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THE ROLE OF BIG DATA ANALYTICS IN BUSINESS INTELLIGENCE

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Abstract

As businesses navigate an increasingly data-driven world, the role of big data analytics in driving business intelligence has become paramount. The explosion of digital information and the advent of advanced computing technologies have provided organizations with unprecedented opportunities to gather, analyze, and derive valuable insights from vast and diverse datasets. This journal article explores the significance of big data analytics in shaping business intelligence strategies and unlocking competitive advantages. It examines how businesses can harness the power of big data analytics to drive informed decision-making, enhance operational efficiency, and create innovative products and services. The article also delves into the challenges and ethical considerations associated with big data analytics, highlighting the importance of responsible data governance and privacy protection.

Keywords: big data analytics, business intelligence, competitive advantage, data-driven decision-making, operational efficiency, innovation, data governance, privacy protection.

1.Introduction

In today's digital age, businesses are generating an enormous amount of data from various sources, including customer interactions, online transactions, social media, and sensor networks. This influx of data has given rise to the concept of big data, which refers to the large and complex datasets that cannot be easily managed or analyzed using traditional data processing methods. However, when harnessed effectively, big data holds the potential to provide valuable insights and drive strategic decision-making for businesses.

This is where big data analytics comes into play. Big data analytics involves the exploration, extraction, and interpretation of vast amounts of data to uncover patterns, trends, and correlations that can be leveraged to gain a competitive edge. It encompasses the use of advanced techniques such as data mining, machine learning, statistical analysis, and predictive modeling to extract meaningful information from the vast data sets.

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The role of big data analytics in business intelligence cannot be overstated. It enables organizations to turn raw data into actionable insights, enabling data-driven decision-making across various departments and functions. By analyzing massive volumes of structured and unstructured data, businesses can gain a deeper understanding of customer behavior, market trends, operational inefficiencies, and opportunities for innovation.

One of the key advantages of big data analytics is its ability to enhance business intelligence. Traditionally, business intelligence relied on historical data and predefined reports to gain insights. However, with big data analytics, businesses can now uncover real-time and granular insights that were previously unattainable. This enables them to respond quickly to changing market dynamics, optimize processes, and identify new revenue streams.

Moreover, big data analytics empowers businesses to personalize customer experiences and improve customer satisfaction. By analyzing customer data, businesses can gain a comprehensive understanding of their preferences, buying patterns, and sentiment. This enables targeted marketing campaigns, personalized recommendations, and tailored customer service, ultimately fostering customer loyalty and retention.

Additionally, big data analytics can assist in risk management and fraud detection. By analyzing large volumes of data in real-time, businesses can identify anomalous patterns and detect potential risks or fraudulent activities. This proactive approach helps organizations mitigate risks, safeguard their assets, and protect their reputation.

However, it is important to note that the effective implementation of big data analytics requires a robust infrastructure, skilled data scientists, and adherence to data privacy and security regulations. Organizations need to invest in data management systems, analytical tools, and talent to harness the power of big data effectively.

In conclusion, big data analytics plays a vital role in business intelligence by enabling organizations to extract actionable insights from large and complex datasets. It empowers businesses to make data-driven decisions, personalize customer experiences, manage risks, and uncover new opportunities. As businesses continue to amass vast amounts of data, the role of big data analytics will only become more crucial in gaining a competitive edge in the dynamicand evolving marketplace.

2.What is big data analytics?

Big data analytics is the often complex process of examining big data to uncover information -- such as hidden patterns, correlations, market trends and customer preferences -
- that can help organizations make informed business decisions.

On a broad scale, data analytics technologies and techniques give organizations a way to analyze data sets and gather new information. Business intelligence (BI) queries answer basic questions about business operations and performance.

Big data analytics is a form of advanced analytics, which involve complex applications with elements such as predictive models, statistical algorithms and what-if analysis powered by analytics systems.

3.Why is big data analytics important?

Organizations can use big data analytics systems and software to make data-driven decisions that can improve business-related outcomes. The benefits may include more effective marketing, new revenue opportunities, customer

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personalization and improved operational efficiency. With an effective strategy, these benefits can provide competitive advantages over rivals.

