Analysis of Main Concerns for the Adoption of Community Cloud in Decentralized Education Systems

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Abstract

With the rapid change in technology, higher education institutions are being heavily supported by cloud computing models. The use of cloud computing not only facilitates academic activities but also administration and collaboration. A cloud environment provides access to software, hardware, infrastructure, and platform whenever there is internet access regardless of time and location. When it comes to decentralized education systems where the resource usage is high, it is crucial facilitating the demand, hence identification of appropriate cloud models and adoption factors would lead decision makers towards proper cloud migrations. This paper represents the most concerning factors that influence the adoption of community cloud when it is to be implemented in decentralized education systems.

Keywords**:** *Cloud Computing, Community Cloud, Higher Education, Decentralized Education*

INTRODUCTION

Cloud computing is a popular computing paradigm in which everything is delivered as-a-service. It is reported that cloud computing will replace traditional data centers within four years, handling 95% of total data center traffic by 2021, compared to 88% in 2016 (Perspectives and Report, 2022). Everything on the cloud provides an efficient way of sharing information, storage, resource management, and disaster recovery.

A number of companies like Google and Amazon use cloud computing to reduce technology acquisition costs; and provide services such as email (Gmail); cloud storage (Dropbox); hosted desktop (AT & T); streaming music (Spotify) etc. According to experts, it makes no sense for smaller enterprises to operate their own data centers. Cloud computing will be both cost-effective and also environmentally safer and cleaner for such organizations (Alharthi et al., 2015). Therefore, a wide range of businesses and academic institutions adopt cloud computing platforms to reduce costs and increase information systems responsiveness.

When educational institutions are given facilities through the cloud, students can extensively use them with no time or location bounds. This in return provides students with a flexible learning environment and increases student engagement in the teaching-learning process. A survey done by Faronicsin (Cornell, 2013) reports that universities drive towards the cloud based on the following factors.

- Increased efficiency – 55%
- Mobile access – 49%
- Innovation – 32%
- Provide new services – 24%

Thus, number of studies have been carried out by researchers to adopt cloud computing for higher education. The selection of most suitable service delivery model is one of the crucial tasks that involved in it. The decision is usually taken upon various factors that influences the cloud adoption for any organization in general.
At the moment of preliminary study of cloud adoptability, the concept of centralization and decentralization also plays an important role as they have significant effects on the functions of the relevant organization or institute. Decentralized education systems have become extremely appealing due to the numerous benefits of the model compared with centralized systems. With the new and emerging technologies and the tendency of cloud adoption in higher education institutes, decentralized education systems require appropriate cloud adoption models so as to support most of its activities. For any institution, administration and collaboration are as vital as academic

activities. Therefore, when adopting cloud models, it would be essential that the adopted model to be a success for them all. This is where the community cloud draw attention.

A community cloud is a popular concept where infrastructure is shared between several organizations from a specific community. This dispersed infrastructure is manageable by a single organization or by many organizations in the community; thus, making it help solve particular issues by associating services offered by different providers. Application of community cloud is seen in different areas. Many researchers have suggested ways that the model could be adoptable by different sectors such as health, financial, education etc. Valluripally (2019.) states that community clouds allow distribution of data processing workflows across the community and how it is adoptable to health sector. Indian Banking Community Cloud (IBCC) is another aim towards the secure cloud-based services to address the financial sector's growing demand (Sangavarapu et al., 2014).

As the application of community clouds in a commercial setting, there're many related researches in the education sector as well. A study by Paul Heinzlreiter (2012) discusses different application scenarios for a private cloud deployment, to be used as a community cloud. The study explains the use of community cloud by multiple institutions for teaching and research purposes. Another study by Aldahwan and Ramzan, (2022) introduces a research framework that combines Technology-Organization-Environment (TOE), Diffusion of Innovation (DOI) and Institutional Theory (INT) theories that drives an organization toward community cloud adoption. The study determines the important aspects impact the adoption of community cloud in higher education sector.

