

Big Data Analytics For Organizations: Challenges and Opportunities and Its Effect on International Business Education

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Abstract

Big Data refers to large volumes of information. This information varies from pictures, videos, texts, audios and other heterogeneous data. In recent years, the amount of such big data has exceeded the capacity of online or cloud storage systems. The amount of data collected yearly has doubled in the past years and the concern for the volume of this data has reached its Exabyte yearly range. This paper focuses on the major issues and opportunities as well as big data storage with the aid of academic tools and researches conducted earlier by scholars for big data analysis.

Modern learning environment (MLE) has to be understood in order to know how it supports learning in areas of big data such as university education systems. The utilization of online resources and web pages with laptops and mobile phones need to be understood as an attempt to integrate the modern learning environment and improve teaching in international bossiness. Big data can be fine-tuned and used to create new online learning programmers. Data collected by government departments, universities and institutions could be used as a new innovative learning system such as (MLE) which has a passive and active character i.e. it can be accessed anywhere at any time. This would also help in minimizing extended classroom activities because students would have controlled access to online knowledge from their homes.

Keywords: Big data, storage, structured and unstructured data, disk, velocity, volume, Dashboard

1. INTRODUCTION

Storage of data is adopted by many fields from academic purposes to government and private sectors of businesses, firms and organizations. The technological timeline has sped up so fast from storing information and data in books, catalogues and hard drives to making use of the online cloud facilities. This speed in technology has evolved the world into a global machine, with the help of computer and mobile devices, everyday 2.5 quintillion bytes of data is created, this data comes from digital pictures, videos and social media sites. The data is received from various sources come in different formats as well.

2 billion of the international world's populations use the internet and about 5 billion are using mobile devices. This rise in the utilization of devices has created a lot of data either structured or unstructured[1]. Big data when used and analyzed properly has a lot of values for businesses and organization, in customer service organizations the data being collected is tailored and created to make decisions that best fit a consumer taste. There is no doubt that big data and its potential is becoming a driving force of services and worlds innovation Business and organizations must not only be able to store the data but must be capable of using the data to derive business value. There is no formula for deriving benefits and value from big data but the value depends on the application of the data being collected. Business Intelligence and Analytics examines the challenges and opportunities of data storage and further research into the tools and concept of analyzing big data, what kind of technologies exist and what may serve as a potential threat to big data. The speed at which big data has evolved into every sector of life has left the academics and researchers no time to completely study and figure out what big data is made up of and its potentials to make customer service easier. Hence there is not enough fundamental information in the academic field to completely understand big data. A major contribution of this paper is to bring forth the ignored dimensions of big data. When "big data" is mentioned, the first thing that comes to one's mind is size, but big data goes beyond size, other factors such as frequency, volume, velocity and variety of big data are also important to study because they make the framework of big data. With the big data technology, they have been some potential threats relating to cyber risk and the privacy of individuals who use them. There is going to be a review concerning privacy issues and most importantly the opportunities big data offer for international businesses. These are going to be a topic of discussion. A major contribution to this is that firms who participate in the international business world are able to supervise new trends and unveil opportunities that are abroad with the help of big data analytics and participate in their supply and production duties as well as distribution activities around the globe. A major contribution of international business education is its ability to convey information and data to a third-party body that translates the data being received and customize it to meet the users need.

2. LITERATURE REVIEW

Each international business or business organization, little or enormous, needs valuable data and insights, with regards to understanding your intended interest group and client's inclinations, big data assume a significant job. It even encourages you to foresee their needs, the right data should be successfully displayed and appropriately broke down. It can help a business organization accomplish to achieve various goals.

According to researcher[2], big data generally refers to data sets that have become too huge for and become too hard to even think about working with utilizing the traditional tool and database the system management. An additionally suggests data sets that have a lot of variety and velocity, producing a need to create potential answers for remove worth and data from wide-going, quick-moving data sets.

According to an Oxford English Dictionary, "big data" as a term is characterized as "extremely large data sets that may be analyzed computationally to reveal patterns, trends, and

associations, especially relating to human behavior and interactions”.

Research by Gandomi and Haider in (2015)[3] illustrative that various implications of enormous information are utilized in research and business. These big data definitions change contingent upon the acknowledgement of the client, with some mindful on the characteristics of big data as far as volume, variety, and velocity, some centered around what it does, and others characterizing its subjects to their business' necessities.

A Past research work Laney in 2001[4] focused on big data description based on the 3Vs (volume, velocity, and variety).

Sagioglu and Sinanc in 2013[5] ulterior presented a big data research review and observed its security issues, while Lomotey et al in 2014[6] defined big data by 5Vs, extending the work done by Laney in 2001 from 3Vs to include value, and veracity[7].

