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Decision Variables for SMBE Adoption of Cloud Based Big Data Solutions

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1. Introduction

Cloud computing has created a niche place for itself in the Business world today. Businesses today acknowledge the plethora of opportunities possible due to Cloud based technologies. As the world changes, so does business processes and strategies. With the growth of Internet, businesses now have huge data at their fingertips but mining information and insights from this Big Data is still a daunting task. Understanding of Cloud based Big Data (CBD) solutions is still foggy and in its initial steps.

This paper looks at the Small and Medium Business Enterprises (SMBE) in Telecom, Health and Retail sectors with an aim to understand the various factors and attributes which influence the decision of these businesses to move from present practices and platforms to CBD Solutions.

The study will rely on detailed interviews from Industry Experts across these three sectors to gather data. Once data is gathered, decision variables will be identified and bucketed into satisfiers and dissatisfiers for CBD adoption by SMBEs.

The output of this study can pave a way to create or modify solutions by CBD vendors for SMBE sector.

2. Cloud Based Big Data Services (CBDS)

Cloud based solutions are simply a set of IT services running on a network and modeled around existing metered services (pay as per use) like electricity and water. Cloud vendors provide and lease services like infrastructure, software applications, databases, development platforms etc. to enterprises who can now directly avail these services without having the overheads of outsourcing or setting up these functions in house. Cloud technologies focus on efficient delivery of services to consumers with minimum overheads and maximum returns.

Technology has proved to be the key to growth for enterprises all over and early adopters of new stable technologies have always seen unprecedented growth and returns. 1980s saw the arrival of home computer and the universal acceptance of the Internet in the 1990s reduced information arbitrage between the developed and developing economies. With the mass espousal of Internet and related technologies, consumers became more aware, new communication platforms popped up and hand held devices became the new content source and consumer channels. Business had to radically change their old business models to stay germane in the new playing field.

Cloud computing has proved to be the new game changer in the technology space. No longer do businesses have to face challenges of maintaining IT systems and related workforce. Cloud adoption has allowed them to focus on their business and hand over the overhead of setting, maintaining, updating and scaling IT systems to specialized third party vendors.

Cloud services have eradicated the benefits of size, scale and scope previously held by a few businesses and has created platforms for all enterprises, irrespective of size, to avail the benefits of exclusive and cutting edge technologies to operate their business. It has cut down

the investment arbitrage and leveled the corporate landscape for new players.

Big Data is a recent phenomenon, made possible only due to the advancement in technology and its mass acceptance. Big Data is here to change the way business operate in this new digital landscape. Just a couple of years back, businesses insights were based on vague feedback systems with uncertainties and big time curves. With the change in the business landscape, and coming of the new technology savvy consumer, enterprises now have access to data which was never available to them before. The phenomena of websites listing instant product feedbacks by consumers, bloggers discussing their experiences, detailed peer to peer comparisons, tweets and posts effecting consumer perceptions and free open knowledge to everyone on their fingertips, was never seen before. Businesses now are struggling to get this information, understand it and adapt to it. It is clear though that early adopters of Big Data will stand out in their competitor landscape and will see unprecedented rewards in the long run.

With new tools and applications answering the need of Big Data capture and analysis, it is still a formidable and difficult task for business to adapt and change their modus operandi around this technology. Big Data inherently brings huge upfront capital investments in setting up infrastructure followed by creating the complex frameworks required to timely capture, store, mine and present insights which then can lead to new strategies and decisions. This again tips the balance in favor of huge enterprises that have enough reserves and hence risk appetites to take on this endeavor. Thanks to cloud vendors who understood this and came up with Big Data services hence drastically reducing CAPEX investments and metering the OPEX environment.

In a recent whitepaper by IDC [1], it was found that globally CBD services will have a compound annual growth rate (CAGR) of 39.4% which is about seven times that of the overall information and communication technology (ICT) market. Also a recent joint study by NASSCOM and CRISIL[2], India will be in the forefront in offering Big Data analytics across Manufacturing, Telecom, Health and Financial Services sectors. The Big Data market will grow in India at 83% globally. CBD is a disruptive technology, enabling organizations to unravel data's veiled potential and provide competitive advantage.

