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Fourth Industrial Revolution and Role of Big Data Analytics in Business Management

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ORIGINAL ARTICLE



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Abstract :-

This paper attempts to explore the role of 'Big Data Analytics' (BDA) in business organizations. The role of data analytics in industrial development has always been crucial, i.e. facilitating business organizations taking effective decisions through improving efficiency and productivity. Further, this paper explores industry wise applications of BDA. Also in this paper, the relationship between Industrial Revolution and BDA has been examined. So this paper evaluates the significant role of big data analytics in managing business and utilizing the resources i.e. human, natural and manmade, in an optimum manner.

Keywords:-

Big data analytics, Industrial Revolution, human resources

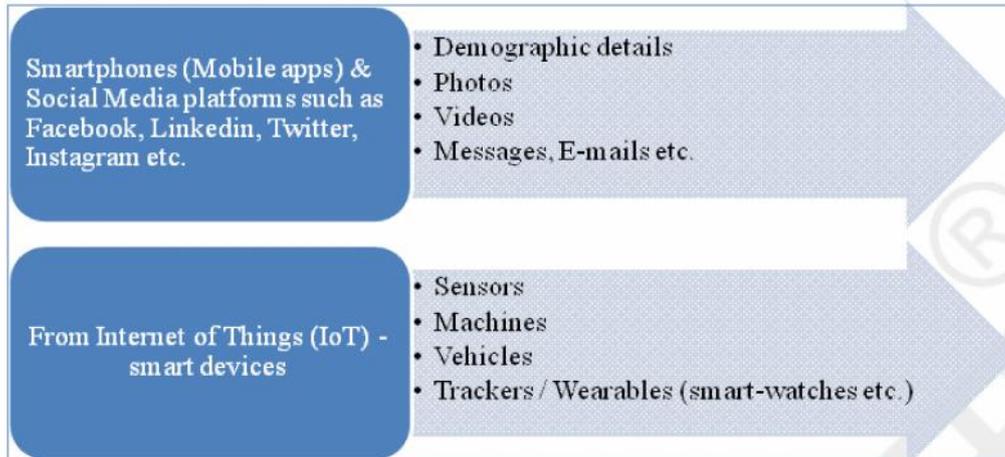
Introduction :-

With technological advancements data is becoming life-oxygen of organizations in the era of Fourth Industrial Revolution (FIR). Analytics of data, especially big data, has been playing crucial role in all type of organizations, be it business or Government organizations across the globe. On the other hand, the primary aspects concerning to application of big data analytics (BDA) in organizations are the followings;

- What are big data ?
- What are various sources of big data ?
- What is big data analytics ?

- How organizations use big data analytics ?
- What are drivers of big data analytics ?
- What are advantages of big data analytics to the organizations ?
- What are various challenges posed by big data analytics in organizations ?

Figure-1: Sources of Big Data



Source: Author's compilation from various sources

Big data refers to the massive volume of unstructured data sets with shorter life-span originating from smart devices such as smartphones or tablets, and from IoT as shown in Figure-1. Various types of companies such search engine-Google, social networking sites-Facebook, LinkedIn, Twitter and e-commerce sites- Amazon, Flipkart etc. generates massive volume of consumers demographic data along-with their online behavior. Further, Smartphones generates big data of consumer's behavior concerning to purchase, post purchase and access to media and geo-locations.

Huge volume of data sets generated from social media websites / mobile applications, consumer surveys and feedback, mobile phones, and Internet of Things (IoTs). Organizations use these data sets to understand the data patterns, correlations between variable data sets etc. so that behavior of individuals can be analyzed and products / services required to them can be marketed on real-time basis.

Big data as a tool has been one of the significant and valuable facilitator in key decisions making to the organizations in digital era of trade, commerce and business. Further, diverse applications of Artificial Intelligence (AI), Internet of Things (IoT), robotics, and 3D printing etc. in industries has greater impact on productivity, efficiency and effectiveness of organizations.

Objectives of the study :-

The objectives of this study are the followings:

1. To understand about Big Data Analytics and its application in industries.
2. To understand about Industrial Revolutions.
3. To examine the relationship between Industrial Revolution and Big Data analytics.
4. To understand the drivers and challengers of Big Data Analytics.
5. To Understand the role of data analytics in a business organization
6. To understand industry-wise application of Big data analytics.

Nature of Big Data :-

Literature review suggests that the term 'Big Data' was coined during the mid-1990s to large volume of data sets. The ambit of big data was increased by Doug Laney of Consultancy Meta Group Inc. in 2001. Initially blue-chip companies such as Facebook, Yahoo, Google etc. utilized the BDA for expanding their operational activities. However, the application of BDA is widely used by various organizations at later stage.

