Faculty of Information and Communication Technology

TECHNOLOGY ADOPTION MODEL ON CLOUD COMPUTING E-LEARNING FOR HIGHER EDUCATION

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Doctor of Philosophy

2022

TECHNOLOGY ADOPTION MODEL ON CLOUD COMPUTING E-LEARNING FOR HIGHER EDUCATION

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A thesis submitted
in fulfillment of the requirements for the degree of Doctor of Philosophy

Faculty of Information and Communication Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

DECLARATION

I declare that this thesis entitled “Technology Adoption Model On Cloud Computing E-Learning For Higher Education” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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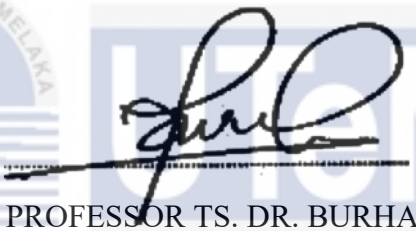
APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Doctor of Philosophy.

Signature : 

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DEDICATION

I dedicate my dissertation work to Allah, my Creator, and my Master, Mohammed (May Allah bless and grant him), who taught us the meaning of life, as well as Universiti Teknikal Malaysia Melaka, my second lovely home. Iraq, my family, and my friends are all important to me. I owe a great debt of appreciation to my father, mother, sisters, brothers, and wife, who have always encouraged me and pushed me to develop myself in all of my endeavors, as well as my precious children, Mustafa and Lujain, whom I can't stop loving who has always been there for me to help me get through difficult periods in my life.

ABSTRACT

The advancements of information technology infrastructure along with the extremely high demands and expectations of learning solutions today have directed the e-learning community towards the centralization of learning resources. Thus, delivering the e-learning content to students who have different backgrounds, interests, and locations allows service providers to host their proprietary learning resources over a unified network. Cloud computing with its powerful and sophisticated capabilities and features is highly a potential solution to act in such a learning scenario. However, the technological, environmental and organizational factors may affect the process of maintaining secured and effective software applications that are necessary to manage learning resources for any learning providers in integrity and secure environment. In addition, those factors are dynamic and in such a way due to the limited number of studies that are concerned with critical factors that impact the adoption of e-learning and learning management solutions in Iraq's universities. Therefore, the main objective of this research is to propose a mode that examines how technological, environmental and organizational factors influence several aspects of cloud computing e-learning utilization and adoption in higher education institutions in Iraq. A quantitative research method was adopted, meanwhile, a questionnaire was gathered from 262 information technology staff and managers who were randomly selected from different academic institutions in Iraq. Two analyzing tools, i.e. Statistical Package for the Social Sciences and Partial Least Squares were utilized to study the impact of the adopted factors. The finding of this research shows that the technological, organisational, environmental, and usability factors play a major role in cloud e-learning adoption in Iraq. The results of the analysis revealed a set of factors which are cost saving, compatibility, complexity, privacy and security, integrity, relative advantage, quality system and service, top management support, technology readiness, competitor pressure, regulation and reputation, trading partner pressure, trust, ease of use and perceived usefulness were recognized to have a significant impact on adoption cloud-based e-learning solutions in higher education institutions in Iraq. These reveal crucial implications and are of much value to researchers and e-learning professionals in Iraq. In addition, the new model developed in this study was validated to be more effective for the adoption of cloud computing based on e-learning in Iraqi higher education organizations.

