

Factors Influencing Cloud Computing Adoption by SMEs in Eastern Region of Sri Lanka

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Abstract. The paper presents the factors influencing the adoption of cloud computing in SMEs. ICT provides potential to SMEs because it seeks an innovative way to explore their business globally. To conduct this research, eastern region's 50 SMEs were selected and categorized into Small, Medium and large according to their capital intensity, turn over and number of employees. All together 13 small enterprises, 17 medium enterprises and 20 large organizations were examined to arrive at the conclusions. Four variables were selected from the Technology–Organization–Environment (TOE) Framework such as firm size, top management support, security concern and technology readiness. Data were collected through the questionnaire and direct discussion. The finding shows that there is a positive relationship among the variables and willingness to adopt the cloud computing in SMEs. The significant impact was identified to adopt the cloud computing is top management support and technology readiness.

Key words: Cloud computing, Security Concern, Enterprises.

1. Introduction

Cloud computing is an inventive method to do the business through the internet. Now a day many organizations turned their sights to adopt cloud computing in their business. There are many factors influencing the adoption of clouding computing in the organization. Cloud computing provides information technology (IT) infrastructure, platform, and various applications via the Internet with minimum start-up cost, network access to a shared pool of configurable computing resources [1],[2]. The TOC frame work used by the implementers to analyze the feasibility of adoption. Many large companies got success in this process. Now their concentration bowed to adopt this in SMEs. The adoption helps to SMEs to reduce the cost, increase the efficiency and quality market reach. Cloud computing has significant impact on SMEs at the same time it has more barrier such as limited capital, shortage of skilled labor and lack of number of IT infrastructures.

SMEs is a key driver of the Sri Lanka's economy. Cloud computing is a disruptive technology that has the potential to enhance collaboration, agility, scaling, and availability, and provides the opportunities for cost reduction through optimized and efficient computing [3].

In present, government and private sectors are searching to find a best solution to improve efficiencies of SMEs in Sri Lanka and these SMEs play a major role in uplifting the economy of the country as well [4]. They believe that adoption of cloud computing will be the solution to overcome the challenges faced by SMEs. It will give more competitive advantages to act the

changing market condition of SMEs. Various theoretical models and methodologies are used by researchers to assess important factors influencing adoption of cloud computing by SMEs. This research aims to find out the significant factors influencing the adoption of cloud computing in SMEs. This study integrates three theoretical frame work to find out important factors affect the adoption in Sri Lanka's SMEs. Such as organizational context, innovative characteristic and technological concern.

2. Literature Review

According to the Pragati, Cloud computing is an universal topic in recent years. Cloud computing provides the benefits to the SMEs because of size, resource, IT expertise. Even though transferring internal Information Technology data and applications to the cloud gives a big challenges and risk to the SMEs. Further they need to concern Security, confidentiality, auditability, regulatory compliance before adopting any technology. Migrating data, applications or services to the cloud exposes a business to a number of new threats such as vulnerabilities and compatibility problems. In addition, SME increases a number of issues: Protection of Critical Infrastructures; Information Assurance and Trusted Computing; Privacy and Freedom of Information; and Laws and Regulation of IT Security. Hardware, software, operations, help desk, and back up are conducted by cloud vendors. Also software as a service, software development and platform control are managed by the vendors. Addressing these issue can develop a way forward for more and more SMEs to adopt Cloud computing. Current market is characterized as being very competitive. Therefore, for companies who want to survive, it is essential to adopt innovations [5].

Being an important area for IT innovation and business investment the adoption of cloud computing has received increasing attention in both practice and research [6]. Many researches are done by authors in different perspective of cloud computing. These authors have employed different theoretical models, factors, and data analysis techniques to better understand the adoption of cloud computing at firm level. Limited studies are found on cloud computing adoption by SMEs. TOE framework and DOI theory are used most frequently in the research on cloud computing adoption by SMEs. A recent research reveals the most successful areas of business improvement as a result of cloud computing implementation, wherein the enhancement of business performance and service automation as well as cost reduction has been positioned in the top. This research tries to investigate three factors such as innovative characteristics, Technological characteristic and organizational context. Technology context from the TOE framework is used to check the technology readiness of the SME for adopting cloud computing. Organizational context investigates the role of top management and firm size in cloud adoption decisions. The innovative characteristics has the major determinants such as relative advantage, compatibility, and security concern. Relative advantage of cloud computing for SMEs is described in the form of cost advantage, easy deployment and maintenance, improved scalability and business continuity [7].

