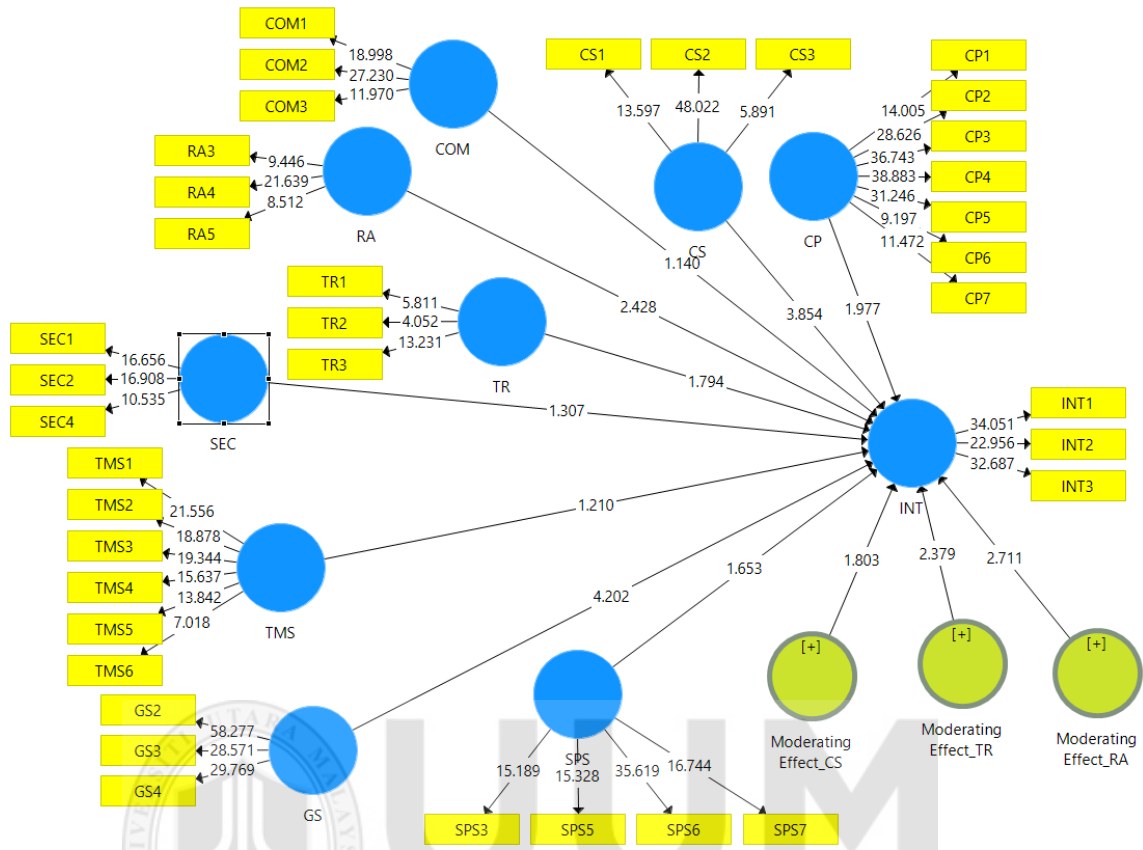


Figure 5. 4. Structural Model with Moderator (Full Mode)

Table 5. 13

Structural Model Assessment of Model A, B

Hypotheses	Relationship	β	t-value	p-values	Result
H ₁	RA -> INT	0.186	2.846	0.002***	Supported
H ₂	COM -> INT	0.095	1.385	0.083	Not-Supported
H ₃	TR -> INT	0.083	1.076	0.137	Not-Supported
H ₄	SEC -> INT	0.093	1.203	0.115	Not-Supported
H ₅	TMS -> INT	-0.079	1.333	0.092	Not-Supported
H ₆	CS -> INT	0.213	2.551	0.006***	Supported
H ₇	CP -> INT	0.139	1.543	0.062	Not-Supported
H ₈	SPS -> INT	0.173	1.922	0.028**	Supported
H ₉	GS-> INT	0.269	3.321	0.000***	Supported
H _{9A}	RA-> GS	-0.125	2.830	0.002***	Supported
H _{9B}	CS -> GS	0.123	1.943	0.026**	Supported
H _{9C}	TR->GS	-0.161	2.442	0.007***	Supported

Hypothesis h1 predicted that Relative Advantage is positively related to the Intention to adopt IaaSBEL. Results from Table 5.14 and Figure 5.4 indicated that Compatibility has a negative relationship with the Intention to adopt IaaSBEL; hence, h2 is not supported. Also, in inspecting the influence of Trust and Security, the result demonstrated that both Trust and Security negatively influence the Intention to adopt IaaSBEL. Therefore, hypotheses 3 and 4 are not supported.

Hypothesis 5 predicted that Top Management Commitment is negatively related to the Intention to adopt IaaSBEL. As depicted in Table 5.14, a significant positive relationship between Cost Savings and the Intention to adopt IaaSBEL ($\beta = 0.213$, $t = 2.551$, $p = 0.006$) was found, indicating support for H6. Competitive Pressure was predicted not to influence the Intention to adopt IaaSBEL (H7).

Service Provider Support was predicted to be positively related to the Intention to adopt IaaSBEL (H8). The findings indicated a significant positive relationship between Service Provider Support and the Intention to adopt IaaSBEL ($\beta = 0.173$, $t = 1.922$, $p = 0.028$). H9 which is GS has showed a significant positive relationship between GS and the Intention to adopt IaaSBEL, as shown in Table 5.14 ($\beta = 0.269$, $t = 3.321$, $p = 0.000$). Hence, this hypothesis is supported.

5.7.1 Assessment of Variance Explained in the Endogenous Latent Variables

As mentioned above, the R^2 value, also known as the coefficient of determination, is an essential criterion for assessing the PLS-SEM model (Henseler et al., 2009; Hair et al., 2011; Hair et al., 2012). The R^2 is a measure of the model's predictive values of specific endogenous variables (Hair et al., 2017). Nonetheless, there is no specified value for the R^2 , and this study, follows the recommendation of Hair et al. (2017) value 0.25, 0.50 and 0.75 as weak, moderate, and high R^2 values. As indicated in Table 5.15, the Intention to adopt IaaSBEL has medium R^2 .

Table 5. 14

Analysis of Predictive Accuracy in Model A

Construct	R²	Variance Explained	Level of R²
INT	0.473	47.3%	Moderate

Note. INT = Intention to Adopt IaaS BEL

As shown in Table 5.15, the research model explains that 47.3% of the total variance in IaaS BEL, suggesting that the nine (9) variables collectively explain 47.3% variance, respectively. Hence, based on Falk and Miller (1992) and Chin (1998) criteria, the R² value is considered moderate.

5.7.2 Assessment of Effect Size

The effect size (f^2) demonstrates the overall impact of a specific exogenous variable on the endogenous variable by the changes in the R² (Chin, 1998). It estimates the changes in R² when the specific predictor is excluded from the model. The following formula shows how to calculate the f^2 .

$$f^2 = \frac{R^2 \text{ Included} - R^2 \text{ Excluded}}{1 - R^2 \text{ Included}} \quad (5.1)$$

From the above formula, Cohen (1998) interpretation of f^2 effect size is 0.02 for small, 0.15 medium, and 0.35 for large effects.

Table 5. 15

Analysis of f² effect size

Variables	R²	R² Excluded	F²	Effect size
Technology:				
RA	0.473	0.448	0.04	Small
COM	0.473	0.469	0.01	None
TR	0.473	0.47	0.01	None
SEC	0.473	0.471	0.01	None
Organization:				
TMS	0.473	0.473	0.00	None
CS	0.473	0.452	0.04	Small
Environment:				
SPS	0.473	0.459	0.03	Small
CP	0.473	0.465	0.02	Small
Moderating Variable:				
GS	0.473	0.447	0.05	Small

As illustrated in Table 5.15, the effect sizes for “Relative Advantage, Compatibility, Trust, Security, Top Management Support, Cost Savings, Service Provider Support, Competitive Pressure, and Government Support”, respectively. Therefore, based on Cohen's (1988) effect size guidelines, the exogenous latent constructs' effect can be considered small, small, small, and none.

5.7.3 Assessment of Blindfolding and Predictive Relevance (Q^2)

This study applied the Stone-Geisser test of predictive relevance using the blindfolding technique (Geisser, 1974; Stone, 1974). Thus, it is usually used as a supplementary assessment of the goodness-of-fit in PLS-SEM (Duarte & Raposo, 2010). The blindfolding technique was utilised to ascertain the predictive relevance of the model. Sattler, Völckner, Riediger, and Ringle (2010) defines “Blindfolding technique is only

applied to endogenous latent variables that have a reflective measurement model operationalisation” (p. 320). Due to this reason, this study applied the blindfolding technique.

Furthermore, Q² was applied to examine the research model's predictive relevance (Stone, 1974; Geisser, 1974; Chin, 2010; Hair et al., 2012; Hair et al., 2013). The Q² criterion is used to measure how well a model predicts the data omitted cases (Chin, 1998; Hair et al., 2014). According to Henseler et al. (2009) threshold value of predictive relevance ranges from 0.02, 0.15, and 0.35 indicates that a particular exogenous variable has a small, medium, and high predictive relevance towards the endogenous variables (Hair et al., 2017). Table 5.16 shows the result of the cross-validated redundancy Q² of this study.

Table 5. 16

Construct Cross-Validated Redundancy

Total	SSO	SSE	Q² (= 1-SSE/SSO)
INT	558.000	412.587	0.261

Source: The Researcher

As shown in Table 5.17, the measurement of Q² for the endogenous variable was > 0, suggesting a good predictive relevance of the model (Chin, 1998; Henseler et al., 2009).

5.7.4 Testing Moderating Effects

In Model B, the study applied a product indicator technique using the PLS-SEM modelling to detect as well as estimate the strength of the moderating effect of Government Support (GS) on the relationship between Relative Advantage (RA), Cost Savings (CS), and Trust (Tr). Thus, to assess the hypothesized moderating effect, a bootstrapping technique was utilized (Hair et al., 2014). Figure 5.5 depicts the moderating role of GS on RA, CS, and TR.

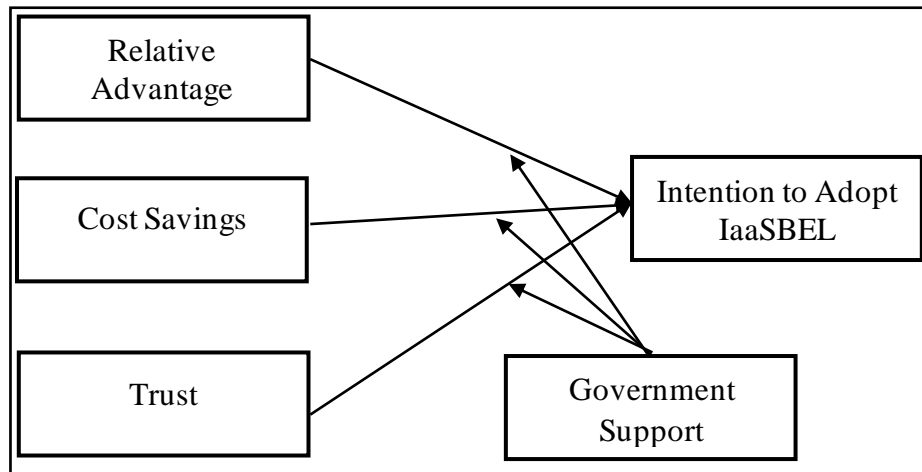


Figure 5. 5. The Moderating Role of Government Support in Model B

Similarly, the findings are shown in Table 5.18 below support the Hypothesis H9A, which stated that “Government Support has a moderating effect on the relationship between Relative Advantage and the Intention to adopt IaaSBEL”, with $\beta = -0.125$, $t = 2.739$, $p = 0.003$. Thus, the moderating effect shows a negative relationship between RA and GS. This implies that the ICT directorates’ perception of the ample benefits of adopting IaaSBEL infrastructure will negatively affect the adoption of IaaSBEL. The result is contrary to the initial hypothesized statement (H9A).

Specifically, as illustrated in Table 5.18, Hypothesis (H9B) states that “Government Support has a moderating effect on the relationship between Cost Savings and the Intention to adopt IaaSBEL,” with $\beta = 0.123$, $t = 1.942$, $p = 0.026$. Therefore, this implies that the ICT directorates’ perception of the CS associated with the adoption of IaaSBEL infrastructure will save the cost of operation in Nigerian HEIs. Hence, the result corroborates with the proposed hypothesis.

Furthermore, Hypothesis H9C posited that “Government support has a moderating effect on the relationship between Trust and the Intention to adopt IaaSBEL”. Results shown in Table 5.18 demonstrated a significant negative interaction between Trust (Tr) and the Intention to adopt IaaSBEL infrastructure with $\beta = -0.161$, $t = 2.327$, $p = 0.010$. This indicates

that despite the government's involvement, the ICT directorates top managers perceive trust as a hindrance or concern towards adopting the IaaSBEL infrastructure. Table 5.18 shows the tabular summary of the moderation analysis.

Table 5. 17

Structural Model Assessment of Model B

Hypotheses	Relationship	β	t-value	p-values	Result
H9A	RA-> GS	-0.125	2.739	0.003***	Supported
H9B	CS -> GS	0.123	1.942	0.026**	Supported
H9C	TR->GS	-0.161	2.327	0.010***	Supported

***indicates significant level at $p < 0.01$, **indicates significant level at $p < 0.05$, *significant at 0.1

As shown in Table 5.18, the Hypothesis H9A shows the moderation effect of GS on the relationship between RA, CS, TR, and the Intention to adopt IaaSBEL. Thus, The H9A shows that the relationship between RA and GS is supported negatively, implying that even with GS's introduction on the Intention to adopt IaaSBEL, the ICT directorates' top managers are still sceptical of the commitment of the Government towards the diffusion of innovation in the HEIs. Similarly, H9C findings show that GS's moderating effect on the relationship between TR, GS, and the Intention to adopt IaaSBEL is supported negatively, showing that the ICT top managers are concerned about the security and trust of the IaaSBEL infrastructure. This is further supported by extant literature where Security and Trust are believed to distort CC's adoption (Ghazali et al., 2017; Tom, Virgiyanti, & Osman, 2019). Besides, the qualitative (semi-structured interview) findings as presented by Informant P1, P2, P3, and P4 shows that poor policy awareness, personal interest or corruption, lack of maintenance, lack of adequate policy and support are among the reasons why despite the involvement of the Government, the ICT directorates are still reluctant about the adoption of IaaSBEL.

Furthermore, H9B shows the positive relationship between CS and GS on the Intention to adopt IaaSBEL. The outcome was anticipated as theorized in the study. The result shows that the ICT directorates' top managers agree that adopting IaaSBEL will help save costs

in the Nigerian HEI's. Therefore, according to Creswell and Creswell (2018), “The researcher must decide which quantitative results need to be further explained. Although this cannot be determined precisely until after the quantitative phase is complete” (p. 91-92). Similarly, identifying specific quantitative results that call for additional explanation and using these results to guide the development of the qualitative strand” (Creswell & Creswell, 2018, p. 91-92). Therefore, based on the above justification, this study selects the contradictory findings to the theorized hypothesis. Hence, RA and Tr will be used for qualitative interview questions development.

5.7.5 Determining the Strength of the Moderating Effects

To determine the strength of Government Support's moderating effect on Relative Advantage, Cost Savings, and Trust, Cohen's (1988) effect size was utilized. Thus, the moderating effect strength can be examined by comparing the coefficient of determination (R2 value) of the primary effect model with the R2 value of the full model. Thus, incorporating the exogenous latent constructs and the moderating variable (Henseler & Fassott, 2010; Wilden, Gudergan, Nielsen, & Lings, 2013). Cohen's effect size formula was utilized:

$$Effect\ Size: f^2 = \frac{R^2\ model\ with\ a\ moderator - R^2\ model\ without\ moderator}{1 - R^2\ with\ moderator} \quad (5.2)$$

Furthermore, the f^2 value of into small 0.02, medium 0.15, and for a strong effect 0.35. Nonetheless, a small effect size does not mean that the moderating effect is insignificant (Chin et al., 2003). Similarly, “Even a small interaction effect can be meaningful under extreme moderating conditions, if the resulting beta changes are meaningful, then it is important to take these conditions into account” (Chin et al., 2003 p. 211). Table 5.19 presents the effect size of the moderating variable.

Table 5. 18

Strength of the Moderating Effects Based on Cohen's (1988) and Henseler and Fassott's (2010) Guidelines

Endogenous variables	R²	R² Excluded	F²	Effect Size
RA	0.554	0.508	0.14	Small/Moderate

5.8 Summary

In summary, following the significant path coefficients' assessment, the study's key findings were introduced. In particular, the path coefficient revealed a significant positive and negative relationship between Relative Advantage, Competitive Pressure, Service Provider Support, and Government Support. Regarding the negative relationship: Compatibility, Trust, Top Management Support, and Cost Savings. Furthermore, the moderating effect of Government Support on the relationship between the three predictor variables revealed a positive and negatively significant outcome. In particular, Government Support moderates the relationship between; (1) Relative Advantage and IaaS BEL, (2) Trust and IaaS BEL, (3) Cost Savings and IaaS BEL, respectively. The upcoming chapter will elaborate more on the explanatory sequential research design's (Quan) phase.

CHAPTER SIX

QUALITATIVE DATA ANALYSIS

6.1 Introduction

This chapter presents a step-by-step guide as well as techniques for performing qualitative data analysis. Thus, the interview data were collected from informants via phone calls, email communication and analyzed using the thematic method. Similarly, subjectivity in translating data, the validity of the instrument, and reliability were further discussed. For data analysis, NVivo (v.10) was utilized. The final section discusses the interpretations, summary, and conclusion of the qualitative results towards understanding the Intention to adopt IaaSBEL model by the HEIs ICT directorates.

6.2 Sampling Procedure

The sampling procedure section dealt with the sampling technique used to select the sample size from the population of the study.

6.2.1 Purposive Sampling Procedure

The purposive sampling is a non-probability sampling which does not draw statistical inferences. In this method, the informants were chosen based on their knowledge in the subject area (Creswell, 2014). Therefore, informants must be chosen in a way that will reflect the diversity of the population. A purposive sampling, also known as judgmental, selective or subjective sampling is a type of non-probability sampling techniques were particular characteristics of a population that are of interest, which will best answer the research questions. In the same vein, expert sampling was utilised in this study. Expert

sampling is a type of purposive sampling technique which is used to select experts in the field of study.

Furthermore, Creswell and Creswell (2018) recommended that qualitative data should be from much smaller sizes. Because having unequal sizes is consistent with this type of research design. On the suitable number of informants for an interview, Harry argues that one informant is enough provided the information given is capable of explaining the research Phenomenon (Baker et al., 2012). Hence, "for many qualitative studies, one respondent is all you need" (Harry as cited in, Baker et al., 2012). Similarly, Ivankova and Stick (2007) supported a small number of informants for sequential design qualitative study by using four (4) informants. For these reasons, this study will also use four (4) informants for the interview. Table 6.1 presents the category and number of chosen informants.

Table 6. 1

Category of selected informants

S/No	Category	Interpretation	Frequency
1	A	ICT Director of Sokoto State University	1
2	B	ICT director of Federal University Dutse	1
3	C	ICT Director Alqalam State University	1
4	D	ICT Director Yobe State University	Not Assessed
5	E	ICT Director Ibrahim Badamasi Federal University	Not Assessed
6	F	ICT Director Kano University of Science and Technology, Wudil	1
7	G		
Total			4

6.3 Interview Protocols

The interview protocol is a form used by a qualitative researcher for recording and writing down information obtained during the interview (Creswell, 2014). The qualitative interview is a process in which a researcher conducts face-to-face interviews with participants by telephone, on the internet or engages in focus group interviews with six to eight interviewees in each group. These interviews involve unstructured and generally open-ended questions that are few and intended to elicit views and opinion from the informants (Creswell, 2014). The interview protocol was implemented by following the recommendations of (Creswell, 2014; Creswell & Creswell, 2018). The guidelines are listed below:

- Gain approval (consent) from the interviewee before and during the interview.
- Conduct need assessment with participants about their needs.
- Contact participants and tell them the purpose of the study.
- The participant does not have to sign the consent form.
- Having a prearranged and elastic questions in time of the interview with date, place, interviewer, and interviewee.
- Start the interview with a formal introduction.
- Start with main questions, then follow up questions to explain their ideas in more details, or to elaborate on what they have said.
- Give spaces between the questions to record responses.
- The interviewee must approve (with his consent), before recoding any (audio, video, or notes) during the interview.
- A final thank you or appreciation after the interview.

6.4 Data Analysis

The qualitative data analysis was assessed using NVivo (v. 10). Thus, it compasses several explanations, such as concepts, themes, or general ideas. Therefore, non-statistical or quantitative data analysis was used. The upcoming subsections present the steps of qualitative analysis for this study.

6.4.1 Pre-interview

In the pre-interview stage, different informants were approached via their email addresses, direct calls as well as during chats (WhatsApp). The researcher sent the interview questions, operational definitions, and statistical results to the ICT directors of the concerned universities.

6.4.2 Informant Consent

For seeking the approval of the potential informants, an introductory letter was sent to the informants. Thus, the letter was attached with appropriate documents (IaaSBEL semi-structured interview questions, operational definitions of variables, and the statistical findings of the PLS-SEM delineating the purpose of the study). Meanwhile, in the consent form, the potential informants were asked to sign the form before any recording or note-taking will be conducted. However, only if they agree to sign the consent form, then their voices will be recorded. Similarly, during the interview, the researcher clarified the questions asked by the informants. Also, the researcher humbly requests the appropriate and convenient time for the meeting. Therefore, the semi-structured questions were made available to the informants for rehearsal before the interview.

6.4.3 Interview and Data Management

The interview session was conducted in a quiet environment with less noise. A one-on-one interview was carried out (via phone call), the informants were asked open-ended questions and followed by probing or follow-up questions required to clarify some information. The interview responses were audiotaped, subject to the approval of the informants. Similarly, after the completion of the interview, the informant's contact information was collected and adequately documented. Hence, a transcript-based analysis was carried out as described by (Bernard, Wutich, & Ryan, 2016; Creswell & Poth, 2016; Denzin & Lincoln, 2007; Saldaña, 2013; Seidman, 2006; Silverman, 2013). The adopted interview stages were depicted in Figure 6.1 below:



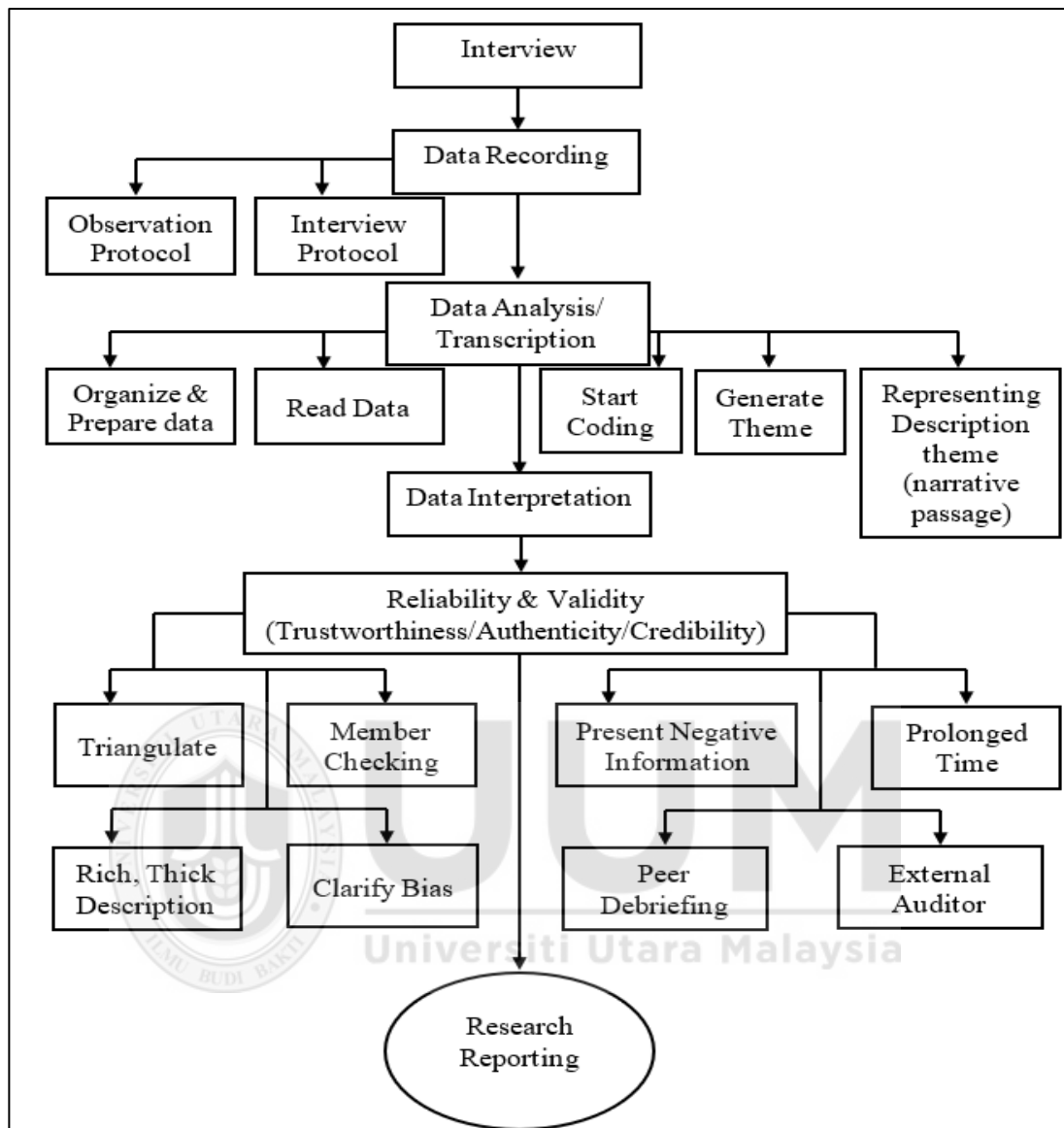


Figure 6. 1. Interview process and Data Management
Sources: adapted from Creswell and Creswell (2018)

Figure 6.1 illustrates the interview process and data management at a glimpse. It depicts numerous stages and substages involved in how the qualitative data will be collected, managed, transcribed, coded, analysed as well as reported.

The goal of the qualitative phase was to explore and elaborate on the statistical results (Creswell, 2003), the study intends to find out why certain predictor variables differently

contributed as well as contradicts the research findings and hypotheses. The interview informant that was selected is the subset of the individuals who participated in the first quantitative data collection. In this study, we use the respondents that could not be accessed during the initial quantitative phase. Hence, Creswell and Creswell (2018) recommended the qualitative data should be from much smaller sizes.

One of the issues usually encountered during the initial interview question design is what to incorporate or clarify the initial quantitative findings. According to Creswell and Creswell (2018), there are numerous options for making the decision, and the first option is "to conduct the quantitative analysis and examine the results to see which ones are unclear, surprising, or unexpected and call for further analysis" (p. 249-250). Creswell and Clark further suggested that "follow-up options is to conduct qualitative data collection. Thus, related to statistically significant results, statistically non-significant results, key significant predictor, variables that distinguish groups, outlier or extreme results, or distinguishing demographic characteristics" (p. 249-250). However, Ivankova and Stick (2007) use the variables that were significant in her study. The decision is on the researcher's discretion, as to which yields the best information about the study. Therefore, in this study, the non-significant variables were used to devise the qualitative interview questions, where researchers are free to decide what will better explain the initial quantitative result.

6.4.4 Coding Procedure

In the process of coding the data, the study commenced the analysis with coding the data, to see the outline from the large volume of text. The coding procedures were adopted from (Saldaña, 2013). Hence, the themes, idea repeating, relevant text and narrative were analysed using NVivo (v. 10) for qualitative data analysis. In the same vein, the data were

coded in congruence with the themes developed. Meanwhile, after relevant grouping, theme grouping, as well as sub-themes, were allocated to the broader domains.

Table 6. 2

The general profile of the informants

Category	Interviewed Informants	Frequency
P1 (Staff)	ICT director	1
P2 (Staff)	ICT director	1
P3 (Staff)	ICT director	1
P4 (Staff)	ICT director	1
Total		4

6.4.5 Reporting

In reporting informants' opinions, it is appropriate to note that, the researcher tried as much as possible to present the original wording of the informants. According to Bloor et al. (2001), editing of themes, spelling, punctuations, as well as faltering, could reduce the readability of text and how the reader perceives the speaker. Nonetheless, according to Atkinson (1992) states " if we quote a completely unvarnished version... then it may be so difficult to read (because so incomplete, so far from the official discourse, so full of hesitations and similar phenomena) that the sense of the utterances is all but lost to view" (p. 25-26). Further, Bloor et al. (2001) are of the supposition that during the reporting stage, any altering of content and transcription takes place, to render it comprehensible. Therefore, this study succumbs to the postulations of Atkinson (1992) and Bloor et al. (2001).

6.5 Demographic Profile

In the demographic profile, this study examines the justification of selected informants from various institutions, with vast knowledge and experience in IT adoption, implementation, and maintenance.

6.5.1 Thematic Analysis

Thematic Analysis is the process of identifying patterns or themes within qualitative data. Braun and Clarke (2006) suggest that the first qualitative method to be learned is the thematic analysis as "it provides core skills that will be useful for conducting many other kinds of analysis" (p. 78). Additionally, it is a method rather than a methodology (Braun & Clarke, 2006; Clarke & Braun, 2013). Thus, showing that it is not attached to a particular epistemological or theoretical perspective, and therefore, making it flexible. In conducting a thematic analysis, the goal of thematic analysis is to identify themes, i.e. patterns in the data that are crucial or interesting and use these themes to address the research or say something about an issue. Thus, an excellent thematic analysis interprets and makes a sense out of it. However, a common pitfall is to use the main interview questions as the themes (Clarke & Braun, 2013).

Typically, this reflects the fact that the data have been summarised and organised rather than analysed. There are numerous divergent methods to thematic analysis (Alhojailan, 2012; Boyatzis, 1998; Javadi & Zarea, 2016). However, Braun and Clarke (2006) 6-step framework because, it is the most robust approach for doing thematic analysis (Maguire & Delahunt, 2017). However, in this study, all the variables were used.

Table 6. 3

Summary of the theme and sub-theme

Themes	Sub-theme	Sources	References
1. Compatibility Concerns	• Interoperability Issues	1	1
	• Staff Training	2	2
	• Student Training	2	3
	• Work Ethics	1	1
2. Competitive Pressure	• Behavior	1	3
	• Culture and Behavior	2	3
	• Traditional Method	2	2
3. Government Support Moderates Relative Advantage and Trust	• Failed System	1	2
	• Lack of Bandwidth	1	1
	• Lack of Policy	3	3
	• Lack of Support	1	2
	• Personal Interest/Corruption	2	5
	• Policy Makers Awareness	2	4
4. Top Management Support	• Assess CSPs Reliability, Cost, and Security	2	4
	• Create Awareness	4	10
	• Fear of losing job	2	3
	• ICT limits Fraud	2	2
	• Lack of Funds	3	6
	• Lack of Honesty	1	1
	• Lack of Management Support	2	3
	• Personal Integrity	1	3
	• Resistance to Change	1	4
	5. Trust and Security	• Data Location Issues	2
• Fear of Hacking		1	2
• Lack of Trust		2	5
• Reliability and Data Safety		1	1

The above Table 6.3 illustrates the themes, sub-themes, sources (informants) as well as references of this study. There are five (5) themes, twenty-six (26) sub-themes, and four (4) informants identified. Theme one (1) Compatibility of technology in the Nigerian Higher Education Institutions (HEIs), has four (4) sub-themes, thus, interoperability issues, staff training, student training, and work ethics.

Nonetheless, to keep the promise of protecting the confidentiality of the informant's details, the study used codes, thus, informant 1, informant 2, informant 3, and informant 4, as illustrated in Table 6.3 above.

6.6 Intention to Adopt IaaS BEL in the developing countries Higher Education

Institutions

The Sequential explanatory research design was adopted in this study where quantitative and qualitative (Quan-qual) data are collected sequentially and integrated to give a holistic understanding on the factor that influence the Intention to adopt IaaS BEL Model in the Nigerian HEIs. Thus, the variables that were not supported in the Quan finding are utilized in the development of the qual (semi-structured interview) phase of the study as suggested by Creswell et al. (2003), Creswell and Creswell (2018), Sekaran and Bougie (2016a).

Furthermore, a thematic analysis technique was utilized for the qual phase (Creswell & Creswell, 2018). According to Braun and Clarke (2006) and Clarke and Braun (2013), a thematic analysis is a technique for identifying patterns (themes) in a dataset, where the description and interpretation of the meaning and important themes and sub-themes are generated. Seven questions were designed in the qual phase, to further understand why these variables are inconsistent with the initial theorized hypotheses (See **Appendix M**, for more detail). Thus, five (5) themes “Compatibility, Competitive Pressure, Government Support moderates Relative Advantage and Trust, Trust and Security, and Top

Management Support”, respectively. Also, numerous sub-themes were also generated to explain why some of the findings are insignificant. The developed themes and sub -themes were illustrated in Figure 6.2.

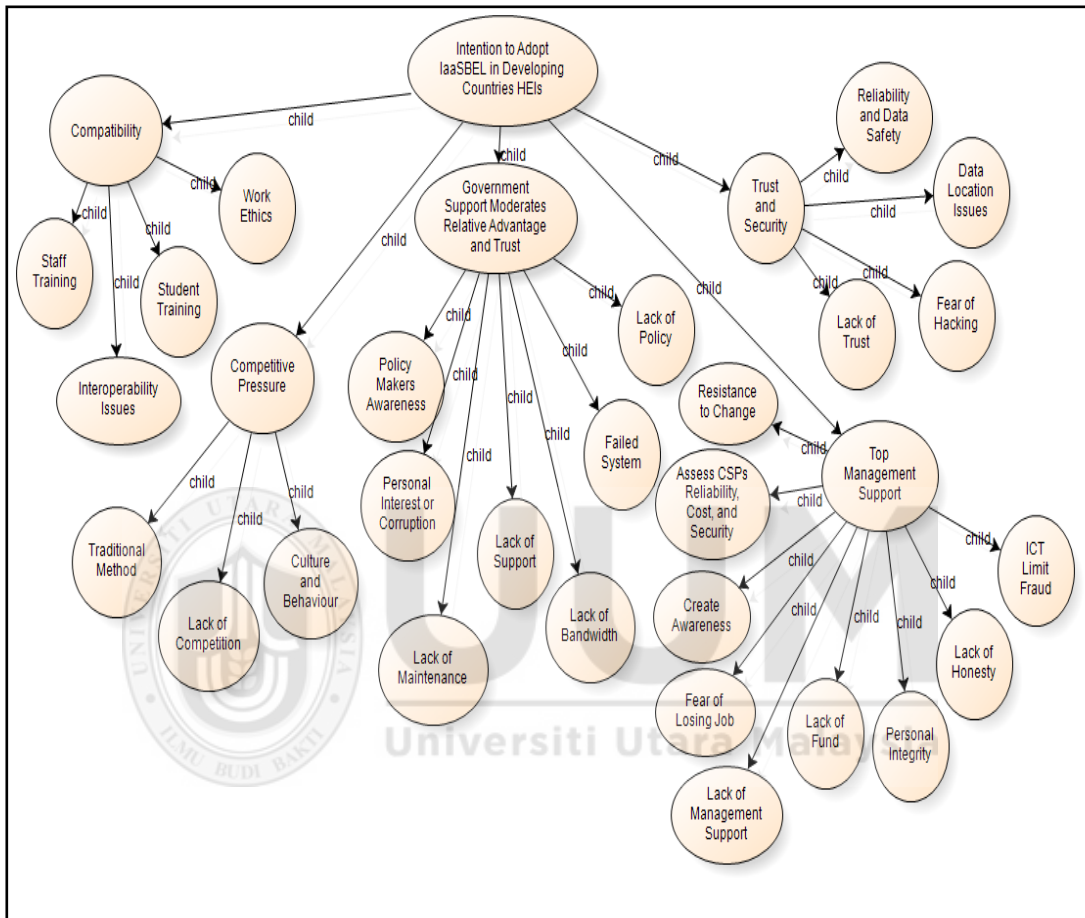


Figure 6. 2. Model of all themes and sub-themes

Figure 6.2 depicts the themes and sub-themes generated during the thematic analysis phase.

6.6.1 Theme 1: Compatibility

Numerous authors have argued the Compatibility of technology to be a critical factor in innovation adoption decisions in organizations (Hiran & Henten, 2020; Tom, Virgiyanti, & Rozaini, 2019; Tornatzky & Fleischer, 1990). The Compatibility of CC and the IaaSBEL specifically play a crucial role in its diffusion in the Nigerian HEIs. Similarly, Norman (2020) findings indicated that Compatibility of CC among IT security managers that “the IT managers indicated that the encryption offerings took different forms, which confused selecting an encryption option based on data compliance requirements”. Nonetheless, “software at the hospital is found to be incompatible with CC services and will lead to difficulties in the integration process between some IT resources and CC environment” (Alharbi et al., 2017). Hence, indicating the shortage of qualified IT staff to make modifications for the hardware and software to be CC compatible. The informants explained the non-significant result of Compatibility of IaaSBEL infrastructure. Besides, Compatibility generated sub-themes, which include the interoperability issues, staff and students training, and work ethics, as depicted in Figure 6.3 below:

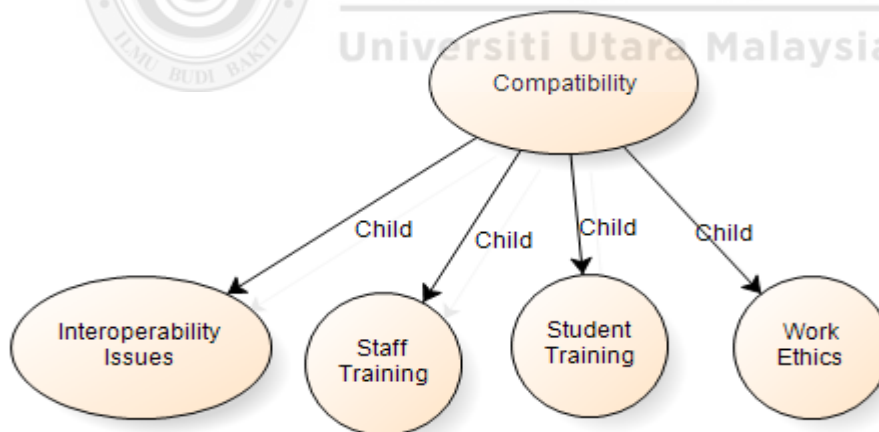


Figure 6. 3. Theme 1, Model of Compatibility of IaaSBEL in Nigerian HEIs

Figure 6.3 shows the Four (4) sub-themes generated during the thematic analysis, which comprises interoperability issues, staff training, students training, and work ethics.

6.6.1.1 Interoperability issues

Interoperability is one of the sub-themes of IaaS/BEL compatibility concerns in the Nigerian HEIs. This sub-theme from the informant P1, words to the best of efforts, as shown in Figure 6.4 below.

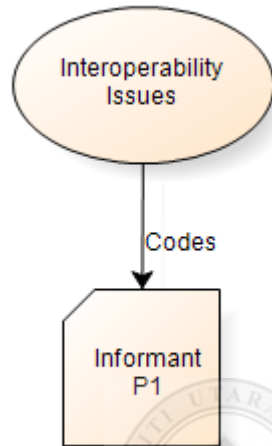


Figure 6. 4. Model of Interoperability issues

Interoperability issues is a sub-theme that emerged during the coding and were backed with clarifications from the informant. Hence, one of the informants from ICT director Federal University Dutse (FUD) had this to say:

“Compatibility can be an issue because, you know there are some equipment that has interoperability issues, I could recall there was a time we invited director ICT from VC to Lagos, there was demonstration from some, they wanted to introduce one smart device to be used in the classroom, but, my first observation was the issue of compatibility because they said only Samsung devices should be able to connect to that particular smart device. So, we now call their attention but do you take into consideration that a university is a complex environment, where you see different students using different devices, if you say for a student or a staff of the university to use that facility, has to have Samsung device. There is going to be a problem. So, of course, compatibility is an issue as far as these facilities are used in our environment is a concern because it's an environment that is made up of different people using different

devices so definitely compatibility is going to be an issue as far as that technology is concerned.” (Personal Interview with informant P3).

Similarly, the issue of compatibility by informant P3 has commensurate with the view of some scholars. For instance, Odeh, Garcia-Perez, and Warwick (2017), who examine the main barriers and enablers of adopting CC in developing countries HEIs, a case study of Jordan had this to supplement:

"Compatibility problem makes a headache for the technical team all the time. For example, the ACAD software can only use inside the institution (intranet), and there is no way to use it outside it. In addition, this system needs a specific configuration on the end user machines that can only work in the specific situation." (Odeh, Garcia-Perez & Warwick, 2017).

Furthermore, he revealed that some professors from Bayaru University Kano (BUK) were skeptical about this technology because of fear of taking over their responsibilities. Thus, making it very difficult for them to even acquire the smartboard because of that fear. Many of them still prefer using makers and do not even use projectors to teach in their respective classrooms, he said. Accordingly, IaaS/BEL compatibility with mobile devices and its easy integration with the in-house technology is crucial for its diffusion in the Nigerian HEIs.

6.6.1.2 Staff Training

Staff training is among the sub-themes of theme 1, compatibility in the intention to adopt IaaS/BEL. This sub-theme expresses the explanations from the informants P2 and P3, as displays in Figure 6.5.

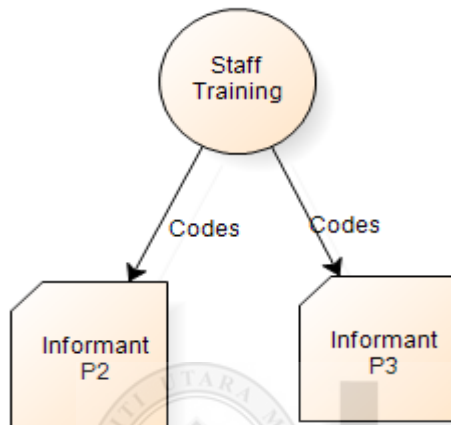


Figure 6. 5. Model of Staff Training

Staff training in the education sector is essential and a continuous process, particularly in Nigerian HEIs, with the Tertiary Education Trust Fund (TETFUND) introduction in 1993. Training staffs within HEIs in CC (IaaS/BEL) infrastructure is a crucial driver of the assimilation of innovation (Njenga et al., 2019). In a study conducted by Alharbi et al. (2017), their findings indicated that the respondents identified the need for more CC training in an organization. Ahmad and Waheed (2015) findings indicated that “an organized training is required for understanding cloud features and how to use them efficiently”. Hence, informant P2 says:

“Lecturers/staffs of the university need to be well trained, well informed of the technology. So, I think this one honestly gives much more influence to attract either the management/staff of the university.” (Personal Interview with informant P2).

Similarly, another informant had this to contribute to a similar issue.

So, most of the academics need to acquire basic training about these e-learning and even Cloud Computing. When you say Cloud Computing, how many academics if you take out, we from the IT discipline, how many academics are even aware of this Cloud Computing. (Personal Interview with informant P3).

The sub-theme of the lack of staff training is in congruence with numerous scholars. For example, Dillenburger et al. (2016) believe that having a skilled workforce is a potential key to guarantee the best quality of services, particularly to the society affected with quality service usually tend to have more significant support. Lack of trained staff hampers CC's adoption (Ahmad & Waheed, 2015; Njenga et al., 2019). Therefore, training brings positivity to the acceptance attitude of users (Ahmad & Waheed, 2015). Additionally, a study conducted by Dillenburger et al. (2016) pointed out that most participants pointed out the lack of trained or skilled staff and limited access to required services.

6.6.1.3 Student Training

In the setting of HEIs, students play a prominent role in adopting and using technology in universities. "Students also need to be well informed and well trained about the technology." (Personal Interview with informant P2). Similarly, to empower students' digital literacy and knowledge and skills, they need training on technology application in teaching and learning (Liton, 2015). For instance, if students are skilled in technology, they could probably be motivated to use technology more often for learning and other activities. Gonzenbach and Davis (1999) opined that to "become successful members of the global marketplace, all the countries globally must produce competent persons who are highly qualified in the realm of information and communication technology". Similarly, to develop a positive belief towards adopting and using technology for learning, students and teachers need to have technical ideas and skills (Liton, 2015). Therefore, student experience and training will play a significant role in using IaaS in the Nigerian HEIs.

6.6.2 Theme 2: Competitive Pressure

Competitive Pressure is a crucial variable in innovation adoption decisions by organizations. In the environment of HEIs, competitiveness and the effecting of adopting IaaS/BEL, since its adoption will give an edge to the university adopting it. In a study conducted by Makoza (2016) one of his findings stated that "*relevant cloud applications and systems may facilitate the process of developing our operations to be at par with global best practices*" (HEI-RESP-2). Also, "*with Cloud Computing etc. our organisation may have software services that are at par with other leading institutions*" (HEI-RESP-2). The statement implies that universities may be competitive with other universities that were advanced in ranking and research output. Competitive Pressure is one of the main themes with three sub-themes: culture and behaviour, lack of competition, and traditional method. Competitive Pressure was supported with details from the informant's divergent viewpoints, as shown in Figure 6.6 below.

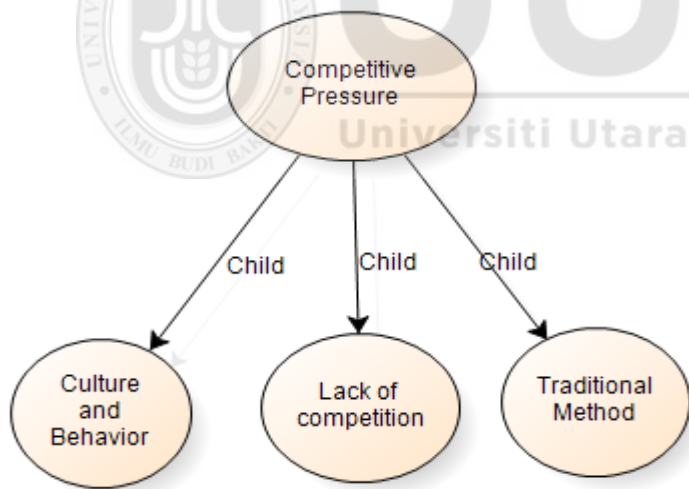


Figure 6. 6. Theme 2, Model of Competitive Pressure

6.6.2.1 Culture and Behavior

Culture is crucial when analyzing a phenomenon that affects human behavior. “Human beings are part of a social system, which are bounded by things they believe constitute a norm for them” (Ekundayo, 2013). Thus, culture and behavior shape the way people perceived things and interact with technology positively or negatively. Culture and behavior are the sub-theme under the second theme, the IaaSBEL Intention’s competitive pressure to adopt the model in Nigerian HEIs. It comprises of two informants P1 and P3, respectively, as shown in Figure 6.7 below:

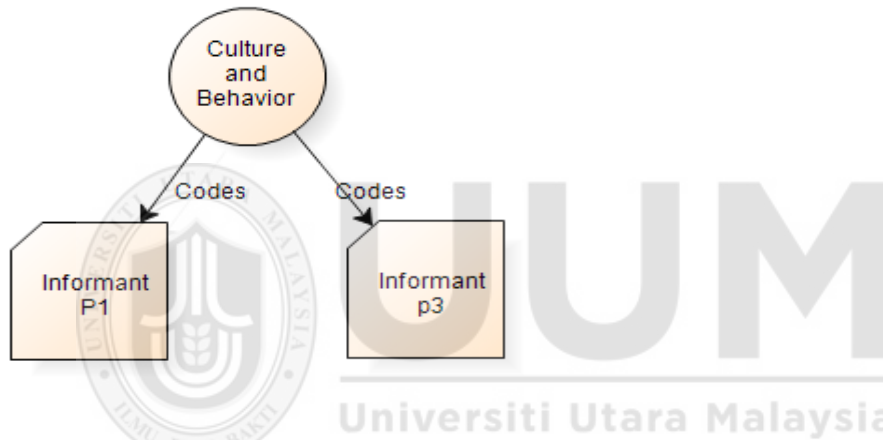


Figure 6. 7. Model of Culture and behavior

Culture and behavior play a prominent role in people beliefs towards technology adoption.

One of the informants from Sokoto state university had this to say:

“Well, it is still referring to the behavior of our people ... Maybe our cultural tendency and behavioral tendency to accept new things, when the new thing came, they find it difficult that the data is secured... Ethics is lacking when it comes to technology. It is very difficult to accept technology because of their Behavior. This makes it difficult to accept changes easily.”
(Personal Interview with informant P1).

The submission of informant P1, P3, and P4 is in concordance with some scholars regarding how culture shapes people's behavior towards adopting innovations. Hence, Tierney (1988, p.3-4) argues that the notion of organisational culture “[...] is a useful concept for understanding management and performance in higher education [...]” and that our “lack of understanding about the role of organisational culture [...] inhibits our ability to address the challenges that face higher education”. Furthermore, informant P1 added that:

“The reason is we have almost the same culture and attitude or cultural behavioral diversity is almost the same. What is in university A for e.g. Usmanu Danfodio University, our sister university within the same region, we are the same people, the same culture, and the same understanding, so what they are opposing there, they may also be the same thing. So, since we have the same thing, there may be difficult to have competitive regarding the adoption of this technology. They do not look at it as a positive change likewise at the sister university, because, they are the same region. You do not expect much difference in competitive pressure because of the culture and belief; hence, they do not feel competitive; they do not have it and opposing it. Even though the structures are available, they do not look at it as competition”. (Personal Interview with informant P1).

Moreover, another informant also enlightened that:

“We have our sister universities using the same thing, so this will not be factor, because, the competition is not there, like I told you, there is a forum we use to meet the director ICTs, where ever you go, if you are narrating your problem with people, to even co-operate is an issue. In software development, there is what we called the agile development method, you involve your customers or users from inception to the end of the project, at every stage, your customer is involved. So, but it is unfortunate in most of the higher institutions, the co-operation is not there because there will be a lot of interests, conflicts of interest.” (Personal Interview with informant P3).

Similarly, the above findings are in concordance with some prior studies conducted in Nigeria HEIs; Ekundayo (2013) found that:

“...because, we do not have the local technology of our own, so it is very difficult to comply with or imbibe this culture of ICT. It is not locally made; it is not made in Nigeria. So, we find it difficult, because of the cultural beliefs and all other social means... people find it difficult and they ask, “Is it a taboo; is it not?””

