



The Study on Awareness and Adoption of Cloud Computing by Academics in Sri Lankan Universities

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Abstract: *The main objective of this study is to understand the level of awareness and adoption of cloud computing by the academic staff in Sri Lankan universities. This study aimed at investigating the level of awareness of this emerging technology and the extent that they use cloud computing, and the reasons for adoption and non-adoption. The study found that two-third of the sample respondents are not aware of cloud computing. The level of adoption is limited to several applications, namely Google Apps Engine and Dropbox. Cost and time saving were stated as the reasons for adoption and the lack of benefits and security concerns were stated as the most important drivers for non-adoption. Although 78.4% of the respondents stated to be aware of cloud computing, but only 14% confirmed they are very knowledgeable about it. Considering the benefits that cloud computing could offer to organizations, this trend provokes for more involvement from the government and cloud computing service vendors to further promote this technology to the universities.*

Keywords:

I. INTRODUCTION

The recent many cloud computing adoption studies by many organizations in different sectors stated that although users realized the opportunities available from the cloud technology, the adoption of the technology is still very low (Aboelmaged, 2010). Therefore, identifying the factors of cloud technology adoption, especially at the user level, has become paramount importance, hence received much attention from researchers (Ekufu, 2012). Thus, Williams (2010) argued that the most reported barriers for cloud adoption are the issues of security and trust. Other commonly reported factors, as highlighted in Shimba, (2010), include the dilemma in recognizing the benefits and the cost of shifting to cloud, the legal compliance issue, and the organizational impact as a result of the adoption.

Although many advantages and opportunities could be realized from the adoption of cloud computing, the level of adoption by different people and organizations varies in scale. Further, there have been lesser number of researches in this area (Jäättmäa, 2010; Obeidat & Turgay, 2012; Sriram & Khajeh-hosseini, 2008). Most of the prior research had mainly focused on the adoption effect to the firm and also the technical issues inherent in cloud implementations (Obeidat & Turgay, 2013). Other notable cloud issues which were studied were cloud architecture (Saya, Pee, & Kankanhalli, 2010), cloud applications (Liu & Orban, 2008), cloud cost benefits (Dillon, Wu, & Chang, 2010) and cloud adoption process (Alshamaila, Papagiannidis, & Li, 2013). However, none of those studies were done in Sri Lanka. Hence, this study in the context of the adoption by the university academics is a paramount considering the significant contribution to the higher education and the economic development of this country.

The objectives of this study falls in to two dimensions. At first, it investigates the level of awareness and adoption of cloud computing by the academic staff of Sri Lankan national universities. And then, it explores the reasons for adoption and non-adoption of the technology. The study is considered to be important for several reasons. The research findings would contribute to the existing literature base and research on cloud computing adoption in the context of academic environment. The study also offers practical insights to the cloud computing developers and vendors some ideas on the level awareness of cloud computing so that more initiatives could be implemented to further enhance its acceptance and adoption. As information and communication technology sector represents one of the key economic areas of the country, the finding of the study provides important indicator on the extent of technology utilization by the academics in Sri Lanka. Since academics are considered to be important people in the areas of teaching and research in a country, their level of awareness on cloud computing and its adoption would enhance the university education and would get the attention by the government to give priority this technology.

This research paper is organized as follows. The next section discusses the relevant literature, followed by the research methods section. The findings are discussed in the fourth section. The final section concludes and provides recommendations for future studies.

II. LITERATURE REVIEW

Many definitions and explanation given to the term Cloud Computing from different perspective. Cloud computing can be defined as “a model for enabling convenient, on-demand network access to share pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell & Grance, 2009, p.1). Cloud computing is perceived as an emerging technology and new paradigm for conducting the business (Leimeister, Leimeister, Knebel, & Krcmar, 2009; Lyer & Henderson, 2010). The cloud computing service model are categorized in to three categories based on the user requirements, they are infrastructure as a service (IaaS), where users have control over the operating systems, storage, network and applications; platform as a service (Paas), where user have the control over applications but not over the infrastructure; and software as a service (SaaS), where users only access services from the service provider and no control over the applications or infrastructure. The type of cloud deployment model also has been divided into either public cloud (non-exclusive) and private cloud (exclusive) or hybrid (Mell & Grance, 2009; Shimba, 2010). The applications cover a wide range of areas inclusive of word processing, social media, project management, email, web development, data storage, accounting, file hosting, and note taking.

