The importance of cloud computing trends and the conceptual model in higher education for sustainable development

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Abstract. Computing increases the flexibility and access of educational users to a wide range of educational resources. This includes access to infrastructure, software, hardware, and platform at any time in any place provided there is internet access. Current research trends on cloud computing have sought to study the acceptance or adoption of technology; however, little research has been devoted to the continuance use in an organizational setting. To address this gap, this study aims to investigate the antecedents of cloud computing continuance use in HEIs. The collective nature of all these entities is known as the Cloud. While respondents from all types and sizes of institutions showed some similarities in their perceptions of the cloud and cloud usage, there are some notable differences that are highlighted in the key findings. This paper also aims to identify the benefits and limitations of SaaS in higher educational institutions, closes with a discussion of the research limitations, contribution, and future directions

1 Introduction

Higher educational institutions (HEIs) are faced with the need to be innovative in order for them to remain competitive. There is also a need for HEIs to offer their students quality education so that they can be well equipped for the job market after graduation. As a result, there is a need for software and applications that could be used in training students and improving communication among members of HEIs. These software and applications are often expensive and some HEIs are unable to afford them due to the high price [1]. HEIs are therefore seeking alternative ways to procure these software and applications at affordable price [2].

However, while the subscription model of cloud services contributes to the growth of the overall market and makes it accessible for HEIs, a new set of challenges have arisen. This research addresses one such challenge that the cloud service providers face. The possibility of making such decision to discontinue a cloud service provider is exacerbated

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by the low cost of switching between applications [3] and in general the competitive markets [4]. Therefore, the conceptualization of CC service in HEIs changes to a decision on continuance, rather than adoption.

Moreover, in the subscription models offered through cloud-based educational systems, universities can switch providers if they see great benefits elsewhere. Thus, it is essential to understand the conceptual differences between adoption and continuance [5]. Hence, CC continuity studies have practical and artifact-specific motives. Furthermore, theoretical research on organizational-level continuance is also scarce [6], particularly in HEIs [7, 8]. Typically, continuance research has been undertaken at the individual user level; however, organizational continuance decisions are often made by senior IS executives or others in the organization who may not be intense users of the service in question [6]. For many of these executive decision makers, a strong influence may be attributed to factors that are insignificant for individual users (e.g., lowering organizational costs or shifting a strategic goal) [9].

2 Methods

Cloud Computing has three main service models which are based on the type of resource being offered. These are Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS).

A. SaaS provides users with access to applications over a wide range of devices through a program interface or a thin client such as web browser over the internet [10]. Users are able to access these applications at any time in any place and are able to continue from where ever they stopped the previous time [7]. Because of the possibility of accessing course content anytime and anywhere, knowledge sharing can be improved among users in HEIs [14].The response of Saas users is shown in Fig. 1.
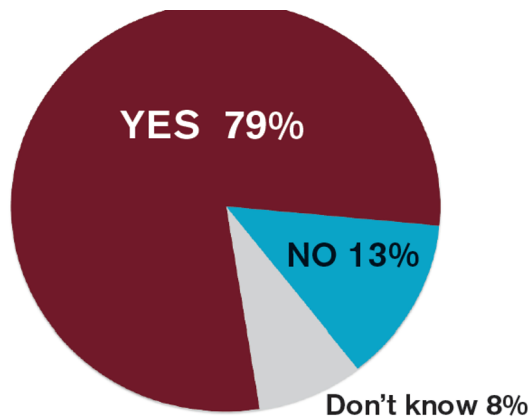
B.

Fig. 1. Saas service users in higher education systems

C. IaaS provides users with access to computing resources such as storage, processing and networks over the internet [11].This allows users to be able to run applications on and save their data on the provided resources without having to worry about the management and maintenance of the resources [10].The response of Iaas users is shown in Fig. 2.D.
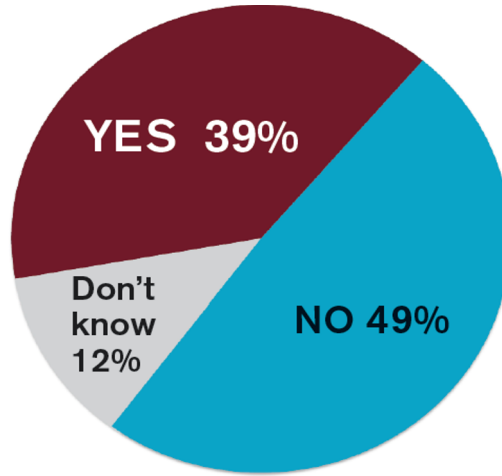
Fig. 2. Iaas service users in higher education systems

E. PaaS allows users to deploy their own applications onto the cloud and gives them control over their applications [11]. The service provider is left with the responsibility of managing and controlling the underlying infrastructure such as servers, networks, storage and operating systems [10]. The response of Paas users is shown in Fig. 3.
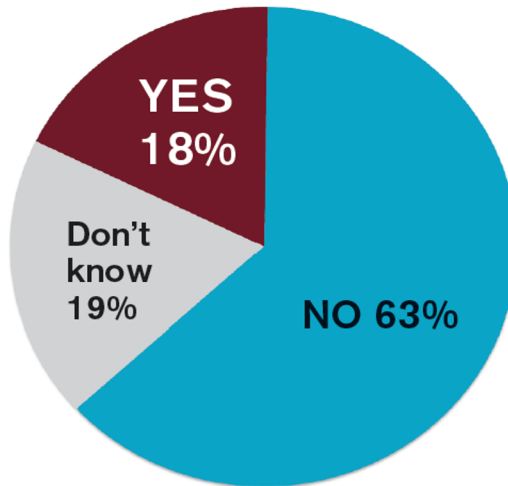

Fig. 3. Paas service users in higher education systems

Although the three service models are used in higher educational institution, the focus on this paper is on SaaS because it is the most common service model among higher educational institutions.