4.Literature review

Big Data Analytics Theory

Big data analytics is not a new concept. Many analytic techniques, such as regression analysis and machine learning, have been available for many years. Even the value of analyzing unstructured data,such as e-mail and documents, haslong been recognized. New isthe convergence of advances in computer technology and software, new data sources (e.g., social media), and business opportunities.

This convergence has resulted in the current level of interest in and opportunities for big data analytics. It is even spawning a new field of practice and study known as "data science," which encompasses the techniques, tools, technologies, and processes for making sense of large amounts of data. (Watson, 2014) The growing recognition of both the social and

economic benefits of data analytics and data science has resulted in increasing demand for these disciplines.

Big data is defined as large and complex data sets collected from different sources. Big data sources include data collected through data mining techniques, artificial intelligence tools, learning systems, and social networking sites (Chen, 2016; Lu, 2015). Big data has been used as an effective means that organizations benefit from to understand consumer behavior, reduce operational costs, product costs, and operating fees (Toole, 2015).

The use of big data technologies in the field of social networking sites has been proven to understand consumer behavior by reducing messages and comments sent on sites such as Facebook which allows organizations to produce

and supply products to end customers based on their requests (Jiang, 2016).

Data intelligence and Big Data intelligence

Data intelligence is "the use of various tools and methods to analyze and transform data into information from which valuable insight can be drawn" (OmniSci, 2020). There are two questions in this definition. First is what is intelligence in data intelligence from the following?

1. Is it use of various tools and methods?

2. It is to analyze and transform data into information?

It can draw valuable insight. Item 1 has no relationship with intelligence. Item 2 has no relationship with intelligence either, because item 2 is an objective of any information systems (Laudon & Laudon, 2016). Item 3 is related to intelligence, because valuable insight is what customers and clients are expecting to make informed decisions.

The second is "if methods to analyze and transform data into information from which valuable insight can be drawn" then can we change it into "methods to analyze and transform data into either knowledge or intelligence (or both) from which valuable insight can be drawn"? If this is right, then this definition should be changed to Data intelligence is "the use of various intelligent tools and methods to analyze and transform data or information to knowledge andintelligence or intelligent artifacts from which valuable insight can be drawn for supporting decision making", where intelligent artifacts include intelligent data insights.

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learning tools to analyze and transform massive datasets into intelligent data insights, which can then be used to improve services and investments".

Data can be classified into five categories: descriptive data, prescriptive data, diagnostic data, decisive data, and predictive data in order to develop data intelligence (OmniSci, 2020). This basically confirms the four categories of data for data analytics: descriptive data, prescriptive data, diagnostic data, and predictive data which corresponding to descriptive data analytics, prescriptive data analytics, diagnostic data analytics, and predictive data analytics (Sun & Stranieri, 2020).

The input of data using intelligent data input technology can be called intelligent data, which is a core component of intelligent analytics (Sun & Stranieri, 2020). intelligent data input technology provides a strong data foundation, data cleanses, restructuring and enhancing big datasets.

Intelligent data processing is a core component of intelligent analytics as an intelligent system, it incorporates advanced analytics techniques to enhance descriptive analytics, diagnostic analytics, prescriptive and predictive analytics to transform big data into big information, big knowledge, big insight, and big intelligence that support informed decisions, (OmniSci, 2020) (Sun & Stranieri, 2020).

The intelligent outputs include intelligent visualized reports for supporting informed decision (Sun & Stranieri, 2020). Enterprise data intelligence is used in business intelligence operations, analyzing sales, evaluating inventories, and building customer data intelligence (OmniSci, 2020).

Data intelligence platforms and data intelligence solutions are available from data intelligence companies such as Data Visualization Intelligence, Strategic Data Intelligence, Global Data Intelligence (OmniSci, 2020).

For example, Google analytics is a data intelligence platform and data intelligence solution. Big data intelligence is data intelligence for big data.

Furthermore, big data intelligence consists of a set of intelligent techniques and tools that make big data analytics actionable and transform big data into big knowledge, big insights for supporting decision making, and provides engagement capabilities for customers (OmniSci,2020).

In other words, big data intelligence is a kind of intelligence driven from intelligent big data analytics (Sun & Huo, 2019).

5.Business Intelligence

In Business intelligence (BI), it is the analysis of the past data, which is backwards- looking.BI tools will generate a report, chart, summary, dashboard, graph, map etc by performing data analysis.