MODEL PENGGUNAAN TEKNOLOGI PADA E-PEMBELAJARAN PENGKOMPUTERAN AWAN UNTUK PENGAJIAN TINGGI

ABSTRAK

Perkembangan infrastruktur teknologi maklumat bersama permintaan dan keperluan penyelesaian pembelajaran yang sangat tinggi sekarang telah memandu komuniti e-pembelajaran ke arah pemusatan sumber pembelajaran. Oleh itu, penyampaian isi e-pembelajaran kepada para pelajar yang mempunyai latar belakang, minat, dan lokasi yang berbeza membolehkan penyedia perkhidmatan menjadi tuan rumah sumber pembelajaran proprietari mereka melalui rangkaian yang disatukan. Pengkomputeran awan dengan kemampuan dan ciri canggih berkeupayaan menyediakan penyelesaian yang berpotensi untuk bertindak di dalam senario pembelajaran seperti itu. Walau bagaimanapun, terdapat beberapa faktor yang mempengaruhi proses mengekalkan aplikasi perisian yang selamat dan berkesan yang diperlukan untuk menguruskan sumber pembelajaran bagi mana-mana penyedia pembelajaran di dalam persekitaran berintegriti dan selamat. Faktor-faktor yang secara langsung mempengaruhi penggunaan penyelesaian e-pembelajaran berasaskan awan adalah dinamik dan berubah-ubah di mana sebilangan besar kajian adalah berkaitan dengan faktor-faktor kritikal yang mempengaruhi penerapan penyelesaian pengurusan e-pembelajaran dan pembelajaran di universiti-universiti Iraq. Oleh itu, objektif utama kajian yang dicadangkan ini adalah untuk mengusulkan model konseptual dan mengenal pasti faktor-faktor kritikal, yang dapat mempengaruhi pelaksanaan penyelesaian e-pembelajaran berasaskan awan di institusi pendidikan tinggi di Iraq. Kemudian, pengesahan model berasaskan awan e-pembelajaran dicadangkan. Untuk mencapai objektif ini, kajiselidik kendiri telah dijalankan terhadap 262 kakitangan teknologi maklumat dan pengurusan yang dipilih dari institusi akademik yang berbeza di Iraq. Dua alat analisis, iaitu Pakej Statistik untuk Ilmu Sosial dan Kuadrat Sedikit digunakan untuk mengkaji kesan faktor-faktor yang diadaptasi. Empat dimensi dipertimbangkan untuk mencapai objektif kajian termasuk dimensi teknologi, organisasi, persekitaran, dan kegunaan. Hasil daripada analisis menunjukkan beberapa faktor iaitu penjimatan biaya, keserasian, kerumitan, privasi dan keamanan, integriti, kelebihan relatif, sistem dan layanan berkualiti, sokongan pengurusan tertinggi, kesediaan teknologi, tekanan pesaing, peraturan dan reputasi, tekanan rakan dagang, kepercayaan dan kemudahan penggunaan, kegunaan adalah dikenalpasti mempunyai pengaruh yang signifikan terhadap penerapan penyelesaian e-pembelajaran berasaskan awan di institusi pendidikan tinggi di Iraq. Ini mendedahkan implikasi penting yang sangat bernilai bagi penyelidik dan profesional e-pembelajaran di Iraq. Sebagai tambahan, model baru yang dikembangkan di dalam kajian ini disahkan menjadi lebih berkesan untuk penggunaan komputasi awan berdasarkan e-pembelajaran di organisasi pendidikan tinggi Iraq.

ACKNOWLEDGEMENTS

Praise be to Allah, whose gracious help it was possible to accomplish my study.

I would like to express my sincere thankful to my supervisors, Professor Ts. Dr. Burhanuddin Mohd. Aboobaider and Professor Dr. Mohd. Khanapi Abd. Ghani for their guidance, encouragement, and support.

Also, I wish to express my gratefulness to Professor Ts. Dr. Rabiah binti Ahmad, Dean of the Faculty of Information and Communication Technology, for her official and personal support and encouragement. May Allah bless their sincere efforts in the service of science and Islam.

Also thanks to Dean of Centre for Graduate Studies in UTeM for their help and support to complete this study. The members of the discussion committee for accepting to discuss this study.