3. SMBE Sector in India

Small and Medium Business Enterprises (SMBE) are vital to the progress of Indian economy. Findings uncovered in a recent study by Boston Consulting Group [3] for Microsoft, state that India has over 40 million small businesses contributing 45% of its industrial output. They also contribute up to 40% of overall exports, 42 million jobs;add1 million employment avenues yearly and produce 8000 plus quality products for local and international markets.

SMBEs have always been the underdogs in the economic landscape of India but in the last few years, these enterprises have seen phenomenal growth due to reasons like improving government policies, rise of educated and entrepreneur youth, and the maturity and slowdown of the IT sector which is the main absorber of straight out of college "freshers". The recent launch of "Make in India" campaign by Prime Minister Mr. Narendra Modi, will further pave a new road to SMBE growth in the country.

The MSMED Act 2006[1] defines SMBEs on the Investment incurred on plant, equipment and machinery.

Type of SMBE	***Services Units***	***Manufacturing Units***
Micro	<= $25000	<=$62500
Small	$25000 - $0.5 mn	$60000 to -$1.25 mn
Medium	$0.5 mn - $1.25 mn	$1.25 mn - $2.50 mn

The study will concentrate mainly on three SMBE sectors.

1. Telecom: The Indian telecom market is around $800 million and the SMBE segment contributed around $200 million and is growing at a staggering pace.
2. Retail: The Retail sector is a very dynamic industry with local and international players trying to create their place in the field. Recently with the rise of new "Mall" culture, retail segment has seen staggering growth.
3. Health: Healthcare is proving to be the next green pasture for SMBE industry. Indian healthcare sector is estimated to grow from $40 billion in 2010 to $280 billion by 2020 and SMBEs will have a major role to play in this growth spurt.

4. CBDS and SMBE Sector

It is essential for SMBEs to deliver quality services and products at a reduced cost and competitive prices. Reducing OPEX through optimizing material, procurement, labor and transaction cost is important for creating a competitive edge. But it is also important to understand the pulse of the customer to be a step ahead than the rest. It is also indispensable to have better information of the current Supply chain, sales, operations processes like to be flexible enough to control and optimize them for competitive advantage.

Like big organizations, SMBEs can leverage big data to gather insight on their customers, explore new markets and reduce costs across the business. However collecting and storing all available data can be a huge

challenge as raw data can quickly reach huge sizes and investing capital for associated hardware and software resources can be a real problem for SMBEs. SMBEs can leverage inherent strengths to inculcate technology enabled processes. The relatively small size of these businesses makes them nimble, responsive and adaptable to the dynamic market conditions than big organizations and allows them to gain further benefits of speed, reliability and control that the e-environment offers.

Appropriate CBDS technology adoption benefits SMBEs in cutting down costs by improving internal processes, product creation and delivery through better client communication, and increasing customer reach through online presence.

Indian subcontinent is in amidst of a technology revolution. There is an exponential growth in smart device adoption fuelled further by decreasing data costs and better 3G or 4G networks. We also see an increased popularity of social media websites like Tumblr, Twitter, Facebook, Pinterest etc. There is a rapid growth of client data being captured by businesses across various touch-points. Business decisions can now be based on real time through intelligence being generated through analytic tools. Cloud based business process have helped businesses to be sleek, mobile and cost effective.

Despite the proven fact that technology has the potential to improve their core business at every step of the business life cycle, Indian SMBE sector has shown slower adoption of upcoming technology due to various exogenous and endogenous constraints. This low level of adoption impedes the competitiveness of SMBEs in the country.

The slow adoption of CBDS can be attributed to few factors:

- Lack of understanding of end to end business value chain benefits which this technology delivers
- Lack of guidance on technology abilities and knowledge of how to integrate and institutionalize these in business
- Resistance to incurring significant upfront investment to implement technology
- Lack of processes and skilled personnel to manage technology infrastructure

CBDS enable SMBEs to overcome the technology barrier by providing easy access to technology and allow them to get rid of the overheads of maintaining costly technology infrastructure while still reaping the benefits of business intelligence tools and services.

SMBEs can now use Big Data services provided by Cloud vendors and thus have access to technology resources in a utility model which are effectively and cost-optimized. They can bypass the burden of huge upfront investments in technology infrastructure, servicing costs, issues related to new technology migration, data security and service downtimes, and focus on their core business and grow based on business insights generated by CBDS.