A Ren et al in 2019[8] thus recently developed a set of up-to-date big data definitions, in Figure 1 shows predictions of global data volume provided by International Data Corporation (IDC) [9].

Also, a research by Wang et al in 2016[10] the enormous volume of big data, the composite structure of this new data and the hard in managing and protective such data have added further issues. Then the idea of big data was higher, it has so become one of the greatest generals focuses in both technical and international business and engineering areas.

Demonstrations many big data definitions or characteristics since the period 2001 to 2017.

Six illustrative definitions of big data adopted [8].Global data volume forecast through IDC [10].

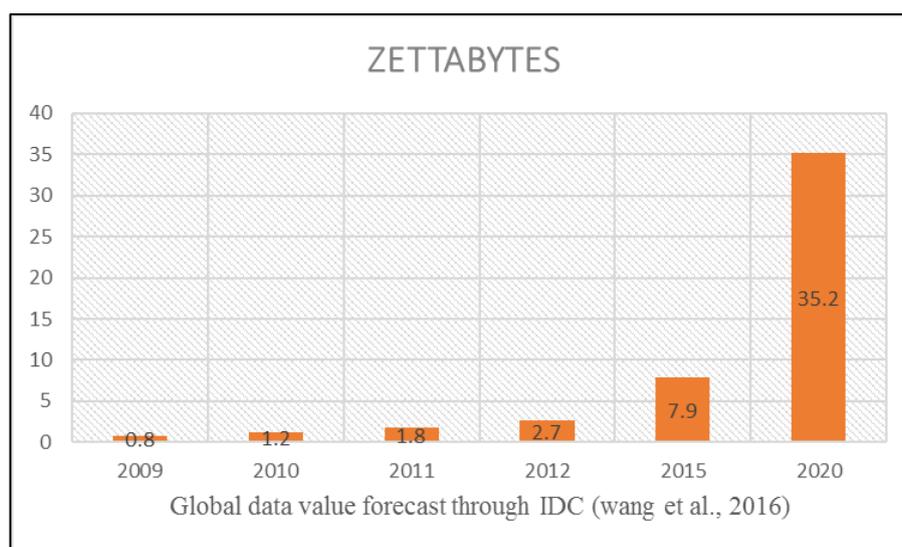


Figure 1: Developed a set of up-to-date big data definitions

3. METHODS AND MATERIALS

In this paper a research methodology approach that comprises of three stages. The first stage would be a descriptive stage to understand what big data is and the major terminologies used when referring to big data, while the second stage would be conducted by a comprehensive literature review of Journal articles by different scholars on the topic of big data with the use of statistical data such as chats, figures and other related findings retrieved from earlier researches. This paper also proposes a model that can be used for enhancing learning through innovative means by integrating big data frameworks in different sources of information and knowledge in universities and other higher institution of learning.

Lastly, the literature review of an organization that has adopted big data for improving customer satisfaction with the help of a unique structural technique.

Table 1: Showing examples of big data

Data set/domain	Description
Large Hadron Collider/Particle Physics (CERN)	13-15 petabytes in 2010
Internet Communications (Cisco)	667 Exabytes in 2013
Social Media	12+ Tbytes of tweets every day and growing. Average retweets are 144 per tweet.
Human Digital Universe	1.7 Zbytes (2011) -> 7.9 Zbytes in 2015 (Gantz and Reinsel 2011)
British Library UK Website Crawl	110 TBytes per domain crawl to be archived
Other	RFIDS, smart electric meters, 4.6 billion camera phones w/ GPS

4. T OF BIG DATA

Besides internet communications and Social Media services, other organizations utilize the concept of Big data as well, a study was conducted from the year 2015-2017 on attitudes of organizations towards the adoption of big data and the results were amazing, earlier in the study organizations were reluctant to adopt the big data management concept but with the visible growth exhibited by those who embedded the concept into their organizations, other organizations were sooner persuaded to join the bandwagon.