Cloud computing lets enterprises to get their applications to run the program very faster with good utilization of resources and less maintenance, and enables to encounter fluctuating and unpredictable business demand. Cloud computing dramatically reduce the fixed costs of initial investment and day to day operational activities. This will have a positive impact on entry and competition in all. But for many organizations, in a short period of time may not be possible to make the transition to cloud computing, particularly as the cloud market is so new [8]. Adopting cloud computing is providing many advantages in SMEs. They are Flexibility, increased

collaboration, automatic software updates, document control, security, competitiveness and disaster recovery [9].

The organizations are gaining more experience in the cloud and they start to shift more core business functions onto cloud platforms. Because of this fact, we are seeing that cloud adoption is significantly more complex than we imagined initially, particularly in terms of data management, system integration and the management of multiple cloud providers [10]. There are different cloud delivery models available such as Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS). Software-as-a-Service (SaaS) can be explained as a process to get the different software applications provided by the Application Service Provider (ASP) as a charge over the Internet leveraging cloud infrastructure [11].

Over the years, the adoption of Cloud computing was slower due to various reasons such as mobility, bandwidth, the fear of losing control, security, privacy, data protection, performance and uptime, lack of Cloud business brokers, and unawareness [12]. The economic benefits of this wider acceptance to adopting Cloud computing are enormous and many companies have embraced Cloud computing now. Over the years, technology emergence has helped to enhance the growth of Cloud computing, but the growth had not been as per expectations in the beginning era of the cloud computing [13].

3. Research Methodology

The research was conducted to find out the significant factors in TOE frame impact the adoption of cloud computing in SMEs in eastern region of Sri Lanka. For this purpose there are four variables were selected such as security concern, technology readiness, top management support and firm size. Eastern region's SMEs were selected in different sectors which are manufacturing, beverage, electronic and electrical, Pharmaceutical and biotech, educational sectors, sea food production and agro production. These are categorized by large firm, medium firm and small firm according to their capital intensity, number of employees and production capacity. There are several methods used to gather the information for instance, observations of the process, inquiries and formal discussion with employees and management, issuing questionnaires and referring the past records of the firms. From those many opportunity and risks identified in internal and external environment of the SMEs.

3.1 Research Model

According to the TOE model the following variables are identified to find out the significant variable that influence the adoption of cloud computing in SMEs.

According to the literature review the hypothesis are developed as follows:

- H1:** Top management support is positively influences to adopt the cloud computing in SMEs.
- H2:** Firm size is positively influences to adopt the cloud computing in SMEs.
- H3:** Technology readiness is positively influences to adopt the cloud computing in SMEs
- H4:** Security concern is positively influences to adopt the cloud computing in SMEs.

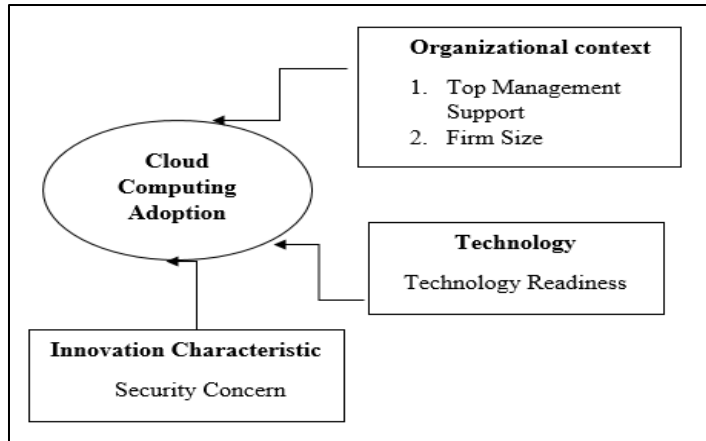


Fig 1: Research model

4. Data Analysis

Data collected from 50 SMEs in eastern region of Sri Lanka and analyzed by using SPSS software. Regression analysis, correlation and reliability test has been done to come conclusions. The research was conducted among the 50 SMEs. In that 13 Small enterprises, 17 medium firms and 20 large firms were selected. The below table shows the frequencies and percentage of participants.