BDA is an advanced technique of analytics which includes predictive model building, statistical algorithms applications, scenario-building analytics etc.

- Big data being unstructured data with shorter life-span requires further assimilation and computing work so that meaningful trends and observations pertaining to a particular person, object or domain can be analyzed. The use of data in business organizations has been through data intelligence practices.
- During the nascent stage of big data analytics, the role of Data Analyst, Data specialist, Statistician and Mathematician becomes crucial in optimizing processes and machinery so as to create opportunities in application emerging areas whether for business organizations or Government or communities / social sector.
- In the era of FIR, with the help of big data analytics customized products and services can be produced and delivered by the organizations without incurring marginal cost thus reducing gaps in customer / consumer product/service post-purchase experience.
- Big data analytics has been one of emerging tool enabling the business organizations in optimum utilization of the scarce resources and eliminating unwanted product / process losses. Thus helping towards developing more sustainable products, processes and communities.

Data analytics :-

Data analytics (DA) is the analytical process of finding insightful information from the available data sets through usage of computers and software's in an organized and logical way. In this process, data is used to make significant pattern or analyzing trends pertaining to a particular event, object or process etc.

Applications of Data Analytics in Commercial enterprises/organizations :-

Data analytics (DA) as a decision making tool is significantly used by the data analysts, researchers and data scientists in the organizations. DA is used by the various departments such as sales, marketing, production and operation, finance, etc. to optimize the available resources for achieving the objectives of the organization as a whole. Further, data of various natures such as quantitative, qualitative and both are analyzed for drawing significant conclusions pertaining to the products or services offered by the organizations in the market.

Gartner after acquiring Meta Group Inc. popularized 3Vs (volume, velocity and variety) of big data. Further industry experts and data scientists believe that BDA can facilitate the organizations in processing huge unstructured data sets through four Vs i.e. volume, velocity, variety and variability. By volume, huge data sets from terabytes to petabytes and exabytes can be processed with real-time insights enabling the organizations to take decisions at faster pace signifying velocity. Thirdly, variety of data can be processed effectively with the help BDA to uncover the hidden correlation, significant patterns of a particular events, objects or persons. Fourthly, variability aspect which considers management of data formats for improved operational activities.

Further applications of Data Analytics in Commercial enterprises are as follows :-

- To better manage the key activities of the organizations such as effective supply chain management, risk management, customer relationship management, optimization of web content etc.
- To enhance the features and qualities of offered products and services through analyzing voice of customers (VOC) in the existing market.
- For research and development of new products and services offered by the organization either in existing market or through exploring new market.
- With the help of BDA focusing on product/services offerings through Segmentation, Targeting and Positioning (STP) practices of marketing management.
- Restructuring business models through incorporating insightful information.
- BDA is extensively used by the organizations such as Telecommunications, Financial Services Providers, Social Media websites, e-commerce, Retailing, Banking, Insurance, Healthcare, Media & Entertainment, Event Management, Manufacturers, Educational sector and other sectors to enhance the customer experience through providing value addition.

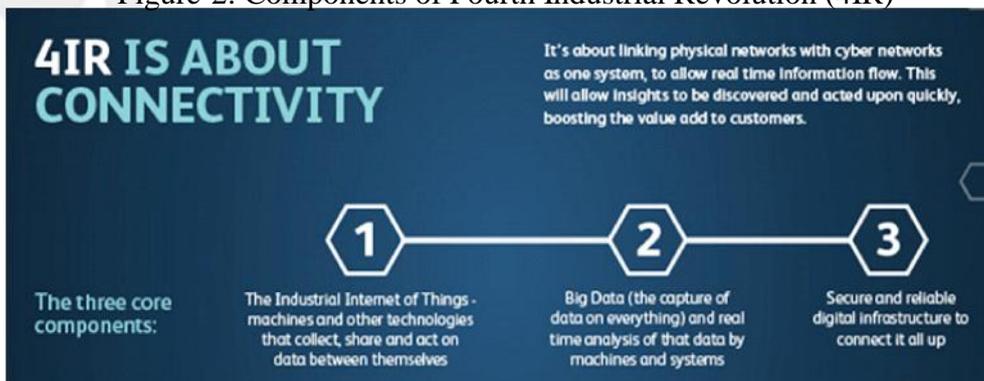
Data and information has been key enabler in taking more informed decisions from the beginning of industrial revolution. In the era of FIR, BDA is being utilized significantly by the organizations to address several issues relating to operational, technical, production, marketing and customer relationship management etc. in an improved way.

