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## RESEARCH ARTICLE

### CLOUD COMPUTING AND SMEs IN INDIA-OPPORTUNITIES AND CHALLENGES

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#### ABSTRACT

This is the age of Information Technology and the access to and availability of information is crucial Small Scale Enterprises (SMEs) are a very vibrant segment of the Indian economy making substantial contribution to the Indian economy. SMEs need to obtain and store information at a competitive cost. Cloud computing provides an easy solution. Cloud computing refers to a set of services that provide the necessary infrastructure for data storage on a third party server. This paper after covering extensively the definition and types of clouds goes to look at the benefits and limitations of cloud computing for SMEs. Given the benefits it outlines the opportunities and challenges for SMEs.

#### INTRODUCTION

This is the age of information technology where accessing information is the key to success for all businesses. Information is not vital to large enterprises alone. The Small and Medium Industries (SMEs) will also have to be go-getters in accessing information. While accessing information is essential on one side, it is also important to store them and access them whenever required. Understanding this trend, the big and giant web based companies like Google, Amazon, Salesforce.com came with a model named "Cloud Computing" the sharing of web infrastructure to deal with the internet data storage, scalability and computation (Kambli, 2009). Cloud computing is a very useful tool for SMEs in India which constitute about 50% of the total industries and make a contribution of 70% to the GDP. In India 95% of the industrial units are SMEs which give over 50% of the industrial output (Popli and Rao, 2009). Thus SMEs form the backbone of the Indian economy Before we proceed to identify the opportunity and challenges faced by SMEs let us define and understand the concept of cloud computing. SMEs are said to be the lifeblood of any vibrant economy. They are known to be the silent drivers of a nation's economy. SMEs are leading the way for entering new global markets and for innovations in the emerging economic order. In India 95% of the industrial units are SMEs which give over 50% of the industrial output (Popli and Rao, 2009). Thus SMEs form the backbone of the Indian economy. SMEs of India are one of the most aggressive adopters of ERP Packages. Online services are better suited for small industries whereas large enterprises face more problems in implementation because of their complex functionalities and data security concerns (Dubey and Wagle, 2007).

##### Definition of Cloud Computing

For the purposes of this paper the following definition of Cloud computing as a delivery model for IT services as defined by the

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National Institute of Standards and Technology (NIST) Australia, is used. Specifically NIST defines cloud computing as "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"<sup>5</sup>. NIST specify five characteristics of cloud computing:

**On-demand self-service** involves customers using a web site or similar control panel interface to provision computing resources such as additional computers, network bandwidth or user email accounts, without requiring human interaction between customers and the vendor.

**Broad network access** enables customers to access computing resources over networks such as the Internet from a broad range of computing devices such as laptops and smart-phones.

**Resource pooling** involves vendors using shared computing resources to provide cloud services to multiple customers. Virtualization and multi-tenancy mechanisms are typically used to both segregate and protect each customer and their data from other customers, and to make it appear to customers that they are the only user of a shared computer or software application.

**Rapid elasticity** enables the fast and automatic increase and decrease to the amount of available computer processing, storage and network bandwidth as required by customer demand.

**Pay-per-use measured service** involves customers only paying for the computing resources that they actually use, and being able to monitor their usage. This is analogous to household use of utilities such as electricity. Cloud computing describes a broad movement to treat IT services as a commodity with the ability to dynamically increase or decrease capacity to match usage needs. By leveraging shared infrastructure and economies of scale, cloud computing presents governments and business with a compelling business model.

It allows users to control the computing services they access, while sharing the investment in the underlying IT resources among consumers.

