A CHALLENGE OR BOON TO INDUSTRIAL INTERNET OF THINGS: BIG DATA

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Abstract
Big Data refers to data volumes in the range of Exabyte (10^{18}) and beyond. Such volumes exceed the capacity of current on-line storage and processing systems. Industrial Internet of Things phrase consists of three different words, i.e. Internet, industrial and things. The "Internet" is a global computer network consists of millions of public, private and government networks while "Things" are objects embedded with electronics, sensors and software. By combining these two words it becomes a network of things embedded with software, electronics and networking capability through which these objects can collect and exchange required data. This is known as "Internet of Things". When IoT applied in manufacturing it is known as "Industrial Internet of things". With characteristics like volume, velocity and variety big data throws challenges to the traditional IT establishments. Computer assisted innovation, real time data analytics, customer-centric business intelligence, industry wide decision making and transparency are some possible advantages of Big Data. This review paper focuses on many issues with Big Data that warrant quality assessment methods in terms of computational analysis on the basis of cloud computing and edge computing.
Keywords: Big Data, Industrial Internet of things, Data Analytics

I. Introduction

The Industrial Internet of Things (IIoT) is often presented as a revolution that is changing the face of industry in a profound manner. In reality, it is an evolution that has its origins in technologies and functionalities developed by visionary automation suppliers more than 15 years ago. As the necessary global standards mature, it may take around another 15 years to realise the full potential of IIoT. Over this period of time the changes to the industry will be massive. The good news is that end users and machine builders can now leverage their existing investments in technology and people while taking advantage of available new IIoT technologies. Introducing IIoT solutions using a "wrap & re-use" approach, rather than a "rip & replace" approach will enable greater business control[1]. In addition, this measured approach will drive the evolution towards a smart manufacturing enterprise that is more efficient, safer, and sustainable. The emergence of the IIoT mega trend has created both hope and confusion among stakeholders responsible for operating industrial plants. Much of the early hype is focused on the impact of technological advancements on existing automation platforms.

II. Literature Review

This technology is a combination of different technologies like M2M communication, machine learning, big data, sensor data and automation; those are already existed in industries [2]. Some of the well-known examples of IIoT technology arerobotic arms for lifting or shifting materials, temperature sensors and level indicators etc. IIoT is a transformative manufacturing strategy that helps to improve productivity, quality, safety and delivery in an industry and manufacturers are increasing uses of IIoT solutions to enhance their analytics functionalities, to track assets and to upgrade their control rooms [3]. The global industrial IoT market is expected to reach USD 933.62 billion by 2025[4] and estimated potential economic impact will be $4 trillion to $11 trillion by 2025[5].

III. Classification or categorization of Big Data

3.1 How is big data different from traditional data sources

In the mainstream media, the explosive growth of the IoT is most often discussed mainly in terms of consumer devices and products. But if you consider the scale of the industrial products sector and its potential for device connectivity throughout the supply chain and with customers, then it's set to dwarf the size of the consumer IoT by several magnitudes. While a few billion consumer devices— wearables, home automation devices, cars— will become IoTconnected during the next five years, the equivalent global growth curve for the industrial IoT is set to rocket towards 100 billion devices as the technology becomes pervasive in industrial sectors worldwide.

IV. Applications of Big Data

4.1 How big data plays a vital role in industrial sector

Industry influencers, academicians, and other prominent stakeholders certainly agree that big data has become a big game changer in most, if not all, types of modern industries over the last few years. As big data continues to permeate our day-to-day lives, there has been a significant shift of focus from the hype surrounding it to finding real value in its use.

While understanding the value of big data continues to remain a challenge, other practical challenges including funding and return on investment and skills continue to remain at the forefront for a number of different industries that are adopting big data. With that said, a Gartner Survey for 2015 shows that more than 75% of companies are investing or are planning to invest in big data in the next two years. These findings represent a

significant increase from a similar survey done in 2012 which indicated that 58% of companies invested or were planning to invest in big data within the next 2 years.
Generally, most organizations have several goals for adopting big data projects. While the primary goal for most organizations is to enhance customer experience, other goals include cost reduction, better targeted marketing and making existing processes more efficient. In recent times, data breaches have also made enhanced security an important goal that big data projects seek to incorporate points like

1. Trying to decide whether there is true value in big data or not
2. Evaluating the size of the market opportunity
3. Developing new services and products that will utilize big data
4. Already utilizing big data solutions . Repositioning existing services and products to utilize big data, or
5. Already utilizing big data solutions

