



Global Advanced Research Journal of Management and Business Studies ISSN: 2315-5086 Vol. 6(3) pp. 052-059, May, 2017  
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*Full Length Research Paper*

# **Role of Analytical Tools and Business Intelligence Applications in supporting Big Data and Decision Making Process**

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Accepted 08 June, 2017

**Big data provides a competitive advantage for enterprises if they are well utilized and analyzed because they provide a deeper understanding of their customers and requirements. This helps to make proper decisions within the organization more effectively based on the information extracted from the customer databases and thus increase efficiency. So, the objective of this article is to shed the light about the major analytic tools that are used in analysing Big data aiming to extract accurate information assist in decision making process. We assure that Big data advantages not exist only on enterprises and commercial projects, but extends to many areas, including energy, education, health and large scientific projects, so we must search for the proper tools that assist us in extracting precise information to support the various enterprises. Also, we'll talked on employing business intelligence in the planning and execution of a balanced performance card that help in obtaining the required data on time taking into consideration that Business intelligence acts as a framework for many methodologies, processes, solutions, tools, and technologies that work together to provide value-added information that can be applied and thus deliver intelligence within various enterprises.**

**Keywords:** Big Data, Business Intelligence, Performance Card, Hadoop

## **INTRODUCTION**

Since the beginning of the 1990s, intellectual and scientific developments in various fields of administration have accelerated and many trends have emerged in the field of IT applications in the administrative field. With the rapid and continuous change in the organizations' environment, the need to develop new technical and administrative methods to meet these challenges has emerged. Business Intelligence has found its way into existence to replace the traditional way of dealing with information technologies in the organization and promoting new ways to address many problems (Akkermans and Oorschot, 2002). Over the past five

years, organizations around the world, both private and public, have begun adopting business intelligence initiatives to support various management functions and activities.

On other hand, Big data is not a newly learned data analysis and the extraction of underlying knowledge has always been a concern for all businesses. Business Intelligence systems have been one of the most important sources of knowledge in business over the past two decades. They have contributed significantly to decision-making and forecasting events based on the analysis of operations within the business from selling,

buying, etc., over a relatively long period of time. The method of decision making of all types in any company depends mainly on the information collected and processed (processed) to reach the output of the decision, and therefore the lack of sufficient information, accurate and correct may lead to decisions, if not failed, they may be similar to other random Guaranteed results (Gang et al., 2008).

Big data technologies of business intelligence differ from the fact that large data deals with different sources and larger volumes of structured, unstructured and distributed data on many devices over the Internet rather than limited to a limited number of systems and databases in one place, as in business (Mircea et al., 2006). At the same time using the same analytical methods known in the field of business intelligence and data warehouses, and the exploration of data such as neural networks, algorithms and artificial intelligence and logic Fuzzy Logic and inductive reasoning and clustering methods and other methods.

Finally, we assure that Big data is a term used for data packets that are so large and complex that it is difficult to address with only one database management tool or traditional data processing applications. The challenges involved include updates, access, duration, storage, research, participation, transport, analysis and presentation. The term usually refers to the use of predictive analytics techniques and analysis of user behavior or any advanced data analysis that helps extract valuable data from which to help make more accurate decisions.

## **BIG DATA: STRUCTURE, TOOLS, EFFECTIVE USAGE AND PRIVACY**

In the current times, many of us believe that Big data is classified according to size only, in fact it is classified according to the principle of (3V's) and consists of (Montejano et al., 2005; Zeng et al., 2006; Alexander, 2008):-

**Volume:** Which is the size of data extracted from a source, which determines the value and the potential of data to be classified within the huge data; and may be the most important property in the analysis of large data. Also, the description of the huge does not specify a certain amount; as mentioned above that the size is usually measured in bytes Or by default. By 2020, cyberspace will have about 40,000 megabytes of data ready for analysis and data extraction; it is estimated that 90% of the world's data today has been developed over the past two years, both by machines and human hands, both of which have contributed to data growth.

**Diversity Variety:** It is intended for the variety of data extracted, which helps users, whether researchers or analysts, to choose the appropriate data for their field of research. They include structured data in unstructured databases and data that come from their non-systematic nature, such as pictures, video clips, audio recordings, GPS data ... is too much; it takes time and effort to configure it in a form suitable for processing and analysis.