**Other Definitions of Cloud Computing-Literature Review**

Cloud computing is an online service model by which hardware and software services are delivered to customers depending upon their requirements and pay as an operating expense without incurring high cost (Bandyopadhyay *et al.*, 2009). Basically cloud computing is a set of services that provide Infrastructure resources using Internet media and data storage on a third party server. It has three dimensions known as Software level service, Platform level service, Infrastructure service (Fox, 2009). The main cloud computing attributes are pay per use, elastic self provisioning through software, simple scalable services, virtualized physical resources (Tucker). Models, such as cloud computing based on Virtual technologies enable the user to access storage resources and charge according to the resources access (Marcos *et al.*, 2009). Cloud computing platforms are based on utility model that enhances the reliability, scalability, performance and need based configurability and all these capabilities are provided at relatively low costs as compared to the dedicated infrastructures (Wyld, 2009). Benefits provided by cloud computing ranges from cost savings to speed and flexibility to enhanced performance (Veverka, 2010). This new model of infrastructure sharing is being widely adopted by the industries (Hartig, 2008). Industries experts predicts that cloud Computing has bright future in spite of changing technology that faces significant challenge (Leavitt, 2009). The report from IDC says that due to the emergence of cloud computing, IT marketplace is undergoing a change and it expects that investment on cloud services will reach to \$42 billion by 2012

**Cloud and the Internet**

How is Cloud different from outsourcing, from Hosted services, from the Internet? Cloud computing is a way of accessing IT infrastructure in a geographically independent, scale independent, pay-for-what-you-use way. It relates to infrastructure, or infrastructure and software. Outsourcing can be applied to cloud computing. It just adds a services layer on top. The Internet is a necessary precursor to Cloud Computing as it provides the network that cloud computing resources are accessed through. Cloud computing can substitute for hosted IT services while the hosting model deploys dedicated hardware and software for a customer which is not 'elastic', the cloud model deploys elastic, 'virtual' infrastructure

**Types of Cloud**

In their paper on cloud computing (Alexa Huth and James, Cebulea, 2011) mention the following categories of cloud computing based on need:

**Public Cloud:** A public cloud can be accessed by any subscriber with an internet connection and access to the cloud space.

**Private Cloud:** A private cloud is established for a specific group or organization and limits access to just that group.

**Community cloud:** A community cloud is shared among two or more organizations that have similar cloud requirements.

**Hybrid Cloud:** A hybrid cloud is essentially a combination of at least two clouds, where the clouds included are a mixture of public, private, or community. An SME can derive maximum value by using a Public cloud based system.

**They also describe three types of cloud service providers:**

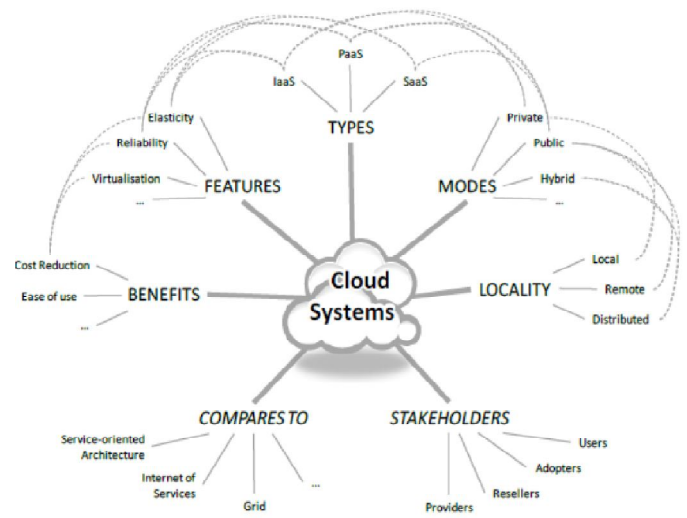
Software as a Service (SaaS): SaaS provider give user based access for resources and applications. This help to almost eliminate software cost and licensing cost and greatly reduces hardware cost for the

organization\_ However, the entire database of an organization in owned and held by the service provider and user have minimal control over cloud

**Platform as a Service:** A PaaS system goes a level above the Software as a Service setup. It is a development platform that allows its user to create application that can be commercially used by the cloud users.

**Infrastructure as a Service:** In an IaaS agreement, all computational resources of an organization are managed by a cloud service provider and are used by organizations employees only. All cost related to computational resources are eliminated by the organization and user based subscription fee is paid

From an SME perspective due to their limited requirements and small size SaaS brings maximum value to organization.



**Figure 2. Cloud Computing Ecosystem (Image Courtesy: Future of Cloud Computing – Opportunities for European Cloud Computing beyond 2010 by European Commission Information Society and Media)**

**Traditional Vs Modern Cloud Computing Approaches- A Comparative Analysis**

A study by Kaur (2012) brought out the differences between the conservative and modern cloud computing methods to accessing and storing data. The following table elaborates the same. By traditional they meant a company or organization owned data resources where entire data base is hosted on local servers or PCs. By modern they meant the cloud computing method through which all services are accessed by an organization on SaaS basis. The following table provides a clear comparative picture.