In concordance with the above submission, another informant had this to contribute:

“As far as I am concerned, there is no competitive pressure among the higher institutions to deploy this infrastructure-as-a-service. The reason as I told you before is, in Nigeria, the competition among the universities, the people do not consider the technological level or technological advancement they only consider this is a state university, this is a federal university this is a first-generation university, this is a second-generation university, this is a third-generation university. This is the only competition that our higher institution does.” (Personal Interview with informant P4).

In the same vein, Das and Dayal (2016) found that “in the education sector, not many institutions similar to ours have implemented CLERP. Hence the question of peer or competitive pressure does not arise at all.” (p. 28). Similarly, Sahin (2005) had this to say about culture.

“The expectation is that I am keeping up with my email. So that definitely affects my level of freedom. And it would what I can do because it’s expected. It’s part of the culture... All I’m trying do is to read my email and get the information. So there’s just lots of, lots of, lots of conversations that are going on. Sometimes we get overlapped in the conversations... And you got to be able to all keep up. And if you miss a half a day, you’re out of league.”

Therefore, the informants’ postulate that a people’s culture and behavior play a prominent role in their adoption and use of technology. Hence, much should be invested in enlightening people on technology and its benefits to society at large.

6.6.2.2 Traditional Method

The traditional method is a sub-theme of compatibility. Ideally, the adoption of innovation such as IaaSBEL in the Nigerian HEIs is a transformation from old and traditional methods to new ones, signifying a new teaching method and learning for both lecturers and students. This theme shows the explanations from informant P1 and P2 words to the best of efforts, as depicted in Figure 6.8 below:

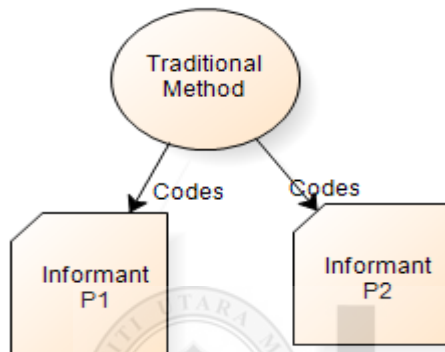


Figure 6. 8. Model of Traditional Method of Teaching and Learning

The traditional method of teaching and learning is one of the significant problems of Nigerian HEIs. Given the above, this informant had this to contribute:

“I know in several institutions when the Government provides these facilities and infrastructure. Instead, they just put them in the laboratory and locked because, when you ask them, they say they do not trust them, they still wanted to continue with their traditional way of doing things, the traditional method of teaching, keeping records, especially teaching. We have over 6,000 students now in my university, and there is a course with 500-600 students, so you see you, can imagine how a lecturer can deliver a lecture to about 500 students in a lecture theatre, you know it is not going to be easy for all the 500 students to be able to understand.” (Personal Interview with informant P1).

In line with the issue of the traditional method of teaching and learning in HEI, the second informant had this to say:

“As I said, every university has its settings, beliefs that we adopt this, we do not need this, because in Nigerian universities if you understand some universities are just analogue, some higher education institutions in Nigeria are still using the old system in running the affairs of the university. E.g. trying to compute the process, financial activities, bursaries computation of financial activities, automating student’s record, or payment system of accommodation, etc.”(Personal Interview with informant P2).

Nonetheless, the adoption of innovation such as IaaSBEL at the HEIs in developing countries in general and Nigeria in specific will be a transformation from old and traditional learning methods to a cloud-based IaaSBEL infrastructure. Nevertheless, again, Odeh et al. (2017) had this to say:

“In the current situation, the adoption of Cloud Computing would not be a success. There is a strong resistance by students and lecturers to use any new technology such as Cloud Computing. In other words, they prefer the traditional methods of teaching and learning.”

The above expression showed that resistance to change leads staff/lecturers to not use innovative methods in delivering lectures.

6.6.3 Theme 3: Government Support Moderates Relative Advantage and Trust

In the context of the Nigerian HEIs or developing countries in general, the Government plays a vital role in moulding and coming up with effective policies for the revitalization of the HEIs (Tom et al., 2019). With the involvement of the Government, the adoption of IaaSBEL infrastructure is theorized to be faster. Government support moderates the relationship between relative advantage and trust. This theme is the third theme that emerged during the coding phase due to the target informants’ similar answers. The theme has seven sub-themes, which were supported with details from the informant’s divergent viewpoints to the best of their ability, as shown in Figure 6.9 below:

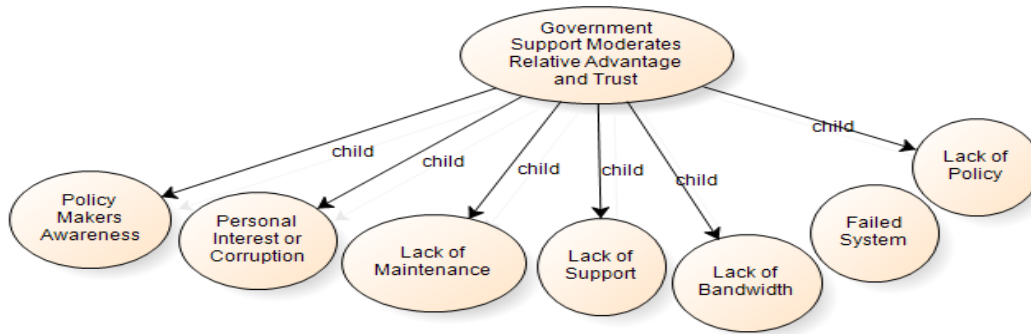


Figure 6. 9. Model of Government support, Relative Advantage, and Trust

6.6.3.1 Personal Interest/Corruption

Corruption refers to the misuse or abuse of public office for private gains via illicit behavior, e.g., bribery, extortion, fraud, theft, influence peddling, and falsification of academic records (Abdul-Lateef & Sofoluwe, 2018). Corruption in the HEIs in Nigeria is not new as there has been allegation and prosecutions. Personal interest/corruption is among the sub-themes of theme 3. This sub-theme expresses the level of explanation from the informant P1, as depicted in Figure 6.10 as follows:

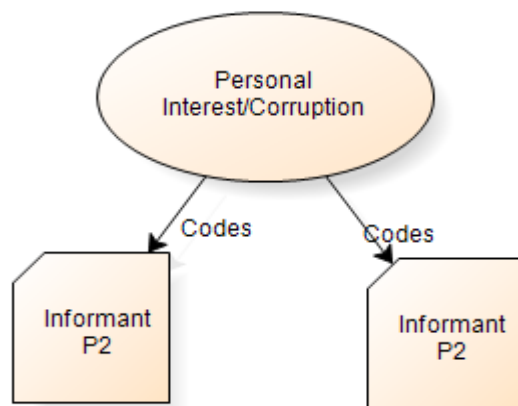


Figure 6. 10. Model of Corruption/Personal Interest

Corruption in the Nigerian HEIs education sector has become enormous. It is spread widely to various sectors like politics, public service, and ministries (Famade et al., 2015). The HEIs stakeholders who are into corrupt and sharp practices are among the crippling educational transformation factors in Nigeria today (Famade et al., 2015). Similarly, “Corruption breeds embezzlement, misappropriation, and other social vices that impede socio-economic growth and money meant for improving teaching standards (investment in ICT) is siphoned (Nyeko & Ogenmungu, 2017). Regarding the potential challenges faced by the Nigerian HEIs, one of the informants has this to say:

“So, in this regard, I can say it has to do with politicizing issues. Politicizing issues means you see sometimes, as I always say, people do not look at the university itself; they always look at themselves. If I can get this, then let it go, if that person will get that, do not let it go. So that is why the Government has this negativity. Maybe who is in charge? Is he driving benefit from the technology? If yes, let it go, he will allow the process to proceed. But if he does not benefit from anything, I can assure you a lot of things they don’t care about new technology or any new implementation……. So that was why a lot of people thought they have blamed the country itself, but not the country, but the system. The system is a combination of government representatives in various offices, so the combination of all those people is what I am referring to the system. For example, the constitution the policies which make the provision for that. Because, in Nigeria, we have bodies that regulate all this like the NCC and NITDA. So, they always try to bring in new technology (innovation). So, whenever they try to bring in innovation, maybe some will accept, some will just look, you are trying to bring new technology, what I am going to get out there. So, if I see that I can get something, then I will

keep pushing, but if I did not get anything, I would not push, I do not mind....” (Personal Interview with informant P2).

He continued to explain that:

But according to individual personal interest, so they keep looking at if this has been implemented, what is my benefit? What is my return? If I have a return, I might be in a position to process the information so that the project can be executed else I will just abandon the file. Abandon the process, not giving it much concern because I do not receive any benefit... The government intends to, but along the line, when it reaches personal interest, so that was why if the government says we want to implement this, in some cases, they really mean it (the government), but in the process of getting this, somebody will cripple the process because of his personal interest (Personal interview with informant P2).

Similarly, Abdullahi (2019) had this to say about corruption in the Nigerian HEIs:

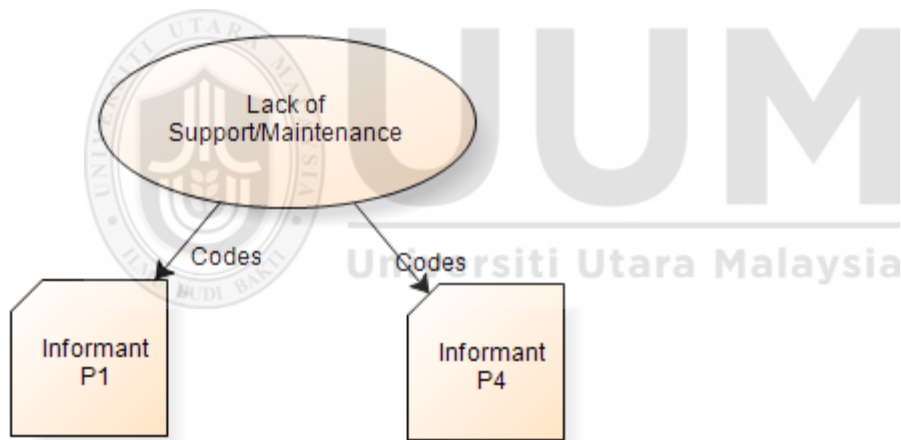
Corruption is the dominant problem affecting the resources of every 220organizational sector. It hinders the progress of the education system directly or indirectly. Corruption in the education sector has become a clamouring issue today”. (p. 191).

Therefore, from the above discussion of the informants and extant literature. Personal interest or corruption hampers the required investment and development in the Nigerian HEIs to meet the world standard.

6.6.3.2 Lack of Support/Maintenance

The lack of maintenance or support is one of the banes to the anticipated development in the Nigerian HEIs. Nonetheless, with the IaaSBEL infrastructure, maintenance and support will lessen for the IT staff, where most of the operations would be redirected to the adopted CSPs. The lack of support or maintenance was one of the problems that ICT directorates perceived among the negligence of the Nigerian Government's investment in the HEIs. The theme comprises two informants (P1 and P4) with their explanations and viewpoints based on their experiences, as depicted in Figure 6.11. as depicted in Figure 6.11.

Figure 6. 11. Model of Lack of Support/Maintenance



Nigeria is one of the emerging nations with many financial constraints due to the economic recession. ICT is the primary driver of e-education. ICT facilities refer to computers, networking devices, servers, mobile phones, laptops, desktops, LAN, WAN, etc. The maintenance of ICT resources and upgrades is a continuous process for effective ICT implementation. Therefore, lack of support or maintenance is one of the potential factors that hinder the intention to adopt IaaSBEL in the Nigerian HEIs. Hence, this came in comfort with the view of informant P1 and P4 as elaborated below:

"For example, if they are talking about Cloud Computing technology, the university has these facilities, they now keep duplicating what the university already have, for example, we have fiber optic cable within the campus and enough desktop computers and likely network facilities, what we are looking lacking is cloud-based facilities, so instead of them to provide what we are looking for, they keep providing what we already have. They support, but the support is negative because they are not listening to us at the field, they will just look at their end, without consulting the actual stakeholders in the universities. They do it at their end because they wanted to provide or give out contracts, instead of liaising with the beneficial institutions to them the requirements, but they do not do that. The support is there, but it is negative support." (Personal Interview with informant P1).

Similarly, he further added that:

"The support is there, but it is negative support. Cloud infrastructure is not only providing computers, but we are also lacking bandwidth, network facilities, projector in classrooms, etc. Instead, they keep providing what we are not requesting. That is why I think it is not significant." (Personal Interview with informant P1).

Furthermore, in line with the above statement, informant P4 has a similar opinion, the negative support leads to the dilapidation of ICT infrastructure. He, therefore, stated that:

"Of course, the government does provide services to schools, computer lab, and everything, and when you come and create a computer lab, maybe you do the LAN networking, you provide the infrastructures, but there is nothing like an upgrade, if they build it, they will leave it, then no maintenance and it will just decay like that, maybe after 2-3 years, you will come and see the places are dilapidated." (Personal Interview with informant P4).

Nonetheless, some scholars are in concordance with the above opinions. For example, according to Abdullahi (2019), tertiary institutions in Nigeria lack adequate ICT infrastructure to fully utilize ICT, such as lack of student access to computers, lack of software to support and aid in teaching and learning. Similarly, he further argued that the lack of sufficient bandwidth limits the support during the peak period.

Similarly, Olofin and Aniede (2015) and Oloyede et al. (2017) agree with the above informant's submissions. Thus, the lack of reliable and accessible physical telecommunications infrastructure with overly restrictive regulations and high-cost hampers ICT growth in Africa in general and Nigeria in specific. Therefore, the above responses indicated that government support is limited, and more support should be readily available.

6.6.3.3 Lack of Effective Policy and Awareness

The regulation set by the government may affect the environment for the assimilation and diffusion of CC in organizations (Makoza, 2016). Thus, it is also true in most developing countries where the government plays a crucial role in promoting and enacting policy and awareness towards innovation adoption. Nonetheless, the ICT policy in Nigeria was provided for planning, research, and evaluation purposes. The policy aims to address innovation, entrepreneurship, development problems/strategies, and the digital divide in Nigeria (Ololube et al., 2007). However, ICT infrastructure has not been the priority of government; thus, “Government policy has been the deregulation of telecommunication industry, and ICT infrastructures are therefore mostly provided by a private entrepreneur for business purpose” (Akinsola et al., 2005). The lack of adequate policy leads Nigerians not to believe in what the government is doing, as shown in the postulations of informant P1, P3, and p4, respectively.

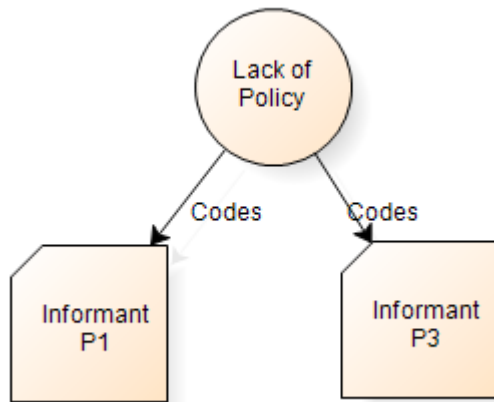


Figure 6. 12. Model of Lack of Policy

Furthermore, Informant P1 has this to say:

The Government support even though most of our policymakers at the top Government officials, most of them do not have the understanding of these technologies. "So, the support they are giving is actually not enough, because most of them in the corridor of power, who are expected to ensure adequate ICT policy has been implemented in our Higher Education Institutions. But they lack the understanding of the importance and advantages of these technologies. That is why, even with their support, it is not enough. Even if they are giving it, it is negative because what they are supposed to do, they are not doing it." (Personal Interview with informant P1).

This issue of lack of policymakers awareness has similar views of some scholars. Oye et al. (2011) believe that "awareness campaign and sensitization of personnel is a necessary step in developing ICT infrastructure in education. Organization of seminars, conferences and workshops for top management and other critical staff within the Ministry of Education, National University Commission (NUC), and in the universities and with other stakeholders is necessary for ICT infrastructure development."

Similarly, another informant had this to contribute:

"I think this is definitely attached to the policy we have on the ground. People have not seen the Government punishing publicly, those people that are hacking our systems, even recently, there was a time EFCC, I think paraded some people that are "yahoo boys". I think there was a raid about a month or so, but prior to that time, people have not been seeing government or security agencies catching those hackers. I think that is why even with the government, people will not trust it. They know so many young people that are into cybercrime, and they were not caught. There is no policy on ground or law/legislation on the ground that says any person that is caught doing this or doing that is going to be punished. The punishment is not mated on him publicly for others to learn their lessons. So, I think these are some of the factors that we say even if there is government, the government is not enforcing all the laws they have, so they would not have trusted even with the government. In other countries, where the Government is serious about tackling the issue of those people that are hacking and committing fraud, they are dealing with them severely and publicly. But in our country and I think African countries. The government did not attach much importance to dealing with those kinds of people. I think definitely the trust will not be there." (Personal Interview with informant P3).

In the same vein, informant P1 and P3 contribute to the explanation given by the informant P4, saying that:

"Because the government, as regulators and policy-makers, do not do their work, they will leave people on their own, and people will be helpless and restless...The policy-makers are not doing what they are supposed to do. Whenever the regulators and the policymakers are honest, there are things that the customers or the end-users should not be even complaining about...." (Personal Interview with informant P4).

Similarly, these views conform with the opinion of other scholars. While ICT has much to offer, it has failed to deliver on that front (Ololube et al., 2007). "The Nigerian government's policy and capitalization of higher education to enhance distance education is nothing to write home about. Instead, it maintains the traditional position of paying lip service or little attention to empowering higher education and distance education" (Ololube et al., 2007, p.183). In this way, there are no reasonable methods for adequately

subsidizing (funding), observing and controlling, and policy implementation to guarantee that measures are met (Princely Ifinedo, 2005; Ololube, 2006). Therefore, the above informants argue that the policymakers are not aware of the technology and their lack of adequate policies lead to people negative perception about the government.

6.6.4 Theme 4: Top Management Support

The Top Management Support is the fourth theme that emerged during the initial coding phases. The final decision of CC adoption requires the top managers' support (Odeh et al., 2017). In the same vein, the adoption of IaaS/BEL in the Nigerian HEIs would be strongly influenced by the top managers' support and commitment (Tom, Virgiyanti, & Rozaini, 2019). Nine sub-themes were generated, as shown in Figure 6.13.

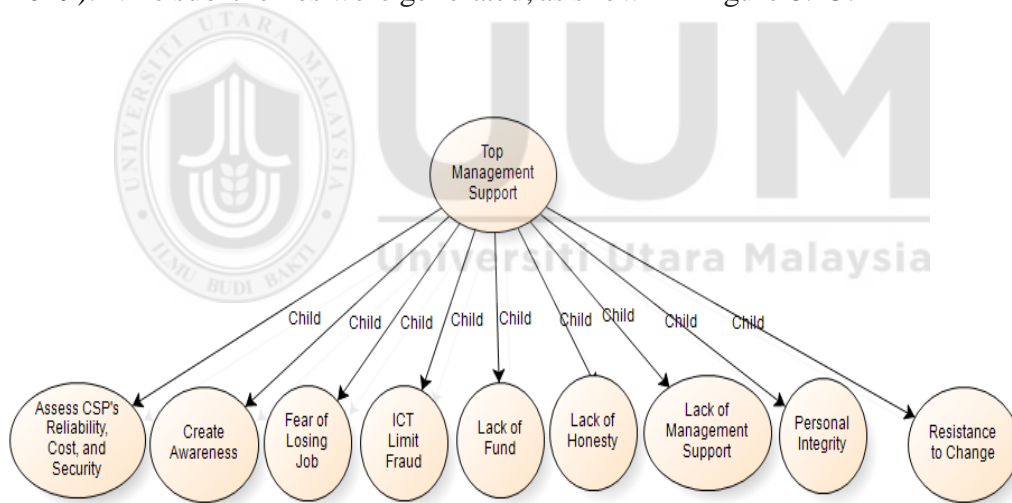


Figure 6. 13. Model of Top Management Support

As indicated in Figure 6.13, nine sub-themes include access CSPs reliability, cost, and security, create awareness, fear of losing job, ICGT limit fraud, lack of honesty, lack of management support, personal integrity, and resistance to change.

6.6.4.1 Assess CSPs Reliability, Cost, and Security

The reliability of the CSPs is a crucial determinant of IaaS/BEL adoption decision. In essence, a monitoring mechanism should be integrated into the IaaS/BEL infrastructure to assess the CSPs reliability, which should be written in the Service Level Agreement (SLA), from both the CUs and CSPs (Ghazali et al., 2017). Nonetheless, the cost reduction associated with CC is among the key drivers in its adoption (Ghazali et al., 2017; Tom, Virgiyanti, & Rozaini, 2019). One of the responsibilities of ICT directorates in Nigerian Universities is to assess any technology and propose it to the top management.



Figure 6. 14. Model of Assessing CSPs Reliability, Cost, and Security

Assessing the CSPs' reliability, cost, and security is among the first requirement that the ICT directors should confirm before subscribing to any CSP. Therefore, informant P2 from Alqalam University Katsina had this to say:

“In that regard, everybody is talking about security issues, so it is the director's responsibility as well to explore the technology first and look into the technology because he is an expert in that field and other people are laymen. If the director explores the functionality, maybe look at security issues, costs, reliability, etc. For example, having virtual servers somewhere and other things, it depends on how you look at it, do you trust it? Because you trust and believe in cloud-based

services is the universities believe. Your belief experience and final say on any cloud-based applications and services are the universities believe. The university has no choice but to accept. Like before I left, there are so many subscriptions that I made, cloud-as-a-service, I think even yesterday (15/11/2019), I was called that it is time for renewal and I said, let them go and renew. Nobody knows how it works, but I was an initiator of the subscription and services, so I think all weight is being thrown on to me. It depends on your beliefs. Before you believe, you have to explore certain service providers and see their reliability, cost-effectiveness, security issues, and if you are fully satisfied, then the university will accept.” (Personal Interview with informant P2).

Furthermore, he added that:

“...honestly, I think to my understanding, in life, security issues must be given much concern, so I always check on the reliability for any subscription. Security issues are from different categories like we have student portal, where students can make payments and other things. We need to be highly secured.”

Similarly, the issue of assessing CSPs reliability, cost, and security by the ICT director, which was explained by the informant P2, has commensurate with the viewpoints of some scholars Chauhan and Jaiswal (2015), who found that:

“Security is a valid concern that is raised by most of our clients. We take a SQL dump, i.e., their database dump; we copy it in a CD and give it to customer. The data is encrypted, and this backup process is properly over sighted to eliminate the threat of data theft. In such a scenario, they can have SQL at their end and restore the database and access.” (Regional Head, Ramco).

Equally important, Chauhan and Jaiswal (2015) further contributed that:

“We are accessing new technology. New features are coming up. These are free of cost, but this would not have been the case with traditional ERP. We do not need to spend on maintenance of the data. The subscription fee is sufficient for the entire expenditure. Moreover, we are not required to have IT personnel dedicated to this task. We also do not need to keep back up.” (Head of the ERP implementation team, Chang Yun)

Therefore, assessing the CSPs reliability, cost, and security is crucial before subscribing to the IaaSBEL infrastructure by the Nigerian HEIs.

6.6.4.2 Lack of Awareness

The Lack of awareness of CC's benefits hampers its diffusion in an organization (Tarmidi et al., 2014; Hashim & Hassan, 2015). Thus, the awareness of the IaaSBEL would aid its adoption by the Nigerian HEIs. In a study conducted by Ali et al. (2016), their findings indicated that “senior management gets much information from external sources which I do not think they understand” (Ali et al., 2016). This study's findings indicated that the senior management in the Nigerian HEIs who decided to adopt IaaSBEL has limited knowledge. Hence, the Lack of awareness is the sub-theme of top management support. This sub-theme expresses one of the potential reasons top management was skeptical about supporting the adoption of IaaSBEL in the Nigerian HEIs. Informant P1, P2, and P3 with different response percentage coverage, thus: informant P1 (5.39%, 2.78%), P2 (2.34%, 5.09%, 3.72%), and P3 (4.67%, 1.63%, 3.09%) respectively.

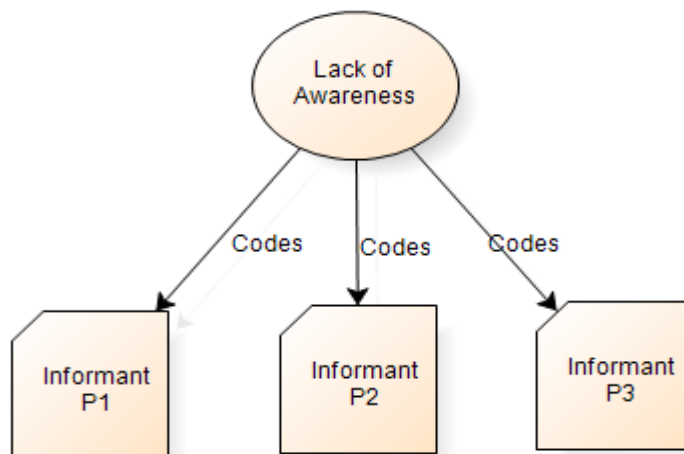


Figure 6. 15. Model of Lack of Awareness

Lack of awareness is a sub-theme that emerged and were backed with clarifications from the informant's words. Therefore, one of the informants from Sokoto State University had this to say:

“...we try to convince them to understand that it is going to support their work, but they find it difficult to accept even though most of the management team is academic staffs. This technology will support their teaching and learning services and activities, but they still find it difficult to accept because they believe they are going to lose their job. That is why some of the top management finds it difficult to accept whatever we brought to the management level.” (Personal Interview with informant P1).

He further added that:

“We always try to make them understand that the cloud-based is there to reduce the cost of ICT infrastructure also to minimize the delay in delivering educational services to our children, our students, yet they find it difficult to accept.” (Personal Interview with informant P1).

Similarly, another informant has similar enlightenment on the same challenge of lack of awareness as explained by informant P1 above, as follows:

“...to have management full commitment in terms of accepting the technology, but before they accept, they need to be enlightened and be well informed that the technology is working based on this and can contribute to the university. Maybe you will list some certain factors that may derive benefit from the university.” (Personal Interview with informant P2).

He further clarified that:

“On our website, we have highlighted some examples where we said the example of our students’ registration number is (...) and the default password for all students is (...), so in that regard, it is a security lapse. Already, the hackers you have given them everything (50%) of work done, the password is known, all the hacker need is to get the username and then you have given them the password pattern. Because, sometimes to get the password pattern is a task, so when you get the pattern, half of the work is done so, I think in technology, sometime on any issues,

you will see some people trying to give an example to aid, but other people take that advantage and go somewhere else.” (Personal Interview with informant P2).

In the same vein, the informant P2 had this to add:

“Before I left, I was asked to renew the subscription, the management themselves asked me to write a proposal so that I will collect the financial implications so that we can renew, I say No because we subscribed last year and none of the university staff made use of it, no single person, no single student use it. So why would I as a director ICT and as representative of the university agree? So, to save costs, since nobody is using it, there is no point in the university spending money on it.” (Personal Interview with informant P2).

Furthermore, Informant P2 viewpoints are in concurrence with the views of P1 and P2 above; thus, P3 had this to say:

“So, I think the issue is the level of enlightenment. They need to be enlightened, they need to be taught that these things are not here take over their jobs, but it is here to help them. There was a time in Bayaro University Kano (BUK), the university invited them to acquire smartboard, the university invited a company to come and make a demonstration on how to use the smartboard. Many professors were skeptical, and this technology won't it take over our responsibilities? So, I think the university had to find it very difficult even to acquire those smart boards because they had to sensitize them, we had to educate them to tell them that no, this is going to help, this is just a technical aid, it would aid their teaching in the classroom.” (Personal Interview with informant P3).

To further clarify the explanation of lack of awareness, informant P3 also contributed that:

“The environment, the people we have, how many of them are educated about these modern facilities? So, you know, they have to have an understanding of a particular phenomenon before you even start asking questions or entertaining fear that you have trust or not.” (Personal Interview with informant P3).

In the same vein, he further added that:

“...when we come to testing the portal, we requested the department to give us data, past records of students, the staff did not comply, very few complied. So, everywhere you go it is like that, the issue of e-learning or using even the cloud is not an issue, if you go to the neighboring universities, they are not doing it, other neighboring universities are not doing it. Maybe you discover that at times you are even ahead of them. So, since we are ahead of them, there will be no competition....”
(Personal Interview with informant P3).

The lack of awareness in the Nigerian HEIs, according to informant P2 and P3 have commensurate with some scholars' views. Alshwaier et al. (2012), examine the challenges of using computing for e-learning in Saudiya Arabiya has this to supplement: “lack of awareness of the foundations of the system, weak awareness of the importance of some department heads and the refusal to activate e-learning and finally some faculty members consider e-learning system is just win, but there are other administrative obstacles such as lack of support from the Scientific Section.” Therefore, the numerous informants' above submissions present the problems of lack of awareness, which may be aided in the insignificant findings of the statistical results of the initial quantitative phase of the study.

6.6.4.3 Fear of Losing Job/ Resistance to Change

The fear of losing a job is the third sub-theme of top management support. This theme depicts the explanations from informant P1 and P3 words to the best of their experience and knowledge, as illustrated in Figure 6.16 below: with reference coverage P1 (3.56%, 2.56%, 0.79%, 1.00%, 7.33%), and P3 (2.51%).

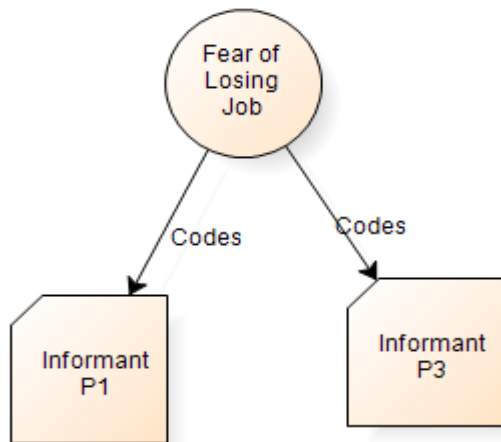


Figure 6. 16. Model of Fear of Losing Job

Fear of losing a job or resistance to change is one factor that hinders the adoption of IaaSBEL and ICT in general. "The personal barriers mentioned by the user are the fear of technology, community resistance to the operations of e-learning as a luxury and fun" (Alshwaier et al., 2012). Besides, according to Alshwaier et al. (2012), "there is the concern of faculty members not willing to take the "soft" approach to teaching and learning. Instead, they stick to the traditional hard "approach". In line with these scholars, one of the informants had this to say:

"This technology will support their teaching and learning services and activities, but they still find it difficult to accept because they believe they are going to lose their job. That is why some of the top management finds it difficult to accept whatever we brought to the management level. So being the management staff and director of ICT, I always attend management meetings, anytime when the ICT issues are brought to the table, you hardly find 70% of the management supporting it because of that fear in mind, about losing their job. Thinking a new technology will make them irrelevant, not necessary the cloud, anything that relates to ICT, they find it like that." (Personal Interview with informant P1).

Similarly, the Informant P3 agrees with the informant P1 submission, and thus, he had this to add:

My personal understanding is when you look at the Higher education institutions in Nigeria, most of them, especially the old ones you discover that even now some of them are not computer literate, some of them are "even afraid of touching computer, for instance, in the teaching environment, you discover that most of them are thinking that technology is going to take over their responsibilities. So, I think the issue is the level of enlightenment. They need to be enlightened. They need to be taught that these things are not here take over their jobs, but it is here to help them." (Personal Interview with informant P3).

Furthermore, the first informant added: "A lot of people find it difficult to be conversant with the changes to accept changes. When new things come, people always resist it, find it difficult to accept. It takes time to convince people to accept changes easily." (Personal Interview with informant P1). Hence, "They find it difficult to accept change, they are resistant to that... they are resistant to change, for example, the bursary department, registry department, they always think they are going to lose their job..." (Personal Interview with informant P1). In the same vein, he further clarified that:

So that is why the cloud-based learning can be able to assist to decongest, but people find it difficult to trust, and still wanted to do the traditional way of teaching, even though the Government is providing support, but not consulting we the IT practitioners in the institutions, they just do it on their own. Still, even if they provide our people who are, there will not provide these services to the university community. The university community finds it difficult to trust theses because of these behavioral tendencies that we have to resist change. They always find it difficult to accept changes easily. It has to take time. (Personal Interview with informant P1).

Similarly, another scholar's findings agree with the opinions of the informants, Odeh et al. (2017), where he found that:

“In the current situation, the adoption of Cloud Computing would not be a success. It is clear that there is a strong resistance by students and lecturers to use any new technology such as Cloud Computing. In other words, they prefer the traditional methods of teaching and learning.”

Therefore, with the proper knowledge of IaaS/BEL infrastructure, the resistance to change due to the fear of losing a job will die naturally. Proper enlightenment and awareness campaigns for all stakeholders (academic and non-academic staff, students, top managers, etc.) should be made compulsory.

6.6.4.4 ICT Limit Fraud

The utilization of ICT in limiting fraud is the fourth sub-theme of top management support with reference coverage P2 (1.80%) and P3 (4.75%). This sub-theme comprises two informants (P2 and P3) with their explanations. Hence, expressing their opinions based on expertise about the sub-theme, as depicted in Figure 6.17.

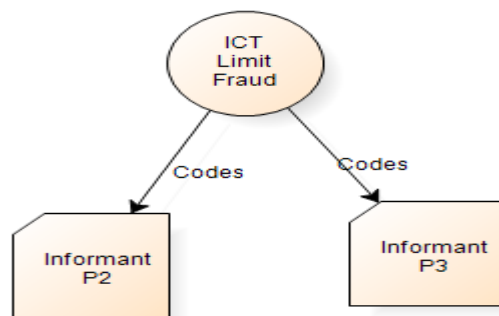


Figure 6. 17. Model of ICT Limit Fraud

ICT can be utilized to nip fraud and sharp practices in HEIs in Nigeria. Corruption in HEIs merits consideration for some reasons, especially given its negative effect on society (Deliversky, 2016). This is because the HEIs are enjoined with training the future generation of leaders. Hence, reducing the chances of fraudulent activities or corruption could enhance the quality, quantity, and efficiency of the education system since education is a fundamental human right and driver for economic transformation. This came in support of the view of the second informant P2:

“But in reality, regarding the current situation that we are in, the adoption of new technology attracts high benefits to the university, it creates a huge revenue increase which is more than 80% and cutting off fraud because of the paperwork.” (Personal Interview with informant P2).

Furthermore, in line with the above statement, informant P3 has a similar view that ICT facilities and stops fraud/corruption. He, therefore, stated that:

“So, you see, part of the factors I think is a misplacement of priority and the top management are not even happy with the ICT innovations. Especially, ICT will be able to checkmate them, and there will not be fraudulent activities. At that level, it minimizes if you employ the service of the ICT. In any corrupt nation, you discover that you people in the ICT, you just have to be at times closing your ears and eyes because many people will be attacking you if there are some people that have a problem. When you devise ICT, then you are blocking their chances, so you will not find it easy. So, that is why you see the top management support will not be there, some of them, if they see that maybe they may have some issues, they may decide to sideline you. So, something that is vital, they may decide to say OK, why can't you do this manually.” (Personal Interview with informant P3).

Similarly, the views of informant P2 and P3 conform to the opinion of scholars. For example, Nyeko and Ogenmungu (2017) are of the view that: “Obviously, embezzlement is one factor associated with developing societies and Nigerian universities are not an exception; the misappropriation of public funds causes barriers to ICT adoption, thereby rendering its processes ineffective (A3)”. Therefore, the appropriate use of ICT in limiting

fraudulent activities in the Nigerian HEIs could improve how teaching and learning are delivered.

6.6.4.5 Lack of Funds

The lack of funds is the fifth sub-theme of top management support. This sub-theme shows the explanations from the informant P2 with reference coverage (0.63%) and informant P3 (3.93%, 7.53%, 6.80%, 2.54%) respectively. The informant has this to say: "But in some circumstances like my university, sometimes we can have financial issues."

Similarly, he further contributed that:

"You know when you talk of support of the top management in Nigeria, you see, in Nigeria, it is unfortunate that this ICT is not being given higher priority as far as the Higher education in Nigeria is a concern. So, that is why because, you discover that at the end or the beginning of any session, people will make payment for their registration, then that amount in millions of Nigeria and you discover when it comes to the top management, to even release funds for the ICT directorates to acquire bandwidth is a problem. That cost of bandwidth is not even up to one-third of the total amount of money generated for ICT per student." (Personal Interview with informant P3).

Additionally, the issue of lack of funding in HEIs is supported by numerous scholars; for example, Nyeko and Ogenmungu (2017) findings on ICT adoption in Nigerian universities show that:

"Poor funding and corruption greatly set a barrier to embarking on capital intensive projects like ICT (E2). Project(s) with poor funding structure are often abandoned (A3). Funds meant for ICT are often misappropriated and diverted either by top government officials in the sector or by the management of these institutions (C6)."

Furthermore, these findings are in concordance with the views of informant P2 and P3. This view is precisely in line with the expression of informant P2.

“Another issue is, the top management will always tell you that there is no available funding; we do not have money for that. So, they do not have goodwill. So, you discover that most of the ICT directors in Nigeria are a time frustrated because, at times, I use to tell my boss that ICT is capital intensive. If you really you want to go for ICT, then you should be ready to spend money and you know spending money now is just like what is happening to our politicians, there are some areas they want to spend money in areas where it will be visible for people to see if you enter any institution, they want to see erecting structures so that you say, this was built during this person tenure. But you know, ICT is something that is not visible when you enter our institutions. Most of our people in Nigeria do not want to spend on those areas; they want to spend in an area whereby it will be visible whenever you go into any environment; you will see it. So, I think this is a factor. They do not want to spend much money, that is why ICT is suffering, and that is why any innovation you bring from ICT without the help of the top management if they do not have the will, I doubt if it will succeed.”

In the same vein, he further added:

“The Government support is negligible as far as ICT is concerned because, I think it was recently that TETFUND introduced ICT support intervention, but all these years, this is going to be the first time we are going to receive the ICT support intervention from TETFUND. More especially in Nigeria, all the higher institutions, including the state-owned higher institutions, most of the funding is coming from TETFUND. Apart from TETFUND, if we are talking about ICT intervention, we will not forget about NITDA and NCC. But even with the support of NITDA and NCC, you discover that the support is negligible. For example, the ICT support intervention for a university is just 10 million Naira per annum. So, tell me what 10 million Naira will do as far as ICT is concerned. Initially, I think the first year was 15 million, but the second year that was last year (2018) was 10 million for a university. Polytechnics and colleges of education will be somewhere around 6 or 7 million Naira. With that meagre amount, government support is negligible. So that is why it cannot influence.”

He further clarified that:

“The Government is giving meagre amount, and you know if the government is paying a meagre amount at times even hosting your things on the cloud, maybe the amount of money that is allocated from government in higher institutions is so meagre that people in the ICT or those people that will be using the system would not have trust in using the cloud, because of the meagre amount the government is giving.”

Therefore, to transform the educational system in Nigeria, massive funding should be available. However, this is not easy to attain due to the economic situation of the country. According to Aina (2013), the government is not sincere in the citizens' quality of education; this is reflected in the government's yearly spending plan on education.

6.6.4.6 Lack of Honesty

The lack of honesty is the sixth sub-themes of top management support. This sub-theme shows the explanation from informant P2 with a reference coverage of 4.28%. The ICT director contributed that:

“The answer people normally give is that the government didn't come, or the government decided not to implement it. Not telling people the reality. Like in my university, last year, we had a meeting with Dr Pantami (present minister for communication), he said give me a place in your university, and I will come and install e-library facilities such as computers, servers, etc. but we (NITDA) are not going to build, just give us a place. They provide all the equipment. I was asked to provide one lab, and then I directed my staff to remove all the desktops and empty one lab.” (Personal Interview with informant P2).

Therefore, this shows that the top managers' honesty will undoubtedly enhance technology adoption in the Nigerian HEIs. Even though the government provides some kinds of support, it is the university's responsibility to show commitment so that the little provided can be utilized, not necessarily blaming the government.

6.6.4.7 Lack of Management Support

The lack of management support is the seventh sub-theme of top management support. This sub-theme presents the explanations from the informant P1 and P2 with a reference coverage of (2.30%, 2.81) and (3.01%).

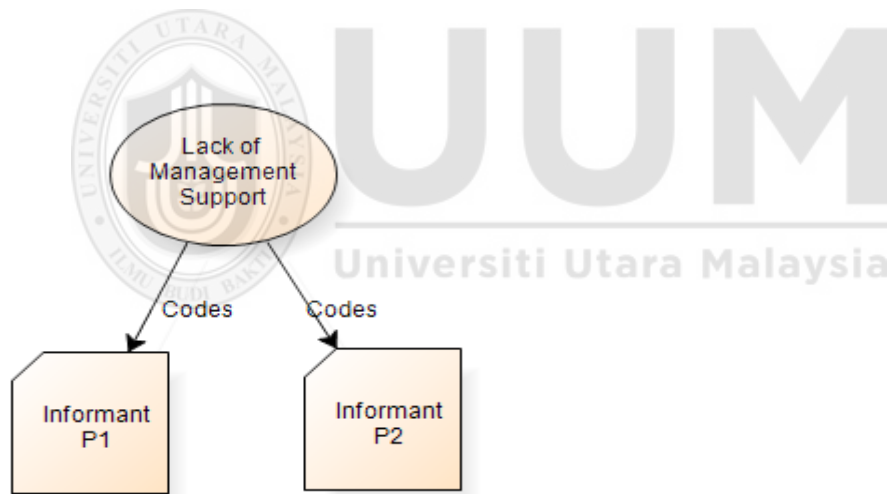


Figure 6. 18. Model of Lack of Management Support

The lack of management support is mainly due to the lack of awareness and probably sharp practices. Informant P1 has this to contribute: "Most times, when I brought the issues of ICT, I find it difficult to have the number of people at the management level, we are more than 12, to support I have brought to discuss with the management, they are resistant to change..." (Personal Interview with informant P1).

Furthermore, he revealed that, moreover, “So being the management staff and director of ICT, I always attend management meetings, anytime when the ICT issues are brought to the table, you hardly find 70% of the management supporting it because of that fear in mind, about losing their job.” Moreover, another informant also enlightened that:

“It depends on the university management combination. What I mean is the leadership of any university varies. I can tell you the reality. Some university's top management is realistic, and they are very honest, and they mean what they say. Other management does not mean what they say, what I mean by that is some certain situations are politically motivated like I know this technology is really important.” (Personal Interview with informant P2).

Nevertheless, the contributions of P1 and P2 aligns with some scholars, Eze, Awa, Okoye, Emecheta, and Anazodo (2013) found that:

“Most top executives lack adequate exposure to ICT and its inherent benefits largely because of insufficient government support (A5). However, because top executives are regarded as the decision-makers, and perhaps models, whatever they agree upon will be passed down (A2). There is little or no management support on the grounds that (D5) observes the absence of adequate adoption policies and ICT curriculum for fear of defacing corporate status-quo. (A4) said that because of threats of novelty owing to top executives' limited IT friendliness, the willingness to adopt is relatively low.”

Additionally, Odeh et al. (2017) findings are also in concordance with the results of this study; they found that:

“Our top management has the power to make the final decision regarding the adoption of Cloud Computing. However, they are not aware of the technology benefits. Therefore, cloud technology would not be adopted in the near future, unless the top managers learn the excellence of this technology.”

The above finding presents numerous informants' opinions, which was in concordance with informant P1 and P2. Hence, the top managers should be enlightened and behave ethically towards innovation decisions for the benefit of their students and respective universities.

6.6.4.8 Personal Integrity

ICT director's integrity plays a prominent role in persuading the top managers to succumb to his ICT proposals and eventually approve them. Personal integrity refers to (6.35%, 3.81%, and 3.12%) respectively. It is supported by the explanations of the informant P2, as elaborated below:

“Once the director of ICT in any particular university has a very good working relationship to the management of the university because one of the activities of the ICT director is to make sure any new technology or anything related to ICT issues should be brought to the management. So, once the ICT director created a very good atmosphere between him and the management, they will trust him that anything he brings to the university, they will just assume this is a fantastic and a very good initiative and will just accept it. So, but if the ICT director fails to do the right things, and the ICT director fails to initiate physical development for the entire university. What have you brought to the university? So, you may not have the trust of the management, staff, and students, but if you don't have those capabilities, you will lose your trust.” (Personal Interview with informant P2).

Similarly, the informant further added that:

“I brought it to the university may be the university management will say, give us a proposal, I give the proposal, some management might see it that maybe I am trying to exploit the university. Not looking into the real functions of the technology to the staff, students and the entire university. But sometimes, they look at you as a person; you are bringing this, we will not accept it, but if somebody from outside brought it, they would accept it. So, there are such kinds of challenges in other universities.”

Furthermore, he contributed that:

“...in everything you do in ICT, there are a lot of security issues, a lot of strategies that the director ICT should adopt so that he can get the trust and the attention of the top management. 1) Always make sure you bring substantial and genuine proposals, so initially, if you have all the combinations of attitudes which have to do with your office ethics, work ethics, so definitely, you do not have a problem with that.”

According to the above contribution, director ICT's integrity plays a vital in influencing other top management to buy-in to the proposals from the ICT directorates. Therefore, ICT directors must be honest in all their dealings to increase the chances of smooth approval of innovation in the HEIs.

6.6.5 Theme 5: Trust and Security

Trust and security play a prominent role in adopting IaaSBEL infrastructure in the Nigerian HEIs (Tom et al., 2019). Security generally comprises of Confidentiality, Integrity, Availability, Authentication, and Authorization (CIAAA). The threats to the IaaSBEL infrastructure's data where the danger of uploading crucial data in the cloud data center can course discomfort for the HEIs (Ali et al., 2016; Tom, Virgiyanti, & Rozaini, 2019). The security and privacy of the data would increase the trust of IaaSBEL infrastructure by the CUs. Moreover, regarding trust and security (i.e., theme 5),

informants' ideas or opinions concerning the Intention to adopt IaaS/BEL in the Nigerian HEIs were provided. The emerged theme and its sub-themes were supported with explanations of the informants. Thus, serving as a linkage between these objective and subjective opinions/viewpoints of the informants, as depicted in Figure 6.19.

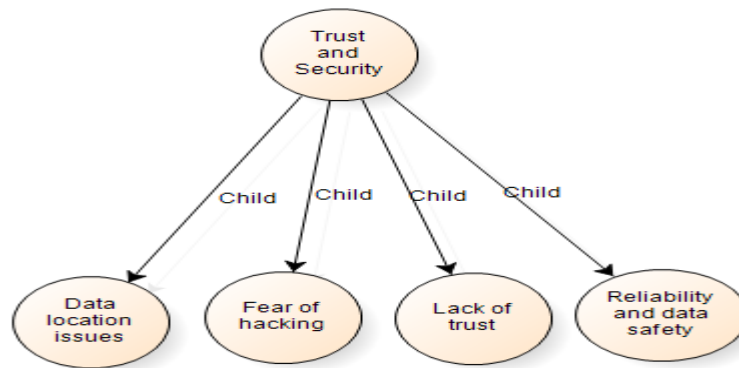


Figure 6. 19. Model of Trust and Security

The above Figure 6.19 displays the theme, sub-themes, and the informants who responded to this study's questions. The sub-themes generated include the data location issues, fear of hacking, lack of trust and reliability, and data safety. The upcoming sub-section presents the viewpoints of informants on the subject matter.

6.6.5.1 Data Location Issues

In a cloud setting, the data centers are located in numerous countries in the world, where the data regulations may affect the data residing in the data center. Data location issue is among the seven CC security risks, according to Gartner (Brodkin, 2018). Hence, when you use the cloud, the hosted data's exact location would not be known to the CUs. So, the CIA of the data may not be inevitable since cyber law may require access to those

files. The data location issues are among the Trust and security themes of adopting IaaS/BEL in Nigerian HEIs. Showing the explanation from the informant P1 and P3 words to the best of efforts as depicted in Figure 6.20 below:

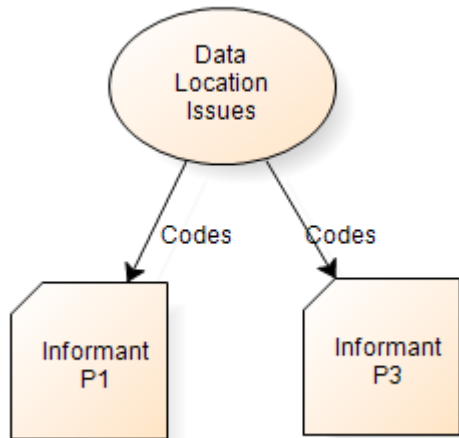


Figure 6. 20. Model of Data Location Issues

The data location issue is a sub-theme that emerged and were back with clarifications from the informant's words. The reference coverage of informant P1 is (2.22%, and 2.25%). Informant P1 has this to say: "The issue of the cloud is something that deals with records of the student's record and many people find it difficult to accept that their data is going to be migrated out of the institutions." (Personal Interview with informant P1). In a study conducted by Odeh et al. (2017), their findings indicated that;

"Although there are several solutions such as data encryption, we believe that the service providers can access the customer data. As many governments around the world have polices and regulations that enable them to access the companies and service providers customer data if needed for security purposes".

Similarly, Informant P1 further added: "There are trust and reliability of the data, but they still find it difficult to accept it. So that is the issue. People still find it difficult to believe that the data is not in the university." Furthermore, the third informant (with 3.67% reference coverage), who is the ICT director of FUD university, is of the same view as the informant P1. He contributed that:

“...the issue of security is there, there is a lot of problems with the security, especially on the cloud, when you are hosting on the cloud, because, we don't even know those people that are managing our data and system. So that issue of security is always a fear. So, it is supposed to be a factor maybe that is why some people will say no, we would not go to the cloud because of security since the cloud is just like a market place where everybody will come and dump his things. You don't know this person, you don't know that person, and you are all using that particular facility.” (Personal Interview with informant P3).

In addition, Odeh et al. (2017), “privacy is a main concern in using Cloud Computing. A considerable number of publications agreed that privacy and security are the main issues in Cloud Computing, and we cannot ignore this fact”. Furthermore,

“Although there are several solutions such as data encryption, we believe that the service providers can access the customer data. As many governments around the world have policies and regulations that enable them to access the companies and service providers customer data if needed for security purposes” (Odeh et al., 2017).

Moreover, informant P1 and P3 viewpoints are in concordance with the views of Ghazali et al. (2017) where they stated, “Thus, security, policies, governance and the physical location of the data in the cloud arena is still a concern in IaaS adoption”. Therefore, the findings revealed that data location issues and privacy are the main barriers that negatively affect the adoption of IaaSBEL in the Nigerian HEIs.