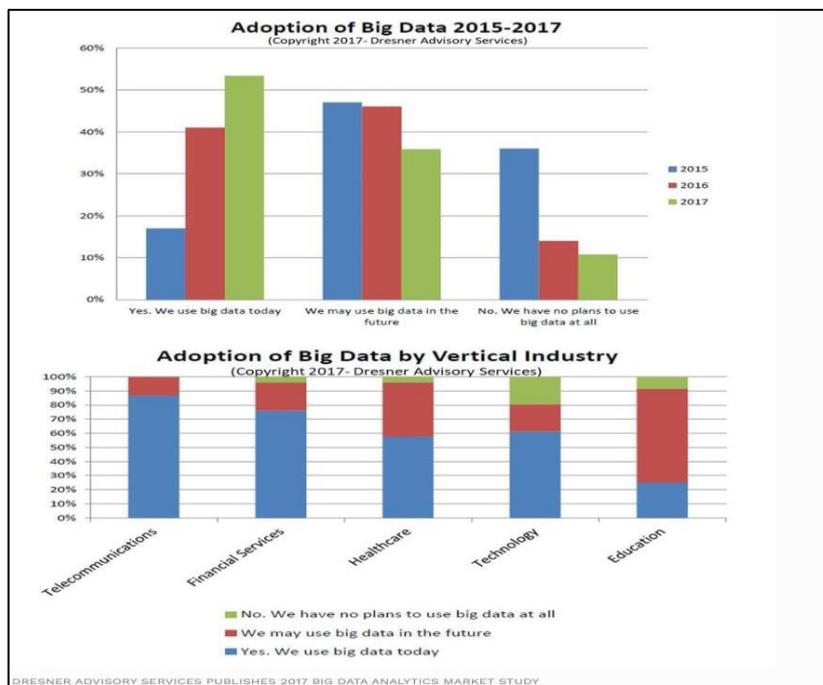


Figure 2: showing the growth of big data adoption www.solverglobal.com

Before being able to understand and solve the needs of big data storage, it is important to know the major characteristics of data which are Volume, Velocity and Variety. Each of them playing a major role in determining how data is being analyzed and processed.

4.1. The five V's of big data and how they pose as a challenge

A lot of business promises come along with big data but what exactly is the reality of big data, this section explains the various data frameworks are commonly known as the 5 V's of big data. This includes data volume, variety, volatility, velocity and veracity and how these factors affect data efficiency.

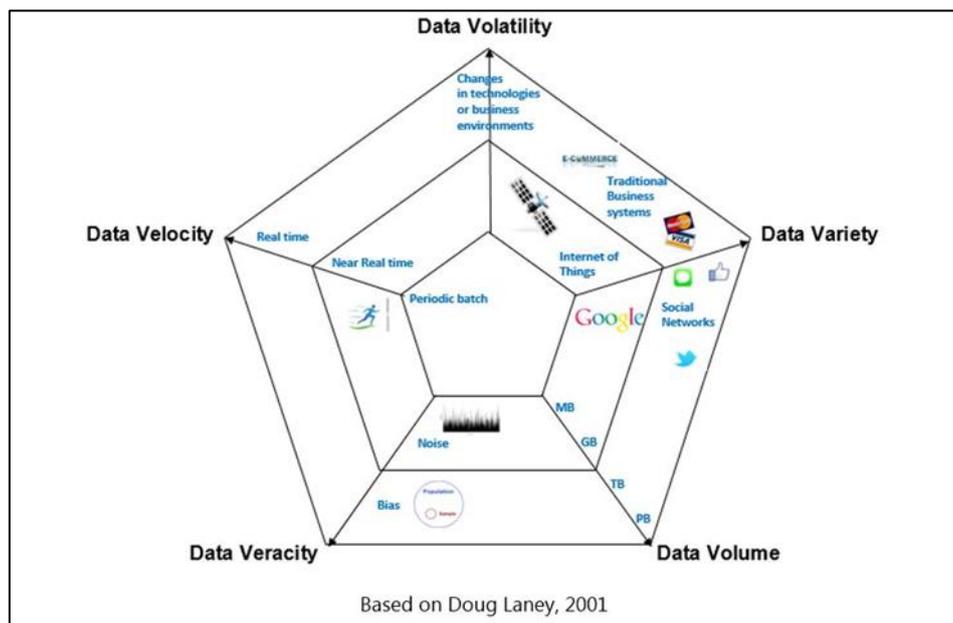


Figure 3: The five V's of big data characteristics based on Doug Laney at 2001[11]

- Volume:** Volume refers to the spaces defined to store information, in other words, simply said data volume is the amount of data/information in a file. The volume of a data especially those generated by data machines is reaching its peak. The amount of data created is expected to reach 35 zeta-bytes (ZB) by 2020 (according to IBM). As data volume increases, the value of data decreases in proportion to age, quantity, richness and other factors. Media such as Facebook and twitter create 9+ Terabytes of data every day. The challenge is how to deal with the size of big data that gets processed every day.
- Variety:** Variety of data refers to the formats in which this data is being received, data is received in some cases as unstructured because it requires time and a lot of effort and machine performance to categorize all the data received. A lot of data is unstructured or some might have a complex structure that is hard to represent in machine columns and rows. Hence the problem of how to process such multiple sources of data in different formats at a required time poses a problem.
- Data Quality:** Data quality simply talks about the exact precision of data being received, how true this data maybe, were there external factors that lead to the result of the data received? These are typical questions asked when data quality is involved. Tsunami recordings of a disaster that happened might not match the readings to those in another country, is data quality high in some countries and low in some due to the technology available, all these uncertainty and imprecision are major setbacks in Big

Data Analytics. Besides having machine-related issues, data management is also very important. Major challenges of these are data privacy, security and ethical usage of the data. Matters relating to whether data is used correctly, abiding by the laws and its intended uses.