S.No.	Parameter	Traditional Approach	Cloud Computation
1.	Boot Time	-	++
2.	Internet Connectivity	++	-,-
3.	Capital Expenses	-,-	++
4.	Operational Expenses	-,-	-
5.	Software Updating	-,-	++
6.	Mobility	-,-	++
7.	Scalability	-	++
8.	Storage Space	-	+
9.	Implementation	-	+
10.	Security	++	-,-
11.	Lock in	-	-
12.	Uptime Guarantee	+	-,-
13.	Performance Instability	++	-
14.	Network Limits	++	-
	Net Impact	-,-,-,-	++

Source: Kaur 2012

**Positive Impact (+):** Parameter has a moderately positive impact on investment decision by the business.

**Strong Positive Impact (+, +):** Parameter has a large positive impact on investment decision by the business.

**Negative Impact (-):** Parameter has a moderately negative impact on investment decision by the business.

**Strong Negative Impact (-, -):** Parameter has a large negative impact on investment decision by the business

### Cloud Computing in India

SMEs in India constitute about 35 million and the Indian market is therefore a huge market for cloud computing. The SMEs want easy to use, reliable and scalable application that when used will help them to expand their businesses. Cloud computing is the solution. The vast presence of SMEs has made India the fastest growing SAAS market in Asia Pacific region. According to Jeremy Cooper, VP-Marketing (APAC), Salesforce.com 'software as a service' provider started its services in India in September 2005 and since then the adoption rate of cloud computing is increasing. The SAAS' model success prompted IBM to launch its cloud computing centre in Bangalore in 2008. The centre proposes to cater to the increasing demand for web infrastructure sharing services. IBM further collaborated with IIT Kanpur and came up with some new developments in computing. Bharti Airtel has launched the cloud computing services with their Net Pc model. Other giant companies like Reliance Communications, TCS, HCL technologies, Wipro, Netmagic, Verizon, Novatium to name a few have also launched cloud computing services in India. Cloud computing globally and India is gaining mass popularity due to its cost effectiveness and efficient delivery models. This accounts for the large shift of ICT spending towards cloud computing. The global gloom has been the prime reason for businesses to keep an eye on their expenditures and the cloud has provided them with a solution. This has prodded India to deploy cloud computing as the preferred technology. Business Software Alliance (BSA), a global nonprofit IT alliance, ranks India 19th among 24 in its preparedness for cloud computing implementation. With an overall score of 50, India is ahead of BRIC nations, China (47.5) and Brazil (35.1), while it is ranked well below advanced economies like Japan (83.3), Australia (79.2) and the US (78.6). These 24 countries together account for 80 per cent of the global ICT market.

Already, Indian IT companies are competing with each other for a slice in the cloud computing market. The total cloud market in India, currently at \$ 400 million, will grow ten-fold to reach a market value of \$ 4.5 billion by 2015, according to a report by Zinnov Management Consulting. Of this, private cloud adoption will dominate and account for \$ 3.5 billion in revenues, growing at over 60 per cent. The study also estimates that the segment will create one lakh jobs by 2015 from 10,000 today. Infosys CEO and MD, SD Shibulal, reveals that the amount of integration the cloud can deliver shows its immense functionality and opportunities for all stakeholders. "It is an opportunity for both the government and small and medium enterprises (SMEs) – which are the true drivers of our economy – to improve productivity, economies of scale, cut costs and boost employment," he adds. Also, SMEs can gain from the opportunity to use critical software like Tally and ERP which have eluded them so far due to high costs. An IT research firm IDC stated that the cloud computing market in India is expected to grow at a CAGR of 40% by 2014, from an estimated \$66.7 million in 2009. As per a recent study by Zinnov, the cloud computing market in India is estimated at around \$400 million and is expected reach \$4.5 billion by 2015 and SMEs being the backbone of Indian economy are likely to drive the growth.

