Future Trends of Business Intelligence and Big Data Analytics in Ubiquitous Environment

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Abstract—Business intelligence and analytics has emerged as an important area to generate new applications by decision makers thereby assessing the impact of data-related issues in business enterprises. This is a rapid multibillion-dollar across the globe opportunity and is expanding rapidly. Research on Business Intelligence provides an umbrella activity to identify the applications in upcoming research areas of Business Intelligence and Analytics. The current research framework revolves around different areas of analytics and Big Data. Big data is rising up out of the domain of coincidental ventures to standard business appropriation; anyway the genuine estimation of huge information isn't in the mind-boggling size of it, yet more in its successful use. We will likely acquire knowledge from voluminous information, with billions of approximately organized bytes of information originating from various channels spread crosswise over various areas, which should be handled until the needle in the bundle is found. It can be functional to diverse domains such as improving the Safety, Security, privacy preservation, Intellectual property rights, cyber law, Optimizing Business Processes, improving Health sector, Optimizing Villages, Cities and habitats which build on their existing strengths and tangible benefits as well as on developing new avenues, where conventional and new networks and services are improved by means of electronics, telecommunication technologies, and smart devices for the better use of processed information, Optimizing Machine and Device Performance, improving E-Governance, Financial forecasting, Stock market prediction, fraud detection, E-Business and Market Intelligence, improving Research in Science and Technology.

Keywords: Business Intelligence, Business analytics, big data

1. INTRODUCTION

As Artificial Intelligence (AI) and Machine Learning (ML) technologies persist to transform organizations and business will increasingly depend on the automated and semi automated data-analysis capabilities of powerful BI tools. So far as Business Analytics and BI are concerned, AI research has reached to optimal level, and both ML applications in a big way, and Deep Learning and machine learning applications in a small way have begun to pave the

future business. The users will experience Advanced Analytics in mainstream access in near future.

The AI and BI platforms are highly subjective business decisions, such as talent selection or market trends, selection, and dissemination of goods and logistics, are now completely driven by data and insights. Moreover, the earlier data-driven analyses like risk identification, risk mitigation and monitoring are becoming more complicated and more adaptive to user needs.

In various organizations, the avenues associated with the data and its analysis have helped generate significant interest in Business intelligence and data analytics, which is often referred to as the systems, tools, techniques, practices, methodologies, technologies, and applications that critically transform business data to better understand an enterprise's business market and make informed decisions. In addition to the underlying data processing and online analytical processing tools, Big Data Analytics includes business-centric practices and technologies. A recent survey indicates that the Business intelligence and Big Data Analytics services market will grow at about six times the growth rate of the overall information technology market or at a 27% CAGR to $33 billion through 2017 or 4.4 million People are expected to be employed worldwide at various levels and are openly involved with big data analytics by 2019. But this will not be sufficient. Indian Commerce industry is targeting to implement 70% BI and Big Data analytics applications by 2020.

Due to the decrease in size and cost of Hardware and the explosion of smart sensors, smart devices, new software applications, and the ubiquitous Internet of Things, telecom companies can expect to see a doubling of data volume each year. Think terabytes of information and more. This massive amount of information is why experts coined the term "Big Data." Developing and implementing effective, automated and semi automated tools to process voluminous amounts of information and benefit from this information is what marks the difference between the unrelated data that is Big Data and Smart Data, organized intelligence that can help decision makers to make profitable business decisions.

1.1 Big Data

Big Data is often in an unstructured format and voluminous in size, meaning it comes from sources as disparate as social media posts, intelligent devices, chat rooms and data from various sources. Documents are much easier to process and analyze. The difficulty in analyzing Big Data resides in the labor-intensive costs and time constraints.

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Furthermore, companies that can't get their arms around Big Data find they cannot give it a useful purpose. Big Data's value lies in its usefulness to predict, bolster threat detection, or guide policy decisions. Developing strategic guidance about the company's future is also a great benefit.

The first step in understanding Big Data is to review your in-house data. To do this, it is critical to:

- Identify the data that exists in the organization to date, who uses it and how;
- Employ data scientists to analyze the data if you do not already have them on staff; and
- Identify any special tools your company will need to manage and massage the Big Data.

1.2 Big Data into Smart Data

For Telecom executives, the essential task is asking the right questions for each set of circumstances. When analyzed appropriately, Big Data can drive company decisions in product development, sales forecasts, customer relationship and marketing programs. It can even be applied in selecting the right data scientists, data analysts, database administrators for an organization.

Smart Data

Big Data developments and its impact on the IT industry are enormous. At this point, however, telecom companies are using Big Data to develop 5G technologies. This technology offers unlimited potential, with advances such as

- Scaling telecom services.
- Improved speed imperative for future infrastructure architecture (5G is 100 times faster than existing networks),
- Creating smart villages, cities that use Big Data and technology with a goal to better resident lives, such as sustainability, improved efficiencies, and rapid economic development.
- Virtual and augmented reality platforms.
- Continued expansion of devices utilizing IOT technology.