**Velocity Speed:** Speed is a crucial factor in decision-making based on these data, which is the time it takes from the moment these data arrive at the moment the decision is made. Previously, companies used to process a small set of data stored in a structured data image in a process database called the Batch Process, where each data set was analyzed one by one, pending results. With the huge increase in data size and frequency, the need for a system that ensures high speed data analysis in real-time or near-real time is becoming more urgent. This has led to the development of technologies and solutions such as Apache, SAP HANA, Hadoop and many more.

The above three principals have also been recently added to these three principles according to Big data characteristics: the principle of the validity of large data: the ability to assess them is an essential element in laying the groundwork for making important decisions.

The tools that deal with Big data consist of three main parts (Cios et al., 2007):-

- Data mining tools that usually detect structured or unstructured data (such as text and images) distributed across different Web devices. Where software tools extract that data and put it appropriately for later processing.
- Data Analysis tools that analyze the data discovered through the use of comparison, classification, approach, linking and other analytical and regulatory tools in order to achieve the desired results, which have been defined in advance.
- Dashboard display tools that visually and graphically display the final results of the analysis according to what has been identified as a pre-analysis goal.

Data inflation over the past years has led to the development of large data or data science. Any traffic you

make on the Internet is part of this data and any information added or video uploaded or tweeted is sent or a situation is changed in the social media is ultimately the bulk of the repository of data that is examined and analyzed for use for marketing purposes or Development or treatment of diseases, improvement of education or welfare and so on. Participating in the creation of this huge repository of data are all telecommunications companies, governments, social networking platforms, search engines, internet browsers, mobile applications, e-commerce sites, educational and health service providers and payment providers of various forms (Elizabeth et al., 2002).

Through your social networking moves, for example, Facebook knows more about you than you know about yourself. By analyzing your movements and what you read, write or watch, you can know what you love and what you hate, when you sleep, when you wake up from sleep, and direct you to advertisements that suit those tendencies, desires and behaviors. This is the case with the web browser, where by analyzing your website traffic, you know what you are interested in or like to offer as a suggestion across ads (Hammergren and Simon, 2009).

### ***How can Big data be used ?***

It is not possible to limit the use of huge data today, as everyone is able to benefit from them in one way or another, whether companies, individuals, bodies and governmental or quasi-governmental organizations. Everyone is able today to read, study and analyze data even in a simplified way to be able according to them to make different decisions as needed. The Google analyst and the analytics coming from the platforms are a clear example so they are tools available to everyone and therefore the process is no longer exclusive to anyone.

Companies, institutions and agencies of all kinds can now analyze the movements of customers from buying, selling and so on with greater precision so that they can know the goods that are most in demand or stagnant and offer their customers specific commodities according to the purchases made. They also have the ability to understand customers' behavior more accurately, identify those who are discerning and who need help, determine their direction, or monitor their performance. This is not only for traditional sales centers but now also includes electronic stores on the Internet and on a larger scale (Hurwitz et al., 2007; Chan, 2012; Chan, 2013).

It is no longer limited to data coming from the company's customers, but companies are now able to rely on data coming from the Internet to

study the behaviour of consumers in general and to evaluate their products and services accordingly. This vast repository of data has become available to all to benefit from the development of better products and services that are appropriate to the behavior of the real consumer after the development of a sample of consumers. It has become a task of those who work in marketing today to read these data and study to reach the consumer better and more appropriate.

### ***Big Data Privacy***

There is a close relationship between massive data and privacy. Your statement today is no longer part of your privacy. Yes, the huge data technologies do not deal with the detailed data of each one of us but rather deal with the data collected about the movements we do, but this does not negate the fact that these detailed data already exist and can be found. Anyone can know that you bought a product on that date. After that, you took a cup of coffee somewhere. Then your car crashed. I sent it for repair. I used one of the transportation services to reach your house. You find that one of the family members needs a hospital. For treatment and then surprised by the announcement on your mobile phone from an auto dealership offers you to replace your car !!!!.

If you consider that information to be private to you, then I know that it is no longer the case in today's Internet world. These data are publicized and recorded through the application of transportation services, credit card, hospital records and records of your vehicle's agent. Therefore, it is not a secret, and since there are parties who are aware of it, even if they are few, they are advertised through the Internet and cannot be hidden or considered private even if all the laws of the world claim otherwise (Inmon et al., 2008).