TABLE OF CONTENTS

		PAGE
DECLARATION		
DEDICATION		
ABSTRACT		**i**
ABSTRAK		**ii**
ACKNOWLEDGEMENTS		**iii**
TABLE OF CONTENTS		**iv**
LIST OF TABLES		**ix**
LIST OF FIGURES		**xii**
LIST OF APPENDICES		**xiii**
LIST OF ABBREVIATIONS		**xiv**
LIST OF PUBLICATIONS		**xv**
CHAPTER		
1. INTRODUCTION		**1**
1.1	Introduction	1
1.2	Research background	2
1.3	Problem statement	3
1.4	Research question	6
1.5	Research objective	6
1.6	Purpose of the study	7
1.7	Significance of the study	9
1.8	Scope of the study	9
1.9	Thesis organization	10
2. LITERATURE REVIEW		**12**
2.1	Introduction	12
2.2	Background of research	14
2.3	Iraq higher education	15
2.4	E-learning background	18
2.4.1	E-learning advantages	20
2.5	Studies on e-learning system acceptance	23
2.6	Cloud computing	26
2.6.1	Cloud computing services models	30
	2.6.1.1 Software as a service (SaaS)	31
	2.6.1.2 Platform as a service (PaaS)	32
	2.6.1.3 Infrastructure as a service (IaaS)	33
2.6.2	Cloud deployment models	35
	2.6.2.1 Public cloud	36
	2.6.2.2 Private cloud	37
	2.6.2.3 Community cloud	39
	2.6.2.4 Hybrid cloud	39
2.7	Cloud e-learning	40
2.8	Cloud E-learning adoption worldwide	44

2.9 E-learning development based on leading universities 45
2.9.1 Eastern Michigan University 45
2.9.2 University of California 46
2.9.3 University of Westminster 46
2.9.4 Kentuckys Pike County Schools 47
2.9.5 Florida Atlantic University Florida 48
2.10 Theoretical bases 48
2.10.1 Technology Acceptance Model (TAM) 49
2.10.2 Technology-Organization-Environment (TOE) framework 49
2.10.2.1 Technological context 50
2.10.2.2 Organizational context 51
2.10.2.3 Environmental context 52
2.10.3 Summary of analysis theoretical framework 53
2.11 Factors affecting of adoption of cloud computing for E-learning in Iraq 55
2.11.1 Technological factors 56
2.11.1.1 Relative advantage 57
2.11.1.2 Compatibility 58
2.11.1.3 Complexity 60
2.11.1.4 Cost saving 61
2.11.1.5 Security and privacy 63
2.11.1.6 Integrity 67
2.11.2 Organizational factors 69
2.11.2.1 Technology readiness 69
2.11.2.2 Top management support 71
2.11.2.3 Quality system and services 73
2.11.3 Environmental factors 74
2.11.3.1 Competitive pressure 74
2.11.3.2 Regulation and reputation 75
2.11.3.3 Trust for e-learning based on cloud computing 76
2.11.3.4 Trading partner pressure 77
2.11.4 Usability factors 79
2.11.4.1 Perceived ease of use 79
2.11.4.2 Perceived usefulness 81
2.12 Related work procedure for selecting 83
2.13 Related work 84
2.14 Summary 92

3. RESEARCH METHODOLOGY 94
3.1 Research methodology 94
3.1.1 The preliminary data gathering 96
3.1.2 The delineation of problems 97
3.1.3 Preliminary semi-structured interview 98
3.1.3.1 Interview objective 99
3.1.3.2 Preparing and conducting interviews 100
3.1.3.3 Analyzing interview results 102
3.1.3.4 Coding 102
3.1.3.5 Theme and construct 105
3.1.4 Formulation of theory and the conceptual model 106

3.1.5 Hypothesizing 107
3.1.6 Research design 110
3.1.7 Identifying data collection method 112
3.1.8 Questionnaire survey 116
3.1.9 Research instrument 117
3.1.10 Validity of the questionnaire 120
3.1.11 Pilot study and questions improvised for an actual study 121
3.2 Data collection 129
3.3 Data analysis 130
3.4 Interview on qualitative end validation 132
3.5 Summary 135