Cloud computing provides many benefits include creating economies of scale by waiving the upfront cost for infrastructures acquisition hence leads for cost saving (Shimba, 2010). It allows enterprises to scale down and give more focus to business areas and activities as information system and technology had been taken care of by the cloud vendors. This model of computing environment is very much suitable for universities, which do not have the enough resources in terms of money, time, and expertise (Wymer & Regan, 2005). Most of the national universities in Sri Lanka run cloud applications such as Google Apps for education and Microsoft 365, Cloud based University Management System etc. Many applications like word processing, spreadsheets, presentations, databases and more could all be accessed via a web browser and the software and files are retained in the cloud. Educational institutions can utilize the advantage of cloud applications to provide students and teachers with free or low-cost alternatives to expensive, proprietary productivity tools. Further, browser-based applications are also accessible with a variety of computing devices including mobile platforms, making these tools available anywhere in the Internet and can be accessed (Mohammed Al-Zoube, 2009).

Sri Lanka government also Only recently, Sri Lanka Government has launched first ever cloud platform services. However, organizations in the private sectors have already started to adopt the cloud services.

III. RESEARCH METHODS

This study is descriptive in nature and self-administered survey questionnaires were used to gather data. The questionnaire was divided into three parts. The Part A consisted questions relevant for respondent's demographic profiles. The Part B contained the questions related to the awareness of cloud computing services by the academic and related reasons for non-adoption by the respondents who choose ‘NO’ as their answer for awareness. The Part C consisted the questions that required the respondents to indicate the cloud computing services that they use from the list provided and their plan to use cloud computing services in the future. This part was answered by respondents who choose 'YES' for the awareness of cloud computing. The questionnaires were distributed to 200 randomly selected academic staff in the Sri Lankan national universities through the research assistant. The academics who are chosen as the sample are involved mostly in teaching and researching computing related subjects in different universities. Of the 200 questionnaires that was sent, 125 were completed and returned (62.5% response rate) and they were used for further analysis.

The demographic profiles of the respondents are as follows. A total of 72% of the respondents are Male, and in terms of race distribution, 65% are Sinhalese, 23% are Tamils and 12% are Muslims. Most of them are degree holders (85%) with experience of less than 5 years in the field (55.2%). Less than half of the practitioners are the members of professional bodies (38.9%) and, professional membership was mostly from IEEE and Computer Society Sri Lanka. Finally, only 21.6% of the respondents said that they are using cloud computing for different purposes.

IV. FINDINGS

Out of 125 respondents, 78.4% (98 respondents) said that they are aware with cloud computing. The study further evaluated the difference in the awareness level across demographic profiles. The result has been shown in Table 1. Based on the table, awareness with cloud computing is higher among the PhD and Masters holders. However, this could be due to small representative of the respondents from the academics.

Table 1. Level of respondents' awareness with cloud computing.

| Respondent profile | | Yes (1) | | No(0) | |
|--------------------|--------------|---------|------|-------|------|
| | | Freq | % | Freq | % |
| Gender | Male(72%) | 68 | 29.1 | 171 | 70.1 |
| | Female (28%) | 30 | 32.9 | 57 | 67.1 |
| Ethnicity | Sinhala | 63 | 29.7 | 148 | 69.8 |
| | Tamil | 25 | 33.3 | 49 | 65.3 |
| | Muslim | 11 | 28.9 | 27 | 71.1 |
| Level of education | Certificate | 3 | 21.4 | 11 | 78.6 |
| | Diploma | 4 | 13.8 | 25 | 86.2 |
| | Degree | 85 | 30.4 | 187 | 69.3 |