5. Research Methodology

Cloud platforms are a much better and cost-effective for hosting Big Data services. SMBEs can instead of building a complete in-house infrastructure can now opt for an open and flexible big data solution on cloud and thereby focus on what they should focus on – the business – while the grease-monkey work of sustaining the platform can be looked after by the cloud vendor.

It's apparent that CBDS are useful for SMBEs that want to be able to govern how they scale their big data functions. But it doesn't mean that it comes without its own challenges.

SMBEs today are still hesitant in abandoning their in house traditional IT and Business intelligence models. Despite the hype of Big Data solutions, the 'real' gains from CBDS look hazy to the industries. To compound it, the risks of dependence on a full-fledged cloud based business intelligence solution are not fully quantified and understood. With the growth of technology adoption and the need of Businesses to leverage this data, it is high time for cloud vendors to introspect and identify how new offerings on Big Data will be perceived by the customer. The problem formulation of this research paper is a step in that direction.

This paper adopts a Descriptive kind of research. The top ten gain and risk perception variables are identified by using the personal interview methods. Various discussions with industry experts and SMBE leadership were organized to arrive at gains and risks which they perceive are the guiding factors in SMBE adopting Big Data solutions from Cloud vendors.

6. Method

SMBEs can benefit from the utility: pay-per-use model of Cloud computing and can enrich their business processes using business intelligence generated through Big Data architecture deployed on cloud. This allows them to save up front cost of setting up IT infrastructure, bringing in skilled manpower and configuring applications for BI.

The research paper looks at capturing the top 10 ex-ante preferences (both satisfiers and Dissatisfiers) of SMB Enterprises on adoption of Big Data solutions deployed on Cloud platforms. The Satisfiers and Dissatisfiers are based on what the businesses feel would be the benefits reaped and risks faced in an a-posterior adoption scenario.

- Plan for Data Collection: We have collected data through personal interviews with SMBE leaders and Industry experts distributed to various SMBEs in

Delhi, Mumbai and Chennai. We held 32 interviews out of which 10 we in person and the rest were on Skype Video or on calls.
- During the interviews a lot of knowledge was captured in descriptive form. This was then condensed into 10 heads.

7. Analysis and Interpretation

A key to gaining competitive advantage for any SMBE is to understand the cost versus benefit of identifying, capturing, analyzing and using data. This data can either by the voice of consumers captured through social media, the information captured in the business supply chain, internal financial data or any other data which is related to the business process. SMBEs today understand that Big Data can give them the boost to grow exponentially in market, but they also understand that there will be challenges in doing so. This research identifies following satisfiers and dissatisfiers which SMBEs perceive when questioned about adopting Big Data solution on Cloud.

SATISFIERS:

1. **Cost Effective**:

Clients use the Big Data Solutions provided by cloud vendors in a Utility model. This allows them to save upfront huge costs of establishing servers, manpower and data connections. SMBEs now can simply use these solutions off the cloud directly on their existing infrastructure and leave the hassles of maintaining the infrastructure to the Cloud vendors. This is the cheapest way available for utilizing the CBD solutions. The vendor takes care of

- Server maintenance
- Latest software updates
- Data backups
- Generic support software (Operating system, antivirus etc) updates
- Skilled manpower like DBAs and Server Technicians

Capital Expenditure (CAPEX) comes down drastically breaking down the entry barriers in utilizing these solutions. The expenses associated with cloud based solutions are economical for resources such as real estate, power, support hardware and bandwidth.

Moreover Operational Expenditure (OPEX) also comes down as the client only pays as per use for as long as he requires to. Setting up Big Data tools like Hadoop servers and Visualization tools for SMB enterprises could get very expensive. Also costs of licensing software, setting up interfaces and maintaining this infrastructure could run into thousands of dollars. A cloud implementation of these tools allows SMBEs to simply "plug" into the cloud architecture and use these solutions and pay only for what they use. Payment options like one time payments, pay as per use and other scalable options make CBDS an attractive package for SMBEs.

2. **Innovation**:

Big Data and Cloud are slowly converging into a powerful force and making way for a huge shift in the existing business landscape. The combination of these two technologies will not only unlock new business opportunities but will also revolutionize the way enterprises work. On the whole, this convergence technology is enabling innovation in industries and SMBE need to jump on this bandwagon to get a winning edge over competitors.