### Benefits of Cloud Computing

Cloud computing is similar to electric power utility when the computing resources that are provided by another organization. The

providers get economies of scale which they are able to pass on to the users in terms of lower individual costs and centralization of infrastructure costs. Users pay for only what they consume. They can increase or decrease their usage, and leverage the shared underlying resources. Further in this approach, the cloud customer spends less time managing complex IT resources and more time investing in core business. The next major advantage of cloud computing is that it significantly brings down the running cost for an organization. "Cloud computing has emerged as a new era in IT and is at the top of the agenda for every CIO today". In the words of Neeraj Athalye, Head, Cloud Business, SAP India Pvt Ltd " Cloud adaptation not only brings down total cost of ownership, lowers risk and promotes innovation, but also offers a protected IT set up with high business continuity and IT talent retention which is most crucial for SMEs today," says Neeraj Athalye, Head, Cloud Business, SAP India Pvt Ltd

Yet another advantage of cloud computing is the low infrastructure set-up that it requires. According to Abhishek Tyagi of Perfect Solution "to avail cloud computing services only a basic computer is required, so that it gets connected to cloud and the rest is taken care of by the host. You just need to keep your computer up and running. This eventually makes functioning of an organization a hassle-free affair, as far as IT solutions are concerned. All you need is one account with a cloud computing provider, where entire staff can log in and operate," As already mentioned the SMEs need have to invest large amounts. Just a couple of hundred dollars can get them started. But this has not been understood by many of the SMEs as they still believe that they cannot afford cloud services as it way beyond their budget. This lack of awareness is holding back many SMEs to make the most of cloud services," points out Manmohan Aggarwal of Yebhi.com. The cloud model of flexible payment model (pay per user per month) makes access to technology affordable for resource-constrained SMEs One more significant thing to consider according to Rajesh Janey, President, EMC India & SAARC is that the adoption of cloud speeds up the implementation of technology and would help the vast SME base in India to achieve global competitiveness," states Rajesh Janey, President, EMC India & SAARC. The best example of success in reaping the benefits of cloud computing are a large number of small cooperative banks. They are using cloud computing for core banking solutions. They are now setting examples for SMEs. These banks have long used manual methods and how now successfully adopted the cloud and are therefore able to offer smart and efficient services such as internet banking, online money transfer and ATM services, mobile banking, etc., to their customers. They are now operating on a centralized network twice as fast and at half the cost compared to an on-premise licensed software model. They have thus proved that cloud technology has actually helped the bank to reduce its burden of upfront capital expenditure and move to a pay-as-you-use model

### Cloud Limitations

While the advantages abound cloud computing comes with its own set of limitations. Some of them are discussed below.

**Data Security:** The entire information data base is outside the control of an organization. It is therefore at risk of losing its database to other organizations. Those organizations using cloud computing will have to so on mutual trust and trust of the service provider in terms of security available. This is an area where the R & D efforts are being directed at.

**Lock-in:** The service provider takes full charge of the entire data infrastructure set-up and the system design will be provided by the service provider. This sets limit to migration of data and workability of reports once there is a switch over in the service provider. This is a severe handicap as the organization is tied down to the service provider and will have to use its services at all quoted costs.

**Uptime Guarantees:** The host server uptime is controlled and managed by the service provider. Hence the uptime is highly

dependent on maintenance and system architect developed by the host. Any user organization will have to trust on the market reputation of the host on uptime. This becomes mandatory in the absence of any service Level Agreements (SLAs) on user uptime.

**Performance Instability:** As per Houfmann in *The Limits of Public Clouds for Business Applications*-. Performance of major cloud platforms is subject to variations which causes instability.

**Network Limits:** Data transfer is highly dependent upon mode of transfer. The different modes define the speed and capability of data volumes for transfer and analysis. These modes can cause inevitable delay in data accessibility and information processing.

**Limited resources-** "Small and medium businesses in India operate in lean environments with limited resources and IT personnel. Due to these limitations, upfront infrastructure investment is a big challenge for the vast base of SMEs and hence they consider cloud infrastructure to enhance competitiveness.

**Power Shutdown:** Then comes the serious problem of power shutdown where the data of the organization resides. There could be a power shutdown even when the organization uses its own servers but that is something he can manage on his own. The expectations are indeed high when outsources to an external agency.

