

Adoption of Cloud Computing Environment in Higher Education.

¹Dimple Dawar and ²Jitendra Sheetlani

¹Research Scholar , ²Jitendra Sheetlani Associate Professor 1,2 Dept. of CA, SSSUTMS, Sehore, MP, India

ABSTRACT: Cloud computing in academic is an emerging research field.. This cross-sectional investigative experiential research is based on technology–organization–environment (TOE) framework, within a Maharashtra state targeting higher education institutions. In this study, the factors that affect the cloud adoption by higher education institutions were identified and tested. Three factors were found significant in this context. Relative advantage, complexity and data concern were the most significant factors. The findings offer education institutions and cloud computing service providers with better understanding of factors affecting the adoption of cloud computing.

KEYWORDS: Higher education, Adoption of cloud computing, Technology, organization, environment framework,

I. INTRODUCTION

Cloud computing services are expected to be the fastest area of growth [1]. Maharashtra government is investing heavily in e-government solutions to enhance public sector services. One of the initiatives of the second national e-government action plan is building cloud computing delivery model for government agencies. There are potential benefits of adopting cloud computing technology in higher education institutions. Some cloud vendors offer programs for educational institutions. Examples of these programs are Microsoft Live@edu, Google Apps and IBM Cloud Academy [5]. Microsoft Live@edu service has been transformed to Microsoft Office 365 recently. It includes Word, Excel, PowerPoint, Outlook, OneNote, Publisher, and Access. The offer includes shared collaboration storage in the cloud to allow sharing documents among students in their projects. Google also provides a program for education through its Google Apps for Education Suite. This suite also includes Google Docs. The suite includes email service, classroom management system, shared storage represented by Google Drive, website creation and hosting, and collaboration tools. The case study of the University of Westminster indicated that the benefits and savings were attained by using Google Apps services. The primary purpose of the services is to use email, collaboration and storage services for non-sensitive information [6]. IBM Cloud Academy is a community cloud computing program. It provides best practices and consultation services in addition to the cloud solutions offered to higher education institutions. Cloud computing offers a shift from computing as a product that is owned to as a service that is delivered to consumers over the network from large scale data centers or clouds [7]. This shift created an efficient operation for higher education institutions. The aim of this research is to explore the factors affecting cloud computing adoption. The results of this research study will help both cloud computing providers and education institutions. The paper is organized as follows. First, the research motivation and objectives, second, the literature review and research hypotheses are proposed, followed by the methodology, the results, and the discussions, and the contribution and implications for practitioners. Third, the paper's limitations are summarized and future research directions are suggested.

II. RESEARCH MOTIVATION AND OBJECTIVES

Cloud computing is one of the most required technology in current situation. Current research on the use of cloud computing in education mainly focused on cloud computing frameworks, security, pricing mechanisms, and implementation [11, 9] and has not mainly addressed the use and adoption of cloud computing in education. There is a lack of experimental studies focusing on the adoption of cloud computing by educational institutions. The research objective is to identify and test technological, organizational and environmental factors that directly affect the adoption of cloud computing by higher education institutions. The focus of this study is on cloud computing solutions that are hosted outside the premises of higher education institutions (i.e. public cloud).

Examples of cloud computing solutions being addressed by this study are institutional level solutions such as library systems, ERP, learning management systems and research solutions. Specifically, we attempt to answer the following research question: what are the technological, organizational and environmental factors affecting cloud computing adoption.

III. LITERATURE REVIEW AND RESEARCH HYPOTHESES

Cloud computing do offers economies of scale through aggregating computing resources and virtualization. Cloud computing ensures a global reach of information and services. It uses computing environment that offers on-demand scalability, performance guarantees, minimal initial investment and on-going cost containment. In short, the cloud provides educators architecture to offer pre-built educational services and solutions together with the required skills for running and maintaining them.

The National Institute of Standards and Technology (NIST) defines cloud computing as “a model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Cloud computing model was evolved from several technologies. The model is an evolution of virtualization, grid computing, utility computing, and Internet services. Cloud computing is more than an outsourcing.