- **Data velocity:** Data velocity measure the speed at which data travels. Ecommerce has increased the speed of data used for different business transactions [5].
- **Linking data:** Linking data refers to how the data is being connected to each other, usually, data is collected from different data sets and combined together to create meaning. Poor data frequency would mean a bad result and vice-versa. Collecting big data is an objective while being able to take advantage of it is another challenge. Most businesses lack the knowledge necessary to turn data into organizational values. This lack of knowledge stems from their incapability of processing statistical data and their inability to catch up with the technology time clock. As little as these setbacks may sound, every new technology takes time to learn so as it is with big data, it would take a period of time before it reaches its maturity stage. Besides dealing with data variety, velocity and veracity, another important aspect to deal with in data architecture is Privacy[12]. privacy causes a lot of problems in creating data, for example an individual who wants to hide a piece of information may pose as a barrier to data analysis because when the received data is to be aggregated and associated the privacy sets barriers to accessing the full information being received and also cause a lot of inconsistencies during cleansing big data.

4.2. Data Processing

Other challenges of big data are related to the processing of data. Generally, these processes are shown below in figure4 below and would be further dissolved to really understand what happens in every stage of processing data[13].

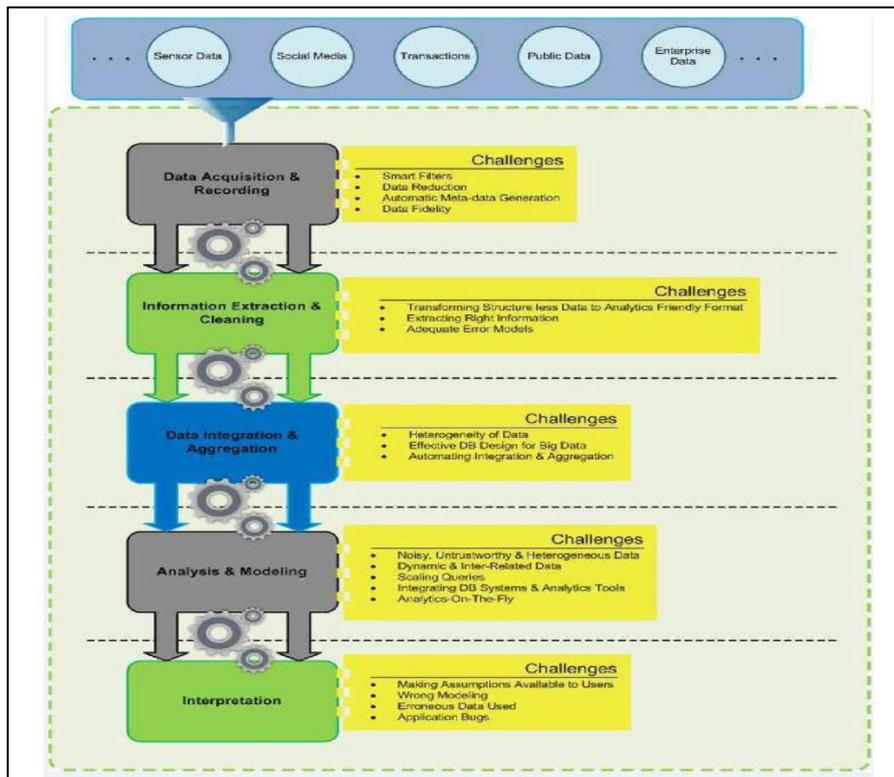


Figure 4: showing the data processing stages

- **Data Acquisition and Recording:** Every big data has a source it's coming from, it does not just emerge from outer space, from health organizations to scientific experiments petabytes data is being recorded and sourced every day. The major challenge is how these data being sent every day is filtered. Smart computers should distinguish between which data is useful and to capture and which data is not useful to be deleted. For example, faculty weather sensors would give a different metric reading to sensors that are fully functional, however, this should not cause a major course of concern as it could be solved with analytical logarithms that process the data being streamed and reduce it based on similarities with other corresponding reading. The most challenging aspect of the recording is the automatic domain that records every piece of Metadata being generated before it is stored[14]. A scientific experiment that records every stage and condition of its process might have a compromised or wrong result if there is an error encountered on subsequent stages, each stage relies on the previous one to develop and generate results, therefore research should develop systems that would generate precise metadata and carry along a provenance data throughout all stages of analysis.
- **Information and extractions:** The formation which data is collected cannot be used unless it is processed and extracted to pull out the required information which is saved in a standard and structured form ready for analysis the big data being saved is not always true, it might have some false information in it that would affect how it is used and applied, hence quality control has been a major issue and no technique has been successful in quality control models for most big data which present another major challenge[15].
- **Data integration and aggregation:** The stream of data is composed of different dissimilar parts and elements which makes it difficult to capture all parts. For example, the data retrieved from a company survey about consumer behavior would vary from the region due to cultural and social consumer effects, it is wrong to ignore the variables that affect change in results. Thus, the problem comes when differences on the host subjects are dominant, the company/organization would not be able to satisfy both consumers from diverse regions at the same time and this would lead to an alternative forgone. A lot of work has been done concerning this subject to achieve at equilibrium in data collection but more work has to be done.