6.6.5.2 Fear of Hacking

The fear of hacking affects the adoption of IaaSBEL, as suggested by the informants. Thus, the fear of hacking is the sub-theme of theme 5, trust and security issues. This sub-theme expresses the level of explanations from the informant P3 with overall reference coverage of (5.73% and 1.66%). Concerning the fear of hacking in the HEIs, one of the informants lamented that:

"But when I talk for example, as an IT professional, I know the issue of trust is there like I told you is there was a time, our university engages the services of a company to even manage our student portal, these people were the ones handling our data of the students, and our examination results. So definitely, you know, there was that fear, from across section of the academic staff, even on the floor of the senate, many people were of the opinion that these people, how can we trust them that they cannot modify student result. Do you understand, so that was that fear honestly, because, the people were not our staff, the university just engage their services, paying them on session basis and many of our colleagues then, were not in support, but they cannot trust these people to be handling our student's record that if any student can have his way, he can go and influence changing of his or her result. (Personal Interview with informant P3).

He, therefore, continued to explain that:

"...but you know, we are hosting it on the cloud, but on many occasions, we experience some people hacking into our data, there was even a time we experience people, a particular student was hacking our system to allow other students to register without making payment." (Personal Interview with informant P3).

Moreover, the above description has agreed with some scholars such as Alshaher (2013), where he points that the main security aim is to use divergent approaches and methods to ensure individual and organizational security of their data. Thus, ensuring the authenticity of the transmitted data and preventing hackers from tampering with the data into the educational environment makes it safe for all users, such as students, administrators, and lecturers.

Hacking is one of the critical risks for an organization. Thus, almost three-quarters of the study participants named "hacker attack" as the primary cyber incidents course (Bartholomae, 2018). IaaS is in the bottom layer known as the system layer, where computing resources like servers, network devices memory, and storage are made available on-demand to the CUs. Therefore, the fear of IaaS security primarily involves hackers who abuse the powerful GPU capabilities provided by the cloud to break or

perform brute force attacks smoothly. Hackers could rent VMs, analyze the configuration, find vulnerabilities, and attack other VMs (Mozumder et al., 2017).

6.6.5.3 Lack of Trust

Lack of trust is the deterrent contributor towards IaaSBEL adoption globally (Ghazali et al., 2017; Tom, Virgiyanti, & Rozaini, 2019). It is the sub-theme of theme 5; trust and security. The sub-theme expresses the level of clarifications by informant P4 and P3. The overall reference coverage of P4: (8.21%, 2.35%, and 3.14%) and P3: (2.55%) respectively, as shown in Figure 6. 21 below:

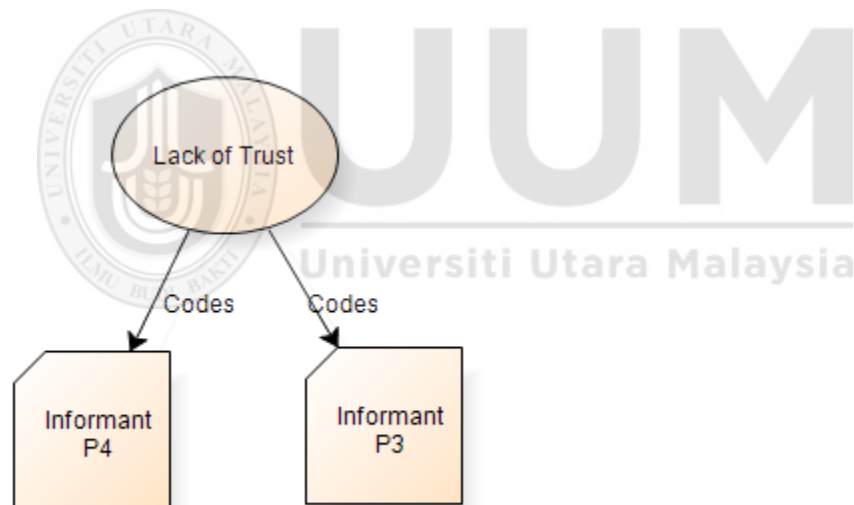


Figure 6. 21. Model of Lack of Trust

This sub-theme was backed with clarifications from the informant's words. Therefore, one of the informants had this to say:

"Nigeria, in particular, is a developing country and in terms of ICT, we are not growing, but the issue of trust, if someone is not so much IT-oriented, you do not expect him to trust all these systems, but as far as I am concerned, there is whatever you are plotting as far as Cloud Computing is concerned. There are issues of Security and trust, and there is no trust 100%. You cannot trust someone 100%. Because there are issues that people might attack you and considering the environment that we leave in, people can easily compromise, you can trust someone, and they can easily compromise for their benefit. Let me give you an example with internet service providers when maybe you subscribe for 155 MBS, and you have paid for that 155 MBS, but at the end of the day, maybe you notice you have peak, and non-peak period, during your peak period, they will be able to give you that your 155mbs as indicated, you will be using it during the day but in the night, instead of them to dedicate the same energy, they might decide to take part of it and give to someone else that needed it at that time. But, if to say, the providers will be trustworthy, there is no problem in plotting it across." (Personal Interview with informant P4).

Moreover, he further enlightened:

"Security and trust are the most peculiar things you look at whenever you are going to plot any online application. You may find it to be secured, but because in a developed country, like America, they do almost everything online. They are more secure, and due to the maturity and the high-level technology, they always deploy, which is not the same as ours. Because of the different speeds, we are advancing, and they are still using the latest technology." (Personal Interview with informant P4).

Furthermore, he further added that:

"All I am saying is if the school trusts the provider, and hand it over their data to the providers, the integrity of the providers at first should be confirmed. As far as the providers will adhere strictly to the terms and conditions of the consent, if they can protect that, I do not think there is a problem. It is a good thing to plot it." (Personal Interview with informant P4).

Similarly, another informant has similar enlightenment on the same challenges of lack of trust as explained by informant P4 above, as follows:

The issue of security can be married to the issue of trust, you know, anything that is related to the internet, nowadays, people are scared. Especially, the system that contains vital data, you know, people entertain fear that maybe somebody would hack into our systems. It is true because I can tell you, our university disengages the services of the people that were administering our student portal. (Personal Interview with informant P3).

Moreover, the above description has agreed with some scholars, where lack of Trust arises when users are not clear about why their critical information is requested, how, and accessed by whom; thus, this lack of control and visibility leads to suspicion and distrust (Tweney & Crane, 2007). As a result, the HEIs top managers may hold back from adopting IaaS/BEL services since critical data is involved.

Furthermore, one of the centre obstructions of adopting CC and its advantages is the issue of trust (Ghazali et al., 2017; Hiran & Henten, 2020; Tom, Virgiyanti, & Rozaini, 2019). Trust alludes to an individual or organization's willingness to be vulnerable to another party, dependent on inspirational desires for their conduct (Rousseau et al., 1998). The significance of Trust in the CC settings has been repeatedly highlighted due to the lack of transparency surrounding cloud offerings (Yu et al., 2017) and cloud users inability to thoroughly audit cloud services (Stankov et al., 2012). Therefore, Trust is a key to the adoption of IaaS/BEL in the Nigerian HEIs, and hence, improving Trust mechanisms between the cloud service providers and cloud users is significant to aid in the diffusion of IaaS/BEL in the Nigerian HEIs.

6.6.5.4 Reliability and Data Safety

The main aim of promoting IaaSBEL is to improve the reliability and access to e-learning content while reducing IT expenses. The IaaSBEL services' reliability should be available in the HEIs 24/7, where the data is tampered free. Reliability and data safety are one of the sub-themes of theme 5. The informant P1 explains this sub-theme with a reference coverage of 4.10%. This concern of reliability and data safety have similar views and findings of some scholars (Odeh et al., 2017) "privacy is the main concern in using Cloud Computing. A considerable number of publications agreed that privacy and security are the main issues in Cloud Computing, and we cannot ignore this fact". This view is precisely in line with the expression of Informant P1.

“People find it difficult to trust the reliability and safety of the data, especially for the student's record. They are used to hardcopy records, keeping the record in the university for them to be told that this data is going to be located, even though it is secured, but still, they find it difficult to accept that the data is not physically available.” (Personal Interview with informant P1).

Also, Odeh et al. (2017) further contributed that:

“Although there are several solutions such as data encryption, we believe that service providers can access customer data. As many governments around the world have policies and regulations that enable them to access the companies and service providers customer data if needed for security purposes”.

Therefore, reliability and data safety issues should be spelled in the SLAs, and monitoring mechanism provided by the CPSs to assure their reliability and safety precautions.

6.7 Qualitative Trustworthiness

Notable qualitative gurus have proposed steps to ensuring trustworthiness. For instance, Lincoln and Guba (1985) proposed four techniques for trustworthiness; "credibility, transferability, dependability, and confirmability. Nonetheless, the worry arises when selecting "how many strategies should be used within a project, and at which point? The number and pacing of these strategies depend on the complexity and size of the project as well as the investigator's skill." (Denzin & Lincoln, 2007).

Under credibility, for instance, member checking (i.e., "having outside auditors or participants validate findings" and independent analysis of data by one or more researchers" (Hannes, 2011, p. 4 as cited Denzin & Lincoln, 2007). Nonetheless, Hannes (2011) listed the criteria but did not mention which one should be used or not be used. Nonetheless, Creswell (2012) instructed the use of "at least two in any project" (pp. 251-253). However, he does not provide the readers with a guide on which of the two strategies to use, when, where, and why (Denzin & Lincoln, 2007). Based on the above justifications, this study will use two techniques to ascertain the qualitative study's trustworthiness. Hence, this study adopted member checking and peer briefing/debriefing.

6.7.1 Member Checking

Member checking is a qualitative technique used to build up the fundamental of credibility in trustworthiness. Credibility includes setting the reality (truth) of the research findings, clarifying that the findings are accurate and honest without distortions. The "Member checking is primarily used in qualitative inquiry methodology and is defined as a quality control process by which a researcher seeks to improve the accuracy, credibility, and validity of what has been recorded during a research interview" (Lincoln & Guba, 1985; Doyle, 2007). Member checking is also known as participant verification (Rager, 2005),

informant feedback, respondent validation, applicability, external validity, and fittingness (Morse et al., 2002).

In general, during an interview, the researcher will restate or summarise information and then question the participant to determine accuracy. The participants either agree or disagree that the summaries reflect their views, feelings, and experiences, and if accuracy and completeness are affirmed, then the study is said to have credibility (Lincoln & Guba, 1985; Creswell, 2007a). Lincoln and Guba believed another kind of member checking occurs near the end of the research project when the analyzed data and report are given to the participants to review the work's authenticity. The participants check to see whether a "true" or authentic representation was made of what he or she conveyed during the interview. Member checks may involve sharing all of the findings with the participants and allowing them to critically analyze the findings and comment on them (Creswell, 2007a). The most significant benefit of conducting member checks is that it allows the researcher to verify the accuracy and completeness of the findings, which then improves the study's validity (Cohen & Crabtree, 2006).

Member checking was used by numerous authors (Rager, 2005; Harper & Cole, 2012). For instance, Rager (2005) stressed that member checking helped her as a self-care strategy, where each participant reviewed their transcript for accuracy and returned it. From her experience, she found that it "benefited her emotionally" (Rager, 2005, p. 26). Nonetheless, member checking is also known as participant verification (Rager, 2005), informant feedback respondent validation, applicability, external validity, and fittingness (Morse et al., 2002).

To further strengthen the member checking, according to Doyle (2007), researchers should view the research as a "negotiated process" (p.889), meaning that the interview

informants should be given the power, voice, and engagement throughout the research process (member check). Therefore, this study succumbs to the above submission in the design of the member checking questions (see Appendix O, for more details) and include options for the informants to either agree or to disagree, and further asking them if they have anything to add regarding each transcript if it accurately reflects the data they provided. Finally, the informants were also asked to comment (feedback) on the overall transcript and sign the form if they agree the transcript reflects the exact wordings, experience, and beliefs. The informants were asked how they feel about the overall transcript. Also, they were thanked for their valuable input and time.

Nonetheless, despite the member check's glaring benefit, particularly concerning enhancing the credibility and the capability for informants to contribute to the research process meaningfully, according to Doyle (2007), there is scarce information or guidance on conducting member checks. This study is in concordance with other scholars that sent the transcripts of interviews for informants for verification and confirmation, such as (Doyle, 2007). Furthermore, to conceal the informants' identity, P1, P2, P3, and P4 were used. Therefore, this study sends the transcripts and summaries of themes were returned to the initial informants for verification and confirmation. Therefore, the study's member check is consistent with Doyle (2007) and Embi et al. (2004).

6.7.2 Peer Debriefing/Review

Peer debriefing or review refers to the “process of exposing oneself to a disinterested peer in a manner paralleling an analytical session and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind” (Lincoln & Guba, 1985, p. 308). Peer debriefing, also known as analytic triangulation, is a situation where a researcher solicited upon an unprejudiced peer who is not involved in the research.

Hence, aiding in probing researchers' methodology, interpretation, and data analysis (Nguyen, 2008). It is one of the techniques for enhancing credibility and trustworthiness via the use of external peers. However, there is no designated procedure in Peer debriefing, and peers should be knowledgeable about interrogating both substantially and methodologically (Nguyen, 2008). The peer briefer has to know the study and well versed in qualitative methodology (Nguyen, 2008).

Besides, the peer briefer could also help clarify interpretations and challenge the researcher's assumption contributing to the trustworthiness of findings, analysis, and the conclusion drawn (Nguyen, 2008). In this study, peer debriefing occurred through discussions with a colleague at the school of computing, who is an expert in mixed-method research design, and another colleague at the School of International Studies (SOIS) colleague, in particular, they became this study peer debriefers for most of the study duration. This method was applied by Agostinho (2005) and Embi et al. (2004). They provided support in the form of empathy, as they understood the emotional challenges that qualitative and mixed-method research entails. The input generated at the peer debriefing session indicated that the findings and categorizations were appropriate.

6.8 Mixing Quan-qual Result

The research audiotaped and transcribed verbatim each interview (Hanson et al., 2005). Thus, the study further conducted a thematic analysis of the data while using NVivo (v. 10) qualitative software for storing interview data, coding, and theme development. The verification procedure includes triangulating different information sources, including member checking and peer debriefing (Ivankova & Stick, 2007). According to Hanson et al. (2005), "in the mixed-methods sequential designs, the quantitative and qualitative phases are connected in the intermediate stage when the data analysis results in the first

phase of the study inform or guide the data collection in the second phase. Creswell et al. (2003) were in support of Hanson et al. (2005) submission, in sequential explanatory design, a researcher typically connects the two phases while selecting the participants for the qualitative follow-up analysis based on the qualitative results from the first phase (Creswell et al. (2003). Similarly, another connecting point is developing the qualitative data collection protocols, based on the results from the first quantitative phase, investigating those results in more depth, and collecting and analyzing the qualitative data in the second phase of the study. Figure 6.22 presents the process of mixing Qualitative (Qual) and Quantitative (quan) results.

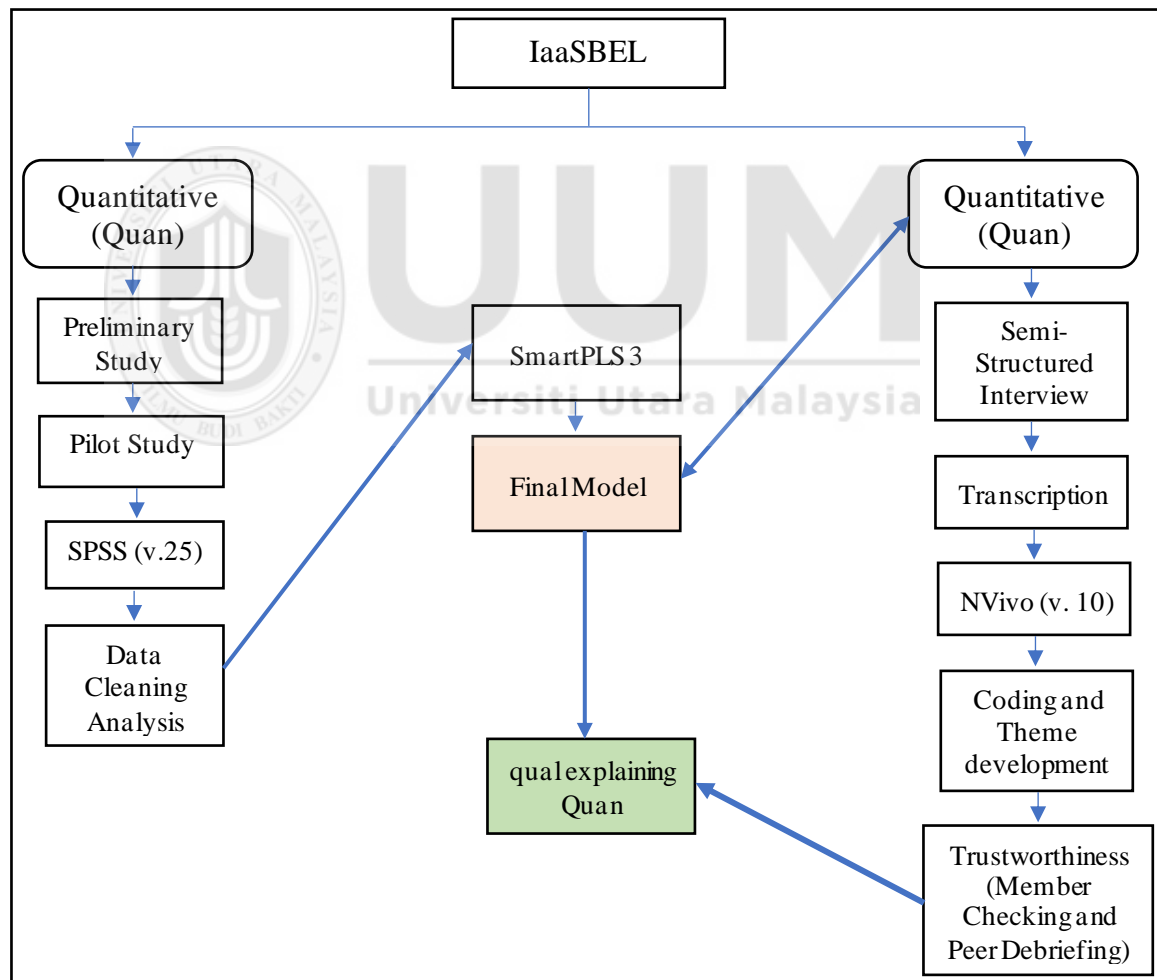


Figure 6. 22. The Process of Mixing Qual-qual Results

As illustrated in Figure 6.22, the study connected the quantitative and qualitative phases during the intermediate stage in the research process while selecting the suitable participant (via purposive sampling technique) for the qualitative study. The second connecting/mixing point included developing the interview questions based on the initial PLS-SEM model and statistical inferences. The non-significant variables were used to design the interview (semi-structured) questions. Furthermore, the study mixed the quantitative as well as qualitative approaches at the study design stage.

6.9 Summary

In line with the study's research questions, this chapter presents the analysis of the qualitative data, which is the second phase of the explanatory sequential research design adopted in this study. The chapter further performs the steps of data analysis, interview protocols, demographic description of participants, and the thematic analysis, respectively. From the initial seven questions generated from the quantitative results, the study follows Creswell's suggestions about developing the qualitative questions based on the insignificant statistical findings from the quantitative part (Quan). Then, five (5) themes were generated with numerous sub-themes according to the coding procedure. The main themes include theme 1: compatibility, theme 2: competitive pressure, theme 3: government support, relative advantage, trust, theme 4: top management support, and theme 5: trust and security. On the other hand, the next chapter will present the conclusion, summary, and recommendations for future study.

CHAPTER SEVEN

DISCUSSION AND CONCLUSION

7.1 Overview

This chapter discusses the key findings demonstrated in the preceding chapters, which dealt with quantitative and qualitative data analysis concurrently. In specific, this study examines the effect of the Intention to adopt IaaSBEL on the relationship between Technology (Relative Advantage, Compatibility, Trust, and Security), Organization (Top Management Support and Cost Savings), and the Environment perspective (Competitive Pressure and Service Provider Support) respectively. This chapter also summarizes the main findings and the moderating hypotheses based on the PLS-SEM analysis output. Also, the qualitative data analysis and findings were presented in this chapter. Similarly, the study's limitations were noted, thus offering suggestions to guide future researchers in this domain, and conclusions are drawn in the final section.

7.2 Discussion of the Study's Findings

This study's main objective is to examine the factors that influence the Intention to adopt IaaSBEL in the Nigerian Higher Education Institutions (HEIs). This study further targeted the exploration of dual analytical technique that covers quantitative and qualitative data (i.e., sequential explanatory research design). First, the quantitative method of data collection involved questionnaires adapted from preceding studies, where content validity and face validity were conducted. A cumulative of four hundred and fifty-four (454) questionnaires were dispersed to the ICT directorates in the Nigerian HEIs, out of which one hundred and eighty-six (186) were utilized for PLS-SEM analysis after the initial data pre-processing or cleaning techniques. Moreover, preceding studies have revealed that despite the numerous benefits of CC and Infrastructure as-a Service-Based E-learning (IaaSBEL), its adoption in the Nigerian HEIs is limited. Consequently, this could make it difficult for the Nigerian Government to attain the 15-20% of investment in education, as

UNESCO suggested, considering the average 6-7% of the total budget over the years (NBS, 2020).

Secondly, the qualitative method (i.e., semi-structured interview questions) was administered to the selected informants using a purposive sampling technique. The data were collected from the selected informants in the Nigerian HEIs ICT directorates, where four informants were interviewed. Two methods were used to collect the interview data: a phone call and face-to-face sessions. Hence, numerous themes and sub-themes were generated after the initial coding process and transcription phase. The primary themes are “Compatibility,” “Competitive Pressure,” “Government Support moderates Relative Advantage and Trust,” “Top Management Support,” and “Trust and security,” respectively. This study advances the understanding of the critical determinants of the Intention to adopt IaaSBEL by providing answers to the following research questions:

- **RO1:** To identify the factors that influence the Intention to adopt a Public IaaSBEL Model in Nigerian HEIs.
- **RO2:** To determine the relationship between Relative Advantage, Compatibility, Trust, Security, Top Management Commitment, Cost Savings, Competitive Pressure, Service Provider Support, and the Intention to adopt a public IaaSBEL Model in Nigerian HEIs.
- **RO3:** To assess the moderating effect of Government Support on the relationship between Relative Advantage, Trust, and Cost Savings on the Intention to adopt a Public IaaSBEL Model in Nigerian HEIs.
- **RO4:** To validate the quantitative results using the qualitative method.
- **RO5:** To develop and validate the implementation strategy based on the Intention to adopt IaaSBEL model.

Based on research objective 1, the determinants or factors that influence the Intention to adopt IaaSBEL include "Technology (Relative Advantage, Compatibility, Trust, and Security), Organization (Top Management Support and Cost Savings), and Environment (Competitive Pressure and Service Provider Support), and Government Support" as a moderating variable will influence the Intention towards adopting IaaSBEL were derived from the literature and further evaluated and validated by experts on their suitability in this study.

In addition, Research objective 2 determines the relationship between Relative Advantage, Compatibility, Trust, Security, Top Management Commitment, Cost Savings, Competitive Pressure, and Service Provider Support predict the Intention to adopt a Public IaaSBEL Model in Nigerian HEIs. Thus, eleven (11) hypotheses were postulated and empirically tested. The results showed that Relative Advantage, Service Provider Support, Cost Savings, and Government Support were positively significant. In contrast, Compatibility, Trust, Security, Top Management Support, and Competitive Pressure were a non-significant determinant of the Intention to adopt IaaSBEL. Furthermore, in research objective three (3), Government Support's moderating effect was significant (H9a, H9b, and H9c). However, Relative Advantage and Trust (H9a, H9b) were negatively supported, while Cost Savings (H9c) was positively supported.

Research objective four (4) elaborates on how the qualitative results help explain the quantitative findings. The thematic analysis findings generated the main themes: "Compatibility, Competitive Pressure, Government Support Moderates Relative Advantage and Trust, Top Management Support, and Trust and Security" with numerous sub-themes explaining the IaaSBEL model holistically (coherently). Lastly, research objective five (5) discusses how to develop the Intention to adopt a Public IaaSBEL implementation strategy for the Nigerian HEIs. The implementation strategy was developed and further evaluated by practitioners and academic experts, hence, serving as a bridging stone towards the easy diffusion of IaaSBEL in the Nigerian HEIs.

7.3 Main Effect Hypotheses

This section discusses the hypothesis findings' critical effect with the direct relationships between the model's exogenous and endogenous variables. Thus, including the relationships between "Relative Advantage, Compatibility, Trust, Security, Top Management Support, Cost Savings, Competitive Pressure, Service Provider Support, Government Support and the Intention to adopt IaaSBEL," respectively. The Technology, Organisation, and Environment (TOE) theory underpin the other factors in this study (refer to Figure 3.1). Therefore, the fundamental factors are grouped as Technological, Organisational, and Environmental aspects, respectively.

7.3.1 The Relationships between H₁, H₂, H₃, H₄ and the Intention to Adopt

IaaSBEL

This section summarizes the Technology findings as an aspect of the TOE theory, including the Relative Advantage, Compatibility, Security, and Trust. The relationship between hypothesis H₁ Relative Advantage and the Intention to adopt IaaSBEL were found to be significant. Hence, suggesting that top management are conversant with the advantages that IaaSBEL will bring on board. The top managers agree that IaaSBEL will improve the quality of operations and job performance in their respective universities. IaaSBEL will also enhance the university operations' e-learning systems' effectiveness, where students and staff will use it effectively. The academic productivity of the Nigerian HEIs would also increase since the new e-learning systems using the IaaSBEL would eliminate the bottlenecks faced with the former e-learning system.

Furthermore, the advantage of CC in HEIs was also highlighted by numerous authors towards improving e-learning systems and the significance of Relative Advantage in the diffusion of innovation in HEIs (Tornatzky & Fleischer, 1990; Almubarak, 2017; Sabi et al., 2017; Hiran & Henten, 2020). Nonetheless, Relative Advantage is one of the DOI

factors which consistently predict innovation adoption in an organization (Torynnatzky & Fleischer, 1990). Theoretically, this finding further strengthens the previous empirical results that produced the significant positive influence of RA on technology adoption (Rogers, 2003a).

The hypothesis H2, which states, “there will be a positive relationship between Compatibility and the Intention to adopt IaaSBEL in Nigerian HEIs,” was statistically non-significant. Hence, a non-significant relationship exists between Compatibility with Intention to adopt IaaSBEL in this study is expected because extant studies have confirmed similar findings such as Sabi et al. (2018) and Wu (2011) whereas, it contradicts with other studies (Rogers, 2003b). Indicating that HEIs have focused attention on the Compatibility of the IaaSBEL with current systems in operation, hence, implying further that in Nigeria, IaaSBEL adoption is presently at its early stage. Nonetheless, compatibility is a critical factor for technology adoption in HEIs (Rogers, 2003b; Hiran & Henten, 2020). Besides, the insignificant findings according to the Informant P1, P2, and P3 in the qualitative study implies that “interoperability issues, lack of students and staff training” are among the reasons for the unexpected outcome, especially for the technical teams where the integration of the existing systems, databases, applications, and SLAs may be a problem due to the introduction of IaaSBEL.

Furthermore, hypothesis H3 findings revealed that the Trust in IaaSBEL infrastructure is not statistically significant. Thus, it is expected since Trust is among the factors that deter the adoption of CC services in organizations (Ghazali et al., 2017). Besides, hackers can use one instance or VM to perform DDOS attacks or brute force attacks on organization systems. Hence, the IaaSBEL infrastructure's Trust is perceived by the Nigerian HEIs, due to the database and lack of control of the infrastructure, making them reluctant. Furthermore, the finding of this variable is supported by Almazroi et al. (2019), and on the other hand, Trust of CC was not supported by the study of Almazroi et al. (2016). Trust concerns the level of risks that is willingly accepted by CUs when cloud services

are used (Tom, Virgiyanti, & Rozaini, 2019). However, the contradictory outcome is not an indication of the unwillingness of HEIs to revolutionize e-learning systems in the country. Further, the insignificance of Trust might be accounted for by the issues relating to the perception of users on data ownership, especially considering that data centers could be located in different country other user's country thus, could be guided by Cyberlaw and regulations of the host country (Mell & Grance, 2012). Similarly, based on the qualitative findings' clarifications, Informant P1, P3, and P4, postulated the reasons why Trust is not supported due to the data location issues, fear of hacking, lack of Trust, as well as reliability and data safety issues.

Additionally, concerning hypothesis H4 testing, the results revealed that Security exerts a negative effect on the intention to adopt IaaSBEL. Thus, the findings imply that Security is considered a critical deterrent factor in adopting CC, as Ghazali et al. (2017) suggested. Security is referred to "as the extent to which a person believes that using a particular system or application will be risk-free" (Xu et al., 2003). Critical data such as exams and records and other mission-critical data make it challenging to trust the IaaSBEL infrastructure, implying that CSPs that are not under government control could pose a security threat (Shin, 2013). Possibly, with the expansion in the volume of data stored by data cloud centers, the Nigerian HEIs might become disturbed by privacy breaches, specifically concerning projects and grades of students. Simultaneously, the indirect effect can be explained by Trust concerns, which is a significant factor influencing CC adoption among organizations (Tom, Virgiyanti, & Rozaini, 2019). In the same vein, data location issues, fear of hacking, lack of trust, reliability, and data safety were listed by Informant P1, P3, and P4 as the main reasons why the Security of IaaSBEL technology is perceived negatively by the ICT directorates top managers. Table 7.1 presents the summary of the Technological perspective hypotheses.

Table 7. 1

Summary of the Hypotheses testing results of Objective Two (Technology Perspective)

Hypotheses	Relationship	β	t-value	p-values	Result
H ₁	RA -> INT	0.186	2.846	0.002***	Supported
H ₂	COM -> INT	0.095	1.385	0.083	Not Supported
H ₃	TR -> INT	0.083	1.076	0.137	Not Supported
H ₄	SEC -> INT	0.093	1.203	0.115	Not Supported

In summary, only Relative Advantage was statistically significant out of the four Technology variables, whereas the remaining three variables were not statistically significant as a determinant of the Intention to adopt IaaSBEL in the Nigerian HEIs.

7.3.2 The Relationships between H₅, H₆, and the Intention to Adopt IaaSBEL

This section summarizes objective two findings: the Organizational perspective and the Top Management Support and Cost Savings. Hypothesis H5 postulates that Top Management Support (TMS) would positively affect the Intention to adopt IaaSBEL. The findings of this study established a non-significant relationship between TMS with Intention towards adopting IaaSBEL. Thus, implying that the passive standard point of top management on IaaSBEL could be that diffusion of IaaSBEL infrastructure is still at an immaturity stage in the HEIs. Thus, top management must recognize the advantages of convincingly and direct resources and effort towards adopting IaaSBEL effectively. Molla and Licker (2005b) alluded that top management's commitment refers to the level of responsibility directed by an organization's managers towards sustaining the adoption of CC. However, adopting IaaSBEL is described as a complicated procedure that could necessitate the entire revamping of resources alongside altering the organizational structure (Low et al., 2011). The top management plays an essential role in innovation adoption decisions (Workineh et al., 2017). According to Alharbi et al. (2017), top

managers' support was an essential factor for CC adoption. The lack of knowledge, resistance due to fear of losing jobs, and attitude toward change, mostly from IT personnel, hampers CC's adoption (Alharbi et al., 2017). In the same vein, Informant P1, P2, P3, and P4, in the qualitative analysis, mentioned the reasons why top managements were skeptical about IaaS/BEL adoption are mainly due to the; lack of awareness, fear of losing jobs, lack of funds, lack of honesty, lack of management support, personal integrity, resistance to change, and the cloud service providers reliability, cost and security.

In Conformity with the model for this study, hypothesis H6 Stated that: “there will be a positive relationship between Cost Savings and the intention to adopt IaaS/BEL in Nigerian HEIs.” The path analysis of this study supports H6, in which the findings revealed that Cost Savings signifies an essential predictor of the Intention to adopt IaaS/BEL infrastructure in the Nigerian HEIs. his study's findings are in line with Gupta et al. (2013) and Oliveira et al. (2014). Statistical inferences have indicated that Cost Savings represents the primary determining factor for universities to adopt IaaS/BEL in Nigeria. The Cost Savings exerts a substantial impact on the Intention to adopt IaaS/BEL because CC has been proven to lower the cost implication of “running a server-based system.” Although, few extant studies indicate contrary findings (Sabi et al., 2018). The current finding conforms with common discernment regarding the cost-effectiveness of CC and IaaS/BEL infrastructure Sabi et al., (2018) and Tom et al. (2019), Because, IaaS/BEL supports the integration of all functions without difficulty through virtualization, database integration, among others and thus, offering e-learning packages at a cheaper rate. This indicates several students could employ instance purposely to access contents in e-learning, thus a drastic decrease in cost. Table 7.2 shows the hypotheses testing result for the Organizational perspective variables.

Table 7. 2

Summary of the Hypothesis Testing for Objective Two (Organization Perspective)

Hypotheses	Relationship	β	t-value	p-values	Result
H ₅	TMS -> INT	-0.079	1.333	0.092	Not Supported
H ₆	CS -> INT	0.213	2.551	0.006***	Supported

In summary, out of the two Organization variables, Cost Savings was statistically significant, whereas Top Management Support was not significant.

7.3.3 The Relationships between H₇, H₈, and the Intention to Adopt IaaSBEL

Several reports indicate that Competitive Pressure impact strongly the adoption of IS innovations and further assertion points that it predicts business innovation (Tom, Virgiyanti, & Rozaini, 2019; Hiran & Henten, 2020). Hence, it can position HEIs at an advantage when they adopt CC in e-learning systems. Hypothesis H7 states; There will be a positive relationship between Competitive Pressure and the Intention to adopt IaaSBEL in Nigerian HEIs. However, Competitive Pressure is found to be non-significant in predicting Intention to adopt IaaSBEL. Thus, implying competitive pressure is not a crucial predictor of the university's adoption of IaaSBEL. Nonetheless, Competitive Pressure was a significant determinant in the Intention to adopt CC (Alkhatir et al., 2014; Hiran & Henten, 2020).

Furthermore, this is affirmed considering that IaaSBEL enables sharing and collaboration of resources alongside learning contents. This non-significant effect of Competitive Pressure towards predicting adoption of IaaSBEL can be explained by top manager's inability to consider competition as a factor that drives innovation, especially in universities considering the stream of applicants for admission. Similarly, Informant P1, P2, and P3 outlined the reasons for its non-significant effect: culture and behavior, lack of competition, and the traditional methods of teaching and learning.

Moreover, in this study, Service Provider Support (SPS) is the "availability of support for implementing and using information systems" (Premkumar & Roberts, 1999). Accordingly, the service providers adduce external support on cloud services, which might influence adoption by HEIs in developing countries, considering the limitation in availability of technical know-how. According to this study's results, "Service Provider Support" significantly influences the adoption Intention of IaaSBEL. This result corroborates the preceding literature that affirms that Service Provider Support significantly influences CC adoption (Al Isma'ili et al., 2016; Tom, Virgiyanti, & Rozaini, 2019). Therefore, the current finding denotes that in Nigeria, top managers in HEIs affirms the positive effect of cloud services providers on overall adoption. Thus, an inference is drawn that cloud service providers' adequate support enhances the faster rate of IaaSBEL diffusion among HEIs. Also, in the public cloud model, the service provider would not enable the CUs to control the physical resources at any level (Odeh et al., 2017). Table 7.3 shows the hypotheses of the Environmental factors variables findings.

Table 7.3

Summary of the Hypothesis testing Results for Objective Two (Environment perspective)

Hypotheses	Relationship	β	t-value	p-values	Result
H ₇	CP -> INT	0.139	1.543	0.062	Not Supported
H ₈	SPS -> INT	0.173	1.922	0.028**	Supported

In summary, it can be noted that only Service Provider Support was supported among the Environment perspective variables, while Competitive Pressure is not supported. Hence, according to the study findings, Competitive Pressure is not a strong determinant of IaaSBEL adoption in Nigeria HEIs.

7.3.4 The Relationships between H₉ and the Intention to Adopt IaaSBEL

Hypothesis H₉ Government Support (GS) infers the policies, incentives, and assessments adduced by Government (Dahnil et al., 2014). Furthermore, policies, programs, institutions, and other supporting services offered by the Government are generally referred to as regulations and rules, and they serve foster adoption rate in innovations (Tornatzky & Fleischer, 1990; Tweel, 2012). Government policies encompass finance, relevant training, policies' stability, and designed curriculum (Chang et al., 2006). In harmony with hypothesis H₉, the finding shows a positively significant relationship between Government Support to adopt IaaSBEL in the Nigerian HEIs. This result was also consistent with the findings of Alhammadi et al. (2015). However, some studies discovered that GS is not a statistically significant factor influencing CC adoption (Oliveira et al., 2014; Tashkandi & Al-Jabri, 2015). Thus, the current finding affirms Government Support significantly influences the adoption of IaaSBEL among HEIs in Nigeria. Although this applies to other developing nations constrained by finance, appropriate policy and regulations supported by adequate finance by Government can enhance faster diffusion of IaaSBEL. Table 7.4 presents the Government Support (GS) hypothesis results and the Intention to adopt IaaSBEL.

Table 7. 4

Summary of Hypothesis Testing Results for Objective Two

Hypotheses	Relationship	β	t-value	p-values	Result
H ₉	GS-> INT	0.269	3.321	0.000***	Supported

In summary, the relationship between Government Support and the Intention to adopt IaaSBEL in the Nigerian HEIs is significant.

7.3.5 Moderating effect of Government Support

Government Support (GS) is one key driver in promoting CC adoption among enterprises (Lee et al., 2014). The support comprises a policy, incentive, training, policy, and curriculum stability (Chang et al., 2006; Dahnil et al., 2014). The GS can provide critical support for technology adoption (Zhu et al., 2006; Oliveira et al., 2014). Hence, the introduction of policy can encourage innovation in organizations (Tornatzky & Fleischer, 1990). Nonetheless, numerous studies have utilized Government Support as a moderator for RFID adoption in UK logistics Ramanathan et al. (2014) and green technology adoption in Pakistan (Kousar et al., 2017). This study proposes Government Support as a moderator of the relationship amongst Trust, Relative Advantage, and Cost Savings based on Baron and Kenny's (1986) submission.

Besides, following this argument, research question three clarifies: “Does Government Support moderate the relationship between Relative Advantage, Trust, Cost Saving, and the Intention to adopt a Public IaaSBEL Model in Nigerian HEIs?”. In conformity to the third research question, the third objective set out by the current study involves assessing the moderating effect of Government Support on existing relationships amid Relative Advantage, Trust, and Cost Savings.

7.3.5.1 Moderating Effect of Government Support on the Relationship Between Relative Advantage and the Intention to Adopt IaaSBEL

In answering research question three, three hypotheses were formulated and assessed utilizing the PLS path modelling (i.e., H9a, H9b, H9c). It could be recalled that H9a stated that "Government Support has a moderating effect on the relationship between Relative Advantage and the Intention to adopt IaaSBEL." Specifically, the findings revealed that it significantly and negatively moderates Relative Advantage's relationship with Intention to adopt IaaSBEL. This means the findings regarding the moderating effect represent the main contribution of this research. One possible clarification of the negative moderating effect of Government Support on Relative Advantage could mean that even with the introduction of Government Support, the HEIs top managers are still skeptical about adopting IaaSBEL despite the advantage of CC. In particular, IaaSBEL is a paradigm that comprises numerous uncertainties such as the service level agreement, data ownership, etc. Education in Nigeria is also underfunded, especially the lack of investment in ICT development and infrastructure (Olutola & Olatoye, 2015; Tom, Virgiyanti, & Rozaini, 2019; Eze et al., 2020). Hence, it could be due to the former and present government's ample promises to overall Nigeria's education system but lack the political will to do that.

Furthermore, concerning the literature review, no empirical evidence was found to use Government Support as a moderating variable in CC adoption in Nigerian HEIs. Hence, Government support is theorized to moderate the relationship between Relative Advantage and the Intention to adopt IaaSBEL in Nigerian HEIs. Besides, the qualitative findings suggest the lack of policymaker's awareness, personal interest/corruption, lack of maintenance, lack of support, lack of bandwidth, failed system and lack of policy are the reasons why the ICT directorates top managers perceive the involvement of the government negatively in influencing the Intention to adopt IaaSBEL. Table 7.5 presents the findings of the moderating variable.

Table 7. 5

Summary of Government Support Moderating Relative Advantage

Hypotheses	Relationship	β	t-value	p-values	Result
H _{9A}	RA-> GS	-0.125	2.830	0.002***	Supported

In summary, the moderating effect of Government on the Relationship between Relative Advantage and the Intention to adopt IaaSBEL is perceived negatively by the respondents.

7.3.5.2 Moderating Effect of Government Support on the Relationship Between Cost Savings and the Intention to Adopt IaaSBEL

The findings regarding the moderating effect of the relationship between Cost Savings with Intention to adopt IaaSBEL supports hypothesis H9b. This positive moderation is expected because CC has proven to be cost-effective compared to traditional computing methods (i.e., server-based). The cost savings associated with CC's adoption was found to be significant (Qasem et al., 2020). Additionally, it can be understood that government support, such as financial incentives and stable policies, will drastically influence HEI's adoption of IaaSBEL in Nigeria. In other words, the positive effect cost savings in CC have been proven in first world countries to save cost, processing time, and availability of learning contents 24/7. Therefore, the positive moderation of Cost savings will influence the Intention to adopt IaaSBEL in Nigerian HEIs. Table 7.6 presents the findings of hypotheses 9b.

Table 7. 6

Summary of Government Support Moderating Cost Savings

Hypotheses	Relationship	β	t-value	p-values	Result
H _{9B}	CS -> GS	0.123	1.943	0.026**	Supported

In summary, it can be noted that the Cost Savings associated with the adoption of IaaS/BEL infrastructure is perceived positively by the ICT directorate's top management. Therefore, Cost Savings is a strong determinant of IaaS/BEL adoption decision in the Nigerian HEIs.

7.3.5.3 Moderating Effect of Government Support on the Relationship Between Trust and the Intention to Adopt IaaS/BEL

From the literature, Government Support is expected to moderate how Trust relates to IaaS/BEL. Hypothesis H9c, which postulates the "Government Support has a moderating effect on the relationship between CS and IaaS/BEL," is negatively supported. However, this analysis yields an unpredictable outcome, as the current study established that Government Support negatively moderates Trust. This result explains that even with Government Support, the Nigerian HEIs top managers are sceptical of the trust issues in CC such as confidentiality, integrity, data availability, data ownership, service level agreement, etc. However, a plausible explanation for the negative or inconsistent findings might be because experiences have shown the Government's lack of commitment towards revitalizing education and in-effective policy, making the respondents not trust the IaaS/BEL even when the Government is involved. Another possible explanation for this outcome is that the Nigerian Government must put a mechanism that will make the managers trust the IaaS/BEL technology, thereby influencing its adoption. Similarly, the qualitative findings from informant P1, P2, P3, and P4 explain the inconsistent findings is due to the lack of policymakers' awareness, personal interest/corruption, lack of maintenance, lack of support, lack of bandwidth, failed system and lack of policy are the main reasons why the result was negatively supported. Table 7.7 shows the finding of hypotheses 9C.

Table 7. 7

Summary of Government Support Moderating Cost Savings

Hypotheses	Relationship	β	t-value	p-values	Result
H _{9C}	TR->GS	-0.161	2.442	0.007***	Supported

In summary, the PLS-SEM results show that Trust is negatively moderated by the Government support, indicating the lack of Trust towards government involvement in adopting IaaSBEL in the Nigerian HEIs.

7.4 Mixing the Quantitative and qualitative Data

The research employed recorded audio interviews then transcribed each in its literal form (Creswell, 2005). The study further performed thematic analysis using the transcribed data while using NVivo (v.10) qualitative software for storing interview data, coding, and theme development. Further verification procedures include triangulating diverse information sources, including member checking and peer debriefing (Ivankova & Stick, 2007). According to Hanson et al. (2005), the sequential design in mixed methods involves the quantitative and qualitative phases connected through the intermediate stage. During the first phase of the study, the initial analysis outcome serves as a guide during the second data collection or the second phase. Creswell et al. (2003) were in support of Hanson et al. (2005) submission, in sequential explanatory design, involve typically that researchers link the dual phases during participant selection in the analysis phase of qualitative follow-up, which is guided by results obtained at the first phase of qualitative assessment (Creswell et al., 2003).

Similarly, further connecting point involves developing a protocol for qualitative data retrieval based on results obtained in the initial quantitative phase to undergo an in-depth investigation of initial results by retrieving and analyzing more qualitative data at a second phase. As illustrated above, quantitative data with the qualitative phases was achieved at the intermediate stage in this research process while selecting the suitable participant (via purposive sampling technique) for the qualitative study. The third connecting or amalgamating point included developing questions for the interview guided by the initial PLS-SEM model and statistical inferences. The non-significant variables were used to design the interview (semi-structured) questions. Furthermore, the study mixed the quantitative and qualitative techniques during the design stage of the study. This is attained via the introduction of both the quantitative and qualitative research questions. The integration of both the Quan and qual results is the outcome of the entire study. Therefore, the rigorousness of this study supersedes only qualitative or quantitative alone. This study adopted the sequential explanatory research design proposed by Creswell (2003; 2007; 2013) and Hanson et al. (2005).

7.5 Contributions of The Study

Based on the study's findings, this section describes the theoretical and practical contributions to policy and practice. There are considerable impacts of the factors that influence the Intention to adopt IaaS BEL in the Nigerian HEIs. Thus, providing an avenue for addressing the poor infrastructure, insufficient education budget, storage problems, server failure, and the traditional web-server e-learning system problems. IaaS BEL infrastructure is expected to cushion the numerous issues of education in Nigerian HEIs as described above. Hence, envisioning that IaaS BEL adoption should be the focal point of developing countries, especially Nigeria when searching for solutions to improving access to effective and efficient e-learning experience for both students, staff, and other stakeholders and meeting their SDG goals. The following sections describe the related contributions.

7.5.1 Theoretical Contribution

This study's conceptual framework was based on the preceding empirical studies and theoretical gaps identified in the extant literature. The Intention to adopt IaaS/BEL model was explained for two theoretical lenses: TOE theory (Tornatzky & Fleischer, 1990) and DOI theory (Rogers, 1995). In view of this, the study fills the literature gap by introducing Government Support as a moderating variable to grasp better the relationship between Relative Advantage, Cost Savings, and Trust. Based on the research findings, this study has made several theoretical contributions in the research of the Technology, Organization, and Environment variables.

7.5.1.1 Additional Empirical Evidence of TOE and DOI theories

This study has presented a theoretical implication by providing additional empirical evidence in the TOE and DOI theory domain. The TOE theory posits that technology, organization, and Environment determines the adoption of innovation in an organization. Although, instead of focusing on the TOE theory alone, this study amalgamated the two theories where the TOE serves as the base theory and some variables of the DOI theory were incorporated because the TOE is a generic theory (Zhu & Kraemer, 2005). Hence, there is consistency between the TOE and DOI theory (Tornatzky & Fleischer, 1990). Also, other external variables like Security, Trust and Cost savings were further integrated into the theories to suit the study's objectives. The amalgamation of these theories broadens the understanding of TOE variables' vital role as determinants of the Intention to adopt IaaS/BEL. This reflected the proposed theories in illustrating ICT top management's Intention to adopt IaaS/BEL in the Northern region of Nigerian Public federal and state universities.

Furthermore, this study also tested the moderating effect of Government Support on Relative Advantage, Cost Savings and Trust's relationship due to inconsistent findings. According to Baron and Kenny (1986), “moderator variables are typically introduced when there is an unexpectedly weak or inconsistent relation between a predictor and a criterion variable” (p. 1178). The introduction of Government Support enhances the understanding of Relative Advantage, Cost Savings, and Trust among ICT directorates top managers in the universities located in the Northern region of Nigeria. The results indicated that Government Support positively influences Cost Savings and negative effect on Relative Advantage and Trust.

Furthermore, from the Technological perspectives, the findings indicated that Relative Advantage positively influence the Intention to adopt IaaS BEL in Nigeria. Whereas, Compatibility, Trust, and Security does not have a significant influence on the Intention to adopt IaaS BEL. The positive result of the Relative Advantage shows that the simplicity, scalability, data storage elasticity, among others is perceived as beneficial to the cloud users especially students and teachers (Sabi et al., 2018; Hiran & Henten, 2019, 2020). The Compatibility of IaaS BEL infrastructure with the existing e-learning system is perceived negatively, probably due to the data ownership, software integration, OS, among others. The Trust and Security of IaaS BEL is among the major concerns that deter its adoption (Almazroi et al., 2019, 2016; Ghazali et al., 2017; Tom et al., 2019).

In the same vein, the Organizational perspective results indicated that Cost Savings is positively correlated with the Intention to adopt IaaS BEL, while the Top Management Support is not a significant determinant of the Intention to adopt IaaS BEL. The Cost Savings expected (e.g., cost of deploying computers and latest software, reduction in energy cost, server, data, and environmental costs) from the adoption of IaaS BEL technology is perceived positively (Qasem et al., 2020; Tom, Virgiyanti, & Rozaini, 2019). In the same vein, top management's negative effect is the resistance, fear of losing job, and changes in the IT ways of operation resulted in the resistance to the adoption of

IaaS in the Nigerian HEIs. The perceived risks associated with the IaaS could also be another reason for the outcome.

Lastly, the Environmental perspective results indicated that Competitive Pressure does not positively influence the Intention to adopt IaaS, whereas Service Provider Support positively influences the Intention to adopt IaaS in Nigeria. This indicated that using the IaaS infrastructure for the non-significant influence of competitive pressure, and the subscribing universities would use Virtual Machines (VMs) for numerous students, especially for high demand computing like big data analytics and AI research. Hence, research and collaborated is more important than competition among universities. Similarly, the support of the IaaS service providers is perceived positively due to technical support, incentives, and discounts and the confidentiality of the university's data. IaaS provides virtual machines that allow clients to build complex network infrastructures. This approach not only reduces the cost of buying physical equipment for businesses it also eases the load of network administration because IT professionals are not required to continuously monitor the health of physical networks (Mozumder et al., 2017).