The theoretical foundation of this research is based on the technology–organization–environment (TOE) framework. The process of buying, keeping up, and administering computing assets requires a large investment of money related and manpower resources for a business, government, or university. One alternative that centralizes computing assets and can lower expenses and manpower requirements for these associations is the use of centralized computing assets provided as Cloud Computing. Cloud Computing is these days a trendy point. Currently, numerous establishments are interested in utilizing Cloud Computing capabilities, yet they don't have a clue where to expect changes when deciding for the Cloud Computing concept.

TECHNOLOGY FACTORS

Technology factors focus on the attributes of technology innovation. The study conducted shows that relative advantage, complexity, and compatibility were the main attributes associated with technology innovation behaviour. The advantage can be used to measure the degree a technology is considered advantageous from an adopter perspective. Relative advantage is associated with cost reduction and responsiveness to business requirements. Cloud computing should increase the efficiency of educational institutions. Computing information system hosted in house requires capital investment to build data centre infrastructure and high availability, train operator staff and so on.

Based on this argument, I propose:

There is a statistical significant relation between organization readiness and the adoption of Cloud Computing (at level of significance $\alpha = 0.05$).

IV. RESEARCH METHODOLOGY

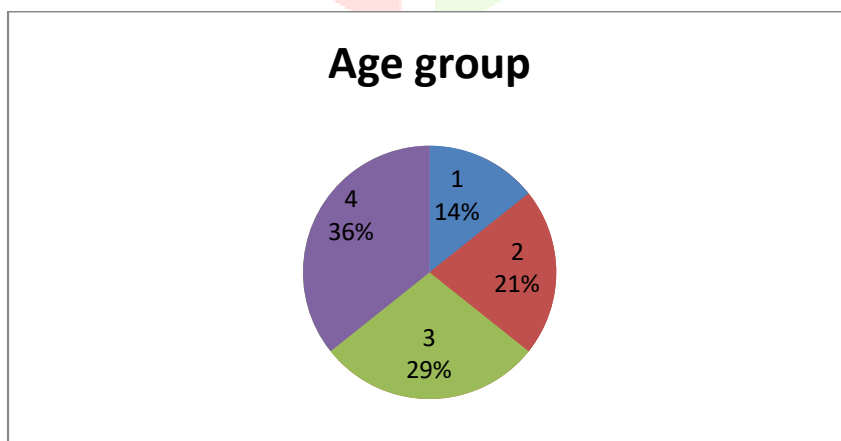
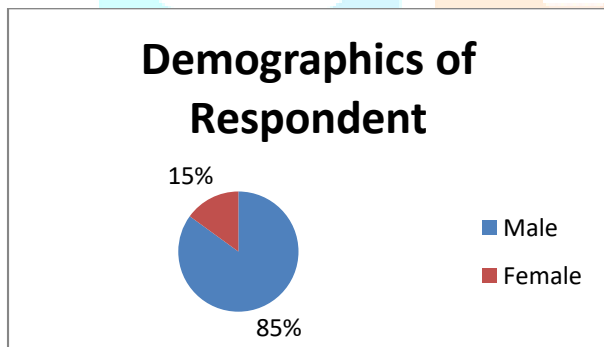
Development Of Survey Instrument

In order to test the research hypotheses, the research variables have to be measured. Measurement items were either developed or adapted from relevant prior research studies. Some measurement items were rephrased or reworded to suit the context of this study. The variables in this study were measured using a five-point Likert scale, ranging from “strongly disagree” (1) to “strongly agree” (5). Additional items were used to collect data on the number of students, faculty and staff members, and position of the IT of the key informant who responded to the survey questions. The last part of the survey included open-ended questions to capture important qualitative data related to the advantages of and concerns with cloud computing adoption. The information in this section is based on the results of surveying almost 1250 different participants that includes IT-architects, business development manager, executive consultant, chief technical officer, programmers, business consultant, CEO and end users who are actual stakeholder of proposed e-Learning model, either linked or aware with cloud computing or eGovernance.

