Journal of Basic and Applied Engineering Research
Print ISSN: 2350-0077; Online ISSN: 2350-0255; Volume 1, Number 7; October, 2014 pp. 9-14

http://www.krishisanskriti.org/jbaer.html

Determinants of Cloud Computing Adoption in SMEs: An Emerging it Platform

Nazir Ahmad[1], Jamshed Siddiqui[2]

[1]*Research Scholar, Dept. of Computer Science, Aligarh Muslim University*
[2]*Dept. of Computer Science, Aligarh Muslim University*

Abstract: **Cloud computing, one of the emerging technologies which have vast possibilities for the SMEs for their Information technology requirements, considering the conditions of Indian SMEs technology adoption rate is quite low which needs to be eliminated and required to make them to use the latest available technologies to remain competitive in this cut throat market competition. SMEs are considered as major source of employment in both developed and in developing countries. This paper have discussed the factors which can be favorable for the adoption of cloud computing by the SMEs, at present technology in business organizations are widespread inhomogeneous, inefficiently utilized and with complex interdependencies, maintenance of IT becoming increasingly complex. Cloud computing provides various services which are easy to implement and easy to use and is cost effective, SMEs can explore the immense possibilities available in this technology and get them benefited in less time and without imparting extra financial burden. Cloud computing provide various services like SaaS, PaaS and IaaS which can be used as per the requirement.**

Keywords: Cloud computing, SMEs IT Adoption, SaaS, PaaS, IaaS.

1. INTRODUCTION

The evolution of cloud computing is one among the major advances in the history of computing. By enabling to deploy, operate and consume technology with greater agility and improved economics, cloud computing is compelling many organizations to explore a deployment. Cloud computing in India is still in its growing phase it requires to create awareness among the SMEs about its advantages over existing technology, the concepts related to this technology is relatively new like people are using the services of cloud computing but they are not aware of that. Emergence of smart phones and their applications have huge impact on the usage of cloud services. It has been defined in numerous ways; it refers to the on demand delivery of scalable IT resources (data and software) globally via the internet instead of local computer. The services of cloud computing are flowing from large organization towards the SMEs and the paradigm is shifting towards providing more and more services to the smaller business which are need of cost effective IT services for their IT needs, though there are many drivers for the adoption of cloud computing but cost effectiveness is the most cited reason[1]. The lack of knowledge/awareness about how to use the technology, low computer literacy and poor management processes are other factors which affect SMEs' adoption of cloud computing in India, lack of awareness may result in SMEs not understanding the potentials which technologies can provide in the areas of efficiency enhancement and productivity. Awareness has a positive influence on an organization's inclination to adopt cloud computing. To understand the need for a new enterprise computing paradigm cloud computing need to put into historical context of evolution of enterprise computing. Cloud computing enables organization to access different software's and other related services, there is a misconception among SMEs that the recent technologies are beyond their reach and expensive while the truth is exactly opposite to it. India has achieved tremendous growth in information technology development which shows the potential of cloud computing adoption by organization but somehow it has not been utilized up to its potential in India especially by SMEs.

Although more and more companies (large and small) are adopting and embracing Cloud Computing as a strategic pillar of their business states that for large business to transfer all their information system to the cloud can be time consuming and costly. In this sense Cloud Computing services could be critical and very important in the future especially for SME's that want to stay competitive and innovative, since it allows these companies to decrease considerably their IT costs and provide customize and lower cost services. Additionally, Cloud Computing could fosters innovation and improve business competitiveness levels in way SME's "alone" could not achieve for example trough the use of collaborative applications . In India and other economies, SMEs play a vital role, often acting as the primary drivers of job and economic growth. The large informal economy in India means this potential is not always reflected in official statistics, but there is nonetheless a big opportunity for both SMEs and policymakers to increase output and employment substantially. More tech leaders would also help lead to a more vibrant economy because leaders outperform in

innovation. At this point two kinds of scenarios emerge. SMEs where there is no awareness of IT in the past are gradually adopting desktop and payroll kind of applications. The second category of enterprises are those that had already embraced these front end applications and are on the maturity curve, and as a result they become the ideal candidates for enterprise wide applications like ERP and more robust and larger IT solutions like messaging and collaboration suites

