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Cloud Computing: An Exploratory Study on Adoption among SME Clusters in Bangalore and Mysore

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Abstract

The constant evolution of computing has helped businesses to automate and innovate, providing them a competitive advantage in the global marketplace. Nevertheless, with the coming of the Cloud, organizations are once again at the crossroad of technology. Early adoption of the Cloud can provide organizations with an opportunity to transform their business models and gain a competitive edge. While cost reduction is one of the benefits, several other benefits accrue to organizations. This paper is aimed at exploring the need for adoption of Cloud computing in the electronic and print clusters in Bangalore and Mysore. To this end, we explore the factors that drive SME clusters to employ cloud computing while gaining additional insights by examining barriers to cloud computing. This study employs regression methodology to determine the significance of each identified factor with respect to adaptability of cloud computing among the SME clusters, thereby determining which of the factors can make an impact on the adaptability. The study conducted among two SME clusters in Bangalore and Mysore revealed that none of the factors had a significant impact on the adaptability, rendering the result not in line with potential suppositions.

Keywords: Cloud Computing, ICT Technology, SME Clusters

1. Introduction

SMEs are improving their performance and presence through cluster approaches. Lot of study has been engaged in determining factors that enhance the information and communication technology among the SME clusters.

The Indian economy is expected to grow by over 8 per cent per annum until 2020 and can become the second largest in the world, ahead of the United States, by 2050, and the third largest after China and the United States by 2032. Small and Medium Enterprises (SMEs) constitute 6 per cent of GDP, 34 per cent of national exports and account for the employment of more than 30 million people.

SMEs have improved their performance and presence through industrial cluster approaches. In this study, two clusters in Karnataka which have been sanctioned the Special Purpose Vehicle (SPV) by the government have been taken as sample study[4]. CDP or Cluster Development Programme contributes to overall performance and collective efficiency of small and medium enterprise clusters, under which the SPV granted clusters are chosen to be beneficiaries of various government schemes. Information and Communication Technology is one of the agenda for which Karnataka Council for Technology Upgradation will be a monitoring agency.

It is argued that the diffusion of Information and Communication Technologies (ICTs) is changing the way by which companies compete and succeed the business models, and the value-creating processes. New opportunities are taking place both to create new ventures and to modify the existing businesses[3]. These changing processes are due to the ICTs' capability to transfer, collect, manage a great amount of information and to reduce the space and time barriers. Therefore, firms may reduce the transaction costs of information-intensive activities by resorting to ICTs. These opportunities may especially favour Small and

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Medium Enterprises (SMEs) that in most cases operate in a dense network of inter-firm relationships and consequently manage a great amount of information[5].

Cloud computing follows IT's evolutionary logic, and has since become the predominant way of delivering and consuming IT infra-structure (computation and storage), middleware and applications. In our opinion, Cloud Computing is one of the fundamental transformations that as with the advent of the web will change how we communicate, do business and offer services[14,15].

2. Theoretical Background

Source 1

http://www.business-standard.com/article/companies/karnataka-to-develop-six-theme-based-industrial-clusters-113083000424_1.html

To promote use of Information and Communication Technologies (ICT) in the Indian MSME sector, GoI has initiated a programme with some clusters of MSMEs. The GoI has stipulated as ₹ 160 crore (approx.) for this scheme. Under this scheme, clusters that have quality production and export potential are identified for ICT intervention. E-readiness infrastructure, web portals and e-catalogues for the clusters are set up, skill development of MSME staff in ICT applications and preparation of local software solutions for MSMEs are undertaken to enhance their competitiveness. Networking MSME cluster portals on the National Level Portals in order to outreach MSMEs into global markets is also initiated. One such initiative called Project Vikas was undertaken by National Manufacturing Competitive Council (NMCC) in association with Microsoft India in Textile cluster Tirupur.

Source 2

Studies revealed that despite an elaborate and dynamic policy framework, the progress of Indian SMEs continues to be hindered by some of the basic constraints as poor credit availability, low levels of technology (hence low product quality and limited exportability) and inadequate or no basic infrastructure, both physical and economical[10].

