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A Quantitative Study of the Factors Affect Cloud Computing Adoption in Higher Education Institutions: A Case Study of Somali Higher Education Institutions

Dr. Mohamed Adam Isak, Assistant Professor
engmaisak@gmail.com

Prof. Dr. Elsamani Abd Elmutalib Ahmed, Professor
profsamani@gmail.com

Dr. Bushra Mohamed Elamin, Assistant Professor
Bushra_Moh@hotmail.com

ABSTRACT : *This research proposes an empirical model for cloud computing adoption by the higher education institutions. Successful migration to cloud computing by higher education institutions (HEIs) depends on well definition for transition strategies which requires deeply understanding the factors affect cloud adoption by the HEIs. This research will provide a framework that shows the factors that influent the Somali HEIs to adopt cloud computing paradigm, and the researchers aimed to develop an implementation strategy that will enable the HEIs in Somalia to adopt easily and effectively to the cloud computing. So, the researchers employed a case study strategy which is appropriate for investigating a contemporary research phenomenon; Somali higher education institutions are the case study applied in this research. This research adopts quantitative research approaches. Nonetheless, a survey is used to provide an exploratory snapshot of the cloud computing adoption by the Somali higher education institutions (HEIs). Questionnaires were conducted to identify whether the HEIs in Somalia interest to adopt cloud computing and the questionnaires were conducted to reveal the level of understanding cloud computing and the factors that effect to adopt cloud computing. The analysis of the collected d through the questionnaire was undertaken using descriptive statistics as well as frequency analysis using SPSS V20.0 which is useful for the analysis of quantitative data means it is used for survey authoring, data mining, and statistical analysis.*

KEYWORDS – Cloud computing adoption model, Adoption of cloud computing by higher education institutions, Quantitative study of cloud adoption.

INTRODUCTION

Somalia as a developing nation is suffering limitation of educational budgets. Emerging information technology will be the key enabler for the rapid development of the private sector. So, cloud computing which is Internet-based computing is the new technology which optimizes the IT services with less cost and time, the computing tasks are assigned to a combination of remote connections, software and services will be demand. Somali higher education institutions have not fully benefitted from the technology revolution because of the expensive upfront costs of buying hardware and software, and managing it on premise. But more importantly, the lack of an IT skilled workforce prevented the development of supporting ecosystems of service providers, similar to those available in the industrialized world.

There is a growing recognition of the importance of Higher Education Institutions (HEIs) in social and economic development, as their performance is of interest to all countries. HEIs can benefit from

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using Cloud Computing by increasing the computing performance, storage capacity, universal accessibility and cost reduction. This can help most of the institutions in terms of cost reduction in the IT investment of both hardware and software as well as computer services. Moreover, (Ashrafi & Murtarza, 2010) (Isak M. A., 2018)confirm that governments around the world are adopting ICT in general, and they started nearly adopting with cloud computing to enable them to provide better services to their citizens. Thus, (Isak M. A., 2013) state that cloud computing plays an important role in national development. The researches about cloud computing are endless, there is need for continuous research in the area, for the sake of understanding the main factors that drive the adoption of cloud computing with in the HEIs context as an example. The purpose of this study is to propose an enhanced model for Somali HEIs to adopt cloud computing solutions and this model will be based on previous models were derived from studies conducted in some of the developed countries those emanated with cloud computing early or from some of the developing countries those are stepping into cloud computing word slowly.

RELATED WORK

Cloud Computing

In Cloud Computing, the word “cloud” is used as a metaphor for "the Internet," so the phrase cloud computing means "a type of Internet-based computing," where different services such as Servers, storage and applications are delivered to an organization's computers and devices through the Internet. (Vangie Beal). A common definition of cloud computing is the European Network and Information Security Agency (ENISA) definition which says: “Cloud computing is an on-demand service model for IT provision often based on virtualization and distributed computing technologies”. (Isak M. A., 2018) defined cloud computing as: “Cloud computing is the delivery of computing as a service on demand, whereby shared resources, software, and information are provided to computers and other devices as a metered service over the Internet”.

SOMALIA AND ICT DEVELOPMENT

Somali Federal government pays good attention to the developing of the ICT infrastructure of the country through working as partners with international organizations. Minister of posts and telecommunication Mr. Guuled Hussein Kasim addressed in ICT development meeting that the ministry supervises and facilitates building ICT infrastructures in the interim capital cities of the federal states, to disseminate the internet coverage and facilitate the communications. This program is part of the new deal that will be invested by the ICT Sector Unit of the World Bank Group. The project development objective is to contribute towards the process of developing a regulatory framework for the telecommunications sector and building an ICT infrastructure in Somalia. The budget of this program is in its first phase 15 million U.S dollar. The program will achieve two main goals: First, the program will help setting teleconference center for the different capital cities of the regional states of the country. Second, the program will provide a high speed internet for 14 higher education institutions in the country and this program shows the chances that the HEIs will have to adapt cloud computing whenever this ICT infrastructure settled up. (Kasim, 2016)

The minister of education and higher education in Somalia Dr. Abdulkadir abdi Hashi addressed Somalia will have as soon as possible the higher education commission which will help the ministry to develop the HE laws and ethics; the ministry organized conferences participated by the different

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HEIs in the country, all of these efforts will help the HEIs to enhance the education ranking of the country and this will assist the HEIs to take step forward towards delivering a qualified education through using the latest technology solutions available (Hashi, 2016).Despite the lack of a central government and an economy in ruins, and to the surprise of its closest neighbors, Somalia's telecommunication sector boasts cutting-edge technologies and a mushrooming of wireless solutions. For several years, the country was, to all intents and purposes, disconnected from the rest of the world, but it has the lowest calling rates in the region. Prior to 1991, the country had only 8,500 operational fixed lines, most of which were in the capital, Mogadishu. After the war, infrastructure had to be built from scratch, but the situation has developed quickly off a low base. The only data available according to the development of ICT infrastructure in Somalia is written by the world fact book and the data is issued in 2007; Table 1 The ICT situation of Somalia in 2005 shows the ICT situation of the country in 2005 as shown in World Fact book (2007) and Table 2 The ICT Situation of Somalia in 2014 shows the ICT situation of the country in 2014 (at that time, the world fact book was forecasting) and the difference is very clear.

