The Significance of Big Data for the Base of the Pyramid Segment

Keerthan Raj & P. S. Aithal

Srinivas Institute of Management Studies, Srinivas University, Mangalore-575 001, INDIA.
E-Mail: 2keerthanraj@gmail.com

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Keerthan Raj & P. S. Aithal

Srinivas Institute of Management Studies, Srinivas University, Mangalore-575 001, INDIA.
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ABSTRACT

Big data is a term traditionally used to denote data sets that are so voluminous and complex that traditional data processing application software is inadequate to deal with them. Big data challenges include capturing data, storage, analysis, transfer, querying, updating, information privacy, data source, and such aspects. As of recently, 'big data' also refers to predictive analytics, user behaviour analytics and other advanced analytic methods that churn value from data. Data sets are growing very rapidly because of the ability to gather cheap and enormous data from devices such as mobile phones, remote sensing, software logs, cameras, microphones, radio frequency identification readers, and wireless sensor networks. By 2025, IDC predicts that there will be 163 zettabytes of data. On the other hand, the base of the pyramid markets is the growing 4 billion populations who are living on less than $ 2 a day. Management thinkers, Prahalad and Hart, in 1999, propounded their idea on how multinationals can help alleviate poverty and generate profits successfully by selling their products in these markets; many companies have been looking at strategies to serve the BOP segment in emerging markets. Many large corporations have invested a lot of money in these markets and have failed, but also some multinationals who have engaged with the BOP sector have created scalable businesses and generated large profits. Some successful companies have used mobile phone and other information gathering and dissemination technologies to generate valuable information and devise relevant strategies to sell successfully in these markets. While the attraction of the BOP segment has been a topic of research for close to two decades, big data and its applicability to doing business better is prevalent only since 3-4 years. Big data and analytics using big data available all around us are huge in terms of impact for the consumer and the marketer. It has become so imperative that there are in depth studies revolving around big data and how it can be utilized in specific and generic ways and to devise various business strategies of multinationals, companies, domestic players and the like. It has become a huge opportunity that has come about as a result of technological progress and big data can be used in myriad ways to tap and deepen the base of the pyramid markets. There is very little data on the application of big data to the base of the pyramid markets. This paper is an attempt to create a new facet of application of big data to the base of pyramid segment research on how the BOP markets can be served better and companies can get better insights to strategize to enter and serve these markets in a mutually successful manner.

Keywords: Analytics, Big data, BOP, Opportunities, Challenges, Strategies.

1. INTRODUCTION :

'Big data' has become a buzzword in several spheres. As a term it is going through a constant pace of evolution, while earlier it was meant to denote large amounts of information, today big data even includes aspects which refer to predictive analytics, user behaviour analytics and other advanced analytic methods that churn value from data. So, it has gone through a sea change since the word was first coined where it was used to refer to just large sets of data.