It helps in the identification of key performance indicator. With BI, entrepreneurs can know much details about the nature of business.

BI is done using data mining, process analysis, performance benchmarking anddescriptive analytics.Many software tools are available which are customized for end-users.Some of the notable BI tools are SAP business intelligence, Microstatregy, Sisense, SAS business intelligence, Yellowfin BI, Qliksense, Zoho Analytics,Systum, Microsoft Power BI, Looker, Clear analytics, Tableau, Oracle BI, Domo, IBM Cognos Analytics.

The process of organizations reaching digital transformation is a complex but necessaryprocess, due to the difficulty of working at the present time without the extensive use of technological systems, the ability of organizations to deal with and analyze big data and try to extract new values, a complex process that forced

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organizations to use analytical business intelligence tools (Bordeleau et al., 2018; Raffoni et al. 2018).

The process is summarized by storing data in data warehouses, then classifying and ensuring its accuracy, and then trying to find new relationships between data in order to build new knowledge that gives organizations the ability to extract new ideas, support the decision-making process, solve complex and intractable problems, and finally provide new services and products to customers (Lamba & Singh 2017).

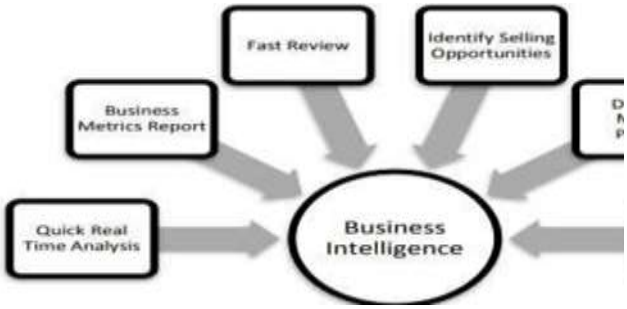

Figure 1 . *Business Intelligence - Offers Tools*

6.Data Analytics

Data analytics is done to provide a visual representation of the data. Firstly, data analyst will perform explanatory analysis thereafter they do experiment through data mining processes.

A data analyst will find patterns and correlation with the given data set and then they build the model and they will check how their data respond to the model. Data analytics playsa pivotal role in the utilization of big data for business intelligence purposes.

It involves the systematic exploration and interpretation of vast and complex datasets to extract meaningful insights and drive decision-making. In the context of big data analytics, various data analytics techniques and approaches are employed to transform raw data into actionable intelligence.

The following are key aspects of data analytics within the role of big data analytics in business intelligence.

7.Descriptive analytics:

Descriptive analytics focuses on understanding and summarizing historical data to gain insights into past events and trends. It involves the use of statistical techniques, data visualization, and exploratory data analysis to uncover patterns, correlations, and anomalies within the data.

Descriptive analytics provides a foundation for understanding the current state of the business and identifying areas for improvement.

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8.Predictive analytics:

Predictive analytics utilizes statistical modeling, machine learning algorithms, and datamining techniques to forecast future outcomes and trends based on historical data patterns.

It helps businesses make informed decisions by estimating probabilities, identifying potential risks, and predicting customer behavior. Predictive analytics empowers organizations to proactively respond to emerging trends and anticipate market shifts.

9.Prescriptive analytics:

Prescriptive analytics goes beyond descriptive and predictive analytics by providing recommendations and actionable insights.

It leverages advanced analytics techniques, optimization algorithms, and simulation models to determine the best course of action to achieve desired outcomes.

Prescriptive analytics assists businesses in optimizing processes, resource allocation, and strategic decision-making, ultimately driving operational efficiency and competitive advantage.

10.Real-time analytics:

Real-time analytics focuses on processing and analyzing data in near-real-time or real-time to enable immediate decision-making.

It involves the use of stream processing technologies, complex event processing, andreal-time data visualization tools.

Real-time analytics allows businesses to monitor key performance indicators (KPIs),detect anomalies, and respond rapidly to changing market conditions.

Figure 2*. importance of big data analytics*

11.Data Science

In business intelligence and business analytics, it can use only small size data or structured data.Data science can analyse even unstructured and semi-structured data. Semi- structured data will be in the form of CSV, XML and JSON documents, NoSQL database, HTML, EDI and RDF (Forsey).