**Low Awareness:** The service providers are all offering pay-as-per-use method like a pre-paid mobile SIM card. But yet the awareness is very low among SMEs and is ironically even so in metros.

### Cloud Computing and SMEs

Cloud computing can impact both the economics and business models of SMEs. Cloud services offer new ways of working and collaborating. They provide more flexible options for businesses through the ability to obtain the information and communication capacity they need, on demand. It thus is an alternative to expensive and resource intensive in-house IT solutions and hardware and software investments. SMEs can by cloud computing avoid high overheads. In many cases they also find it difficult to keep them updated. Let us look at some of the core benefits that cloud computing offers for SMEs.

**Simplicity:** Technical complexities related to set-up, operations and maintenance which are the important components of ICT is taken care by the cloud provider. This therefore reduces the burden on the SMEs to be equipped with technical knowledge. SMEs can thus focus on their core business.

**Accessibility:** As already mentioned the cloud provides accessibility to information which businesses are in dire need of.

**Flexibility:** SMEs are far more advantaged than larger enterprises when it comes to the flexibility that cloud computing provides. According to an AMI study, the Indian SMEs are gradually becoming more interested in cloud based services like data storage/back up, servers and security solutions being the main focus. But lack of complete understanding surrounding the cloud services and the intrinsic value they offer is still a major hindrance to the adoption of cloud-based services

**Technological Capability:** Business and technology change at rapid speeds. So SMEs will have to be fully equipped to adapt their operations quickly. SMEs can work at their technological capabilities and grow in their businesses. Given the cyclical nature of business, they can increase and decrease resource utilization in accordance with business needs which follow business fluctuations.

**IT Hardware Requirements:** SMEs can base their entire IT systems on the cloud and therefore invest only negligibly in IT hardware. They

can also choose the components that suits their business like cloud driven e mail services, database, or storage. Capital investment in infrastructure, including servers, storage and software is avoided. Hardware and software upgrades, software version control etc become the sole responsibility of the cloud service provider.

**Affordability:** Business applications like Customer Relationship Management (CRM) programs or Enterprise Resource Programs (ERP) are very expensive to acquire, install and maintain. In a cloud computing model, these sorts of applications become much more affordable. The cloud web services are suitable for ERP solution by paying only for what the SMEs actually use. By using and accessing services through the cloud, the companies can buy components relevant to their business on pay per basis instead of buying whole ERP suite. (Sharif, 2009).

**Improved Productivity:** SMEs can avoid the need to dedicate or redirect costly resources to maintain the systems they rely on to deliver their business because the routine IT tasks will now be performed by the service provider. This improves productivity and will help SMEs to focus on their core business.

**No Costly Overheads:** SMEs can reap the benefits of smart technology without heavy investment in overheads.

The promoter of 'The India Cloud Initiative' Vijay Mukhi said that "there is a huge saving of money by using cloud technology as the industries have to pay only for the operating cost. The biggest advantage of a hosted model (cloud computing) is that it eradicates the need to purchase the software licenses and also eliminates the cost associated with developing and operating in-house applications. In a hosted model, the capital investment, security, backup and server maintenance costs are all the provider's responsibilities."

### Some Companies Tapping the SME Base:

BSNL, which will be deploying 'Bharat' (its cloud offering) in 10 cities. Oracle has over 100 different Oracle applications on the cloud, including ERP, HCM, Talent Management, Sales and Marketing and Customer Experience. Microsoft CEO Steve Ballmer recently said, "India will not only see a surge in cloud computing services but companies all over the world will look to India to support their transition to cloud computing." Roughly 30 per cent or \$ 7 billion of global cloud computing work is to be offshored, says a Zinnov study. AMI has found that "expenditures on cloud-computing within India SME ICT portfolio are on the rise. These expenditures comprise almost 10 percent currently and are predicted to increase by a CAGR of 23 percent over the next five years", added Chakravarty.