4.2 **How big data adds value to the businesses and how it is important in designing business models**
In the past decade, the concept of has drawn great interest in both science and engineering fields as a means to overcome the challenges associated with rapidly growing urbanization. A smart city is an urbanized area, where multiple sectors cooperate to achieve sustainable outcomes through the analysis of contextual, real-time information. Smart cities reduce traffic congestion and energy waste, while allocating stressed resources more efficiently and improving quality of life.
[1]. Smart city technologies are projected to become massive economic engines in the coming decades and are expected to be worth a cumulative 1.565 trillion dollars by 2020, and 3.3 trillion dollars by 2025. Today, companies are actively vying for a central role in the smart city ecosystem, creating an expanding number of technologies and employment opportunities. Already, IBM, Intel, GE, and many other companies have initiated projects to integrate their products and services into a smart city framework
[2]. Hundreds of millions of jobs will be created to facilitate this smart city conversion; in June 2014, Intel and the city of San Jose, CA, USA, began collaborating on a project implementing Intel's Smart City Demonstration Platform, installing a network of air quality and climate sensors which alone fostered 25,000 new high-tech jobs in San Jose [3].

V. Main technological components in a Big Data ecosystem
The various steps which are important for maintaining big data eco system are defined below in diagram below in Figure 1.

1. Data Collection and Registration
2. Data Classification
3. Data Analytics
4. Data Visualization

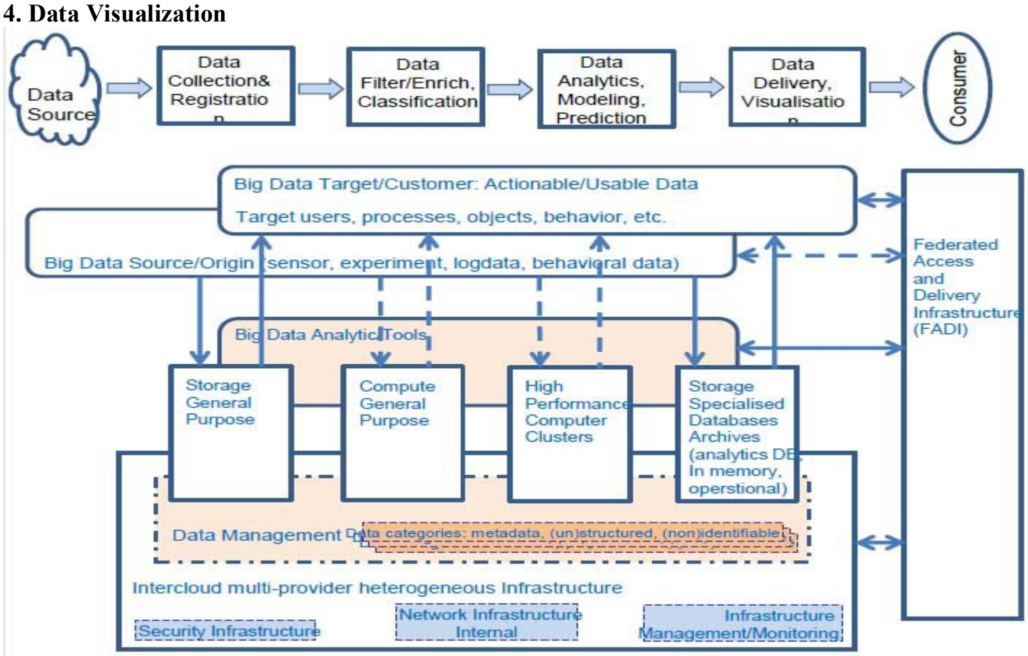

Figure 1. Big Data Ecosystem Steps

VI. Various analytics tools of Big data

There are thousands of Big Data tools out there for data analysis today. Data analysis is the process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision making.

Open Source Data Tools

6.1 Knime

KNIME Analytics Platform is the leading open solution for data-driven innovation, helping you discover the potential hidden in your data, mine for fresh insights, or predict new futures.

With more than 1000 modules, hundreds of ready-to-run examples, a comprehensive range of integrated tools, and the widest choice of advanced algorithms available, KNIME Analytics Platform is the perfect toolbox for any data scientist.

6.2 OpenRefine

OpenRefine (formerly Google Refine) is a powerful tool for working with messy data: cleaning it, transforming it from one format into another, and extending it with web services and external data. OpenRefine can help you explore large data sets with ease.

6.3 R-Programming

R is primarily written in C and Fortran. And a lot of its modules are written in R itself. It's a free software programming language and software environment for statistical computing and graphics. The R language is widely used among data miners for developing statistical software and data analysis. Ease of use and extensibility has raised R's popularity substantially in recent years.

Besides data mining it provides statistical and graphical techniques, including linear and nonlinear modeling, classical statistical tests, time-series analysis, classification, clustering, and others.

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