Table 1 The ICT situation of Somalia in 2005 (Somalia: The World Factbook, 2007)

Indicator	**Statistics**	**Published year**
Telephone fixed lines	100000	2005
Mobile phone subscribers	500000	2005
Internet users	90000	2005
Television stations	4	2001
Internet hosts	3	2006
Radio hosts	11FM, 1shortwave	2001

Table 2 The ICT Situation of Somalia in 2014 (Somalia: The World Factbook, 2007)

Indicator	**Statistics**	**Published year**
Telephone fixed lines	57,200	2014
Mobile phone subscribers	5.5 million	2014
Internet users	157,500	2014
Television stations	4 (2 in Mogadishu and 2 in Hargeisa) (2001)	2001
Internet hosts	186 (2012)	2012
Radio hosts	AM 0, FM 11 (also 1 station each in Puntland and Somaliland), shortwave 1 (in Mogadishu) (2001)	2001

From the two above tables, the telecommunication sector in general and ICT industry particularly is rapidly advancing in Somalia yet it is believed that cloud computing adoption is not growing at the

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same speed. The Economic Commission for Africa (2005) indicated that many countries in Sub-Saharan Africa (SSA) are still cloud computing technology backward including Somalia. Despite the increased uptake of cloud computing in the developed countries, Somalia as well as most of the developing countries continues to lag behind in their adoption of cloud computing, hence there is need to pull Somalia out of this divide thereby helping to increase the uptake of cloud computing adoption in Sub-Saharan Africa.

Despite the fact that higher education institutions are spread along the country but Mogadishu remains the highest ranked cities have higher education institutions in the country and it contributes the highest number of university graduates according to all Somali territories. Mogadishu is also considered to be the commercial nerve center in Somalia given its strategic location, peculiar demographics and contribution to the national GDP. Most of the HEIs are located in Mogadishu, thus the city epitomizes the higher education institution characteristics of Somalia. Based on the reasons identified above, focusing on HEIs in Mogadishu was considered more useful for this study.

CLOUD COMPUTING ADOPTION MODELS

This study is based on combination of the two most relevant models: Technology-Organization-Environment framework (TOE) and Diffusion of Innovation (DOI).

Diffusion of Innovation (DOI) theory

Diffusion of Innovation (DOI) theory is classical theory of adoption suggested by (Rogers , 1995), it has provided basic concepts, terminology and scope of the field in innovation adoption.

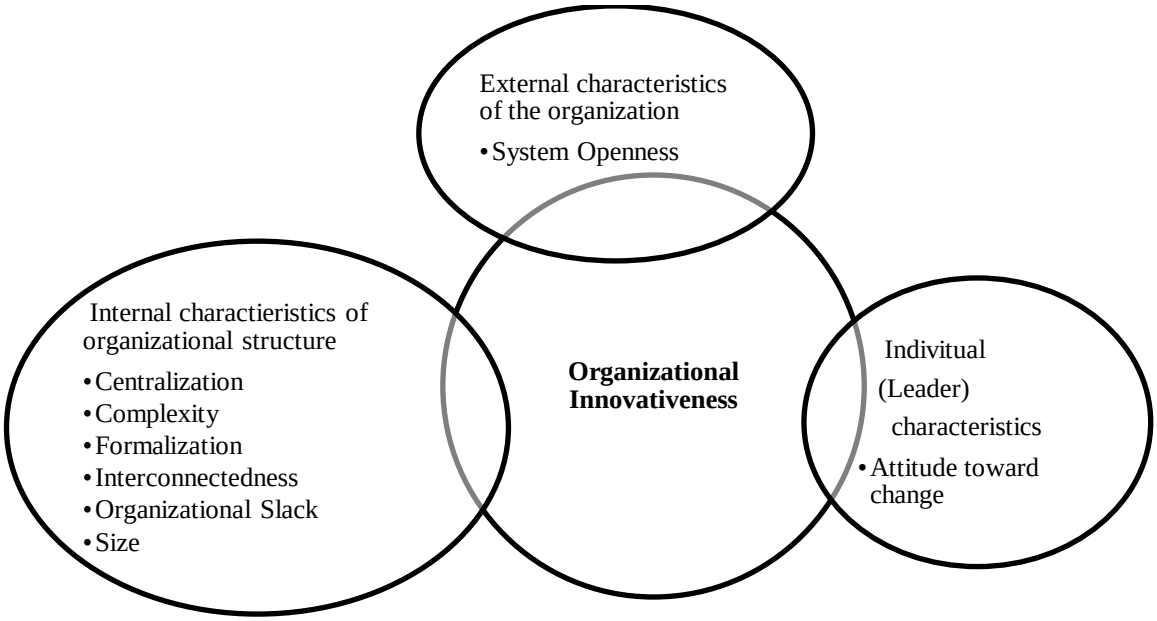

Figure 1 Diffusion of Innovations
Source: (Rogers , 1995)

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Technology-Organization-Environment framework (TOE)

Tornatzky & Fleischer proposed a model for analyzing IT adoption and implementation by organizations as so called TOE (Technology, Organization, and Environment) framework (Tornatzky & Fleischer, 1990).