### The Top Focus Areas for SMEs

AMI analysis finds that the top two spend-components within the SME cloud-portfolio are for website-related expenditures and Remotely Managed IT Services (RMITS). The SMEs have become much more aware of the benefits of hosting their own websites. It provides them multiple benefits such as better brand-building and cost-effective marketing to name the most important ones. A number of web-hosting firms have emerged to assist Indian SMEs. It is forecasted that in the near future IaaS and SaaS based solutions such as Productivity, CRM and Business Intelligence will show considerable growth. Ranjan Chopra managing director of Delhi based Team Computers is one of them. "I feel SMBs are ready to be on cloud right away as it makes perfect commercial sense. Currently, we are seeing both enterprises and SMBs adopting cloud because of lower costs per transaction. I think the key factors which will drive growth especially in the SMB sector would be lower costs and innovation and lower risks," Chopra said.

### Essentials for Successful Cloud Computing

Cloud computing will not be successful if a proper ecosystem is not developed. The base of the cloud computing pyramid is provided

by Power, connectivity and bandwidth, real estate, technology enablers, awareness and local language support. Standardization across States, centre and institutions is a must. This will lead to lower costs, improved efficiencies and higher growth. Government and corporate must work together to build this ecosystem. SMEs will certainly benefit from the opportunity for low cost and efficient IT adoption

### Some Views of Adopters

Take the case of Zenga Media. This is a company in the mobile television services space. The company has not only been able to manage cost better on hardware but has also been able to manage its human resources better. "We moved to cloud almost three years back. We initially started with 10 per cent cloud and 90 per cent data centre usage. Today, there is less than two per cent activity on ground. Due to adoption of cloud infrastructure, the team managing information technology infrastructure has come down from 35 people to only four. The additional staff is now used for more productive purposes," said Shabir Momin, CEO, Zenga Media. He also elaborates that during the IPL telecast, the company would have required a lot of upfront money to buy additional servers. But, due to the cloud infrastructure, they were able to do it in a cost-effective manner. Momin, who is using cloud services from Amazon Web Services, is also of the view that the customer service quality has improved. "Due to cloud, our customer viewing has moved from less than 50,000 users to seven million users now. We have 55-60 million video views a month," he said. IT firms including IBM, Amazon, HP, Tata Consultancy Services (TCS) and others, including Amazon, have been at the forefront of providing this technology to the SMBs. Employ Wise, that provides HR services software, has been using the IBM Cloud for the past one year. For Sumeet Kapur, CEO of Employ Wise opting for cloud computing was driven by the need to boost capacity. "Earlier, we used to take around three weeks to upgrade our hardware. Now, we take only around half an hour for this. Now the hardware is scalable on demand due to the use of cloud. Moreover, we never used to make aggressive bids with big-ticket clients due to the capex on servers that was required. This has been solved now."

The Oxford Bookstore is another example. The bookstore was looking for a simple, cost-effective and scalable system that could integrate the offline and online stores and help in driving the business. They then started using TCS cloud. Oxford Bookstore's online channel was built as an extension of its physical stores with a conscious strategy to provide its online customers the same flavor of collection. Subhashish Saha, Chief Technical Officer of Apeejay Group that owns the Oxford Bookstores explained that "the cloud platform is more convenient because it was feature scalable. Moreover, there was no additional capital expenditure." Saha reiterated that TCS was chosen, as their SMB division ensured that open source software was used by them "Investing in cloud computing can help SMEs in many ways. Many SMEs are based in far-off locations where they don't get the right kind of access to modern technology. Cloud computing helps them get connected. Cloud computing can also help them convert their capital expenditure into operating expenditure," said Mr. Santanu Ghose, Country Head, Converge Infrastructure Solutions, HP. In conclusion it can be said that the concept of cloud computing is picking up and more and more SMEs are coming forward to adopt it. But cloud computing providers need to make it more cost effective and create awareness simultaneously. A 2010 Gartner survey reveals that the percentage of CIOs expected to have their IT running in the cloud will increase from the present 3% to 43% over the next four years. Deloitte predicts that by 2020, 15% of on-premise spending will be replaced by clouds. The worldwide revenue from public IT cloud services is forecast to reach \$55.5 billion in 2014, according to IDC.

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- SME world What is in for SME'S on Cloud  
<http://www.smeworld.org/story/features/sme-on-cloud.php>  
[http://www-935.ibm.com/services/in/igs/pdf/SME\\_world\\_\\_What\\_is\\_in\\_for\\_SME.pdf](http://www-935.ibm.com/services/in/igs/pdf/SME_world__What_is_in_for_SME.pdf)
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