- **Query Processing, data modeling and analysis:** Techniques used to process data are different from those used to analyses it. Big data is very huge, unreliable, and interconnected, however big data has more potential of deriving business intelligence than small data because a repetition of patterns in big data statistics can be used to assume a common pattern and reveal more hidden knowledge. However, big data creates a large network of information that are not similar but which would be compensated for missing information. A lot of requirements for data mining include cleaning, integration, reliability and powerful computing environment. Data mining/collection can assist in improving quality and suggest intelligent query functions. Just as organizations' have multiple networks sometimes errors are being made when analyzing these data, on the other hand, knowledge being extracted from the analysis can help to remove constraints and ambiguity. A consumer might refer to his consumption pattern/behavior as occasional, this might mean something else for another person. Therefore, when making analysis, more attention and emphasis should be placed on such answers that would determine exactly what was intended.
- **Interpretation:** whatever data being analyzed by users would have limited value if it cannot be understood. At the end of every data analysis, the results would be sent to decision-makers who would interpret it. Interpreting data includes all assumptions made and reviewing the analysis. As stated already, errors might come from different sources and dysfunction of computer systems and assumptions made from the models. Decision-makers or end-users must understand and verify the results gotten from computers as the computers ease work for them, but due to big data complexity, this

has prone to be a big challenge. Assumptions have always existed since the beginning of time, but most are initially made before data is collected, therefore it is mandatory for decision-makers to include additional information describing how each step was arrived at and what variable inputs were considered while making a decision, this supplementary information is called Provenance of data. In conclusion, more research should be performed to uncover the best methods to capture and store provenance in relation to the technique to create adequate Metadata.

4.3. Management Challenges

At the center of every technological advancement including big data analytics is the problem of ethical concerns that technology does not put into consideration, technology might have a default way of solving problems but the moral and ethical boundaries of any discipline must be put into consideration [16].

Privacy: privacy has been a major concern when dealing with big data, in the health sector, laws have been put in place to govern the privacy of patients. The fear of unlawful use of personal data especially when this data comes from multiple sources has been a major issue. Location-based services may demand subscribers to give their exact location resulting in privacy concerns, other users might think disclosing their location or address might result in unlawful acts that would compromise their wellbeing, but in real “data world” when a location is sent to the receiver, the service provider can assume the identity of the subscriber by tracing subsequent location information, this is done by leaving a trail by the subscriber which is being followed and attached to a particular person. A lot of personal information is being shared on Twitter and Facebook by different users and until now people don’t understand what it means to share data whereas this data can be put together to come up with more business intelligence and personal use not intended to be shared.

Analytics: Analytics is a group of techniques based on mathematical principles used to count a number of historical events in any given data with the aim of identifying patterns. Analytics helps to predict the unknown and the outcomes in order to make important decisions to avoid any anticipated impact or loss. The most common types of analytics include descriptive analytics, predictive analytics and prescriptive analytics.

