Big Data Analytics: In Service Industry

Rajesh Math[#1], Neha Sharma[#2]

#1 Dr. D.Y. Patil Institute of Master of Computer Applications, University of Pune, Sector no. 29, Akurdi, Pune-411044, Maharashtra, India, Ph. No-9960866179,

#2 Dr. D.Y. Patil Institute of Master of Computer Applications, University of Pune, Sector no. 29, Akurdi, Pune-411044, Maharashtra, India, Ph. No-9923602490,

ABSTRACT

The massive explosion of data and Internet devices has led to rapid advent of Big Data in recent past. Service industry which is a major user for these Big Data applications will lead to major transformation to the delivery process and new insights into consumption pattern and work flows, which in turn will help with new global delivery models encompassing new technologies and distribution of work globally. The Service Industry will use Big Data for various decisions making data system and making the workflow more optimal. The concept of mass production lead to Industrial Revolution, similarly Big Data is expected to drive new forms of economic activity in Service industry with applied human capital, helping to reach new level of economic activity, innovation, and growth.

Key words: Big Data, Decision Making, Service Industry, Customer Satisfaction, Data Analytics, MIS, DSS.

Corresponding Author: Math R.B.

INTRODUCTION

In today's dynamic world, the success of the business depends on selection of right decision among various alternatives available. The choice of right decision mainly depends on the quality and quantity of underlying data. Historically, the business decision making were data oriented systems like personal decision support systems, group support systems, negotiation support systems, intelligent decision support systems, knowledge management based DSS, executive information systems/business intelligence and data warehousing, which were limited in data capture, storage and analytics. Next wave of these data oriented system is Big Data. With the advent of con1`cept of Big Data, technologies like data visualization, cloud computing platforms, massive parallel processing architecture , distributed file systems and scalable storage systems came to forefront. The term Big Data is used almost everywhere these days, from news articles to professional magazines, from tweets to YouTube videos and also for the Blog discussions. The term coined by Roger Magoulas from O'Reilly media in 2005 [1], refers to a wide range of large data sets almost impossible to manage and process

using traditional data management tools. The size of dataset referred as "Big Data" is beyond the ability of traditional DBMS tools to capture, store, manage, and analyze. It is assumed that with technological advances with time the threshold size of datasets qualifying as big data will increase. Also the definition can vary based on the sector and availability of software tools in particular industry. As per our current literature survey, different industries have datasets size ranging from hundred terabytes to multiple petabytes (thousand terabytes). The number of devices and diverse nature of data along with phenomenal growth projected makes the Big Data applications an important source of revenue for IT industry. The difficulty in developing applications is not only due to their sheer size of data but also because of the complexity and diversity of the data. In this paper, our endeavour is to review the recent applications of Big Data and to study the current scope and areas for future application, with focus on Service industry.

The paper is organized in the following manner: Section II discusses the Literature Survey. Customer Satisfaction in Service Industry is discussed in Section III and Background of Analytics and relevance to service industry in Section IV. Big Data Analytics: Global Trend and Trend in India is covered in Section V and conclusion in section VI followed by References.

LITERATURE SURVEY

The study begins with an attempt to understand contemporary decision support system which is a specialized area of information systems with a focus on improving the decision making. Ackoff [2] studied that the goal of the management information systems (MIS) was to make the information available to executives for decision-making purposes. Unfortunately, only few MIS were successful as the IT professionals of the time did not understand the nature of managerial work. Alavi et al [3] deliberated that the MIS systems developed were large and inflexible and the reports generated were difficult to comprehend. Dearden [4] summarized the approach related to decision support systems. Gorry et al [5] coined the term "decision support systems" in their paper and constructed a framework for improving management information systems using Anthony's [6] categories of managerial activity and Simon's [7] taxonomy of decision types. Keen et al [8] narrowed the definition to semi-structured managerial decisions and proposed a scope that is relevant today. There are the plenty of complex unstructured data available on internet, therefore there is growing enthusiasm for the notion of Big Data. Herbert A. Simon [9] had proposed a behavioral model of rational choice which is used in various industries for decision making. The model was used with the contemporary decision making systems but with the explosion of data in modern era, big data is the relevant data provider for the same. It has revolutionized the scientific research, astronomy, education, health care etc. [10-13]. McKinsey estimates [14] a savings of 300 billion dollars every year in the US alone by applying big data concept. Such Big Data analysis now drives nearly every aspect of our modern society, including mobile services, retail, manufacturing, financial services, life sciences, and physical sciences [15].