Big Data creates values, allows experimentation and allows new business models to evolve. Analytics based on Big Data is going to be the key for business to take the next big step in evolution.

Companies are changing the way in which products and services were traditionally offered. A lot of innovation is being enabled by Big Data solutions on cloud. For example taxi companies have used technology to provide real time booking of cabs based on driver and client location. A lot of these services are based on cloud and real time analytics based on huge real time data. CBDS can help accelerate the way products are made. One example is how the vehicle manufacturer Jaguar designs its new vehicles. The designers use Big Data solutions on the cloud to crunch thousands of data points generated by the designs which they make to tweak and better the final output. Instant innovation and design is now possible due to this new technology.

SMB enterprises have the advantage of being nimble enough to change their processes based on real time changes in their customer needs and perceptions. They can use CBDS to innovate quickly and stay relevant in the market. By overcoming traditional barriers related to time, cost, location and organizational boundaries, CBDS provide an innovative environment for the organization to grow.

As technology advances and becomes affordable, mass adoption allows companies to understand the consumer mindset. Technology like GPS, accelerometers, heart rate monitors and cameras embedded in mobile devices allow capturing user contexts. This data enables organizations to develop features based on biometric recognition, health status, customized advertisements etc. As the convergence matures, so will the innovation.

3. **Location**:

SMEs have sprung up mostly in Non-Metros, in towns and villages. Could services allow these enterprises to connect and use the BI applications irrespective of their location and distance from the cloud vendor. Cloud based services now remove the barriers of distance and location. A cloud vendor in US could provide services to

an enterprise in remote village of Assam. Enterprises can now also collect data from processes running in remote factories, load it on the cloud, analyze it in the BI tools, and generate business intelligence which can help the remote factories run better. Location is no longer a constraint for enterprises.

4. **Convenience**:
A very compelling advantage for Small enterprises to use BI tools over cloud is continuous and ubiquitous access. Users can have immediate access to data anytime, anywhere and from any device they want. The cloud vendor takes care of getting the best architecture for fastest and efficient services leaving the convenience of using the services with no overheads to the user.
Compared to an old In house mainframe model, a CBDS infrastructure is much faster in terms of response time. All that is needed is an Internet connection and enterprises can use the BI tools and software packages and continue focusing on their business as if they had all infrastructures in a physical office location and at the same time pay for services used based on the usage only.

5. **Speed & Scales**:
A growing SMB enterprise needs to be extremely cautious of its resources. It may not be able to afford setting up an in-house facility for business analytics. Cloud based analytic solutions allow the consumers to adopt services and scale up or scale down based on requirements quickly. Being based on a utility model, cloud services allow consumers to simply pay for only services they consume. In case the enterprise feels that it need not use certain services, it can simply stop using and save immediate OPEX.

6. **Multiple Users, Mobility and Device independence**:
The cloud allows organizations to be flexible to allocate resources to those who need services whenever and wherever they are. Applications on cloud can easily be accessed through a data connection anywhere. Services are not tied down to a set of systems or people. CBDS are mostly device independent and the organization has the advantage to just change their technology platforms and still continue using Big Data tools on cloud without any hassles. Complete utilization of resources is possible without any wastage. The services are stretched- CPU usage, Memory, software licenses, all are used simultaneously, hence proving an effective resource utilization.

7. **Flexibility:**
Organizations have the flexibility to choose between various CBD solutions based on current business needs. For example, it is possible for an online retailer to only use these tools post a major launch or sale to analyze the consumer patterns. Once the insights are gathered from the cloud, the retailer does not need the services till next launch. CBDS give the organization the flexibility to opt out of the services anytime. Also the organization can move to a different service provider if it needs to, without any major issues. Compare this to a traditional approach where the enterprise would be stuck with unused hardware resources for the period they are not required.
Also enterprises that use big data solution from the cloud have the flexibility to experiment with different services, methodologies and tools to identify the best fit for their organization. This is very difficult if they have to set up infrastructure in-house.