Furthermore, a theoretical framework was developed by amalgamating the TOE and DOI theories with some external variables and presenting the moderating role of Government Support in the relationship between the variables. The findings suggest Government Support's relevance as a strong predictor for improving cost savings influencing the Intention to adopt IaaS in Nigerian HEIs. Similarly, considering both the quantitative and qualitative (mix-method) approach, this study increases the understanding of the factors that influence the Intention to adopt IaaS. Numerous factors were examined, such as technological, organisational, and environmental factors. Therefore, this study has proven the positive relationship between the TOE and DOI theory. Another contribution of the study is that it incorporates Government Support as a moderating variable between Relative Advantage, Trust and Cost Savings. The demand of students seeking entrance into the Nigeria HEIs is alarming, with huge students not able to get admitted. In order to

lessen the pressure on both the HEIs and the Nigerian Government, CC technology is an alternative to cheap and reliable and sustainable e-learning.

7.5.2 Practical Contributions

In the viewpoint of practical contributions, this study provides recommendations for academics, students, teachers, researchers, policymakers, and practitioners in understanding the factors that influence the Intention to adopt IaaS in Nigerian HEIs. This study can be a practical reference in the Intention to adopt IaaS in developing countries in general and Nigeria, based on the Technological, Organizational and Environmental perspectives. By adopting IaaS infrastructure, Nigerian universities can minimize lecturers and students' tendency to miss lectures due to e-learning problems or server failure. The research and collaboration between schools, universities, and students would be easier with VMs.

Similarly, these results suggested that Relative Advantage, Cost Savings, Service Provider Support, and Government Support are crucial for measuring the Intention to adopt IaaS among ICT directorates, top managers. Therefore, these factors should be considered by policymakers (stakeholders) in implementing a cloud-based e-learning system. Non-significant factors like Competitive Pressure, Security, Trust, Top Management Support, and Compatibility are also crucial, as indicated in the qualitative research findings (refer to section 6.6 for more details).

In view of the discoursed quantitative and qualitative determinants, the empirical examination of the factors that influence the Intention to adopt IaaS BEL will serve as a recommendation to policymakers, Nigerian Universities Commission (NUC), National Information Technology Development Agency (NITDA), and the Nigerian Government in effectively implementing and providing education "as-a-Service" to all citizens.

However, with the recent happenings of the Coronavirus (COVID-19) pandemic that ravaged the whole world, its effect has brought countries to their knees, disrupts businesses as well as education (United Nations Educational Scientific and Cultural Organisation [UNESCO], 2020). This pandemic will significantly negatively impact developing countries' economies, especially from the education perspective. Coronavirus has deprived half of the world's students of education (UNESCO, 2020). Nonetheless, due to the current Coronavirus, the Nigerian ministry of education, in a circular, "confirms that all schools shall remain closed as we closely monitor development on the containment of COVID-19" (Federal Ministry Of Education [FME], 2020). This strongly shows the need for an effective and sustainable solution, hence, justifying the reason for conducting this research (see Appendix S, for the circular by the Nigerian Federal Ministry of Education).

Furthermore, the states in Nigeria currently embarking on e-learning during the COVID-19 pandemic are Ondo, Ogun, Edo, Kaduna and Lagos State (FME, 2020). Due to the lack of readily available e-learning systems, some states use radio Frequency Modulation (FM) as stated by the Nigerian Federal Ministry of Education. However, FM learning is only for Primary and Secondary schools (FME, 2020). However, the FME is closing all tertiary, secondary, and primary schools nation-wide over the coronavirus outbreak in Nigeria (Adedigba, 2020; FME, 2020). This further shows the need for the proposed IaaS BEL solution to the Nigerian HEIs, where e-learning will be readily available at a subsidised rate. Therefore, based on the quantitative and qualitative research findings, the research

proposed some recommendations for adopting the IaaSBEL in the HEIs. For more details on the recommendations, refer to Appendix Q, for more details.

7.6 Limitations and Directions for Future Research

This study provides a direction for future studies regarding IaaSBEL adoption; nonetheless, there are some limitations. Even though the study has shown significant support for many hypothesised relationships between the exogenous and endogenous variables, the findings have shown some limitations. Firstly, the study utilised the cross-sectional design, which does not allow causal inferences from the population. Therefore, a longitudinal design is suggested for future study, to measure the different points in time to confirm the findings of the study.

Secondly, the study adopts a probability sampling (disproportionate stratified random sampling and systematic random sampling), while a proportionate sampling could be used in a future study to get an equal number of representations in the data collection phase. Thirdly, the research model explained that 41.7% of the total variance in the Intention to adopt IaaSBEL, other latent variables could significantly explain the Intention variance to adopt IaaSBEL. Thus, the remaining 58.3% of the variance could be explained by other factors. Therefore, future research should consider other factors such as Culture, Work Ethics, Interoperability, Staff and student training, corruption, awareness, reliability, data location issues, hacking, and data safety, as shown in Table 6.4.

Fourthly, in the sequential exploratory research design, only four (4) informants were interviewed. Future research should have more informants to have a rigorous analysis and

more insights into the factors that influence adopt IaaS/BEL. Fifthly, this study is centred on the TOE and the DOI theories, with TOE as the base theory with which the DOI and other external variables are placed. However, future studies may incorporate additional variables such as Service Level Agreement (SLA), Collaboration and Sharing, Quality of Service (QoS), and data ownership. In the same vein, different technology adoption theories could be used to assess their suitability in predicting CC determinants for e-learning (IaaS/BEL) adoption in developing countries in general and Nigeria in specific.

Sixthly, based on the TOE theory, this study's finding shows that Relative Advantage is an essential element in influencing ICT directorates acceptance of IaaS/BEL. Also, because this study is cross-sectional, an accurate result might not be produced when investigating these factors. Therefore, performing a longitudinal study in future research could increase the accuracy of the result when investigating how factors like Government support could influence the Intention to adopt IaaS/BEL. The study only considers Government Support as moderator, and other studies should look at the factor such as Human Resource and Security as the moderator in the Intention to adopt a Cloud Computing model.

7.7 Conclusion

In conclusion, the present study has provided additional evidence to the body of knowledge concerning the moderating role of Government Support on the relationship between Relative Advantage, Cost Savings, and Trust. Results from the approaches, quantitative and qualitative findings support the main theoretical postulations. The study has achieved the research objectives. Thus, all the eleven (11) hypotheses were tested, in which six (6) were supported and five (5) were not supported. Also, an interview with four informants contributed to a considerable measure by expressing their expert opinion on the challenges and came up with appropriate solutions that will support the successful Intention to adopt IaaS/BEL in Nigeria. While there have been limited studies investigating

the factors that influence the Intention to adopt IaaS/BEL, the present study addressed the theoretical gap by incorporating Government Support as a significant moderating variable.

In addition to the theoretical contributions, this study's results provide some important practical implications to NUC and other education stakeholders. Also, on the limitations of the study, numerous future research directions were drawn. In conclusion, the present study has added valuable theoretical and practical ramifications to the growing body of knowledge, particularly the Higher Education Institutions.



References

- Abba, A., & Bakon, K. A. (2016). An Overview of Cloud Computing Platform For E-Learning In Institutions Of Higher Learning In Nigeria. *International Journal of Information System and Engineering*, 4(1), 48–54. <https://doi.org/DOI:10.24924/ijise/2016.11/v4.iss1/48.54>
- Abdul-Lateef, A. O., & Sofoluwe, A. O. (2018). Combating corruption in Nigerian Universities through Treasury Single Account policy. *Research Journal of Business and Economic Management*. <https://doi.org/https://doi.org/10.31248/RJBEM2018.017>
- Abdullahi, D. A. (2019). *Information and Communicatioin Technology Adoption and Staff Performance in Public Tertiary Institutions in Bauchi State, Nigeria*. Universiti Utara Malaysia.
- Aboderin, O. S. (2015). The Challenges and Prospects of E-learning in National Open University of Nigeria. *Ournal of Education and Learning (EduLearn)*, 9(3), 207–216. [https://books.google.com/books?hl=en&lr=&id=qzOHCgAAQBAJ&oi=fnd&pg=PA207&dq=Challenges+and+proprospects+of+elearning+at+the+national+open+university+of+nigeria+\(Aboderin,+2015\)&ots=rL6WJbUui8&sig=ZhoMGgNxj2YGNFHGNhSn-_32dGI](https://books.google.com/books?hl=en&lr=&id=qzOHCgAAQBAJ&oi=fnd&pg=PA207&dq=Challenges+and+proprospects+of+elearning+at+the+national+open+university+of+nigeria+(Aboderin,+2015)&ots=rL6WJbUui8&sig=ZhoMGgNxj2YGNFHGNhSn-_32dGI)
- Abur, C. C. (2019). Dynamics of Cloud Computing in Nigeria: Strategic Options for Sustainable Higher Educational Institution. *Direct Research Journal of Social Science and Educational Studies*, 65–70.
- Adam, M., Elmutalib, E. A., & Mohamed, B. (2019). A Quantitative Study of the Factors Affect Cloud Computing Adoption in Higher Education Institutions: A Case Study of Somali Higher Education Institutions. *European Journal of Computer Science and Information Technology*, 7(4), 16–39.
- Adedigba, A. (2017). *2018 Budget: Buhari allocates 7% to education - Premium Times Nigeria*. <https://www.premiumtimesng.com/news/top-news/248663-2018-budget-buhari-allocates-7-education.html>
- Adedigba, A. (2020, March 19). *Coronavirus: Nigerian govt orders closure of schools nationwide*. <https://www.premiumtimesng.com/news/top-news/382806-coronavirus-nigerian-govt-orders-closure-of-schools-nationwide.html>
- Adegoke, Y. (2020, March 30). *Coronavirus: Africa faces recession, debt problems, commodity hit — Quartz Africa*. <https://qz.com/africa/1828110/coronavirus-africa-faces-recession-debt-problems-commodity-hit/>
- Adeoye, I. A., Adanikin, A. F., & Adanikin, A. (2020). COVID-19 and E-Learning: Nigeria Tertiary Education System Experience. *International Journal of Research and Innovation in Applied Science (IJRIAS)*, V(V), 28–31.

- Adeyemi, T. O. (2011). Financing of education in Nigeria: An analytical review. *American Journal of Social and Management Sciences*, 3(2), 295–303. <https://doi.org/10.5251/ajsms.2011.2.3.295.303>
- African Development Bank. (2020). *Nigeria Economic Outlook | African Development Bank - Building today, a better Africa tomorrow*. <https://www.afdb.org/en/countries-west-africa-nigeria/nigeria-economic-outlook>
- African Economic Outlook. (n.d.). *Nigeria – African Economic Outlook*. Retrieved April 6, 2020, from <https://www.africaneconomicoutlook.org/nigeria/>
- Aggarwal, M., Rinkey, & Gupta, P. (2017). Impact of Cloud Computing in E-Learning: A Study. *International Journal on Recent and Innovation Trends in Computing and Communication*, 5(5), 912–922.
- Agostinho, S. (2005). Naturalistic inquiry in e-learning research. *International Journal of Qualitative Methods*, 4(1), 13–26.
- Ahmad, T., & Waheed, M. (2015). Cloud Computing Adoption Issues and Applications in Developing Countries: A Qualitative Approach. *Int. Arab. J. e Technol.*, 4(2), 84–93.
- Ahmed, F. F. (2015). Comparative Analysis for Cloud Based e-learning. *Procedia Computer Science*, 65, 368–376. <https://doi.org/10.1016/J.PROCS.2015.09.098>
- Aina, J. K. (2013). Effective teaching and learning in science education through Information and Communication Technology [ICT]. *IOSR Journal of Research and Method in Education*, 2(5), 43–47.
- Ajebomogun, F. O., Okunlaya, R. O. A., & Alawiye, M. K. (2017). Analytical study of E-learning resources in national open University of Nigeria. *Education and Information Technologies*, 22(5), 2403–2415. <https://doi.org/10.1007/s10639-016-9548-z>
- Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In *Action Control* (pp. 11–39). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-69746-3_2
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Ajzen, I., & Fishbein, M. (1975). *Belief, attitude, intention, and behavior : an introduction to theory and research* (illustrate). Addison-Wesley Pub. Co. https://books.google.com.my/books/about/Belief_attitude_intention_and_behavior.html?id=8o0QAQAAIAAJ&redir_esc=y
- Akande, A. O., & Van Belle, J.-P. (2014). A proposed framework to assess and increase the cloud computing readiness of financial institutions in South Africa. *2014 5th International Conference - Confluence The Next Generation Information Technology Summit (Confluence)*, 46–52. <https://doi.org/10.1109/CONFLUENCE.2014.6949250>

- Akin, O. C., Matthew, F. T., & Comfort, D. (2015). The Impact and Challenges of Cloud Computing Adoption on Public Universities in Southwestern Nigeria. *International Journal of Advanced Computer Science and Applications*, 5(8), 13–19.
- Akinsola, O., Herselman, M., & Jacobs, S. (2005). ICT provision to disadvantaged urban communities: A study in South Africa and Nigeria. *International Journal of Education and Development Using ICT*, 1(3), 19–41.
- Al-Badi, A., Tarhini, A., & Al-Kaaf, W. (2017). Financial Incentives for Adopting Cloud Computing in Higher Educational Institutions. *Asian Social Science*, 13(4), 162. <https://doi.org/10.5539/ass.v13n4p162>
- Al Isma'ili, S., Li, M., Shen, J., & He, Q. (2016). Cloud computing adoption determinants: an analysis of Australian SMEs. *Faculty of Engineering and Information Sciences - Papers: Part A*. <http://ro.uow.edu.au/eispapers/5826>
- Alavi, M., & Leidner, D. E. (2001). Research Commentary: Technology-Mediated Learning - A Call for Greater Depth and Breadth of Research. *Information Systems Research*, 12(1), 1–10. <https://doi.org/10.1287/isre.12.1.1.9720>
- AlGhamdi, R., Drew, S., & Alkhalaf, S. (2012). Government Initiatives: The Missing Key for E-commerce Growth in KSA. *World Academy of Science, Engineering and Technology*, 77, 772–775. <http://arxiv.org/abs/1211.2398>
- AlGhamdi, R., Nguyen, A., Nguyen, J., & Drew, S. (2012). Factors influencing E-commerce Adoption by Retailers in Saudi Arabia. *Int. J. Electron. Commer. Stud*, 3(1), 83–100. <http://arxiv.org/abs/1211.2799>
- Alhammadi, A., Stanier, C., & Eardley, A. (2015). The Determinants of Cloud Computing Adoption in Saudi Arabia. *Computer Science & Information Technology (CS & IT)*, 55–67. <https://doi.org/DOI:10.5121/csit.2015.51406>
- Alharbi, F., Atkins, A., & Stanier, C. (2017). Cloud computing adoption in healthcare organisations: a qualitative study in Saudi Arabia. *Transactions on Large-Scale Data-and Knowledge-Centered Systems XXXV*, 96–131.
- Ali, O., Soar, J., & Yong, J. (2016). An investigation of the challenges and issues influencing the adoption of cloud computing in Australian regional municipal governments. *Journal of Information Security and Applications*, 27, 19–34.
- Ali, S., Uppal, M. A., & Gulliver, S. R. (2017). A conceptual framework highlighting e-learning implementation barriers. *Information Technology & People*, 1–39. <https://doi.org/10.1108/ITP-10-2016-0246>
- Alkhatir, N., Walters, R., & Wills, G. (2018). An empirical study of factors influencing cloud adoption among private sector organisations. *Telematics and Informatics*, 35, 35–84. <https://doi.org/http://dx.doi.org/10.1016/j.tele.2017.09.017>
- Alkhatir, N., Wills, G., & Walters, R. (2014). Factors influencing an organisation's intention to adopt cloud computing in Saudi Arabia. *2014 IEEE 6th International Conference on Cloud Computing Technology and Science*, 1040–1044.

- Almazroi, A. A., Shen, H., & Mohammed, F. (2019). The Impact of Trust on the Adoption of Cloud Computing Services by University Students. *International Conference of Reliable Information and Communication Technology*, 902–911.
- Almazroi, A. A., Shen, H., Teoh, K.-K., & Babar, M. A. (2016). Cloud for e-Learning: Determinants of Its Adoption by University Students in a Developing Country. *2016 IEEE 13th International Conference on E-Business Engineering (ICEBE)*, 71–78. <https://doi.org/10.1109/ICEBE.2016.022>
- Almubarak, S. S. (2017). Factors influencing the adoption of cloud computing by Saudi university hospitals. *Computing*, 8(1).
- Alonso, F., Lopez, G., Manrique, D., & Vines, J. M. (2005). An instructional model for web-based e-learning education with a blended learning process approach. *British Journal of Educational Technology*, 36(2), 217–235. <https://doi.org/10.1111/j.1467-8535.2005.00454.x>
- Alreck, P. L., & Settle, R. B. (1995). *The survey research handbook* (2nd ed.). Irwin Professional Publishing. https://trove.nla.gov.au/work/11700610?q&sort=holdings+desc&_=1535472719144&versionId=45626555
- Alshaher, A. A.-F. (2013). The McKinsey 7S model framework for e-learning system readiness assessment. *International Journal of Advances in Engineering & Technology*, 6(5), 1948.
- Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England. *Journal of Enterprise Information Management*, 26(3), 250–275. <https://doi.org/10.1108/17410391311325225>
- Alshwaier, A., Youssef, A., & Emam, A. (2012). A new trend for e-learning in KSA using educational clouds. *Advanced Computing*, 3(1), 81.
- Alzougool, B., & Kurnia, S. (2010). Towards a better understanding of SMEs' perception of electronic commerce technology adoption. *Interdisciplinary Journal of Contemporary Research in Business*, 2(3), 9.
- Amakvitaa. (2017). *JAMB Statistics 2017 : List Of All Universities And total number of Applicants – NGstudents.com*. <https://ngstudents.com/2017/08/31/jamb-statistics-2017-list-of-all-universities-and-total-number-of-applicants/>
- Amoo, A. (2019, October 11). *Nigeria allocates 6.7% of 2020 budget to education ministry | EduCeleb*. <https://educeleb.com/nigerian-2020-budget-education-ministry/>
- Amron, M. T., Ibrahim, R., & Chuprat, S. (2017). A Review on Cloud Computing Acceptance Factors. *Procedia Computer Science*, 124, 639–646. <https://doi.org/10.1016/J.PROCS.2017.12.200>
- Anaekwe, M., & Nnaka, C. (2017). Challenges of Teaching and Learning Science at a Distance in National Open University of Nigeri. In S. P. Rotterdam (Ed.), *Maringe F., Ojo E. (eds) Sustainable Transformation in African Higher Education* (pp. 189–

- 201). <https://doi.org/DOI> https://doi.org/10.1007/978-94-6300-902-7_14
- Anagwo, E. C., Aminigo, I. M., & Nwaokugha, D. O. (2019). Early childhood care and education in Nigeria: Prospects and challenges. *Multi-Disciplinary Journal of Research and Development Perspectives (MJRDP)*. December, 8(2), 56–76.
- Aparicio, M., Bacao, F., & Oliveira, T. (2016). An e-Learning Theoretical Framework. *Journal of Educational Technology & Society*, 19(1), 292–307. <https://doi.org/10.2307/jeductechsoci.19.1.292>
- Aremu, D. R., Jacob, B. P., & Ogedebe, P. M. (2015). Cloud Based E-Learning Model for Open and Distance Learning in Nigerian Universities. *International Journal of Science and Research (IJSR)*, 4(3), 1998–2006.
- Arinto, P. (2016). Issues and challenges in open and distance e-learning: Perspectives from the Philippines. *International Review of Research in Open and Distance Learning*, 17(2), 162–180. <https://doi.org/10.19173/irrodl.v17i2.1913>
- Arinze, B., & Anandarajan, M. (2013). Adapting cloud computing service models to subscriber requirements. *6th International Symposium on Wireless Personal Multimedia Communications (WPMC)*, 1–5. <https://www.infona.pl/resource/bwmeta1.element.ieee-art-000006618623>
- Ariwa, K. C., & Ariwa, E. (2017). Engineering Sustainability and Cloud Computing in Higher Education-a case study Model in Nigeria. *International Journal of Computing and Network Technology*, 5(02), 65–75.
- Armstrong, S. J., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 14(3), 396–402. http://repository.upenn.edu/marketing_papershttp://repository.upenn.edu/marketing_papers/17
- Asiyai, R. I. (2013). Challenges of quality in higher education in Nigeria in the 21st century. *International Journal of Educational Planning & Administration*, 3(2), 159–172.
- Atcharyachanvanich, K., Siripujaka, N., & Jaiwong, N. (2014). What Makes university students use cloud-based e-learning?: Case study of KMITL students. *International Conference on Information Society (i-Society 2014)*, 112–116. <https://doi.org/10.1109/i-Society.2014.7009022>
- Atkinson, P. (1992). *Understanding ethnographic texts*.
- Avinetworks. (2021). *Technical Glossary | Technical Definitions Avi Networks*. <https://avinetworks.com/glossary/>
- Aworanti, O. A. (2016). Information and Communications Technology (ICT) in Nigeria Educational Assessment System--Emerging Challenges. *Universal Journal of Educational Research*, 4(6), 1351–1356.
- AWS. (2018). *AWS Case Study: IE Business School*. <https://aws.amazon.com/solutions/case-studies/ie-business-school/>

- Bacon, D. R., Sauer, P. L., & Young, M. (1995). Composite Reliability in Structural Equations Modeling. *Educational and Psychological Measurement*, 55(3), 394–406. <https://doi.org/10.1177/0013164495055003003>
- Bagozzi, R. P., & Youjae, Y. (1988). On the Evaluation of Structural Equation Models. *Journal of the Academy of Marketing Science*, 16(1), 74–94. <https://doi.org/10.1177/009207038801600107>
- Bagozzi, Richard P, Yi, Y., & Phillips, L. W. (1991). Assessing Construct Validity in Organizational Research. *Administrative Science Quarterly*, 36(3), 421–458. <https://www.jstor.org/stable/pdf/2393203.pdf?refreqid=excelsior%3Ae526201d8ee9b91ec524193d42197ea7>
- Baker, J. (2012). The Technology–Organization–Environment Framework. In *Information System Theory* (pp. 231–245). Springer, New York, NY. https://doi.org/10.1007/978-1-4419-6108-2_12
- Baker, S. E., Edwards, R., & Doidge, M. (2012). *How many qualitative interviews is enough?: Expert voices and early career reflections on sampling and cases in qualitative research*.
- Barnett, V., & Lewis, T. (1978). *Outliers in Statistical Data* (3rd editio).
- Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182. <http://psycnet.apa.org/fulltext/1987-13085-001.html>
- Bartholomae, F. (2018). Cybercrime and cloud computing. A game theoretic network model. *Managerial and Decision Economics*, 39(3), 297–305.
- BBC. (2012). *Deadly attack on Nigeria's Bayero university in Kano - BBC News*. <https://www.bbc.com/news/world-africa-17886143>
- Bernard, H. R., Wutich, A., & Ryan, G. W. (2016). *Analyzing qualitative data: Systematic approaches*. SAGE publications.
- Bhalalusesa, R., Lukwaro, E. E. A., & Clemence, M. (2013). Challenges of Using E-learning Management Systems faced by the Academic Staff in Distance Based Institutions from Developing Countries: A Case Study of thw open university of Tanzania. *Journal of The Open University of Tanzania*, 14, 89–110. http://www.academia.edu/download/31589904/huria_journal_vol_14_-_final_2013.pdf#page=98
- Bhatiasevi, V., & Naglis, M. (2015). Investigating the structural relationship for the determinants of cloud computing adoption in education. *Education and Information Technologies*, 21(5), 1197–1223.
- Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, 58(2), 843–855. <https://doi.org/10.1016/J.COMPEDU.2011.10.010>

- Bijttebier, P., Delva, D., Vanoost, S., Bobbaers, H., Lauwers, P., & Vertommen, H. (2000). Reliability and Validity of the Critical Care Family Needs Inventory in a Dutch-speaking Belgian sample. *Heart & Lung, 29*(4), 278–286. <https://doi.org/10.1067/mhl.2000.107918>
- Bisanda, E. T. (2009). Opportunities for knowledge transfer through open and distance learning in Sub-Saharan Africa. *Proceedings of the 2nd ACDE Conference and General Assembly Lagos, Nigeria*.
- Blomqvist, K. (1997). The many faces of trust. *Scandinavian Journal of Management, 13*(3), 271–286. [https://doi.org/10.1016/S0956-5221\(97\)84644-1](https://doi.org/10.1016/S0956-5221(97)84644-1)
- Bloor, M., Frankland, J., Thomas, M., & Robson, K. (2001). *Focus groups in social research*. Sage Publications.
- Blythe, J. (2005). *Essentials of Marketing* (Third Edit). Prince Hall.
- Bonthala, S. (2016). *The Various Modes of E-learning for Corporate Training / eLearning Blogs*. <https://blog.commlabindia.com/elearning-design/models-of-elearning-for-corporate-training>
- Borg, W., & Gall, M. (1989). The methods and tools of observational research. *Educational Research: An Introduction, 473–530*. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=the+methods+and+tools+of+observational+research.+educational+research%3A+an+introduction+Borg+and+Gall+1989&btnG=
- Brannen, J. (2017). *Mixing Methods: Qualitative and Quantitative Research*. Routledge. <https://books.google.com.my/books?id=YSIuDwAAQBAJ>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.
- Brodkin, J. (2018). *Gartner: Seven cloud-computing security risks | InfoWorld*. <http://www.infoworld.com/article/2652198/security/gartner--seven-cloud-computing-security-risks.html>
- Brown, J. S., & Duguid, P. (2017). *The social life of information: Updated, with a New Preface* (revised). Harvard Business Review Press. https://books.google.com.my/books?id=dynuDAAAQBAJ&dq=information+technology+helps+countries+develop+and+update+standards+of+living&lr=&source=gbs_navlinks_s
- Bryman, A., & Bell, E. (2015). *Business research methods* (illustrate). Oxford University Press. https://books.google.com.my/books?id=l7u6BwAAQBAJ&dq=Business+Research+Methods+Bryman,+%26+Bell,+2015&lr=&source=gbs_navlinks_s
- Buyya, R., Yeo, C. S., & Venugopal, S. (2008). Market-Oriented Cloud Computing: Vision, Hype, and Reality for Delivering IT Services as Computing Utilities. *2008 10th IEEE International Conference on High Performance Computing and Communications, 5–13*. <https://doi.org/10.1109/HPCC.2008.172>

- Buyya, R., Yeo, C. S., Venugopal, S., Broberg, J., & Brandic, I. (2009). Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility. *Future Generation Computer Systems*, 25(6), 599–616. <https://doi.org/10.1016/j.future.2008.12.001>
- C. R. Kothari. (2004). *Research Methodology: Methods and Techniques* (illustrated). New Age International. <https://books.google.com.my/books?id=8c6gkbKi-F4C&dq=Research+Methodology:+Methods+and+Technique+2nd+edition+Kothari,+2004+%2Bpdf&hl=en&sa=X&ved=0ahUKEwi4zd2QyZPbAhXINo8KHQunDR4Q6AEIKDAA>
- Cavana, R. Y., Delahaye, B. L., & Sekaran, U. (2001). *Applied business research : qualitative and quantitative methods* (illustrated). John Wiley & Sons. <https://books.google.com.my/books?id=sx1LAAAACAAJ&dq=applied+business+research:+qualitative+and+quantitative+methods&hl=en&sa=X&ved=0ahUKEwjc m7m7lunbAhWbdn0KHfDRAQ6AEIKTAA>
- Chandrasekaran, K. (2014). *Essentials of cloud computing* (illustrated). CRC Press. https://books.google.com.my/books?id=7JvNBQAAQBAJ&dq=pros+and+cons+of+private+cloud&source=gbs_navlinks_s
- Chang, I.-C., Hwang, H.-G., Yen, D. C., & Lian, J. W. (2006). Critical factors for adopting PACS in Taiwan: Views of radiology department directors. *Decision Support Systems*, 42(2), 1042–1053. <https://doi.org/10.1016/J.DSS.2005.08.007>
- Chang, S.-J., van Witteloostuijn, A., & Eden, L. (2010). From the Editors: Common method variance in international business research. *Journal of International Business Studies*, 41(2), 178–184. <https://doi.org/10.1057/jibs.2009.88>
- Channy, D. Y., & Ogunniran, M. O. (2019). A Comparative Analysis of the Role of International Organizations in Financing Higher Education System: A Case Study of Nigeria and Cambodia. *US-China Education Review*, 9(1), 1–17.
- Chatterjee, S., & Yilmaz, M. (1992). A Review of Regression Diagnostics for Behavioral Research. *Applied Psychological Measurement*, 16(3), 209–227. <https://doi.org/10.1177/014662169201600301>
- Chau, P. Y. K., & Tam, K. Y. (1997). Factors Affecting the Adoption of Open Systems: An Exploratory Study. *MIS Quarterly*, 21(1), 1–24. <https://www.jstor.org/stable/pdf/249740.pdf>
- Chauhan, S., & Jaiswal, M. (2015). Exploring factors affecting service quality of ERP on cloud: A revelatory case study. *IJBIS*, 19(1), 87–102.
- Chen, L.-D., & Tan, J. (2004). Technology Adaptation in E-commerce:: Key Determinants of Virtual Stores Acceptance. *European Management Journal*, 22(1), 74–86. <https://doi.org/10.1016/J.EMJ.2003.11.014>
- Chen, S.-L., Chen, Y.-Y., Wang, H.-P., & Hsu, C. (2014). ICISLM: Design of an Integrated Cloud Information System for Logistic Management Based on Web Server Virtualization. In *Intelligent Data analysis and its Applications, Volume I*

(pp. 79–86). Springer.

- Chin, W. W. (1998). The Partial Least Squares Approach to Structural Equation Modeling. In *Psychology Press*.
https://www.researchgate.net/publication/311766005_The_Partial_Least_Squares_Approach_to_Structural_Equation_Modeling
- Chin, W. W. (2010). How to write up and report PLS analyses. In *Handbook of partial least squares* (pp. 655–690). Springer.
- Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research*, *14*(2), 189–217.
- Chiu, C.-M., & Wang, E. T. G. (2008). Understanding Web-based learning continuance intention: The role of subjective task value. *Information & Management*, *45*(3), 194–201. <https://doi.org/10.1016/J.IM.2008.02.003>
- Chiu, C.-Y., Chen, S., & Chen, C.-L. (2017). An Integrated Perspective of TOE Framework and Innovation Diffusion in Broadband Mobile Applications Adoption by Enterprises. *International Journal of Management, Economics and Social Sciences*, *6*(1), 14–39. <http://ijmess.com/volumes/volume-VI-2017/issue-I-03-2017/full-2.pdf>
- Chong, A. Y., Ooi, K., Lin, B., & Tan, B. (2010). Online banking adoption: an empirical analysis. *International Journal of Bank Marketing*.
- Chrysikos, A., McDowell, J., & Ward, R. (2016). Cloud Services in UK Higher Education: A Feasibility Study for Providing IaaS in the Computing and Library Services of a UK University. In *Handbook of Research on Cloud-Based STEM Education for Improved Learning Outcomes* (pp. 377–402). <https://doi.org/DOI:10.4018/978-1-4666-9924-3.ch023>
- Chuang, S.-M., Chang, K.-E., & Sung, Y.-T. (2011). The cost effective structure for designing hybrid cloud based enterprise E-learning platform. *2011 IEEE International Conference on Cloud Computing and Intelligence Systems*, 523–525. <https://doi.org/10.1109/CCIS.2011.6045123>
- Churchill, G. A. J. (1979). A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research*, *16*(1), 64. <https://doi.org/10.2307/3150876>
- Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, *16*(1), 64–73.
- Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *The Psychologist*, *26*(2), 120–123.
- Cloudflare. (2020). *What Is a Public Cloud? | Public vs. Private Cloud | Cloudflare*. <https://www.cloudflare.com/learning/cloud/what-is-a-public-cloud/>

- Cohen, D., & Crabtree, B. (2006). *Qualitative Research Guidelines Project*.
<http://www.qualres.org/>
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (Second Edi). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Collins, P. D., Hage, J., & Hull, F. M. (1988). Organizational And Technological Predictors Of Change In Automaticity. *Academy of Management Journal*, 31(3), 512–543. <https://doi.org/10.2307/256458>
- Conner, M., & Armitage, C. J. (1998). Extending the Theory of Planned Behavior: A Review and Avenues for Further Research. *Journal of Applied Social Psychology*, 28(15), 1429–1464. <https://doi.org/10.1111/j.1559-1816.1998.tb01685.x>
- Creswell, J. (2013). Steps in Conducting a Scholarly Mixed Methods Study. *DBER Speaker Series*, 48, 1–54. <http://digitalcommons.unl.edu/dberspeakers/48>
- Creswell, J. W. (2003). *RESEARCH DESIGN Qualitative, Quantitative. and Mixed Methods Approaches*.
- Creswell, J. W. (2007). Five qualitative approaches to inquiry. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*, 2, 53–80.
- Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (4th Editio). Pearson Education Limited. <http://basu.nahad.ir/uploads/creswell.pdf>
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- Creswell, J. W. (2014). *Research design : qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
- Creswell, J. W., & Creswell, D. J. (2007). *Qualitative Inquiry & Research Design Choosing Among Five Approaches* (Second Edi). SAGE Publications.
- Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Fifth Edit).
- Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed methods research designs. *Handbook of Mixed Methods in Social and Behavioral Research*, 209, 240.
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches* (4th Editio). Sage publications.
- Crocker, L., & Algina, J. (1987). Introduction to Classical and Modern Test Theory. *Journal of Educational Measuremen*, 24(4), 371–377. <http://www.jstor.org/stable/1434888>

- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *American Psychological Association, Inc.*, 1, 16–29. <https://psycnet.apa.org/buy/1996-03170-002>
- Da Silva, M. M. (2016). *Cable and wireless networks: Theory and practice*. CRC Press.
- Dahiru, A. A., Bass, J. M., & Allison, I. K. (2014). Cloud computing adoption in sub-Saharan Africa: An analysis using institutions and capabilities. *International Conference on Information Society (i-Society 2014)*, 98–103.
- Dahnil, M. I., Marzuki, K. M., Langgat, J., & Fabeil, N. F. (2014). Factors Influencing SMEs Adoption of Social Media Marketing. *Procedia - Social and Behavioral Sciences*, 148, 119–126. <https://doi.org/10.1016/J.SBSPRO.2014.07.025>
- Damanpour, F. (1992). Organizational Size and Innovation. *Organization Studies*, 13(3), 375–402. <https://doi.org/10.1177/017084069201300304>
- Damanpour, F. (1996). Organizational Complexity and Innovation: Developing and Testing Multiple Contingency Models. *Management Science*, 42(5), 693–716. <https://doi.org/10.1287/mnsc.42.5.693>
- Daniel, B. K., & Harland, T. (2017). *Higher Education Research Methodology A Step-by-Step Guide to the Research Process*. Routledge. https://books.google.com.my/books?id=rzZDDwAAQBAJ&dq=research+process+in+research+methodology&source=gbs_navlinks_s
- Darking, M. (2004). Integrating on-line learning technologies into higher education [the London School of Economics and Political Science (LSE)]. In *PhD thesis, The London School of Economics and Political Science (LSE)*. http://etheses.lse.ac.uk/259/?from_serp=1
- Das, S., & Dayal, M. (2016). Exploring determinants of cloud-based enterprise resource planning (ERP) selection and adoption: A qualitative study in the Indian education sector. *Journal of Information Technology Case and Application Research*, 18(1), 11–36.
- Davis, F. D. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies*, 38(3), 475–487. <https://doi.org/10.1006/IMMS.1993.1022>
- Davis, F. D., Bagozzi, R. P., Warshaw, P. R., Richard, B. . . , & Paul, R. W. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 35(8), 982–1003. <http://home.business.utah.edu/actme/7410/DavisBagozzi.pdf>
- DeFranzo, S. E. (2012). *Advantages and Disadvantages of Surveys*. <https://www.snapsurveys.com/blog/advantages-disadvantages-surveys/>
- Deliversky, J. (2016). Preventing corruption in the education system. *Journal Of Educational And Instructional Studies*, 6(1), 1–6.

- Delone, W., & McLean, E. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19(4), 9–30. <https://doi.org/10.1080/07421222.2003.11045748>
- Denzin, N. K., & Lincoln, Y. S. (2007). The Sage Handbook of Qualitative Research. In *AIBR: Revista de Antropología Iberoamericana* (5th Editio, Vol. 2, Issue 2). Asociación de Antropólogos Iberoamericanos en Red (AIBR).
- Dhull, K. (2013). Cloud computing based e- learning system to provide easy access of e- contents and web resources for educational institutes in developing countries. *International Journal Of Informative And Futuristic Research (IJIFR)*, 1(2), 75–83.
- Dibra, M. (2015). Rogers Theory on Diffusion of Innovation - The Most Appropriate Theoretical Model in the Study of Factors Influencing the Integration of Sustainability in Tourism Businesses. *World Conference on Technology, Innovation and Entrepreneurship*, 195, 1453–1462. <https://doi.org/doi:10.1016/j.sbspro.2015.06.443>
- Dillenburger, K., McKerr, L., Jordan, J.-A., & Keenan, M. (2016). Staff training in autism: The one-eyed wo/man.... *International Journal of Environmental Research and Public Health*, 13(7), 716.
- Dillon, T., Wu, C., & Chang, E. (2010). Cloud Computing: Issues and Challenges. *2010 24th IEEE International Conference on Advanced Information Networking and Applications*, 27–33. <https://doi.org/10.1109/AINA.2010.187>
- Donnelly, C. (2017). *Staffordshire University goes all-in on Microsoft Azure for digital transformation*. <https://www.computerweekly.com/feature/Staffordshire-University-on-going-all-in-on-Microsoft-Azure-for-digital-transformation>
- Doyle, S. (2007). Member checking with older women: A framework for negotiating meaning. *Health Care for Women International*, 28(10), 888–908.
- Duarte, P. A. O., & Raposo, M. L. B. (2010). A PLS model to study brand preference: An application to the mobile phone market. In *Handbook of partial least squares* (pp. 449–485). Springer.
- Dwivedi, Y. K., Papazafeiropoulou, A., Brinkman, W.-P., & Lal, B. (2010). Examining the influence of service quality and secondary influence on the behavioural intention to change internet service provider. *Information Systems Frontiers*, 12(2), 207–217. <https://doi.org/10.1007/s10796-008-9074-7>
- Edokpolor, J. E., & Egbri, J. N. (2017). Business education in Nigeria for value re-orientation: A strategic approach for poverty alleviation and national development. *Journal of Educational Research and Review*, 5(3), 41–48.
- Edomwonyi, J., & Osarumwense, R. (2017). Business education in Nigeria: Issues, challenges and way forward for national development. *Journal of Collaborative Research and Development (JCRD)*, 5(1), 1–25.
- Ekundayo, M. S. (2013). *The use of activity theory to explain the complexities*

surrounding the use of ICT in overcrowded university classrooms: the case of Nigeria. Auckland University of Technology.

- Ekwonwune, E. N., & Oparah, C. C. (2020). A Multimedia Based Virtual Learning System: A Panacea for Nigerian Tertiary Institutions. *Circuits and Systems*, 11(01), 1.
- El-Mhouti, A., Erradi, M., & Nasseh, A. (2017). Using cloud computing services in e-learning process: Benefits and challenges. *Education and Information Technologies*, 1–17. <https://doi.org/10.1007/s10639-017-9642-x>
- El Khatib, M. M., & Opulencia, M. J. C. (2015). The effects of cloud computing (IaaS) on E-libraries in United Arab Emirates. *Procedia Economics and Finance*, 23, 1354–1357.
- Embi, P. J., Yackel, T. R., Logan, J. R., Bowen, J. L., Cooney, T. G., & Gorman, P. N. (2004). Impacts of computerized physician documentation in a teaching hospital: perceptions of faculty and resident physicians. *Journal of the American Medical Informatics Association*, 11(4), 300–309.
- Eugene. (2017). *Virtualization Techniques in Cloud Computing*. <https://www.sam-solutions.com/blog/virtualization-techniques-in-cloud-computing/>
- Ewa, U. E. (2013). Root causes of project abandonment in tertiary institutions in Nigeria. *International Business Research*, 6(11), 149.
- Eze, Sunday C, Awa, H. O., Okoye, J. C., Emecheta, B. C., & Anazodo, R. O. (2013). Determinant factors of information communication technology (ICT) adoption by government-owned universities in Nigeria: A qualitative approach. *Journal of Enterprise Information Management*, 26(4), 427–443.
- Eze, Sunday C, Chinedu-Eze, V. C. A., Okike, C. K., & Bello, A. O. (2020). Factors influencing the use of e-learning facilities by students in a private Higher Education Institution (HEI) in a developing economy. *Humanities and Social Sciences Communications*, 7(1), 1–15.
- Eze, Sunday Chinedu, Chinedu-Eze, V. C., & Bello, A. O. (2018). The utilisation of e-learning facilities in the educational delivery system of Nigeria: a study of M-University. *International Journal of Educational Technology in Higher Education*, 15(1), 34.
- Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. University of Akron Press.
- Famade, O. A., Omiyale, G. T., & Adebola, Y. A. (2015). Towards improved funding of tertiary institutions in Nigeria. *Asian Journal of Humanities and Social Sciences (AJHSS)*, 3(2), 2320–9720.
- Fang, J., Shaukat, Z., Ali, S., & Zulfiqar, A. A. (2017). Cloud Computing: Virtual Web Hosting on Infrastructure as a Service (IaaS). *International Conference on Mobile Ad-Hoc and Sensor Networks*, 450–460.

- Farid, S., Ahmad, R., Niaz, I. A., Arif, M., Shamshirband, S., & Khattak, M. D. (2015). Identification and prioritization of critical issues for the promotion of e-learning in Pakistan. *Computers in Human Behavior*, *51*, 161–171. <https://doi.org/10.1016/J.CHB.2015.04.037>
- Federal Ministry Of Education. (2020, May 6). *E-LEARNING RESOURCES*. <http://education.gov.ng/e-learning-resources/>
- Fernández, A., Peralta, D., Herrera, F., & Benítez, J. M. (2012). An Overview of E-Learning in Cloud Computing. In *Advances in Intelligent Systems and Computing* (pp. 35–46). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-30859-8_4
- Field, A. (2013). *Discovering Statistics using IBM SPSS Statistics* (4th ed.). SAGE. [https://books.google.com.my/books?id=c0Wk9IuBmAoC&dq=field+a.\(2009\).+discovering+statistics+using+spss+\(4thed.\)&source=gbs_navlinks_s](https://books.google.com.my/books?id=c0Wk9IuBmAoC&dq=field+a.(2009).+discovering+statistics+using+spss+(4thed.)&source=gbs_navlinks_s)
- Field, A. P. (2009). *Discovering statistics using SPSSd rock “n” roll* (3rd editioin). SAGE Publications.
- Filho, L. W., Pallant, E., Enete, A., Richter, B., & Brandli, L. L. (2018). Planning and implementing sustainability in higher education institutions: an overview of the difficulties and potentials. *International Journal of Sustainable Development & World Ecology*, *25*(8), 713–721.
- Flavián, C., & Guinalú, M. (2006). Consumer trust, perceived security and privacy policy. *Industrial Management & Data Systems*, *106*(5), 601–620. <https://doi.org/10.1108/02635570610666403>
- Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39. <https://doi.org/10.2307/3151312>
- Foster, I., Zhao, Y., Raicu, I., & Lu, S. (2008). Cloud Computing and Grid Computing 360-Degree Compared. *2008 Grid Computing Environments Workshop*, 1–10. <https://doi.org/10.1109/GCE.2008.4738445>
- Fraenkel, J. R., & Wallen, N. E. (2009). *How to Design and Evaluate Research in Education* (8th ed.). McGraw-Hill Education.
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (1993). *How to design and evaluate research in education* (New York: McGraw-Hill. (ed.); Vol. 7). [http://www.johnlpryor.com/JP_Digital_Portfolio/EDU_7901_files/EDU_7901 Data Definitions.pdf](http://www.johnlpryor.com/JP_Digital_Portfolio/EDU_7901_files/EDU_7901_Data_Definitions.pdf)
- Gall, M. D., Borg, W. R., & Gall, J. P. (2003). *Educational Research: An Introduction* (7th Edition). Pearson. <https://www.pearson.com/us/higher-education/product/Gall-Educational-Research-An-Introduction-7th-Edition/9780321081896.html>
- Galvan, J. L., & Galvan, M. C. (2017). *Writing literature reviews: A guide for students of the social and behavioral sciences* (7th Editio). Routledge.

- Gangwar, H., & Date, H. (2015). Exploring Information Security Governance in Cloud Computing Organisation. : : *International Journal of Applied Management Sciences and Engineering (IJAMSE)*, 2(1), 44–61. <https://doi.org/10.4018/ijamse.2015010104>
- Gangwar, H., & Date, H. (2016). Understanding cloud computing adoption: A model comparison approach. *Human Systems Management*, 35(2), 93–114. <https://doi.org/10.3233/HSM-150857>
- Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management*, 28(1), 107–130. <https://doi.org/10.1108/JEIM-08-2013-0065>
- Garača, Ž. (2011). Management : journal of contemporary management issues. In *journal of contemporary management issues* (Vol. 16, Issue 2). Faculty of Economics. https://hrcak.srce.hr/index.php?id_clanak_jezik=111171&show=clanak
- Garrison, G., Kim, S., & Wakefield, R. L. (2012). Success factors for deploying cloud computing. *Communications of the ACM*, 55(9), 62. <https://doi.org/10.1145/2330667.2330685>
- Garson, D. (2012). Testing Statistical Assumptions. In *researchgate.net*. Asheboro, NC: Statistical Associates Publishing. https://www.researchgate.net/profile/Jurandy_Penitente-Filho/post/What_is_the_best_statistical_method_to_correlate_immunohistochemistry_and_rt-pcr/attachment/59d61d9879197b807797853c/AS:271755204071424@1441802897825/download/assumptions.pdf
- Gartner. (2009). *Gartner Says Cloud Consumers Need Brokerages to Unlock the Potential of Cloud Services*. <http://www.gartner.com/newsroom/id/1064712>
- Gaskin. (2017). *Data Screening*. http://statwiki.kolobkreations.com/index.php?title=Data_screening#Linearity
- Gefen, D., Straub, D., & Boudreau, M.-C. (2000). Communications of the Association for Information Systems Structural Equation Modeling and Regression: Guidelines for Research Practice. *Communications of the Association for Information Systems*, 4(1), 1–77. <http://aisel.aisnet.org/cais>
- Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika*, 61(1), 101–107.
- Ghazali, O., Abubakar, M. T., Hatim, M. T., Suhaidi, H., Shahrudin, A. N., & Ahmad, H. M. S. (2017). *Security Measurement as a Trust in Cloud Computing Service Selection and Monitoring - Volume 8, No. 2, May 2017 - JAIT*. Journal of Advances in Information. <https://doi.org/doi:10.12720/jait.8.2.100-106>
- Gibson, J., Rondeau, R., Eveleigh, D., & Tan, Q. (2012). Benefits and challenges of three cloud computing service models. *2012 Fourth International Conference on*

- Computational Aspects of Social Networks (CASoN)*, 198–205.
<https://doi.org/10.1109/CASoN.2012.6412402>
- Globerman, S. (1975). Technological Diffusion In The Canadian Tool and Die Industry. *The Review of Economics and Statistics*, 57(4), 428–434.
<http://www.jstor.org/stable/1935902>
- Godse, M., & Mulik, S. (2009). An Approach for Selecting Software-as-a-Service (SaaS) Product. *2009 IEEE International Conference on Cloud Computing*, 155–158. <https://doi.org/10.1109/CLOUD.2009.74>
- Gonzenbach, N. M., & Davis, D. C. (1999). Business employees' perceptions of content areas to be included in an information systems technologies curriculum. *NABTE Review*, 26, 58–62.
- Götz, O., Liehr-Gobbers, K., & Krafft, M. (2010). Evaluation of Structural Equation Models Using the Partial Least Squares (PLS) Approach. In *Handbook of Partial Least Squares* (pp. 691–711). Springer Berlin Heidelberg.
https://doi.org/10.1007/978-3-540-32827-8_30
- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations. *The Milbank Quarterly*, 82(4), 581–629.
<https://doi.org/10.1111/j.0887-378X.2004.00325.x>
- Guasch, T., Alvarez, I., & Espasa, A. (2010). Roles and Domains to Teach in Online Learning Environments: Educational ICT Competency Framework for University Teachers. In *Changing Cultures in Higher Education Moving Ahead to Future Learning* (pp. 339–352). Springer. <https://doi.org/DOI> https://doi.org/10.1007/978-3-642-03582-1_25
- Gupta, P., Seetharaman, A., & Raj, J. R. (2013). The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management*, 33(5), 861–874. <https://doi.org/10.1016/j.ijinfomgt.2013.07.001>
- Haag, S., & Eckhardt, A. (2014). Organizational cloud service adoption: a scientometric and content-based literature analysis. *Journal of Business Economics*, 84(3), 407–440. <https://doi.org/10.1007/s11573-014-0716-6>
- Hair, J. (2007). Research Methods for Business. *Faculty Publications*.
<https://digitalcommons.kennesaw.edu/facpubs/2952>
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2014). *Multivariate Data Analysis* (7th edition). Pearson Education Limited.
www.pearsoned.co.uk
- Hair, J. F. J., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (Seventh Ed). Pearson. <https://www.pearson.com/us/higher-education/program/Hair-Multivariate-Data-Analysis-7th-Edition/PGM263675.html>
- Hair, J. F. J., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2013). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd Edition). Sage.