BACKGROUND OF ANALYTICS AND RELEVANCE TO SERVICE INDUSTRY

Historically academician developed analytic models primarily for Manufacturing Industry and looked at it as Production Maximization problem. Here the central theme for analysis is optimizing the assembly line production and minimizing the primary costs. In case of the

service industry the analytics study has to be focused on workflow analytics as that will be high impact differentiator. The Service Industry differs as the product here is service and the perception of consumer/customer differs based on the 'perceived service level'. Also channels or data sources holding the underlying data define the customer satisfaction.

A. Customer Satisfaction in Service Industry

Most decision-makers/stake holders confirm that customer satisfaction is driven not only by the depth and breadth of their services and locations from where their services are offered but entire communications they have with the company through various media ranging from voice/visual and other media. If the existing customer of bank is applying for a loan on the internet; he/she expects not to visit the bank and certainly wants the bank to know when he/she call for a loan that they have already started an application online and their personal information should be picked up from their prior relationship.

The service industry differs from manufacturing and other traditional industries as the service offered is often intangible as compared to other industries and might be offered using an virtually in today' s modern communication technology. Therefore, customer satisfaction is a problem in all industries but more importantly in service industry.

B. Building Big Data analytics

Data transforms to information and then becomes knowledge which helps us in arriving at a decision. The focus of data analytics is to develop technology to turn data into knowledge for the economic and social benefit to support enterprise. There are multiple uses for big data in every industry – from analysing larger volumes of data than was previously possible to drive more precise answers, to analyse data in motion to capture opportunities that were previously lost. With the level of competition in most industries, it is very important to address a small niche market for all industries and see if the service offering is commensurate with that market segment. The delivery models cross geographies and due to accessibility of data world-wide throw up interesting challenges for analytics. A big data platform enables us o to tackle complex problems that previously could not be solved. When companies can analyse ALL of their available data, rather than a subset, they gain a powerful advantage over their competition. Though people believe that there is a lot of buzz about big data in the market, it isn't hype.

C. Big Data as applied in Service Industry today and near future

The new and growing set of data sources is characterized by its volume (hence the term "big data") and its diversity. So, now more than ever, the techniques to collect this data, align it and interpret it are crucial. e.g., text, voice and video are increasingly important data formats. Other things to note are social networking data, online web data analysis. More and more service sector companies are spending time and resources on these analytics to help them with Customer Analytics: Customer acquisition and retention, customer wallet sizing, Marketing Analytics, Customer Profiling, risk analytics, resource utilization and various operational analytics. Big data – information of extreme size, diversity and complexity – is everywhere. This disruptive phenomenon is destined to help organizations drive innovation by gaining new and faster insight into their customers and conduct the business in different way from the older way.

D. Key Challenges in Big Data

All the organization using 'Big data' are forced to wrestle with some key critical and important issues:

1) The challenge for Big Data enterprises is how to scale out the transactional databases and their traditional IT workflows used to drive revenue, whether from advertising or direct revenue from online services to the cost option is to use commodity servers and open-source SQL databases. The challenge with this approach is that the scaling of the database infrastructure requires a significant amount of redesign of the database and infrastructure to minimize locking issues across the servers.

2) Government Data Significant amount of data that is required for this analytics is in the government domain and it comes with regulation, privacy and security concerns.

3) Enterprise Information Management: Enterprise Information is everywhere – volume, variety, velocity and it keeps growing. This remains one of the biggest CIO challenges to manage this information.

4) Information Strategy: The need to harness the power of information assets. Big data is causing enterprises to find new ways to leverage information sources to drive growth.