FIR is integrating physical, digital and biological areas through application of Internet of Things (IoT), humanoid robots, artificial intelligence (AI), 3D printing and augmented reality etc. Data and analytics plays crucial prime role in successfully integrating all components such as men, smart machines and smart devices.

Drivers of Big Data Analytics

- Digitalization and realigning businesses to market dynamics
- Competitive market structure and quest for information that can help the organizations in achieving its objectives
- Consumer behavior dynamics and positive attitude towards online sites for various activities leading to generation of huge data sets
- Improving efficiency, productivity and effectiveness of organizations for optimum utilization of available resources

Figure-2: Components of Fourth Industrial Revolution (4IR)

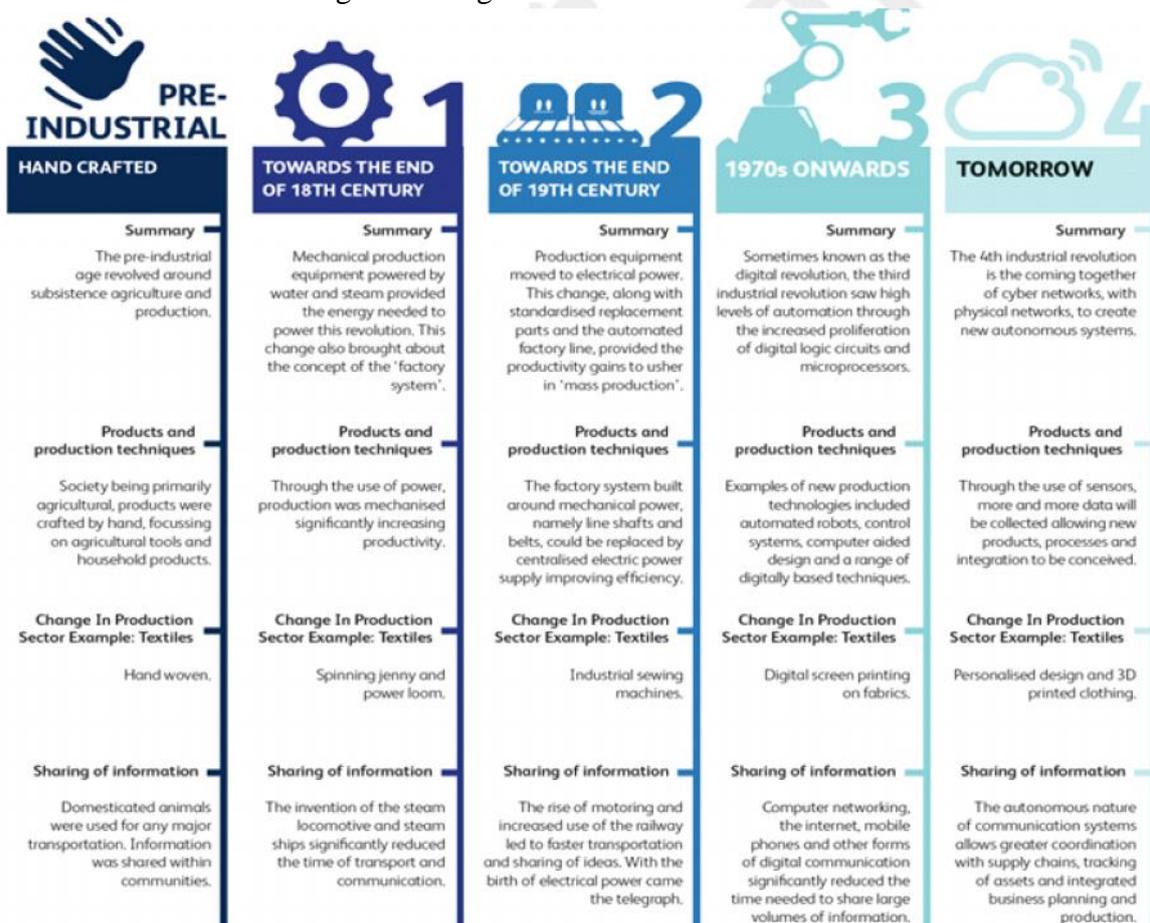


Source: Chris Richards, Fourth Industrial Revolution (4IR) www.eef.org.uk

Industrial Revolution and Business Management :-

- During the 18th century, innovations such as development of Steam engines and mechanization of production facilities, led to studies of scientific management for enhancing the productivity and efficiency at lower time-cost framework.
- Further, at the end of the 19th century, the second industrial revolution led to advent of the telegraph and industrial sewing machines. Also, with the advent of electricity as source of power industrial operations changed significantly. Mass production enhanced the efficiency and productivity of industries.
- The Third industrial revolution, which began during late 1970s, revolutionized the world by connecting world through innovation of Internet and Smart Phones. Further, with the usage of computers, robotics and artificial intelligence in the manufacturing other industrial activity has not only enhanced efficiency, productivity and products / service qualities but also has significantly improved human working conditions.
- The Fourth Industrial revolution (4IR) consisting of Internet of Things (IoT) connecting smart devices with the use of big data analytics. It is expanding the arena of communications, physical production of goods and augmenting human decision-making capabilities through application of artificial intelligence in various capacities. All of these leading to better human living experience, improved efficiency and productivity at optimum time-cost intervention. So the big data is expected to play crucial role in fourth industrial revolution.

Figure-3: Stages of Industrial Revolution



Source: Chris Richards, Fourth Industrial Revolution (4IR) www.eef.org.uk

Challenges posed by FIR :-

- Access to employment opportunities only to the highly skilled individuals.
- Greater efficiency, productivity and effectiveness of organizations in the era of FIR leading to greater dependence on machine.
- Cyber security issues requires proper attention.

Apprehensions are that with increasing mechanization and increasing role of machines in human day-to-day activities, may lead to promoting technology intensive jobs and unemployment.

Applications of Big Data Analytics in Industries :-

- BDA is considerably useful in the areas of predictive manufacturing thus ensuring consistent accuracy in production process.
- Organizations engaged in financial activities such as disbursing loans of short and long terms, credit card companies etc., with the help of BDA, can effectively optimize their operations and performances.