- <https://uk.sagepub.com/en-gb/asi/a-primer-on-partial-least-squares-structural-equation-modeling-pls-sem/book244583>
- Hair, J. J. F., Wolfinbarger, M. F., Ortinau, D. J., & Bush, R. P. (2009). *Essentials of Marketing Research*. McGraw-Hill Irwin.
- Hair, Joe F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *The Journal of Marketing Theory and Practice*, 19(2), 139–152.
<https://doi.org/10.2753/MTP1069-6679190202>
- Hair, Joseph F., Hult, Jr., G. T. M., Ringle, C., & Sarstedt, M. (2014). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. SAGE Publications,.
[https://books.google.com.my/books?id=TjzABAAAQBAJ&dq=hair,+Hult,+Ringle ,+Sarstedt+2014+a+premier+on+partial+least+squares+structural+equation+modell ing+\(PLS-SEM\)+%2Bpdf&source=gbs_navlinks_s](https://books.google.com.my/books?id=TjzABAAAQBAJ&dq=hair,+Hult,+Ringle,+Sarstedt+2014+a+premier+on+partial+least+squares+structural+equation+modell ing+(PLS-SEM)+%2Bpdf&source=gbs_navlinks_s)
- Hair, Joseph F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM) (SECOND EDI)*.
<https://uk.sagepub.com/en-gb/asi/a-primer-on-partial-least-squares-structural-equation-modeling-pls-sem/book244583>
- Hair, Joseph F., Ringle, C. M., & Sarstedt, M. (2012). Partial Least Squares: The Better Approach to Structural Equation Modeling? *Long Range Planning*, 45(5–6), 312–319. <https://doi.org/10.1016/j.lrp.2012.09.011>
- Hanson, W. E., Creswell, J. W., Clark, V. L. P., Petska, K. S., & Creswell, J. D. (2005). Mixed methods research designs in counseling psychology. *Journal of Counseling Psychology*, 52(2), 224.
- Harman, H. H. (1976). *Modern factor analysis* (Third Edition). University of Chicago Press. https://books.google.com.my/books?id=e-vMN68C3M4C&dq=modern+factor+analysis+harman&source=gbs_navlinks_s
- Harper, M., & Cole, P. (2012). Member checking: can benefits be gained similar to group therapy? *The Qualitative Report*, 17(2), 510–517.
- Hashim, H. S., & Hassan, Z. (2015). Factors That Influence The Users ' Adoption Of Cloud Computing Services At Iraqi Universities : An Empirical Study. *Australian Journal of Basic and Applied Sciences*, 9(27), 379–390.
<https://www.semanticscholar.org/paper/Factors-That-Influence-The-Users-'-Adoption-Of-At-%3A-Hashim-Hassan/234f86e672e6d16c3c434b90c71dc17e80dde009>
- Hashimi, A. M. (2018). Challenges of Educational Development in Nigeria: Issues of Chemical Sciences. *Chemistry and Materials Research*, 10(3), 1–7.
- Hassan, H., Nasir, M. H. M., Khairudin, N., & Adon, I. (2017). Factors influencing cloud computing adoption in small medium enterprises. *Journal of Information and Communication Technology*, 16(1), 21–41.
- Hautamaki, J., Hirvimaki, S., Vatanen, M., Rantonen, M., & Siltanen, J. (2009).

- Virtualization In Learning Environment. *ICERI2009 Proceedings*, 5764–5774.
- Helmi, A. M., Farhan, M. S., & Nasr, M. M. (2018). A framework for integrating geospatial information systems and hybrid cloud computing. *Computers and Electrical Engineering*, 67, 145–158.
<https://doi.org/10.1016/j.compeleceng.2018.03.027>
- Henseler, Jörg, Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Emerald Group Publishing Limited*, 20, 277–319. [https://doi.org/10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014)
- Henseler, Jörg, & Fassott, G. (2010). Testing moderating effects in PLS path models: An illustration of available procedures. In *Handbook of partial least squares* (pp. 713–735). Springer.
- Henseler, Jörg, & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Comput Stat*, 28, 565–580. <https://doi.org/10.1007/s00180-012-0317-1>
- Hiran, K. K., & Henten, A. (2019). An integrated TOE–DoI framework for cloud computing adoption in the higher education sector: case study of Sub-Saharan Africa, Ethiopia. *International Journal of System Assurance Engineering and Management*, 1–9.
- Hiran, K. K., & Henten, A. (2020). An Integrated TOE-DoI Framework for Cloud Computing Adoption in Higher Education: The Case of Sub-Saharan Africa, Ethiopia. In *Soft Computing: Theories and Applications* (pp. 1281–1290). Springer.
- Hooper, D. (2012). Exploratory Factor Analysis Exploratory Factor Analysis in Chen, H. (Ed.), *Approaches to Quantitative Research – Theory and its Practical Application: A Guide to Dissertation Students*. *Dublin Institute of Technology*, 1–33.
<https://arrow.dit.ie/buschmanbk/8>
- Horton, W. (2011). *E-Learning by Design* (2nd ed., pp. 1–8). Pfeiffer.
- Huang, A. (2019). Teaching, learning, and assessment with virtualization technology. *Journal of Educational Technology Systems*, 47(4), 523–538.
- Huang, J., & Nicol, D. (2010). A Formal-Semantics-Based Calculus of Trust. *IEEE Internet Computing*, 14(5), 38–46. <https://doi.org/10.1109/MIC.2010.83>
- Huang, J., & Nicol, D. M. (2013). Trust mechanisms for cloud computing. *Journal of Cloud Computing: Advances, Systems and Applications*, 2(1), 9.
<https://doi.org/10.1186/2192-113X-2-9>
- Hunt, S. D., Sparkman, R. D., & Wilcox, J. B. (1982). The Pretest in Survey Research: Issues and Preliminary Findings. *Journal of Marketing Research*, 19(2), 269.
<https://doi.org/10.2307/3151627>
- Hurwitz, J., Robin, B., Marcia, K., & Fern, H. (2010). *Cloud computing for dummies*. John Wiley & Sons.
- Hvorecký, J. (2004). European journal of open, distance and e-learning. *European*

- Journal of Open, Distance and E-Learning*, 7(2).
<http://www.eurodl.org/?p=archives&year=2004&halfyear=2&article=143>
- Idowu, A. I., & Esere, M. (2013). ICT and higher educational system in Nigeria. *Educational Research and Reviews*, 8(21), 2021–2025.
- Ifejiofor, A. P., & Nwankwo, C. A. (2015). The Undercurrents of ICT Skill Acquisition in Nigeria: Problems and Prospects. *International Journal of Research*, 1, 1–7.
- Ifijeh, G., & Yusuf, F. (2020). Covid–19 pandemic and the future of Nigeria’s university system: The quest for libraries’ relevance. *The Journal of Academic Librarianship*, 46(6), 102226.
- Ifinedo, Princely. (2005). Measuring Africa’s e-readiness in the global networked economy: A nine-country data analysis. *International Journal of Education and Development Using ICT*, 1(1), 53–71.
- Ifinedo, PRINCELY. (2011). An Empirical Analysis of Factors Influencing Internet/E-Business Technologies Adoption By SMEs In Canada. *International Journal of Information Technology & Decision Making*, 10(04), 731–766.
<https://doi.org/10.1142/S0219622011004543>
- Iruonagbe, C. T., Imhonopi, D., & Egharevba, M. E. (2015). Higher education in Nigeria and the emergence of private universities. *International Journal of Education and Research*, 3(2), 49–64.
- Ivankova, N. V., & Stick, S. L. (2007). Students’ persistence in a distributed doctoral program in educational leadership in higher education: A mixed methods study. *Research in Higher Education*, 48(1), 93.
- Javatpoint. (2018). *Virtualization in Cloud Computing - javatpoint*.
<https://www.javatpoint.com/virtualization-in-cloud-computing>
- Jeffrey, R. M. (2001). *E-learning : Strategies for Delivering Knowledge in the Digital Age*. McGraw-Hill Professional.
- Jeyaraj, A., Rottman, J. W., & Lacity, M. C. (2006). A review of the predictors, linkages, and biases in IT innovation adoption research. *Journal of Information Technology*, 21(1), 1–23. <https://doi.org/10.1057/palgrave.jit.2000056>
- Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, 1(2), 112–133.
- Jones, S. (2015). *Integrating Virtualization and Education: A Highly Attainable Proposition*. <https://www.linkedin.com/pulse/integrating-virtualization-education-highly-attainable-stephen-jones>
- Kaiser, H. F. (1970). A Second Generation Little Jiffy*. *PSYCHOMETRIKA*, 35(4), 401–415.
- Karen, G.-M. (2017). *When Unequal Sample Sizes Are and Are NOT a Problem in ANOVA - The Analysis Factor*. <https://www.theanalysisfactor.com/when-unequal-sample-sizes-are-and-are-not-a-problem-in-anova/>

- Karim, F., & Rampersad, G. (2017). Cloud Computing in Education in Developing Countries. *Computer and Information Science*, 10(2), 87.
<https://doi.org/10.5539/cis.v10n2p87>
- Kashif, L., & Shaikh, Z. A. (2016). Challenges and Opportunities of Cloud-Based E-Learning Systems. *International Journal of Educational and Pedagogical Sciences*, 10(2), 693–697.
https://www.researchgate.net/profile/Kashif_Laeq2/publication/315957987_Cloud-based_E-learning_Model/links/58ed23f9458515c4aa50d198/Cloud-based-E-learning-Model.pdf
- Kayali, M. H., Safie, N., & Mukhtar, M. (2016). Literature Review of Cloud Based E-learning Adoption by Students: State of the Art and Direction for Future Work. *IOP Conference Series: Materials Science and Engineering*, 160(1), 012087.
<https://doi.org/10.1088/1757-899X/160/1/012087>
- Kazeem, Y. (2017). A majority of university applicants in Nigeria fail to gain admission annually, data shows — *Quartz*. <https://qz.com/915618/only-one-in-four-nigerians-applying-to-university-will-get-a-spot/>
- Khajeh-Hosseini, A., Greenwood, D., & Sommerville, I. (2010). Cloud migration: A case study of migrating an enterprise it system to iaas. *2010 IEEE 3rd International Conference on Cloud Computing*, 450–457.
- Kituyi, G. M., & Kyeyune, R. (2012). An analysis of E-learning information system adoption in Ugandan Universities: Case of Makerere University business school. *Information Technology Research Journal*, 2(1), 1–7.
https://www.researchgate.net/profile/Geoffrey_Kituyi/publication/258725320_An_Analysis_of_E-learning_Information_System_Adoption_in_Ugandan_Universities_Case_of_Make_rere_University_Business_School/links/00b7d528df2612d143000000.pdf
- Kline, R. B. (2015). *principles and practice of structural equation modeling* (Third). Guilford publications.
- Knowledgenet. (2017). *Pros and Cons of Public, Private and Hybrid Cloud*. / *KnowledgeNet*. <https://www.knowledgenet.com/cloud-computing/pros-cons-public-private-hybrid-cloud/>
- Kobayashi, Y. (2018). *Faculty of Engineering at Hokkaido University uses the cloud to improve online learning*. <https://customers.microsoft.com/en-in/story/hokkaido-university-higher-education-azure>
- Kotrlik, J., & Higgins, C. (2001). Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, 19(1), 43.
- Kousar, S., Sabri, P. S. U., Zafar, M., & Akhtar, A. (2017). Technological Factors and Adoption of Green Innovation-Moderating Role of Government Intervention: A Case of SMEs in Pakistan. In *Pakistan Journal of Commerce and Social Sciences* (Vol. 11, Issue 3). <http://www.jespk.net/publications/397.pdf>

- Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30(3), 607–610. <https://doi.org/10.1177/001316447003000308>
- Krosnick, J. A., & Fabrigar, L. R. (1997). Designing Rating Scales for Effective Measurement in Surveys. In *Survey Measurement and Process Quality* (pp. 141–164). John Wiley & Sons, Inc. <https://doi.org/10.1002/9781118490013.ch6>
- Kuhl, J., & Beckmann, J. (2012). *Action Control : From Cognition to Behavior Springer Series in Social Psychology* (J. B. Julius Kuhl (ed.); illustrated). Springer Berlin Heidelberg. https://books.google.com.my/books?id=e-yPBAAAQBAJ&dq=springer+series+in+social+psychology+action+control+from+cognition+to+behavior+&lr=&source=gbs_navlinks_s
- Kumar, R. (2011). *Research Methodology A Step-By-Step Guide for Beginners* (3rd editio). Sage. http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar-Research_Methodology_A_Step-by-Step_G.pdf
- Kumar, R. (2014). *Research Methodology : a Step-by-Step Guide for Beginners*. (4th ed.). SAGE Publications. https://books.google.com.my/books?id=WK05AwAAQBAJ&dq=research+process+in+research+methodology&source=gbs_navlinks_s
- Lai, H.-M., Lin, I.-C., & Tseng, L.-T. (2014). High-Level Managers' Considerations for RFID Adoption in Hospitals: An Empirical Study in Taiwan. *Journal of Medical Systems*, 38(2), 3. <https://doi.org/10.1007/s10916-013-0003-z>
- Lambert, D. M., & Harrington, T. C. (1990). Measuring Nonresponse Bias in Customer Service Mail Surveys. *Journal of Business Logistics*, 11(2), 5–25. <https://search.proquest.com/docview/212644617?pq-origsite=gscholar>
- Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, 55(1), 79–105.
- Lee, S.-G., Hwang, S.-W., Kang, J.-Y., & Yoon, S. (2014). Factors Influencing the Adoption of Enterprise Cloud Computing. *Journal of Internet Technology*, 15(1), 65–75. <https://doi.org/10.6138/JIT.2014.15.1.07>
- Levin, S. G., Levin, S. L., & Meisel, J. B. (1987). A Dynamic Analysis of The Adoption of A New Technology: The Case of Optical Scanners Technology: The Case of Optical Scanners. *The Review of Economics and Statistics*, 69(1), 12–17. <http://www.jstor.org/stable/1937895>
- Liao, J., Welsch, H., & Stoica, M. (2003). Organizational absorptive capacity and responsiveness: An empirical investigation of growth-oriented SMEs. *Entrepreneurship Theory and Practice*, 28(1), 63–86.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newberry Park. CA: Sage.
- Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in

- cross-sectional research designs. *Journal of Applied Psychology*, 86(1), 114–121. <https://doi.org/10.1037/0021-9010.86.1.114>
- Lindner, J. R., & Wingenbach, G. J. (2002). Communicating the Handling of Nonresponse Error in Journal of Extension Research in Brief Articles. *Journal of Extension*, 40(6), 1–5. <https://www.joe.org/joe/2002december/rb1.php>
- Liton, H. A. (2015). Examining students' perception & efficacy of using technology in teaching English. *International Journal of Education and Information Technology*, 1(1), 11–19.
- Liu, F., Tong, J., Mao, J., Bohn, R., Messina, J., & Leaf, D. (2011). *NIST Cloud Computing Reference Architecture* (p. 35).
- Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, 111(7), 1006–1023. <https://doi.org/10.1108/02635571111161262>
- Lynn, M. R. (1986). Determination and Quantification Of Content Validity. *Nursing Research*, 35(6), 382–385. <https://doi.org/10.1097/00006199-198611000-00017>
- Lyytinen, K., & Damsgaard, J. (2001). What's Wrong with the Diffusion of Innovation Theory? *Diffusing Software Product and Process Innovations*, 173–190. https://doi.org/10.1007/978-0-387-35404-0_11
- Macleod, H. (2005). What role can educational multimedia play in narrowing the digital divide? *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, 1(4), 42–53. <http://ijedict.dec.uwi.edu/include/getdoc.php?id=862&article=120&mode=pdf>
- Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A Comparison of the Theory of Planned Behavior and the Theory of Reasoned Action. *Personality and Social Psychology Bulletin*, 18(1), 3–9. <https://doi.org/10.1177/0146167292181001>
- Madisha, M., & Van Belle, J. P. (2011). Factors Influencing SaaS Adoption by Small South African Organisations1. *Proceedings of the 11th Annual Conference on World Wide Web Applications, Durban, South Africa*.
- Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *AISHE-J: The All Ireland Journal of Teaching and Learning in Higher Education*, 9(3).
- Mahmoud, A. M., Ahmad, S. Bin, & Poespowidjojo, A. L. D. (2018). The Relationship between Entrepreneurial Behavior, Psychological Factors and Individual Performance of Middle Managers in Nigerian Medium Enterprises: A Pilot Study. *International Journal of Organization & Business Excellence*, 3(1), 1–17. http://www.ijobe.uum.edu.my/images/Full_Text/vol.3_issue.2_2018/IJOBE-31-proofread.pdf
- Makoza, F. (2016). Cloud computing adoption in Higher Education Institutions of Malawi: An exploratory study. *International Journal of Computing & ICT Research*, 9(2).

- Malak, J. (2016). *An analysis of the technological, organizational, and environmental factors influencing cloud adoption*. Walden University.
- Marchewka, J. T., & Kostiwa, K. (2007). An Application of the UTAUT Model for Understanding Student Perceptions Using Course Management Software. *Communications of the IIMA*, 7(2), 93–104. <http://scholarworks.lib.csusb.edu/ciima>
- Masud, A. H., & Huang, X. (2016). strategies and practice of cluod-based e-learning environment implementation. In *Handbook of Research on Cloud-Based STEM Education for Improved Learning Outcomes* (pp. 42–63). <https://doi.org/DOI:10.4018/978-1-4666-9924-3.ch004>
- Mathieson, K. (1991). Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior. *Information Systems Research*, 2(3), 173–191. <https://doi.org/10.2307/23010882>
- Mayes, T., & De Freitas, S. (2004). Review of e-learning theories, frameworks and models. *JISC E-Learning Models Desk Study*, 1–43. <chrome-extension://ngpampappnmepgilofjohadhmbhlaek/captured.html?back=1>
- McCrae, R. R., Kurtz, J. E., Yamagata, S., & Terracciano, A. (2011). Internal Consistency, Retest Reliability, and Their Implications for Personality Scale Validity. *Personality and Social Psychology Review*, 15(1), 28–50. <https://doi.org/10.1177/1088868310366253>
- Meegama, R. G. N., Upeksha, G. N., & Wickramasinghe, S. P. (2015a). Use of cloud-based services for higher education in developing countries. *International Conference on Education and Distance Learning, Colombo, 2015*, 1–8. <http://www.academia.edu/download/39054319/paper-V5.pdf>
- Meegama, R. G. N., Upeksha, G. N., & Wickramasinghe, S. P. (2015b). Use of cloud-based services for higher education in developing countries. *International Conference on Education and Distance Learning, Colombo, 2015*, 1–8.
- Mell, P., & Grance, T. (2012). *The NIST definition of cloud computing*. <http://faculty.winthrop.edu/domanm/csci411/Handouts/NIST.pdf>
- Mohammadi, S., & Emdadi, Y. (2014). E-Learning Based on Cloud Computing. *International Journal of Basic Sciences & Applied Research*, 3(11), 793–802. <http://www.isicenter.org/fulltext/paper-328.pdf>
- Mokhtar, S. A., Al-Sharafi, A., Ali, S. H. S., & Al-Othmani, A. Z. (2016). Identifying the determinants of cloud computing adoption in higher education institutions. *2016 International Conference on Information and Communication Technology (ICICTM)*, 115–119.
- Molla, A., & Licker, P. S. (2005a). Perceived E-Readiness Factors in E-Commerce Adoption: An Empirical Investigation in a Developing Country. *International Journal of Electronic Commerce*, 10(1), 83–110. <https://dl.acm.org/citation.cfm?id=1278077>
- Molla, A., & Licker, P. S. (2005b). eCommerce adoption in developing countries: a

model and instrument. *Information & Management*, 42(6), 877–899.
<https://doi.org/10.1016/J.IM.2004.09.002>

- Moore, G. C., & Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research*, 2(3), 192–222. <https://doi.org/10.1287/isre.2.3.192>
- Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International Journal of Qualitative Methods*, 1(2), 13–22.
- Mozumder, D. P., Mahi, J. N., Whaiduzzaman, M., & Mahi, M. J. N. (2017). Cloud computing security breaches and threats analysis. *International Journal of Scientific & Engineering Research*, 8(1), 1287–1297.
- Mtebe, Joel S, & Kissaka, M. M. (2015). Deployment and adoption strategy of cloud computing for blended learning in higher education institutions in sub-Saharan Africa. In *Handbook of Research on Educational Technology Integration and Active Learning* (pp. 395–408). IGI Global.
- Mtebe, Joel Samson, & Raisamo, R. (2014). eLearning Cost Analysis of On-Premise versus Cloudhosted Implementation in Sub-Saharan Countries. *The African Journal of Information Systems*, 6(2), 48–64.
<http://repository.udsm.ac.tz:8080/xmlui/handle/123456789/691>
- Muhammad, A. R., & Abdulrahman, S. M. (2015). Cloud computing based e-Learning: Opportunities and challenges for tertiary institutions in Nigeria. *International Journal of E-Education, e-Business, e-Management and e-Learning*, 5(3), 144–152.
<http://search.proquest.com/openview/8a3521f6971415ebc3f4d85489b617c8/1?pq-origsite=gscholar&cbl=2027423>
- Müller, D. (2012). *Design characteristics of virtual learning : a theoretical integration and empirical test of technology acceptance and IS success research* (illustrated). Springer Gabler research.
[https://books.google.com.my/books?id=_kT26kmPcF0C&dq=design+characteristics+of+virtual+learning+environments:+A+theoretical+integration+and+empirical+test+of+technology+acceptance+and+IS+success+research+Muller+\(2012\)&lr=&source=gbs_navlinks_s](https://books.google.com.my/books?id=_kT26kmPcF0C&dq=design+characteristics+of+virtual+learning+environments:+A+theoretical+integration+and+empirical+test+of+technology+acceptance+and+IS+success+research+Muller+(2012)&lr=&source=gbs_navlinks_s)
- Musingafi, M. C. C., Mapuranga, B., Chiwanza, K., & Zebron, S. (2015). Challenges for Open and Distance Learning (ODL) Students: Experiences from Students of the Zimbabwe Open University. *Journal of Education and Practice*, 6(18), 59–66.
<https://eric.ed.gov/?id=EJ1079750>
- Mwakisole, K. F., Kissaka Dr, M. M., & Mtebe PhD, J. S. (2019). Cloud Computing Architecture for eLearning Systems in Secondary Schools in Tanzania. *The African Journal of Information Systems*, 11(4), 3.
- Mwakisole, K., Kissaka, M., & Mtebe, J. (2018). Feasibility of cloud computing implementation for eLearning in secondary schools in Tanzania. *International Journal of Education and Development Using ICT*, 14(1).

- Naresh, B., & Reddy, B. S. (2015). Challenges and Opportunity of E-Learning in Developed and Developing. *International Journal of Emerging Research in Management & Technology*, 4(6), 259–262.
- National Bureau of Statistics. (2020). *National Bureau of Statistics*. [https://nigerianstat.gov.ng/elibrary?queries\[search\]=education](https://nigerianstat.gov.ng/elibrary?queries[search]=education)
- National Universities Commission. (2018). *Federal Universities / National Universities Commission*. <http://nuc.edu.ng/nigerian-univerisities/federal-univeristies/>
- Navarro Sada, A., & Maldonado, A. (2007). Research Methods in Education. In *British Journal of Educational Studies* (6th Editio, Vol. 55, Issue 4). Wiley/Blackwell (10.1111). https://doi.org/10.1111/j.1467-8527.2007.00388_4.x
- Netcov. (2020, June 19). *Implementations Of Virtualization In Cloud Computing*. <https://netcov.com/implementations-of-virtualization-in-cloud-computing/>
- Netemeyer, R. G., Bearden, W. O., & Sharma, W. (2003). *Scaling procedures: Issues and applications*. Sage Publications. [https://books.google.com.my/books?hl=en&lr=&id=woiECgAAQBAJ&oi=fnd&pg=PR11&dq=Netemeyer,+R.+G.,+Bearden,+W.+O.,+%26+Sharma,+S.+\(2003\).+Scaling+Procedures:+Issues+and+Applications.+Thousand+Oaks:+SAGE+Publicatio ns.&ots=MB9rtn7y6G&sig=IQQCASOOkKJDvRoiJGe9tI](https://books.google.com.my/books?hl=en&lr=&id=woiECgAAQBAJ&oi=fnd&pg=PR11&dq=Netemeyer,+R.+G.,+Bearden,+W.+O.,+%26+Sharma,+S.+(2003).+Scaling+Procedures:+Issues+and+Applications.+Thousand+Oaks:+SAGE+Publicatio ns.&ots=MB9rtn7y6G&sig=IQQCASOOkKJDvRoiJGe9tI)
- Newman, A. (2012). *Transform K-12 Schools through Virtualization*. <https://www.kaseya.com/blog/2012/08/24/benefits-of-virtualization-in-k-12-schools/>
- Nguyen, T. D., Nguyen, T. M., Pham, Q.-T., & Misra, S. (2014). Acceptance and Use of E-Learning Based on Cloud Computing: The Role of Consumer Innovativeness. In *International Conference on Computational Science and Its Applications* (pp. 159–174). Springer, Cham. https://doi.org/10.1007/978-3-319-09156-3_12
- Nguyen, T. S. T. (2008). *The SAGE Encyclopedia of Qualitative Research Methods*. <https://doi.org/https://dx.doi.org/10.4135/9781412963909>
- Njenga, K., Garg, L., Bhardwaj, A. K., Prakash, V., & Bawa, S. (2019). The cloud computing adoption in higher learning institutions in Kenya: Hindering factors and recommendations for the way forward. *Telematics and Informatics*, 38, 225–246.
- Noor, T. H. (2016). Usage and Technology Acceptance of Cloud Computing in Saudi Arabian Universities. *International Journal of Software Engineering and Its Applications*, 10(9), 65–76. <https://doi.org/http://dx.doi.org/10.14257/ijseia.2016.10.9.07>
- Norman, E. (2020). *The Reluctance Toward Cloud Computing Adoption: A Qualitative Study*. Capella University.
- Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric Theory. In *American Educational Research Journal* (3rd.). McGraw-Hill. <https://doi.org/10.2307/1161962>

- Nyabiage, J. (2019, April 3). *China asked to write off more African debts as coronavirus hits economies / South China Morning Post*.
<https://www.scmp.com/news/china/diplomacy/article/3078333/china-asked-write-more-african-debts-coronavirus-hits>
- Nyeko, J. S., & Ogenmungu, C. (2017). Determinants of Electronic Learning Adoption in Higher Institutions of Learning in Uganda: A Learners' Perspective. *Global Journal of Computer Science and Technology*, 17(1).
<https://computerresearch.org/index.php/computer/article/view/1515>
- Odeh, M., Garcia-Perez, A., & Warwick, K. (2017). Cloud computing adoption at higher education institutions in developing countries: a qualitative investigation of main enablers and barriers. *International Journal of Information and Education Technology*, 7(12), 921–927. <https://doi.org/doi: 10.18178/ijiet.2017.7.12.996>
- Ohioze, W. F., Odishika, V. A., Adedeji, L. A., Olusanya, S. O., & Adesina-Uthman, G. A. (2013). Appraisal Of Open And Distance Learning Education In Nigeria: National Open University Of Nigeria Experience. *Pan-Commonwealth Forum 7 (PCF7)*, 1–14. <http://oasis.col.org/handle/11599/1790>
- Okai, S., Uddin, M., Arshad, A., Alsaqour, R., & Shah, A. (2014). Cloud computing adoption model for universities to increase ICT proficiency. *SAGE Open*, 4(3), 2158244014546461.
- Oke, T. I., Mainoma, H. M., & Bukar, I. B. (2018). Exploring Alternative Sources of Funding Universal Basic Education for Sustainable Development in Nigeria. *KIU Journal of Humanities*, 2(2 (A)), 31–38.
- Okoye, R., & Arimonu, M. O. (2016). Technical and Vocational Education in Nigeria: Issues, Challenges and a Way Forward. *Journal of Education and Practice*, 7(3), 113–118.
- Oliveira, T., & Martins, M. F. (2010). Understanding e-business adoption across industries in European countries. *Industrial Management & Data Systems*, 110(9), 1337–1354. <https://doi.org/10.1108/02635571011087428>
- Oliveira, T., & Martins, M. F. (2011). Literature Review of Information Technology Adoption Models at Firm Level. *The Electronic Journal Information Systems Evaluation*, 14(1), 110–121.
https://www.researchgate.net/profile/Tiago_Oliveira3/publication/258821009_Literature_Review_of_Information_Technology_Adoption_Models_at_Firm_Level/links/0c960528fdf0cc370b000000.pdf
- Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management*, 51(5), 497–510.
<https://doi.org/10.1016/j.im.2014.03.006>
- Oliveri, M. E., & Wendler, C. (2020). *Higher Education Admission Practices: An International Perspective* (C. W. María Elena Oliveri (ed.)). Cambridge University Press. <https://books.google.com.my/books?id=NYHCDwAAQBAJ>

- Olofin, B., & Aniede, P. I. (2015). *Challenges and Barriers to ICT Deployment in Nigerian Universities*. 1–10.
https://www.researchgate.net/publication/303810498_Challenges_and_Barriers_to_ICT_Deployment_in_Nigerian_Universities
- Ololube, N. P. (2006). The impact of professional and non-professional teachers' ICT competencies in secondary schools in Nigeria. *Journal of Information Technology Impact*, 6(2), 101–118.
- Ololube, N. P., Ubogu, A. E., & Egbezor, D. E. (2007). ICT and distance education programs in a sub-Saharan African country: a theoretical perspective. *Journal of Information Technology Impact*, 7(3), 181–194.
- Oloyede, A. A., Ajimotokan, H. A., & Faruk, N. (2017). Embracing the future of engineering education in Nigeria: teaching and learning challenges. *Nigerian Journal of Technology*, 36(4), 991–1001.
- Olutola, A. T., & Olatoye, O. O. (2015). Challenges of e-learning technologies in Nigerian University Education. *Journal of Educational and Social Research*, 5(1), 301.
- Oralu, T., & Oladele, B. (2016). The Management and Funding of Education in Nigeria. *World Academy of Science, Engineering and Technology, International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, 9(7), 2614–2619.
http://www.academia.edu/download/46172623/1ST_PAPER_AT_WASET.pdf
- Organization for Economic Co-operation and Development. (2020). *OECD Interim Economic Assessment Coronavirus: The world economy at risk*.
- Oye, N. D., Iahad, N. A., & Rabin, Z. A. (2011). A model of ICT acceptance and use for teachers in higher education institutions. *International Journal of Computer Science & Communication Networks*, 1(1), 22–40.
- Oyediran, W. O., Omoare, A. M., Owoyemi, M. A., Adejobi, A. O., & Fasasi, R. B. (2020). Prospects and limitations of e-learning application in private tertiary institutions amidst COVID-19 lockdown in Nigeria. *Heliyon*, 6(11), e05457.
- Oyoyo, Y. J., & Rehema, Baguma, P. (2019). Adoption of Cloud Computing in Government Institutions in Nigeria. *International Journal of Scientific and Research Publications*, 9(8), 709–744.
- Pachghare, V. K. (2015). *Cloud computing*. PHI Learning Pvt. Ltd.
- Pallant, J. (2010). *A step by step guide to data analysis using the SPSS program: SPSS Survival Manual* (4th editio). McGraw Hill.
[http://www.fb4all.com/download/ebooks/statistics/%23SPSS survival manual 2010.pdf](http://www.fb4all.com/download/ebooks/statistics/%23SPSS%20survival%20manual%202010.pdf)
- Palos-Sanchez, P. R., Arenas-Marquez, F. J., & Aguayo-Camacho, M. (2017). Cloud Computing (SaaS) Adoption as a Strategic Technology: Results of an Empirical Study. *Mobile Information Systems*, 2017, 1–20.

<https://doi.org/10.1155/2017/2536040>

- Pankratz, M., Hallfors, D., & Cho, H. (2002). Measuring perceptions of innovation adoption: the diffusion of a federal drug prevention policy. *Health Education Research, 17*(3), 315–326. <http://www.ncbi.nlm.nih.gov/pubmed/12120847>
- Pavlou, P. A. (2003). Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model. *International Journal of Electronic Commerce, 7*(3), 101–134. <https://dl.acm.org/citation.cfm?id=1288221>
- Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of Operations Management, 30*(6), 467–480. <https://doi.org/10.1016/j.jom.2012.06.002>
- Peterson, R. A., & Kim, Y. (2013). On the relationship between coefficient alpha and composite reliability. *Journal of Applied Psychology, 98*(1), 194–198. <https://doi.org/10.1037/a0030767>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology, 88*(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of Method Bias in Social Science Research and Recommendations on How to Control It. *Annual Review of Psychology, 63*(1), 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Podsakoff, P. M., & Organ, D. W. (1986). Self-Reports in Organizational Research: Problems and Prospects. *Journal of Management, 12*(4), 531–544. <https://doi.org/10.1177/014920638601200408>
- Polttano, M. P., Walton, R. O., & Roberts, D. L. (2017). *Introduction to the Process of Research: Methodology Considerations* (illustrated). LULU COM. https://books.google.com.my/books?id=iVMYDwAAQBAJ&dq=research+process+in+research+methodology&source=gbs_navlinks_s
- Premkumar, G., & Roberts, M. (1999). Adoption of new information technologies in rural small businesses. *Omega, 27*(4), 467–484. [https://doi.org/10.1016/S0305-0483\(98\)00071-1](https://doi.org/10.1016/S0305-0483(98)00071-1)
- Punch. (2017). *Boko Haram Attacks: 70 Lecturers Quit UNIMAID / Sahara Reporters*. <http://saharareporters.com/2017/08/06/boko-haram-attacks-70-lecturers-quit-unimaid>
- Qasem, Y. A. M., Asadi, S., Abdullah, R., Yah, Y., Atan, R., Al-Sharafi, M. A., & Yassin, A. A. (2020). A Multi-Analytical Approach to predict the determinants of cloud computing adoption in higher education institutions. *Applied Sciences, 10*(14), 4905.
- Rager, K. B. (2005). Self-care and the qualitative researcher: When collecting data can

- break your heart. *Educational Researcher*, 34(4), 23–27.
- Ramanathan, R., Ramanathan, U., & Ko, L. W. L. (2014). Adoption of RFID technologies in UK logistics: Moderating roles of size, barcode experience and government support. *Expert Systems with Applications*, 41(1), 230–236. <https://doi.org/10.1016/j.eswa.2013.07.024>
- Rezvani, Z. (2017). Who is a Middle Manager: A literature Review. *International Journal of Family Business and Management*. www.symbiosisonlinepublishing.com
- Ringim, K. J., Osman, N. H., Hasnan, N., & Razalli, M. R. (2013). Exploring the Implementation of Business Process Reengineering in. *Asian Social Science*, 9(11), 243–253. <https://doi.org/10.5539/ass.v9n11p243>
- Robinson, L. (2009). *A summary of Diffusion of Innovations*. https://www.enablingchange.com.au/Summary_Diffusion_Theory.pdf
- Rockmann, R. (2014). Identifying Organizational Capabilities for The Enterprise-Wide Usage of Cloud Computing. *Pacific Asia Conference on Information Systems (PACIS)*, 355. <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1032&context=pacis2014>
- Rogers, E. M. (1995). *Diffusion of Innovations Third Edition* (Third). Collier Macmillan Publishers. <https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf>
- Rogers, E. M. (2003a). *Diffusino of Innovations* (5th ed., Vol. 1, Issue 38). Free Press.
- Rogers, E. M. (2003b). *Diffusion of innovations* (5th ed., Vol. 1, Issue 38).
- Rousseau, D. M., Sitkin, S. B., Burt, R. S., & Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of Management Review*, 23(3), 393–404.
- Sabi, H. M., Uzoka, F.-M. E., Langmia, K., Njeh, F. N., & Tsuma, C. K. (2017). A cross-country model of contextual factors impacting cloud computing adoption at universities in sub-Saharan Africa. *Information Systems Frontiers*, 1–24. <https://doi.org/10.1007/s10796-017-9739-1>
- Sabi, H. M., Uzoka, F.-M. E., & Mlay, S. V. (2018). Staff perception towards cloud computing adoption at universities in a developing country. *Education and Information Technologies*, 23(5), 1825–1848.
- Sahin, I. (2005). Understanding Faculty Adoption of Technology Using the Learning/Adoption Trajectory Model: A Qualitative Case Study. *Turkish Online Journal of Educational Technology-TOJET*, 4(1), 75–84.
- Sahin, I. (2006). Detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *Turkish Online Journal of Educational Technology-TOJET*, 5(2), 14–23.
- Saldaña, J. (2013). *The coding manual for qualitative researchers* (S. Edition (ed.)).

Sage.

- Salim Silva, M., Smith, W. T., & Bammer, G. (2002). Telephone reminders are a cost effective way to improve responses in postal health surveys. *Journal of Epidemiology and Community Health*, 56(2), 115–118.
<https://doi.org/10.1136/jech.56.2.115>
- Sallehudin, H., Razak, R. C., & Ismail, M. (2015). Factors Influencing Cloud Computing Adoption in the Public Sector: An Empirical Analysis. *Journal of Entrepreneurship and Business*, 3(1), 30–45. <https://doi.org/DOI:10.17687/JEB.0301.03>
- Sattler, H., Völckner, F., Riediger, C., & Ringle, C. M. (2010). The impact of brand extension success drivers on brand extension price premiums. *International Journal of Research in Marketing*, 27(4), 319–328.
- Sayginer, C., & Ercan, T. (2020). Understanding Determinants Of Cloud Computing Adoption Using An Integrated Diffusion Of Innovation (DOI)-Technological, Organizational And Environmental (TOE) Model. *Humanities & Social Sciences Reviews*, 8(1), 91–102.
- Scandura, T. A., & Williams, E. A. (2000). Research Methodology In Management: Current Practices, Trends, And Implications For Future Research. *Academy of Management Journal*, 43(6), 1248–1264.
- Scott, S. (2020, October 19). *What is Infrastructure as a Service (IaaS) | InMotion Hosting*. <https://www.inmotionhosting.com/support/product-guides/private-cloud/what-is-infrastructure-as-a-service-iaas/>
- Segooa, M. A., & Kalema, B. M. (2015). Virtual Learning Environments for Higher Learning Institutions in Developing Countries. *2015 Fifth International Conference on E-Learning (Econf)*, 353–359. <https://doi.org/10.1109/ECONF.2015.67>
- Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (Third Edit). Teachers college press.
- Sekaran, U. (2003). *Research Methods for Business: A Skill-Building Approach* (4th Editio). ohn Wiley & Sons.
- Sekaran, Uma., & Bougie, R. (2010). *Research methods for business : A skill-building approach* (5th, illustrated ed.). John Wiley & Sons.
https://books.google.com.my/books/about/Research_Methods_for_Business.html?id=a__YI3TJQuAC&redir_esc=y
- Sekaran, Uma., & Bougie, R. (2013). *Research methods for business : a skill-building approach* (6th Edition). Wiley. <https://www.wiley.com/en-us/Research+Methods+for+Business%3A+A+Skill+Building+Approach%2C+6th+Edition-p-9781119942252>
- Sekaran, Uma. (2006). *Research methods for business: A skill building approach*. John Wiley & Sons.

- Sekaran, Uma. (2014). *Research Methods for Business: A Skill-Building Approach* (J. Marshall (ed.); Fourth Edi). John Wiley & Sons, Inc.
- Sekaran, Uma, & Bougie, R. (2016a). *Research methods for business : a skill-building approach* (Seventh). John Wiley & Sons.
[https://books.google.com.my/books?id=Ko6bCgAAQBAJ&dq=research+methods+for+business+:+A+skill+building+approach+seventh+edition+\(Uma,+Bougie\)&lr=&source=gbs_navlinks_s](https://books.google.com.my/books?id=Ko6bCgAAQBAJ&dq=research+methods+for+business+:+A+skill+building+approach+seventh+edition+(Uma,+Bougie)&lr=&source=gbs_navlinks_s)
- Sekaran, Uma, & Bougie, R. (2016b). *Research Methods For Business: A Skill Building Approach* (Fifth Edit). John Wiley & Sons.
https://books.google.com.my/books?id=Ko6bCgAAQBAJ&pg=RA1-PA23&dq=what+is+deductive+research+method&hl=en&sa=X&redir_esc=y#v=onepage&q=what+is+deductive+research+method&f=false
- Selviandro, N., & Hasibuan, Z. A. (2013). Cloud-Based E-Learning: A Proposed Model and Benefits by Using E-Learning Based on Cloud Computing for Educational Institution. In *Information and Communication Technology* (pp. 192–201). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-36818-9_20
- Shana, Z., & Abulibdeh, E. (2017). Cloud Computing Issues for Higher Education: Theory of Acceptance Model. *International Journal of Emerging Technologies in Learning (IJET)*, 12(11), 168–184. <http://journals.sfu.ca/onlinejour/index.php/ijet/article/view/7473>
- Sharma, S. K., Al-Badi, A. H., Govindaluri, S. M., & Al-Kharusi, M. H. (2016). Predicting motivators of cloud computing adoption: A developing country perspective. *Computers in Human Behavior*, 62, 61–69.
<https://doi.org/10.1016/J.CHB.2016.03.073>
- Shaughnessy, J. J., Zechmeister, E. B., & Zechmeister, J. S. (2012). *research methods in psychology* (M. Magaziner (ed.); Ninth Edit). McGraw-Hill Education.
- Sheng, Y., & Sheng, Z. (2012). Is Coefficient Alpha Robust to Non-Normal Data? *Frontiers in Psychology*, 3, 34. <https://doi.org/10.3389/fpsyg.2012.00034>
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research. *Journal of Consumer Research*, 15(3), 325.
<https://doi.org/10.1086/209170>
- Shin, D.-H. (2013). User centric cloud service model in public sectors: Policy implications of cloud services. *Government Information Quarterly*, 30(2), 194–203.
<https://doi.org/10.1016/J.GIQ.2012.06.012>
- Silva, C. N. (2017). *United Nations E-Government Survey 2016: E-Government in Support of Sustainable Development*. IGI GLOBAL 701 E CHOCOLATE AVE, STE 200, HERSHEY, PA 17033-1240 USA.
- Silverman, D. (2013). *Doing qualitative research: A practical handbook* (4th Editio). SAGE publications limited.

- Slater, S. F. (1995). Issues in conducting marketing strategy research. *Journal of Strategic Marketing*, 3, 257–270.
<https://www.tandfonline.com/doi/abs/10.1080/09652549500000016>
- Spector, P. E. (1992). *Summated rating scale construction : an introduction* (illustrated). Sage Publications.
[https://books.google.com.my/books?id=rFtk95nycBgC&dq=summated+rating+scale+construction:+An+introduction+spectator+\(1992\)+&lr=&source=gbs_navlinks_s](https://books.google.com.my/books?id=rFtk95nycBgC&dq=summated+rating+scale+construction:+An+introduction+spectator+(1992)+&lr=&source=gbs_navlinks_s)
- Spector, P. E. (2006). Method Variance in Organizational Research Truth or Urban Legend? *Organizational Research Methods* *Spector*, 9(2), 221–232.
<https://doi.org/10.1177/1094428105284955>
- Ssl2buy. (2020, June 14). *Building Trust and Security in the Cloud Computing*.
<https://www.ssl2buy.com/wiki/building-trust-and-security-in-the-cloud-computing>
- Stankov, I., Datsenka, R., & Kurbel, K. (2012). *Service level agreement as an instrument to enhance trust in cloud computing—an analysis of infrastructure-as-a-service providers*.
- Stone, M. (1974). Cross-validatory choice and assessment of statistical predictions. *Journal of the Royal Statistical Society: Series B (Methodological)*, 36(2), 111–133.
- Suhr, D. D. (2006). Exploratory or Confirmatory Factor Analysis? *Statistics and Data Analysis*, 1–17.
http://tx.liberal.ntu.edu.tw/~PurpleWoo/Literature/!DataAnalysis/FactorAnalysis_SAS.com_200-31.pdf
- Sun, W., Chou, C.-P., Stacy, A. W., Ma, H., Unger, J., & Gallaher, P. (2007). SAS and SPSS macros to calculate standardized Cronbach’s alpha using the upper bound of the phi coefficient for dichotomous items. *Behavior Research Methods*, 39(1), 71–81. <https://doi.org/10.3758/BF03192845>
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th Edition). Pearson/Allyn & Bacon. <https://dl.acm.org/citation.cfm?id=1213888>
- Tan, P. J. B. (2013). Applying the UTAUT to Understand Factors Affecting the Use of English E-Learning Websites in Taiwan. *National Penghu University, Magong, Taiwan*, 1(12). <https://doi.org/10.1177/2158244013503837>
- Tarhini, A., Al-Gharbi, K., Al-Badi, A., & AlHinai, Y. S. (2018). An Analysis of the Factors Affecting the Adoption of Cloud Computing in Higher Educational Institutions: A Developing Country Perspective. *International Journal of Cloud Applications and Computing (IJCAC)*, 8(4), 49–71.
- Tarhini, A., Masa’deh, R., Al-Badi, A., Almajali, M., & Alrabayaah, S. H. (2017). Factors Influencing Employees’ Intention to Use Cloud Computing. *Journal of Management and Strategy*, 8(2), 47. <https://doi.org/10.5430/jms.v8n2p47>
- Tariq, M. I., Tayyaba, S., Rasheed, H., & Ashraf, M. W. (2017). Factors influencing the Cloud Computing adoption in Higher Education Institutions of Punjab, Pakistan. *2017 International Conference on Communication, Computing and Digital Systems*

- (C-CODE), 179–184. <https://doi.org/10.1109/C-CODE.2017.7918925>
- Tarmidi, M., Rasid, S. Z. A., Alrazi, B., & Roni, R. A. (2014). Cloud Computing Awareness and Adoption among Accounting Practitioners in Malaysia. *Procedia - Social and Behavioral Sciences*, 164, 569–574. <https://doi.org/10.1016/J.SBSPRO.2014.11.147>
- Tarus, J. K., Gichoya, D., & Muumbo, A. (2015). Challenges of implementing e-learning in Kenya: A case of Kenyan public universities. *The International Review of Research in Open and Distributed Learning*, 16(1). <https://doi.org/10.19173/irrodl.v16i1.1816>
- Tashakkori, A., & Creswell, J. W. (2007). *The new era of mixed methods* (pp. 3–7). Sage Publications. <https://doi.org/10.1177/2345678906293042>
- Tashkandi, A. N., & Al-Jabri, I. M. (2015). Cloud computing adoption by higher education institutions in Saudi Arabia: an exploratory study. *Cluster Computing*, 18(4), 1527–1537. <https://doi.org/10.1007/s10586-015-0490-4>
- Taylor, S., & Todd, P. (1995a). Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions. *International Journal of Research in Marketing*, 12(2), 137–155. [https://doi.org/10.1016/0167-8116\(94\)00019-K](https://doi.org/10.1016/0167-8116(94)00019-K)
- Taylor, S., & Todd, P. A. (1995b). Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research*, 6(2), 144–176. <http://home.business.utah.edu/actme/7410/TaylorTodd.pdf>
- Tehseen, S., Ramayah, T., & Sajilan, S. (2017). Testing and Controlling for Common Method Variance: A Review of Available Methods. *Journal of Management Sciences*, 4(2), 146–175. <https://doi.org/10.20547/jms.2014.1704202>
- Tenah, K. A. (1986). Management level as defined and applied within a construction organization by some US contractors and engineers. *International Journal of Project Management*, 4(4), 195–204. [https://doi.org/10.1016/0263-7863\(86\)90003-7](https://doi.org/10.1016/0263-7863(86)90003-7)
- Tens. (2019). *Nigerian Educational System*. <http://tens-niger.com/about-tens/nigerian-educational-system/>
- Teo, T., Su Luan, W., & Ching Sing, C. (2008). A cross-cultural examination of the intention to use technology between Singaporean and Malaysian pre-service teachers: an application of the Technology Acceptance Model (TAM). *Educational Technology & Society*, 11(4), 265–280. https://www.j-ets.net/ETS/journals/11_4/19.pdf
- Thanasegaran, G. (2009). Reliability and Validity Issues in Research. *Integration & Dissemination*, 4, 35–40.
- TheEagleOnline. (2018). *Boko Haram: Schools shut over fears of attack on Adamawa town* -. <https://theeagleonline.com.ng/boko-haram-schools-shut-over-fears-of-attack-on-adamawa-town/>

- Thompson, R., Barclay, D. W., & Higgins, C. A. (1995). (PDF) *The partial least squares approach to causal modeling: Personal computer adoption and use as an illustration*.
https://www.researchgate.net/publication/313137896_The_partial_least_squares_approach_to_causal_modeling_Personal_computer_adoption_and_use_as_an_illustration
- Tierney, W. G. (1988). Organizational culture in higher education: Defining the essentials. *The Journal of Higher Education*, 59(1), 2–21.
- Tom, A. M., Virgianti, W., & Osman, W. R. S. (2019). The Impact of Government Support on the Adoption of IaaS/BEL by University's Top Management. *2019 International Conference on Data and Software Engineering (ICoDSE)*, 1–6.
- Tom, A. M., Virgianti, W., & Rozaini, W. (2019). Understanding the Determinants of Infrastructure-as-a Service-Based E-Learning Adoption Using an Integrated TOE-DOI Model: A Nigerian Perspective. *2019 6th International Conference on Research and Innovation in Information Systems (ICRIIS)*, 1–6.
<https://doi.org/10.1109/ICRIIS48246.2019.9073418>
- Tornatzky, L.G., & Fleischer, M. (1990). *Technological Innovation as a Process* (pp. 27–50). Lexington Books.
https://www.researchgate.net/publication/291824703_Technological_Innovation_as_a_Process
- Tornatzky, Louis. G., & Fleischer, M. (1990). The processes of technological innovation. *The Journal of Technology Transfer*, 16(1), 45–46.
<https://doi.org/10.1007/BF02371446>
- Traina, S. B., MacLean, C. H., Park, G. S., & Kahn, K. L. (2005). Telephone reminder calls increased response rates to mailed study consent forms. *Journal of Clinical Epidemiology*, 58(7), 743–746. <https://doi.org/10.1016/J.JCLINEPI.2005.02.001>
- Turban, E., Outland, J., King, D., Lee, J. K., Liang, T.-P., & Turban, D. C. (2018). Innovative EC Systems: From E-Government to E-Learning, E-Health, Sharing Economy, and P2P Commerce. In *Electronic Commerce 2018 A managerial and Social Networks Perspective* (9th Edition, pp. 167–201). Springer, Cham.
https://doi.org/10.1007/978-3-319-58715-8_5
- Tushman, M., & Nadler, D. (1986). Organizing for Innovation. *California Management Review*, 28(3), 74–92. <https://doi.org/10.2307/41165203>
- Tweel, A. (2012). Examining the Relationship between Technological, Organizational, and Environmental Factors and Cloud Computing Adoption [Northcentral University (USA)]. In *ProQuest Dissertations Publishing*.
<https://search.proquest.com/docview/1101947090/abstract/EC45851E744B4920PQ/1?accountid=42599>
- Tweney, A., & Crane, S. (2007). Trustguide2: An exploration of privacy preferences in an online world. In *Expanding the Knowledge Economy: Issues, Applications, Case Studies*. IOS Press.