5) Data Analytics: The need to draw more insight from your Big Data Analytics or large and complex datasets. This helps organization to need to predict future customer behaviors, trends and outcomes.

What we see today is a trend where Big-Data economics are driving organizations to find innovative ways of addressing the cost structure of large-scale infrastructures. Most of Services Providers for internet related services like ISP, GIS, Telecom vendors & payment gateways are implementing approaches that are likely to become standard for enterprise IT, as they tackle their own big-data implementations. Service Industry specifically and the other industries is poised to become much more significant as services products integrate computerized sensing and broadcasting abilities into our physical environment, creating what is sometimes called an "Internet of things." Data from sensor networks, RFID tags and various transactional databases is bound to create interesting challenges of integration and raise social and privacy issues in times to come. There is going to be significant work in customizing the service offering from these business e.g. customizing the Google API for a Utility companies offering a customer help desk. While we believe that Open Source tools are adequate and provide a feasible alternative, the sheer volume of data and complexity of writing interfaces to these will drive a significant business opportunity to service provider as they could have niche skills to implement them

BIG DATA ANALYTICS: GLOBAL TREND AND TREND IN INDIA

The huge amounts of complex and ever increasing data, consumed by business and corporate, helping them to make evidence-based and consumer-oriented decisions with a huge impact on business operations. "Big Data" relates to this rapidly growing datasets with sizes beyond the ability of conventional database tools to store, manage, and analyse them. This is creating a huge opportunity for the Big Data industry globally. By 2015, Big Data is expected to become a US$25 billion industry, growing at a CAGR of 45 per cent, driven by uses across industries such as manufacturing, retail, financial services, telecom, and healthcare. IDC estimated that in 2011 all the data created in the world amounted to 1.6 trillion gigabytes (1.56 billion terabytes). By 2020, 50 billion devices will be connected to networks and the Internet. While IT services and analytics firms in North America currently dominate the

global market with their Big Data solutions, companies in emerging markets like India and China are expected to catch up soon with the region becoming a hub for high-end data solutions. The Indian Big Data industry is expected to grow from US$200 million in 2012 to US$1 billion in 2015 at a CAGR of 83 per cent. Intel Corp. estimates that the world generates 1 petabyte (1,024 terabytes) of data every 11 seconds, the equivalent of 13 years of high-definition video.

The service industry in India is using the Big Data to help them with Better Capacity Utilization, Resource Allocation, Marketing Analysis, HR Analytics, Better Resource Utilization and making the overall workflow more optimal. The BPO (Business Process Outsourcing) industry which caters to global clientele is starting to make increasing use of Big-Data. The BPOs use analysis of various forms of communications with various stakeholders to identify new opportunities of business and improve their Service Level. E.g. A telephone call-log analysis and analysing of the geographical data of the caller along with analysis of social networking site communications can lead to opening of a new avenue of business. In Service Industry some of the practitioners of these analytics have found that a third-party preparation and building of underlying data is a preferred trend, but what is significant is that analysis is best done by internal resources of organization as they tend to have better intrinsic understanding of data. This gives the Big Data Service Providers an opportunity to build the large datasets and provide that as a service. The enterprise can build their decision models based on the interpretation of these datasets. Some of the examples of these are projecting raw material procurement strategies, Vendor order management fast moving items, impact of promotional activities on sales project staffing requirements, evaluating cross-selling opportunities and identifying the new market segments, penetrating existing market segments and better distribution channels.

Bharti Telecom a leading Telecom player in India for instance, handles around eight billion calls every day, generating Petabytes of data to be analysed for identifying new revenue opportunities. Royal Dutch Shell Plc., according to a McKinsey report in May, uses advanced seismic monitoring sensors to collect up to a Petabyte of geological data per exploration well that need to be analysed; it plans to use the sensors on 10,000 wells.