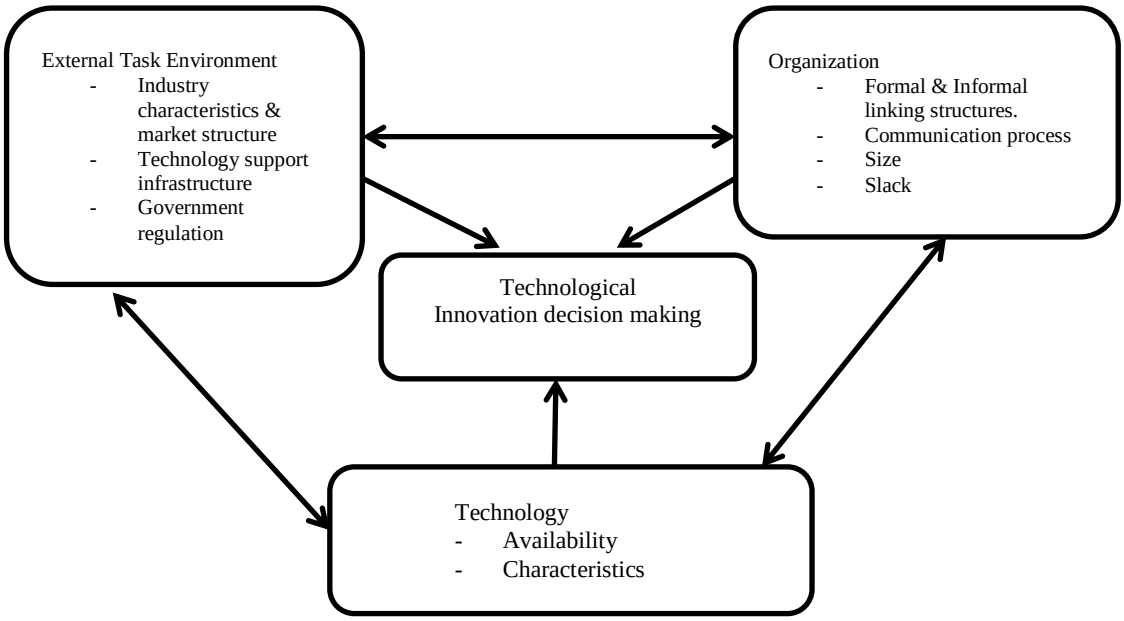

Figure 2 TOE Framework

Source: (Tornatzky & Fleischer, 1990).

There are little academic studies have investigated the adoption of cloud in educational institutions whether in developing or developed countries. In addition to that, there is lack of any research discussed cloud computing adoption in Somali context at all. This research will develop an empirical cloud computing adoption model by the Somali Higher education institutions framework, that framework is based on the most used adoption theories DOI and TOE.

PROPOSED MODEL

The proposed framework of cloud computing adoption by Somali Higher education institutions is based on TOE; this theory is a much more relevant adoption theory though it can classify all determinants of cloud computing adoption according to the technological, organizational and environmental contexts. When discussing cloud computing adoption framework by the HEIs, it must be analyzed the technology of cloud computing, then, the organization which is in this case the higher education institutions in Somalia, then, the environment which is in this case the cloud providers and other stakeholders. So, TOE framework can be useful analytical tool for explaining the adoption of cloud computing innovation by higher education institutions in Somalia.

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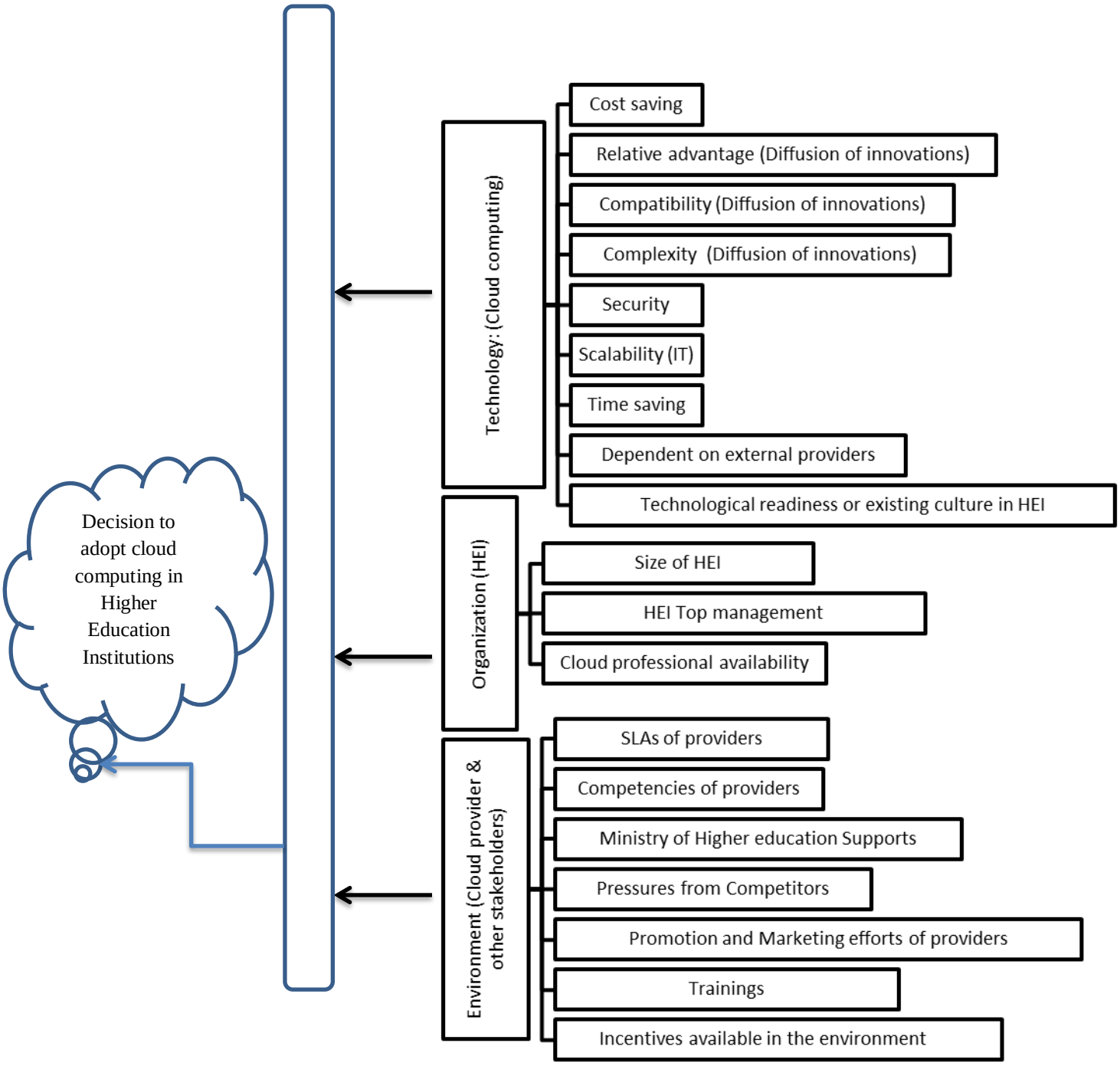