Privacy today is what you do or say outside the world of the Internet so be careful not to take the phone with you to the bedroom or to be outside your privacy is also the other. Receiving free and valuable online services will force you to pay for that, which is at least the data you send through your online traffic. If you want to have your privacy, do not use the Internet.

But there is a bright side here, you get as a result of analyzing your data on ads, services and products that suit you and fit your needs more accurately than the randomness that it had previously. Companies are becoming more able

to provide products that are more convenient for you and solve your problems every day. Disturbing ads that you have nothing to do with are starting to disappear from your life because they become more understanding and able to deliver ads that are right for you. Government and educational services will soon become preferred because they will know about your needs without having to complain or be restless (Jarke et al., 2003).

## BUSINESS INTELLIGENCE COMPONENTS

The great sophistication of the business environment and the flexible architecture of business intelligence make the scope of its technical components not limited to or Specific types, but in general, when looking at the business intelligence architectures presented by researchers in the previous axis can be observed Agreement on the classification of business intelligence components into five basic categories (Langit, 2007; Malik, 2005; Malinowski and Zimányi, 2008; Fitzgerald, 2014):

- a- Data sources or information.
- b- Data integration technologies (extraction, transport, loading).
- c- Data storage technologies (data repositories).
- d- Data analysis technologies and applications (immediate analytical processing systems and data mining).
- e- Information display technologies (reports, instrument panel, performance cards).

In view of the business intelligence architectures, the emphasis of most researchers on operational systems or immediate transaction processing systems can be observed OLTP (Online Transaction Processing) is one of the most important sources of business intelligence data. These systems are all systems that deal directly with users or respond quickly to their needs and are used in many fields and industries, including banking, airlines, factories, retail, In addition to ERP and CRM systems, the researchers believe that business intelligence also deals with many external sources of data and information, such as demographic data, and surveys conducted by public and private entities.

To assess data sources and information and their use in business intelligence systems, there are three main points that can be used to assess business intelligence data sources and determine their ability to support practical design of the system, as follows:-

• **The ability of data sources to support dimensions and metrics:** by assessing the data source's ability to support dimension and metric design (which will be

explained later), an example of the tasks used to implement this assessment, planning each dimension or scale to one or more data sources, Integrate these sources.

• **Data source capability to support data update requirements and historical requirements:** This is done by assessing the data update requirements. To implement this assessment, data storage units can be estimated based on the lowest required level of detail, and the update rate compared to the expected time of data processing.

• **Data Quality:** This point evaluates the cleanliness of data sources. This assessment is performed by sampling data, determining whether the data sources are missing a field, containing invalid data, and identifying possible fault areas.

Based on the results of the assessment of the data source at previous points and if not achieved, several steps will be taken to fill any gap in the data sources before moving to other areas. The most common situations that can occur if the data source fails Evaluation is as follows:

• The data source does not support dimensions and measurements: in this case, some adjustments are usually made, such as deleting a dimension or scale for not being able to support it, leaving these problems aside and finding out their reasons later, continuing to build the other dimensions and measurements, As planned, to see how important this source is, and to take the appropriate action, such as storing it in a separate database.

• Frequency of data update: Difficulty accessing the data source due to security constraints or lack of access to data in a systematic manner, or technical limitations, may lead to many problems, and each of these problems has a way of resolving them. For greater access to data sources or to update the IT infrastructure.

• Data is not valid: It means invalid, missing or inconsistent data. Here, some decisions must be made on how to handle this data. The simplest way is to address it in the data source. If this is not possible, the role of data integration technologies Which will be discussed later, and the reasons for the loss of data in the Organization and ways of compensating them.

Unlike traditional systems that typically require a source or source of data that is specific and clear, business intelligence applications often need a wide range of data sources and multiple internal and external sources to achieve their objectives. And that the selection of business intelligence inputs should begin by identifying the target outputs, so that the type of data to be analyzed can be considered. An important element should be taken into account when starting data sources, namely, the sustainability and availability of these sources (LaValle et al., 2011; Moss and Atre, 2003; Niven, 2002; Parmenter, 2007).



Figure 1. Big Data form

## ANALYSIS AND SIGNIFICANCE OF BIG DATA

Many large companies rely on large and complex data analysis policies that require specialized software only for data management and analysis, which cannot be processed using only one tool or working on traditional data processing applications. It is well known that data collection and information help to accurately describe the problem and analysed them to arrive at accurate results, so it was necessary to adopt an administrative system that includes the analysis of huge and very large data (Figure 1).