| | | | | | |
|--|---------------------|----|------|-----|------|
| | Master | 8 | 66.7 | 4 | 33.3 |
| | PhD | 2 | 66.7 | 1 | 33.3 |
| Member of professional bodies | Yes | 41 | 32.0 | 86 | 67.2 |
| | No | 55 | 27.8 | 142 | 71.7 |
| Years of experience in computing field | Less than 5 years | 58 | 33.1 | 117 | 66.9 |
| | 5 years to 10 years | 17 | 23.9 | 52 | 73.2 |
| | More than 10 years | 14 | 32.6 | 29 | 67.4 |

The Table 2 displays the reasons for non-adoption, arranged from the most important to the least important for the respondents who choose 'NOT AWARE' with cloud computing, the most important reason for not using cloud computing is the belief that they do not need the technology. This can be seen from the answer 'Frankly I have never thought about using/not using cloud computing (48%) and 'Because I don't know exactly what can I do with cloud computing' (41%). This means that the respondents do not feel that using cloud computing bring any significant benefits to them. This is followed by the issue with data security with the perception that data might be hacked for illegitimate purposes (see Reason No. 4, 5, and 7 in Table 2). The table also shows that the issue of trust and internet availability is regarded as the least important reason for non-adoption.

Table 2. Reasons for not using cloud computing (n = 230).

| Reason | Freq | % |
|---|------|------|
| Frankly I have never thought about using/not using 'cloud computing' | 109 | 47.8 |
| Because I don't know exactly what can I do with 'cloud computing' | 93 | 40.8 |
| Just don't feel OK about it (a general feeling of skeptic) | 84 | 36.8 |
| Because when the confidential data can be disclosed and published, the data on internet can be accessed easier by hackers | 83 | 36.4 |
| Because I do not trust any of Internet-based services which may be attacked by a group of hackers to steal data | 45 | 19.7 |
| Because using 'cloud computing' is not popular and I am not sure about its future that can be succeed/failed | 32 | 14.0 |
| Because I always think that the owners of Internet can always control and fetch my data whenever they want | 28 | 12.3 |
| Because I don't need 'cloud computing' | 21 | 9.2 |
| Because I don't trust 'cloud computing' | 12 | 5.3 |
| Because I don't have access to high speed internet to be able to use 'cloud computing' | 12 | 5.3 |

Further questions were asked to the 98 respondents who claim to be familiar with cloud computing. Although not tabulated here, a total of 46.4% of the adopting respondents claimed that they use cloud computing at their work place as 20% on voluntary basis and less than 9% were just figured out its capability. This study offered a list of cloud services/applications for the respondents to determine their usage level. As depicted in Table 3, Google Apps Engine represents service with the highest usage among the respondents (48%), followed by Dropbox (15%). This could be due to its multifunction and storage features and capabilities. Six items listed were not even chosen by the respondents. To further understand the adoption of cloud computing, the adopting respondents were asked to rank several reasons for their adoption of such technology. The results is depicted in Table 4. The most important reason is low cost (35%) and current update of the system itself (36.4%). This is followed by speed on deployment time (26.4%) and the audit and evidence gathering (23%).

Security reason is ranked fifth. However, this is agreed by a small group of respondents (18.7%). Hence, this provides support to the reason of non-adopters of cloud as they are very much concerned with the security issues.

Finally, more than half of the respondents (57.7%) agree that cloud computing may cause a radical shift in information technology innovation. They also feel that this new technology concept will quickly evolve and may face a maturity stage in the near future (63.4%). Respondents also agreed that the current on demand offering by cloud service providers are appropriate to accommodate current business demand (63%).