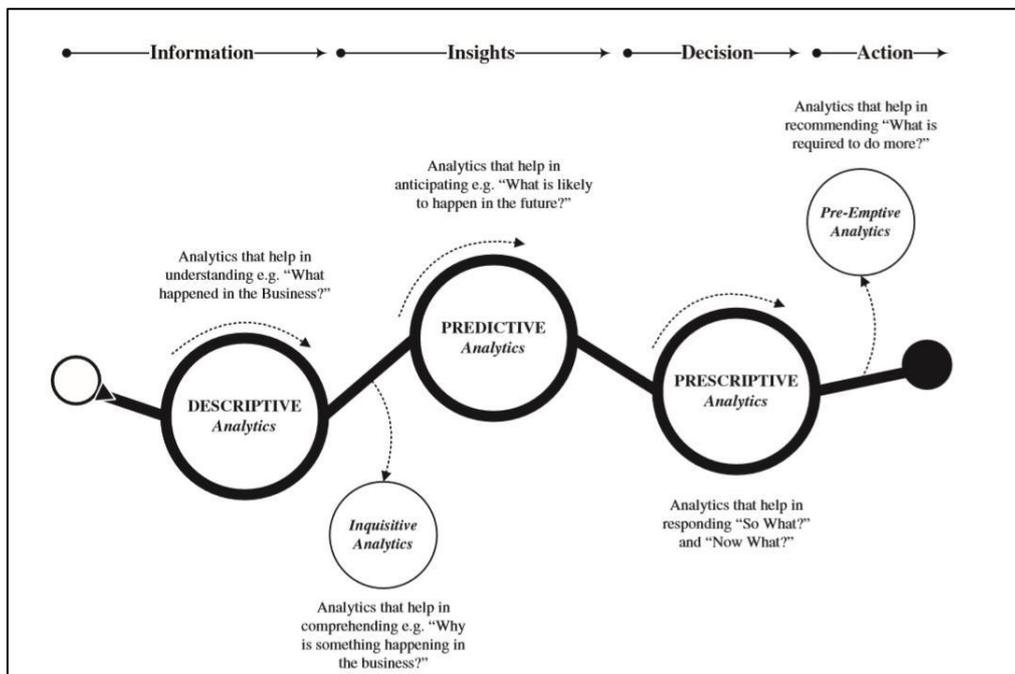


Figure 5: Types of data analytics of data. source: Naser T big challenges of data (2015)

- **Descriptive analytics:** descriptive analytics is the easiest type of analytics that only involve the description and summary making of data collected with the use of statistical and mathematical methods such as mean, mode, variance and deviation. The kind of data used in descriptive analytics is mostly historical data because when compared can be used to predict patterns and make correct management reports [17]. However descriptive analytics are considered to be backward because it reveals what has clearly happened but however it is used most times to predicts the future.
- **Predictive analytics:** Predictive analytics basically entails determining future possibilities based on supervised models [18]. With the aid of statistical methods behavior can be predicted and the new solution made. Unlike descriptive analysis that uses only historical data, the predictive analysis uses both historical and current data to predict the future. It can be used to predict customers' tendency and inclination to certain goods by comparing frequent behavior of usage and fault indicators [19]
- **Prescriptive analytics:** Prescriptive analytics is carried out to determine what must have caused an analytic result. It entails the use of knowledge gained from predictive analytic models, compared to other analytic methods, prescriptive analytics is the most difficult to deploy but has a strong effect of managing information shift and continuous evolution of business process models [20]. In general, this analytics method support business in making decisions by evaluating actions and assessing their effect regarding business goals.

5. BIG DATA ANALYSES

Before big data which is received raw and unstructured can be used for business intelligence, it has to be analyzed into 4 stages commonly known as the 4 "A's of data analyses namely Acquisition or Access stage, Assembly or Organization stage and the Analysis or Action Stage. These stages would be further explained and broken down for easy understanding.

Acquisition: Acquisition is the analyses stage where big data is filtered from a variety of sources e.g. (web, DMBS, OLTP, NoSQL). These sources come in different varieties and these varieties have to be dealt with diverse protocols. In a situation where the generation of data is important, the acquisition has to make further analysis to capture the metadata and store them with their similar corresponding data.

Organization: this is the arrangement of data that come in various formats e.g. texts, compressed files and various other formats. The big data receiver has to extract the actual information and ignore the irrelevant data to avoid data overload. The important data are named entities coming from different sources, Organization deals with these sources and integrates the received data either structured or unstructured and store them in the right location (NoSQL, database, data marts or operational data store).

Analysis: This stage basically examines big data to know its trustworthiness and to understand its semantics. This involves running queries and building algorithms to find new insights. This process helps to provide an intelligent approach to understanding big data. Decisions are being taken from the analyzing stage and it is important for the user of big data to know what is being obtained by verifying outputs through a stage called Provenance.

This is supplementary information that seeks to explain to the user how the results were derived and to help in understanding what is being obtained.

6. OPPORTUNITIES OF BIG DATA

Big data offers numerous opportunities for organizations. The amount of importance you can get from big data depends on the values that could be derived from it. This process is called the Analytic stage or Analytics of Big data.