Big data analysis seeks to improve management decision-making, as well as to review data management options. Data of large sizes can range from several terabytes to bytes and sometimes exa bytes, so there is a need to develop platforms that deal with this huge number Of data, forcing many companies to develop the hardware, software and expertise of their employees, to prepare them to benefit from the systems of large data analysis correctly and effectively (Niven, 2002; Parmenter, 2007).

The analysis of Big data significantly increases data processing capacity at four main levels:

**Size:** It works with high data analysis capability from the terabyte to the max.

**Speed:** Be able to take appropriate action and modify them in a timely manner, they are using high-speed software and performance.

**Diversity:** It analyzes all types of data within the work system, on a high-performance computing platform and analytical capabilities for capture, processing, conversion, detection and extraction of value and deep insights.

**Ability to change:** it manages changes in data and information models, allowing results to help managers better measure and manage the most important tasks in their business.

Data analysis is especially important for business people and managers who may want to convert data into information that can be used for decision-making. Using

these data through sophisticated analytics and by adopting key metrics in an easy and efficient way, we will find ourselves with unprecedented insights and insights in various aspects of business planning, operationally and strategically.

Business intelligence aims to collect relevant data in one or more areas, to identify past trends, to create predictive models, and to use those models to make decisions. For example, such a retail analysis can determine the behavior of a consumer or group of consumers (e.g., identifying business travellers, business enthusiasts, or fast-food restaurant visitors). The result can also be used to adapt marketing campaigns, advertising and promotion, and even display products in the store and inventory management (Scheps, 2008; Williams and Williams, 2007).

The Big Data are classified as follows:-

- Resources arising from the management of a program, whether governmental or non-governmental, such as electronic medical records, hospital visits, insurance records, bank records and food banks.
- Commercial or transaction-related sources arising from transactions between two entities, for example credit card transactions and transactions conducted through the Internet, including through mobile devices.
- Sources of sensor networks, for example, satellite imaging, road sensors, and climate sensors.
- Sources of tracking devices, for example tracking data from mobile phones and GPS.
- Behavioural data sources, for example, online search times for a product, service, or other type of information, and page views on the Internet.
- Sources of data on opinions, for example, comments on social media.
- Facebook handles more than 50 billion images of its users.
- Google deals with about 100 billion searches per month.

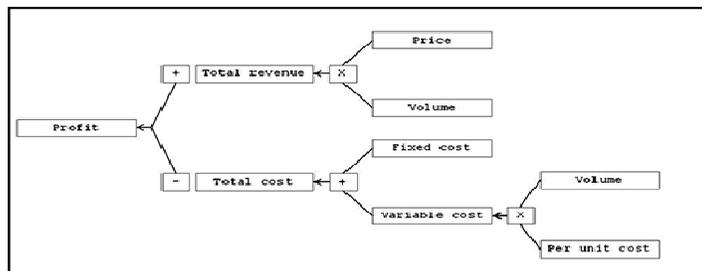


Figure 2. Big Data Analysis Steps

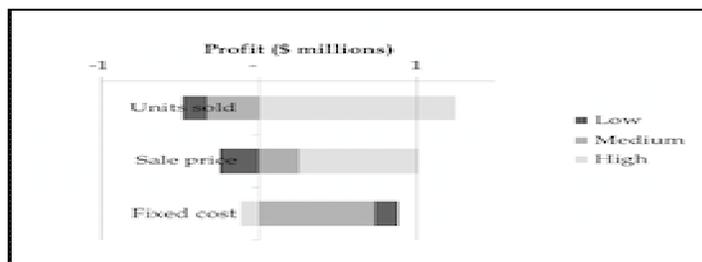


Figure 3. Profits of Big Data analysis

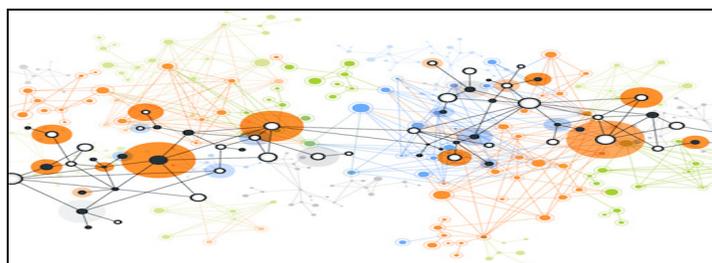


Figure 4. Big Data from Business Perspective

Suppose you have a set of data, how do you analyze? This area is broad, but some practical application may help you identify the skills that you have to come from abroad or to develop within the company, to take advantage of the advantages of data science.