2. DEFINITION OF CLOUD COMPUTING

Since the cloud computing have came into existence no exact definition have been given[1, 2] researchers are still searching for the accurate definition of cloud computing, different organization and academician have given the different definition, the NIST[1] have defined the cloud computing as "*Cloud computing is a model for enabling 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.*" Another definition given by research group of California university [2] as *"Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services. The services themselves have long been referred to as Software as a Service (SaaS). The data centre hardware and software is what we will call a Cloud. When a Cloud is made available in a pay-as-you-go manner to the general public, we call it a Public Cloud; the service being sold is Utility Computing. We use the term Private Cloud to refer to internal data centers of a business or other organization, not made available to the general public. Thus, Cloud Computing is the sum of SaaS and Utility Computing".*

Cloud computing services can be availed on different devices as shown in fig1

Fig.1 cloud computing

2.1 Services of cloud computing

There are three main services provided by cloud vendors to the consumer, clouds offer services that can be grouped into three categories: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).every service has their own importance for the consumer and they have their specific use which is mentioned in table 1.

a. S*oftware as a service*: SaaS refers to providing on demand applications over the Internet. Examples of SaaS providers include Salesforce.com, Rackspace and SAP.

b. *Platform as a Service*: PaaS refers to providing platform layer resources, including operating system support and software development frameworks. Examples of PaaS providers include Google App Engine, , Microsoft Windows Azure and Force.com

c. *Infrastructure as a Service*: IaaS refers to on-demand provisioning of infrastructural resources, usually in terms of VMs. The cloud owner who offers IaaS is called an IaaS provider. Examples of IaaS providers include Amazon EC2, GoGrid and Flexiscale.

Table 1: Services of cloud computing

SaaS services	PaaS Services	IaaS Services
Email and office productivity	Business Intelligence	Backup and recovery
Billing	Database	Compute
CRM	Development and testing	Content Delivery Networks
Collaboration	integration	Service management
Content Management	Application development	Storage
Document management		
financial		
Human Resources		
sales		
ERP		

There are four deployment models of cloud computing which are defined by NIST [1].

- *Private cloud*—the cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be

owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.

- *Community cloud*—the cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.
- *Public cloud*—the cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.
- *Hybrid cloud*—the cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

3. SMES

SMEs statistical definition usually varies per country. However, most of the time the choice whether or not a company is an SME is based on the number of employees, value of assets or value of sales. Generally, countries adopt different statistical definition for SMEs based on their different policy targets. Nowadays, most economies have policies put in place to cater for the SME sector. Governments thus establish these definitions based on the proportion of companies in the economy that they believe require special attention. In other words, the definition of SMEs set by a country depends on its policy concept or priorities, it is noticed that governments of developed countries set greater upper limits of number of employees and capital size than developing countries when defining the SME sector, Indian SMEs defined in table 2.

Defining SME's in India

Particulars	Manufacturing Enterprises (Investment in Plant &Machinery)	Service Enterprises (Investment in Equipment's)
Small Enterprises	Above Rs25 Lakhs & up to Rs 5 Cr	Above Rs 10 Lakhs & up to Rs 2 Cr
Medium Enterprises	Above Rs 5 Cr & up to Rs 10 Cr	Above Rs 2 Cr & up to Rs 5 Cr

Source: Ministry of Micro, Small & Medium Enterprises

The small and medium enterprises (SME) sector is the backbone of the Indian economy as it employs around 40 per cent of the Indian workforce. With the sector growing at a rate of 8 per cent per year, India has the largest number of SMEs in the world — at 48 million —, second only to China. Ironically, the contribution of this workforce is a huge mismatch of numbers as it contributes approximately only 17 per cent to the GDP. However, the sector has the potential to contribute to overall economic growth, modernization of infrastructure and employment generation. The latest BCG research says that if more SMEs adopted the latest IT tools in India they could boost revenues by $56 billion and create more than 1.1 million jobs in the country. Cloud computing is a technology which has changed the way IT solutions are being delivered. According to Zinnov, a leading management consulting company, the cloud computing market in India is expected to reach $4.5 billion by 2015 and the SME sector is likely to drive growth.