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The evolution of 'big data' - even before the dawn of the digital age, computers, and databases we have had information which was stored on paper in customer records, transaction records, archived files and so on. The computer age with spreadsheets, databases paved the way to store and access this volume of information in an easy manner which was quick and easy to store and retrieve. The term has been in use since the 1990s, the concept gained momentum in the early 2000s when industry analyst Doug Laney articulated the current use of the term as we know it to encompass three Vs - volume, velocity, and variety. The volume of the data has to be huge; it could arise from business transactions, social media, from sensors or machine to machine information, but is characterized by the voluminosity of the data. These data sets are at unprecedented speeds and come in all types of formats - structured, numeric data in traditional databases to unstructured text documents, email, and video, audio, stock ticker data and so on. Additionally, features of variability and complexity have been added to characterise big data. Hence, big data requires a set of techniques and technologies with new forms of integration to reveal insights from datasets that are diverse, complex and of a massive scale. Other complementary characteristics of big data are machine learning (big data does not question or reason and simply detects patterns) and digital footprint (it is a by-product of digital interactions). Big data has huge implications for all sectors of society from government to manufacturing to healthcare because digital interactions are increasingly becoming a part of our social fabric and every digital interaction is putting out data, if this volume of data can be studied to established patterns of correlation it can benefit to get things done more cost effectively in a time bound manner, for instance, the government and policymakers can use data to study patterns of development, to strategize further policies to strengthen the economy and the well-being of the public. There has been extensive research on the effective usage of information and communication technologies for development (known as ICT4D), which has depicted that big data technology can make significant contributions to address issues in economic productivity, resource management, prognostics and predictive manufacturing begin with big data. In the field of job creation, it has been found that big data by itself has a shortfall of 1.5 million jobs in the form of highly trained data professionals and managers. Of recent interest is also, big data and the Internet of Things (IOT), These both work together because data extracted from IoT devices provides a mapping of device interconnectivity which is further used to accurately target audience and increase media efficiency [1]. IOT has increasingly also become a medium to gather sensory data to aid further applications in every stream of life. Every action that is taken by an individual leaves a data trail, when we go online, GPS equipped devices, social media, chat applications, shopping etc and there is a huge amount of machine generated data that is getting churned every minute. Most equipment are equipped with sensors which gather and transmit data.

Big data basically works on the principle that the more information we have about something, the more reliably we can make predictions about something or gain insights into the future. Big data can be broken down into various data point classifications such as demographic, psychographic, behavioural and transactional data. Then by building models and then simulating this data, tweaking the value of data points and monitoring the results, new relationships emerge. Big data projects use cutting edge technology such as artificial intelligence and machine learning. While some critics have opined that big data is only a buzzword, big data faces the same challenges as small data - saying that adding more does not add to the problem additionally, would very large data sets still constitute a sample of the population and how defined would be predictive analysis on this basis. It is important to note that the value of big data does not come from its raw form but by processing it and analysing it in a manner most applicable for the decisions under considerations.

2. OBJECTIVES AND SCOPE OF THE PAPER :

The development of Big data techniques to study the business intelligence to handle invisible market opportunities for competitive decisions is considered to be important in the Bottom of the Pyramid sector for many companies due to the large un-served population. Thus it has become so imperative that there are in depth studies required revolving around big data and how it can be utilized in specific and generic ways and to devise various business strategies of multinationals, companies, domestic

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players and the like. In this regard, a huge opportunity that has come about as a result of technological progress and big data can be used in myriad ways to tap and deepen the base of the pyramid markets. Hence in this conceptual paper, we made an attempt to know the opportunities and challenges on identifying, capturing, processing, and using big data from the base of the pyramid markets. This paper also attempts to create a new facet of application of big data to the base of pyramid segment and tried to analyse how the BOP markets can be served better and companies can get better insights to strategize to enter and serve these markets in a mutually successful manner.

3. BOTTOM OF THE PYRAMID (BOP) & BIG OPPORTUNITIES :

The bottom or base of the pyramid refers to the segment of people who live on less than $ 2 per day or with purchasing power parity (PPP) of less than $ 1500 per year. Over the years the word changed from bottom to base to erase away negative connotation associated with the word, bottom. Management thinkers C. K. Prahalad and Stuart Hart in their work in 2002, which later was elaborated by Prahalad in his book 'The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits' (2005) [3] emphasised this, they theorized that there exists a huge, untapped, consumer market at the bottom of the economic pyramid and companies by engaging in this market can earn significant profits by selling products and services to the poor. In their efforts to enter these markets of the future, most multinationals have focussed on elite at the top of the economic pyramid and have developed products and services similar to those in the developed countries, this has resulted in multinationals using an 'imperialist mindset' to sell existing products in established upscale markets in emerging economies such as India, Indonesia, Brazil, China and Mexico [3, 4]. Prahalad and Hart propounded that the size of this market is more than 4 billion potential consumers and corporations can help eradicate poverty by incorporating this market into the formal economy. This proposition by integrating the seemingly contrasting concepts of commercialisation and poverty eradication has been the topic of much further work by various persons and has attracted corporate attention as well as many criticisms by eminent researchers over the years. The base of the pyramid segment has attracted many corporations and multinationals and consumers have better access to products and services today.