Table 1: Details of SMEs in the Survey

	Frequency	Percent	Valid Percent	Cumulative Percent
Small	13	26.0	26.0	26.0
Medium	17	34.0	34.0	60.0
Large	20	40.0	40.0	100.0
Total	50	100.0	100.0	

The pie chart shown in Fig 2 illustrates the willingness to adopt the cloud computing in SMEs. 32% of firms strongly agree to adopt cloud computing, 30% of firm agree to adopt cloud computing, 22% of firms are in middle level whether they adopt or not and remaining 16% firm disagree with adoption.

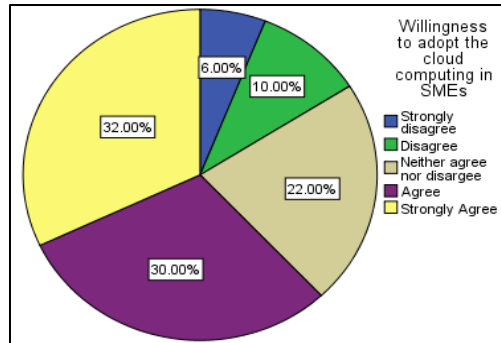


Fig 2: Willingness to adopt cloud computing

According to the chart, 62% of SMEs interested in adoption of cloud computing because of high local competitions, global market access and consumer purchasing patterns change to online based shopping. So they target the global market to expand their business internationally. This reason emerged them to adopt the cloud computing.

Table 2: Correlation Analysis

		Willingness to adopt the cloud computing in SMEs
Willingness to adopt the cloud computing in SMEs	Pearson Correlation	1
	Sig. (2-tailed)	
	N	50
Technology Readiness	Pearson Correlation	.845**
	Sig. (2-tailed)	.000
	N	50
Top management supports	Pearson Correlation	.915**
	Sig. (2-tailed)	.000
	N	50
Security concern	Pearson Correlation	.795**
	Sig. (2-tailed)	.000
	N	50
firm size	Pearson Correlation	.602**
	Sig. (2-tailed)	.000
	N	50

** . Correlation is significant at the 0.01 level (2-tailed).

The above correlation table shows the summary of correlation analysis of the variables. In this research mainly focusing the factors that influences in SMEs to adopt the cloud computing. Four independence variables selected in this analysis, such as top management support, firm size, security concern and technology readiness. The dependent variable is willingness to adopt the computing in SMEs. From pearson correlation analysis all four factors are positively influence the adoption of cloud computing. The correlation between technology readiness and willingness to adopt cloud computing is 0.845, it shows the strong positive correlation meanwhile if the firm has enough technological capacity such as technical expert, hardware software capacity they prefer to adopt cloud computing.

The top management support is important factor that influences the adoption of cloud computing. Because the top management wants to take decision regarding the capital investment and organization structural changes.

If there is resistance to change it is impossible to adopt the new technology in the firm. The correlation of the top management support is 0.915 it shows high strong positive correlation. It is highly influences than other variables. SMEs panic to adopt the cloud computing because of security issues, if the cloud computing provides enough security to protect their data then they are willing to adopt the cloud computing. The table shows high strong positive correlation and that is 0.795. The firm size has moderate influences in the adoption. Its correlation value is 0.602 which is a moderate positive correlation.

4.1 Regression Analysis

The regression analysis specify the relationship between dependent variable and independent variables. Linear regression analysis has done to find out the influences on dependent variable. The research outcomes as follows:

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.963 ^a	.928	.922	.297

Table 4: ANOVA Analysis

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	51.024	4	12.756	145.090	.000 ^b
Residual	3.956	45	.088		
Total	54.980	49			

The output indicates, R² value (0.928) that is 92.8% of variance in willingness to adopt cloud computing could be explained by collective independent variables such as technology readiness, firm size, security concern and top management support. The significant value is 0.000, it is lesser than at the 0.01 significant level so null hypothesis is rejected and alternative hypothesis is accepted.

5. Conclusion

The aims of this research is to analyze the significant factors that influences in the adoption of cloud computing in SMEs. The data were collected from the 50 SMEs in eastern region of Sri Lanka by using the questionnaires and direct discussion with employees of the SMEs. There are 4 factors selected from the TOE frame work such as top management support, firm size from organizational context, security concern from innovative characteristic and technology readiness from Technology context. SPSS has used to analyze the data. Result shows that top management support highly influences in the adoption of cloud computing as well as technology readiness and security concern also influences in the adoption. According to the regression analysis R^2 values is 0.928 and the significant value is 0.000 that lesser than the significant level 0.001. So that null hypothesis were rejected and alternative hypothesis were accepted. According this we can conclude that the above four factors positively influences in the adoption of cloud computing.

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