3.1 Cloud computing and SMEs

SMEs can take a lot of benefit from embracing business cloud solutions. Cloud platforms allow SMEs to compete in the cloud giant-controlled environment, and gives the level playing field required to succeed in business. One of the most important benefits of cloud computing is the extensive environment that gives enough leverage for SMEs to compete with the giants in the industry. With VMware, EMC and Cisco as one among the many cloud partners, SMEs can have the most cost-effective, yet very efficient IT infrastructure. Advantages of the Cloud for SMEs are as follows

It's simple, cost-effective

The myth is that IT investments require purchase of hardware, software, modern networks and personnel with necessary skill sets to operate. Actually, it is simple and cost-effective for SMEs to run IT solutions by having an account with a cloud computing service provider. Cloud solutions help SMEs implement technology quicker so that they gain competitive advantage.

Costs cut down

Cloud computing solutions are considered expensive and beyond anyone's comprehension. But, actually cloud computing cuts down the cost of investment in hardware and software as these services are provided by the service provider on pay per use basis or subscription basis, which is affordable by cash-strained SMEs. Cloud computing drastically brings down the operating cost and total cost of ownership by reducing the risk of operation.

Secure network

Data stored in the cloud is not considered to be secure, trustworthy and reliable. But, the cloud ensures a well-

functioning, developed and secure network enabled by the service provider requiring high-speed Internet connectivity.

Maintained by service provider

Data maintenance and software upgrades are an expensive affair. Data is maintained by the service provider and the client need not worry about the change in version of software and installation charges of the software.

Custom solutions

The need of SMEs is limited but they have to spend on entire software suite. In fact, there are custom cloud-based solutions for different verticals under SMEs.

Conversion

The myth is that huge volumes of data are present in the old systems and conversion is an issue. Data in the legacy systems can be easily incorporated into cloud solutions without any break in business activities.

Cloud computing helps in collaborative work among various team members in online mode. This enables SMEs get access to new markets with better branding and prompt delivery.

After 2000 the status quo of the IT industry started changing once again for a more centralized storage [3]. Nicholas Carr [4] argues is it possible to draw a parallelism between electricity and computing in the sense that computing as electricity is started to become a public utility. Therefore, well known corporations as Google, Amazon, Microsoft, IBM, Apple and others have created giant servers, commonly called "Sever Farms" [5] which taking advantages of economies of scale can sell computing services in a pay-per-use basis [6]. It is in this context that Cloud Computing emerged [7]. Cloud computing has been a much debated topic in the IT sector today [8]. According to Haag and Cumming [9] "cloud computing is a technology model in which any and all resources-application software, processing power, data storage, backup facilities, development tools… literally everything (in the computing context) - are delivered as a set of services via the Internet".

Although more and more companies (large and small) are adopting and embracing Cloud Computing as a strategic pillar of their business [10], Staten [11] states that for large business to transfer all their information system to the cloud can be time consuming and costly. In this sense Cloud Computing services could be critical and very important in the future especially for SME's that want to stay competitive and innovative [12] since it allows these companies to decrease considerably their IT costs [13] and provide customize and lower cost services [14]. Additionally, Cloud Computing could fosters innovation and improve business competitiveness levels in way SME's "alone" could not achieve [15], for example through the use of collaborative applications [16]. Therefore, today's Cloud customers are in the large majority companies mainly concentrated in industries like Ecommerce, Technology and Telecommunications [17]. However, it is expected that in 2015 approximately 65% of the growth in the cloud will be due to companies with currently almost no use of cloud computing services .