Figure 3 Proposed framework in cloud computing adoption in Somali Higher education institutions

There are two related researches; one was literature review paper (Isak, Ahmed, & Elamin, Identifying the factors of cloud computing adoption in higher education institutions – a case study of Somali higher education institutions, 2018) and other was qualitative study paper (Isak & Elamin, A qualitative study of the factors affect cloud computing adoption in higher education

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institutions – a case study of Somali higher education institutions, 2018), the results of those two researches have been shown in Table 3.

The qualitative study has been done through an interview which is conducted with a purposive sample of the research population which consists of staff with academic & administrative positions those have relations in Computer Science and Information Technology fields at five HEIs in Somalia. The qualitative data analysis package NVIVO was used for the initial stages of coding. **Error! Reference source not found.** shows the factors in the two stages that the study stepped on literature review stage and qualitative study stage. Each column of the table will describe the outcome of that stage whether it is omitting or assuring or adding new factors to the existing factors.

Table 3 Factors findings of the two stages

HYPOTHESIS	**Factors in Literature review stage**	**State of the factors in qualitative stage**
H1	Cost saving	Supported
H2	Relative advantage	Supported
H3	Compatibility	Supported
H4	Security	Supported
H5	Complexity	Rejected
H6	Scalability (IT)	Supported
H7	Time Saving	Rejected
H8	Dependent on external providers	Supported
H9	Technological readiness in HEI	Supported
H10	Availability of acceptable SLA	Supported
H11	Competencies of the Providers	Rejected
H12	Supports of Ministry of Higher education	Rejected
H13	Pressures of the available cloud provider competitors	Supported
H14	Promotion and Marketing	Supported
H15	Availability of Trainings	Supported
H16	Incentives available in the environment	Rejected
H17	Size of HEI	Supported
H18	HEI Top management	Supported
H19	Cloud professional availability	Rejected
H20	***	Speed of the available internet (New Factor revealed through this study)
H21	***	Availability of steady electrical supply (New Factor revealed through this study)

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QUANTITATIVE STUDY

Quantitative Method is a data collection approach usually deals with numerical and statistical data which can be measured in units or ranked in order. Data that are collected using this method are usually translated in terms of their range, average or percentage and can be presented using graphs. (Sayed Farid Mousavi Shoshtari, 2013)

A) Target population and sampling

The Somali public university sector was totally destroyed during the civil war and all equipment looted. Currently, the first statistics available published by the government declares that there are about twenty five (25) private higher education institutions operating in South-Central Somalia (Ministry of Human Development and Public Services, 2013)In contrast, there is a study done by The Heritage Institute for Policy Studies in 2013 which estimates the universities in Somalia (South-central-Somaliland and Puntland) more than 44 universities. Only one university existed in the country prior to the collapse of the state in 1991 (The Heritage Institute for Policy Studies. Somalia, 2013).

The official website of the Association of Somali universities lists 40 universities located in the South-Central Somalia those are members of the association (Members of Association of Somali Universities, 2016), 32 HEIs of those members are located in Mogadishu-The capital city of Somalia. Thus, about 15 HEIs located in Mogadishu which represents 46% of all HEIs in Mogadishu were selected as judgmental sample and the respondents were selected based on being well suited for the study and would give in-depth information and provide better and comprehensive information on cloud computing in the Somalia HEIs.

Consequently, this research is based on nonprobability sampling. It is also based on purposive sampling, which means that the best suitable respondents were chosen from different HEIs in order to receive the best responds though the cloud computing phenomenon is not a phenomenon that all the HEIs staff can be participated in such survey, so rather than only making statistical generalizations the researchers selected to discover new viewpoints through cloud computing adoption with in Somali HEIs. Accordingly, different persons including IT experts and ICT managers from different HEIs were selected for filling up the questionnaire. The criteria for selecting the respondents of the questionnaire were their position of authority due to formal position or expertise and knowledge in some specific area to this study. The criteria also were to select the HEIs were their status of maturity in the IT teaching field and their focusing of teaching IT, the capacity of the IT infrastructures owned by the HEI and their encouragement of IT researches.

The questionnaire is distributed to 150 members (10 members from each 15 HEIs) through the 15 surveyed HEIs those include the administration and the staff those have relations in computer and IT field at the higher education institutions. The supposed respondents may include (Deputy of vice chancellor, Dean and Vice Dean of faculty of computer science, Head of Computer Science

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department, head of IT department, ICT director, Assistant ICT director, Web administrator, Web developer, IT manager, IT Lecturer, Software Engineer and Network and Security administrator).

B) Questionnaire procedure

In order to gather the required information to address the Research Questions a questionnaire has been developed. The questionnaire was delivered to the selected management and IT members of the selected twenty-five Somali Higher education institutions as discussed already in target population and sampling section. The survey was gathered between October 2016 and November 2016. A number of criteria were set for the participants, which included:

- They had to have extensive experience of working in the management or IT related field.
- Senior management or IT experts in the HEI were targeted.
- Preference was given to IT managers in the HEIs.
- Teachers and instructors of the IT related fields were also included.

The questionnaire is intended to offer a brief explanation and summary on the importance of research for Somali HEIs, with there being no amount or coercion or there being no attempt to influence the results in any way whatsoever.

C) Questionnaire development

Survey method was used to complement the case study research in terms of getting possibility to generalization. A survey is conducted in the second phase of the study about 15 HEIs in Mogadishu-Somalia.