V. RESULTS AND CONCLUSION

4.1. Demographics of Respondent

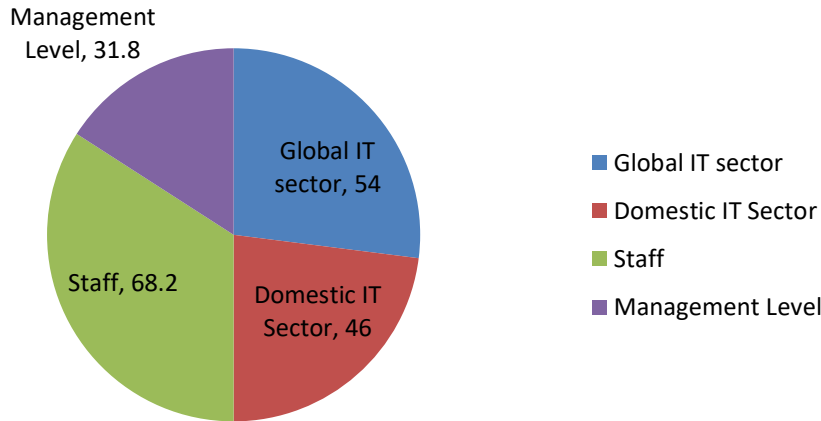
Of the 1250 respondents, 84.8% were male, while 15.2% were female. As for their age range, 7.1% were younger than their 20s, 21.1% were in their 30s, 56.5% were in their 40s and 15.2% were in their 50s, showing that those in their 30s and 40s accounted for the majority. As for their educational background, 1.5% were high school graduates, 68.2% had Bachelor's degree, 29.3% had Master's degree while 1% had Doctoral degree. As for their affiliation, 54% were working at global IT companies, while 46% worked at domestic IT companies. 68.2% of the respondents were staff while 31.8% were managerial level.



Type of responders



Type of respondent - By profession



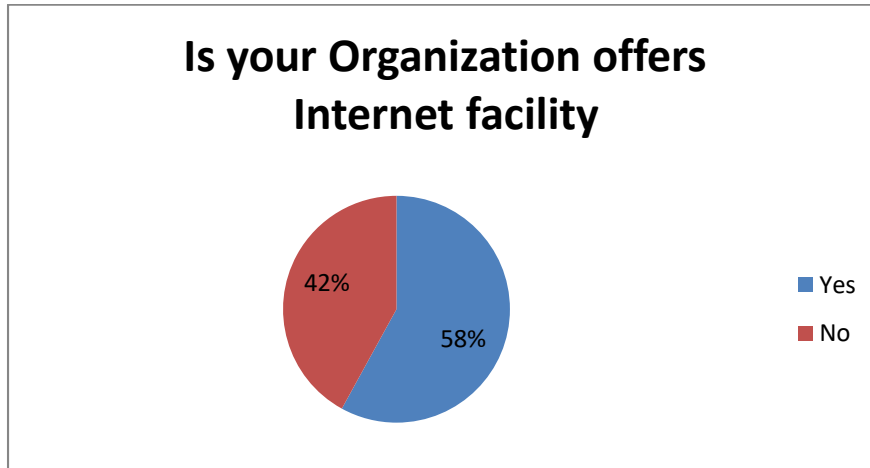
- a. Internet Access / Computer facility :Internet connection is must to access the cloud which means —if we want to look at a specific document we have housed in the cloud, we must first establish an internet connection either through a wireless or wired internet or a mobile broadband connectionl.
- 1. Is your Organization offers Computer facility 97% of pupils say that organization offers computer facility, this is the basic feature needed for cloud computing.

Is your Organization offers Computer facility



Looking at the responses we can claim that , yes the organization are very keen about their stakeholders and so provides Computing facilities to all. Which is a good sign for having e–learning environment in the institute.

2. Is your Organization offers Internet facility 98% of pupils say that their organization offers Internet facility. This gives a clear picture that nearly all the organization has the infrastructure ready for adopting cloud computing.