The potential of Cloud Computing for SMEs does not restrict to costs savings with IT, there are other important advantages for these types of companies Cloud Computing applications could fosters innovation through the use of collaborative tools [18] this way helping employees, customers and suppliers to share ideas [19]. Another important advantage for SMEs is the possibility the employees have to access the cloud from any device anywhere. Consequently, there is the opportunity for employees to work remotely since they can access any document from the cloud being the only requisite a device with an internet connection [20]. Additionally, this characteristic from Cloud Computing allows the companies to save in travel costs Moreover, the speed of implementation of a cloud application could be very important for SMEs, which could get access to a new and innovative application in days or even in a couple of hours [21].

4. CHALLENGES OF CLOUD COMPUTING

At the moment the market has proved that the Cloud computing phenomenon represents the next step in the development of the Internet. The cloud within cloud computing offers means through which everything – from performance, infrastructure, applications, business processes, and up to personal collaboration – can be delivered as a service anywhere and anytime, if necessary.

While the adoption of such services entails countless benefits, information security and the guarantee of professionalism should be enough reasons to perform analyses of deep impact and risk assessment so that managers could be informed about potential risks. Risk management activities must take place throughout the life cycle of information, and risks should be re-assessed periodically or in case of a change.

- Lack of awareness of the benefits of IT, Cloud computing and advanced software products increases the uncertainty and search costs for SMEs. There is a need to increase the awareness of SMEs on the benefits and usage of IT and cloud computing through various programs and trainings. These activities can typically be taken up by industry bodies and associations.
- The lack of IT skills and the unavailability of suitable advanced IT products for SMEs are inhibitors which compound the asset specific transaction costs related to proprietary environment and increased customization. The IT industry in India is more export-oriented and hence the

unique skills required for cloud are not available to the domestic IT market. Moreover the pricing models and rates of the export oriented Indian IT industry are very expensive for the SME segment users. The global MNC do not yet find the Indian SME segment lucrative enough to offer specific products to this market. Hence there is a need to encourage development of IT products and services for the domestic market, especially the SME segment. This market for cloud SME products can be best catered to by the SME IT sector using cloud based infrastructure. The IT skills required by SMEs can also be outsourced to the SME IT firms. Hence there is a need to develop the SME IT sector which can focus on the domestic market.

- Lack of cloud specific policies to handle vendor lock-in and contractual safeguards are compounded for SMEs as they lack the financial power and resources to take on the powerful global CSPs.
- The uncertainty related to data privacy in the cloud is negated by the lack of concerns related to information security by the SMEs.
- Smaller volume and frequency of transactions of the SMEs increases the cost, but can be handled if SME clusters adopt cloud as a group. This will require the SMEs to co-operate and group together in spite of the competitive nature among them. Such cooperation provides negotiating power to the SMEs to procure domain specific products and other requirements from the CSPs. Industry bodies can also facilitate the negotiation with the CSPs. One such pilot has already been initiated in a SME cluster in West Bengal by the government along with the CII. The pay-as-you- go pricing model of the cloud works in favor of the SMEs as it reduces the upfront financial investments required for IT adoption. Better pricing can be negotiated if SMEs approach CSPs as a cluster or group.
- Jurisdiction of the cloud contracts and data-related regulations at the remote locations are aspects which can only be handled through formal cloud regulations and rules by the respective Indian government departments.

5. CONCLUSION

Given the scope of SME rise in India it only makes the competition advantage more relevant. So it is of serious concern that the companies look for ways to adopt the cost savings mechanisms applicable, In the current economic environment, cloud computing is one of the top technologies trends and intends to be the saving solution for optimizing the IT budgets. Currently, cloud computing is considered the next best thing when in comes to optimize IT budgets in the current economic environment. It's believed that it will become a key technology oriented at sharing infrastructure, software or business processes. Cloud Computing is a way to serve the needs of computation through the virtualization of some resources through the Internet.