- Verardi, V., & Croux, C. (2008). Robust Regression in Stata. *SSRN Electronic Journal*, 9(3), 493–453. <https://doi.org/10.2139/ssrn.1369144>
- VMware. (2021). *Cloud Solutions / Any App Any Cloud / VMware*. <https://www.vmware.com/cloud-solutions.html>
- Vujin, V., Simić, K., & Milić, A. (2014). Management of Cloud Computing Infrastructure for E-Learning. In *Innovative Management and Firm Performance* (pp. 329–346). Springer.
- Wahab, A. A. (2016). *Designing an Information Infrastructure to Support Research Degree Programmes: Identifying Information and Technology Needs* [Newcastle University]. <https://theses.ncl.ac.uk/dspace/bitstream/10443/3149/1/Wahab%20A2016.pdf>
- Wahsh, M. A., & Dhillon, J. S. (2015). An investigation of factors affecting the adoption of cloud computing for E-government implementation. *2015 IEEE Student Conference on Research and Development (SCORED)*, 323–328. <https://doi.org/10.1109/SCORED.2015.7449349>
- Wang, Y.-M., Wang, Y.-S., & Yang, Y.-F. (2010). Understanding the determinants of RFID adoption in the manufacturing industry. *Technological Forecasting and Social Change*, 803–815. <https://doi.org/doi:10.1016/j.techfore.2010.03.006>
- Wenr. (2019). *Education in Nigeria - WENR*. <https://wenr.wes.org/2017/03/education-in-nigeria>
- Wiersma, W., & Jurs, S. G. (2005). *Research methods in education : an introduction* (8th ed.). Pearson/A and B. https://books.google.com.my/books/about/Research_Methods_in_Education.html?id=QxZKAAAAYAAJ&redir_esc=y
- Wilden, R., Gudergan, S. P., Nielsen, B. B., & Lings, I. (2013). Dynamic capabilities and performance: strategy, structure and environment. *Long Range Planning*, 46(1–2), 72–96.
- Workineh, M., Garcia, N. M., & Midekso, D. (2017). Cloud computing as technological solutions for higher education institutions: Adoption readiness assessment model: Reseach in-progress. *2017 International Conference on Computing Networking and Informatics (ICCNI)*, 1–7. <https://doi.org/10.1109/ICCNI.2017.8123812>
- World Bank. (2013). *Smarter Education Systems for Brighter Futures*.
- Wu, W.-W. (2011a). Mining significant factors affecting the adoption of SaaS using the rough set approach. *Journal of Systems and Software*, 84(3), 435–441. <https://doi.org/10.1016/j.jss.2010.11.890>
- Wu, W.-W. (2011b). Developing an explorative model for SaaS adoption. *Expert Systems with Applications*, 38(12), 15057–15064. <https://doi.org/10.1016/J.ESWA.2011.05.039>
- Xu, S., Fang, X., & Chan, S. (2003). What tasks are suitable for handheld devices? In C.

- S. Julie Jacko (Ed.), *Human-Computer Interaction: Theory and Practice Volume 2 of Human Factors and Ergonomics* (illustrated, pp. 333–337). Lawrence Erlbaum Associates.
https://books.google.com.my/books?id=XP8Y0S0q0ccC&dq=What+tasks+are+suitable+for+handheld+devices%3F+&lr=&source=gbs_navlinks_s
- Yakaraju, G. (2018). *Synchronous and Asynchronous Types of E-learning*.
<https://blog.commlabindia.com/elearning-design/types-of-elearning>
- Yu, Y., Li, M., Hao, J., Li, X., & Zhao, J. L. (2017). Mediating role of trust brief in SMEs' strategic choice of cloud service. *Americas Conference on Information Systems (AMCIS)*.
- Yuvaraj, M. (2016). Determining factors for the adoption of cloud computing in developing countries. *The Bottom Line*, 29(4), 259–272.
<https://doi.org/10.1108/BL-02-2016-0009>
- Zainab, B., Bhatti, M. A., Pangil, F. B., & Battour, M. M. (2015). E-training adoption in the Nigerian civil service. *European Journal of Training and Development*, 39(6), 538–564.
- Zhu, K., & Kraemer, K. L. (2005). Post-Adoption Variations in Usage and Value of E-Business by Organizations: Cross-Country Evidence from the Retail Industry. *Information Systems Research*, 16(1), 61–84.
<https://doi.org/10.1287/isre.1050.0045>
- Zhu, K., Kraemer, K. L., & Xu, S. (2006). The Process of Innovation Assimilation by Firms in Different Countries: A Technology Diffusion Perspective on E-Business. *Management Science*, 52(10), 1557–1576. <https://doi.org/10.1287/mnsc.1050.0487>
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2010). *Business research methods*. (8th Edition). South-Western Cengage Learning.
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business Research Methods* (9th ed.). Cengage Learning.
https://books.google.com.my/books?id=ydcKAAAAQBAJ&dq=Business+research+methods+Zikmund,+Babin+2012&lr=&source=gbs_navlinks_s

Appendices

Appendix A: Questionnaire

SURVEY QUESTIONNAIRES



Questionnaire No:

--	--	--

Research Title: Intention to Adopt Model of Cloud-Based E-learning in Higher Education Institutions

Dear Sir/Madam,

I am a Ph.D. research student from the School of Computing, College of Arts and Sciences, Universiti Utara Malaysia. Presently, I am conducting a research on the topic mentioned above. Attached herewith, self-explanatory questions that will take a little much of your time to answer. Your kind cooperation, participation, and response to this survey questionnaire are highly appreciated and all data will be kept confidential for research purpose only. Please feel free and answer all questions honestly and objectively as possible, as this will contribute towards the achievement of the purpose of this study.

Definition of Terms

E-learning is the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere.

Cloud Computing is a pool of services that enables ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Infrastructure as a Service (IaaS) is a form of Cloud Computing that allows the Cloud User to provision processing, storage, networks, and other fundamental computing resources where the Cloud User is able to deploy and run arbitrary software, which can include operating systems and applications.

Infrastructure as-a Service-Based E-learning (IaaSBEL) is the hosting of E-learning systems on the IaaS platform.

Please do not hesitate to contact the researcher for any inquiry or clarification related to the questionnaire.

Thank you.

Abubakar Magira Tom (900945)

Mobile Telephone Numbers:

+60-1116963648

+234-9061103646

E-mail: magiratom@gmail.com

Supervisors:

1) **Prof. Dr. Wan Rozaini Sheik Osman**

Email: rozai174@uum.edu.my

2) **Dr. Wiwied Virgiyanti**

E-mail: wiwied@uum.edu.my

SECTION A
DEMOGRAPHICS PROFILE

Please tick (√) in the appropriate box

1.	Please indicate your gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
2.	Please indicate your education level: <input type="checkbox"/> Diploma <input type="checkbox"/> Bachelor's Degree <input type="checkbox"/> Master's Degree <input type="checkbox"/> Doctorate
3.	Please indicate your position in the university: <input type="checkbox"/> Director <input type="checkbox"/> Deputy Director <input type="checkbox"/> Unit Head <input type="checkbox"/> Assistant Unit Head <input type="checkbox"/>
4.	Please indicate the type of institution you are attached to: <input type="checkbox"/> Federal University <input type="checkbox"/> State University
5.	Please indicate the zone of your University: <input type="checkbox"/> North-East <input type="checkbox"/> North-West <input type="checkbox"/> North-Central
6.	Please indicate the location of your university: <input type="checkbox"/> Adamawa <input type="checkbox"/> Gombe <input type="checkbox"/> Bauchi <input type="checkbox"/> Taraba <input type="checkbox"/> Borno <input type="checkbox"/> Yobe <input type="checkbox"/> Jigawa <input type="checkbox"/> Kaduna <input type="checkbox"/> Kano <input type="checkbox"/> Katsina <input type="checkbox"/> Kebbi <input type="checkbox"/> Sokoto <input type="checkbox"/> Zamfara <input type="checkbox"/> Abuja <input type="checkbox"/> Benue <input type="checkbox"/> Kogi <input type="checkbox"/> Kwara <input type="checkbox"/> Nasarawa <input type="checkbox"/> Niger <input type="checkbox"/> Plateau
7.	Please indicate your experience in managing E-learning: <input type="checkbox"/> None <input type="checkbox"/> ≤ 1 year <input type="checkbox"/> 1-2 years <input type="checkbox"/> 2-3 years <input type="checkbox"/> 4-5 years <input type="checkbox"/> >5 years
8.	Do you have any experience in using Cloud computing for E-learning purposes? <input type="checkbox"/> Yes <input type="checkbox"/> No
9.	Which Public Infrastructure as-a Service-Based E-learning are you familiar with? <input type="checkbox"/> Microsoft Azure <input type="checkbox"/> Amazon Web Service (AWS) <input type="checkbox"/> Google GCP <input type="checkbox"/> Others (specify) <input type="checkbox"/> None
10.	Please indicate the student population in your Institution: <input type="checkbox"/> < 5,000 <input type="checkbox"/> 5,000-10,000 <input type="checkbox"/> 10,000-20,000 <input type="checkbox"/> 20,000-30,000 <input type="checkbox"/> > 30,000

SECTION B:
TECHNOLOGICAL, ORGANIZATIONAL AND ENVIRONMENTAL FACTORS

Please tick (√) accordingly from 1 to 7 that matches your view or level of agreement in each statement.

The following statements describe the extent to which you agree with the technological factors that influence the adoption of IaaSBEL in your University.

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7

No	Statements	1	2	3	4	5	6	7
1.	IaaSBEL will improve the quality of our operations.	1	2	3	4	5	6	7
2.	IaaSBEL will enhance the effectiveness of our Universities' operations.	1	2	3	4	5	6	7
3.	IaaSBEL will enable us to perform our operations more quickly.	1	2	3	4	5	6	7
4.	IaaSBEL will give us a greater control over our operations.	1	2	3	4	5	6	7
5.	IaaSBEL will improve our job performance.	1	2	3	4	5	6	7
6.	IaaSBEL will allow us to increase academic productivity.	1	2	3	4	5	6	7
7.	IaaSBEL will be compatible with all aspects of our academic operations.	1	2	3	4	5	6	7
8.	IaaSBEL will fit well with the way we operate.	1	2	3	4	5	6	7
9.	IaaSBEL will fit into our working style.	1	2	3	4	5	6	7
10.	IaaSBEL will be completely compatible with our current academic operations.	1	2	3	4	5	6	7
11.	IaaSBEL will easily be integrated into existing systems.	1	2	3	4	5	6	7
12.	IaaSBEL services will not require many technical changes	1	2	3	4	5	6	7
13.	IaaSBEL provider will be trustworthy.	1	2	3	4	5	6	7
14.	IaaSBEL service provider will have more to lose than to gain by not delivering on their promises.	1	2	3	4	5	6	7
15.	IaaSBEL service provider's behavior will meet our expectations.	1	2	3	4	5	6	7
16.	IaaSBEL will provide sufficient security controls.	1	2	3	4	5	6	7
17.	The security systems built into IaaSBEL services will be strong enough to protect our University's data.	1	2	3	4	5	6	7
18.	IaaSBEL will be secure.	1	2	3	4	5	6	7
19.	Top management will be interested in the use of IaaSBEL technologies in our operations.	1	2	3	4	5	6	7
20.	Top Management will be enthusiastically supportive of the use of IaaSBEL technologies in our operations.	1	2	3	4	5	6	7
21.	The top management will allocate adequate resources to the IaaSBEL technologies adoption.	1	2	3	4	5	6	7
22.	Top management is aware of the benefits of IaaSBEL technologies adoption.	1	2	3	4	5	6	7
23.	Top management will actively encourage employees to use IaaSBEL technologies in their daily activities.	1	2	3	4	5	6	7
24.	The University's management will be willing to take risks (financial and organizational) involved in the adoption of IaaSBEL.	1	2	3	4	5	6	7

25.	Using IaaS/BEL instead of buying and deploying physical computers and software will be cheaper.	1	2	3	4	5	6	7
26.	The benefits of IaaS/BEL will be greater than the cost of this adoption.	1	2	3	4	5	6	7
27.	With IaaS/BEL there will be reduction of energy costs and environmental costs.	1	2	3	4	5	6	7

Please tick (✓) accordingly from 1 to 7 that matches your view or level of agreement in each statement. The following statements describe the extent to which you agree with the technological factors that influence the adoption of IaaS/BEL in your University.

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7

28.	Maintenance costs for IaaS/BEL will be very low.	1	2	3	4	5	6	7
29.	Our university is under pressure from competitors to adopt IaaS/BEL technologies.	1	2	3	4	5	6	7
30.	Other universities know the importance of IaaS/BEL.	1	2	3	4	5	6	7
31.	Universities think that IaaS/BEL will have an influence on the competition in Higher Education Institutions.	1	2	3	4	5	6	7
32.	I feel it is a strategic necessity to use IaaS/BEL technologies to compete in the marketplace.	1	2	3	4	5	6	7
33.	I think other universities see my university as more respected because of using IaaS/BEL.	1	2	3	4	5	6	7
34.	The use of IaaS/BEL differentiates my university from other universities.	1	2	3	4	5	6	7
35.	I think my University experienced competitive pressure from other universities to adopt IaaS/BEL.	1	2	3	4	5	6	7
36.	The service providers will offer adequate technical support after the adoption of IaaS/BEL applications.	1	2	3	4	5	6	7
37.	High quality training programs will be provided by the IaaS/BEL service providers.	1	2	3	4	5	6	7
38.	Effectiveness in recommending suitable IaaS/BEL solutions will be provided by the service providers.	1	2	3	4	5	6	7
39.	IaaS/BEL service providers will provide adequate technical support during implementation.	1	2	3	4	5	6	7
40.	Cloud computing Service providers will be actively marketing IaaS/BEL to our University.	1	2	3	4	5	6	7
41.	Cloud computing Service providers will be providing incentives for the adoption of their products and services.	1	2	3	4	5	6	7
42.	IaaS/BEL providers will maintain the privacy and confidentiality of our University's data.	1	2	3	4	5	6	7
43.	My University intends to adopt IaaS/BEL.	1	2	3	4	5	6	7
44.	It is likely that my University will take steps to adopt IaaS/BEL in the future.	1	2	3	4	5	6	7
45.	My University will try to use IaaS/BEL in daily life.	1	2	3	4	5	6	7
46.	The Government is providing us with incentives to adopt IaaS/BEL technologies.	1	2	3	4	5	6	7
47.	The government is active in setting up the facilities to enable IaaS/BEL adoption.	1	2	3	4	5	6	7
48.	There is legal protection in the use of IaaS/BEL.	1	2	3	4	5	6	7

49.	laaSBEL development is becoming one of the government major policies.	1	2	3	4	5	6	7
-----	---	---	---	---	---	---	---	---




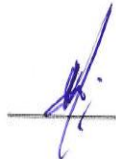
** Thank you very much for participating in this survey. Your cooperation is highly appreciated.

**



Appendix B: Preliminary Analysis and Factors Confirmation: Qualitative Study

The preliminary analysis and factors confirmation were performed in two phases, the first phase is the qualitative phase (where the researcher contacted expert in the field from UUM), and the quantitative phases were mainly collected from Nigeria. The rigorousness of the qualitative phase and quantitative phases gives an in-depth understanding of the problem understudy.

Experts Information	Evidence
Expert 1: Preliminary Study and Factor Confirmation Name: Dr. Alawiyah Bt Abd Wahab Position: Senior Lecturer Current responsibilities: Senior Lecturer Experience with the current responsibilities: 22 years Experience in using E-learning: 10 years Experience in managing E-learning: 8 years Do you have any experience using Cloud Computing For E-learning Purposes? : No Are you familiar with any of the public Infrastructure as-a Service-Based E-learning: Email: alawiyah@uum.edu.my	Respondent's signature:  Date: <u>16/07/2018.</u> Interviewer's signature:  Date: <u>16/07/2018</u>
Expert 2: Preliminary Study and Factor Confirmation Name: Prof. Madya Dr. Abdul Malek Hj Abdul Karim Position: DVC Academic Affairs Department Current responsibilities: Student Affairs Experience with the current responsibilities: 6 years Experience in using E-learning: 18 years Experience in managing E-learning: 4 years Do you have any experience using Cloud Computing For E-learning Purposes? : Yes Are you familiar with any of the public Infrastructure as-a Service-Based E-learning: Microsoft Azure Email: malek@uum.edu.my	Respondent's signature:  Date: <u>28/8/18</u> Interviewer's signature:  Date: <u>28/8/2018</u>

Appendix C: Preliminary Analysis and Factors Confirmation: Interview Questions sample

Survey Interview



Research Title: A Public Infrastructure as-a Service-Based E-learning Intention to Adopt Model for Higher Education Institutions in Developing Countries: A Nigerian Perspective

Target Respondents: E-learning Experts, IT Administrators, Cloud Computing Experts

PRELIMINARY STUDY AND EXPERT CONFIRMATION OF FACTORS/DETERMINANTS

Dear Sir/Madam,

I am a Ph.D. research student from the School of Computing, College of Arts and Sciences, Universiti Utara Malaysia. I am conducting a research on the topic as mentioned above under the supervision of Prof. Dr. Wan Rozaini Sheik Osman assisted by Dr. Wiwied Virgiyanti. Attached herewith, a self-explanatory interview question that will take a little much of your time to answer. Your kind cooperation, participation, and response to this interview questions are highly appreciated, and all data will be kept confidential, for research purpose only.

During the interview, the researcher would like to discuss the determinant of A Public Infrastructure as-a Service-Based E-learning Intention to Adopt Model with the sole aim of providing education for all in developing countries HEIs. The interview is expected to take about half an hour or more, and the researcher would like to record the session because the researcher does not want to miss any of your comments, even though the researcher will be taking some notes during the session. Additionally, you do not have to talk about anything you do not want to, and you may end the interview at any time.

Please do not hesitate to contact the researcher for any inquiry or clarification related to the interview.

Thank you.

Abubakar Magira Tom (900945)
School of Computing,
College of Arts and Sciences
Universiti Utara Malaysia,
Sintok 06010,
Kedah Darul Aman,
Malaysia.
Phone Number: +601116963648
Email: abubakar_magira@ahsgs.uum.edu.my

Prof. Dr. Wan Rozaini Sheik Osman
School of Computing,
College of Arts and Sciences,
Universiti Utara Malaysia,
Sintok 06010,
Kedah Darul Aman,
Malaysia.
Phone Number: +60194432666
Email: rozai174@uum.edu.my

Please answer as appropriate.

1	Name: _____ _____
2	Position: _____ _____
3	Organization: _____ _____
4	Current Responsibilities: _____ _____
5	Experience with the current responsibilities: <u>22</u> Years
6	Experience in using E-learning: <u>10</u> Years
7	Experience in managing E-learning: <u>8</u> Years
8	Do you have any experience using Cloud Computing for E-learning purposes? a) Yes <input checked="" type="radio"/> b) No
9	Are you familiar with any of the Public Infrastructure as-a Service-Based E-learning? a) Microsoft Azure b) Amazon Web Service (AWS) c) Google GCP

Section B: General Information About Cloud-Based E-learning

The following statements describe the extent to which you agree with the following factors that influences the adoption of a Public Infrastructure as-a-Service Based E-learning Intention to Adopt Model.

From your point of view, please answer the questions accordingly.

1	Do you consider the implementation of a Public Infrastructure as-a Service- Based E-learning will solve the limitations of tradition E-learning? Why?
2	Do you think the Public Infrastructure as-a Service-Based E-learning Intention to adopt is low in developing countries?.....

	Why?.....
3	Do you think using the Public Infrastructure as-a Service-Based E-learning will help reduce Cost when compared to traditional E-learning?..... Why?.....
4	Do you think Government will support the Public Infrastructure as-a Service-Based E-learning adoption in developing countries?..... Why?.....
5	Do you think using the Public Infrastructure as-a Service-Based E-learning will provide education for all in developing countries?..... Why?.....

Section C: Determinants of a Public Infrastructure as-a Service-Based E-learning Intention to adopt Model

The following statements describe the extent to which the listed factors/determinants that influence Public Infrastructure as-a Service-Based E-learning Intention to adopt in developing countries HEIs.

Please answer the questions accordingly.

S/N	Main Question	Follow up Questions
1	Do you think " Relative Advantage " is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
2	Do you think " Compatibility " is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
3	Do you think " Trust " is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?

4	Will the introduction of “ Security ” determine the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	Do you think it can be a determinant ? Why?
5	Do you think “ Top Management Commitment ” is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
6	How will “ Institution Size ” be a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
7	Do you think “ Cost Savings ” is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
8	Do you think “ Collaboration & Sharing ” is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
9	Do you think “ Competitive Pressure ” is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
10	Do you think “ Service Provider Support ” is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?

11	Do you think “Government Support” is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?
12	Do you think “Intention to Adopt CBEL” is a determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries HEIs?	How do you think it can be a determinant ? Why?

Official Stamp: _____

Date: _____



UUM

Thank you for your co-operation
Universiti Utara Malaysia

Appendix D: Qualitative Findings

Coding procedure

In the process of coding the data, the author commenced the analysis with coding the data, to see the outline from the large volume of text. The coding procedures were adopted from (Saldaña, 2013). The themes, idea repeating, relevant text, and narrative. Nvivo software (v.10) for qualitative data analysis were utilised, hence, data was coded in congruence with the themes developed. Meanwhile, after relevant grouping, theme grouping as well as sub-themes were allocated to the wider domains.

Table 6. 4

General profile of the informants

Category	Interviewed Informants	Frequency
A1 (Staff)	Former ICT director (DVC Student Affairs Department)	1
A2 (Staff)	Senior Lecturer	1
Total		2

Thematic Analysis

Thematic Analysis is the process of identifying patterns or themes within qualitative data. Braun and Clarke (2006) suggests that the first qualitative method to be learned is the thematic analysis as "it provides core skills that will be useful for conducting many other kinds of analysis" (p. 78). Additionally, it is method rather than a methodology (Braun & Clarke, 2006; Clarke & Braun, 2013). Thus, showing that it is not attached to a certain epistemological or theoretical perspective, and thus, making it flexible. In conducting a thematic analysis, the goal of a thematic analysis is to identify themes i.e. patterns in the data that are crucial or interesting and use these themes to address the research or say something about an issue. Thus, a good thematic analysis interprets and makes sentence

of it. However, a common pitfall is to use the main interview questions as the themes (Clarke & Braun, 2013).

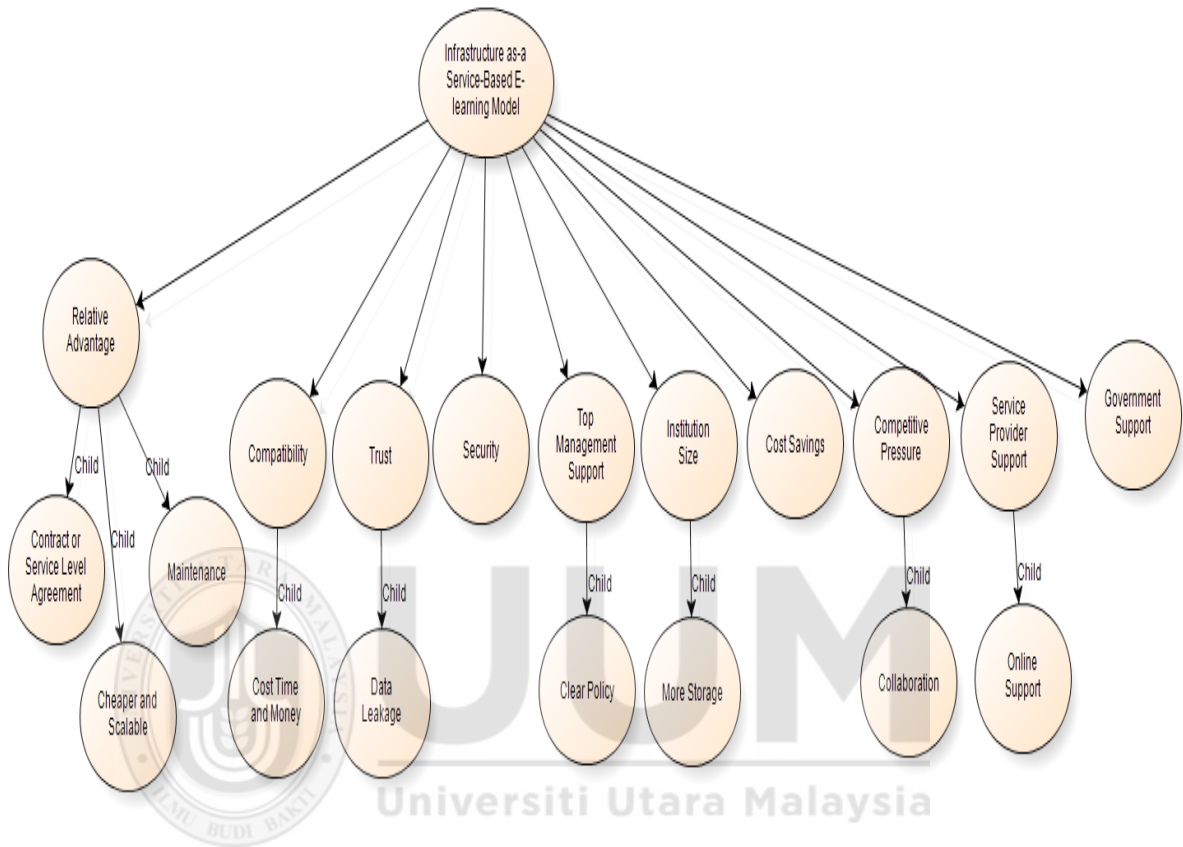


Figure 1. Overall Qualitative Model

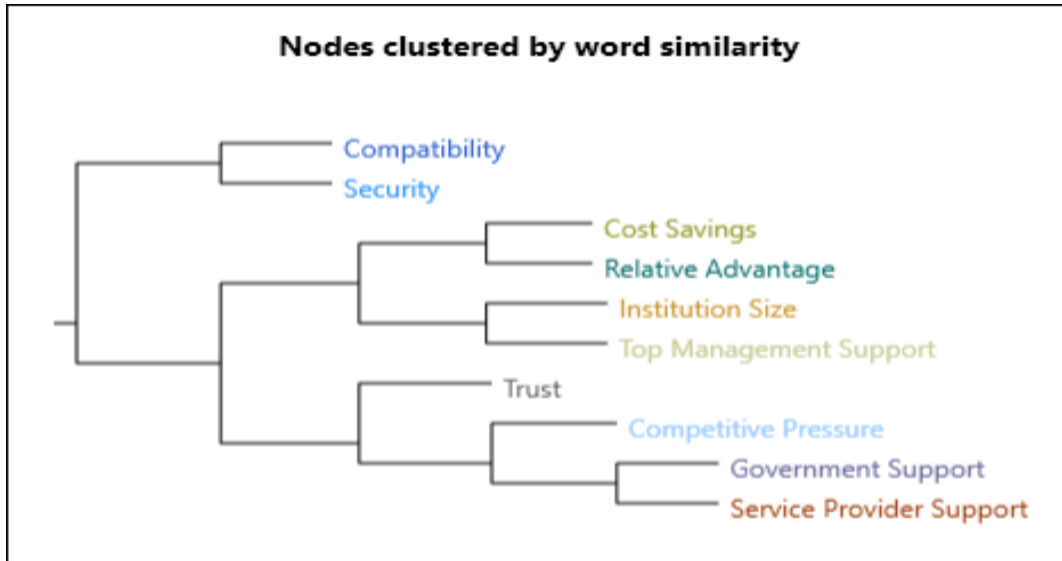


Figure 4. Nodes clustered by word similarity




Appendix E: Interview Transcription

Demographic Profile (First 1st Informant)

Gender	Male
Marital Status	Married
Position	DVC Academic Affairs Department
University	University Utara Malaysia (UUM)
Experience in using E-learning	18 years
Current Responsibility	Student Affairs Department
Experience in Managing E-learning	4 years
Do you have any experience using Cloud Computing for E-learning Purposes?	Yes
Are you familiar with any of the public Infrastructure as-a Service-Based E-learning?	Microsoft Azure
Email: malek@uum.edu.my	

<p>Relative Advantage</p> 	<p>Do you think “Relative Advantage” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><i><u>Answer</u></i></p> <p>Ok, I need you to define what is a relative advantage, compatibility, security, top management commitment, institution size, cost savings, competitive pressure, service provider support, government support, Intention to adopt IaaSBEL.</p> <p>0:02:39.5 relative advantage from server base to cloud base, yes. I think definitely there is an advantage in terms of cloud-based because one thing is that is cheaper and easily scalable, so that means, you do not need to add more storage, and so on, it is much more easier to scale it to the size that you want when you need it, and it is definitely much faster than if you are using web-based. Because it is the physical infrastructure that you have to buy and so on. One thing is that when you are talking cloud-based, are you talking about renting space or what? Of course, the other thing is if that is what you are planning to do, it definitely will be cheaper, and the other advantage is the maintenance. The maintenance will be there, does not matter it is cloud-based or server-based or you know whatever. The maintenance is going to be there, but I would see the maintenance rather than it been replicated, let us say, the state universities in Nigeria been replicated ten times, you know it is just like one central administration, but on the time side, there will be some problems, I mean in terms of security. That is something to me is something of the biggest reason, is how secure is the data that we have up there. So, security will be a problem, and then, of course, there is the contract agreement (service level agreement), that you have to consider. That one is something that on the surface level, you look at it as something very small, but it can be a problem in terms of this contract, all these things have to be clear like you are doing it. Then all those things, the legal unit will really have to look into it to see that all the loopholes and everything flows. So, that one is something that I foresee happens, I mean in terms of the ownership of the data. You know, when you put data there, let us say UUM, puts our data there and UKM also put the data there and so on. You know the ownership issue arises.</p>
--	--

<p>Compatibility</p>	<p>Do you think “Compatibility” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>That one is something it depends on how advanced are you in terms of your implementation. So you if you are in the beginning stage of the implementation, it does not matter because, you know, you follow whatever the government has decided. If it is a government thing, you know whatever platform that they are deciding and so on, you follow. So that means if you at zero stage, it is easy lah. But if you are let say at 50%, you know you have done it for like say three years, and you know you are on something different, you know like even in our UUM IT, when they want to migrate into something else, then you know its messy. Because you know they have used software which is not compatible with the new software and you know the whole system, so and the older system, so that means it takes a lot of time, so you know, that is something that has to be considered. I mean in terms of how advanced are you in terms of the implementation. If you are advance and what they are proposing works with your system, then, it is easy. But if you advance and you know what you are doing is something different from what system they are using, then it would be a problem. Because it is going to cost a lot of money, a lot of time means money because you are talking about getting your people to sort of redo it a gain, the same thing that they did maybe 3-4 years ago.</p>
<p>Trust</p>	<p>Do you think “Trust” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>0:06:50.7 as we say just now, you know trusting another organization to manage your data and you know the privacy information, about your students you know, whether the data is going to be sold off to someone else, you know, now you see I use one bank and then suddenly people keep on calling me nonstop because they know that for example, that I have quite a good standing in term money, my financial standing is quite good, so, you know almost every day, I get people calling me you know, you want this insurance, you want to go on holiday, you know, so, it is worrisome, you know they will not call a person who has 1000RM in the bank, but you know, when you have a certain amount in the bank, and they know that you are stable, you have the extra money in the bank, so you know you will get this data been shared, you know, because, I am very I would say an advance user in terms of my mobile phone, you know my banking, my insurance, the whole work, even my online shopping is all been done on my phone. So i do not know who leak the info you know, so if I only use say online banking, maybe i use Maybank, then maybe Maybank is the one who leaks the information. Now you know you are using across the board, you are using it across all things now, you know I pay all my bills online, I do not go anywhere. I do not go to the bank and go and pay bills, my electricity bills all paid online. So, you know now somebody has leaked the information about this person, so you know, there is something that is maybe offensive, because people can sell off the data, so you know that is why I said going back to that agreement the contract is important.</p>

Security	<p>Do you think “Security” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u><i>Answer</i></u></p>
<p>Top Management Support</p> 	<p>Do you think “Top Management Support” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u><i>Answer</i></u></p> <p>0:11:08.1 it is very important, extremely important, top management. When i was the director of the teaching and learning centre, that was in 1999-2000, I work very closely with the vice-chancellor, and the TNCA, the deputy vice-chancellor academic. Because of academic matters. Why I say it is important is because you must have a clear policy on e-learning. For example, if you tell people if you like if you do not like, it is OK. Probably nobody is going to use it. I would say a very small percentage will use it. Only you know that technology geeks or those people really interested in technology will take it up. You know, but the early adopters will come in they will use it. But early adopters will be small. You know the laggard adopter is a lot more and so all the people who are sort of i do not quite care I think my teaching is OK. I can teach OK, even with my PowerPoint or whatever I have or some say you know with my voice, I am doing a good job. My students are happy, and they are graduating, so why should I use another burden, a additional burden, why should I go into it. You know, so the fact is that they must be a clear policy. A clear policy can only come from the top management, so if you do not have their policies, the IT unit or UTLC, may say that we want to do this, but if the top management does not buy it, then how can use it. So the top management must be serious on it. The other thing is, of course, the top management is going to approve the finances, right? The funds, so if they are not serious about it, the main thing is to convince them first, before you convince the masses.</p>
Institution Size	<p>Do you think “Institution Size” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u><i>Answer</i></u></p> <p>0:13:30.0 the bigger you go, more people you, you have more behaviour, more character, you know more problem, the bigger it is, the bigger the problem is, and of course, a gain cost as well, the server space, you know it is going to cost money. So how much. Talking about policy just now, because, you have to start talking about, you know when we first implemented the first one we implemented e-learning in this university (UUM), and the thing was that you know how much space do you give to a lecturer in terms of server space, is one GB enough? Is 500MB enough? You know, and then, there is going to be IT lecturers that will need a little bit more or multimedia lecturer may need a little bit more, all this is in a clear policy. As oppose to social scientist, you know, but then there will be one or two social scientists who are even more advance than the IT people, in terms of usage, and they may say that ooh, I want more space, you know I am going to use all these videos in my e-learning teaching. So, all those things you must ensure that you have this clear policies and guidelines. Otherwise, you get to a stage where it is like</p>

	<p>fire-fighting. You have a problem then you bring the fire brigade out. Otherwise, you are not thinking long term.</p>
Cost Savings	<p>Do you think “Cost Savings” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u><i>Answer</i></u></p>
Competitive Pressure	<p>Do you think “Competitive Pressure” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u><i>Answer</i></u></p> <p>0:15:18.7 Competitive pressure... Competition is always important, but you compete within your category, you know, for example, I do not know how Nigeria's universities are ranked, whether you have like research universities. For example, let us say you our universities are categorized as research universities, five or six universities are competing against each other, so you are competing in that cluster. Then there are clusters like a comprehensive university or technical university or whatever it is. Then the competition may be withing the cluster, but as a whole when you are talking about competition, it is against collaboration right? Is competition Vs collaboration. I think the way to go now is to go on collaboration because every university will gain from the other university. If you can collaborate, I think it is better than for you to compete.</p> <p>Because, when you compete, one will come out top, the rest will die off. It is unhealthy because you kill the other one, but when you collaborate, everyone gets stronger, since you are talking as a country like Nigeria, then you talking about collaboration, so that people see universities in Nigeria. For example, oxford university, Harvard is not strong in everything, but if I ask you, or ask anyone, they say it is the best university. However, NO, they are good in business, the Harvard business school, maybe the Harvard law school, 2 or 3 schools that are strong, but they are mediocre or slightly above the average, they are not the best, but you know, when you talk about Harvard, if you say you have graduated from Harvard, they do not ask you what field right? They do not ask you. You see, that is why you collaborate in the sense that you bring up 2 or 3 schools and you know, they look as if everyone is so good in there, you know, but the other schools are slightly above average, but they are excellent. Why you say Harvard, nobody asks you, Harvard is the best in the world. However, they are strong in specific fields they are very strong in a particular field, but in other fields, they are just above average. They are not strong, so now that why I say for me, collaboration is more important than to compete. Because, when you compete you lose, so, you collaborate then there will be people who want to come out top, that is why you have to change the mindset, they only collaborate and all be good. You know, and you can be good in certain areas, for example, if you can sit down and say OK, let us be good in certain areas if for example, say Kaduna is good in engineering, for example, why don't you being another university use their content for engineering. However, then that kind of collaboration is going to be useful, and my university, maybe is good in Agriculture, and Kaduna maybe offering agriculture as well, but I am very good in agriculture, why don't you take my content and we collaborate, it is a win-win situation. Rather than, you creating mediocre agriculture content. So</p>




	<p>if I, for example, create really good agriculture content, you know, Kaduna can use my content.</p>
Service Provider Support	<p>Do you think “Competitive Pressure” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>0:25:47.4 Service provider support: That one I think is extremely important because, the linkage between the service provider, if anything goes down, you know when you are talking about e-learning, you are talking about 24/7 365, right? So it is non-stop. So even at 3 am something break down, you are gonna get a complaint. Because students work at 3 am. Some of them work even harder in the morning rather than in the day, so you know, service providers, the linkage must be very good, and when you are choosing your platform, you want to choose a platform in which there is a lot of support. You know telephone support, your online support, there will be people answering on the other side or you know if they have an AI kind of thing, bot answering this simple straight forward questions you know. However, there must be online support because now you are talking about the network, you are not talking about supporting one university, you are talking about supporting a network of maybe 10 or 20 universities. So you know all 20 universities will have problems at some point in time, and you know it is going to resolve the problem. So without support, it will be messy.</p>
Government Support	<p>Do you think “Competitive Pressure” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>0:27:18.5 Government Support: Again, it all depends on the structure. I do not know how the public and private institution work in Nigeria. So the fact is that I think government support is important because we are looking for, now you are talking about universities. Universities have smart people in it. When you sit together, they cannot agree on a lot of things because everyone is so smart. Right? So there will be a problem, I have my idea, you have your idea all the VCs, sit down there, so there must be a strong unit or body to regulate, and you know to come out with policies that are suitable, so that means, they must be meetings, discussions. Because at the end of the day, because, there must be a compromise when you are talking about a network of say ten universities, there must be some compromises, I cannot get everything thing that I want. There must be a lot of give and take, a lot of compromises, so that means but a compromise to a certain level, but still fulfils my agenda as a university right? i cannot get everything, but if i get 90% everyone gets 90%, they go out happy. However, you know if I come out 50%, I will agree. If I am forced to agree, I will agree but abandon, and I do not care about that project, then we going to lose all the collaboration. Then you are going back to square 1. For me, it is very important.</p>

Interview Transcript

Demographic Profile (2nd Informant)

Gender	Female
Marital Status	Married
Position	Senior Lecturer
University	University Utara Malaysia (UUM)
Experience in using E-learning	18 years
Current Responsibility	Senior Lecturer
Experience in Managing E-learning	8 years
Do you have any experience using Cloud Computing for E-learning Purposes?	No
Are you familiar with any of the public Infrastructure as-a Service-Based E-learning?	
Email: malek@uum.edu.my	

	<p>Do you think “Relative Advantage” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>OK, I need you to define what is a relative advantage, compatibility, security, top management commitment, institution size, cost savings, competitive pressure, service provider support, government support, Intention to adopt IaaSBEL.</p> <p>In my opinion, Relative Advantage as a factor can be used OK. It is just that I am looking at the big picture, Intention to adopt, perhaps what you can do, I think this is OK, perhaps you can group them or categorize them, you should be thinking to start from now because what i see that the perceived benefits the compatibility, perhaps in different types of group, compatibility perhaps in the technical aspect. Do you think about that? All right.</p> <p>Perhaps later, what are you going to do later when you get all the data, the factors. you want to get the factors, then develop the questionnaires, based on the questionnaires, you will go and ask the 5 top managers</p>
Compatibility	<p>Do you think “Compatibility” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>In my opinion, Compatibility can also be used,</p>
Trust	<p>Do you think “Trust” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>I think the trust, the most important factors in the adoption of IaaSBEL.</p>
Security	<p>Do you think “Security” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p style="text-align: center;"><u>Answer</u></p> <p>I think the security will be the most important factors in the adoption of IaaSBEL.</p>

Top Management Support	<p>Do you think “Top Management Support” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p><u>Answer</u></p> <p>I think the Top Management Support will be the most important factors in the adoption of IaaSBEL. I think whether this kind of factors will be the one that the top management will look at. Are you thinking about asking perhaps the lecturers in Nigeria that perhaps involve in developing e-learning? So that one is the quantitative part, then, because, you mean the data collection is for the top management, top 5 I think all these factors influence the Intention to adopt IaaSBEL. because I am not coming from the top management perspective, and your study is from the top management because the top management makes this decision.</p>
Institution Size	<p>Do you think “Institution Size” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p><u>Answer</u></p> <p>I think the Institution Size will be the most important factors in the adoption of IaaSBEL.</p>
Cost Savings	<p>Do you think “Cost Savings” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p><u>Answer</u></p> <p>I think the Cost Savings will be the most important factors in the adoption of IaaSBEL.</p>
Competitive Pressure	<p>Do you think “Competitive Pressure” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p><u>Answer</u></p> <p>The competitive pressure among the universities, especially from the private and public because you are looking at the public. I think the security will be the most important factors in the adoption of IaaSBEL.</p>
Service Provider Support	<p>Do you think “Service Provider Support” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p><u>Answer</u></p> <p>I think the Service Provider Support will be the most important factors in the adoption of IaaSBEL.</p>
Government Support	<p>Do you think “Government Support” is a good determinant for the Public Infrastructure as-a Service-Based E-learning Intention to adopt Model in developing countries HEIs?</p> <p><u>Answer</u></p> <p>I think the Cost Government Support will be the most important factors in the adoption of IaaSBEL.</p>
<p>Suggestions: 0:24:07.9 As i said before, the factors perhaps later you can group the factors if you are familiar with perceived ease of use, usefulness, they are categorized as usability, so later on, when you try to analyze your data, perhaps you can use factor analysis to group your factors so that you can show that, this group of factors fall into this category. Because I think it is OK, if you put everything together, later during analysis, you try to do that, a similar factor in one group, 0:25:15.2 perhaps one thing you can look at not only in the e-learning perspective but on the institutional perspective how usually they make a decision, so that, from that perhaps you can come up with factors that influence the top management.</p>	

Appendix F: Consent Form

Consent Form

Research Title: A Public Infrastructure as-a-Service Based-E-learning Intention to Adopt Model for Higher Education in Developing Countries: A Nigerian Perspective


At the end of this study, it is hoped that the findings would identify the factors that will be suitable as a determinant of a Public Infrastructure as-a-Service Based E-learning Intention to adopt Model in developing countries Higher Education Institutions. After several years of developing countries consistent effort to provide education for all, still, numerous youths do not have access to education, especially in Nigeria.

This research will serve as reference material for comparative studies and will also be contributing factor to the growing literature in understanding the complexities as well as factors that influences the adoption of Public Infrastructure as-a-Service Based E-learning Intention to adopt model For HEIs in developing countries.

I agree to participate in this research, whose conditions are as follows:

- ✚ The research is aimed at improving the reach of learning in developing countries using a Public Infrastructure as-a-Service Based-E-learning Intention to Adopt Model.
- ✚ Interviews will last for about 30 minutes or more.
- ✚ The interview I give and the information it contains will be used solely for the purposes defined by the researcher.
- ✚ At any time, I can refuse to answer certain questions, discuss certain topics or even put an end to the interview without prejudice to myself.
- ✚ To facilitate the interviewer's job, the interview will be recorded. However, the recording will be destroyed as soon as it has been transcribed.
- ✚ All interview data will be handled so as to protect their confidentiality. Therefore, no names will be mentioned, and the information will be coded.
- ✚ All data will be destroyed at the end of the research.

Respondent's signature:

 Date: 28/8/18

Interviewer's signature:

 Date: 28/8/2018

Consent Form

Research Title: A Public Infrastructure as-a-Service Based-E-learning Intention to Adopt Model for Higher Education in Developing Countries: A Nigerian Perspective


At the end of this study, it is hoped that the findings would identify the factors that will be suitable as a determinant of a Public Infrastructure as-a-Service Based E-learning Intention to adopt Model in developing countries Higher Education Institutions. After several years of developing countries consistent effort to provide education for all, still, numerous youths do not have access to education, especially in Nigeria.

This research will serve as reference material for comparative studies and will also be contributing factor to the growing literature in understanding the complexities as well as factors that influences the adoption of Public Infrastructure as-a-Service Based E-learning Intention to adopt model For HEIs in developing countries.


I agree to participate in this research, whose conditions are as follows:

- ✦ The research is aimed at improving the reach of learning in developing countries using a Public Infrastructure as-a-Service Based-E-learning Intention to Adopt Model.
- ✦ Interviews will last for about 30 minutes or more.
- ✦ The interview I give and the information it contains will be used solely for the purposes defined by the researcher.
- ✦ At any time, I can refuse to answer certain questions, discuss certain topics or even put an end to the interview without prejudice to myself.
- ✦ To facilitate the interviewer's job, the interview will be recorded. However, the recording will be destroyed as soon as it has been transcribed.
- ✦ All interview data will be handled so as to protect their confidentiality. Therefore, no names will be mentioned, and the information will be coded.
- ✦ All data will be destroyed at the end of the research.

Respondent's signature:

 Date: 16/07/2018.

Interviewer's signature:

 Date: 16/07/2018

Appendix G: Quantitative Practitioners Validation

Almantara

Survey Questionnaire



Research Title: A Public Infrastructure as-a Service-Based E-learning Intention to Adopt Model for Higher Education Institutions in Developing Countries: A Nigerian Perspective

Target Respondents: E-learning Experts, IT Administrators, Cloud Computing Experts

PRELIMINARY STUDY AND EXPERT CONFIRMATION OF FACTORS/DETERMINANTS

Dear Sir/Madam,

I am a Ph.D. research student from School of Computing, College of Arts and Sciences, Universiti Utara Malaysia. I am conducting a research on the topic as mentioned above, under the supervision of Prof. Dr. Wan Rozaini Sheik Osman assisted by Dr. Wiwied Virgiyanti. Attached herewith, self-explanatory questions that will take a little much of your time to answer. Your kind cooperation, participation, and response to this survey questionnaire are highly appreciated and all data will be kept confidential, for research purpose only. Please feel free and answer all questions honestly and objectively as possible, as this will contribute towards the achievement of the purpose of this study.

Please do not hesitate to contact the researcher for any inquiry or clarification related to the questionnaire.

Thank you.

Abubakar Magira Tom (900945)
School of Computing,
College of Arts and Sciences
Universiti Utara Malaysia,
Sintok 06010,
Kedah Darul Aman,
Malaysia.
Phone Number: +601116963648
Email: abubakar_magira@ahsgs.uum.edu.my

Prof. Dr. Wan Rozaini Sheik Osman
School of Computing,
College of Arts and Sciences,
Universiti Utara Malaysia,
Sintok 06010,
Kedah Darul Aman,
Malaysia.
Phone Number: +60194432666
Email: rozai174@uum.edu.my

3.	Do you think using a Public Infrastructure as-a Service-Based E-learning will help reduce Cost when compared to traditional E-learning?	1 2 3 4 (5) 6 7
4.	Do you think Government will support a Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries?	1 2 3 4 5 (6) 7
5.	Do you think using a Public Infrastructure as-a Service-Based E-learning will provide education for all in developing countries?	1 2 3 4 5 (6) 7

Section C: Determinants of a Public Infrastructure as-a Service-Based E-learning Intention to adopt Model

The following statements describe the extent to which the listed factors/determinants that influence a Public Infrastructure as-a Service Based-E-learning Intention to adopt in developing countries.

1 = Strongly disagree; 2 = Disagree somewhat; 3 = Degree slightly; 4 = Undecided; 5 = Agree slightly; 6 = Agree somewhat; 7 = Strongly agree.

No	Determinants of Cloud-Based E-learning Adoption	Rate
1	Relative Advantage (<i>benefits derived using a Public Infrastructure as-a Service-Based E-learning with the existing system</i>)	1 2 3 4 (5) 6 7
2	Compatibility (<i>Compatibility of a Public Infrastructure as-a Service-Based E-learning with the existing system</i>)	1 2 3 4 (5) 6 7
3	Trust (<i>Trust towards using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 (4) 5 6 7
4	Security (<i>Security towards using a Public Infrastructure as-a Service Based E-learning</i>)	1 2 3 4 5 (6) 7
5	Collaboration and Sharing (<i>content sharing between students, universities etc using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 (4) 5 6 7
6	Top Management Commitment (<i>Commitment and support towards a Public Infrastructure as-a Service-Based E-learning</i>)	2 3 4 5 (6) 7
7	Institution Size (<i>The size of the institution or number of students</i>)	1 2 3 4 (5) 6 7
8	Cost Savings (<i>The reduction of cost when using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 (6) 7
9	Competitive Pressure (<i>The competition between institutions using a Public Infrastructure as-a Service-Based E-learning and institutions not using E-learning</i>)	1 2 3 4 5 (6) 7
10	Service Provider Support (<i>The support provided by the cloud service providers</i>)	1 2 3 (4) 5 6 7
11	Government Support (<i>Regulations, policies, financial aid in the adoption of a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 (5) 6 7
12	Intention to adopt (<i>The intention to adopt a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 (6) 7

Other suggestions or comments regarding the determinants of a *Public Infrastructure as-a Service-Based E-learning*?



SOKO STATE
UNIVERSITY
ICT DEPARTMENT
SIGN. _____

Official Stamp: _____

Date: 16/09/2018



UUM
Universiti Utara Malaysia

Please answer as appropriate.

1	Name: <u>Muhammad MIKAILU CABO</u>
2	Position: <u>SENIOR LECTURER</u>
3	Organization: <u>SHAHU SHAIQARI COLLEGE OF EDUCATION, SOKOTO, NIGERIA</u>
4	Current Responsibilities: <u>HEAD OF DEPARTMENT COMPUTER SCIENCE</u>
5	Experience in the current responsibilities: <u>5 YEARS</u> Years
6	Experience in using E-learning: <u>15 YEARS</u> Years
7	Experience in managing E-learning: <u>10 YEARS</u> Years
8	Do you have any experience in using Cloud Computing for E-learning purposes? a) Yes b) No
9	Are you familiar with any of the Public Infrastructure as-a Service-Based E-learning? a) Microsoft Azure b) Amazon Web Service (AWS) c) Google GCP

Section B: General Information About Cloud-Based E-learning

The following statements describe the extent to which you agree with the following factors that influence the adoption of a Public Infrastructure as-a Service-Based E-learning Intention to Adopt Model in developing countries HFTs.

From your point of view, please circle accordingly from 1 to 7 that matches your view or level of agreement in each question.

1 = Strongly disagree; 2 = Disagree somewhat; 3 = Degree slightly; 4 = Undecided;

5 = Agree slightly; 6 = Agree somewhat; 7 = Strongly agree.

1.	Do you consider the implementation of a Public Infrastructure as-a Service-Based E-learning will solve the limitations of tradition E-learning?	1 2 3 4 5 6 <u>7</u>
2.	Do you think a Public Infrastructure as-a Service-Based E-learning adoption is low in developing countries?	1 2 3 4 5 6 <u>7</u>
3.	Do you think using a Public Infrastructure as-a Service-Based E-learning will help reduce Cost when compared to traditional E-learning?	1 2 3 4 5 6 <u>7</u>
4.	Do you think Government will support a Public Infrastructure as-a	1 2 3 4 <u>5</u> 6 7

	Service-Based E-learning Intention to adopt model in developing countries?	
5.	Do you think using a Public Infrastructure as-a Service-Based E-learning will provide education for all in developing countries?	1 2 3 4 5 6 7

Section C: Determinants of a Public Infrastructure as-a Service-Based E-learning Intention to adopt Model

The following statements describe the extent to which the listed factors/determinants that influence a Public Infrastructure as-a Service Based-E-learning Intention to adopt in developing countries.