Source 3

According to Venkataram & Parasher, IIM, Indore, the Indian experience discussed in their paper shows that the SME clusters could be significantly upgraded to enhance the levels of cluster productivity and participation in international markets. It is found that the successful clusters have been those that are able to respond to the changing demands of globalised markets in terms of quality consciousness, reliability, rapid delivery and price.

Source 4

Studies on scope of cloud computing for SMEs in India also indicated that 60% of SME are moving towards technology based infrastructure to increase productivity with reduction in their input costs. Traditional ERP becomes high cost for SME. Cloud computing would substitute ERP yet ensure cost efficiency[1]. Around 37% of the SMEs surveyed in the Bengaluru cluster revealed that high implementation cost acted as a major confining factor in implementing/upgrading technology[9]. There has been not much attention paid to factors that could impact the adoption of cloud computing. Hence it becomes relevant to explore a small set of variables that can impact adaptability of cloud computing specially among the SPV granted clusters. SPV is granted to clusters who are approved, based on a defined criteria of government agencies, to avail support services like funding for investments, funding for infrastructure, funding for personnel, technical services, provision for technology know how and provision for external services..

3. Research Model

The study engages 14 variables that would contribute to the adaptability of cloud computing out of which 13 are taken as independent variables and 1 factor becomes the dependent variable. The dependent variable is defined as adaptability to cloud computing while the independent variable comprises of internal and external factors. The external and internal factors are summarised into the Conceptual model (Figure 1)[11].

Determinants

External factors sketch out SME links with local and international markets, and the subsidies they enjoy as clusters, both with government and engaging institutions. External factors also encompass their areas that effect market orientation like customer orientation and competitor orientation. As internal factors, we investigate characteristics like firm age, share of educated employee, share of full time employee engagement in R&D, implementation of information systems and their interest level in Cloud as a solution.

Barriers to adopting cloud computing to gain more complete understanding of innovation in SMEs, we inquire

about obstacles and hampering factors. SMEs are expected to have more problems with barriers to innovation than large firms due to inadequate resources and expertise[11]. Lack of funds, lack of technology, and lack of qualified staff, high adoption costs and lack of awareness of technology comprised the factors for barriers[6].

Internal factors

1. Age of the firm

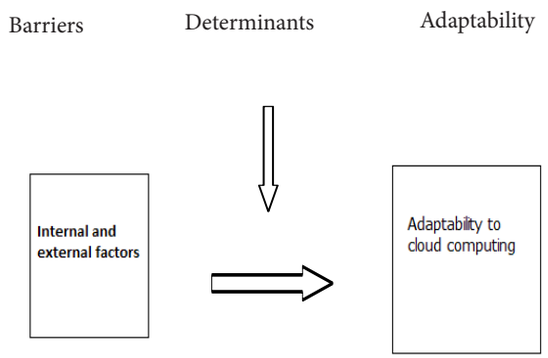

Figure 1. Conceptual model.

2. Turnover of the firm
3. Engagement in R&D
4. Percentage of qualified employees.

External factors

5. Web enablement
6. Information system in use
7. Awareness of cloud
8. Collateral subsidies enjoyed under SPV benefits.
9. Links with international market, national market or local market only
10. Adaptability to cloud computing
11. Factors that influence adoption of cloud computing a) Web connectivity b) Cost saving c) Speed and reached) Price and warranty
12. Customer orientation in terms of business objectives driven by understanding customer needs and giving attention to after sales support
13. Competitor orientation in terms of rapid response to competitor action and attention to competitor strategy.
14. Special purpose vehicle's support services like a) Funding of investment b) Funding of personnel c) Provision of infrastructure d) Technology know how e) Technical services f) Funding of external services.

4. Research Methodology

This phase of study comprises a survey held amongst two SME clusters, one being the Electronic cluster in Bangalore and other, the Print cluster in Mysore. These clusters were chosen because they were granted the SPV to enhance cluster modernisation and restructuring.