Recent research indicated that 5G technology, WIFI, LIFI the next generation of wireless that is ready for seamless integration into the 5G core. LiFi is a wireless technology holds the key to solving challenges by 5G.

Using AI to Capture Smart Data Insights

Most exciting of all, the development of Artificial Intelligence (AI) and Machine Learning make it easier to analyze Big Data to gain insights into your business. Machine learning helps with:

- Fraud detection.
- Trend analysis of market conditions.
- A better understanding of consumer expectations.
- Compliance within the legal environment in which each business operates.

Smart Data in the telecom industry has helped to reduce infrastructure costs by focusing on wireless technology. It's also proven to decrease the rate of customer turnover through improved customer satisfaction.

Smart Data Paves the Way for Internet Security

Turning Big Data into Smart Data means an increased ability to fortify internet security. This advantage is something every business needs in its environment of malware and widespread malicious and intentional threats. Avoiding data breaches and protecting sensitive consumer data is of paramount importance because consumers have high expectations on this front. The recent General Data Protection Regulation proposed by European Union in 2018 is just one example of how important this issue is for multinational companies facing varying levels of global data protection rules. Besides, experts believe that technological advancements will cause companies to adopt business-wide encryption protocols to ensure that their networks stand ready and able to take advantage of future technological advances. Big Data and Business Intelligence are the emerging methodologies analyze, process, transform data in order to improve the top level management to take quick decisions. However, the techniques and type of data used for both these domains differ. Traditional Business intelligence mechanism is based on the principle of mixing all business data into a centralized data repository. Generally, the data collected from external resources are extracted, loaded, transformed using OLAP tools and the information is stored in Data Warehouse, i.e which is subject oriented, non volatile, and time invariant. The data collected from heterogeneous databases is cleaned, extracted, transformed using Analytical processing tools and is stored in Relational databases with an supplement set of indices and forms of access to the two dimensional syntax diagram called tables. Data in the form of multidimensional data bases (Data Cubes).

1.3 BI Vs Big Data

Big Data differs in many ways

1. In a Big Data domain, information is stored on a distributed file system sometimes the information is stored in RAID (Redundant array inexpensive disks), rather than on a central server. It is a more protected and more adaptable.
2. The solutions carry the processing functions to the data, rather than the data to the functions. As the data analysis is the key ingredient in data analytics, it´s easier to make use of voluminous amounts of information in a more responsive approach.
3. It can process data in different styles, both structured, semi structured and unstructured. The quantity of the unstructured data is growing at higher levels when compared with structured data.
4. Data processed by Big Data can be chronological, heterogeneous or come from on line sources. Thus, enterprises can make decisions that affect their business in an agile and efficient way.
5. This technology uses parallel crowd source processing and distributed concepts, which improves the processing speed. With Mass Parallel processing many instructions are executed parallel, and since the various tasks are divided into several parallel execution parts, at the end the overall results are merged and viewed. This makes the decision maker to process voluminous data for rapid decision making.

2. THE NEED OF BUSINESS INTELLIGENCE AND ANALYTICS

The term intelligence Business intelligence became a popular term only in early 1990s. Recently to describe the data sets, data schema, file formats and analytical tools in applications that are so large and complex (from charged coupled devices, multimedia to electronic media data) that they require unique and advanced data storage, management, data process, and visualization technologies, big data and big data analytics have been used. Business intelligence and analytics is used as a unified term they offer new directions in research.
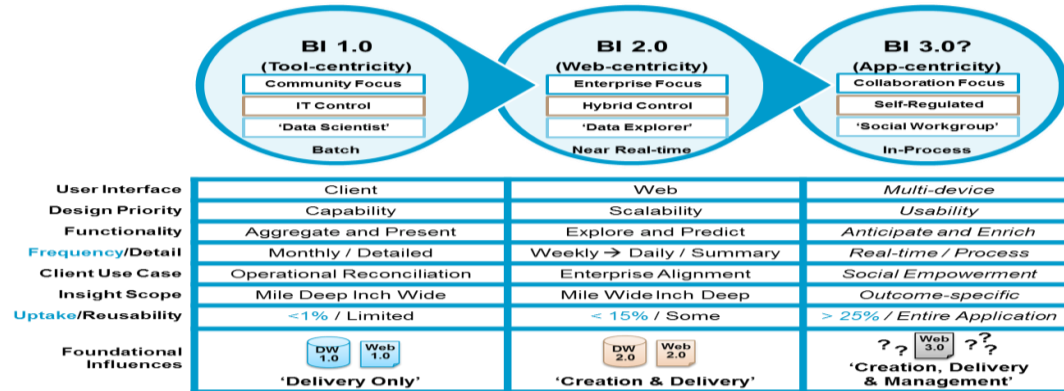