A comprehensive questionnaire designed to cover major aspects of cloud computing adoption, the current state of cloud computing adoption in HEIs in Somalia, proposing adoption strategy processes to cloud computing in the Somali higher education institutions, determining the technological (cloud computing), the organizational (HEI), and the environmental (Cloud providers and other stakeholders) factors that influence cloud computing in Somali HEIs, and lastly, the challenges in cloud computing adoption for the Somali higher education institutions. The study adapted the questionnaire of those sources and references shown in Table 4 those the researchers saw to be comprehensive in addressing the objectives of the study.

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Table 4 Measurement items (Researchers, 2017)

Question. Constructors/ factors	**Number of sub Questions**	**No. of items in each Question**	**Adapted source/Reference**
Demographic and higher education institution information	10	-	The Researchers
Technology factors	9	3	(Mansour A. J., 2013), (Moore & Benbasat, 1991), (Majed Alsanea , 2015), (Alshamaileh, 2013) (Ray D., 2016), the researchers.
Environmental factors	7	3	(Majed Alsanea , 2015), (Omwansa, Waema, & Omwenga., 2014), (Alshamaileh, 2013), the researchers
Organizational factors	3	3	(BIS, 2010), (Majed Alsanea , 2015), (Alshamaileh, 2013), (Lippert & Forman, 2005), the researchers
Cloud computing adoption decision	1	4	(Alshamaileh, 2013), (ALESCO & ITU, 2015), the researchers

The questionnaire was constructed based on the initial factors that were extracted from the interview phase, with a 5- point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree). in the first 6 questions involve demographic of the respondent, the next 4 questions involve the demographic of the HEI, the next 9 questions involve the technological factors affect the adoption of cloud computing within the Somali HEIs (independent variable), the next 7 questions involve the environmental factors affect the adoption of cloud computing within the Somali HEIs (independent variable), the next 3 questions involve the organizational factors affect the adoption of cloud computing within the Somali HEIs (independent variable), the last question involve the cloud computing adoption decision (the dependent variable).

Thus, the questionnaire was structured to capture the Somali HEIs profile, drivers and challenges of cloud computing, as well as the factors (e.g. technological, organizational and environmental) that influence the adoption of cloud computing and the questionnaire will help the researchers to develop a framework of cloud computing adoption with in the Somali HEIs and it will help to design a proposed implementation strategy when the HEIs decided to adapt cloud computing.

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D) Quality assurance of the research:

Reliability and validity of the questionnaire were conducted using cronbach's alpha and factor analysis respectively. The reliability of the of the questionnaire based on the internal consistency of the measures by testing the cronbach's alpha, the overall cronbach's alpha value found is 0.948, which is more than the minimum acceptable value (0.70). In terms of testing validity, the result of the all items showed that the correlations of total scores are valid. All the items of the loadings for the rotated factors were more than 0.40 which is the minimum accepted item and when the loadings for the rotated factors are less than 0.40 they should be omitted to improve clarity, so none of the questionnaire items is omitted. So, those results showed that the questionnaire is highly valid and reliable.

QUANTITATIVE DATA ANALYSIS OF DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

The researchers distributed about 150 copies of the questionnaire randomly to fifteen (15) universities in Mogadishu -Somalia; the respondents of the research are mainly work administration offices and IT lecturers of these universities. At the questionnaire deadline, 140 respondents returned their feedback while 10 of them did not return or invalid. A total of 114 responses were used in the analysis, representing those fifteen higher education institutions. The overall response rate was 93.3% (140/150). The minimum recommended response rate level is 20% for organizational surveys (Grover, 1997) and (Yu & Cooper, 1983). This response rate is better than those obtained in other information systems (IS) research studies (Pinsonneault & Kraemer, 1993); Tiwana and Bush, 2007; and Schwarz, et. Al, 2009).

The valid response rate according to the received responses was 81.4% (114/140). Reasons for excluding questionnaires from analysis included errors in completion which undermined the validity of the response and too man 'don't know' or blank answers for analysis. One of the main required statistics when analysing the quantitative data is to conduct descriptive statistics and that is available in SPSS software. First, the researchers implemented screening of the data through identifying the missing data and declaring the variables and making sure the normality, reliability and validity of the data. It is very important to include demographic data to the findings of the research; it helps the reader to understand the profile of the respondents.

The researchers demonstrated here the following demographic information: The respondent's gender, age, academic level of education, the job title of the respondent in the selected HEI, the working experience of the respondent and the participant's frequency of each responded Somali HEI. The researchers will also demonstrate the descriptive statistics such as standard deviation, mean, percentage and frequency to demonstrate and evaluate the representativeness of the sample and the characteristics of the survey data. These items of the survey statistics were tabulated, summarized, and reported.

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GENDER OF THE RESPONDENT

In terms of which gender the respondent is, the majority of the respondents were male and accounted for 75.0%. 23.3% of the respondents were female, whereby 1.7% of the respondents missed to answer that question as depicted in Table 5.

Table 5 The gender of the respondent (Researchers, 2017)

The gender of the respondent					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Male	87	75.0	76.3	76.3
	2 Female	27	23.3	23.7	100.0
	Total	114	98.3	100.0	
Missing	System	2	1.7		
Total		116	100.0		

THE GROUP OF THE RESPONDENT AGE

In terms of the age of the respondents, the majority of the respondents were in range 20-29 years old and accounted for 58.6% whereby 27.6% of the respondents were in range 30-39 and 10.3% were in range 40-49 and 1.7% of the respondents were 50 or above as depicted in Table 6.

Table 6 The group of the respondent age (Researchers, 2017)

The group of the respondent age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 20-29	68	58.6	59.6	59.6
	2 30-39	32	27.6	28.1	87.7
	3 40-49	12	10.3	10.5	98.2
	4 50 and Above	2	1.7	1.8	100.0
	Total	114	98.3	100.0	
Missing	System	2	1.7		
Total		116	100.0		

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THE ACADEMIC QUALIFICATION OF THE RESPONDENT

In terms of the academic qualification of the respondents, the majority of the respondents holds master degree and accounted for 54.3% whereby 28.4% of the respondents hold bachelor degree and 8.6% hold PhD and 6.9% of the respondents hold secondary certificate as depicted in Table 7.