8. **Unlimited Storage Space and Computing power:**
Big data tools require a lot of computing power and storage for data mining. Cloud vendors base their business models on having top line hardware and fast servers to provide services to clients. Organizations benefit from this model by having fast servers and unlimited storage at their disposal and pay only for the services consumed.
CBD Solution Vendors provide large storage and CPU cores which gets distributed among different clients. Organizations now can pull and store real time big data on cloud and analytics can be performed on this data on fast servers for instant insights giving organizations a competitive edge.

9. **Customize Settings**:
Cloud services are available for all phases of technology framework and clients have the freedom to choose services which suit their business needs. Organizations can choose databases services for centralized data gathering, data cleaning tools for structuring the raw data, analysis tools of this data, or visualization tools for representing the insights or a combination of all these services. Cloud allows the SMBEs to choose and customize what they use and pay for based on their unique business need and existing technology landscape.

10. **Software and Hardware Updates**:
The cloud vendor maintains the actual software and hardware infrastructures and ensures that the service it provides is always in line with the latest technology. Ensuring that software is always updates, latest patches and installed is part of the vendor's responsibility. The service consumers need not worry about software expiration or updates or hardware maintenance. For example the cloud vendor ensures that the any update to the operating system does not affect the tools being used by the client. It also ensures backward compatibility between current data and new updates. The enterprises can leverage advantages of the updated software tools

without working about how the update will affect their data and processes. This minimizes the management overheads and ensures that business is not impacted.

DISSATISFIERS:

1. **Data Security**:

Data is fast becoming one of the major assets any organization can have. This data is the key of competitive advantage and hence its security is usually high priority for organizations. One of major hindrances toward SMBE cloud adoption is data Security. Concern around data privacy, sovereignty and security is a major concern preventing many SMB organizations from considering a move to the cloud for Data solutions. Storing business sensitive data in a third part server and having no control over it is an issue which cloud vendors need to focus on.

Recently a few major cases of data theft on Cloud have come to light.

- The hacking of celebrity personal images from the Apple iCloud servers is a recent example of existing security loopholes of cloud platforms.
- Personal data of thousands of users, almost 98000 files, of a popular social media app: SnapChat was hacked and posted online by hackers who were able to breach the cloud security.
- SMBEs may hesitate in adopting CBDS because of the fear that they cannot keep their company information secure.

2. **Data Privacy**:

Even if the Cloud vendor ensures that the data in the servers is secure, there is a chance that data may still be compromised in the way it is accessed by employees. Since services on cloud are accessed on the network and the client may access it from different locations and devices, it is possible for a simple instance of password sharing by one employee to compromise the entire data security framework.

3. **Data Availability**:

Enterprises need insights from the data real time. Due to the inherent feature of Cloud being available over a network, poses a risk of a network failure leading to non-availability of these tools and data when the business needs it. A concern over whether the cloud can be trusted to provide 24x7 services is always present.

For critical systems, cloud availability is even more of a concern, but even for normal day to day usage, a downtime in the cloud may cause heavy business losses.

4. **Vendor Lock In**:

Storing Big Data in any kind of database requires planning and creation of specific data structures. Overtime as data gets accumulated its mobility becomes an issue. Vendor lock in of organizations data can occur by restricting data mobility from one vendor solution to another. This is also names as a "Roach Motel" for cloud computing. This analogy means that once a client procures the services of a vendor, i.e. checks in data, it cannot check out and transfer its data to another vendor. In simple terms the total cost and effort of exit becomes too high for the enterprise and it gets stuck with the vendor thereby losing control over its data.

5. **System and Process compatibility**:

Organizations need to understand how the Cloud solutions impact their current business processes and if they are compatible with existing systems. For example, the business may be inclined towards using Open Source platforms but the vendor offers services over proprietary platforms. Another case could be that the organization uses an application developed in-house which does not provide any interface to connect to the cloud thereby making cloud adoption impossible or very difficult. Workforce skills could also be an issue wherein the tools and applications which are used internally may not be part of the cloud vendor offering and hence lead retraining on new tools. Understanding the base architecture of the vendor solutions is the key for successful adoption of cloud solutions. SMBEs feel hesitant in adopting cloud out of fear of complexity in handling new tools, frameworks, format, architecture and processes.