4. RESULT AND DISCUSSION 137
4.1 Introduction 137
4.2 The importance of factors and dimensions for adoption of e-learning based on cloud computing 138
4.2.1 The importance of factors affecting of adoption e-learning based on cloud computing for the technological dimension 138
4.2.2 The importance of factors (Organizational Dimension) affecting of adoption E-learning based on cloud computing 141
4.2.3 The importance of factors (environmental dimension) affecting of adoption e-learning based on cloud computing 143
4.2.4 The importance of factors affecting of adoption e-learning based on cloud computing for usability dimension 145
4.3 Demographic characteristics 146
4.4 Research model analysis 147
4.4.1 Assessment of measurement model 147
4.4.1.1 Composite reliability (CR) and internal consistency (IC) 148
4.4.1.2 Indicator reliability 149
4.4.1.3 Convergent validity 152
4.4.1.4 Discriminant validity 153
4.4.2 Assessment of structural model 156
4.4.3 Multicollinearity 157
4.5 Path coefficient 159
4.5.1 Ha: Technological dimension has a positive effect on usability in e-learning based on cloud computing 162
4.5.1.1 Ha.1: Relative advantage has a positive effect on perceived ease of use in e-learning based on cloud computing 162
4.5.1.2 Ha.2: Relative advantage has a positive effect on perceived usefulness in E-learning based on cloud computing 162
4.5.1.3 Ha.3: Compatibility has a positive effect on perceived ease of use in e-learning based on cloud computing 163
4.5.1.4 Ha.4: Compatibility has a positive effect on perceived usefulness in E-learning based on cloud computing 163

4.5.1.5 Ha.5: Complexity has a positive effect on perceived ease of use in E-learning based on cloud computing 164
4.5.1.6 Ha.6: Complexity has a positive effect on perceived usefulness in E-learning based on cloud computing 164
4.5.1.7 Ha.7: Cost saving has a positive effect on in perceived ease of use in E-learning based on cloud computing 164
4.5.1.8 Ha.8: Cost saving has a positive effect on perceived usefulness in E-learning based on cloud computing 165
4.5.1.9 Ha.9: Security and privacy have a positive effect on perceived ease of use in E-learning based on cloud computing 165
4.5.1.10 Ha.10: Security and privacy have a positive effect on perceived usefulness in E-learning based on cloud computing 166
4.5.1.11 Ha.11: Integrity has a positive effect on perceived ease of use in E-learning based on cloud computing 166
4.5.1.12 Ha.12: Integrity has a positive effect on perceived usefulness in E-learning based on cloud computing 166
4.5.2 Hb: Organizational dimension has a positive effect on Usability in E-learning based on cloud computing 167
4.5.2.1 Hb.1: Technology readiness has a positive effect on perceived ease of use in e-learning based on cloud computing 167
4.5.2.2 Hb.2: Technology readiness has a positive effect on perceived usefulness in E-learning based on cloud computing 167
4.5.2.3 Hb.3: Top management support has a positive effect on perceived ease of use in E-learning based on cloud computing 168
4.5.2.4 Hb.4: Top management support has a positive effect on perceived usefulness in E-learning based on cloud computing 168
4.5.2.5 Hb.5: Quality system and services have a positive effect on perceived ease of use in E-learning based on cloud computing 169
4.5.2.6 Hb.6: Quality system and services have a positive effect on perceived usefulness in E-learning based on cloud computing 169
4.5.3 Hc: Usability dimension has a positive effect on adoption model in E-learning based on cloud computing 169
4.5.3.1 Hc2: Perceived ease of use has a positive effect on the adoption model in E-learning based on cloud computing. 170
4.5.3.2 Hc2: Perceived usefulness has a positive effect on adoption model in E-learning 170
4.5.4 Hd: Environment dimension has a positive effect on adoption model in E-learning based on cloud computing 170