Figure 1: BI 3.0 – Business Intelligence-The Journey (Source: Compiled)

Table 1: BI & A capabilities areas and their outreach

S.No	BI & A capabilities areas	Analytically impaired	Localized analytics	Analytical objective	Analytical organizations	Analytical stakeholders
1	People	End Users do not know their own data requirements	BI initiatives are taken by the users	Users try to optimize the efficiency of individual departments by BI	Users have high BI & A capabilities, but often not aligned with right role	Availability time for the Users and capabilities to use BI
2	Processes	Users do not know business requirements	Identifying basic requirements	Standardization of business processes, and building best practices in BI & A	BPM based on specifics	Broadly supported, process-oriented culture based on specifics
3	Technology	Missing data, poor data, un-integrated systems	Missing important data, isolated BI & A efforts	Proliferation of BI & A tools	High quality of data, integrated knowledge repositories	Enterprise-wide BI & A architecture highly implemented
4	Culture	No flexibility & agility	Low support from senior executives	Users are encourage to extract, transform, process, analyze and disseminate information	Establishing a fact approach and learning culture, skill training in BI	Learning from customers, suppliers, communities of practice, social media.
5	Governance	Lack of vision and plan	Businesses plans for limited departments	Integrated business strategy	Have an enterprise BI & A strategy	BI & A strategy oriented on customers, suppliers etc.
6	Creativity & Change	Fear of change, no creativity	Risk mgmt of selected business process, poor and limited creativity	Building the best practices for change management , individual and team creativity	Integrated risk management, team and organizational creativity	Cooperation with competition, organization creativity, creative environment

2.1 Applications of Business intelligence and data analytics

A few global business and IT patterns have helped shape over a wide span of time BI&A look into bearings. Worldwide travel, rapid system relations, worldwide inventory network, and Customer relationship the board, outsider contracts have made a gigantic open door for IT progression. As of late, the Data science period has unobtrusively slid on numerous networks, from private area, open segment and e-business to wellbeing part. A few of these promising and high-sway Business intelligence domains are presented below: (1) Business intelligence and e-business, (2) Good Governance (3) science and technology, (4) health, environment, ecology and (5) safety and security.

I. Improving E-Commerce and Market Intelligence

The excitement surrounding BI and Data Analytics has arguably been generated primarily from the web and ecommerce forums. Market swift has been significantly accomplished by leading e-commerce vendors such Snapdeal, flipkart through their innovative and highly scalable ecommerce platforms and product recommender systems. Major Internet organizations such as lycos, flipkart, and twitter continue to lead the development of web analytics, distributed computing, and social media platforms. The need of customer generated ERP tool content on various platforms, chatgroups, social media platforms, and crowd-sourcing systems offers another opportunity for researchers and practitioners to listen to the voice of the market from a vast number of business constituents that includes customers, employees, investors, and the media.

Product Recommended systems have been developed based on analytical techniques, such as database segmentation, supervised and unsupervised learning techniques, association rule mining, anomaly detection, Support vector machines and graph mining.

II. Improving E-Governance

The advent of new Enterprise Resource planning tools which has promoted much enthusiasm for reinventing good governance. In early 2010 E Governance techniques were introduced in General election this was the initial sign of success for online campaigning and political participation. There is much scope for adopting Business intelligence and analytics research in politics and e-governance policies and applications since the government and the political processes have become more participatory, transparent, online, and multimedia-rich. Selected opinion mining, social media analytics techniques and social network analysis help to better serve their target groups.

III. Improving Research in Science and Technology

Science and technology are the driving forces for today's social, economical and cultural changes in the society. Science and technology is currently being transformed by the new avenues through the use of Voluminous, heterogeneous data. Various fields of specializations in Science and engineering are reaping the benefits of high-throughput sensors and instruments, from astrophysics, nanoelectronics, and climatology, to genome and ecology research.

IV. Improving Healthcare and Public Health

The growth of usage for big data in elevating rural health, livelihoods and well being, in the face of the ageing of global society and the hike in real healthcare costs. It looks at how more use of big data will facilitate to solve these and other health issues, and then gives original or forecasted examples of its use in health sector.
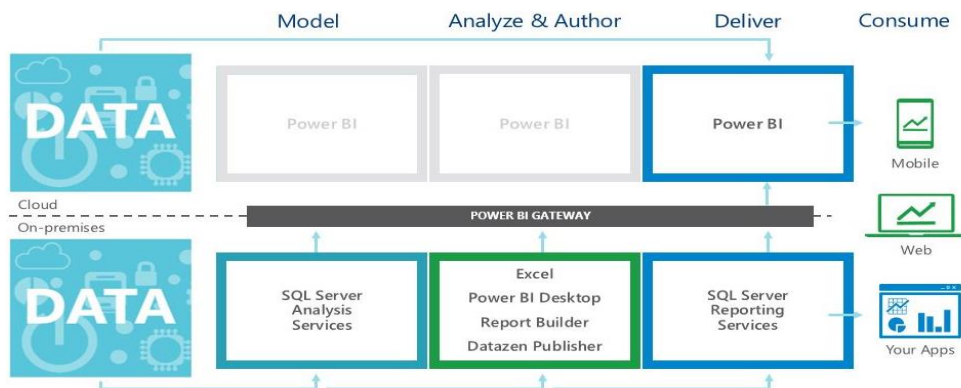