Table 3. Public Cloud Services (n = 98).

| Cloud application | Freq | % |
|-------------------------|------|------|
| 1. Google Apps Engine | 47 | 47.5 |
| 2. Dropbox | 14 | 14.1 |
| 3. Amazon Web Services | 9 | 9.1 |
| 4. Microsoft SkyDrive | 7 | 7.1 |
| 5. Success Factors | 2 | 2.0 |
| 6. VMware | 2 | 2.0 |
| 7. Salesforce Force.com | 2 | 2.0 |
| 8. Terramark Cloud | 1 | 1.0 |
| 9. OpenStack | 1 | 1.0 |
| 10. Rackspace Cloud | 1 | 1.0 |

Table 4. Reasons for using cloud computing (n = 98).

| Items | Frequency | % |
|---|-----------|------|
| 1. Lower costs (Saving money through lower total costs and reduced upfront investment) | 38 | 38.4 |
| 2. Updates (timely patches, updates and security settings can be rapidly rolled out or adjusted) | 36 | 36.4 |
| 3. Speed to deploy (Time to develop, test, deploy, and procure components goes down with clouds) | 25 | 25.3 |
| 4. Audit and evidence-gathering (clouds can readily analyze possible breaches and generate logs) | 22 | 22.2 |
| 5. Better security (Access to a cloud provider's security infrastructure) | 19 | 19.2 |
| 6. Elasticity (The ability to grow and shrink capacity with demand) | 18 | 18.2 |
| 7. Wide set of services (Cloud providers offering additional services such as message busses, mailing and payment systems, image manipulation, and large-scale storage) | 17 | 17.2 |
| 8. Resources concentration (cheaper and easier to control access to one large facility than many smaller ones) | 17 | 17.2 |
| 9. Just like clouds (Generally positive feeling about utility computing) | 9 | 9.1 |
| 10. Standardized interfaces (large cloud providers can offer a standardized, open interface to managed security services providers) | 9 | 9.1 |
| 11. Resilience (ability of clouds to reallocate resources for authentication, encryption, etc) | 7 | 7.1 |
| 12. Market differentiation (Security concerns motivate providers to improve security practices) | 5 | 5.1 |
| 13. Scale (advanced security measures are more affordable when done on a large scale, allowing cloud providers to invest more in security) | 4 | 4.0 |

V. CONCLUSION

The objective of this study was to understand the level of awareness of cloud computing among academic staff in Sri Lankan national universities and found the slow adoption of cloud computing services by the academic. Further, the study also examined the reason(s) for (non)adoption of cloud computing. The findings showed that the two-third of the respondents were not familiar with the technology and the lack of knowledge on cloud computing hindered the academics from utilizing the advantages potentially offered by the cloud computing services. These findings are very important for the cloud computing service vendors and the government of Sri Lanka to devise strategies to promote the use of cloud computing for their academic environment.

Although, the cloud computing service providers had made a huge amount of investment for the development of cloud architecture, the necessary steps must be taken to educate the users in order to fully utilize the technology. As stated in the theory of diffusion of innovation, the advantages of technology can only be experienced if the technology is diffused and used. Hence, more efforts in educating both the academic staff in Sri Lankan national universities should be taken. 33% from the total respondents stated that they are aware with cloud computing but somewhat reluctant and not really aware of it. Although the respondents use cloud computing mostly in their daily routine at work and home, they agreed that cloud computing services offers lower acquisition and maintenance cost as compared to a normal software. This is further supported in the arguments of low cost by Sahandi et al. (2013). However, it could be confirmed that academic staff perceive the cloud computing as an emerging technology that going to dominate the computing world.

Since this study is a descriptive in nature, more researches need to be carried out further to investigate the adoption barriers, challenges and the adoption process of cloud computing. Moreover, further research could be carried out in measuring the post implementation impact of cloud computing at both business process and organization's performance to support the assumption of cost saving resulting from the adoption of cloud computing. As this research only focuses on academic staff of the university system in Sri Lanka, future in-depth research could be carried out to study the whole levels of staff (Academic, Academic Supportive, and Administrative Staff) and considering many other influencing factors to see the level of adoption of cloud computing in order to contribute to both to the theoretical and practical advancements of this new technology.

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