METHODOLOGY

This study aims to identify most concerning factors for adoptability of community cloud in decentralized education systems through a survey, that has been carried out with the participation of individuals from three higher education institutions. The institutions are in a decentralized education system; where they are located in different geographical areas and governed by the same body.

The survey was done through a semi-structured questionnaire, where the survey questions were adapted from Aldahwan's and Ramzan's (2022) research framework. The questionnaire was sent to more than 500 individuals. The questionnaire was sent to the participants via online and received 313 completed questionnaires. A descriptive analysis has been performed and conclusions were drawn based on the selected variables that are of considerable concern to most respondents as per Aldahwan and Ramzan (2022). Following lists more considerable factors used by Aldahwan for each area of concern.

Organizational Concerns:
Technology readiness – 46%, Top management support – 33%, Training – 31%, Size – 14%
Technology concerns:
Compatibility – 37%, University Culture - 40%, Quality of Service – 4%
Human concerns:
Ease of use - 39%, Usefulness – 15%
Advantages Concerns:
Performance - 27%, High automation – 22%, adequate resource – 22%
Security Concerns:
Integrity - 60%, Governance issue – 41%, Privacy - 17%

The questionnaire was prepared to test the level of influence of the following factors that are of higher percentage of the above.

Technology readiness
University Culture
Ease of use
Performance
Integrity

The responses were assessed against the above variables to identify the participant's perspective about them being in a decentralized education system. Only the participants who had prior experience in the cloud were selected for data analysis and 4 points Likert scale was used for the assessment.

RESULTS AND DISCUSSION

Table 1 and Figure 1 show the summary of responses received. According to the results, it is observed that the participants have identified a strong influence in performance (75%), technology readiness (65%), and ease of use (62%) variables while university culture (47%) and integrity (44%) with a moderate influence.

Table 1: Summary of responses

	Technology Readiness	University culture	Ease of Use	Performance	Integrity
No influence	0	13	1	0	23
Limited influence	0	98	27	0	85
Moderate influence	108	146	91	77	138
Strong influence	205	56	194	236	67