Exploratory research is done in attempting to understand practical problems at the small and medium enterprises at micro level, the level of innovation and the need for advancement in technology. A sample of 26 SME respondents of the electronic cluster in Bangalore and 17 respondents of print cluster were considered for the study. Responses were collected using electronic questionnaire and telephonic follow up was enabled with all 43 respondents. A structured questionnaire of 22 questions sought response through dual choices, multiple choices and Likert scale of 0 to 3, on a sequence of average, good and very good.

Factors 1, 2, 4, 9, 13 and 14 are ordinal while factors 3, 5, 7, and 10 are nominal (dichotomous- yes /no). Factors 6, 8, 11, 12 and 15 are nominal (continuous with multiple choices). The research methodology engaged is linear regression. It consisted of three steps. a) To compute correlations between the target variable (dependent here) (Table 1) and the 14 independent variables by bivariate correlation. b) To compute partial correlation between target variable and successive predictors (Table 2). c) To analyse the reduced variables with the target variable using linear regression method (Table 3). The reduced variables were derived out of partial correlation of successive independent variables correlated for controlled variables.

5. Results

Tables 1 and 2 outline the correlation of independent variables. Out of the fourteen variables, one is a dependent variable. Two factors, Age and Adaptability do not have significant correlation and hence get excluded from further analysis[7].

Turnover (V2) and Awareness of cloud (V7) have significant correlation (-.384). And so do Engagement in R&D (V3) and SPV Support services (V14) which is read at .323. Collateral subsidies (V8) negatively associates

Table 1. Bivariate correlation between adaptability and successive independent variables

		V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14
Age of firm	Pearson Correlation														
Turnover	Pearson Correlation							*							
Engagement in R&D	Pearson Correlation														*
Percentage of qualified employees	Pearson Correlation														*
Web enablement	Pearson Correlation								*						
Type of IS used	Pearson Correlation											*			
Awareness of CC	Pearson Correlation		*											*	
Collaborative subsidies	Pearson Correlation					*									
Links with market	Pearson Correlation													*	
Adaptibility to CC	Pearson Correlation														
Factors influencing CC	Pearson Correlation						*						*	*	
Customer orientation	Pearson Correlation											*			
Competitor orientation	Pearson Correlation							*		*		*			
SPV support services	Pearson Correlation			*	*										

*. Correlation is significant at the 0.05 level (2-tailed).

V1 to V14 are variables in sequence of the internal and external factors listed out in the vertical column.

with Web enablement (V5) reading coefficient at -.343. Links with market (V9) show significant correlation with Competitor orientation (V13) and Factors influencing cloud (-.368). While Factors influencing adoption of cloud computing related to three variables, i.e. Type of information system used, Customer orientation and Competitor orientation. (-.362, .382 & .317). Competitor orientation is significantly related to Awareness of cloud computing (-.308) yet questionable. SPV support services and Percentage of qualified employees were significant (.339).

Four significant variables (successive predictors) which had strong correlation with Adaptability were identified as Awareness of cloud computing, Factors influencing cloud computing, Competitor orientation and SPV support services. On applying partial correlation to the successive predictors for control variables which com-

Table 2. Partial correlation for successive predictors controlling for remaining independent variables

		Awareness of CC	Factors influencing CC	Competitor orientation	SPV support services
Awareness of CC	Correlation	1.000	.031	-.107	-.161
Factors influencing CC	Correlation	.031	1.000	.123	-.300
Competitor orientation	Correlation	-.107	.123	1.000	-.157
SPV support services	Correlation	-.161	-.300	-.157	1.000

Table 3. Linear regression explaining F values after partial analysis of four successive predictors

Model		Sum of Squares	df	Mean Square	F
1	Regression	.609	1	.609	11.442
	Residual	2.182	41	.053	
	Total	2.791	42		
2	Regression	.727	2	.364	7.048
	Residual	2.064	40	.052	
	Total	2.791	42		
3	Regression	.728	3	.243	4.591
	Residual	2.062	39	.053	
	Total	2.791	42		
4	Regression	.782	4	.196	3.702
	Residual	2.008	38	.053	
	Total	2.791	42		

Refer to IBM SPSS Base

F 1 <161, F2<18.5 , F3<10.1 , F4<7.71 rendering the identified factors as dispensable to adaptability.

prised of the remaining nine variables, the respondents reduced from 43 to 31 following a pair wise deletion.

