Importance and Use of Big Data in Healthcare Industry

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Abstract

In the current information time, enormous amounts of data have become available on hand to decision makers. Big data refers to datasets that are so large or complex. The term "big data" often refers simply to the use of predictive analytics or user behavior analytics. So many methods that will extract value from data, and rarely to a particular size of data set. Big data usually includes data sets with sizes beyond the ability of commonly used software tools to capture, curate, manage, and process data within a tolerable elapsed time. The big data use in many industries like government healthcare, education, retailer shops, privet sector and many more.

In the field healthcare Big data analytics helped healthcare improve by providing personalized medicine and prescriptive analytics, clinical risk intervention and predictive analytics, waste and care variability reduction, automated external and internal reporting of patient data, standardized medical terms and patient registries and fragmented point solutions. This paper aims to understand the importance n use of big data in Healthcare Industries.

Introduction of Big Data.

Big Data mean a massive volume of structured and unstructured data that is so large in volume; it is difficult to process using traditional database and software techniques. It is the volume of data, that isn't always the case.

Big Data might be in petabytes (1,024 terabytes) or Exabyte (1,024 petabytes) of data consisting of billions to trillions of records of millions of people. The source of big data includes Web, sales, customer contact center, social media, mobile data and many more. [1]

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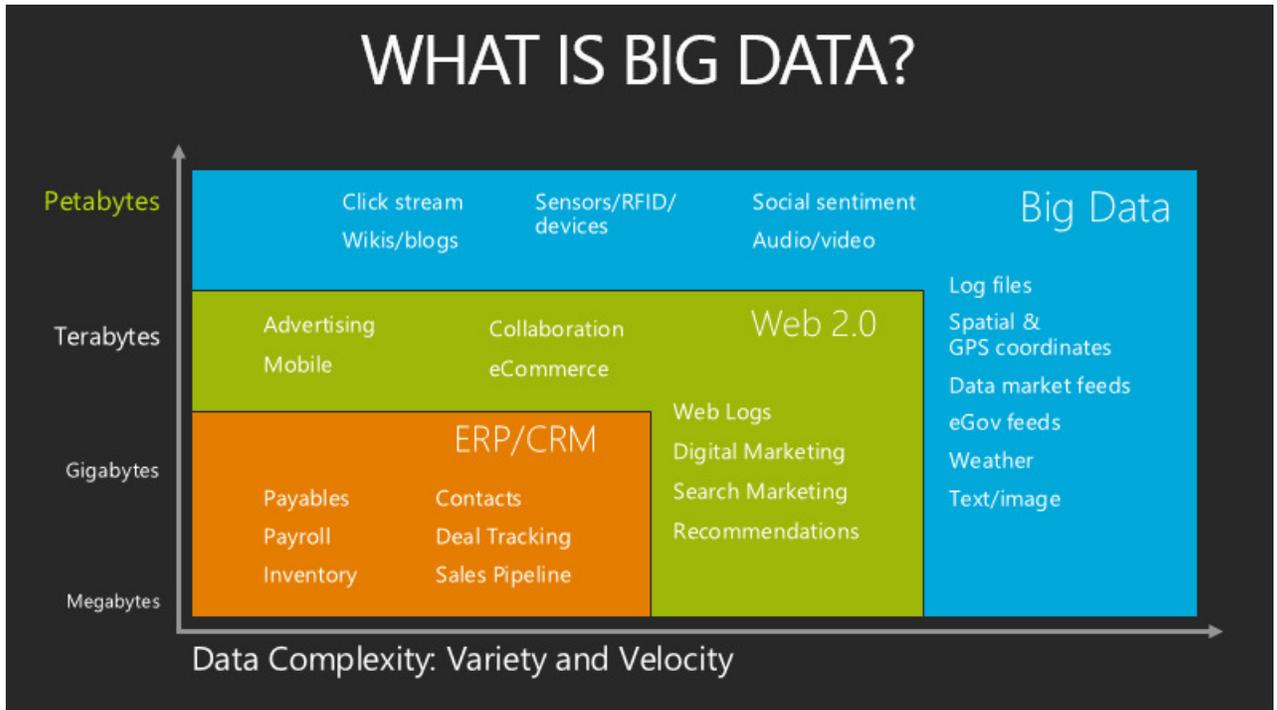
[2]Source: https://blogs.msdn.microsoft.com/data__knowledge__intelligence/2013/02/18/big-data-big-deal/4113.Bigdata.png

We can use this big data by make analysis on it. The mainly three benefits of big data analytics are as below.