Table 7 The Academic qualification of the respondent (Researchers, 2017)

The Academic qualification of the respondent					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Secondary	8	6.9	7.0	7.0
	2 Bachelor Degree	33	28.4	28.9	36.0
	3 Master Degree	63	54.3	55.3	91.2
	4 PhD Degree	10	8.6	8.8	100.0
	Total	114	98.3	100.0	
Missing	System	2	1.7		
Total		116	100.0		

THE YEARS OF EXPERIENCE OF THE RESPONDENT

In terms of the experience years of the respondents, the majority of the respondents has years in their experience between 2-4 years and accounted for 42.2% whereby 25.9% of the respondents have years in their experience between 5-7 years and 11.2% of the respondents have less than 2 years' experience and 19% of the respondents have 8 years' experience and more as depicted in Table 8.

Table 8 The Years of Experience of the respondent (Researchers, 2017)

The Years of Experience of the respondent					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Less than 2 years	13	11.2	11.4	11.4
	2 Between 2 –4 years	49	42.2	43.0	54.4
	3 Between 5 – 7 years	30	25.9	26.3	80.7
	4 Between 8 -10 years	11	9.5	9.6	90.4
	5 More than 10 years	11	9.5	9.6	100.0
	Total	114	98.3	100.0	

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Missing	System	2	1.7		
Total		116	100.0		

CURRENT SERVICE POSITION OF THE RESPONDENT

In terms of which title the respondent holds, the majority of the respondents was serving as head or member of the institution administration, or lecturer in the institution and accounted for 32.8% per each. 16.4% of the respondents were head or member of ICT department of the institution, 14.7% were dean or member of faculty administrative staff as depicted in Table 9.

Table 9 The Current service position in the respondent's HEI (Researchers, 2017)

The Current service position in the respondent's HEI					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Head / Member of the institution administration	38	32.8	33.9	33.9
	2 Dean / Member of faculty administrative staff	17	14.7	15.2	49.1
	3 Head / Member of ICT department	19	16.4	17.0	66.1
	4 IT Lecturing staff	38	32.8	33.9	100.0
	Total	112	96.6	100.0	
Missing	-1 No Data	2	1.7		
	Total	2	3.4		
Total		114	100.0		

LINEAR REGRESSION ANALYSIS

Linear regression analysis is as an appropriate approach used to examine the correlation between the projected factors and HEI IT related staff and HEI decision makers' intent in adopting cloud computing (Palacios-Marqués, Soto-Acosta, & Merigó, 2015). Many previous innovation and new technology adoption research studies that examined research design including interval data employed regression analysis methods (Brace, 2004) ; (Chebrolu, 2010); (Opala, 2012); (Ross, 2010); (Zorn, Flanagin, & Shoham, 2011). Regression analysis aids researchers in defining the relationship among various independent variables and dependent variables (Azzopardi & Nash); (Vogt & Johnson, 2011).

Logistic regression techniques were used to test support for the hypotheses proposed by the research or conceptual model. In linear regression matrix there are four parameters, the first parameter is R^2 (the coefficient of the correlation or the relation) and it shows the strength and direction of the relationship between the dependent variable and independent variables. The second parameter is P

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value which indicates the significant of the relationship between the dependent variable and the independent variables; p must be equal or less than 0.05 for the relationship to be significant. The third parameter is Beta β and it shows the slope and the direction of the relationship between the dependent variable and the independent variables.

A simple linear regression analysis was conducted based on 114 completed responses of the questionnaire collected from the fifteen universities operating in Mogadishu the capital city of Somalia. The linear relationship between the technological factors, organizational factors and environmental factors as an independent variable with the cloud computing adoption as dependent variable. The linear regression will clarify whether the factor has significant effect on cloud computing adoption by the Somali higher education institutions according to the collected data through the questionnaire.

FINDINGS OF THE QUANTITATIVE STUDY

Though the research studies the factors that affect cloud computing adoption by the higher education institutions, all the technological, organizational and environmental factors were independent variable whereby cloud computing adoption is the dependent variable. The researchers examined the hypotheses of the study which was revised through qualitative study, added new factors and omitted some factors. Linear regression used to examine the hypotheses. Before performing linear regression analysis the researchers tested for validity and reliability of the gathered data through questionnaire which is participated effectively almost 114 respondents from 15 Somali HEIs in Mogadishu.

The Table 10 shows a summary of the hypotheses testing and the regression results. The table shows the beta value which indicates the size of effect (R^2) along with the P-value of the relationship which is supposed to be more than 0.5 to be accepted. It shows also the status of the hypothesis based on the P-value which supposed to be less than 0.05 for the hypothesis to be accepted.

Table 10 Summary of the linear regression results (Researchers, 2017)

Hypo-thesis	**Relationship Tested**	**Result**			**Status**
		β	**R^2**	**P**	
H1	Cost saving is significance factor in adopting the HEIs to the cloud.	0.857	0.735	0.00	Accepted
H2	Relative advantage is significance factor in adopting HEIs to the cloud	0.944	0.890	0.00	Accepted
H3	Compatibility is significance factor in adopting the HEIs to the cloud	0.856	0.732	0.00	Accepted
H4	Security is significance factor in adopting the HEIs in Somalia to the cloud (at level of significance α= 0.05).	0.740	0.548	0.00	Accepted