4. BIG DATA AND THE BOP MARKET :

The first question we need to understand is, is there a 'BOP market'? The answer to which lies in the definition of a market. A market is a place where sellers and buyers exchange goods for value or a price. BOP communities consist of human beings with a variety of needs and wants [5]. The most basic of the human needs for sustenance - food, clothing, and shelter needs to be addressed. Certain BOP markets may be self-sufficient but there are various gaps and even the basic needs are not getting fulfilled completely in their own subsystems [9-14]. For instance, the consumer might be living in a makeshift thatched kuccha dwelling, even to repair this dwelling and live in it on a day to day basis he may need to procure plastic sheets, containers and so on. This may not be available in his subsystem and he will have to scout and buy it from a local vendor. Hence, a market is created.

Big data technology is growing and reached a stage to handle many big data challenges involving capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy and data source using the concepts like volume, variety, velocity, veracity, and value. Big data technology can be used for processing big data generated in marketing and customer satisfaction activities and strategies [15-22]. Since the size of the BOP market is more than 4 billion potential consumers, serving them through any process generates a huge amount of useful data which can be further analysed through known analytics for business intelligence for futuristic decisions. From the BPO frame of reference, we look at big data from a simple perspective of two seemingly contrasting viewpoints of (1) Opportunities, and (2) Challenges. Table 1 depicts the opportunities and challenges of collecting Big data from BOP segment using various techniques/systems.

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Table 1: Opportunities and Challenges of collecting Big data from BOP segment.

Opportunities	Challenges
1. Biometric Identification System	1. Optimising usage
2. Mobile ubiquity	2. Literacy
3. Wi-Fi hotspots	3. Socio cultural norms
4. 'Smart' Ration cards	4. Implementation
5. e-ticketing	5. Data Sifting
6. Jan Dhan	
7. Health care centres	

The opportunities available for big data in India are:

(1) Biometric Identification System:

The biometric identification system in India has been the most profound opportunity for the marketer from the BOP segment. The various initiatives by the government which had mandated providing of the Aadhar card will ensure that all citizens across the country will be mapped into this data, this in turn which helps policymakers churn a huge amount of data. The applications could range from policy decisions to re-allocating funds for marginalised sectors. Banks financial institutions, government will get crucial information on the financial habits of the subsistence segments of the economy. The saving habits of this class of consumers, financial products that they purchase, investments they make, if any. There is currently very limited information made available through quantitative descriptive research studies that determines the consumption habits of the BOP segment, these in most cases depict a high propensity of bop consumers to spend on gold purchases of whatever little they might be able to save after meeting their basic needs. Since the provision of this biometric identification card has been made mandatory for many financial transactions, the data on purchase and saving habits can throw up a wealth of information to marketers' right from the stage of inception of product suite to devising effective marketing communication strategies. The microfinance initiative as a means of providing credit to the marginalised has paved the way for the borrowers' information being available for a stream of uses. Big data here helps to monitor financial market activity and if the data is segregated using identification process and simulated with population information it will also help in arresting illegal financial activities, money lender rackets in the bop markets.

(2) Mobile Ubiquity:

In most base of the pyramid markets in emerging economies the need hierarchy is not strictly following its course, in most cases higher order needs have become necessities. The most characteristic feature of BOP markets is that there has to be an inherent need or a need has to be created for a purchase venue. The proposition of purchase necessarily starts with need identification. The simple mobile phone has become a necessity today. It is more prevalent in use in all sectors and with consumers transcending economic diversities. The mobile ubiquity is paving the way for tremendous information excess which leads to data capture. Among IOT, the mobile handset has been very prevalent in capturing information, especially with the digital revolution and streamlining of internet access availability, mobiles are going to a big opportunity grosser for big data.

