Big Data Analytics for Business Intelligence in Vertical Industries

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Anton Okolnychyi, Andreas Koslowski

RWTH Aachen University, 52056 Aachen, Germany
{anton.okolnychyi, andreas.koslowski}@rwth-aachen.de

Abstract. to be done

1 Introduction

The business world is going through a revolution induced by the use of data to control decision-making and to perform analytics. A major reason for the business analytics revolution is the rapid proliferation of the amount of data available to be analysed [1]. Tasks in modern analytics require a huge computing power, storage capacity, appropriate information technologies which are needed to gather, analyse and retrieve an asset from data. This becomes possible due to the constant evolution of the corresponding software and hardware techniques. The availability of computing power and data storage capacity have expanded at an exponential pace, and this trend seems unlikely to abate any time soon [2].

Big companies understand the value of their data and possible outcomes of usage of data analysis in adjusting and defining their business strategy. Some of companies try to make use of opinions expressed by customers in order to improve the overall customer experience. Others analyse data to find patterns in customer's behaviour which can be used later to predict future needs and purchases. Data is a strategic asset in making recommendations. Often, data is analysed in order to fine-tune the enterprise itself, with analytical insights used to refine internal processes, promote safety, and pinpoint operational issues the resolution of which can drive up efficiency, profitability, and competitive positioning [3]. This is especially true in the vertical industries, where it is critical to adapt to the needs of the customers and predict the trends of each specific market. By analysing the data the industries gathers, it is much easier to adapt to current trends and they are able to offer the customers complete business solutions.

This paper provides an overview of how Big Data is used in the industry and clarifies how Big Data and it's use will change the Business Intelligence, particularly in the vertical markets. It'll compare how the different vertical industries are dealing with the topic of Big Data Analytics and what strategies are adopted while doing so.

2 Big Data Analytics

Big data analytics is the use of advanced analytic techniques against very large, diverse data sets that include different types such as structured/unstructured and streaming/batch, and different sizes from terabytes to zettabytes [4]. The main aim of big data analytics is to assist organizations in making smart business decisions by enabling data scientists and other analytics professionals to analyse large volumes of data that was previously inaccessible, unusable or just untapped. With a help of advanced methods and tools, such as text analytics, machine learning, data mining, statistics, and natural language processing, companies are able to perform analysis of previously untapped data sources to retrieve new insights which lead to better and more informed decisions. Just having a lot of data does not give anything. Only using the correct analytics one can extrapolate powerful insights. Amir Gandomi, Murtaza Haider say in [5], that Big data is worthless in a vacuum. Its potential value is unlocked only when leveraged to drive decision making. To enable such evidence-based decision making, organizations need efficient processes to turn high volumes of fast-moving and diverse data into meaningful insights. Charter Global in [6] defines 3 types of analytics: Descriptive, Predictive and Prescriptive.

Descriptive Analytics is the simplest kind of analytics. It allows you to retrieve smaller and more useful bits of information from huge data sets. Alternatively, it may provide a summary of what happened. Social media analytics is one of examples of Descriptive Analytics. It refers to the analysis of structured and unstructured data from social media channels. User-generated content (e.g., sentiments, images, videos, and bookmarks) and the relationships and interactions between the network entities (e.g., people, organizations, and products) are the two sources of information in social media [5].

Predictive analytics is the next step up in data reduction. It utilizes a variety of statistical, modeling, data mining and machine learning techniques to study recent and historical data, thereby allowing analysts to make predictions about the future[6]. Predictive Analytics is the use of historical data to forecast on consumer behaviour and trends [7]. This type of analysis makes use of the statistical models and machine learning algorithms to identify patterns and learn from historical data [8]. At its core, predictive analytics seek to uncover patterns and capture relationships in data. Predictive analytics techniques are subdivided into two groups. Some techniques, such as moving averages, attempt to discover the historical patterns in the outcome variable(s) and extrapolate them to the future. Others, such as linear regression, aim to capture the interdependencies between outcome variable(s) and explanatory variables, and exploit them to make predictions [5].

Prescriptive Analytics does not predict only one future, it rather predicts "multiple futures" based on the decision-makers potential actions. Each decision is associated with a likely outcome. This can be used to choose the better action. Thomas H. Davenport and Jill Dyche in [9] say, that there is an increased emphasis on prescriptive analytics. It provides a high-level of operation benefits for organizations and it places a premium on high-quality planning and execution.

3 Business Intelligence

The term "Business Intelligence" was used in scientific context for the first time in an article by Hans Peter Luhn, an IBM researcher, in 1958. In his article [10], Luhn described an automatic method to provide current awareness services to scientists and engineers who required assistance to handle an increase of scientific and technical literature. However, this term became widely used only in the 1990s due to Howard Dresner. In 1989, he (later a Gartner Group analyst) proposed "business intelligence" as an umbrella term to describe "concepts and methods to improve business decision making by using fact-based support systems" [11].

Business Intelligence is one emergent area of the Decision Support Systems (DSS) discipline and can be defined as the a process that transforms data into information and then into knowledge [12]. Being rooted in the DSS discipline, BI has suffered a considerable evolution over the last years and is, nowadays, an area of DSS that attracts a great deal of interest from both the industry and researchers [13].

It is important to distinguish Business Intelligence from Business Analytics since there is a confusion in the literature. Business Intelligence is needed to run the business while Business Analytics are needed to change the business [14]. BI is focused on creating operational efficiency through access to real time data enabling individuals to most effectively perform their job functions. BI also includes analysis of historical data from multiple sources enabling informed decision making as well as problem identification and resolution. Business Analytics relates to the exploration of historical data from many source systems through statistical analysis, quantitative analysis, data mining, predictive modelling and other technologies and techniques to identify trends and understand the information that can drive business change and support sustained successful business practices. Mark van Rijmenam says that Business Intelligence is looking in the rearview mirror and using historical data from one minute ago to many years ago. Business Analytics is looking in front of you to see what is going to happen. This will help you anticipate in whats coming, while BI will tell you what happened. This is a very important distinction as both will provide you with different, not less, insights. BI is important to improve your decision-making based on past results, while business analytics will help you move forward and understand what might be going to happen [14].

The concept of BI, although not new, is experiencing a renaissance which positions the concept in its infancy phase again [13]. Therefore a lot of new and ambiguous definitions have emerged. After some time, BI became a multidimensional concept. It can be described as a process, as a product, as a set of technologies or even as a combination of these. Shariat and Hightower in their article [15] characterize BI as a composition of processes, technologies and products: processes for collecting and analyzing business information; technologies used in those processes; and the product as the information (knowledge) obtained from these processes". Most BI definitions in the literature may be divided into 2 groups: the first group defines BI as a process, while the second one - as a set of technologies. For instance, J. Dekkers and J. Versendaal and R.

Batenburg in [16] define BI as the continuous activity of gathering, processing and analysing data - supported by a BI system. On the other hand, S. Pemmaraju in [17] says that BI encompasses all of the software applications and technologies that a company uses to gather, provide access to, and analyze data and information about its operations.

Business Intelligence systems represent the natural evolution of decision support systems and put a strong emphasis on data-driven decision making, based on the integration of multiple data resources that reflect different aspects of organizational activity [18].

Business Intelligence tools aim at improving the quality and accuracy of information used in decision making processes by simplifying the storage, identification, and analysis of information [19]. BI systems let users at all organizational levels access data, interact with it, and analyze it toward improving business performance, discovering new opportunities, and increasing efficiency. Well-designed BI systems offer a global view of the entire organization, permit analysis of business activities from multiple perspectives, and enable rapid reactions to changes in the business environment.

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