On further analysis of linear regression of the four successive predictors against the dependent variable, four

Table 1 - Bivariate correlation between adaptability and successive independent variables models were derived.

F values obtained out of the four models were 11.44, 7.05, 4.59 and 3.70, each of which were lower than their respective table values. The study hence proves that all the factors were dispensable with regard to the target variable (Adaptability of cloud computing).

Though our results are not in line with potential suppositions, the study goes to say that none of the 14 factors are significant enough to impact adaptability of cloud computing.

6. Discussions of Findings

Turnover of firms have a negative correlation and it does not make sense here, since high turnovers are not typical of adaptability. Engagement in R&D shows strong correlation only with SPV support services in SME clusters. The two clusters have engaged one of the many support services of SPV, called Technical services, thereby relating it with engagement in R&D. Technical services provided by SPV encourages R&D and enhances technical advancement[12].

The factor Collateral subsidies are a doubtful prediction, where most SMEs are not beneficiaries. Links with international and national market are fruitful when associated with competitor orientation. The Electronic and Print clusters innovate in a way guided by competitor information, specially the Print cluster who have to adapt swiftly to external environment. Competitor orientation and Customer orientation need basic information infrastructure, which inclines towards benefits of adopting cloud computing like web connectivity, cost saving and speed and reach, all of which are listed out as factors influencing cloud computing in this study. Factors influencing cloud computing is strongly relevant to the Type of information used. ERP has a monolithic structure that is not suitable for most SMEs who are limited by resources like money, staff and IT skills. While, Type of information system used carries negative correlation. Customer orientation and Competitor orientation positively correlate with the influencing factors. Clusters respond to changing global trends in terms of quality, price and reliability and prioritise customers' needs. SPV support services rendered to the two clusters are pertaining to technical services. Technical services relates to qualified employees indicating that IT skill is a requirement[8].

The final model suggests that Adaptability of cloud computing is a product of four factors, i.e. Awareness of cloud computing, Factors influencing adoption of cloud, Competitor orientation and SPV s support services. Summarising, we understand that web connectivity, cost saving, speed and reach are the decisive characteristics of Adaptability of cloud computing. Competitor orientation and Awareness also add lot of relevance.

While focussing on the significance of four models during linear regression, the successive predictors proved to be dispensable on the reduced model analysis, thereby rendering our result as adaptability of cloud not being impacted by the defined factors. In controversy, one study revealed by Sharma et al[1] proves that the scope of cloud computing is large because of per user annual cost being a deciding parameter. Bazhenova, Taratukhin and Becker[16] revealed that existing researches indicate strong positive correlation between ICT and economic efficiency and competitiveness of SMEs.

Our study shows low level of diffusion in ICT that characterises SME clusters. This paper depicts that the real needs of SME clusters are different from possibilities. A growing number of SME clusters have expressed their readiness to invest in Cloud computing solutions but the clusters in study are not yet ready for the technology upheaval. Traditional disadvantages due to size limitations drive them to remain on sustenance levels than dive into expansion plans, frequently bogged down by capital limitations and challenges in technical know how.

In our study we are not analysing the success rate of cloud computing solutions. The paper has chosen variables based on several studies and has aimed at finding which variable suffices to impact adaptability of cloud computing. We wish to state that our sample size is small and confined to a particular geographic region in Karnataka. The inferences provoke further study to reach out to more clusters that are launched on the Special Purpose Vehicle.

The limitations to this study are peculiarities of each cluster. Though macro environment will remain the same, micro environment can differ depending on the type of cluster. Additional research needs to be done in this area.

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