(3) Wi-Fi Hotspots:

One of the biggest advantages of the digital revolution is that it has paved the way for increasing mobile presence across every strata of Indian society. Companies such as Jio were given increasing bandwidth to increase the mobile revolution among the population. The situation in India has been towards increasing mobile usage and in areas where sometimes electricity and basic water availability may be scarce mobile presence has been seen. The government's initiative of spreading free wifi counters across public places such as bus stations, train stations, hospitals will pave the way for higher usage which would ensure higher amount of data being available from all segments, especially the BOP segments that would be frequently using these services. Studies by Mckinsey Global Institute report has revealed that communication services in India will be the fastest growth sector by 2025 accounting for 13.4 per cent growth [8].

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(4) Smart Ration Cards:

A very large percentage of bop consumers uses the ration card to purchase the monthly subsidized food grains that are available to them. If this activity could be given a digitized edge by converting in a phased manner the existing rations cards to chip based which could track the pattern of consumption and provide volumes of data on not just food grains and essentials consumption but other related activities where ration cards could be quoted such as financial services, e-ticketing services and if mandated for some essential services it will be a very useful data to draw put inferences and patterns on the BOP market which is highly lacking as of date on information on consumption patterns etc because of being predominantly in the informal sector.

(5) E-ticketing:

It has been found that while a major portion of the meagre income of BOP segments is spent on food, the next biggest piece of the consumption pie remains the transportation services [8]. For purposes of employment, selling the goods and services or purchase of essential commodities, education of children, BOP consumers need to spend a significant amount on transportation. Along with availability of wi-fi hot spots in bus and trains stations, ticketing itself at government owned transport services e-ticket issuing is the norm. If it is linked to the UIDAI number or a ration card number at the time of issuance of tickets a lot of information can be cross linked to the segments that the consumer belongs to travelling pattern frequency etc. which again applying big data techniques could be used to further availability of the better planning and strategizing to target and involve this segment better in all policy formation and socio economic developmental decisions.

(6) Jan Dhan:

Jan Dhan account was a huge mobilisation activity that was embarked upon. The biggest benefit that can be gained out of this is the financial inclusion of a vast majority of the population that was underserved and neglected. This also brought about financial literacy among the low income, a segment that was a major drawback. Especially persons in the BOP markets have very sparse access to banking and other financial services and very little had been done to get this segment to come under the ambit of fully fledged banking services. The Jan Dhan paved the way to ensure that every household in India has a bank account and ease of access to these accounts. Since this initiative was launched more than 296 million bank accounts have been opened as on date. Prior to the launch of Jan Dhan more than 35% of Indian households did not have access to a bank account. This account mobilisation will slowly move Indians from cash based transactions to digital transactions and this would give a major boost to the economic growth. In unorganized sectors and BOP segments there are major cash transactions, which are not accounted for, and to that extent the taxes are evaded. Additionally, it becomes near impossible for government to get an accurate estimate of the size and volume of business that is generated in the informal sector. Many of these bottlenecks in addressing the informal economy will be taken care of and huge volumes of information will start being available for data analytics to guide policy decisions and decisions by marketers and corporations. As Erik Simanis, of the Center for Sustainable Global Enterprise at the Johnson School of Management says in his book, without any frames of reference all the data that companies can gather from primary sources or secondary sources will only continue to be "random predictions about an unknowable future"[5]. Data that is going to be captured by these digital equipments and transactions data will give reliable sources to guide predictions and decision making.

(7) Health Care Centres:

Healthcare is going to be the next biggest game changer for the developing economies after food and transportation. With a major portion of the population in emerging economies being in the low income segment, their numbers are large and a lot can be gathered if proper information can be gathered across health centres and hospitals, with the digitization drive in India, e-health and m-health are raging trends that are being targeted by large and small health care providers. There are several initiatives to get the healthcare services on a digital mode and this is going to give key insights into the most critical services sector of tomorrow. Demographics data, psychographic orientations', costs associated, how the BOP consumers make decisions will all throw up a lot of new knowledge for informed choices, market segmentation, targeting, market creation and such other strategies. Certain

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cases in point, such as that of P&G's PUR, where after a thorough research of more than three years and extensive test marketing in four countries P& G's PUR had only a consumer adoption rate of less than 5 per cent [1,8]. Such classic cases of resounding commercial failures would undoubtedly decrease if there is strong data and predictive behaviour to back target marketing and entry strategies for corporations at large because it would also be a mutually beneficial product proposition that would strive for an enhanced like circumstances for the BOP consumers.