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H6	Scalability (IT) is significance factor in adopting the HEIs to the cloud.	0.940	0.884	0.00	Accepted
H8	Dependent on external providers is significance factor in adopting the HEIs to the cloud	0.926	0.858	0.00	Accepted
H9	Technological readiness or existing culture in HEI is significance factor in adopting the HEIs to the cloud	0.934	0.872	0.00	Accepted
H20	Speed of the available internet is significance factor in adopting the HEIs to the cloud.	0.899	0.807	0.00	Accepted
H21	Availability of steady electrical supply is significance factor in adopting the HEIs to the cloud.	0.999	0.998	0.00	Accepted
H17	There is a significance effect between Size of HEI and the adoption of cloud computing	0.730	0.533	0.00	Accepted
H118	There is a significance effect between HEI Top management and the adoption of cloud computing	0.732	0.536	0.00	Accepted
H10	There is a significance effect between availability of acceptable service level agreement and the decision of adopting the HEIs to the cloud computing	0.750	0.562	0.00	Accepted
H13	There is a significance effect between pressures of the available cloud provider competitors and the decision of adopting the HEIs to the cloud computing	0.722	0.522	0.00	Accepted
H14	There is a significance effect between Promotion and Marketing efforts of providers and the decision of adopting the HEIs to the cloud computing	0.768	0.590	0.00	Accepted
H15	There is a significance effect between availability of Trainings delivered by cloud providers and the decision of adopting the HEIs to the cloud computing	0.747	0.558	0.00	Accepted

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FINALIZING THE CONCEPTUAL RESEARCH MODEL

This research examined the factors that affect cloud computing adoption by the Somali Higher Education Institutions and categorized them in three categories: Technological characteristics of cloud computing, organizational characteristics of the higher education institutions and the cloud providers and other related stakeholder's incentives and supporting. Figure 4 shows the finalized conceptual model of cloud adoption by the HEIs and the result of each construct with hypothesis related to the construct.

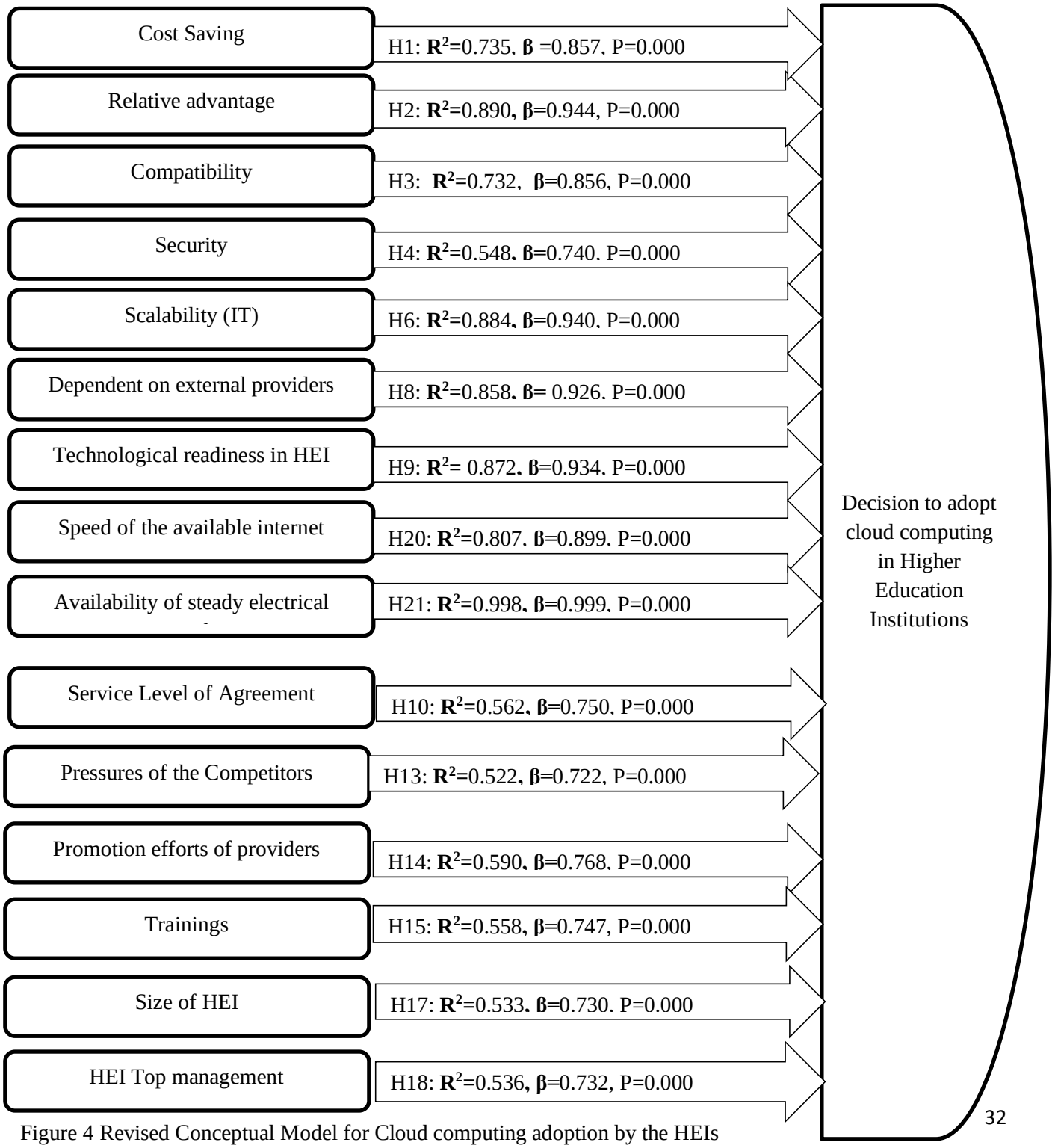

Figure 4 Revised Conceptual Model for Cloud computing adoption by the HEIs

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DISCUSSION OF THE FINDINGS

The main objective of this study was an empirical model for cloud computing adoption by the HEIs and cloud adoption strategy for the higher education institutions. So, the researchers analysed the factors affect the adoption through surveyed data from Somali HEIs. According to the cost saving, this research found that cost saving is one of the factors that influence cloud computing adoption by the HEIs. There is a previous surveys on cloud computing adoption assures that cost reduction factor as a key determinate of cloud adoption. (Parker, C. & Castleman, T., 2009), (Alshamaileh, 2013) (Mansour, 2013)According to relative advantage, this study found it is a significant factor that affects cloud adoption by the HEIs. There is an empirical study that was conducted in Iraq identifies also that relative advantage had significant affect to cloud computing adoption by the higher education institutions. (Hashim & Bin Hassan, 2015) & (Li, Y, 2008)supported the significance effect of relative advantage on E-procurement adoption