4.5.4.1 Hd.1: Competitive pressure has a positive effect on adoption model in E-learning based on cloud computing 170
4.5.4.2 Hd.2: Regulation and reputation have a positive effect on adoption model in E-learning based on cloud computing 171
4.5.4.3 Hd.3: Trust has a positive effect on adoption model in E-learning based on cloud computing 171
4.5.4.4 Hd.4: Trading partner pressure has a positive effect on adoption model in E-learning based on cloud computing 172
4.6 Summary 174

5. CONCLUSION AND RECOMMENDATIONS 175
5.1 Introduction 175
5.2 Discussion of findings 175
5.3 Final model 180
5.4 Contribution of the study 191
5.4.1 Body of knowledge of e-learning contribution 191
5.4.2 Practical contribution 192
5.5 Recommendations 192
5.6 Future work 194
5.7 Limitations of study 195

REFERENCES 197
APPENDICES 236

LIST OF TABLES

TABLE	TITLE	PAGE
1.1	Types of content and cloud computing of services (Buyya et al., 2009)	3
2.1	Relationship between cloud service models and resource assignment	35
2.2	Summary of related work for illustrating TOE and TAM	55
2.3	Relative advantage items (RA)	58
2.4	Compatibility items (Comp)	59
2.5	Complexity items (Compx)	61
2.6	Cost saving items (Cosa)	63
2.7	Security and privacy items (Secpri)	66
2.8	Integrity items (Int)	68
2.9	Technology readiness items (Tech)	70
2.10	Top management support items (Top)	72
2.11	Quality system and service items (Qual)	74
2.12	Competitive pressure items (Compp)	75
2.13	Regulation and reputation items (Regrep)	76
2.14	Trust items (Tru)	77
2.15	Trading partner pressure items (Trad)	78
2.16	Perceived ease of use items (Eaus)	81
2.17	Perceived usefulness items (Usef)	82

2.18	Studies and the proposed factors which affect the adoption of e-learning based on cloud computing	91
3.1	Themes and constructs of the interview	105
3.2	Sample size by population size (Krejcie and Morgan, 1970; Sekaran, 2010)	114
3.3	The constructs of the questionnaire	119
3.4	Reliability tests	123
3.5	Correlation between items and technological dimension for e-learning based on cloud computing	125
3.6	Correlation between items and organizational dimension for e-learning based on cloud computing	127
3.7	Correlation between items and environmental dimension for e-learning based on cloud computing	128
3.8	Correlation between items and usability dimension for e-learning based on cloud computing	129
3.9	Key factors which drive the e-learning program for Iraqi universities	134
4.1	Mean score for each factor and technological dimension	139
4.2	Mean score and std. deviation for each factor and organizational dimension	142
4.3	Mean score and std. deviation for each factor and environmental dimension	144
4.4	Mean score for each factor and technology acceptance model dimension	145
4.5	Exemplifies a demographic-based sample distribution	147
4.6	Internal consistency measures	148

4.7	Indicator outer loadings	150
4.8	Average variance extracted (AVE) values	153
4.9	Fornell-Larcker criterion	154
4.10	Cross loadings	154
4.11	VIF values	158
4.12	List of hypotheses and relative paths	160
5.1	Connection between research gap, research question, hypotheses and the result	177

LIST OF FIGURES

FIGURE	TITLE	PAGE
2.1	Higher education sector in Iraq (Radif, 2018)	16
2.2	Higher education map of Iraq (Elameer et al., 2011)	17
2.3	Cloud computing service models (ISACA, 2011)	31
2.4	Cloud computing deployment models (Diaby and Rad, 2017)	36
2.5	The Technology Acceptance Model (Davis, 1989)	49
2.6	Technology-Organization-Environment (TOE) Framework (Tornatzky and Fletscher, 1990)	50
2.7	PRISMA flow diagram showing articles selection process	84
3.1	Research methodology	96
3.2	Cloud-based e-learning technology adoption model (C-beTAM)	110
3.3	Sampling techniques modifed by Sekaran and Roger Bougie (2016)	116
4.1	A path model	173