1. Cost reduction
2. Faster, better decision making
3. New products and services.

There are so many industries in which big data and its analytics are very useful, some of them are government, healthcare, retailer market, travel & hospitality and many more. We will discuss here on healthcare topic.

Big Data & Healthcare Industries.

Now a day in healthcare section organizations ranging from single-physician offices to multi-provider groups, large hospital networks, and accountable care organizations stand to realize significant benefits. These can include improving the quality and efficiency of health care delivery; detecting diseases at earlier stages, when they can be treated most successfully.

The healthcare industries historically have generated large amounts of data driven by patient profiling, compliance and regulatory requirements, and scientific research. These massive quantities of data hold the promise of supporting a wide range of medical and healthcare functions, including clinical decision support, disease surveillance, and clinical analytics.

Healthcare reimbursement models are changing; meaningful use and pay for performance are emerging as critical new factors in today's healthcare environment. It is vitally important for

healthcare organizations to acquire the available tools, infrastructures, and techniques to leverage this vast amount of data effectively, or risk losing potentially millions of dollars in revenue and profits.[3]

[4] Source: 2012 KPMG Advisory N.V. registered with the trade register in the Netherland under number 33263682.

The types of Big Data which are use in Health care Industries are as below

- **Clinical data:** Doctor's notes, prescriptions, machine generated data, large format of images, cine sequences, scanned documents which are generated during clinical care and are not analyzed as normal text data analysis
- **Genomic data:** Data acquired from gene analysis and sequencing
- **Health tracker data:** Data acquired from various devices, sensors, home monitoring and telehealth
- **Web and social media:** Health related data tweets, posts and publishers
- **Health publications and clinical reference data:** Clinical research, drug information, disease information, ministry and health body reports
- **Other related data:** Personal preferences, behaviors etc. Administrative, commercial, socio economic, population etc.

According to Prof Raghupathi, potential for big data analytics in healthcare to lead to better outcomes exists across many scenarios. For example; applying advanced analytics to patient profiles to proactively identify individuals who would benefit from preventive care or lifestyle change; or creating new revenue streams by aggregating and synthesizing patient clinical records to provide data and service to third parties like licensing data to assist pharmacy companies in identifying patients for inclusion in clinical trials.

In the public health domain, big data helps to analyze disease patterns to improve public health surveillance and speed response. "Big data analysis can help public health department to understand disease trends, help control sudden breakouts, lastly, helps in building awareness with facts and data," says Ashokkan.**[5]**

Advantages of Big Data analytics for Healthcare.

Some benefits of big data analytics in healthcare are

- Analyzing patient characteristics and the cost and outcomes of care to identify the most clinically effective and cost-efficient diagnoses and treatments.
- Identifying, predicting, and minimizing fraud by implementing advanced analytic systems for fraud detection and checking the accuracy and consistency of claims.
- Analyzing large numbers of claim requests rapidly in the pre-adjudication phase to reduce fraud, waste and abuse.
- Using historical data to personalize medical care by predicting and/or estimating developments or outcomes, such as which patients will choose elective surgery, will not benefit from surgery, are at risk for medical complications or hospital-acquired illness, or will have possible co-morbid conditions.
- Collecting and publishing data on innovative medical treatment procedures, assisting patients in determining the care protocols or regimens that offer the best value.
- Aggregating and synthesizing patient clinical records and claims datasets in real time to provide data and services to third parties (e.g., licensing data to assist pharmaceutical companies in identifying patients for inclusion in clinical trials).
- Detecting individual and population trends more rapidly and accurately by developing and deploying mobile applications that help patients manage their care, locate providers, and improve their health.
- Improving predictive modeling to lower attrition and produce a leaner, faster, more targeted R&D pipeline in drugs and devices.
- Leveraging statistical tools and algorithms to improve clinical trial design and patient recruitment to better tailor treatments to individual patients, thus reducing trial failures and speeding new treatments to market.
- Analyzing clinical trials and patient records to identify follow-on indications and discover adverse effects before products reach the market.
- Analyzing disease patterns and tracking disease outbreaks and transmission to improve public health surveillance and speed response.
- Turning large amounts of data into actionable information that can be used to identify needs, provide services, and predict and prevent crises, especially for the benefit of populations.[6]

Big Data for Health Care in the Indian context

For the first time in world's internet's history, in December 2012, India led the way in the mobile internet convergence over desktop internet and that is the big data generator with over 862 million mobile connections in the hands of its people. The cellular network data traffic

more than doubled in 2010 and is expected to increase by more than 13 times to 25,000 Petabytes per annum by 2015 in India. Never ever seen in India's history!