3 Results and Discussion

The proposed basis for mastering the limited cloud of higher education in the world is based on Toe; this theory is a more advanced acceptance theory, but it is possible to classify all determinants of cloud load acceptance according to technological, organizational, and

environmental contexts. In discussing the basics of cloud adoption by higher education institutions, it is necessary to analyze the cloud charge, then the organization where the higher education institution is located, then the environment where the cloud providers are located, and so on. stakeholders. Thus, Toe systems can be a useful analytical tool for the adoption of cloud innovations by universities around the world.
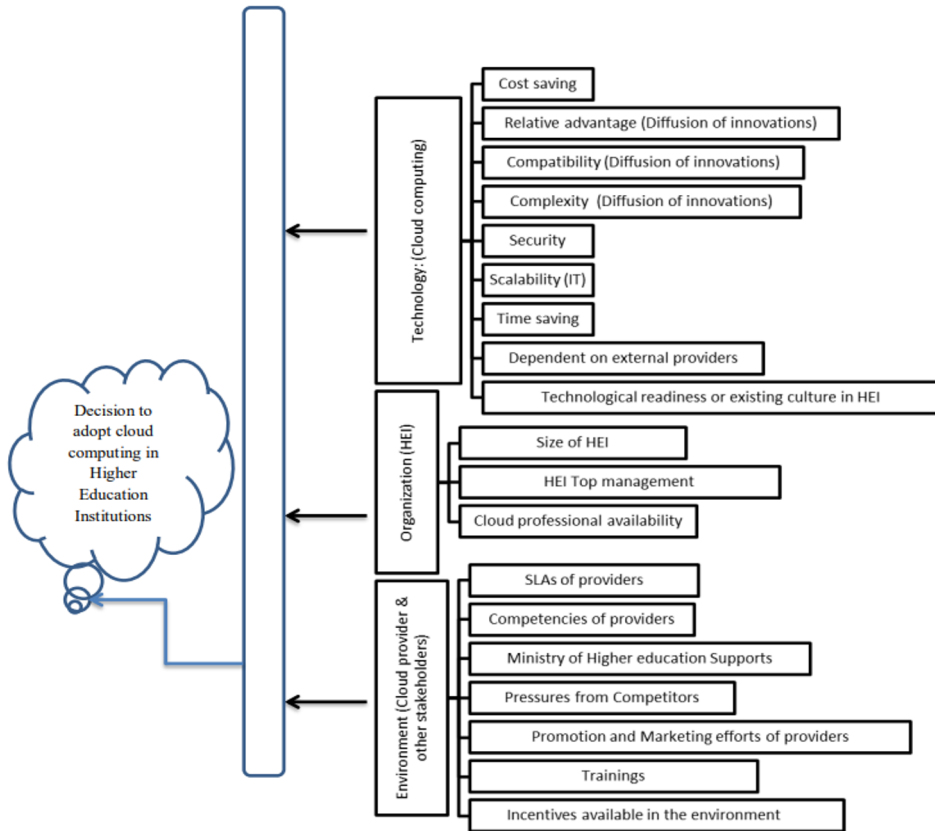

Fig. 4. The proposed framework for the introduction of cloud computing in higher education

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 The world higher education institutions, 2018) and other was qualitative study paper (IsakElamin, A qualitative study of the factors affect cloud computing adoption in higher education institutions – a case study of world higher education institutions, 2018), the results of those two researches have been shown in Table 1.

Table 1. Factors findings of the two stages

Hypothesis	Factors in literature review stage	State of the factors in qualitative stage
H1	Costsaving	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)

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 analyzed the factors affect the adoption through surveyed data from The world HEIs [19,20]. 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 survey on cloud computing adoption assures that cost reduction factors a key determinate of cloud adoption [11]. 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 [12]. The significance effect of relative advantage on E-procurement adoption.

4 Conclusions

In this paper, we discussed the use of SaaS in SA HEIs. The benefits and disadvantages of SaaS in HEIs were also discussed. Some of the benefits include cost saving, accessibility and improved communication. SaaS was found tobe a viable option for HEIs because it allows them to focus on teaching and learning as the installation, upgrades andmaintenance

of the software and applications are done by the service provider. SaaS also assists HEIs to reduce cost and improve access to resources [13, 14].

In order to discover the customized factors that affect cloud computing adoption in the world 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 The world: 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-The world 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[15]. 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 [16]. This paper presented also the findings of the conducted quantitative data gathered through questionnaire research instrument. Reliability and validity of the questionnaire were conducted using Cronbach's alpha and factor analysis respectively [17-19]. 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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