The Major challenges that would disrupt the easy availability of data would be –

(1) Optimising Usage:

The initiatives that have taken place be it Jan Dhan, digitization, wifi, and the rest could be successful at gathering information only when optimum usage of these services by the segments that it was targeted for is rationalized. The Jan Dhan accounts were misused by persons other than account holders even though there was a major influx of transactions. Such one off instances needs to be checked against because this would unnecessarily give wrong and false data and would lead information buckets to be wrong and misleading. Another example could be the availability of wifi but no users from the targeted segments. All of these initiatives should be driven to optimum implementation and usage to ensure that information flows overtime are plateaued to filter away unnatural incidences.

(2) Literacy:

The very low literacy rates among the low income and BOP population is a major challenge to any program. The lack of education and knowledge is augmented by close cohesive communities where illiteracy and ignorance breed. This has brought about the failure of many well thought out product propositions and corporations. Another classic example of this with a positive connotation is that of the soy protein manufacturer, Solae, which ventured into the Indian low income consumer market. The product was new, not used and tested, bland, no attraction but they were initially able to make take home profits within a year of operations because they worked on new techniques' of involving within the communities and creating various programs such as community cooking, cooking outreach meetings etc [5]. So, illiteracy should not be looked at from a standalone point of view, it needs to be addressed by surmounting techniques that could pave the way for mass adoption to new techniques in a way to embed the newer techniques in the lives of the consumers.

(3) Socio cultural Norms:

Most BOP markets are characterized by close knit communities which are immersed in deep rooted socio cultural norms and it is deeply embedded in their lives. To get this class of consumers to adopt new products and services even when these products could be of great value addition to the quality of life of these consumers is an uphill task. There have been many instances where big marketers were not able to make inroads into these close knit communities because of these socio cultural norms. This is a major impediment in getting big data from the BOP segment; they may not be willing to use any of the new IOT devices. Many multinational companies have failed in getting under the socio cultural fabric of the BOP segments and this has been the reason for failure of products intended to serve this segment even when there was inherent quality of life improvement prospects in these products.

(4) Implementation:

Another major challenge is going to be the implementation. As mentioned earlier it could be for reasons of lack of adequate resources – be it financial, economic or otherwise. While there has been a great movement towards digitization in the rural and low income space, the momentum is not yet enough to generate huge volumes of data from this segment. Especially, when it is seen in the context of countries like India where as studies have revealed, even with a small increase in income or there is a great propensity for consumption of negative goods and in certain cases there demand for negative goods such as tobacco and related products, alcohol does not even bear a correlation to income levels. So, inherently there is an issue of implementation, not from the administrative perspective but from the acceptability and usage by the people of this segment. Even though big data can contribute significantly in administration of a city by traffic management or making patient information available in a permanent database of regular update and treatment in health care or in prognostic analytics by businesses implementation and timely availability and access of this could be a challenge. This issue

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is twofold, one implementation by businesses and government of picking this data and using it for community betterment and two, implementation by the public by accepting to use this embedded technologies. There could be a lack of cultural willingness, financial shortages or unavailability of information. The data thrown up could also be unusable due to improper implementation or inadequate [7, 8]. The volumes of data gathered could be so large that majority of the time of may not be used at all. For instance, telephone numbers gathered at billing counters of retail outlets will be able to create models of purchase behaviour, analyse and predict frequencies on demographic variables' etc but it is not being used as extensively today. Even simple traffic cameras across a city could be used to phase traffic movement and ease out city traffic congestion etc.