A recent IDC forecast shows that the Big Data technology and services market will grow at a 27% compound annual growth rate (CAGR) to $32.4 billion through 2017 - or at about six times the growth rate of the overall information and communication technology (ICT) market. There is excellent case studies in services industry where the consumption pattern understood using big data analytics will be used to drive the delivery cycle e.g. TXU Energy – Smart Electric Meters where the use of Smart Electric Meters is being used to drive the delivery cycle. We feel this is an excellent guideline of how the service industry should embrace the application of big data. Table 1 shows some of the global estimates for future based on the information available currently. Based on these we can see Big Data is growing at fast rate and is the one of the fastest growing segment of IT Applications.

Table1. Big Data: Revenue Estimates

	Worldwide	**India**
Year	**US$ Billion**	**US$ Million**
2017	4,740	5,000

Issue 4, Vol.3 (May 2014)
ISSN 2249-6149

2016	3,500	3,500
2015	2,500	2,000
2014	2,000	700
2013	1,810	450
2012	1,159	200

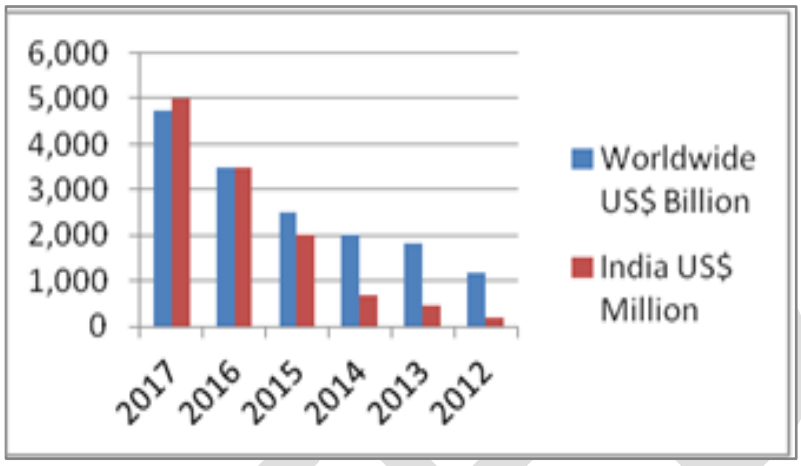

Fig 1: Graphical representation of Revenue Estimates of Big Data

With the rapid advancement in technologies, newer and faster devices are available to capture and process the data. Table 3 and Fig. 2 depicts device and data explosion. This massive increase of Internet Connected Devices will lead to enormous amount of data transfer and storage. This heterogeneous data along with technology and computing power is a big factor in driving the Big Data. The global delivery models gives the business a big advantage is choosing the method and mode of the underlying analytics. The enterprise can use this analytics to explore the areas which were not covered by the traditional data information systems. Another aspect of this rapidly increasing number of devices is the superior processing power of these devices and the diverse nature of data that these devices can create and process. E.g. A smart-phone of today has a processing power of computer of yesteryears and has the ability to send pictures and interpret sound.

Table 2. Devices/Data Explosion - Projected

Year	**# Devices**	**Data Traffic**
	Billion	**Exabytes**
2014	20	44
2016	28	300
2018	36	789
2020	50	1029