It's made of shared services under a virtualized management, accessible to users and other services through the Internet under a "pay per use" payment system. Nowadays the Cloud Computing market includes more and more companies, each and every one of them developing the business more and more. The main reason is the acceptance and adoption of these revolutionary technologies.

REFERENCES

[1] NIST Definition of Cloud Computing v15, csrc.nist.gov/groups/SNS/cloud-computing/cloud-def-v15.doc

[2] Cloud Computing on Wikipedia, en.wikipedia.org/wiki/Cloudcomputing, 20 Dec 2009

[3] Böhm M., Leimeister S., Riedl C., Krcmar K. (2009). Cloud Computing and Computing Evolution, Technische Universität München (TUM).

[4] Carr, N. (2009). The Big Switch – Rewiring the world, from Edison to Google. Norton

[5] Accenture Report (2009). "What the enterprise needs to know about Cloud Computing". Accenture.

[6] Jena R. K. and Mahanti P. K. (2011), "Computing in the Cloud: Concept and Trends", International Review on Computers and Software (I.RE.CO.S.), Vol. 6, N. 1.

[7] Sosinsky, B. (2011). Cloud Computing Bible. Wiley.

[8] Vaquero, L. M., Rodero-Merino, L., Caceres, J., (2009). A break in the clouds: towards a cloud definition. ACM SIGCOMM Computer Communication Review.

[9] Haag, S. & Cummings, M. (2010).Management Information Systems for the Information Age (8thed.). New York: McGraw-Hill/Irwin.

[10] Sultan, N. (2011). Reaching for the "cloud": How SMEs can manage. International Journal of Information Management, 31(3), 272-278.

[11] Staten, J. (2008). Is Cloud Computing Ready For The Enterprise? Forrester

[12] Neves F. T., Marta F. C., Correia A. M. R. C., Neto M. C. (2011). The Adoption of Cloud Computing by SMEs: Identifying and Coping with External Factors. Paper presented at 11ª Conferência da Associação Portuguesa de Sistemas de Informação (CAPSI 2011) – A Gestão de Informação na era da Cloud Computing, Lisboa, ISEG/IUL-ISCTE/, 19-21th Oct 2011

[13] Aljabre, A. (2012), "Cloud Computing for Increased Business Value", International Journal of Business and Social Science, Vol. 3 No. 1

[14] Etro, F. (2009). The Economic Impact of Cloud Computing on Business Creation, Employment and Output in Europe: An application of the Endogenous Market Structures Approach to a GPT innovation. Review of Business and Economics

[15] Tumer, O. S. (2010). *Digital ecosystems & Co-innovation towards sustainable societies.* Paper presented at the 4th IEEE International Conference on digital Ecosystems and Technologies (DEST), 13-16 April.

[16] Barnat, C. (2010), A Brief Guide to Cloud Computing. Robinson.

[17] Heric, M., Kermisch, R., Bertrand, S. (2011). The five faces of the Cloud. Bain & Company. Católica Lisbon School of Business & Economics Diogo de Abreu Duarte.

[18] Tumer, O. S. (2010). Digital ecosystems & Co-innovation towards sustainable societies. Paper presented at the 4th IEEE International Conference on digital Ecosystems and Technologies (DEST), 13-16 April.

[19] King, R. (2008). How cloud computing is changing the world. Business Week online.

[20] Miller, M. (2008).Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Indianapolis: Que Publishing, 2008

[21] Choubey, R., Dubey, R., Bhattacharjee, J. (2011). International Journal on Computer Science and Engineering (IJCSE). Vol. 3 No. 3 Mar 2011 Computing Services. The 2011 Military Communications Conference - Track 5 - Communications and Network Systems