

An Evaluation of Cloud Computing among Technical Colleges in Saudi Arabia

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Abstract

More than ever, educational establishments quest to tap into opportunities to rationalize their management of resources following the 2008's near collapse of global financial institutions. As long as taxpayers' monies and especially in the West countries are channeled towards bailing out banks, educational institutions will remain shortage financially. Cloud computing in this research paper is argued as one of the most viable opportunity for the cash strapped educational institutions. The subject of cloud computing has gained prominence amongst technical and higher education establishments in Kingdom of Saudi Arabia too, as the newest technology hype. Skeptical information technologists and succinctly in Saudi Arabia's technical training institutions dismiss cloud computing as another hype and reaffirm that it is the new paradigm in education and learning. Cloud computing is arguably technical in contrast to previous technological hypes such as application hosts, grids, service bureaus and other sourcing techniques right from high performance network capacity to emergence of virtualization technology. It relies on multiple existing technologies such as grid computing, internet virtualization and web services. Cloud computing is set to gain prominence in Saudi Arabia among the younger generation of managers, students and training institutions' employees who are much familiar with google search, Facebook community and broad connections. In spite of these gains, cloud computing has not virtually been embraced across all technical and higher education institutions in Saudi Arabia. The following research paper examines and evaluates cloud computing among technical colleges in Saudi Arabia with a view to establish adoption, challenges and the future it holds for these tertiary technical institutions especially in revamping Saudi Arabia's growth.

Key Words: Educational establishments, cloud computing, technology hype, Internet Virtualization, Web Services

1.0 Introduction

Technical colleges set to adopt or have adopted cloud computing will realize monstrous potential benefits. According to Abdollahzadehgan, Hussin, Gohary & Amini (2013), cloud computing offers a transition from owning computing as a product to outsourcing computing as a service conveyed to end users over the network from mega data centers called clouds. Before adoption of new technologies and systems, IT managers must consider associated risk

factors before deciding on adopting such technologies. A review of innovation adoption factors helps institutions better understand and analyze these new technologies in a structured strategy.

Technical factors assessment is not solely enough for technical institutions and especially in learning setup. Innovation should exist within the external environment and institutional context. According to Sultan (2010), cloud computing results into IT commoditizing. Consequently, IT departments within institutional contexts are likely rife to resisting new innovations adoption. Public Cloud Computing provides framework for storage of data (servers) outside institutions. Service providers or server hosts need not be in the country, continent or locality of the institution. As a result, legal and data privacy risks arise as potential threats to this outsourcing.

In spite of this, Saudi Arabia ranks highly among the developing countries. The new paradigm technology delivers advanced technological access and sophisticated infrastructure of devoid of large upfront investment. Experts anticipate that cloud computing technology is likely to supersede native outsourcing and computing such as building data centers and internal administration and management of the infrastructure. As a result, Saudi institutions and especially the cash strapped technical learning centers will gain relative advantage associated with cloud computing such as responsiveness to business demands and cost reduction (Sultan, 2010).

Hypothesis

This research study seeks to evaluate and test the following hypothesis.

1. Cloud computing technology is flexible, reliable, and effective and enhances service delivery in technical colleges.
2. Adoption of cloud computing is characterized by several problems for trust, privacy and security.

2.0 Cloud computing in Technical Colleges in Saudi Arabia

According to Alabbadi (2011) and Karla, Katz & Yanosky (2010), there are multiple commercial software as a service (SAAS) cloud computing services in use among technical colleges in Saudi Arabia. These include ERP systems, CRM Salesforce, Microsoft Education Cloud, Google Education Cloud, Amazon Web Services (AWS) cloud, IBM Cloud Academy, HP Cloud Computing and ZManda Application for Education. Specially designed and customized cloud computing systems for educational institutions come with a number of features. For instance, Microsoft's comes with email (live@edu which was until recently changed to Microsoft Office 365), Excel, PowerPoint, Word, Publisher, OneNote, Access and OneDrive shared collaboration storage. Students, teachers, instructors and other stakeholders can share documents and files (Microsoft, 2016).

Google's Education cloud suite has such features as Google Apps, Google Docs, classroom, management system email service, productivity applications like Google Docs, Google Drive collaborated storage, web creation, ads and hosting (Google, 2016). A research done at King Fahd University of Petroleum and Mining in Saudi Arabia in 2016 identified that the primary purpose of Google Education Cloud was email, collaboration and storage services. Google Apps were also used to store non-sensitive information. The resulting cumulative savings to the university amounted to £ 1,000,000 (Tashkandi & Al-Jabri, 2016).