6. **Location of Data**:

A cloud vendor may have infrastructure set up in any remote location. Clients may be concerned with their data being stored in in a particular location or country. Even though storage and presence of geographical dispersed infrastructure is beneficial both in terms of cost and data availability (backup and redundant copies), it can raise export control (ITAR/EAR) issues in the context of research data. Also country laws over security and accessibility may influence cloud adoption by SMBEs.

7. **Duration of Services**:

The kind of service and the time period for which this service is provided is of critical importance to clients. For example support services on Business Intelligence tools provided by the vendor could be an important consideration for the client. Another example could be that the organization is only looking for a small term analytic solution (few months only) and is looking for vendors which provide small term engagement solutions. The kind of service and the service duration should be based on client preferences and not vice versa.

8. **Responsibility for End Users**:
A clear demarcation of vendor and client responsibilities is necessary to avoid issues in the long term. Vendor contracts sometimes require the client to comply with the vendor's Acceptable use Policy (AUP), service terms or similar provisions. Most SMBEs do not have necessary technology awareness and knowhow and hence things which are assumed by the cloud vendor may not make sense to the client. The working culture, business priorities and expectations between the client and vendor organizations could also affect the decision behind cloud adoption.

9. **Ownership of Data**:
There is an active debate on the ownership of data stored on the cloud. Organizations are sometimes wary of storing their business data on cloud due to ownership issues of whether the data and consequently the insights generated are controlled by the vendors since they also have data access. This brings into consideration whether the vendor can use Intellectual Property Rights (IPR) or licenses, to use data for personal use simply by virtue of this transaction or the scenario where the vendor acquires and claims security interest in organizations data.

10. **Bandwidth, quality of service and data limits:**
Being network dependent on there is a high possibility of outages and inconvenience involved in using CBDS through slow or inconsistent network connections. Issues ranging from data availability, maintaining active connections online, uploading data to vendor servers, crunching data, data commits etc. may pop up. A question arises on the extent of accountability of both parties in case of service interruptions from problems like power outages, malicious or natural disasters, system failures. Also questions regarding liability for any direct, indirect, incidental, consequential, special or exemplary damages, including but not limited to loss of profits, goodwill, data etc. are important factors for clients which need clarity before adopting CBDS.

8. Conclusion

Big Data Analytics is always aimed at attempts to improve decision making in an organization. Enterprises seek both faster and better decisions, made possible through big data based intelligence. Big data solutions on cloud have an added advantage of speed, reduced cost and availability of real time data on multiple devices.
But these advantages go hand in hand with issues inherent to cloud based technologies. These issues range from security, data availability, vendor lock in and others. For example, big data requires organizations to store business specific data on vendor servers which might lead to security issues.
Nonetheless Big Data has the potential to change the way an SMBE works and its competitive edge. SMBEs can now use cloud based Big Data tools and technologies to leverage benefits ranging from getting customer insights better data driven processes, business insights, new product development and launch etc.
In the process of writing this paper, we have spoken with SMBE leadership and Industry experts to understand what advantages this sector sees and what concerns it has in adopting cloud based big data solutions. This is very specific to SMBEs and their understanding of Big Data advantages and Cloud platforms.

9. Future Directions of Research

SMBE sector is one of the key sectors which will benefit from CBDS. Still there is less awareness in the SMBE sector on Big Data and even less on Cloud based solutions. Through this paper we have not tried to simply list advantages and risks associated with CBDS but tried to understand what decision variables influence the SMBE adoption of CBDS. Cloud platforms have many advantages and disadvantages which may not help SMBE in the decision to move to this technology. As a future direction the top ten decision variables can be clubbed into fewer major heads more inclined to the current technology tools and processes and then ranked on priority. This will help cloud vendors understand the pulse of the SMBE and model new offerings targeted at them.

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Author Profile

With over 9 Years of experience in Information Technology Consulting for clients in Telecom, Banking, Consumer Goods and Pharma, **Prabhjot Singh Lamba** is also a Certified Project Management Professional (PMP), Certified Agile Scrum Master, Certified Java developer and has many industry specific certifications to his name. A gold medalist in his post-graduation degrees (MCA and MBA), Prabhjot works with an International MNC helping clients in their Business IT transformation. A technology enthusiast, he is interested in fields like Big Data, Cloud, Neural Networks and AI and how these fields are changing the IT and Business landscape.