1 = Strongly disagree; 2 = Disagree somewhat; 3 = Degree slightly; 4 = Undecided; 5 = Agree slightly; 6 = Agree somewhat; 7 = Strongly agree.

No	Determinants of Cloud-Based E-learning Adoption	Rate
1	Relative Advantage (<i>benefits derived using a Public Infrastructure as-a Service-Based E-learning with the existing system</i>)	1 2 3 4 5 6 7
2	Compatibility (<i>Compatibility of a Public Infrastructure as-a Service-Based E-learning with the existing system</i>)	1 2 3 4 5 6 7
3	Trust (<i>Trust towards using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 6 7
4	Security (<i>Security towards using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 6 7
5	Collaboration and Sharing (<i>content sharing between students, universities etc using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 6 7
6	Top Management Commitment (<i>Commitment and support towards a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 6 7
7	Institution Size (<i>The size of the institution or number of students</i>)	1 2 3 4 5 6 7
8	Cost Savings (<i>The reduction of cost when using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 6 7
9	Competitive Pressure (<i>The competition between institutions using a Public Infrastructure as-a Service-Based E-learning and institutions not using E-learning</i>)	1 2 3 4 5 6 7
10	Service Provider Support (<i>The support provided by the cloud service providers</i>)	1 2 3 4 5 6 7
11	Government Support (<i>Regulations, policies, financial aid in the adoption of a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 6 7
12	Intention to adopt (<i>The intention to adopt a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 6 7

Other suggestions or comments regarding the determinants of a *Public Infrastructure as-a-Service-Based E-learning?*

One of the determinants is Constant supply of Power (electricity) which is lack of ~~Unit~~ develop-c countries.

Official Stamp: **COMPUTER DEPT.**
S S C O P . S I K O T O
SIGN *[Signature]* DATE _____
Date: 29/09/2018

Thank you for your co-operation



UUM
Universiti Utara Malaysia

Section A: General Information of Expert

Please answer as appropriate.

1	Name: <u>SALIM YUSHA'U</u>
2	Position: <u>Coordinator ICT</u>
3	Organization: <u>Sokoto State University</u>
4	Current Responsibilities: <u>Overseeing ICT department</u>
5	Experience in the current responsibilities: <u>2 years</u> Years
6	Experience in using E-learning: <u>6 years</u> Years
7	Experience in managing E-learning: <u>4 years</u> Years
8	Do you have any experience in using Cloud Computing for E-learning purposes? a) Yes <input checked="" type="checkbox"/> b) No
9	Are you familiar with any of the Public Infrastructure as-a Service-Based E-learning? a) Microsoft Azure b) Amazon Web Service (AWS) c) Google GCP

Section B: General Information About Cloud-Based E-learning

The following statements describe the extent to which you agree with the following factors that influence the adoption of a Public Infrastructure as-a Service-Based E-learning Intention to Adopt Model in developing countries HEIs.

From your point of view, please circle accordingly from 1 to 7 that matches your view or level of agreement in each question.

1 = Strongly disagree; 2 = Disagree somewhat; 3 = Degree slightly; 4 = Undecided;

5 = Agree slightly; 6 = Agree somewhat; 7 = Strongly agree.

1.	Do you consider the implementation of a Public Infrastructure as-a Service-Based E-learning will solve the limitations of tradition E-learning?	1 2 3 4 5 6 7
2.	Do you think a Public Infrastructure as-a Service-Based E-learning adoption is low in developing countries?	1 2 3 4 5 6 7

3.	Do you think using a Public Infrastructure as-a Service-Based E-learning will help reduce Cost when compared to traditional E-learning?	1 2 3 (4) 5 6 7
4.	Do you think Government will support a Public Infrastructure as-a Service-Based E-learning Intention to adopt model in developing countries?	1 2 3 4 (5) 6 7
5.	Do you think using a Public Infrastructure as-a Service-Based E-learning will provide education for all in developing countries?	1 2 3 4 (5) 6 7

Section C: Determinants of a Public Infrastructure as-a Service-Based E-learning Intention to adopt Model

The following statements describe the extent to which the listed factors/determinants that influence a Public Infrastructure as-a Service Based-E-learning Intention to adopt in developing countries.

1 = Strongly disagree; 2 = Disagree somewhat; 3 = Degree slightly; 4 = Undecided; 5 = Agree slightly; 6 = Agree somewhat; 7 = Strongly agree.

No	Determinants of Cloud-Based E-learning Adoption	Rate
1	Relative Advantage (<i>benefits derived using a Public Infrastructure as-a Service-Based E-learning with the existing system</i>)	1 2 3 4 (5) 6 7
2	Compatibility (<i>Compatibility of a Public Infrastructure as-a Service-Based E-learning with the existing system</i>)	1 2 3 4 (5) 6 7
3	Trust (<i>Trust towards using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 (5) 6 7
4	Security (<i>Security towards using a Public Infrastructure as-a Service Based E-learning</i>)	1 2 3 4 (5) 6 7
5	Collaboration and Sharing (<i>content sharing between students, universities etc using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 (6) 7
6	Top Management Commitment (<i>Commitment and support towards a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 (5) 6 7
7	Institution Size (<i>The size of the institution or number of students</i>)	1 2 3 4 (5) 6 7
8	Cost Savings (<i>The reduction of cost when using a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 (5) 6 7
9	Competitive Pressure (<i>The competition between institutions using a Public Infrastructure as-a Service-Based E-learning and institutions not using E-learning</i>)	1 2 3 4 (5) 6 7
10	Service Provider Support (<i>The support provided by the cloud service providers</i>)	1 2 3 (4) 5 6 7
11	Government Support (<i>Regulations, policies, financial aid in the adoption of a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 (5) 6 7
12	Intention to adopt (<i>The intention to adopt a Public Infrastructure as-a Service-Based E-learning</i>)	1 2 3 4 5 (6) 7

Salim Yusha'u

Other suggestions or comments regarding the determinants of a *Public Infrastructure as-a Service-Based E-learning?*

Official Stamp: _____

SARAWAK STATE
UNIVERSITY
IGT DEPARTMENT
SIGN



Date: 23/09/2018

Thank you for your co-operation



UUM
Universiti Utara Malaysia

Appendix H: Data Collection Form



AWANG HAD SALLEH
GRADUATE SCHOOL OF ARTS AND SCIENCES
UUM College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM SINTOK
KEDAH DARUL AMAN
MALAYSIA



Tel: 604-928 5266/5269/5299
Faks (Fax): 604-928 5297
Laman Web (Web): <http://ahsgs.uum.edu.my>
Email: ahsgsservices@uum.edu.my

UUM/CAS/ AHSGS/900945
November 27, 2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam

DATA COLLECTION FOR PROJECT PAPER/ THESIS

This is to certify that **Mr. Abubakar Magira Tom (matric number: 900945)** is a full-time graduate student in Doctor of Philosophy (Computer Science) at UUM College of Arts and Sciences.

He needs to do his field study and data collection for his project paper/thesis in order to fulfill the partial requirements of his graduate studies.

We sincerely hope that your organization will be able to assist him in the data collection and the distribution of the questionnaires for his research.

Thank you.

"KEDAH AMAN MAKMUR – HARAPAN BERSAMA MAKMURKAN KEDAH"
"KNOWLEDGE, VIRTUE, SERVICE"

Yours faithfully

AHMAD MUJAHID ABD. GHANI
Senior Principal Assistant Registrar
Awang Had Salleh Graduate School of Arts and Sciences
UUM College of Arts and Sciences

Universiti Pengurusan Terkemuka
The Eminent Management University



Appendix I: Pilot Study

Statistics											
		RA_NEW	COM_NEW	TR_NEW	SEC_NEW	TMC_NEW	CS_NEW	CP_NEW	SPS_NEW	INT_NEW	GS_NEW
N	Valid	38	38	38	38	38	38	38	38	38	38
	Missing	0	0	0	0	0	0	0	0	0	0
Skewness		0.678	0.982	0.334	-0.832	1.262	-1.028	1.173	0.728	-0.546	0.848
Std. Error of Skewness		0.383	0.383	0.383	0.383	0.383	0.383	0.383	0.383	0.383	0.383
Kurtosis		-1.284	-0.087	-1.539	-1.023	1.352	0.167	0.376	-0.878	-0.084	-0.966
Std. Error of Kurtosis		0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750

Figure 4. Skewness and Kurtosis of the Pilot Data



Appendix J: Questionnaire (Item Validation)

SURVEY QUESTIONNAIRES



Questionnaire No:

Research Title: Intention to Adopt Model of Cloud-Based E-learning in Higher Education Institutions

Dear Sir/Madam,

I am a Ph.D. research student from the School of Computing, College of Arts and Sciences, Universiti Utara Malaysia. Presently, I am conducting a research on the topic mentioned above. Attached herewith, self-explanatory questions that will take a little much of your time to answer. Your kind cooperation, participation, and response to this survey questionnaire are highly appreciated and all data will be kept confidential for research purpose only. Please feel free and answer all questions honestly and objectively as possible, as this will contribute towards the achievement of the purpose of this study.

Definition of Terms

E-learning is the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere.

Cloud Computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Infrastructure as a Service (IaaS) is the capability provided to the Cloud User is to provision processing, storage, networks, and other fundamental computing resources where the Cloud User is able to deploy and run arbitrary software, which can include operating systems and applications.

Infrastructure as-a Service-Based E-learning (IaaSBEL) is the hosting of E-learning systems on the IaaS platform.

Please do not hesitate to contact the researcher for any inquiry or clarification related to the questionnaire.

Thank you.

Abubakar Magira Tom (900945)
Mobile Telephone Numbers:
+601116963648
+2349061103646
E-mail: magiratom@gmail.com

Supervisors:
Prof. Dr. Wan Rozaini Sheik Osman
Email: rozai174@uum.edu.my
Dr. Wiwied Virgiyanti
E-mail: wiwied@uum.edu.my

SECTION A
DEMOGRAPHICS

Please tick (√) in the appropriate box

1.	Please indicate your gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
2.	Please indicate your education level: <input type="checkbox"/> Diploma <input type="checkbox"/> Bachelor's Degree <input type="checkbox"/> Master's Degree <input type="checkbox"/> Doctorate <input type="checkbox"/> Other (specify)
3.	Please indicate your position in the university: <input type="checkbox"/> IT-Director <input type="checkbox"/> IT- Deputy Director <input type="checkbox"/> IT-Dean <i>How about IT managers?</i> <input type="checkbox"/> IT-Head of Department <input type="checkbox"/> IT- Lecturer <input type="checkbox"/> Others, (specify)..... <i>(the people involve</i> <i>in evaluating new</i>
4.	Please indicate the type of institution you are attached to: <input type="checkbox"/> Federal University <input type="checkbox"/> State University <i>systems).</i>
5.	Please indicate the location of your university: North-East States: <input type="checkbox"/> Adamawa <input type="checkbox"/> Gombe <input type="checkbox"/> Bauchi <input type="checkbox"/> Taraba <input type="checkbox"/> Borno <input type="checkbox"/> Yobe North-West States: <input type="checkbox"/> Jigawa <input type="checkbox"/> Kaduna <input type="checkbox"/> Kano <input type="checkbox"/> Katsina <input type="checkbox"/> Kebbi <input type="checkbox"/> Sokoto <input type="checkbox"/> Zamfara
6.	Please indicate your <u>experience</u> in E-learning: <i>using?</i> <input type="checkbox"/> None <input type="checkbox"/> ≤ 1 year <input type="checkbox"/> 1-2 years <input type="checkbox"/> 2-3 years <input type="checkbox"/> 4-5 years <input type="checkbox"/> >5 years
7.	Please indicate your experience in managing E-learning: <input type="checkbox"/> None <input type="checkbox"/> ≤ 1 year <input type="checkbox"/> 1-2 years <input type="checkbox"/> 2-3 years <input type="checkbox"/> 4-5 years <input type="checkbox"/> >5 years
8.	Do you have any experience in using Cloud computing for E-learning purposes? <input type="checkbox"/> Yes <input type="checkbox"/> No
9.	Which Public Infrastructure as-a Service-Based E-learning are you familiar with? <input type="checkbox"/> Microsoft Azure <input type="checkbox"/> Amazon Web Service (AWS) <input type="checkbox"/> Google GCP <input type="checkbox"/> Others (specify) <input type="checkbox"/> None
10.	Please indicate the student population in your Institution: <input type="checkbox"/> < 5,000 <input type="checkbox"/> 5,000-10,000 <input type="checkbox"/> 10,000-20,000 <input type="checkbox"/> 20,000-30,000 <input type="checkbox"/> > 30,000

**SECTION B:
TECHNOLOGICAL FACTORS**

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

The following statements describe the extent to which you agree with the technological factors that influence the adoption of IaaSBEL in your University.

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
1.0 Relative Advantage						Degree of Agreement
1. IaaSBEL will improve the quality of our operations.						1 2 3 4 5 6 7
2. IaaSBEL will enhance the effectiveness of our Universities' operations.						1 2 3 4 5 6 7
3. IaaSBEL will enable us to perform our operations more quickly.						1 2 3 4 5 6 7
4. IaaSBEL will give us a greater control over our operations.						1 2 3 4 5 6 7
5. IaaSBEL will improve our job performance.						1 2 3 4 5 6 7
6. IaaSBEL will allow us to increase academic productivity.						1 2 3 4 5 6 7

2.0 Compatibility						Degree of Agreement
1. IaaSBEL will be compatible with all aspects of our academic operations.						1 2 3 4 5 6 7
2. IaaSBEL will fit well with the way we operate.						1 2 3 4 5 6 7
3. IaaSBEL will fit into our working style.						1 2 3 4 5 6 7
4. IaaSBEL will be completely compatible with our current academic operations.						1 2 3 4 5 6 7
5. IaaSBEL will easily be integrated into existing systems.						1 2 3 4 5 6 7
6. IaaSBEL services will not require many technical changes.						1 2 3 4 5 6 7

3.0 Trust						Degree of Agreement
1. IaaSBEL provider will be trustworthy.						1 2 3 4 5 6 7
2. IaaSBEL service provider would like to be known as one who keeps promises and commitments.						1 2 3 4 5 6 7
3. IaaSBEL service provider will have more to lose than to gain by not delivering on their promises.						1 2 3 4 5 6 7
4. IaaSBEL service provider's behavior will meet our expectations.						1 2 3 4 5 6 7

4.0 Security						Degree of Agreement
1. IaaSBEL will provide sufficient security controls.						1 2 3 4 5 6 7
2. The security systems built into IaaSBEL services will be strong enough to protect our University's data.						1 2 3 4 5 6 7
3. IaaSBEL providers will maintain the privacy and confidentiality of our University's data.						1 2 3 4 5 6 7
4. Overall, IaaSBEL technology will be more secure than traditional E-learning.						1 2 3 4 5 6 7
5. IaaSBEL will be secure.						1 2 3 4 5 6 7

This item is about the service provider

This item is about IaaSBEL technology

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
5.0 Top Management Commitment						Degree of Agreement
1. Top management will be interested in the use of IaaS/BEL technologies in our operations.						1 2 3 4 5 6 7
2. Top Management will be enthusiastically supportive of the use of IaaS/BEL technologies in our operations.						1 2 3 4 5 6 7
3. The top management will allocate adequate resources to the IaaS/BEL technologies adoption.						1 2 3 4 5 6 7
4. Top management is aware of the benefits of IaaS/BEL technologies adoption.						1 2 3 4 5 6 7
5. Top management will actively encourage employees to use IaaS/BEL technologies in their daily activities.						1 2 3 4 5 6 7
6. The University's management will be willing to take risks (financial and organizational) involved in the adoption of IaaS/BEL.						1 2 3 4 5 6 7

6.0 Cost Savings	Degree of Agreement
1. Using IaaS/BEL instead of buying and deploying physical computers and software will be cheaper.	1 2 3 4 5 6 7
2. The benefits of IaaS/BEL will be greater than the cost of this adoption.	1 2 3 4 5 6 7
3. With IaaS/BEL there will be reduction of energy costs and environmental costs.	1 2 3 4 5 6 7
4. Maintenance costs for IaaS/BEL will be very low.	1 2 3 4 5 6 7

7.0 Competitive Pressure	Degree of Agreement
1. Our university is under pressure from competitors to adopt IaaS/BEL technologies.	1 2 3 4 5 6 7
2. Other universities know the importance of IaaS/BEL.	1 2 3 4 5 6 7
3. Universities think that IaaS/BEL will have an influence on the competition in Higher Education Institutions.	1 2 3 4 5 6 7
4. We feel it is a strategic necessity to use IaaS/BEL technologies to compete in the marketplace.	1 2 3 4 5 6 7
5. I think other universities see my university as more respected because of using IaaS/BEL.	1 2 3 4 5 6 7
6. The use of IaaS/BEL differentiates my university from other universities.	1 2 3 4 5 6 7
7. I think my University experienced competitive pressure from other universities to adopt IaaS/BEL.	1 2 3 4 5 6 7

What do you want to measure here?

8.0 Service Provider Support	Degree of Agreement
1. The service providers will offer adequate technical support after the adoption of IaaS/BEL applications.	1 2 3 4 5 6 7
2. High quality of training programs will be provided by the IaaS/BEL service providers.	1 2 3 4 5 6 7
3. Effectiveness in recommending suitable IaaS/BEL solutions will be provided by the service providers.	1 2 3 4 5 6 7
4. IaaS/BEL service providers will provide adequate technical support during implementation.	1 2 3 4 5 6 7
5. Cloud computing Service providers will be actively marketing IaaS/BEL to our University.	1 2 3 4 5 6 7
6. Cloud computing Service providers will be providing incentives for the adoption of their products and services.	1 2 3 4 5 6 7

The items show that they measure the respondents' believe about the future service providers' support.

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
9.0 Intention to Adopt IaaSBEL						Degree of Agreement
1. My University intends to adopt IaaSBEL.						1 2 3 4 5 6 7
2. It is likely that my University will take steps to adopt IaaSBEL in the future.						1 2 3 4 5 6 7
3. My University will try to use IaaSBEL in daily life.						1 2 3 4 5 6 7
4. My University will plan to use IaaSBEL frequently.						1 2 3 4 5 6 7

10.0 Government Support	Degree of Agreement
1. Our University is under <u>pressure</u> from some government agencies to adopt IaaSBEL technology. <i>I don't think this item measure government support</i>	1 2 3 4 5 6 7
2. The Government is providing us with incentives to adopt IaaSBEL technologies. ✓	1 2 3 4 5 6 7
3. The government is active in setting up the facilities to enable IaaSBEL adoption. ✓	1 2 3 4 5 6 7
4. There is legal protection in the use of IaaSBEL. ✓	1 2 3 4 5 6 7
5. IaaSBEL development is becoming one of the government major policies. ✓	1 2 3 4 5 6 7



UUM
Universiti Utara Malaysia

SURVEY QUESTIONNAIRES



Questionnaire No:

Research Title: Intention to Adopt Model of Cloud-Based E-learning in Higher Education Institutions

Dear Sir/Madam,

I am a Ph.D. research student from the School of Computing, College of Arts and Sciences, Universiti Utara Malaysia. Presently, I am conducting a research on the topic mentioned above. Attached herewith, self-explanatory questions that will take a little much of your time to answer. Your kind cooperation, participation, and response to this survey questionnaire are highly appreciated and all data will be kept confidential for research purpose only. Please feel free and answer all questions honestly and objectively as possible, as this will contribute towards the achievement of the purpose of this study.

Definition of Terms

E-learning is the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere.

Cloud Computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Infrastructure as a Service (IaaS) is the capability provided to the Cloud User is to provision processing, storage, networks, and other fundamental computing resources where the Cloud User is able to deploy and run arbitrary software, which can include operating systems and applications.

Infrastructure as-a Service-Based E-learning (IaaSBEL) is the hosting of E-learning systems on the IaaS platform.

Please do not hesitate to contact the researcher for any inquiry or clarification related to the questionnaire.

Thank you.

Abubakar Magira Tom (900945)
Mobile Telephone Numbers:
+601116963648
+2349061103646
E-mail: magiratom@gmail.com

Supervisors:
Prof. Dr. Wan Rozaini Sheik Osman
Email: rozai174@uum.edu.my
Dr. Wiwied Virgiyanti
E-mail: wiwied@uum.edu.my

**SECTION A
DEMOGRAPHICS**

Please tick (√) in the appropriate box

1.	Please indicate your gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
2.	Please indicate your education level: <input type="checkbox"/> Diploma <input type="checkbox"/> Bachelor's Degree <input type="checkbox"/> Master's Degree <input type="checkbox"/> Doctorate <input type="checkbox"/> Other (specify)
3.	Please indicate your position in the university: <input type="checkbox"/> IT-Director <input type="checkbox"/> IT- Deputy Director <input type="checkbox"/> IT-Dean <input type="checkbox"/> IT-Head of Department <input type="checkbox"/> IT- Lecturer <input type="checkbox"/> Others, (specify).....
4.	Please indicate the type of institution you are attached to: <input type="checkbox"/> Federal University <input type="checkbox"/> State University
5.	Please indicate the location of your university: North-East States: <input type="checkbox"/> Adamawa <input type="checkbox"/> Gombe <input type="checkbox"/> Bauchi <input type="checkbox"/> Taraba <input type="checkbox"/> Borno <input type="checkbox"/> Yobe North-West States: <input type="checkbox"/> Jigawa <input type="checkbox"/> Kaduna <input type="checkbox"/> Kano <input type="checkbox"/> Katsina <input type="checkbox"/> Kebbi <input type="checkbox"/> Sokoto <input type="checkbox"/> Zamfara
6.	Please indicate your experience in E-learning: <input type="checkbox"/> None <input type="checkbox"/> ≤ 1 year <input type="checkbox"/> 1-2 years <input type="checkbox"/> 2-3 years <input type="checkbox"/> 4-5 years <input type="checkbox"/> >5 years
7.	Please indicate your experience in managing E-learning: <input type="checkbox"/> None <input type="checkbox"/> ≤ 1 year <input type="checkbox"/> 1-2 years <input type="checkbox"/> 2-3 years <input type="checkbox"/> 4-5 years <input type="checkbox"/> >5 years
8.	Do you have any experience in using Cloud computing for E-learning purposes? <input type="checkbox"/> Yes <input type="checkbox"/> No
9.	Which Public Infrastructure as-a Service-Based E-learning are you familiar with? <input type="checkbox"/> Microsoft Azure <input type="checkbox"/> Amazon Web Service (AWS) <input type="checkbox"/> Google GCP <input type="checkbox"/> Others (specify) <input type="checkbox"/> None
10.	Please indicate the student population in your Institution: <input type="checkbox"/> < 5,000 <input type="checkbox"/> 5,000-10,000 <input type="checkbox"/> 10,000-20,000 <input type="checkbox"/> 20,000-30,000 <input type="checkbox"/> > 30,000

**SECTION B:
TECHNOLOGICAL FACTORS**

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

The following statements describe the extent to which you agree with the technological factors that influence the adoption of IaaSBEL in your University.

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
1.0 Relative Advantage						Degree of Agreement
1. IaaSBEL will improve the quality of our operations.						1 2 3 4 5 6 7
2. IaaSBEL will enhance the effectiveness of our Universities' operations.						1 2 3 4 5 6 7
3. IaaSBEL will enable us to perform our operations more quickly.						1 2 3 4 5 6 7
4. IaaSBEL will give us a greater control over our operations.						1 2 3 4 5 6 7
5. IaaSBEL will improve our job performance.						1 2 3 4 5 6 7
6. IaaSBEL will allow us to increase academic productivity.						1 2 3 4 5 6 7

2.0 Compatibility						Degree of Agreement
1. IaaSBEL will be compatible with all aspects of our academic operations.						1 2 3 4 5 6 7
2. IaaSBEL will fit well with the way we operate.						1 2 3 4 5 6 7
3. IaaSBEL will fit into our working style.						1 2 3 4 5 6 7
4. IaaSBEL will be completely compatible with our current academic operations.						1 2 3 4 5 6 7
5. IaaSBEL will easily be integrated into existing systems.						1 2 3 4 5 6 7
6. IaaSBEL services will not require many technical changes.						1 2 3 4 5 6 7

3.0 Trust						Degree of Agreement
1. IaaSBEL provider will be trustworthy.						1 2 3 4 5 6 7
2. IaaSBEL service provider would like to be known as one who keeps promises and commitments.						1 2 3 4 5 6 7
3. IaaSBEL service provider will have more to lose than to gain by not delivering on their promises.						1 2 3 4 5 6 7
4. IaaSBEL service provider's behavior will meet our expectations.						1 2 3 4 5 6 7

4.0 Security						Degree of Agreement
1. IaaSBEL will provide sufficient security controls.						1 2 3 4 5 6 7
2. The security systems built into IaaSBEL services will be strong enough to protect our University's data.						1 2 3 4 5 6 7
3. IaaSBEL providers will maintain the privacy and confidentiality of our University's data.						1 2 3 4 5 6 7
4. Overall, IaaSBEL technology will be more secure than traditional E-learning.						1 2 3 4 5 6 7
5. IaaSBEL will be secure.						1 2 3 4 5 6 7

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
5.0 Top Management Commitment						Degree of Agreement
1. Top management will be interested in the use of IaaSBEL technologies in our operations.						1 2 3 4 5 6 7
2. Top Management will be enthusiastically supportive of the use of IaaSBEL technologies in our operations.						1 2 3 4 5 6 7
3. The top management will allocate adequate resources to the IaaSBEL technologies adoption.						1 2 3 4 5 6 7
4. Top management is aware of the benefits of IaaSBEL technologies adoption.						1 2 3 4 5 6 7
5. Top management will actively encourage employees to use IaaSBEL technologies in their daily activities.						1 2 3 4 5 6 7
6. The University's management will be willing to take risks (financial and organizational) involved in the adoption of IaaSBEL.						1 2 3 4 5 6 7

6.0 Cost Savings						Degree of Agreement
1. Using IaaSBEL instead of buying and deploying physical computers and software will be cheaper.						1 2 3 4 5 6 7
2. The benefits of IaaSBEL will be greater than the cost of this adoption.						1 2 3 4 5 6 7
3. With IaaSBEL there will be reduction of energy costs and environmental costs.						1 2 3 4 5 6 7
4. Maintenance costs for IaaSBEL will be very low.						1 2 3 4 5 6 7

7.0 Competitive Pressure						Degree of Agreement
1. Our university is under pressure from competitors to adopt IaaSBEL technologies.						1 2 3 4 5 6 7
2. Other universities know the importance of IaaSBEL.						1 2 3 4 5 6 7
3. Universities think that IaaSBEL will have an influence on the competition in Higher Education Institutions.						1 2 3 4 5 6 7
4. We feel it is a strategic necessity to use IaaSBEL technologies to compete in the marketplace.						1 2 3 4 5 6 7
5. I think other universities see my university as more respected because of using IaaSBEL.						1 2 3 4 5 6 7
6. The use of IaaSBEL differentiates my university from other universities.						1 2 3 4 5 6 7
7. I think my University experienced competitive pressure from other universities to adopt IaaSBEL.						1 2 3 4 5 6 7

8.0 Service Provider Support						Degree of Agreement
1. The service providers will offer adequate technical support after the adoption of IaaSBEL applications.						1 2 3 4 5 6 7
2. High quality training programs will be provided by the IaaSBEL service providers.						1 2 3 4 5 6 7
3. Effectiveness in recommending suitable IaaSBEL solutions will be provided by the service providers.						1 2 3 4 5 6 7
4. IaaSBEL service providers will provide adequate technical support during implementation.						1 2 3 4 5 6 7
5. Cloud computing Service providers will be actively marketing IaaSBEL to our University.						1 2 3 4 5 6 7
6. Cloud computing Service providers will be providing incentives for the adoption of their products and services.						1 2 3 4 5 6 7

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
9.0 Intention to Adopt IaaSBEL						Degree of Agreement
1. My University intends to adopt IaaSBEL.						1 2 3 4 5 6 7
2. It is likely that my University will take steps to adopt IaaSBEL in the future.						1 2 3 4 5 6 7
3. My University will try to use IaaSBEL in daily life.						1 2 3 4 5 6 7
4. My University will plan to use E IaaSBEL frequently.						1 2 3 4 5 6 7

10.0 Government Support						Degree of Agreement
1. Our University is under pressure from some government agencies to adopt IaaSBEL technology.						1 2 3 4 5 6 7
2. The Government is providing us with incentives to adopt IaaSBEL technologies.						1 2 3 4 5 6 7
3. The government is active in setting up the facilities to enable IaaSBEL adoption.						1 2 3 4 5 6 7
4. There is legal protection in the use of IaaSBEL.						1 2 3 4 5 6 7
5. IaaSBEL development is becoming one of the government major policies.						1 2 3 4 5 6 7

DR. AHMAD JELANI SHAARI
 Associate Professor
 Department of Education Studies
 School of Education and Modern Languages
 UUM College of Arts and Sciences
 Universiti Utara Malaysia

Name:

Signature and Date:  20/11/18



Name: Dr. Surendran Sankaran[Senior Lecturer]

Email: surendran@uum.edu.my

Request for Questionnaire and Construct Validation Inbox x



Abubakar M Tom <magiratom@gmail.com>
to surendran

Nov 25, 2018, 12:03 PM ☆ ↶ ⋮

Good Afternoon Dr,

With due respect, I am Abubakar Magira Tom, a Ph.D. student under the supervision of Prof. Wan Rozaini Sheik Osman and Dr. Wiwied Virgiyanti. Presently, I am working on a research titled: "**Intention to Adopt Model of Cloud-Based E-learning in Higher Education Institutions**".

I wish to humbly tap from your vast expertise and experience in this field to validate my questionnaire and operational definition of constructs in the attachment below.

Please do not hesitate to contact me for any inquiry or clarification related to the questionnaire.

Thank you,

Yours Faithfully,

Abubakar Magira Tom
+601116963648

--
Abubakar Magira Tom
PhD in Computer Science
University Utara Malaysia
Cell phone: +60174391394

2 Attachments ↓ ↶



Dr. Surendran A/L Sankaran <surendran@uum.edu.my>
to me

Dec 7, 2018, 11:40 PM ☆ ↶ ⋮

Dear Abubakar Magira Tom

Attached feedback for your instrument. Wish all the best.

Thank you

Dr. Surendran Sankaran[Senior Lecturer]
Department of Educational Studies[School of Education and Modern Languages]
UUM College of Arts and Sciences[Universiti Utara Malaysia]
06010 UUM Sintok, Kedah Darul Aman[Malaysia]

Tel (Off.): +604 9285449
Tel (Fax): +604 9285382
E-mail: surendran@uum.edu.my
Website : https://www.researchgate.net/profile/Surendran_Sankaran
Website : https://scholar.google.com/citations?user=HWI5_uAAAAA&hl=en
Website: https://independent.academia.edu/Surendran_Sankaran

"The Beauty of Life does not depend on how happy you are. But how happy others can be. Because of You!!!"

From: Abubakar M Tom <magiratom@gmail.com>
Sent: Sunday, November 25, 2018 12:03 PM
To: Dr. Surendran A/L Sankaran
Subject: Request for Questionnaire and Construct Validation

**SECTION B:
TECHNOLOGICAL FACTORS**

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

The following statements describe the extent to which you agree with the technological factors that influence the adoption of IaaSBEL in your University.

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
1.0 Relative Advantage						
						Degree of Agreement
1. IaaSBEL will improve the quality of our operations.						
						1 2 3 4 5 6 7
2. IaaSBEL will enhance the effectiveness of our Universities' operations.						
						1 2 3 4 5 6 7
3. IaaSBEL will enable us to perform our operations more quickly.						
						1 2 3 4 5 6 7
4. IaaSBEL will give us a greater control over our operations.						
						1 2 3 4 5 6 7
5. IaaSBEL will improve our job performance.						
						1 2 3 4 5 6 7
6. IaaSBEL will allow us to increase academic productivity.						
						1 2 3 4 5 6 7

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
2.0 Compatibility						
						Degree of Agreement
1. IaaSBEL will be compatible with all aspects of our academic operations.						
						1 2 3 4 5 6 7
2. IaaSBEL will fit well with the way we operate.						
						1 2 3 4 5 6 7
3. IaaSBEL will fit into our working style.						
						1 2 3 4 5 6 7
4. IaaSBEL will be completely compatible with our current academic operations.						
						1 2 3 4 5 6 7
5. IaaSBEL will easily be integrated into existing systems.						
						1 2 3 4 5 6 7
6. IaaSBEL services will not require many technical changes.						
						1 2 3 4 5 6 7

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
3.0 Trust						
						Degree of Agreement
1. IaaSBEL provider will be trustworthy.						
						1 2 3 4 5 6 7
2. IaaSBEL service provider would like to be known as one who keeps promises and commitments.						
						1 2 3 4 5 6 7
3. IaaSBEL service provider will have more to lose than to gain by not delivering on their promises.						
						1 2 3 4 5 6 7
4. IaaSBEL service provider's behavior will meet our expectations.						
						1 2 3 4 5 6 7

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
4.0 Security						
						Degree of Agreement
1. IaaSBEL will provide sufficient security controls.						
						1 2 3 4 5 6 7
2. The security systems built into IaaSBEL services will be strong enough to protect our University's data.						
						1 2 3 4 5 6 7
3. IaaSBEL providers will maintain the privacy and confidentiality of our University's data.						
						1 2 3 4 5 6 7
4. Overall, IaaSBEL technology will be more secure than traditional E-learning.						
						1 2 3 4 5 6 7
5. IaaSBEL will be secure.						
						1 2 3 4 5 6 7

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
5.0 Top Management Commitment						
						Degree of Agreement
1. Top management will be interested in the use of IaaSBEL technologies in our operations.						
						1 2 3 4 5 6 7
2. Top Management will be enthusiastically supportive of the use of IaaSBEL technologies in our operations.						
						1 2 3 4 5 6 7
3. The top management will allocate adequate resources to the IaaSBEL technologies adoption.						
						1 2 3 4 5 6 7
4. Top management is aware of the benefits of IaaSBEL technologies adoption.						
						1 2 3 4 5 6 7
5. Top management will actively encourage employees to use IaaSBEL technologies in their daily activities.						
						1 2 3 4 5 6 7
6. The University's management will be willing to take risks (financial and organizational) involved in the adoption of IaaSBEL.						
						1 2 3 4 5 6 7

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
6.0 Cost Savings						
						Degree of Agreement
1. Using IaaSBEL instead of buying and deploying physical computers and software will be cheaper.						
						1 2 3 4 5 6 7
2. The benefits of IaaSBEL will be greater than the cost of this adoption.						
						1 2 3 4 5 6 7
3. With IaaSBEL there will be reduction of energy costs and environmental costs.						
						1 2 3 4 5 6 7
4. Maintenance costs for IaaSBEL will be very low.						
						1 2 3 4 5 6 7

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
7.0 Competitive Pressure						
						Degree of Agreement
1. Our university is under pressure from competitors to adopt IaaSBEL technologies.						
						1 2 3 4 5 6 7
2. Other universities know the importance of IaaSBEL.						
						1 2 3 4 5 6 7
3. Universities think that IaaSBEL will have an influence on the competition in Higher Education Institutions.						
						1 2 3 4 5 6 7
4. We feel it is a strategic necessity to use IaaSBEL technologies to compete in the marketplace.						
						1 2 3 4 5 6 7
5. I think other universities see my university as more respected because of using IaaSBEL.						
						1 2 3 4 5 6 7
6. The use of IaaSBEL differentiates my university from other universities.						
						1 2 3 4 5 6 7
7. I think my University experienced competitive pressure from other universities to adopt IaaSBEL.						
						1 2 3 4 5 6 7

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
8.0 Service Provider Support						
						Degree of Agreement
1. The service providers will offer adequate technical support after the adoption of IaaSBEL applications.						
						1 2 3 4 5 6 7
2. High quality of training programs will be provided by the IaaSBEL service providers.						
						1 2 3 4 5 6 7
3. Effectiveness in recommending suitable IaaSBEL solutions will be provided by the service providers.						
						1 2 3 4 5 6 7
4. IaaSBEL service providers will provide adequate technical support during implementation.						
						1 2 3 4 5 6 7
5. Cloud computing Service providers will be actively marketing IaaSBEL to our University.						
						1 2 3 4 5 6 7
6. Cloud computing Service providers will be providing incentives for the adoption of their products and services.						
						1 2 3 4 5 6 7

Computer

Why need to use will....better delete the word "will" for all items..be consistent.

Computer

Why need to use will....better delete the word "will" for all items..be consistent.

Computer

Why need to use will....better delete the word "will" for all items..be consistent.

Computer

Why need to use will....better delete the word "will" for all items..be consistent.

Computer

Why need to use will....better delete the word "will" for all items..be consistent.

Computer

Why need to use will....better delete the word "will" for all items..be consistent.

Computer

Why need to use will....better delete the word "will" for all items..be consistent.

Please circle accordingly from 1 to 7 that matches your view or level of agreement in each question

<i>Strongly disagree</i>	<i>Disagree somewhat</i>	<i>Disagree Slightly</i>	<i>Undecided</i>	<i>Agree Slightly</i>	<i>Agree Somewhat</i>	<i>Strongly Agree</i>
1	2	3	4	5	6	7
9.0 Intention to Adopt IaaSBEL						
Degree of Agreement						
1. My University intends to adopt IaaSBEL.	1	2	3	4	5	6 7
2. It is likely that my University will take steps to adopt IaaSBEL in the future.	1	2	3	4	5	6 7
3. My University will try to use IaaSBEL in daily life.	1	2	3	4	5	6 7
4. My University will plan to use E IaaSBEL frequently.	1	2	3	4	5	6 7

10.0 Government Support	Degree of Agreement					
	1	2	3	4	5	6 7
1. Our University is under pressure from some government agencies to adopt IaaSBEL technology.	1	2	3	4	5	6 7
2. The Government is providing us with incentives to adopt IaaSBEL technologies.	1	2	3	4	5	6 7
3. The government is active in setting up the facilities to enable IaaSBEL adoption.	1	2	3	4	5	6 7
4. There is legal protection in the use of IaaSBEL.	1	2	3	4	5	6 7
5. IaaSBEL development is becoming one of the government major policies.	1	2	3	4	5	6 7

Computer
Is it a DV for this research?

Computer
Why suddenly using E IaaSBEL

Computer
Should be Factor no 9



UUM
Universiti Utara Malaysia

Appendix K: Operational Definition Confirmation

Title: Intention to Adopt Model of Cloud-Based E-learning in Higher Education Institutions

ID: 900945

Operational Definitions of Constructs Measurement

Variable	Operational Definition
1- Relative Advantage	The degree to which an IaaSBEL is perceived as being better than its predecessors, has been found to be a good influencer (facilitator) in the adoption of numerous technologies as noted in the literature review (Gangwar & Date, 2016; Moore & Benbasat, 1991; Rogers, 2003; Tweel, 2012).
2- Compatibility	The degree to which an IaaSBEL is perceived as being consistent with the existing values, needs as well as past experiences of HEIs in developing countries such as; work ethics, behavior, values, experience, and practice (Alhammadi et al., 2015; Moore & Benbasat, 1991; Rogers, 1995; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015).
3- Trust	Refers to the willingness of an individual (University) to behave in risky and uncertain situations when expected benefits surpass perceived risks of adopting IaaSBEL (Almazroi, Shen, Teoh, & Babar, 2016; Flavián & Guinaliu, 2006; Jarvenpaa, Tractinsky, & Vitale, 2000; Pavlou, 2003; Pikkarainen, Pikkarainen, Karjaluoto, & Pahlila, 2004; Wu, 2011b).
4- Security	Refers to the extent to which a cloud service provider can prevent unauthorized access or modification to information in storage, processing, and in-transit towards IaaSBEL in developing countries HEIs (Mohammed, Alzahrani, Alfarraj, & Ibrahim, 2018; Oliveira, Thomas, & Espadanal, 2014; Wu, 2011b).
5- Collaboration & Sharing (C)	Refers to the collaboration and sharing between various stakeholders, to share information, store, and retrieve information with each other in IaaSBEL in developing countries HEIs (Chen et al., 2009; Cheung & Vogel, 2013; Gupta et al., 2013).
6- Cost Savings (CS)	Refers to the extent of cost reduction of infrastructure, operating cost, energy consumption cost and maintenance expenditure towards IaaSBEL in developing countries HEIs (Gupta et al., 2013; Oliveira et al., 2014).
7- Top Management Commitment	Refers to the commitment, support of ideas, and project to support the adoption of IaaSBEL in developing countries HEIs (Alhammadi et al., 2015; Lai et al., 2014; Molla & Licker, 2005; Oliveira et al., 2014).
8- Competitive Pressure	Refers to the level of pressure felt by Universities from competitor (other Universities) in the developing countries HEIs (Ifinedo, 2011; Lai et al., 2014; Mohammed et al., 2018; Moore & Benbasat, 1991; Oliveira & Martins, 2010).

9- Service Provider Support	Refers to the external support provided by the cloud service providers, such as; training, and technical support (Al Isma'ili, Li, Shen, & He, 2016; Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011; Klug & Bai, 2014; Lai et al., 2014; Premkumar & Roberts, 1999; Thong, Yap, & Raman, 1996).
10- Institution Size	Refers to the number of students (employees) or the revenue amount (Alhammadi et al., 2015; Damanpour, 1992; Klug & Bai, 2014; Rogers, 1995; Tweel, 2012).
11- Government Support	Refers to the policy stability, incentives, rules and regulations, financial support provided by the Government (Alhammadi et al., 2015; Chang et al., 2006; Dahnil et al., 2014; Lee et al., 2014; Tornatzky & Fleischer, 1990).
12- Intention to Adopt IaaSBEL	The extent of the intention for future use, before the initial adoption of the IaaSBEL in developing countries HEIs (Almazroi et al., 2016; Mathieson, 1991; Nguyen, Nguyen, Pham, & Misra, 2014; Teo, Su Luan, & Ching Sing, 2008; Tweel, 2012; Venkatesh, Thong, & Xu, 2012).



UUM

Universiti Utara Malaysia

Am
DR. ALAWIYAH ABD WAHAB
 Senior Lecturer
 School of Computing
 UUM College of Arts and Sciences
 Universiti Utara Malaysia

29/11/2018

Title: Intention to Adopt Model of Cloud-Based E-learning in Higher Education Institutions
ID: 900945

Operational Definitions of Constructs Measurement

Variable	Operational Definition
1- Relative Advantage	The degree to which an IaaSBEL is perceived as being better than its predecessors, has been found to be a good influencer (facilitator) in the adoption of numerous technologies as noted in the literature review (Gangwar & Date, 2016; Moore & Benbasat, 1991; Rogers, 2003; Tweel, 2012).
2- Compatibility	The degree to which an IaaSBEL is perceived as being consistent with the existing values, needs as well as past experiences of HEIs in developing countries such as; work ethics, behavior, values, experience, and practice (Alhammedi et al., 2015; Moore & Benbasat, 1991; Rogers, 1995; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015).
3- Trust	Refers to the willingness of an individual (University) to behave in risky and uncertain situations when expected benefits surpass perceived risks of adopting IaaSBEL (Almazroi, Shen, Teoh, & Babar, 2016; Flavián & Guinaliu, 2006; Jarvenpaa, Tractinsky, & Vitale, 2000; Pavlou, 2003; Pikkarainen, Pikkarainen, Karjaluoto, & Pahlila, 2004; Wu, 2011b).
4- Security	Refers to the extent to which a cloud service provider can prevent unauthorized access or modification to information in storage, processing, and in-transit towards IaaSBEL in developing countries HEIs (Mohammed, Alzahrani, Alfarraj, & Ibrahim, 2018; Oliveira, Thomas, & Espadanal, 2014; Wu, 2011b).
6- Cost Savings	Refers to the extent of cost reduction of infrastructure, operating cost, energy consumption cost and maintenance expenditure towards IaaSBEL in developing countries HEIs (Gupta et al., 2013; Oliveira et al., 2014).
7- Top Management Commitment	Refers to the commitment, support of ideas, and project to support the adoption of IaaSBEL in developing countries HEIs (Alhammedi et al., 2015; Lai et al., 2014; Molla & Licker, 2005; Oliveira et al., 2014).
8- Competitive Pressure	Refers to the level of pressure felt by Universities from competitor (other Universities) in the developing countries HEIs (Ifinedo, 2011; Lai et al., 2014; Mohammed et al., 2018; Moore & Benbasat, 1991; Oliveira & Martins, 2010).
9- Service Provider Support	Refers to the external support provided by the cloud service providers, such as; training, and technical support (Al Isma'ili, Li, Shen, & He, 2016; Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011; Klug & Bai, 2014; Lai et al., 2014; Premkumar & Roberts, 1999; Thong, Yap, & Raman, 1996).

10- Institution Size	Refers to the number of students (employees) or the revenue amount (Alhammadi et al., 2015; Damanpour, 1992; Klug & Bai, 2014; Rogers, 1995; Tweel, 2012).
11- Government Support	Refers to the policy stability, incentives, rules and regulations, financial support provided by the Government (Alhammadi et al., 2015; Chang et al., 2006; Dahnil et al., 2014; Lee et al., 2014; Tornatzky & Fleischer, 1990).
12- Intention to Adopt IaaSBEL	The extent of the intention for future use, before the initial adoption of the IaaSBEL in developing countries HEIs (Almazroi et al., 2016; Mathieson, 1991; Nguyen, Nguyen, Pham, & Misra, 2014; Teo, Su Luan, & Ching Sing, 2008; Tweel, 2012; Venkatesh, Thong, & Xu, 2012).

DR. AHMAD JELANI SHAARI
 Associate Professor
 Department of Education Studies
 School of Education and Modern Languages
 UUM College of Arts and Sciences
 Universiti Utara Malaysia

Name:

Signature and Date:  26/11/18



Universiti Utara Malaysia

Appendix L: Qualitative Interview Questions Validation



Abubakar M Tom <magiratom@gmail.com>
to Alawiyah

Mon, Oct 28, 2019, 12:30 PM ☆ ↶ ⋮

Salaam Dr,

With due respect, kindly refer to the attachment below for the copy of qualitative research questions.
Thank you

Regards,

Abubakar Magira Tom
PhD in Computer Science
University Utara Malaysia
Cell phone: +601127188060



UUM
Universiti Utara Malaysia

Dr. Alawiyah Bt Abd Wahab <alawiyah@uum.edu.my>

Sun, Nov 3, 2019, 5:28 PM ☆ ↶ ⋮

to Wan, Wiwied, me

Assalamualaikum,

I find the document quite confusing. You have 2 SECTION A (which one do you want to use?); 3 SECTION B and 1 SECTION C.

For section C:

1. I think you need to rewrite the questions using layman's terms so that it can be understood by an average person.
2. I think an indirect question would be better in eliciting your interviewees response. For example, perhaps, find out about the possible reasons of why compatibility factor does not influence the intention to adopt IaaS/BEL. Then, ask for interviewees' opinions on the reasons that you found.

I hope it helps.

Thanks

Google Scholar Link: https://scholar.google.com/citations?hl=en&user=0FX4nBYAAAAJ&view_op=list_works
ResearchGate Link: https://www.researchgate.net/profile/Alawiyah_Abdul

From: Abubakar M Tom [magiratom@gmail.com]
Sent: Monday, October 28, 2019 12:30 PM
To: Dr. Alawiyah Bt Abd Wahab
Subject: Interview Questions Validation

Appendix M: Qualitative Interview Questions: Qual Phase



Awang Had Salleh
Graduate School
of Arts And Sciences
Universiti Utara Malaysia

Consent Form

Title: INTENTION TO ADOPT MODEL OF CLOUD-BASED E-LEARNING IN HIGHER EDUCATION INSTITUTIONS

At the end of this study, it is hoped that the findings would clarify why some key variables are not supported or insignificant as variables of the intention to adopt Infrastructure as a Service-Based E-learning (IaaSBEL) in Nigerian Higher Education Institutions. After several years of developing countries consistent effort to provide education for all, yet, numerous youths do not have access to education especially, in Nigeria.

This research will serve as reference material for comparative studies and will also be contributing factor to the growing literature in understanding the complexities as well as factors that influences the adoption of IaaSBEL in Nigeria.

I agree to participate in this research, whose conditions are as follows:

- The research is aimed at improving the research of learning in developing countries using Cloud-Based E-learning.
- Interviews will last for about 30-45 minutes or less.
- The interview I give and the information it contains will be used solely for the purposes defined by the researcher.
- At any time, I can refuse to answer certain questions, discuss certain topics or even put an end to the interview without prejudice to myself.
- To facilitate the interviewer's job, the interview will be recorded. However, the recording will be destroyed as soon as it has been transcribed.
- All interview data will be handled so as to protect their confidentiality. Therefore, no names will be mentioned, and the information will be coded.
- All data will be destroyed at the end of the research.

Informant's Name: _____

Informant's signature: _____ Date: _____

Interviewer's signature: _____ Date: _____



Semi-Structured Interview Questions

Dear Sir/Madam,

I am a Ph.D. (Information Systems) research student from the School of Computing, College of Arts and Sciences. I am conducting a research on the “**INTENTION TO ADOPT MODEL OF CLOUD-BASED E-LEARNING IN HIGHER EDUCATION INSTITUTIONS**” under the supervision of Prof. Dr. Wan Rozaini Sheik Osman assisted by Dr. Wiwied Virgiyanti. Attached herewith, self-explanatory semi-structured interview questions that will take a little much of your time to answer. Your kind cooperation, participation, and response to this interview questions are highly appreciated, and all data will be kept confidential for research purposes only.

During the interview, the researcher would like to discuss and understand why some of the key findings (variables) for the “*infrastructure as-a service-based e-learning intention to adopt model (IaaSBEL)*” are not supported in the final model as shown in *Table 1*. The interview is expected to take about half an hour or less, and the researcher would like to record the session because the researcher does not want to miss any of your comments, even though the researcher will be taking some notes during the session. Additionally, you don't have to talk about anything you don't want to, and you may end the interview at any time.

Definition of Terms

E-learning is the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere.
Cloud Computing is a pool of services that enables ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.
Infrastructure as a Service (IaaS) is a form of Cloud Computing that allows the Cloud User to provision processing, storage, networks, and other fundamental computing resources where the Cloud User can deploy and run arbitrary software, which can include operating systems and applications.
Infrastructure as-a Service-Based E-learning (IaaSBEL) is the hosting of E-learning systems on the IaaS platform.

Please do not hesitate to contact the researcher for any inquiry or clarification related to the questionnaire.

Thank you.