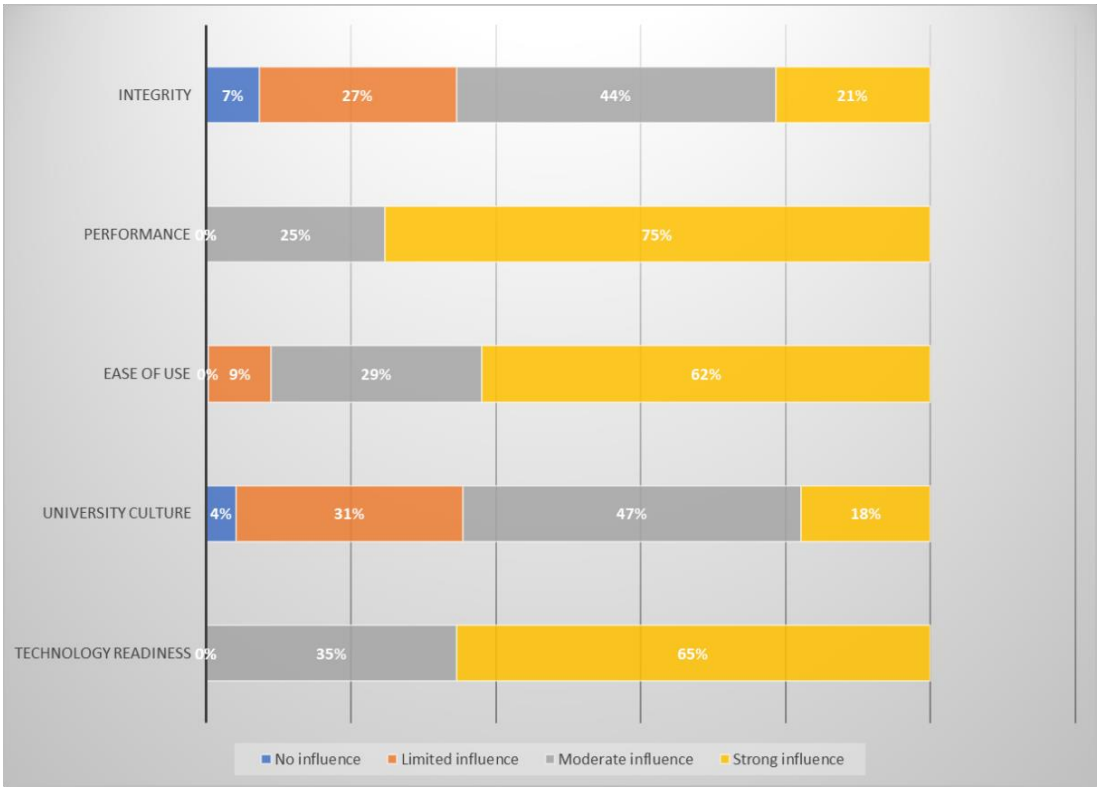

Figure 1. Summary of Responses

Figure 2 shows the mean influence of each cloud adoption variable. According to the results, it is shown that every proposed variable has a considerable influence on community cloud adoption. The variable performance shows the highest influence and the university culture is the lowest.

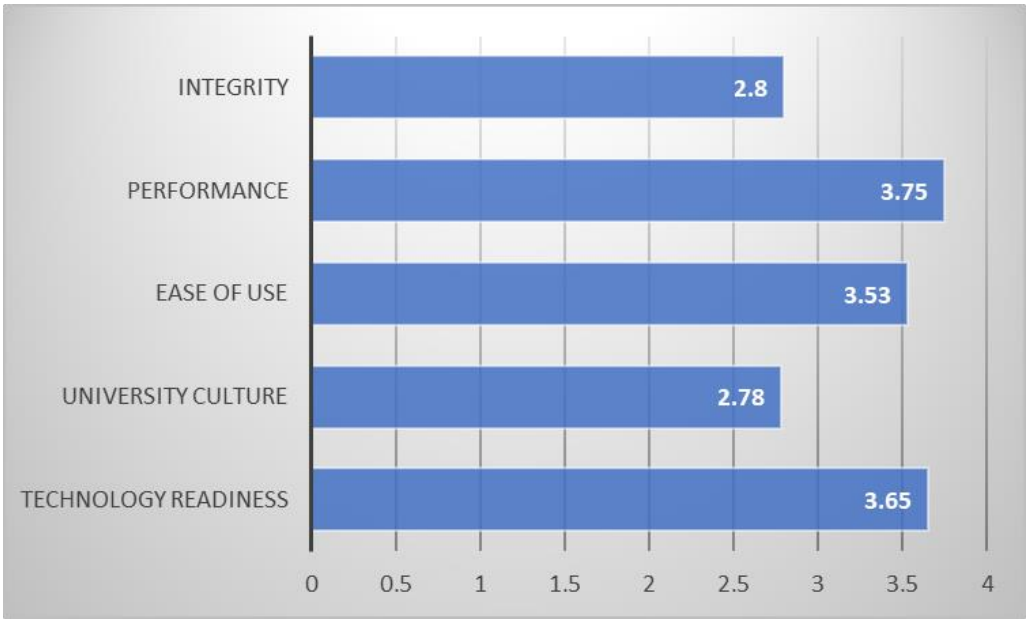

Figure 2. Mean influence of cloud adoption variables

CONCLUSION

A community cloud is an efficient and cost-effective solution that provides a pool of resources that could be shared among multiple member organizations within a community. Any decentralized education system is hence would automatically fit this concept considering its architecture. But before migrating to any cloud model it is necessary to consider the adoptability of the relevant model so as to minimize any conflicts. Therefore, this study proposes and evaluates five main concerns extracted from Aldahwan's and Ramzan's, (2022) research framework for adopting community cloud to a decentralized education system.

This study has been conducted with the participants of a decentralized education system and observed that the proposed five main concerns of community clouds have a strong association with decentralized education systems. Consequently, it is suggested that the concerns, Technology readiness, University Culture, Ease of use, Performance and Integrity would be more productive for testing adoptability of community clouds within decentralized education systems.

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