The first step is to create a driver tree, an analysis of the relationship between metrics of interest and other criteria that affect these metrics. Revenue is based on revenue and costs; revenue, on the other hand, depends on the sales volume and sales price of the unit, while the cost depends on the fixed costs of the company and variable costs that also depend on the volume of sales and the sales price of the unit. Thus, when relationships are correctly defined, one can map them in the tables of the Excel program and then begin the actual analysis (Wrembel and Koncilia, 2007).

This seems to be a simple model, and indeed it is; but let us not forget that the difficulty is not in translating a complex business problem into a complex model, but in transforming a complex business model into a series of meaningful models. With the above model, tasks that

address response analysis and sensitivity analysis become possible. Analysis of the response can be done by changing the input cell in the spread sheet (e.g. volume), and recording the effects within the output cells (e.g. Profit). In this way, data can be worked on in advance, so that the integration of volume information and data tables in the Excel program, for example, can help produce graphs such as Tornado diagrams.

In terms of data analysis, much more can be done, and what is mentioned above is nothing more than door knock. Other types of analysis can include data visualization, curve drawing, regression curves, forecasting, decision trees, and many more. For example, economic regression analysis allows for the creation of economic models based on past data, in order to obtain forecasts and other data that are not previously available, matched by predictable workflows that can be examined. Thus, data sets can help analyze past as well as planning for the future (Zhang, 2008; Watson et al., 2013; Wills, 2014).

## CONCLUDED REMARKS

With the help of business intelligence solutions, organizations can implement corrections and take necessary measures to improve efficiency in various areas of their operations. An organization may also identify new business opportunities and expand accordingly to accommodate its best interests. Business intelligence software tools are highly dependent on rapidly evolving technologies like big data, predictive analytics and data mining. Many technology consultants provide specialized business intelligence tools, technology consulting, and implementation support with extensive industry expertise to help organizations assess their business intelligence needs. Below are highlights key advantages for using business intelligence tools:-

**Faster Decision Making:** Key executives are involved in making decisions that guide business direction and strategy. In the absence of business intelligence solutions, this decision making process often involves making a considerable amount of presumptions. Without the availability of detailed reports and analysis, executives may have to make decisions based on limited information like sales figures and market demand. Business intelligence eliminates this guesswork and presents new information like real-time production stats and customer feedback for various product lines that is backed by hard data. Some predictive BI techniques also allow for "what if" analysis to see how a decision would affect the company in the future. All this information provides key insights and a wider perspective, which enables faster decision making at the right time.

**Real-time Performance Measurement:** Business intelligence tools continuously monitor large amounts of data generated by an organization and carefully analyze it for several performance metrics such as efficiency, sales figures and marketing costs related to the business- in real time. This helps keep top management informed about the status and performance of various critical components within the organization and the collaboration between business units. It also enables business executives to detect market opportunities and take advantage of them.

**Improved Reporting Speed:** BI users can access large amounts of unprocessed data in the form of organized and readable reports that present information in an interactive manner within a short amount of time. This eliminates the need to sift through loads of data and printing a pile of various reports.

**Greater Insights into Customer Behaviour:** BI can analyze sales figures and customer feedback to represent facts that tell a business a great deal about their customer's preferences and needs. Using IT

products as an example, logged customer information can be sent back to a company's servers to be analysed to get an idea of how the customers are responding to the design of a particular software product. Products such as Google Chrome, Microsoft Windows and others are continuously monitored and updated to keep up with the demands of customers. Analyzing this information can also help a company detect what the customer is buying and what his/her needs are enabling decisions that allow the company to retain or grow their customer base.

**Identify New Business Opportunities:** If a business has a numerous products, BI can help detect customer touch points where a customer buys multiple products produced by the same company on an individual basis. Such touch points can provide a company with new business opportunities to sell a group of products together as a single integrated package to retain and grow a particular customer base. Thus, by using business intelligence, opportunities, which were previously undetected, can be put used to maximize profits.

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