- **Analytics**

Analytics could improve existing projects and services by embedding big data with organizations i.e. using big data as a new way of doing business. A device called a progressive new “snapshot” monitors driver’ behavior and determines whether or not a driver is suitable for a job description. This kind of analytic surveys helps in improving work attitudes and behavior. More also, in the case of a designing process where robots are used in modelling 3 dimensional printed models, the ease gained from big data analytics and international business practices permits the production of same design models but with slight differences made to suit the end-users taste due to changes in region and other feasible factors that may be considered. Whereas traditional business practices and production may not be able to adapt to. Traditional manufacturing processes also create a lot of waste due to the usage of the excess material that is not utilized in the real market because of customer expectation and needs. International business procedures can also be reversed where there is a glitch or an error and the manufacturer does not need to be centralized as in local production. With the help of big data, materials could be transported to areas where needed.

- **Implications of big data Analytics for international Practices.**

High technology such as smart machines that are used to derive and gather data are still in their early stages but have had much impact on the data protection laws. The regulation concerning data access and reachability would need to be formulated to keep the privacy of individuals and put borders across what can be accessed, stored or transmitted both locally and internationally. This is important because a lot of concerns have been laid on the growing rate of feudal activities with data stolen from the international business database and used in mischievous ways. A security firewall must be made to chatter for the increasing rate of data.

- **Health care services**

In the past years, electronic health records have been adopted by health organizations and clinics all around the world. The knowledge of a certain type of patient’s disease and a better understanding of the symptoms can be gleaned through previous existing data saved in the hospital's catalogue. This would give them a better understanding of the diseases and virus and how to go about the treatment. More also, health social media site helps in empowering patient especially in chronic diseases like cancer and diabetes.

An insurance company called Humana uses big data to improve its business services. With the help of data analytics, the company can determine who is most likely to have an accident and with this information, intervene quickly. This insurance company and other health organizations use their patient’s data to save lives and another casual occurrence. Data is also used by organizations in decision making, in a situation where medication may vary from person to person depending on their body’s reaction to the treatment, this would give the medical team an edge on how to go to about the treatment without compromising the patients’ health.

With the same big data approach, an emergency unit called NSW SES has received attention from scholars and researchers because of the technique they use in responding to natural disaster victims such as floods, tsunamis, cyclones and other natural disasters. These kinds of disasters are accountable for a lot of human and economic losses in every part of the world. These losses have estimated to claim the lives of 244.7 million people and cost about \$366.1 billion economic losses [21] Government in different countries have made the prevention of these disasters their core objective, therefore, establishing such response unit called the NSW SES. NSW SES was founded by the New South Wales (NSW) state government in Australia. Rendering emergency services with full efficiency does not only require the availability of information from sensors, satellites and GPS signals but also a higher level of collaboration between emergency responders, decision-makers and lower community organization.

April 1955 was the year the NSW SES was formed by the Government of Australia and covers about 800,000km² which is about thrice the size of the United Kingdom. The technique used by the NSW SES was what made it get so much attention, the organization depends on small group pf 280 workers who oversee a larger group of 9000 volunteers, NSW further built a strong relationship with other emergency responding units such as fire service, rescue services

and other units spread all across Australia. The NSW serves as the control centre for the other sub emergency units and provides the big data analytic needed to execute any emergency operation.

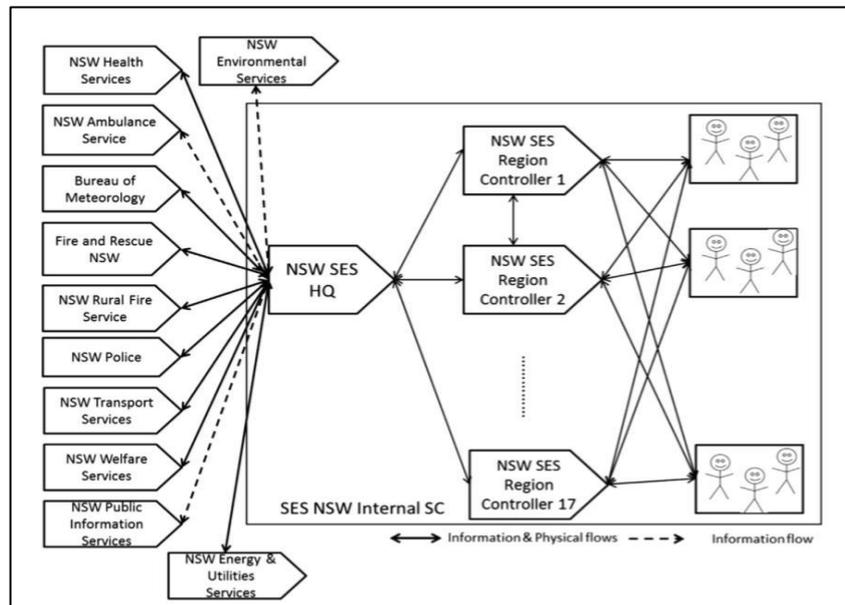


Figure 6: NSW Network for the emergency services delivery.