A study at the Qassim University's College of Engineering identifies efficiency factor as one of the resultant gains from adoption of cloud computing (Sultan, 2010). The

college adopted a virtualization environment a key feature towards achieving cloud computing. The achievements were echoed by similar studies in technical colleges in developing African countries such as Ethiopia, Kenya and Nairobi (Sultan, 2010).

3.0 Methodology

The researcher conducted the research based on Technology Organization Environment model to assess the adoption of cloud computing and contributing factors at institutional rather than personal level. The table below represents the model construct used in this research. It's an exploratory cross sectional quantitative study.

Table 1.0 Factors influencing cloud computing adoption and usage among technical colleges in KSA

Construct	Definition of construct
Privacy Concerns	Threat of security breach by accident, omission or other such vulnerability
Complexity	How difficult does the technical colleges' staff, managers and students perceive cloud computing?
Government influence	Refers to the governments' incentives, efforts and mitigations to assure uptake and use of cloud computing by the technical colleges
Relative advantage	Refers to the extent of an innovation being perceived better than others that it supersedes.
Vendor lock in	Refers to the potential threat of customer being fixed to the same cloud computing vendor without the ability to switch to another
Regulatory Policies	Represents government sanctioned or imposed policies, reference and regulations on cloud computing
Peer Pressure	Refers to the ecosystem's influence over the operations of the technical college. Assessed via such parameters as relationship with universities and colleges in the same line of research and education
Top Management Support	Captures the top brass' attitude towards relevant tech and their level of support dedicated towards adoption.
Organization size moderator	Assessed based on the number of students enrolled, staff members on board and courses on offer. Variably consider date college was established.

Questionnaires were distributed in public places that included technical colleges, shopping centers and government offices. Out of 80 questionnaires distributed the researcher received 52 responses and certified them complete and valid for the study. Twenty eight responses were declined because, based on the demographic information, they were answered by non-key informants.

3.1 Technology, Organization Environment (TOE) Strategy

Haag and Eckhardt (2014) define TOE as taxonomy of features inhibiting and facilitating adoption of new technologies. It is relatively advantageous over innovation diffusion because it considers the environment, organizational and technological factors (Alshamaila et al.,

2013: Oliveira & Martins, 2010). The approach was previously used in research areas such as e-business, internet use and open system.

The approach has been applied previously in cloud computing research in developed worlds such as the USA. Such studies identify compatibility, relative advantage and top management support as significant contributors to the IT managers' interest in cloud computing and its adoption (Taweel, 2012). The size of the institution did not contribute significantly towards determining cloud computing adoption.

3.0 4.0 Results and Data Analysis

Data analysis for the purpose of this article has four sections, namely: descriptive statistics analyzing the frequency and understanding the nature of the respondents, model analysis, moderator variable analysis & open ended questionnaire analysis. The researcher adopted the Partial Least Square analysis approach to test the following hypothesis.

4.1 Hypothesis Testing

First Hypothesis

Ho: Cloud computing technology is not flexible, reliable, and effective and enhances service delivery in technical colleges.

Ha: Cloud computing technology is flexible, reliable, and effective and enhances service delivery in technical colleges.

The table below indicates results of t-test

The result of negative hypothesis	SIGT(T) as in table	(T) as in table	(T) as calculated	
Ho				
Refusal	0.00	2.3561	10.347	

T-test outcomes indicate that the figure of T when calculated was 10.347. This interprets that it is greater than the figure tabulated. Reject Ha if the figure calculated is less than figure tabulated and vice versa

In this case, Ha is accepted and Ho rejected showing that cloud computing is reliable, flexible and enhances service delivery to the institutions that have adopted this technology. Cloud computing plays a vital role as it increases engagement among students, and employees who works at various offices. It is an innovative tool that solves problems in technical colleges, businesses and in government offices. Students are able to access college data and information online. Information that is online can be accessed at any time and from anywhere. It also enhances communication among employees where they chat and meet online. From the study cloud computing is effective as it improves skills and enables adopters to keep themselves with the requirements of contemporary world. It's also enhances cooperation among the users.

Second hypothesis

The second hypothesis was tested using ANOVA test

Ho: Adoption of cloud computing is not characterized by several problems for trust, privacy and security

Ha: Adoption of cloud computing is characterized by several problems for trust, privacy and security.