Figure 2: BI & A-Roadmap

Table 2: Foundation Technologies Vs. Emerging Research

	(Big) Data Analytics	**Text Analytics**	**Web Analytics**	**Network Analytics**	**Mobile Analytics**
Foundational Technologies	• Relation database • Data Consolidated • Extract transform load • Online analytical processing tools • BPM • Data Mining • Supervised learning • Regression • Unsupervised learning • Association analysis • Anomaly detection • FFNN, RBNF • GA • MVC • SVM • Optimizaion • Heuristic search	• IRS • Document representation • Request processing • Relevance feedback • Data models • Information Search engines • Enterprise search systems	• Information retrieval • Computational linguistics • Search engines • Web sources • Web site ranking • Search log analysis • Recommender systems • Web services • mashups	• Bibliometrc analysis • Citation network • Human Network • Social network theories • Network metrics and design • Network picturasation	•Web services •Smartphone platforms
Table 3: Foundation domains Vs. Emerging Technologies					
Emerging Research	• Statistical ML • Sequential and temporal data mining • Spatial mining high dimensional data streams and sensor data • Process mining • Privacy preservation • Data Protection • Network mining • Web mining • Column based DBMS • In memory DBMS • Parallel DBMS • Cloud computing • Hadoop • MapReduce	•Statistical NLP •Information extraction •Topic models •Question-answering systems •Opinion mining •Sentiment/affect analysis •Web stylometric analysis •Multilingual analysis •Text visualization •Multimedia IR •Mobile IR •Hadoop •MapReduce	• Cloud services • Cloud computing • Social search and mining • Reputation systems • Social media analytics • Web visualization • Web based auctions • Internet monetization • Social marketing • Web privacy / security	•Link mining •Community detection •Dynamic network modeling •Social influence and information diffusion models •ERGMs •Virtual communities •Fraud detection /dark networks •Social/political analysis •Trust and reputation	• Mobile web services • Mobile context aware apps • Mobile sensing apps • Mobile social innovation • Mobile social networking • Mobile visualization/ HCI • Personalization and behavioural modeling • Gamification • Mobile advertising and marketing

3. IMPLICATIONS & FUTURE RESEARCH DIRECTION

Be that as it may, the BI scene is developing and the eventual fate of business insight is played now, with rising patterns to watch out for. In 2019, business insight systems will turn out to be progressively redone. Organizations of all sizes are never again inquiring as to whether they need expanded access to business knowledge investigation however what is the best BI answer for their particular business. Organizations are never again thinking about whether information perceptions improve examinations however what is the most ideal approach to recount to every datum story. 2019 will be the time of information quality administration and information disclosure: perfect and secure information joined with a basic and ground-breaking introduction.

It will likewise be a time of multi-cloud methodologies and man-made consciousness. Huge information is never again only a popular expression. Just about 50 percent of firms are actualizing and extending enormous information innovation reception. Another 30 percent are intending to embrace huge information in the following a year.

4. CONCLUSION

In this era of electronic and digital devices, most people are using Big Data, ML, AI and such without really understanding what goes on to provide those services. Data is at the very center of any application and the sheer volumes of data generated, the variety of sources and formats, the need to manage, clean, extract, load, transform, prepare and draw meaningful inferences for business purposes and making decisions is being used extremely widely. And this spawning of data, means the projects involve Big Data and that technology has to evolve and changes to manage it. This also indirectly implies the need for Big data tools. The relationships are symbiotic and spur growth in each other's needs. Since data is an asset people trained on handling the large amounts of data performing analytics on it and providing the right gainful assets for business decisions are also fast being considered invaluable assets. Data is growing and will continue to be used even in the smallest of devices and applications creating a demand of personnel to handle Big Data. As headways in the field of Data Analytics are being made, the procedure is getting computerized. Machines are dissecting huge lumps of information in a computerized procedure. With an ever increasing number of brilliant machines entering our day by day lives, an ever increasing number of information is getting made each hour. This information can be utilized and broke down for understanding client conduct or foreseeing future patterns. With the assistance of machines, information experts are thinking that it's conceivable to comprehend the information in a faster and simpler way.

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