- Towards developing factories into smart factories through encouraging innovations and efficiency and productivity.
- With the help of big data any discrepancies in product specifications can be identified at initial stages of production so that required necessary adjustments can be made accordingly.

Table-1: Industry wise application of Big Data Analytics

S.N.	Industry /Sector	Organization using BDA	Major application area	Usage of BDA
1	Aerospace	Lufthansa Technik	Maintenance, repair and overhaul (MRO) activities of aircraft, engines and other parts	to predict the life-span of parts and their replacement
2	Agricultural	Claas	Remote monitoring of agricultural crops	to share onsite crop related information to farmers or experts
3	Logistics	UPS	IoT Sensors in Trucks, heavy cargo vehicles to collect data for improving operational performance	to identify issues such as truck's location, delivery efficiency & MRO
4	Healthcare	Samsung, FitBit, Garmin, Under Armour, Emiota Xiaomi etc.	Fitness trackers for generation of health related data base	to monitor and measure various health related data
		Hospice	Telemedicine services through connecting IoT medical devices- blood pressure, ECG, glucose meters and insulin pumps	to improve the access of healthcare services

Source: Author's compilation from various sources

The main advantages of using bid data analytics (BDA) to the industries can be summarized as follows :-

- Enhancing efficiency, productivity and effectiveness of the organizations through optimizing supply-chain management.
- Facilitates in production of better quality products / services at cost-effective ways.
- Generation of new employment opportunities.
- Expedites and promotes research and innovation.
- Facilitates in mass production of highly customized products as per market demands.
- Through 3D printing BDA helps in managing industrial emissions i.e. controlling emission of Green House Gases.

Conclusion :-

In the era of the FIR, data is becoming an asset for all kind of organizations. Using BDA and AI in business operations, organizations can achieve their objectives with optimum utilization of resources. Further, digitalization in all areas of business, trade, commerce, law & order, public administration etc. in developing economies like India, will not only enhance the performance of industrial sector but also contribute significantly towards improving quality of individual's life with good governance practices.

Thus, BDA will facilitate and strengthen the nexus between human and artificial intelligence for enriching the quality of human life through delivering environment friendly quality products and services. BDA will help human intelligence to perform the crucial tasks involving creativity such as development of science, art, invention, innovation etc. to be performed by human and activities of repetitive nature by machines.

At the end, FIR is anticipated to play crucial role in developing industrial production through optimum utilization of resources and restructuring supply chain management. It is also anticipated to improve living standards of individuals. Further, industry experts anticipate that BDA and AI will help in preparing and mitigating natural disasters with greater ease. So, it may be concluded that BDA will play extremely important role in managing business and achieving its objectives.

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