In terms of healthcare, this sector in India contributes less than 12 percent of the volume of data generated in India, however, it is anticipated that this opportunity can grow to around 25 percent of the overall data generated by 2015.[7]

In the ancient times India had family healers that were called upon to combat disease and improve the standards of care. These medicine men of the old not only had knowledge of fields like Ayurveda, Siddha and Unani but also had knowledge of family history that used to help in their diagnosis. So family history and your own medical history was known to these physicians. In a sense we had an efficient system for Big Data and Analytics though it was not system driven. But healthcare till then was the privilege of a few and not easily available to all.

With the breakdown of the joint family system and the mass migration to the cities since independence, we see that the family physicians are hard to come by. While healthcare is more available in the cities, most patients prefer specialists and as a result, the medical history is lost.

As a result of this issue, the west has embraced Big Data and Analytics in a big way. In the US for example most hospital systems would have your medical history and even if you switch physicians, your health insurance firm would have your history. In the UK the NHS has health records on all your ailments and also has records on your family history if they lived in the UK. In both these scenarios the adoption of technology has also led to increased investments in areas like Big Data and Analytics.
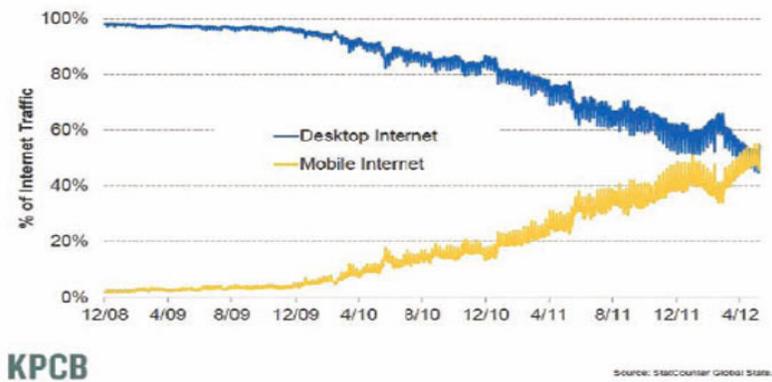
Source: StatCounter Global Stats

In Rural India contains over 68% of India's total population, and half of all residents of rural areas live below the poverty line, struggling for better and easy access to health care and services. Accessing primary health care to the population residing in rural India is still a challenge. Health issues being experienced by rural people are many and diverse – from severe malaria to uncontrolled diabetes, from a badly infected wound to cancer.

In India with technology adoption in the hospitals just at the inception, what is the future for adoption of big data and analytics? To find answers to these questions, a high powered panel

met at the Philips Digital Health Conclave in Bangalore to explore if Indian healthcare was ready for big data and analytics. The panel members were Sandeep Singhal, Managing Director Nexus Venture Partners, Unni Nair VP &head of Information Management, Philips, Dr. Ranjan Shetty, Professor & Head, Cardiology Department, KMC- Manipal, Tushar Vashisht Founder, HealthifyMe, Gopal Devanahalli COO Manipal health enterprise.

Health Conclave concluded following points:

- Form factor was an important consideration for adoption of Big Data and Analytics by the doctors
- Analytics was definitely required but on Big data the opinion was split
- Hospitals had started adoption these technologies on the patient satisfaction front and organizations were coming together to engage on employee wellness initiatives
- The future of adoption belongs to start ups and how they can think innovatively and introduce new ideas that would use these technologies to improve the care models in India.[8]

Big Data in Healthcare That Can Save People's Lives

Electronic Health Records (EHRs)

- It's the most widespread application of Big Data in healthcare. Every patient has his own digital record which includes demographics, medical history, allergies, laboratory test results etc. Records are shared via secure information systems and are available for healthcare providers from both public and private sector. Every record is comprised of one modifiable file, which means that doctors can implement changes over time with no paperwork and no danger of data replication.