Abubakar Magira Tom
Mobile Telephone Numbers:
+601127188060
+2349061103646
E-mail: magiratom@gmail.com

Supervisors:
Prof. Dr. Wan Rozaini Sheik Osman
Email: rozai174@uum.edu.my
Dr. Wiwied Virgiyanti
E-mail: wiwied@uum.edu.my



SECTION A
DEMOGRAPHICS

Note: The main questions are listed below. However, this a semi-structured interview and it is anticipated that other questions may be asked based on the responses of the interviewee/informant.

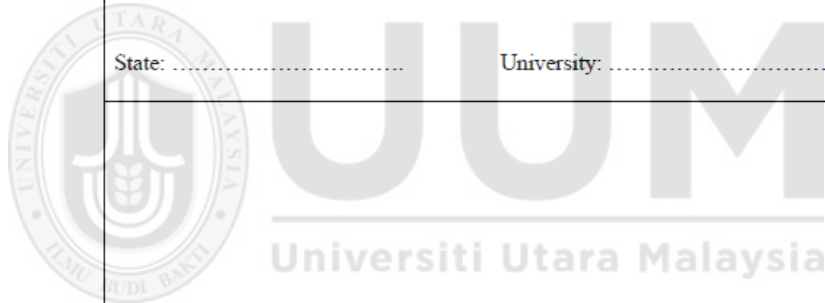
Demographic Profile

Gender: Male [], Female [] Age:

Marital status: Education Level:

Position: Years of experience:

State: University:





SECTION B
FINAL RESEARCH MODEL AND FINDINGS

This section presents the outcome of our research titled "*Intention to Adopt Model of Cloud-Based E-Learning in Higher Education Institutions*". This study was carried out in Nigeria. The outcome of the research shows that some key variables are not supported in the final model. Hence, *we want to understand why the variables are not supported*. Table 1. Illustrates the findings of our study.

Table 1. Summary of the research findings

Hypotheses	Relationship	β -value	t-value	p-values	Result
H1	RA -> INT	0.186	2.846	0.002***	Supported
H2	COM -> INT	0.095	1.385	0.083	<i>Not-Supported</i>
H3	TR -> INT	0.083	1.076	0.137	<i>Not-Supported</i>
H4	SEC -> INT	0.093	1.203	0.115	<i>Not-Supported</i>
H5	TMS -> INT	-0.079	1.333	0.092	<i>Not-Supported</i>
H6	CS -> INT	0.213	2.551	0.006***	Supported
H7	CP -> INT	0.139	1.543	0.062	Not-Supported
H8	SPS -> INT	0.173	1.922	0.028**	Supported
H9	GS-> INT	0.269	3.321	0.000***	Supported
The moderating effect of Government Support on RA, CS, and TR					
H10A	RA-> GS	-0.125	2.830	0.002***	Positively Supported
H10B	CS -> GS	0.123	1.943	0.026**	<i>Negatively Supported</i>
H10C	TR->GS	-0.161	2.442	0.007***	<i>Negatively Supported</i>

Note: RA = Relative Advantage, COM = Compatibility, TR = Trust, SEC = Security, TMS = Top Management Support, CS = Cost Savings, CP = Compatibility, SPS = Service Provider Support, INT = Intention, GS = Government Support



SECTION C
General Questions

1. What do you think are the reasons why *Compatibility* does not influence the intention to adopt IaaSBEL in the Nigerian HEIs?
2. In your opinion, why do you think that *Trust* does not play a prominent role towards the Intention to adopt IaaSBEL in the Nigerian HEIs?
3. How would you describe the insignificant influence of *Security* over the intention to adopt IaaSBEL in the Nigerian HEIs?
4. What in your viewpoint are the reasons why *Top Management Support* does not influence the intention to adopt IaaSBEL in the Nigerian HEIs?
5. In your opinion, why *Competitive Pressure* has no significant influence on the intention to adopt IaaSBEL in the Nigerian HEIs?
6. What do you think are the reasons why *Government Support* has a negative effect over *Relative Advantage* in the intention to adopt IaaSBEL in the Nigerian HEIs?
7. What do you think are the possible reasons why *Government Support* negatively influence *Trust* on the intention to adopt IaaSBEL in the Nigerian HEIs?





Title: Intention to Adopt Model of Cloud-Based E-learning in Higher Education Institutions

Operational Definitions of variable Measurement

Variables	Operational Definition
1- Relative Advantage	The degree to which an IaaSBEL is perceived as being better than its predecessors and has been found to be a good influence (facilitate) in the adoption of numerous technologies as noted in the literature review (Gangwar & Date, 2016; Moore & Benbasat, 1991; Rogers, 2003; Tweel, 2012).
2- Compatibility	The degree to which an IaaSBEL is perceived as being consistent with the existing values, needs as well as past experiences of HEIs in developing countries such as; work ethics, behavior, values, experience, and practice (Alhammedi et al., 2015; Moore & Benbasat, 1991; Rogers, 1995; Sallehudin et al., 2015; Tashkandi & Al-Jabri, 2015).
3- Trust	Refers to the willingness of an individual (University) to behave in risky and uncertain situations when expected benefits surpass perceived risks of adopting IaaSBEL (Almazroi, Shen, Teoh, & Babar, 2016; Flavián & Guinaliu, 2006; Jarvenpaa, Tractinsky, & Vitale, 2000; Pavlou, 2003; Pikkarainen, Pikkarainen, Karjaluoto, & Pahlila, 2004; Wu, 2011b).
4- Security	Refers to the extent to which a cloud service provider can prevent unauthorized access or modification of information in storage, processing, and in-transit towards IaaSBEL in developing countries HEIs (Mohammed, Alzahrani, Alfarraj, & Ibrahim, 2018; Oliveira, Thomas, & Espadanal, 2014; Wu, 2011b).
6- Cost Savings	Refers to the extent of cost reduction of infrastructure, operating costs, energy consumption cost and maintenance expenditure towards IaaSBEL in developing countries HEIs (Gupta et al., 2013; Oliveira et al., 2014).
7- Top Management Commitment	Refers to the commitment, support of ideas, and project to support the adoption of IaaSBEL in developing countries HEIs (Alhammedi et al., 2015; Lai et al., 2014; Molla & Licker, 2005; Oliveira et al., 2014).
8- Competitive Pressure	Refers to the level of pressure felt by Universities from competitors (other Universities) in the developing countries HEIs (Ifinedo, 2011; Lai et al., 2014; Mohammed et al., 2018; Moore & Benbasat, 1991; Oliveira & Martins, 2010).
9- Service Provider Support	Refers to the external support provided by the cloud service providers, such as; training, and technical support (Al Isma'ili, Li, Shen, & He, 2016; Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011; Klug & Bai, 2014; Lai et al., 2014; Premkumar & Roberts, 1999; Thong, Yap, & Raman, 1996).
10- Institution Size	This refers to the number of students (employees) or the revenue amount (Alhammedi et al., 2015; Damanpour, 1992; Klug & Bai, 2014; Rogers, 1995; Tweel, 2012).
11- Government Support	Refers to the policy stability, incentives, rules and regulations, financial support provided by the Government (Alhammedi et al., 2015; Chang et al., 2006; Dahnul et al., 2014; Lee et al., 2014; Tornatzky & Fleischer, 1990).
12- Intention to Adopt IaaSBEL	The extent of the intention for future use, before the initial adoption of the IaaSBEL in developing countries HEIs (Almazroi et al., 2016; Mathieson, 1991; Nguyen, Nguyen, Pham, & Misra, 2014; Teo, Su Luan, & Ching Sing, 2008; Tweel, 2012; Venkatesh, Thong, & Xu, 2012).

Appendix N: Trustworthiness: Peer Debriefing

Peer Debriefing Inbox x 🗑️ 📧 📧

Abubakar M Tom <magratom@gmail.com>
to Hapini, Abdullahi ▾ Fri, Jun 5, 12:51 AM (5 days ago) ☆ ↶ ⋮


Salaam Dr,

Kindly refer to the attachment below for the copy of the qualitative results for your comments.

Thank You,

Regards,

Abubakar Magina Tom
PhD in Computer Science
University Utara Malaysia
Cell phone: +601127188069 / +2349061103646

 Peer Debriefing.docx

Hapini Awang
to me ▾ Fri, Jun 5, 4:00 PM (5 days ago) ☆ ↶ ⋮


Assalamualaikum



Hapini Awang
to me ▾ Fri, Jun 5, 4:00 PM (5 days ago) ☆ ↶ ⋮


Assalamualaikum
Dear Tom,
please find the attachment.

Regards,
Hapini Awang

 Peer Debriefing_To...

Received, thank you. Well received with thanks. Received with thanks.

↶ Reply ➦ Forward



Name: Dr. Hapini Awang

Position: Senior Lecturer

School: School of Computing

University: Universiti Utara Malaysia

Overall, do you have any suggestions/comments to add regarding the study:

The candidate has shown an adequate, systematic and rigorous work, which is properly written and presented. The analysis is correct, and the selection of sampling and data collection procedures are appropriate. Well done.



UUM
Universiti Utara Malaysia

Thank you very much for your response

Appendix O: Member Checking



Member Checking of Interview transcript

Informant P4

Title: Infrastructure As-a Service-Based E-learning Adoption Model Implementation Strategy in the Nigerian Higher Education Institutions

Purpose: The purpose of member checking is to validate the recorded audio during the interview session. The informant is required to ascertain and validate that the transcript reflects your views, feelings, experiences, accuracy and completeness are affirmed.

Member checking is primarily used in qualitative inquiry methodology and is defined as a quality control process by which a researcher seeks to improve the accuracy, credibility and validity of what has been recorded during a research interview (Barbour, 2001; Byrne, 2001; Coffey & Atkinson, 1996; Doyle, 2007; Lincoln & Guba, 1985). The participants check to see whether a "true" or authentic representation was made of what he or she conveyed during the interview. Member checks may involve sharing all of the findings with the participants and allowing them to critically analyse the findings and comment on them (Creswell, 2007).

Dear Sir/Madam,

I am a PhD research student from the School of Computing, College of Arts and Sciences, Universiti Utara Malaysia (UUM). Presently, I am researching the topic mentioned above. Attached herewith, transcription recordings of the interview sessions conducted some months ago, that will take a little much of your time to answer. Your kind cooperation, participation, and response to this transcript confirmation are highly appreciated, and all data will be kept confidential for research purpose only. Please feel free to comment, clarify, agree or disagree to the transcript honestly and objectively as possible, as this will contribute towards the achievement of the purpose of this study.

Please do not hesitate to contact the researcher for any inquiry or clarification related to the questionnaire.

Thank you.

Abubakar Magira Tom (900945)
Mobile Telephone Numbers:
+601116963648
+2349061103646
E-mail: magiratom@gmail.com

Supervisors:
Prof. Dr. Wan Rozaini Sheik
Dr. Wiwied Virgiyanti

SECTION A
INTERVIEW QUESTIONS AND TRANSCRIPT

Q1) What do you think are the possible reasons why compatibility does not influence the intention to adopt IaaSBEL in the Nigerian HEIs?

Answer

Nigeria is a developing country, most of our institutions are trying to move from the traditional way of teaching, learning, and research into ICT based. Because I think the coming generation of Nigerians is more conversant with all these models of IaaSBEL. I think it will be able to start growing now because we do not have it much due to issues with developing countries. They are just trying now to catch up in terms of ICT. In terms of work ethics, you see, software are things that whenever you have been trained on them, you can work on them, and the issue of work ethics, we are educated people, and we always try to learn new things and as far as I am concerned and looking at the bigger picture, it will be compatible with us and will be able to grow in terms of our value and ethics. With existing systems, for example, right now in Kano university of science and technology, we do not have any existing system. So, I do not think this answer will be appropriate because we do not have any existing system.

- i. Do you Agree this is exactly what you said during the interview: Yes No
- ii. Please comment if you have anything to add: *Kano University of Sci. and Technology, Wudil does have an existing system. It is actually an ICT based system. The KUST, Wudil is now conducting e-test and e-examinations for their 100, 200 & 300 Levels students. KUST is now inclined ICT university.*

Q2) In your opinion, why do you think that Trust does not play a prominent role towards the intention to adopt IaaSBEL in the Nigerian HEIs?

Answer

Like I told you, you see, just recently, we are integrating all these models into our institutions, and I always would like you to be looking at it this way, Nigeria, in particular, is a developing country and in terms of ICT, we are not growing, but the issue of trust, if someone is not so much IT-oriented, you do not expect him to trust all these systems, but as far as I am concerned, there is whatever you are plotting as far as cloud computing is concerned. There are issues of Security and trust, and there is no trust 100%. You cannot trust someone 100%. Because there are issues that people might attack you and considering the environment that we leave in, people can easily compromise, you can trust someone, and they can easily compromise for their benefit. Let me give you an example with internet service providers when maybe you subscribe for 155 MBS, and you have paid for that 155 MBS, but at the end of the day, maybe you notice you have peak, and non-peak period, during your peak period, they will be able to give you that your 155mbs as indicated, you will be using it during the day but in the night, instead of them to dedicate the same energy, they might decide to take



part of it and give to someone else that needed it at that time. But, if to say, the providers will be trustworthy, there is no problem in plotting it across.

- i. Do you Agree this is exactly what you said during the interview: Yes No
 ii. Please comment if you have anything to add: Other Internet service providers here Nigeria are not reliable and dependable partner. sometimes, they don't give you what you have paid for.

Q3) How would you describe the insignificant influence of Security over the intention to adopt IaaSBEL in the Nigerian HEIs?

Answer

Security and trust are the most peculiar things you look at whenever you are going to plot any online application. You may find it to be secured, but because in a developed country, like America, they do almost everything online. They are more secure, and due to the maturity and the high-level technology, they always deploy, which is not the same as ours. Because of the different speeds, we are advancing, and they are still using the latest technology. But in Nigeria, there are a lot of times that we cannot be able to afford (the cost aspect). There are certain emerging technologies that are the latest, and we cannot afford it because of the cost. Also, because of our level, maybe someone in Europe might be looking for something from Africa, and you have deployed a system that he has used maybe for the past 3-4 years. He has mastered it, and he can attack you easily. All I am saying is if the school trusts the provider, and hand it over their data to the providers, the integrity of the providers at first should be confirmed. As far as the providers will adhere strictly to the terms and conditions of the consent, if they can protect that, I do not think there is a problem. It is a good thing to plot it.

- i. Do you Agree this is exactly what you said during the interview: Yes No
 ii. Please comment if you have anything to add:



Q4) What in your viewpoint are the reasons why Top Management support does not influence the intention to adopt IaaS/BEL in the Nigerian HEIs?

Answer

A lot of top management in Nigeria not only higher institutions, all most all sectors in Nigeria. You see, there are people not from the IT revolution era that have given their all to ICT, and they believe everything can be done through ICT. So, that is why we find it very difficult to understand what it means, and you have to understand something before you influence someone to do it for you or before you are being influenced to do it. So, I believe a few people are very conversant with IT and a lot of things. If you consider the number of people managing higher institutions in Nigeria, they are very few at the top management that fully understand and know the benefit of deploying these kinds of systems.

- i. Do you Agree this is exactly what you said during the interview: Yes No
 ii. Please comment if you have anything to add: *In addition, most of the (top management) here in Nigeria does not have keen interest in the ICT sector. They think if they adopt and support full ICT infrastructure to be installed in all sectors, they will be left behind, they will be out of the system, ultimately not relevant anymore!*

Q5) In your opinion, why Competitive pressure has no significant influence on the intention to adopt IaaS/BEL in the Nigerian HEIs?

Answer

As far as I am concerned, there is no competitive pressure among the higher institutions to deploy this infrastructure-as-a-service. The reason as I told you before is, in Nigeria, the competition among the universities, the people do not consider the technological level or technological advancement they only consider this is a state university, this is a federal university this is a first-generation university, this is a second-generation university, this is a third-generation university. This is the only competition that our higher institution does. But for example, if you look at the private universities, they deploy this kind of thing, and it makes it easier for them. For example, Nile and Baze university between them, there is this competition of the deployment of technological advancement to beat each other and if you come to the public institution, the only public institution that I can beat my chest for, is deploying high-level technology and all this kind of cloud computing and a lot of things is the is the university of Ilorin, they have gone far on that aspect. Regarding the issue of this deployment, there are two problems: one is the people that are managing the institutions, and secondly, the people that are managing the institution that repost it. For example, the government is not helping matters, even though I believe, things are too much for the government to take, the government cannot do it all for us, it is only recently that the government-appointed Dr. Pantami as the minister of communications and digital economy, that they are thinking of deploying all these kinds of things. Of course, the government does provide services to schools, computer lab, and everything, and when you come and create a computer lab, maybe you do the LAN networking, you provide the infrastructures, but there is nothing like an upgrade, if they build it, they will leave it, then no maintenance and it will just decay like that, maybe after 2-3 years, you will come and see the places are dilapidated. If to say, whenever the government is trying to do something, it

will just try and do it to the best of their ability and to make sure these things that they have done are being managed well. So, it will create a lot of competition. Take Kano as an example, there are a lot of things that even our students from primary and secondary school level, the only time they will come in contact with computers is when they are writing examinations, e-exams such as JAMB examination, because it is the most popular examination that you take before going to the university. So, this is the only time they will come in contact with a computer talk less of using all these things when they are being deployed in the higher institutions. Because let me tell you, what I believe is, you cannot from primary to secondary level, you have taught a pupil or a student how to use a computer or computer application, but when he/she enters to the university, he started writing e-examinations, and you have taught him from scratch how to access all these files, how to do a lot of things which makes it so difficult. It makes it so difficult for him and the teacher also, you cannot be teaching him a different topic and at the same time, teaching him how to access, manage and use all these infrastructures. So, I believe, when we start it at the lowest level, everybody should do his bit, so when they come, they will just automatically pick and use the system. The only thing that maybe they will have a little change that they can easily adapt. But you cannot bring someone into something that he has never come across and expected him to learn, act and use it for his studies, and at the same time use it to pass examinations, and you will have a total failure.

- i. Do you Agree this is exactly what you said during the interview: Yes No
ii. Please comment if you have anything to add: _____



Q6) What do you think are the reasons why Government Support has a negative effect over relative advantage in the intention to adopt IaaSBEL in the Nigerian HEIs?

Answer

Because there is no sincerity of purpose, for example, we believe whatever our government is doing is just for their benefit, not for us. When you deploy a system, all this cloud someone might be, because of the negative effect of the government affected us. Someone can even decide at one corner to cook up a story and say that the government is doing it. For example, here in Kano, things have started changing for the past two months (3/12/2019), the issue of government negative effect over relative advantage. The issue is in the past two months, things are changing for good, the kano state government has launched a free and compulsory basic and secondary education, and through this free and compulsory basic education, the government has made integration of ICT teaching and learning as compulsory. The government said that they would recruit 3000 teachers, must have basic knowledge of ICT. After that, the government announced that it would only employ you after you have done your examinations via a computer-based test system. So now people have started understanding. Here in Kano, I can tell you; people have started seeing the importance of learning all these things. Even the higher institutions have started thinking to graduate students, and the government will employ in teaching our kids. You must put them across all these new technologies and platforms of ICT. So, it has woken up a lot of institutions. Also, it has woken up the populace; they need to go back and learn something that will help them in enrolling all these programs. Additionally, whenever you are teaching, you must have at least a basic knowledge of ICT. So, I think gradually, we will start going from here, we will be soaring higher.

i. Do you Agree this is exactly what you said during the interview: Yes, No

ii. Please comment if you have anything to add: The federal and state government should enforce the relevant people (target audience or customers) towards embracing ICT as a tool for teaching, learning and research; that was what the Kano state GOvt. did during the recruitment of 3000 Teachers. The state government forced all the prospective applicant to get or acquire the necessary ICT skill before they come and take the Exam. Because the Exam is an Aptitude Test.

Q7) What do you think are the possible reasons why Government Support negatively influence Trust on the intention to adopt IaaS/BEL in the Nigerian HEIs?

Answer

The government was always being questioned, and their integrity has been tested, and it has failed woefully. Let me give you an example; for the past two years in Nigeria, people are complaining of extortion by mobile communication companies. When you recharge your phone with 1000 Naira or 2000 Naira and make a call that is worth 200 or 300 Naira before you know it, you will just be receiving some flimsy text messages, and then your money will be deducted. The government has done nothing on that. I am giving you this example because it is an example that touched the lives of almost every Nigerian when it comes to ICT. The telecommunication is an ICT built field, and it is a field that virtually every Nigerian use. With all these kinds of things, that is why people do not have confidence whenever the government assured them; there is no guarantee. Because the government, as regulators and policy-makers, do not do their work, they will leave people on their own, and people will be helpless and restless. For example, money has been deducted by my service provider illegally, without my consent, and I do not know for what reason.

I will complain, complain, and complain a hundred times, and nothing will happen. I will just be left at the mercy of myself. It will force me to move from this service provider to another service provider, before the other one extort me also, and think of going to another. The policy-makers are not doing what they are supposed to do. Whenever the regulators and the policy-makers are honest, there are things that the customers or the end-users should not be even complaining about.

That the regulators cannot notice and even tell the operators to change this or stop doing this. But recently, the minister of communication has taken a bold step to reduce the prices of data and voice calls. If you can look around, especially on social media, people are commending this effort, and people have started to see that regulator of all sectors concerning ICT and the government has begun regaining the confidence of the concerned citizens. So, I think if we can go this way, that whenever you complain, and your complains are being resolved, whenever a company extorts you are being punished, whenever they are not doing their work, their attention will be called and tell them to change this, stop doing this, and that. People will believe in a government that the government is not doing it for themselves but is doing it for them. Then they will start having hope and will be rejuvenated. This issue is just that our people always believe that whenever the government is deploying technology, it is not doing for them. They have this negative perception about the government, but I believe when the government has a real sincerity of purpose, through orientations, people will be informed that this is not so, and they will be able to accept it. Whenever people see things are working for them, they will believe you. You cannot keep telling me something that I cannot see with my physical eye, and I will believe you, while you have told me, I had tested it, and it has failed.

- i. Do you Agree this is exactly what you said during the interview: Yes No
- ii. Please comment if you have anything to add:



Overall, do you have any suggestions/comments to add regarding the transcript:

Informants Name: Musaddiq Wada Mazir
Informant Signature: [Signature]
Date: 04/01/2020

Thank you 😊



UUM
Universiti Utara Malaysia

Member Checking P1

Member Check Inbox x 🔍 🖨 🔗

 **Abubakar M Tom** <magiratom@gmail.com> Jun 10, 2020, 11:03 AM (6 days ago) ☆ ↶ ⋮
to Shehu ▾

Salam Sir,

Kindly refer to the attachment for "member checking" file. It is a technique for validating and confirmation that what was transcribed is actually what you said during the interview session.

Kindly read through and confirm or reject the transcribed data.

Thank you,

Regards,

Abubakar Magira Tom
PhD in Computer Science
University Utara Malaysia
Cell phone: +601127188069 / +2349061103646

 PDF
P1_update_membe... New Message from shehu studu [Show](#)

 **UUM**
Universiti Utara Malaysia

 **shehu studu** 4:46 PM (5 hours ago) ☆ ↶ ⋮
to me ▾

Absolutely, I confirmed that what was transcribed is actually what I have said during the interview session. However, i hope it will help for successful findings and meet the objective of the study.

...

 **Abubakar M Tom** 10:11 PM (15 minutes ago) ☆ ↶ ⋮
to shehu ▾

Thank you for the clarification.
Abubakar Magira Tom
PhD in Computer Science
University Utara Malaysia
Cell phone: +601127188069 / +2349061103646

...

On Tue, Jun 16, 2020 at 4:46 PM shehu studu <shehu.studu@ssu.edu.ng> wrote:
Absolutely, I confirmed that what was transcribed is actually what I have said during the interview session. However, i hope it will help for successful findings and meet the objective of the study.

On Fri, Jun 12, 2020 at 2:36 PM Shehu Studu <stjabo@gmail.com> wrote:

----- Forwarded message -----
From: **Abubakar M Tom** <magiratom@gmail.com>

New Message from shehu studu [Show](#)

Appendix P: Population and Sampling

Universities in North-East, North-Central, and North-West

State Universities: North-East

S/n	State Universities (NE)	ICT Directorates/Units	Number of Personnel	Total	Principal Officers
1	Adamawa (http://www.adsu.edu.ng/)	ICT Director, ICT deputy Director	2	11	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Network Infrastructure and Security Unit	2		
		2) Management and Information System Unit	2		
		3) Equipment and Maintenance Unit	2		
		4) Research and Development Unit	2		
		5) Dean of Sciences	1		
2	Gombe (http://www.gomsu.org)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
3	Taraba (https://www.tsuniversity.edu.ng/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
4	Yobe (http://www.yso.edu.ng/yso/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
5	Bauchi	ICT Director, ICT deputy Director	2	13	

	(http://basug.edu.ng/)	1) Unit Head	5		ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
Total				63	

Federal Universities: North-East

S/n	Federal Universities	ICT Directorates/Units	Number of Personnel	Total	Principal Officers
1	Yobe (https://fugashua.edu.ng/)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
2	Maiduguri (http://www.unimaid.edu.ng/)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
3	Adamawa (http://www.mautech.edu.ng)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		

4	Bauchi (http://www.atbu.edu.ng/#/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Network Infrastructure and Internet Unit	2		
		2) Management Information System Unit	2		
		3) Training Unit	2		
		4) Engineering and Maintenance Unit	2		
		5) Webometrics Unit	2		
		6) Dean of Sciences	1		
5	Taraba (http://www.fuwukari.edu.ng/)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head			
		3) Dean of Sciences	1		
6	Gombe	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
Total				88	

State Universities: North-West

S/n	State Universities	ICT Directorates/Units	Number of Personnel	Total	Principal Officers
12	Kano (http://kustwudil.edu.ng/the kust/index.html)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
1.1	Kano (https://www.nwu.edu.ng/) Yusuf Maitama Sule University	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
2	Kebbi (http://www.ksusta.edu.ng/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1)---	10		
		2) Dean of Sciences	1		
3	Katsina (http://www.umyu.edu.ng/)	ICT Director, ICT deputy Director	2	9	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Management Information System unit	2		
		2) Network and System Administration Unit	2		
		3) CBT and IT security	2		
		4) Dean of Sciences	1		
4	Sokoto (http://www.ssu.edu.ng/)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Network Unit	2		
		2) Hardware and Maintenance Unit	2		
		3) Web/Portal Development Unit	2		

		4) Student Management Information System unit	2		
		5) Training Unit	2		
		6) Help Desk Unit	2		
		7) Dean of Sciences	1		
5	Kaduna (http://www.kasu.edu.ng/)	ICT Director, ICT deputy Director	2	11	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Computer Operations Unit	2		
		2) Infrastructure and Training Unit	2		
		3) Management Information System Unit	2		
		4) Network and Maintenance Unit	2		
		5) Dean of Sciences	1		
6	Jigawa (http://www.slu.edu.ng/)	ICT Director, ICT deputy Director	2	11	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	4		
		2) Assistant Unit Head	4		
		3) Dean of Sciences	1		
Total				85	

Federal Universities: North-West

S/n	Federal Universities	ICT Directorates/Units	Number of Personnel (s)	Total	Principal Officers
1	Kano (http://www.buk.edu.ng/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Network Administration Unit	2		
		2) Maintenance Unit	2		
		3) Internet services Unit	2		
		4) Web Development Unit	2		
		5) Support Services Unit	2		
		6) Dean of Sciences	1		
2	Zamfara https://www.fugusa.u.edu.ng/	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Network Engineering Unit	2		
		2) Software Development Unit	2		
		3) Database Administration Unit	2		
		4) Technical Support Unit	2		
		5) Social Sciences	2		
		6) Dean of Sciences	1		
3	Kebbi (http://www.fubk.edu.ng/)	ICT Director, ICT deputy Director	2	17	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Software Development Unit	2		
		2) Network Unit	2		
		3) Maintenance Unit	2		
		4) Teaching and Learning Technology Unit	2		
		5) Training Unit	2		
		6) Management Information System Unit	2		
		7) IT Support Unit	2		
8) Dean of Sciences	1				
4	Katsina (http://www.fudutsinma.edu.ng/)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant
		1) Unit Head	6		
		2) Assistant Unit Head	6		

		3) Dean of Sciences	1		Unit head, and Dean
5	Sokoto (http://www.udusok.edu.ng/)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
6	Kaduna (https://abu.edu.ng/)	ICT Director, ICT deputy Director	2	19	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Computing and Academic Support Unit	2		
		2) Information Technology Academy Unit	2		
		3) Management Information System Unit	2		
		4) Network Infrastructure and Security Unit	2		
		5) Software Development Unit	2		
		6) Research and Business Development Unit	2		
		7) Web Management Unit	2		
		8) Education and Training Unit	2		
		9) Dean of Sciences	1		
7	Jigawa (http://www.fud.edu.ng/)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
Total				107	

State Universities: North-Central

S/n	State Universities	ICT Directorates/Units	Number of Personnel (s)	Total	Principal Officers
1	Benue (http://www.bsum.edu.ng)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
2	Kogi (https://www.ksu.edu.ng)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
3	Kwara (https://kwasu.edu.ng/cit/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Computer Repair Unit	2		
		2) Network Operation Unit	2		
		3) Portal Unit	2		
		4) Software Unit	2		
		5) Training Unit	2		
		6) Dean of Sciences	1		
4	Nassarawa (https://nsuk.edu.ng/directorates/it-centre/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		

5	Niger (http://ibbu.edu.ng/ict/)	ICT Director, ICT deputy Director	2	13	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
6	Plateau (http://plasu.edu.ng)	ICT Director, ICT deputy Director	2	13	
		1) Unit Head	5		
		2) Assistant Unit Head	5		
		3) Dean of Sciences	1		
Total				78	

Federal Universities: North-Central

S/n	Federal Universities	ICT Directorates/Units	Number of Personnel (s)	Total	Principal Officers
1	Benue (https://uam.edu.ng/directories/directorate-of-ict/)	ICT Director, ICT deputy Director	2, 2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Network Infrastructure Unit	2		
		2) Internet Services and Application Development Unit	2		
		3) E-learning Unit	2		
		4) Training and Development Unit	2		
		5) Accounts Unit	2, 2		
		6) User Support and Maintenance Unit			
		7) Dean of Sciences	1		
2	Kogi (https://www.fulokoja.edu.ng/ict.php)	ICT Director, ICT deputy Director	2	11	ICT Director, ICT deputy director, Unit head, Assistant
		1) Administrative Unit	2		
		2) Software Unit	2		
		3) Networking Unit	2		

		4) Hardware Unit	2		Unit head, and Dean
		5) Dean Sciences	1		
3	Kwara (http://www.unilorin.edu.ng/index.php)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
4	Nassarawa (https://www.fulafia.edu.ng)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
5	Niger (https://www.futminna.edu.ng)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
6	Plateau (https://www.unijos.edu.ng)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		

7	Abuja (https://www.uniabuja.edu.ng)	ICT Director, ICT deputy Director	2	15	ICT Director, ICT deputy director, Unit head, Assistant Unit head, and Dean
		1) Unit Head	6		
		2) Assistant Unit Head	6		
		3) Dean of Sciences	1		
	Total		101		

Overall Total = 522.

North-East Region	State University	Federal University	Total
Director	5	6	11
Deputy Director	5	6	11
Unit Head	24	35	59
Assistant Unit Head	24	35	59
Dean of Sciences	5	6	11
Total	63	88	151
North-West Region	State University	Federal University	
Director	7	7	14
Deputy Director	7	7	14
Unit Head	32	43	75
Assistant Unit Head	32	43	75
Dean of Sciences	7	7	14
Total	85	107	192
North-East Region	State University	Federal University	
Director	6	7	13
Deputy Director	6	7	13
Unit Head	30	40	70
Assistant Unit Head	30	40	70
Dean of Sciences	6	7	13
Total	78	101	179



The population was drawn from the universities in the North-East, North-West, and North-Central region of Nigeria. The reason for selecting Northern Nigerian universities is due to includes the following:

1. The State and Federal universities are approved by the NUC and adhere to the same standards of operation.
2. Many of the states in the north are bedevilled by insurgency, bandits and Fulani herdsmen, which makes education unsustainable.
3. Since Boko haram is against western education, even though they are lying, they kill students, lecturers, and bomb some places in the university of Maiduguri.
4. Northern Nigeria has the largest population of out of school children, according to UNESCO and the World Bank.
5. Northern Nigeria has the highest illiteracy rate in Nigeria
6. It can be noted that some universities take down the staff on their websites due to the fear of attacks from insurgents who are bent on stopping education in Northern Nigeria.

A disproportionate stratified sampling technique was used. Also, a systematic random sampling for each stratum was performed. Hence, the respondents are stratified into ICT director, deputy director, Unit head, Assistant Unit head as well as dean of sciences. Nonetheless, all the top managers are essential, but, the senior managers are more crucial, as they are in charge of making the final decision; hence, the reason for using disproportionate sampling.

Furthermore, in each stratum, the number of managers are accumulated. Thus, systematic sampling was used to select the respondents of the study.

Appendix Q: Recommendations and Expert Comments

Experts Information	Evidence
Expert 1: Recommendations	Do you think that these findings could lessen the problems faced by education in developing countries? *
Name: Prof. Dr. Abdul Malek B Hj Abdul Karim	<input checked="" type="radio"/> Agree
Gender: Male	<input type="radio"/> Disagree
Age: 40 year and above	
Education Level: Doctorate	
Position: Director UUM Information Technology/ Professor	
Do you think that these findings could lessen the problems faced by education in developing countries? *	Can the findings in section B and C serve as a guide for the adoption of laaSBEL in developing countries HEIs? *
Yes	<input checked="" type="radio"/> Agree
Can the findings in section B and C serve as a guide for the adoption of laaSBEL in developing countries HEIs? *	<input type="radio"/> Disagree
Yes	
Comments: 1. What are your suggestions on the best practices of creating trust among users?	Comments or Suggestions: *
Email: malek@uum.edu.my	1. What are your suggestions on the best practices of creating trust among users?
Expert 2: Recommendations	<input checked="" type="radio"/> Agree
Name: Prof. Madya Dr. Muhamad Shahbani bin Abu Bakar	<input type="radio"/> Disagree
Gender: Male	
Age: 40 year and above	
Education Level: Doctorate	Can the findings in section B and C serve as a guide for the adoption of laaSBEL in developing countries HEIs? *
Working Experience: >5 years	<input checked="" type="radio"/> Agree
Do you think that these findings could lessen the problems faced by education in developing countries? *	<input type="radio"/> Disagree
Yes	
Can the findings in section B and C serve as a guide for the adoption of laaSBEL in developing countries HEIs? *	
Yes	Comments or Suggestions: *
Comments or Suggestions: *	For the 2 parts above.. more to agree but some items I not agreed. Example..For developed country, Human resources is the main obstacle for the education compared with financial. I need to see the evidence/data shows the financial is main obstacle. This research also need to discuss more about cloud computing (iaas or security in cloud model) and related with learning outcomes or successful in e-learning planning and implementation.
For the 2 parts above.. more to agree but some items I not agreed. Example..For developed country, Human resources is the main obstacle for the education compared with financial. I need to see the evidence/data shows the financial is main obstacle.	
This research also need to discuss more about cloud computing (iaas or security in cloud model) and related with learning outcomes or successful in e-learning planning and implementation.	
Email: shahbani@uum.edu.my	Thank you very much for your response. Your participation in this survey is highly appreciated
Expert 2: Recommendations	

Name: Dr. Mohd Faiz bin Mohd Yaakob	Do you think that these findings could lessen the problems faced by education in developing countries? * <input checked="" type="radio"/> Agree <input type="radio"/> Disagree
Gender: Male	
Age: 30-40 year and above	
Education Level: Doctorate	
Working Experience: >5 years	
Do you think that these findings could lessen the problems faced by education in developing countries? *	Can the findings in section B and C serve as a guide for the adoption of laaSBEI in developing countries HEIs? * <input checked="" type="radio"/> Agree <input type="radio"/> Disagree
Yes	
Can the findings in section B and C serve as a guide for the adoption of laaSBEI in developing countries HEIs? *	Comments or Suggestions: * Well done. Scrupulous and Meticulous. Good Study. Robust and vigorous data analysis. InshaAllah. Good Luck
Yes	
Comments or Suggestions: *	Comments or Suggestions: * Well done. Scrupulous and Meticulous. Good Study. Robust and vigorous data analysis. InshaAllah. Good Luck
Email: mohdfaizmohdyaakob@gmail.com	



UUM
Universiti Utara Malaysia

Research Title: The Intention to Adopt Model of Cloud-Based E-Learning in Higher Education Institutions

Dear Sir/Madam,

My name is Abubakar Magira Tom (Matrix No: 900945), and I am a Ph.D. (Information Systems) student from the School of Computing, College of Arts and Sciences, Universiti Utara Malaysia. I am conducting a research on the “**The Intention to Adopt Model of Cloud-Based E-Learning in Higher Education Institutions**” under the supervision of Prof. Dr. Wan Rozaini Sheik Osman and Dr. Wiwied Virgiyanti. Attached herewith, self-explanatory questions that will take a little much of your time to answer. Your kind cooperation, participation, and response to this interview questions are highly appreciated, and all data will be kept confidential for research purposes only. Please answer all questions honestly and objectively as possible, as this will contribute towards the achievement of the purpose of this study.

Definition of Terms

<i>E-learning is the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services, to create, foster, deliver and facilitate learning, and exchange and collaboration anytime and anywhere .</i>
<i>Cloud Computing is a pool of services that enables ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.</i>
<i>Infrastructure as a Service (IaaS) is a form of Cloud Computing that allows the Cloud User to provision processing, storage, networks, and other fundamental computing resources where the Cloud User can deploy and run arbitrary software, which can include operating systems and applications.</i>
<i>Infrastructure as-a Service-Based E-learning (IaaSBEL) is the hosting of E-learning systems on the IaaS platform.</i>

Please do not hesitate to contact the researcher for any inquiry or clarification related to the questionnaire.

Thank you.

Abubakar Magira Tom

Contact No:

+601127188060

E-mail: magiratom@gmail.com

Supervisors:

Prof. Dr. Wan Rozaini Sheik Osman

Email: rozai174@uum.edu.my

Dr. Wiwied Virgiyanti

E-mail: wiwied@uum.edu.my

SECTION A
DEMOGRAPHICS

Note: The main questions are listed below.

Demographic Profile

Gender: Male [] Female [] Age:

Education Level: Position or Occupation: Years of working
experience:

Name of Higher Education Institution:



UUM
Universiti Utara Malaysia

SECTION B
FINAL RESEARCH MODEL AND FINDINGS

This section presents the outcome of our research titled "*The Intention to Adopt Model of Cloud-Based E-Learning in Higher Education Institutions*". This study was carried out in Nigeria. The outcome of the research shows that some key variables are not supported in the final model. Table 1 illustrates the findings of our study.

Table 1. Summary of the research findings

Hypotheses	Relationship	<i>β</i>-value	<i>t</i>-value	<i>p</i>-values	Result
H1	RA -> INT	0.186	2.846	0.002***	Supported
H2	COM -> INT	0.095	1.385	0.083	Not-Supported
H3	TR -> INT	0.083	1.076	0.137	Not-Supported
H4	SEC -> INT	0.093	1.203	0.115	Not-Supported
H5	TMS -> INT	-0.079	1.333	0.092	Not-Supported
H6	CS -> INT	0.213	2.551	0.006***	Supported
H7	CP -> INT	0.139	1.543	0.062	Not-Supported
H8	SPS -> INT	0.173	1.922	0.028**	Supported
H9	GS-> INT	0.269	3.321	0.000***	Supported
The moderating effect of Government Support on the Relationship Between Relative Advantage, Cost Savings, and Trust					
H9a	RA-> GS	-0.125	2.830	0.002***	Positively Supported
H9b	CS -> GS	0.123	1.943	0.026**	Negatively Supported
H9c	TR->GS	-0.161	2.442	0.007***	Negatively Supported

Note: RA = Relative Advantage, COM = Compatibility, TR = Trust, SEC = Security, TMS = Top Management Support, CS = Cost Savings, CP = Compatibility, SPS = Service Provider Support, INT = Intention, GS = Government Support

SECTION C
QUALITATIVE RESEARCH FINDINGS

This section presents the outcome of the qualitative findings using thematic analysis. Thus, showing the themes and sub-themes generated from the final model results, as shown in Table 1 above. Table 2 presents the summary of the qualitative findings.

Table 2. Summary of Qualitative Findings

Themes	Sub-themes
1. Compatibility	<ul style="list-style-type: none"> i. Interoperability Issues ii. Staff Training iii. Student Training iv. Work Ethics
2. Competitive Pressure	<ul style="list-style-type: none"> i. Culture and Behavior ii. Lack of Competition iii. Traditional Method
3. Government Support_Relative Advantage and Trust	<ul style="list-style-type: none"> i. Failed System ii. Lack of Bandwidth iii. Lack of Maintenance iv. Lack of Policy v. Personal Interest/Corruption vi. Policymakers Awareness
4. Top Management Support	<ul style="list-style-type: none"> i. Access CSPs reliability, Cost, and Security ii. Create Awareness iii. Resistance to Change iv. Fear of Losing job v. Personal Integrity vi. Lack of Management Support vii. Lack of Honesty viii. ICT Limit Fraud ix. Lack of Fund
5. Trust and Security	<ul style="list-style-type: none"> i. Data Location Issues ii. Fear of Hacking iii. Lack of Trust iv. Reliability and Data Safety

SECTION D

Recommendation

The inadequate provision of financial resources has been recognized as the greatest obstacle to education development in Nigeria. However, in view of the contending demand for improving education, the HEIs found it challenging due to the inadequate provision of funds, poverty, recession, inconsistent policies, infrastructural decay and inadequate technical resources to support research, teaching and collaboration. Furthermore, the Nigerian 2019 and 2020 education budget is only 7.25% and 6.7% of the total budget (National Bureau of Statistics, 2020).

In the same vein, Coronavirus pandemic has deprived half of the world's students of education (UNESCO, 2020). Hence, due to the current situation, in a circular submitted to Higher Education Institutions (HEIs) confirms that all schools shall remain closed as we closely monitor development on the containment of COVID-19 (Federal Ministry of Education, 2020).

Therefore, based on the quantitative and qualitative findings in Section B and C, this study recommends that; Relative Advantage, Compatibility, Trust, Security, Top Management Support, Cost Savings, Competitive Pressure and Government Support are factors should be considered by the National University Commission (NUC), policymakers, HEIs, National Information Technology Development Agency (NITDA) and Cloud Service Providers (CSPs).

The findings of this study are relevant for pre and post COVID-19 pandemic in Nigeria to ascertain the availability of e-learning contents without any barriers. Besides, education can be provided for all populace as-a-service in a subsidized manner, thereby considerably reducing the cost.

Therefore, based on the quantitative and qualitative findings in Section B and C, this study recommends the following:

- 1) The advantage that comes with the adoption of IaaS/BEL, such as improving the quality of operations, effectiveness of e-learning. Thus, increasing job and academic productivity as enhancing the effectiveness of the Nigerian HEIs operations.
- 2) The Compatibility of the existing system in Nigerian HEIs integration and interoperability with the cloud ecosystem is a concern to ICT directorates top managers, as indicated in our findings. It is pertinent that the cloud service providers and ICT top managers agree on modalities on how best their software will be compatible.
- 3) Trust is among the crucial factors in cloud computing adoption. The cloud service providers should find a way to improve cloud users trust when adopting their services. A mechanism that will guarantee the ownership of data, and the security of data at rest and in-transit. The ICT directorates are sceptical of the trustworthiness of the cloud service providers.
- 4) Security has been a significant concern in the adoption of Cloud computing. The cloud service providers must ensure the security which comprises of the confidentiality, availability, integrity, authorization and authentication of the Nigerian HEIs data. Nonetheless, security concerns are a significant deterrent towards the adoption of IaaS/BEL as indicated in Section B.
- 5) The top managers are reluctant to support the adoption of IaaS/BEL. As indicated in our findings, the ICT directorates top managers are sceptical about the risks of adopting IaaS/BEL. Therefore, cloud service providers should be transparent to the cloud users and proof beyond reasonable doubt about their commitment and honesty.

6) The Nigerian ICT directorates top managers agree with the cost savings associated with the adoption of IaaS/BEL. Nonetheless, a precise payment plan should be outlined by the cloud service provider and spelt in the service level agreements.

7) Competition between the Nigerian HEIs would not influence the adoption of IaaS/BEL. Instead of competing against one another, research collaboration and sharing are one of the advantages of cloud computing. The Nigerian HEIs should think of collaborative research and learning towards improving the standard of education in the universities instead of competing against one another.

8) The support provided by the service providers will encourage the adoption of IaaS/BEL by the Nigeria HEIs. In the context of IaaS/BEL, the online learning platform should be available 24/7 during peak period.

9) The Nigerian Government should invest in creating awareness of the Cloud computing infrastructure towards a digital Nigeria. Besides, suitable policies that will enable the HEIs to adopt IaaS/BEL quickly should be introduced as well as financial support and waivers provided to interested universities.

10) Therefore, this study should be considered by the National University Commission (NUC), policymakers, HEIs, National Information Technology Development Agency (NITDA) and Cloud Service Providers (CSPs).

a) Do you think that these findings could lessen the problems faced by education in Nigeria developing countries?

Agree Disagree

b) Can the findings in section B and C serve as a guide for the adoption of IaaS/BEL in Nigerian/developing countries HEIs?

Agree Disagree

c) Do you agree that IaaS/BEL can be implemented based on these findings?

Agree Disagree

d) Comments or Suggestions:

Thank you very much for your response. Your participation in this survey is highly appreciated

Appendix R: Recommendation Expert Comments

Expert 1:

1. What are your suggestions on the best practices of creating trust among users?

Answer:

Trust and security are among the measure factors hindering the diffusion of cloud computing in many organizations. The questions of organization trusting the Cloud Service Providers (CSPs) to implement a adequate security is of vital concern to the cloud users. However, the following are the recommendation and practices of ensuring security and trust by the CSP.

Organizational: Malicious risks from employees, misuse and BYOD vulnerabilities and policies

1. The organization should define roles and responsibility as they migrate to the CC. The cloud users should understand security management, and cloud service providers
2. Security awareness and training should be established, and cloud users should be aware of the security policies (Ssl2buy, 2020).
3. The CSPs should manage roles and responsibilities in concordance with organizations mission and vision.
4. The CSPs should provide an exit plan or termination plan.
5. BYOD should be controlled based on the access control policies.

Technological: includes vulnerability in the virtualization infrastructure as well as the APIs.

1. Maintain and upgrade with latest industry certifications
2. APIs should be standardised for security and easy data analysis
3. Up to date encryption, technics, as well as awareness of technology, should be provided by the CSPs.

Data Management: Data centre location problem due to host countries cyber policies and compliance

1. Employ security mechanisms such as SSL for secure transit and robust encryption for data at rest.
2. Provide live monitoring and audit of data at rest, in transit and online for any anomaly.

Operations: handing over the control of the IT operations to the CSPs, this raises the issue of physical risks, business continuity and disaster recovery plan

1. Provide systems that are physically secured and robust.
2. Provide policies, procedures and controls for monitoring the systems
3. Risks and other vulnerabilities should be discussed with the cloud users upfront.
4. Before and during a disaster, a recovery plan should be provided to include the business continuity, incidence response plan, and disaster recovery plan to the cloud users.

Audit and Compliance: Service Level Agreements, audit, and Legal Compliance

1. Provide regulatory information coupled with data located in the cloud and the type of mission-critical data.
2. The CSPs must provide certification, compliance requirements by providing a holistic data management agreement.
3. Gives room for organizations and third-party to conduct access to the audit report for any anomaly.

Governance: The overall security of the data, risk and incident management

1. A governance policy should be provided by the CSPs that should include the classification, data handling, policies, monitoring and logging to identify anomalies.
2. The CSPs should be in contact with the cloud users and other stakeholders.
3. Perform risk assessments that evaluate regulatory compliance and policies.
4. Define metrics to assess if the CSP is meeting the organizational security expectations.
5. The exit plan and how data will be destroyed by the CSP in case, the cloud users are moving to other CSPs, should be spelt.

Therefore, the above recommendations could make the cloud users trust the CSPs if they comply with the suggested guidelines.



Expert 2:

1) “For the 2 parts above.. more to agree but some items I not agreed. Example. For developed country, Human resources is the main obstacle for the education compared with financial. I need to see the evidence/data shows the financial is main obstacle”.

2) “This research also need to discuss more about cloud computing (iaas or security in cloud model) and related with learning outcomes or successful in e-learning planning and implementation”.


Answer 1:

The expert agrees with the two findings but does not agree with the financial constraints. The human resource is in line with the results of the qualitative analysis, where the informant's list Culture and behavior, lack of support, lack of technical know-how, lack of expertise, and lack of awareness and training are among the crucial constraint. Besides, in developing countries, especially Nigeria, education budget remains a problem because the Nigerian budget on education is between 6-7% from 2009 to 2020. Hence, by considering the current recession and COIVD-19 pandemic, the effect on the Nigerian economy and education will be catastrophic.

Answer 2:

Security is one of the main factors addressed in this research, and nonetheless, based on the statistical results, security is not supported. Hence, the experts were contacted to explain why the outcome of the result is not supported. The experts during the interview session listed data location issues, fear of hacking, lack of trust, and the reliability and data safety as the main reason they are concerned about the security of cloud computing. As the expert rightly stated, “learning outcomes or success in e-learning planning and implementation”, the scope of the research is skewed towards the Intention to adopt IaaS/BEL. Nonetheless, this could be recommended for future study.

Appendix S: Ministry of Education Circular on Stopping Education in Nigeria


FEDERAL MINISTRY OF EDUCATION
Office of the Permanent Secretary
1st Floor, Federal Secretariat Complex, Phase 3, Shehu Shagari Way, PMB 146, Garki Abuja
Tel: +234 (0) 9 6282 803, Fax: 09 6280354, Email: pse@fme.gov.ng, website: www.education.gov.ng

CIRCULAR


FME/PSE/HE/1041/C.1/Vol. I/138 **8th May, 2020**

Executive Secretary (NUC)
Executive Secretary (NBTE)
Executive Secretary (NCCE)
Director (BSE)

RE: MANAGEMENT OF CORONA VIRUS PANDEMIC

Further to our earlier Circular with Ref. No. FME/PSE/HE/1041/C.1/Vol. I/137 of 19th March, 2020, this is to confirm that all schools shall remain closed as we closely monitor developments on the containment of COVID-19.

2. This is without prejudice to officers on essential services and other operational exigencies as may be determined by the Chief Executive of each organization.
3. All Chief Executives and other stakeholders are to ignore "fake news" on the subject matter in the social media as the situation is under constant review and any decision on resumption shall be conveyed through the appropriate channels.
4. Please notify all institutions under your supervision for strict compliance.


Sonny S. T. Echono
Permanent Secretary