(5) Data Sifting:

Big data is been heard everywhere today and most companies want to gather more and more data from all possible owned or general sources. The IOT is also proving to be a major weapon in the hands of information builders, every conceivable device embedded with a chip in throwing up large volumes of information. The challenge for the business implication of using this information and churning this information into data and applicability of it would be in sifting relevant and irrelevant data [11, 12]. Most devices would have captured information but taking away only the relevant information to be used is going to be a bigger challenge requiring higher levels of data management techniques. As per research studies, 89 % of companies believe that they need to adapt to big data analytics else they would be left behind by competitors. For this to be a reality, companies need to focus a higher amount of time on gathering specific relevant data and rejecting unfit and irrelevant data, a mechanism to create this bifurcation is going to need focus. For businesses, the ability to leverage big data effectively in the coming years is going to be critical for success.

Below (figure 1), is a value chain of big data and its relevance for businesses and industries, apart from data analytics, predictive analytics and artificial intelligence which is just the mid phases of big data application, it could be used going forward in a variety of ways in industries and businesses.

Figure 1: Big Data Value Chain
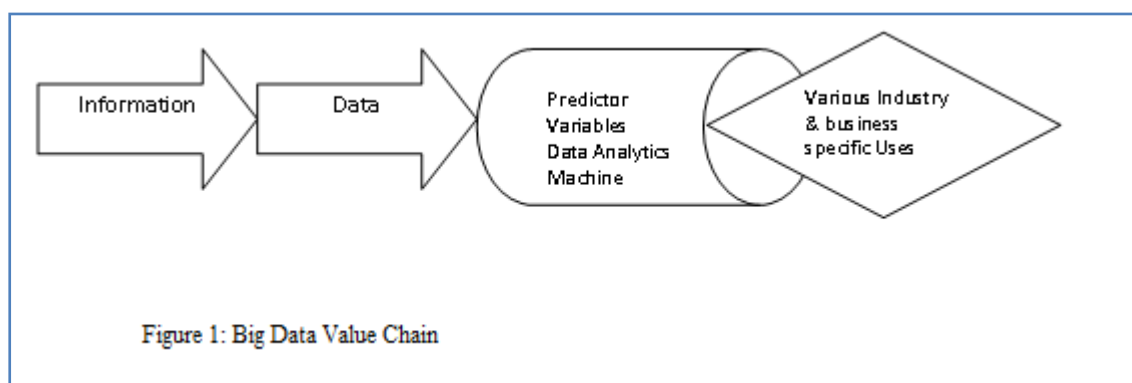
The industrial internet has been projected to be worth $ 500 billion in worldwide spending by 2020; this includes both hardware, software and services sales as per research from Accenture and General Electric. The study shows that many corporations are investing a majority of their time in analysis and predictive analysis is catching up.

The other concerns that can be associated with big data can be of data privacy, as was recently the case with Facebook when people realised a lot of data leak happening and data security and its impending repercussions need to be handled with utmost care. While big data has positive effects on businesses, technologies and decision making, it should not be allowed to lead to data discrimination, especially for the segment of people at the base of the pyramid, if corporations, businesses and agencies start using this data to discriminate on offering facilities and services, since these are people with already lesser means, resources, and access to information [6, 7].

5. CONCLUSION :

For most corporations, there is substantial real spending on big data. Even though we are talking

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about huge voluminous information, companies have spent a lot of time and resources in putting data capturing techniques in place to gather this information. Specifically understanding the relevance of this information and tweaking it to adapt to business and decision making models are going to be the game changer for companies and governing bodies alike. Moving the publicly available linked open data to object oriented data in public domains is also critical. It will take a lot more time for the general public to be able to effectively utilise this data churn and to get knowledgeable insights from this data. However, as of now, especially for our discussion of the base of the pyramid segment where there is very little information available, big data is going to be the answer to a lot of questions among corporations and aided agencies in tapping this sector. It would help shape future policy in governments and future decisions in business in a better way.

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