These semistructured data are non-organised structured data (Forsey). Data without any pre-defined data model is said to be unstructured data. social media data, mobile data, website content, satellite images, audio files and video files are some examples for unstructured data.

Some of the prominent software used in data science are TensorFlow, RapidMiner, BigML, Weka and R. With advanced machine learning algorithms, predictions and pattern discovery are possible with huge volume and variety of data.

Data science involves the preparation of data to the cleaning of data and to data analysis. Here they use statistics knowledge along with mathematics, problem-solving and programming abilities.With advanced algorithm and machine learning principles, data science discovers a hidden pattern from raw data. In big data, firstly data is inspected, transformed, cleansed and

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modelling is done.The basic concept of big data is handling large data, In data science, it is analysing the data.Big data developer will give insights from the huge volume of data.

But data scientist is involved in decision making by understanding the pattern within data. Thus data science has a broader scope than big data. By using the NavieBayes technique a study was conducted to identify potential MSMEs, this was done to help the government of Indonesia.

Data was collected from Tangerang region.The attributes used in their study was (id, name of entrepreneur, business name, business address, telephone number, business form, and business fields) and found 9 data integrity (id, name of entrepreneur, business name, business address, telephone number, sub-seconds, business forms, business fields, and business classifications) policy and business assistance based on potential business fields in areas that have high business productivity was recommended (Amalya & Widyaningsih, 2018).

Data science is a multidisciplinary field that involves extracting insights and knowledge from structured and unstructured data using various scientific methods, algorithms, and tools. It combines elements of mathematics, statistics, computer science, and domain expertise to analyze and interpret complex data sets.

12.Data Collection and Integration:

The first step in big data analytics is the collection and integration of data from multiple sources, such as internal databases, external sources, social media, customer interactions, IoT devices, and more. This process involves identifying relevant data sources, ensuring data quality, and integrating data into a centralized repository.

13.Data Storage and Management:

Big data analytics requires scalable and efficient storage and management systems to handle large

volumes of data. Technologies like Hadoop, NoSQL databases, and data lakes are commonly used to store and organize data for further analysis.

14.Data Preprocessing and Cleaning:

Before analysis can take place, data needs to be cleaned and preprocessed. This involves handling missing data, dealing with outliers, normalizing data, and addressing inconsistenciesto ensure data quality and reliability.

15.Exploratory Data Analysis (EDA):

EDA involves examining and visualizing data to gain an initial understanding of its characteristics, patterns, and relationships. Techniques such as data visualization, summary statistics, and data profiling are used to explore and uncover insights from the data.

16.Statistical Analysis:

Statistical methods are applied to analyze data and derive meaningful insights. Techniques like hypothesis testing, regression analysis, time series analysis, and clustering are used to identify correlations, make predictions, detect anomalies, and uncover patterns within the data.

17.Machine Learning and Predictive Analytics:

Machine learning algorithms are employed to build predictive models that can forecast future trends and outcomes based on historical data. This enables organizations to make proactive decisions, optimize processes, and identify opportunities or risks.

18.Data Visualization and Reporting:

Communicating insights effectively is crucial in business intelligence. Data visualization techniques, such as charts, graphs, and dashboards, are utilized to present complex data in a visually appealing and understandable format. Reporting tools are also employed to generate informative reports that facilitate decision-making.

19.Text Mining and Natural Language Processing (NLP):

Text mining and NLP techniques are used to extract insights from unstructured textual data, such as customer reviews, social media comments, or survey responses. These methods help analyze sentiment, identify trends, and gain a deeper understanding of customer opinionsand preferences.

20.Data Security and Privacy:

Given the sensitivity of data, ensuring security and privacy is essential. Methods to protect data, comply with regulations, and implement ethical data practices are integral parts of big data analytics research.

Conclusion:

Despite the immense potential of big data analytics in driving business intelligence, organizations face several challenges in effectively harnessing its power. Addressing data quality and integration, data security and privacy, scalability and infrastructure, data analysis expertise, complexity, and ROI/business value are key challenges that organizations need to overcome. By investing in the right technologies, data governance practices, talent acquisition, and aligning analytics initiatives with business objectives, organizations can overcome these challenges and unlock the full potential of big data analytics for business intelligence.

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