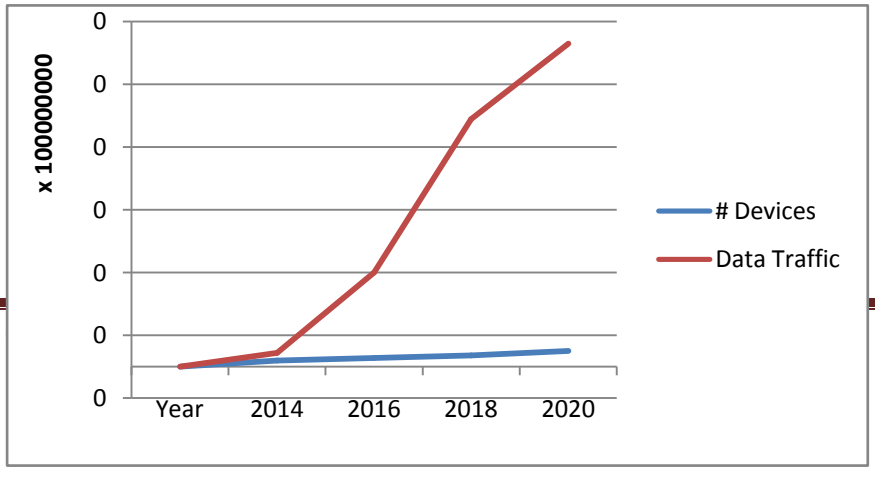

Fig 1: Graphical representation of Projected Devices/Data Explosion

CONCLUSIONS

The massive explosion of devices and data in the next few years will make the Big Data has one of the fastest areas of growth for IT Industry (CAGR of 27-45% per year estimated). As Services industry evolves in the using Big Data Analytics there will be lot of Services and Products which are tailor-made to consumption pattern understood using Big Data analytics which in turn will be used to drive and improvise the delivery cycle. This will leady to new Global Delivery models which will encompass new technologies and delivery nodes that are distributed globally driving innovation and providing insights into phenomenon which were unexplored with traditional systems.

The Service Industry will have segregation of building data for analytics by a external service providers but they will have it interpreted by internal resources of enterprise. We feel this is a trend but can confirm after some research.

The Big Data Analytics Service Providers will have significant business opportunities to build large datasets and derive inferences leading to organizations able to customize and offer services and products which will be able to cope with new demands of business for the Service industry.

REFERENCES

[1] http://strata.oreilly.com/2010/01/roger-magoulas-on-big-data.html

[2] Ackoff, R.L. (1967) Management misinformation systems. Management Science, 14(4), 147-156.

[3] Alavi, M. and Carlson, P. (1992) A review of MIS research and disciplinary development. Journal of Management Information Systems, 8(4), 45-62.

[4] Dearden, J. (1972) MIS is a mirage. Harvard Business Review, 50(1), 90-99.

[5] Gorry, G.A. and Scott Morton, M.S. (1971) A framework for management information systems. Sloan Management Review, 13(1), 1-22.

[6] Anthony, R.N. (1965) Planning and Control Systems: A Framework for Analysis (Harvard University Graduate School of Business Administration, Cambridge, MA).

[7] Simon, H.A. (1977) The new science of management decision (rev. ed.). Englewood Cliffs, NJ: Prentice-Hall. (Original work published 1960).

[8] Keen and Scott Morton, Keen, P.G.W. and Scott Morton, M.S. (1978) Decision Support Systems: An Organizational Perspective. (Addison-Wesley, Reading, MA).

[9] Herbert A. Simon, A Behavioral Model of Rational Choice, The Quarterly Journal of Economics, Vol. 69, No. 1. (Feb., 1955), pp. 99-118

[10] SDSS-III: Massive Spectroscopic Surveys of the Distant Universe, the Milky Way Galaxy, and Extra-Solar Planetary Systems. Jan. 2008.

[11] Advancing Personalized Education. Computing Community Consortium. Spring 2011.

[12] Smart Health and Wellbeing. Computing Community Consortium. Spring 2011.

[13] A Sustainable Future. Computing Community Consortium. Summer 2011.

[14] Big data: The next frontier for innovation, competition, and productivity. James Manyika, Michael Chui, Brad Brown, Jacques Bughin, Richard Dobbs, Charles Roxburgh, and Angela Hung Byers. McKinsey Global Institute. May 2011

[15] Challenges and Opportunities with Big Data, A community white paper developed by leading researchers across the United States

[16] http://www.eol.ucar.edu/projects/bomex/

[17] http://www.eol.ucar.edu/projects/bomex/images/DataAcquisitionSystem.jpg

[18] http://www.bis.gov.uk/assets/biscore/science/docs/i/11-p123-international-comparative-performance-uk-research-base-2011.pdf

[19] http://wikibon.org/wiki/v/4_Excellent_Big_Data_Case_Studies

[20] Mapping the Future Big Data By Patrick Tucker THE FUTURIST July-August-2013http://•www.wfs.org