As we can see that organizations do provide the free internet facility to all, it will be not difficult to implement e-learning platform in the institute.

b. Adoption of Cloud in Organizations

3. Does your organization use cloud computing?

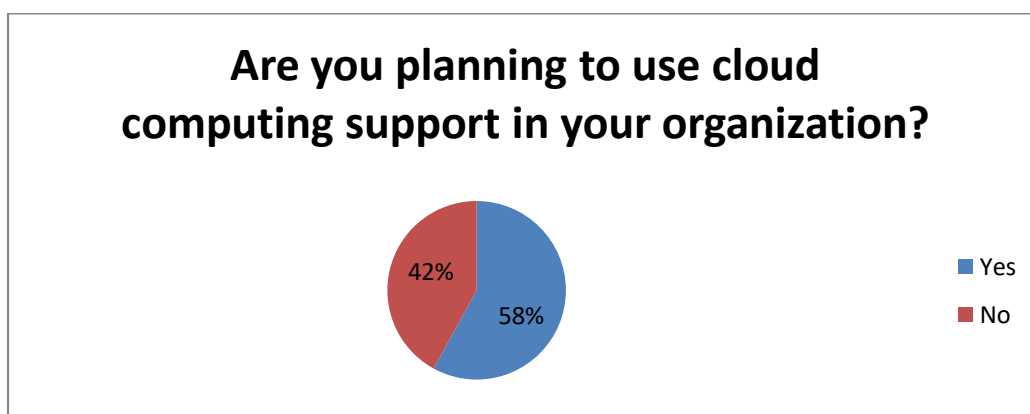
58% of respondents agrees that their organization use cloud computing. Whereas 42% says that their organizations does not use cloud computing.



The result shows that organizations are aware about cloud utility and benefits and because of that the organizations started using it.

4. Are you planning to use cloud computing support in your organization?

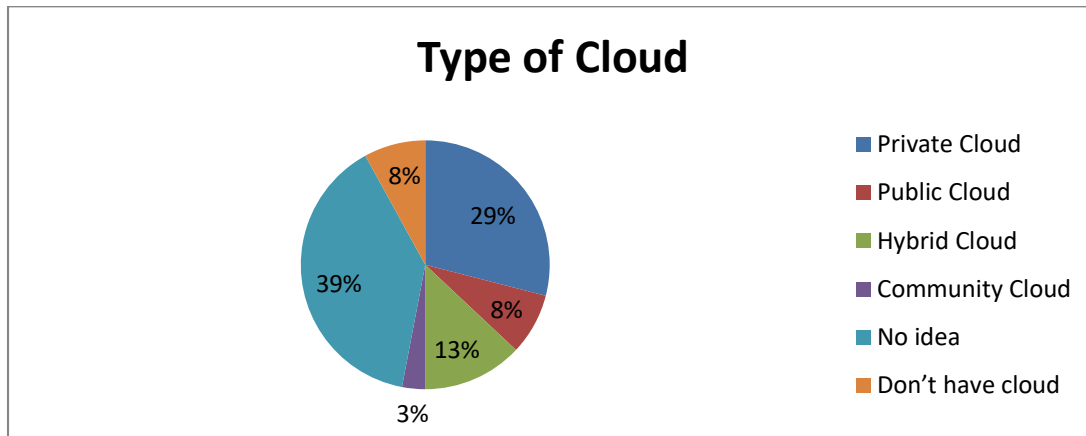
58% respondents are planning to use cloud computing support in their organization, and, 42% says no to this question.



Again it shows that the organizations , companies , people are adopting new technologies , new techniques which is again better sign for future development.

5. What kind of cloud environment does the organization use/intend to use?

When respondents were asked that what type of cloud environment they are using or intend to use, 29% says they are using private cloud, 13% are using hybrid cloud, 8% are using public cloud, and 3% are using community cloud. Whereas, 39% don't know about the type of cloud they are using, and 8% have no plans to adopt cloud.



We all are aware that there are various types of cloud platforms like Private, Public, Hybrid, Community. The diagram shows that majority of people are started using cloud computing technology no matter what type of it is. Also it shows that there is need to make people aware about the various type of cloud platform they are using.

In all , looking at the results it shows that majority of organizations, institutions , people are aware about this new technology and they have started adopting it for their regular use. This is a good sign for any of the institutions to start their e-learning platform in their institutions. As said earlier, by utilizing cloud-based E-learning execution expenses to prepare against the present E-learning, progressively decreases the measure of the upkeep by utilizing distributed computing framework and expanding efficiency will be conceivable .