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Main Questionnaire	236
B	Interview	243
C	Opinions of 11 Experts on Key Factors Which Drive The E-Learning Program For Iraqi Universities	245
D	Table of Validity of the Questionnaire	246

LIST OF ABBREVIATIONS

CBT	-	Computer-Based Training
CC	-	Cloud Computing
CoC	-	Community Cloud
CSP	-	Cloud Service Provider
DDoS	-	Distributed Denial of Service
HC	-	Hybrid Cloud
HE	-	Higher Education
IaaS	-	Infrastructure as a Service
ICT	-	Information and Communication Technology
IS	-	Information System
IT	-	Information Technology
MHE	-	Ministry of Higher Education
MOHESR	-	Ministry of Higher Education and Scientific Research
NIST	-	National Institute of Standard and Technology
PaaS	-	Platform as a Service
PC	-	Private Cloud
PEOU	-	Perceived Ease of Use
PU	-	Perceived Usefulness
PuC	-	Public Cloud
QoS	-	Quality of Service
SaaS	-	Software as a Service
SMS	-	Short Message Service
SOA	-	Service Oriented Architecture
TOE	-	Technology Organization Environment
TRA	-	Theory of Reasoned Action
TTP	-	Trusted Third Party
URLs	-	universal resource locators
VPN	-	Virtual Private Network
WBT	-	Web-Based Training
WWW	-	World Wide Web

LIST OF PUBLICATIONS

1. Abdulsaeed, A. A., Aboobaider, B. M., Ismaelb, M., Abd, M. K. G., Elzamly, A. and Doheir, M., 2019. Adoption of Cloud Based Solutions for E-Learning Technologies and their Relative Perspectives for Higher Education. *Revista Aus*, 26 (10), pp. 105-114

2. Abdulsaeed, A. A. and Aboobaider, B. M., 2017. Development Cloud Computing System for Managing Risks in an E-Learning Environment, *Journal of Engineering and Applied Sciences*, 12 (5), pp. 7000–7003.

3. Abdulsaeed, A. A. and Aboobaider, B. M., A New Conceptual Model for E-learning System Based on Cloud Computing Environments in Iraqi Higher Education Organizations, *Journal of Advanced Research in Dynamical and Control Systems (JARDCS)*. (Accepted)

CHAPTER 1

INTRODUCTION

1.1 Introduction

Cloud computing is the "new dawn" for higher education institutions. Cloud computing offers access to new computing paradigms for students, researchers, educators and administrative staff from institutions and universities, infrastructure, platforms, and software services are all examples of IaaS, PaaS, and SaaS (SaaS) (Sultan, 2010). Cloud computing virtualizes resources, such as software applications and laboratories, allowing them to be delivered over internet-available classroom workstations and student computers (Vouk, 2008). Cloud computing has, therefore, become a significant facilitator for distance and online education programs, e-learning environments and mobile application learning (Behrend et al., 2011). Institutions execute one of three distinct cloud computing designs. First, schools developed their cloud infrastructure or private cloud settings (Doelitzscher et al., 2011).

Second, universities created consortia with other organizations to build prototypes or community clouds or hybrid cloud and governments are investing in the shared cloud infrastructure of universities. Third, universities purchase cloud computing services from third parties or government, suggest research models explore variables that determine the acceptance of cloud computing by schools, universities and show the significance of cloud computing in higher education organizations (Deng et al., 2015). However, they have also given sufficient research to develop a test to determine the variables connected with

universities and schools adopting cloud computing. The chapter includes distinct parts on the context of the study, the declaration of the issue, the objective of the study, the theoretical context, research issues, and research objectives, procedure and performance chart. Cloud computing (CC) is considered the next generation of computing (Qasem et al., 2019). It is now the primary paradigm for the delivery of resources and services. CC's flexibility, cooperation, cost-effectiveness, and scalability make it a popular choice for both corporate and governmental enterprises. Users and organizations, such as higher education institutions, find these characteristics indispensable (HEIs) (Qasem et al., 2019). The following parts of this chapter include the nature and importance of the scope of research and research.