The table below shows results of ANOVA test.

Ho results	F abstract Values	F tabulated Value	F calculated Values
Refusal	0.000	2.4	8.345

The calculated value is 8.345 which is greater than the tabulated values 2.7

Rule: If the calculated figure is less tabulated value, we accept Ho and reject Ha

Therefore, we reject Ho and accept Ha. This means that cloud computing adoption exposes institutions and businesses to various risks. Despite of eminence benefits of cloud computing, it poses serious problems in term of trust, privacy and security. These are similar problems with outsourcing. Some of the measures that are available to institutions and businesses to assist manage trust, security and privacy problems resulting in adoption of cloud computing might be less effective. These challenges results from the complexity of evaluating and formulating risks control measures across the legal, institutional and technological boundary between cloud user and service provider. This research study finds that cloud computing technology is relatively new to many users; thus, it is problematic to discuss specific terms and conditions with the service provider. The survey identified several problems such as regulatory and legal framework concerning data protection and privacy, cybercrime, and privacy rule relating to electronic communication.

4.2 Discussion

Relative advantage construct was dissected into “personnel reduction”, “agility” and “cost saving” factors prior to hypothesis testing aimed at increasing the degree of composite reliability. This construct was identified as significant in evaluating adoption of cloud computing among technical colleges. It was more imminent among adopters of the system than non-adopters. Out of 52 valid responses, 28 respondents indicated that their respective colleges, offices and business have adopted cloud computing technology. This represents 54%, indicating that there is a high number who have not yet adopted this tech. There were 24 respondents from non-adopters, representing 46 percent.

Data privacy concerns associated negatively with adoption of cloud computing among the technical colleges. According to the statistical results, 26 respondents (95%) of adopters of the tech were nonchalant with the level of concern associated with privacy risks in contrast to 19 respondents (90%) non-adopters. This is because adopters of the tech indicated that they had implemented risk mitigation measures such as Service Level Agreement with cloud computing service providers. The two respondents from the adopters of the system and the 5 responses from non-adopters were not aware of risk mitigation measure.

The 24 non-adopters respondent confirmed the negative association of cloud computing adoption with complexity whilst 80% of business, government offices and colleges with cloud computing regarded it as efficient and less complexes. Out of the total accepted responses, 24, 13 and 15 respondents come from colleges, government institutions and businesses. The results showed that out of 15 businesses, only 5 colleges had adopted the tech while 10 were non-adopters. Cloud computing non adopting from businesses and government offices perceived it as complex due to insufficient IT skills and resources to assess the tech. One respondent from a government office indicated that they even do not have an IT department. They outsource IT services when the need arises. The 83% of users (20 respondents) regarded insufficient Saudi Law to protect them, especially when using cloud computing partly because of service level trust between users and service providers.

Also, all respondents from the adopters of clouding computing (28 respondent), indicated that this tech is cost saving, highly reliable and manageable. Respondents from non-adopters have expressed about insecurity and limited control because the system is managed and monitored by the service provider.

ANOVA tests and discriminant analysis confirmed uptake of cloud computing among more established and larger technical colleges than government office and businesses. Businesses perceived cloud computing as complex and incompatible with their small size. Besides, they were concerned with vendors lock in issue. A big number of respondents from colleges (84 %), larger technical institutions were more inclined to adopt cloud computing because other larger technical institutions had adopted. From the analysis, it was apparently clear that cloud computing adoption level in technical colleges in Saudi Arabia was 80% and was expected to roll even higher in future.

4.0 5.0 Conclusion

The study targeted technical colleges, government offices and shopping centers in Saudi Arabia and their adoption, use and the future of cloud computing in these institutions. The researcher obtained a relatively high response rate, which contributed to the high external validity of this study. Employees and staff from larger institutions are more experienced and skilled compared to a huge number of people from business settings and government offices. From this research, it is clear that advantages of cloud computing weighs associated disadvantages. Therefore, I would recommend that Technical colleges in KSA especially smaller institutions, government offices and businesses to invest in future technologies to enhance service delivery and low operations cost. The potential of cloud computing uptake and success in the near future in KSA is also high. Consequently, these institutions should introduce information systems related training to provide sufficient and buffer skills and human resources for the new technology.

It is crystal clear that adoption of cloud computing in technical colleges, government offices and businesses poses security threats. Hence, it is essential before the adoption or implementation of this technology to other institutions security terms and condition should be negotiated with the service provider.

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