As seen in fig NSW SES (New South Wales) emergency headquarters with its available technical resources (sensors for earthquake and tsunami) controls the other smaller emergency units when it receives signals from the sensors it sends the regional branches with the volunteers to react quickly to the scene to evacuate the area or help victims as the situation may be. Besides only working with the emergency u is to aid rapid response, the NSW SES also shares its weather information with the public, giving real-time access of accurate weather forecast and emergency information. With cutting edge tools and technologies, NSW has been very effective compared to a typical response operation which would involve multiple information gathering and processing.

After this study of how NSW SES has changed its emergency response, another key benefit from NSW is that it also helps in decision making, helping Government to decide where to allocate resources and aid against future reoccurrence. It takes only a good manager who is willing and understands how to integrate a good work structure to its organization and good employees who are willing to push themselves to make any ‘big data’ work structure effective.

- **Contribution in international business education.**

An important tool that international business use is the dashboard. This is a natural display of the most relevant information and data needed to arrive at one or more conclusions, arranged on a single screen so the information can be accessed at a glance.



Figure 7: the dashboard display concept

This dashboard data streams comprise of metric figures and quality control concerning deliveries and supplies. The concept helps to give a full-time display of all ongoing processes at a glance which is appealing and fast. However, some setbacks are encountered when working with a dashboard as there is performance error due to the bad production of the dashboard and may give the manager a false record of events. There is also a poor training problem as some managers do not acquire the skills in interpreting readings from the dashboard, how to interpret low and high risks and what action is needed to be taken to avoid a loss.

7. DISCUSSION

In this research acquired the point of the big data, the big data concept of business, especially of the education business, then the business has several consequences to develop productively and modernize a proxy system that used to turn out more innovation and growing various types of organization and business. And modernize dashboard concept helps a lot in the decision-making process as managers have a tool in which they take critical decisions when working with suppliers.

Big data is a term to utilize for data collection and sets. The variety of data that it encompasses. The big data always brings a number of challenges relating to its volume and complexity. So there are big data technologies used to store and analyses Big Data. We can categorize them into two (storage and Querying/Analysis) which's (apache Hadoop, Microsoft HDInsight, NoSQL, Hive, Sqoop, polybasic, Big data in Excel and presto).

To become efficient in the data game, an organization must exercise 3 characteristics of data stakes.

- The data itself
- A format allowing the data to be accessible and
- Advanced analytical tools such as Hadoop and NoSQL.

These are platforms that are readily available in the market. Parallel database or NoSQL datastore is the current art of technology in data analysis. It is connected to a platform called Hadoop. Hadoop provides an open source to process the big data being received. This technology was inspired by Google's Map Reduce and Google file system (GFS). All these deal with a higher-level data language's, users of this system are top PhD holders with high expertise in analysis and database. There are only a few of such practitioners who have the license to run their Hadoop infrastructure.

Other similar tools and techniques available for big data management include Google Big table, simple DB, not only SQL (NoSQL) Data stream management systems (DSMS) and

Voldemort. Big data differs from traditional data, therefore, companies must develop special tools and technologies that can store, access and analyze large volumes of data, The new Big data technology improves organizations capability to process and store a large amount of unstructured information, it also aims to reduce the use of hardware and the cost of processing data. Properly managed big data are accessible, secure and very reliable.

8. CONCLUSION

We started our study by defining the term ‘big data’ and giving a wide range of how big data is being used by different fields from the government to private organizations and everyday life. We also examined the challenges of big data relating to its management and analytic stage with help from earlier research and study conducted by experts in the game of big data and examined major tools such as SQL and DB used in by big organizations to for data management and processing. Two case studies were also provided to further explain how big data have been used perfectly to improve service. These all have contributed in makings understand the question regarding what, how and why the term big data is used.

Volume, velocity, variety, veracity and value are the five keys to making big data a huge business.

We live in an age of information; were the amount of information and knowledge one poses determines its power. It has also become clear that more data is different from other existing data. In a few years with the promising technological advancements, more data would be collected in a year than it has ever be collected. Mankind is evolving from a data-centric to a knowledge-centric community. As technology breaks the barrier and the issues concerning big data are resolved as well as the challenges and opportunities discussed in this paper, there would be a major enhancement in big data flow and storage at minimum risk.

This paper aimed at discussing the major challenges and opportunities of big data analytics for organizations. We also identified major issues in data storage and management that must be solved within the next decade.

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