REFERNCES

1. Son, I.; Lee, D.; Lee, J.-N.; Chang, Y.B. Market perception on cloud computing initiatives in organizations: An extended resource-based view. *Inf. Manag.* **2014**, *51*, 653–669.
2. Salim, S.A.; Sedera, D.; Sawang, S.; Alarifi, A.H.E.; Atapattu, M. Moving from Evaluation to Trial: How do SMEs Start Adopting Cloud ERP? *Australas. J. Inf. Syst.* **2015**, *19*.
3. González-Martínez, J.A.; Bote-Lorenzo, M.L.; Gómez-Sánchez, E.; Cano-Parra, R. Cloud computing and education: A state-of-the-art survey. *Comput. Educ.* **2015**, *80*, 132–151.
4. Qasem, Y.A.M.; Abdullah, R.; Jusoh, Y.Y.; Atan, R.; Asadi, S. Cloud Computing Adoption in Higher Education Institutions: A Systematic Review. *IEEE Access* **2019**, *7*, 63722–63744.
5. Rodríguez Monroy, C.; Almarcha Arias, G.C.; Núñez Guerrero, Y. The new cloud computing paradigm: The way to IT seen as a utility. *Lat. Am. Caribb. J. Eng. Educ.* **2012**, *6*, 24–31.
6. IDC. IDC Forecasts Worldwide Public Cloud Services Spending. 2019. Available online: <https://www.idc.com/getdoc.jsp?containerId=prUS44891519> (accessed on 28 July 2020).
7. Hsu, P.-F.; Ray, S.; Li-Hsieh, Y.-Y. Examining cloud computing adoption intention, pricing mechanism, and deployment model. *Int. J. Inf. Manag.* **2014**, *34*, 474–488.
8. Walther, S.; Sedera, D.; Urbach, N.; Eymann, T.; Otto, B.; Sarker, S. Should We Stay, or Should We Go? Analyzing Continuance of Cloud Enterprise Systems. *J. Inf. Technol. Theory Appl.* **2018**, *19*, 4.
9. Qasem, Y.A.; Abdullah, R.; Jusoh, Y.Y.; Atan, R. Conceptualizing a model for Continuance Use of Cloud Computing in Higher Education Institutions. In *Proceedings of the AMCIS 2020 TREOs, Salt Lake City, UT, USA, 10–14 August 2020*; p. 30.
10. Almazroi, A.A.; Shen, H.F.; Teoh, K.K.; Babar, M.A. Cloud for e-Learning: Determinants of its Adoption by University Students in a Developing Country. In *Proceedings of the 2016 IEEE 13th*

International Conference on E-Business Engineering (Icebe), Macau, China, 4–6 November 2016; pp. 71–78.

11. Meske, C.; Stieglitz, S.; Vogl, R.; Rudolph, D.; Oksuz, A. Cloud Storage Services in Higher Education- Results of a Preliminary Study in the Context of the Sync&Share-Project in Germany. In *Learning and Collaboration Technologies: Designing and Developing Novel Learning Experiences; Pt. I*; Zaphiris, P., Ioannou, A., Eds.; Springer: Berlin/Heidelberg, Germany, 2014; pp. 161–171.
12. Khatib, M.M.E.; Oplencia, M.J.C. The Effects of Cloud Computing (IaaS) on E-Libraries in United Arab Emirates. *Procedia Econ. Financ.* **2015**, *23*, 1354–1357.
13. Arpaci, I.; Kilicer, K.; Bardakci, S. Effects of security and privacy concerns on educational use of cloud services. *Comput. Hum. Behav.* **2015**, *45*, 93–98.
14. Gonzalez-Martínez, J.A., Bote-Lorenzo, M.L., Gomez-Sanchez, E.: Cloud computing and education: a state-of-the-art survey. *Comput. Educ.* *80*, 132–151 (2015) 55.
15. Ratten, V.: A cross-cultural comparison of online behavioural advertising knowledge, online privacy concerns and social networking using the technology acceptance model and social cognitive theory. *J. Sci. Technol. Policy Manage.* *6*(1), 25–36 (2015)