1.2 Research background

E-Learning is a term that refers to virtualized remote learning using electronic communication channels, most notably the Internet. They are based on the utilization of a variety of ways to assist the teaching-learning process (such as, e-mail, Web sites, forums, learning platforms, and so on). Because it can be dynamically adapted by providing a scalable system for changing needs over time. E-learning is one of the most popular techniques discovered to promote traditional instruction by software applications and a virtual learning environment. According to Ercan (2010), e-learning involves various kinds of media that supply text, audio, images, animation, video streaming. It involves technology apps and processes such as sound, video, satellite TV, and computer-based learning, as well as local intranet or extranet, and web-based learning. Furthermore, cloud computing systems, whether stand-alone, depending on networked learning on either local networks or the Internet, underlie many e-learning systems., the Cloud Computing environment emerges as a natural platform for providing support to e-Learning systems and also for the

implementation of data mining techniques that allow exploring the enormous databases generated from the former process to extract the inherent knowledge. Cloud computing systems is one of the most common buzzwords used in the IT globe. The word CC is obtained from the manner network diagrams often imply the Internet. Based on the distinct virtual concentrations, cloud computing is typically split into three kinds depending on computer assets packaging into separate abstraction layers, that is infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). According to CBE-L services, as outlined in Table 1.1 can be split into four kinds.

Table 1.1: Types of content and cloud computing of services (Buyya et al., 2009)

	Content	**Cloud**
1.	Data, audio, video, pictures, and text are all common types of information.	*IaaS*
2.	Data can be turned into standard data content.	*SaaS*
3.	Player embedded in web pages that accesses private data through the internet. Web-based.	*SaaS*
4.	The player must download private data on their own.	*PaaS*

1.3 Problem statement

E-learning is learning to use electronic technologies to access the instructional curriculum in and out of a traditional school, which promotes education through communications networks, which has rendered it feasible to use the Internet from anywhere at any time. E-learning is a recognized educational approach that offers a flexible model of access to knowledge, enabling education and training numerically bigger audience than what is traditional education models can successfully support. As the years go by, systems of learning are continually adjusted and adapted to meet the trends and the necessities of the

times. “The success of Web 2.0 prompted e-learning to grow into e-learning 2.0, which uses the collective intelligence to attain education-centric user E-learning is a recognized educational approach that offers a flexible model of access to knowledge, enabling education and training numerically bigger audience than what is traditional education models can successfully support. As the years go by, systems of learning are continually adjusted and adapted to meet the trends and the necessities of the times. “The success of Web 2.0 prompted e-learning to grow into e-learning 2.0, which uses the collective intelligence to attain education-centric user. The developed countries and most advanced developing countries have produced important advances towards the inclusion of higher education for e-learning platforms (Tarus et al., 2015). Yet, in most education systems in the Middle East, there is a definite gap in e-learning implementation. Therefore, most of the e-learning studies were conducted in developed and advanced developing countries and resulted from a large body of knowledge. However, in many developing countries, such as the development of the educational system through technology use still forms a big challenge. For example, in Iraq, the United Nations Educational, Scientific and Cultural Organization (UNESCO) noted that the education system suffers severe shortcomings in many fields of learning and teaching. The reason is that inadequate technical support is considered the main obstacle for the application of e-learning in Iraqi universities (Al-Shboul, 2013). The Iraqi higher education industry could not explore e-learning willingness due to the absence of ICT, network infrastructure and communications (Elameer et al., 2011). The current issue is as follows:

i. Old exercise between learners and lecturers is the primary problem that has hindered the effective implementation of e-learning owing to traditional leadership techniques, especially in Iraqi universities (Al-Azawei et al., 2016).