According to compatibility, it was found in this study to be significant factor which affects cloud computing adoption by the HEIs in Somalia. This result on compatibility is in line with the results of (Hashim & Bin Hassan, 2015) and (T. Oliveira, M. Thomas, & M. Espadanal, 2014), (Lee, O.K. et al., 2009)and those studies revealed that compatibility is one of the most factors had the most significant contributions to cloud computing adoption by the higher education institutions.
Security factor was found to be a more significant factor influencing cloud adopting. The finding on security concern is in line with the findings of previous studies such as: (Alshamaileh, 2013), (A. Rahimli, 2013), (Loebbecke, C., Thomas, B., & Ullrich, T, 2012), (Benlian, A. & Hess, T., 2011), (Bhattacherjee, A. & Park, S. C., 2014), (Mansour, 2013)

The findings of the study also suggest that scalability is one of the crucial factors influencing cloud computing adoption. Previous study considered scalability as one of the significance adoption factors in higher education institutions (Anjali Jain & U.S. Pandey, 2013) .This study also determined that dependent on external cloud providers had strong influence on cloud adoption by the HEIs, Cloud computing services are often hosted in one country and adopted in other countries. Cloud providers may use data centres scattered around the globe hence enterprises using the cloud may feel uncertain of the location of their data. In addition, there may be issues of legal jurisdiction in the event of dispute and uncertainty about the applicable law. Both factors were reported as limiting the use of cloud computing, particularly for large enterprises already using the cloud. This was a result of prior statistics research in Cloud computing statistics on the use by enterprises (Cloud computing statistics on the use by enterprises, 2016)

The next factor suggested by the TOE framework model was technological readiness; as expected technology readiness was found statistically significant factor that effect cloud adoption by the HEIs. This result is in contrast with (R. AlGhamdi, A. Nguyen, J. Nguyen, & S. Drew, 2012), (Oliveira, Martins, & Lisboa, 2011) they found that technology readiness was not significant predictor in cloud adoption by the organizations in the developing countries. This study found also that Speed of the available internet and Availability of steady electrical supply play a central role with addition to the other discussed factors in cloud adoption by the HEIs, the majority of participants emphasised the importance of them in the decision making process. These two factors haven't been discussed in any other previous studies as significance factors that affect in cloud computing services adoption by HEIs.

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This study also determined service level agreement as one of the main factors affecting cloud computing adoption by the HEIs in Somalia and this result has been in consistent with (Hsu, Kraemer, & Dunkle, 2006) which presented regulatory concern as a significance factor in e-business adoption. The Pressures of the available cloud provider competitors is one of the, the findings presented in this study is revealed that external pressures have a statistically significant effect on the adoption of cloud computing. This is in consistent with early studies (Majed Alsanea , 2015) and (WANG, WANG, & YANG, 2010).

This study found also the significant relationship between promotions and marketing efforts of providers and the adoption of cloud computing. According to the available cloud computing trainings, this study found the significance effect of cloud computing by the HEIs, and prior research supports that trainings and improving skills of IT human resources are important influencers on cloud computing adoption by the HEIs in Palestine (Mansour, 2013) and (Oliveira, Martins, & Lisboa, 2011)supported the significance of IT trainings on e-business adoption.

In contrast to the expectations, this study found a significance relationship between the HEI size and cloud adoption. This result is similar to earlier findings (T. Oliveira, M. Thomas, & M. Espadanal, 2014), (Y. Alshamaila, S. Papagiannidis, & F. Li,, 2013), (C. Low, Y. Chen, & M. Wu, 2011), all those studies found a significant relationship between cloud adoption and enterprise size (HEI in this case).Top management support was found to be a more significant factor influencing cloud adopting. The finding on top management support is in line with the findings of previous studies. (Y. Alshamaila, S. Papagiannidis, & F. Li,, 2013), (H. Gangwar, H. Date, & R. Ramaswamy, 2015) (T. Oliveira, M. Thomas, & M. Espadanal, 2014), (H. P. Borgman, B. Bahli, H. Heier, & F. Schewski, 2013), (Mansour, 2013)

CONCLUSION

In order to discover the customized factors that affect cloud computing adoption in the Somali higher education institutions required to do empirical research focusing that issue; the researchers did quantitative research study and it is used to generalize the results of a qualitative study done before. In this research fifteen factors have been determined as key factors of cloud adoption in the HEIs in Somalia: Cost saving, Relative advantage, Compatibility, Security, Scalability, Dependent on external providers, Technological readiness, Size of HEI, HEI Top management, Availability of acceptable service level agreement, Pressures of the available cloud provider competitors, Promotion & Marketing efforts of providers, & Availability of Trainings, Speed of the available internet & Availability of steady electrical supply.

About fifteen HEIs in Mogadishu-Somalia and around 150 participants but after cleaning the data, 114 respondents' data became usable, the participants of the questionnaire were chosen because they are all closely involved in the process of migrating the HEIs into cloud computing. They have the essential technical knowledge and are responsible for the decision-making processes in their HEI; therefore, this makes them an appropriate source of information for the purpose of this research. This paper presented also the findings of the conducted quantitative data gathered through questionnaire research instrument.

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Reliability and validity of the questionnaire were conducted using cronbach's alpha and factor analysis respectively. The result showed that the questionnaire is highly valid and reliable. Descriptive analysis was performed to analyze the part of the demographic in the questionnaire. A simple linear regression was used to examine the relationship between the variables as well to test the research hypotheses. The result of the regression indicated that all hypotheses are acceptable and significant. Finally, the paper concluded with illustrating the modified conceptual model of the research.

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