Real-time Alerting

- Other Big Data in healthcare examples share one crucial functionality – real-time alerting. In hospitals, Clinical Decision Support (CDS) software analyzes medical data on the spot, providing health practitioners with advice as they make prescriptive decisions. However, doctors want patients to stay away from hospitals to avoid costly in-house treatments.

Predictive Analytics in Healthcare

- The goal is to help doctors make Big Data-informed decisions within seconds and improve patients' treatment. This is particularly useful in case of patients with complex medical histories, suffering from multiple conditions. For example who is at risk of diabetes and who is advised to make use of additional screenings or weight management.

Using Health Data For Informed Strategic Planning

- The use of Big Data in healthcare allows for strategic planning thanks to better insights into people's motivations. Healthcare professionals can analyze check-up results

among people in different demographic groups and identify what factors discourage people from taking up treatment.

Telemedicine

- Telemedicine has been present on the healthcare services market for over 40 years, but only today, with the arrival of online video conferences, smart phones, wireless devices and wearable's, it has been able to come into full bloom. The term refers to delivery of remote clinical services using technology. It is used for primary consultations and initial diagnosis, remote patient monitoring and medical education for health professionals. Some more specific uses include telesurgery – doctors can perform operations with the use of robots and high-speed real-time data delivery without physically being in the same location with a patient.[11]

Big data challenges in health care

Electronic health records are becoming the norm in the medical field. In addition to offering advantages for health care providers and patients in terms of information accessibility and fast, easy ways to share data with other members of patients' care teams, the platform provides opportunities for deep analytics.

Big data analytics further enhance these possibilities, especially with the assistance of powerful cloud computing to store and process large amounts of information. However, health care organizations face significant challenges before they can turn digital resources into meaningful insights and effective programs.

Challenges in Big Data for Health care are mainly divided as

Strategic challenges

According to Health Affairs, one of the biggest obstacles for health care organizations to overcome is getting the right information for their analytics projects. This includes the type of information obtained as well as its quality. As the source emphasized, medical centers sometimes gather as much easy-to-obtain data as they can, without really honing in on the most appropriate and valuable resources. Consequently, their results have little real value.

Technical difficulties

Furthermore, putting the right technical foundation in place is a prerequisite for successful data analysis. As Health IT Analytics highlighted, many medical entities struggle to eliminate data silos, which obstruct innovative analytical efforts. Particularly within a big data context, strong analytics are driven by integrating disparate sets of information, such as clinical, financial and operational data, the source added. Only by facilitating the flow of information from these components can health care organizations pursue insights about factors such as gaps in care, identify patients not adhering to instructions or reduce costs in resource utilization.

Another potential issue arises from poor documentation, whether it's the result of human error or problems with EHR software. Ensuring data is clean and accurate before running analytics will naturally have a strong impact on the quality of the results.

Regulatory requirements

Some entities may find it challenging to create the IT infrastructure they need to pursue big data analytics and other projects while also implementing measures to comply with HIPAA, this basic foundation is a critical element to long-term success with analytical projects in the health field.[9]

No One Likes Change

Institutions are notoriously resistant to change. This is especially true as they grow larger and existing processes and procedures become "the way it's always been done." The shift to an analytics-based culture requires everyone in the organization to use a single source of truth to guide choices, stop making gut decisions, and avoid "data shopping" to find data that supports a conclusion that has already been made. [10]

Conclusion

Big Data Analytics is a process which has many steps like data acquisition, cleaning etc and each step has a unique challenge. Across the world, scientific, academic, research, business, as well as, government communities is aggressively charting plans and paths to benefit from developments in the big data field the challenges remain to its implementation in healthcare. The Big Data Analytics has shown remarkable outcomes in many healthcare organizations. Learning from recent applications of big data across the world, and identifying the initiatives embraced by governments of prosperous nations, we underscore the huge potential that big data holds and can unfold for the central and state governments in India.

In the future, with even more advancements in the Big Data Analytics processes we expect that healthcare cost will come down drastically, life expectancy will increase, and we will see much healthier population as compared to now with people taking more accountability and charge of their health using technological advancements.

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