



Applications of data analytics in business decision making

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Abstract

Data is everywhere. It has many faces like numbers, images, texts, videos, graphs, symbols popularly known as Big Data. The business organizations are rapidly moving towards data-driven decision making from that of assumption based. They constantly look for the professionals who can transform data into business insights. Right from gathering to wrangling, cleaning to transforming, modelling and predicting, data analytics work across different fields and industries. This has resulted in improved decision-making in various problem areas, not only in the field of management sciences including the allied areas be it commerce, economics, industry and business, innovation, operations, IT or human resources but also for individuals, businesses, industries and economies.

In today's digital age, the significance of data analytics cannot be overstated, as it has become the cornerstone of decision-making processes across various industries. The journey through the realms of descriptive, diagnostic, predictive, and prescriptive analytics has showcased how businesses can leverage data to enhance their operations, drive efficiency, and ultimately boost their bottom line. This transformative power of data analytics has not only revolutionized traditional business models but has also paved the way for innovative approaches and solutions to complex challenges.

As we look toward the future, it is evident that the continuous evolution of data analytics will play a pivotal role in shaping business strategies and fostering innovation across all sectors. The increasing reliance on sophisticated data-driven technologies such as machine learning and AI underscores the ever-growing potential of data analytics to unravel complex business challenges and unlock new opportunities. By embracing the transformative power of data analytics, businesses can position themselves at the forefront of innovation, making informed decisions that drive sustainable growth and success in the dynamic global landscape. With the right integration and implementation of data analytics, businesses can effectively steer their operations, adapt to changing market dynamics, and achieve their strategic objectives, ultimately redefining the boundaries of success in the digital era. Against this background, the present paper attempts to highlight aspects of data analytics especially in the context of business decision making.

Keywords: Artificial Intelligence, business decision making, data analytics, data storage, data visualization

Introduction

In today's fast-paced and increasingly complex business landscape, organizations are constantly seeking innovative ways to stay ahead of the competition and drive growth. One key strategy that has emerged as a game-changer in recent years is the use of data analytics in business decision making. The ability to collect, analyse, and interpret large amounts of data has revolutionized the way companies operate, enabling them to make informed, data-driven decisions that drive business success.

The importance of data analytics in business decision making cannot be overstated. With the exponential growth of data in recent years, organizations are now faced with an unprecedented amount of information that can be leveraged to inform business strategy. Data analytics provides a powerful tool for extracting insights from this data, enabling companies to identify trends, patterns, and correlations that may not be immediately apparent. By applying advanced statistical and computational techniques to large datasets, businesses can uncover hidden relationships and gain a deeper understanding of their customers, markets, and operations.

The role of data analytics in business decision making is multifaceted. On one hand, it enables companies to optimize their operations and improve efficiency. By analyzing data on supply chain logistics, inventory management, and production processes, businesses can identify areas of waste

and inefficiency, and implement data-driven solutions to streamline their operations. On the other hand, data analytics also plays a critical role in driving business growth and innovation. By analyzing customer data and market trends, companies can identify new business opportunities and develop targeted marketing campaigns to capitalize on them.

Moreover, data analytics has also transformed the way companies approach risk management and strategic planning. By analyzing data on market trends, customer behavior, and competitor activity, businesses can anticipate potential risks and opportunities, and develop proactive strategies to mitigate or capitalize on them.

Review of Literature

The role of data analysis in business decision-making has received considerable attention in recent years in academic and industrial circles. Numerous studies highlight its transformative potential in improving business processes and performance outcomes.

Historically, data analysis has evolved from basic descriptive statistics to advanced machine learning and artificial intelligence (AI) algorithms. Davenport and Harris (2007) highlighted the shift from traditional data management practices to more sophisticated analytics-based approaches that support real-time decision making in businesses. Early literature often focused on descriptive

analytics where businesses analyzed past performance data to identify trends and patterns (Provost and Fawcett, 2013). Over time, predictive analytics with the ability to predict future results and prescriptive analytics offering solutions to optimize decision-making came to the fore.

According to McAfee and Brynjolfsson (2012), companies that use data analytics are more likely to outperform their peers in key performance indicators. These businesses use data-driven insights to inform strategic decisions such as market positioning, product development and customer engagement. Sivarajah *et al.* (2017) further demonstrate that data analytics improves decision-making accuracy by removing bias and providing factual evidence to guide action.

Data analytics has been shown to improve operational efficiency by optimizing resource allocation and streamlining processes. Many studies, such as those by Chen, Chiang and Storey (2012), highlight those analytics can reveal inefficiencies within operations, allowing businesses to make timely adjustments.

A growing body of literature explores the impact of data analytics on customer behavior analysis. Chaffey and Ellis-Chadwick (2019) argue that businesses that adopt data analytics in customer relationship management (CRM) are better able to personalize their marketing strategies, enhance customer experiences, and boost customer retention rates.

Despite the numerous benefits, the literature also identifies challenges associated with the adoption of data analytics. Some researchers, such as Ransbotham, Kiron, and Prentice (2015), point to issues such as data quality, privacy concerns, and lack of qualified personnel as significant barriers.

Ayokanmbi, Fola *et al.* (2021) opine that in order to attain performance excellence, it is crucial to use the technologies of industry 4.0 and foster a culture that is fact-based and data-driven. Wearable technology, desktop and laptop computers, social media, and mobile phones all contribute to the deluge of data created by digital gadgets. To enhance performance, it is essential to manage, use, analyze, and enhance this data in order to support strategic activities. Raw facts are transformed into insights and knowledge by processing data. This information then helps in decision-making. In order to increase organizational performance, a data-driven decision-support system needs both a lot of data and a way to get knowledge out of it. In order to enhance operations and procedures and take use of data science's potential in organizational workflows, digital transformation is essential. The process for improving the quality of decision-making by extracting value from huge data is provided by huge Data Analytics (BDA).

Goar, Vishal *et al.* (2022) observed that to regulate the performance of decision-makers with the quality of a choice, information is the crucial component towards success. Nowadays, businesses have access to a deluge of data for analytical purposes. With the proliferation of internet-connected gadgets, data has emerged as the 21st century's most crucial asset for companies. In light of this, research into potential solutions is necessary to manage and extract the knowledge-value combination from the datasets. Afterwards, decision-makers should be able to obtain useful and insightful insights derived from the high-velocity, dynamic data utilizing big data analytics. Our studies center on finding ways to incorporate analytics from big data into the decision-making process.

Emma (2024) observed that using big data analytics, companies may get insights in real-time and plan strategically. Organizations may now get real-time insights that drive strategic decision-making and better company planning thanks to big data analytics, which has completely transformed the way firms' function. Businesses in the modern digital environment have both possibilities and problems as they try to use the ever-increasing amount, diversity, and velocity of data to their advantage. This study delves into the ways big data analytics is changing strategic company planning in different sectors and how it's influencing real-time insights. With the help of real-time big data analytics, companies can keep tabs on and make sense of a deluge of data coming in from all directions: social media, financial transactions, supply chain operations, and consumer interactions. Advanced analytical approaches like data mining, machine learning, and artificial intelligence allow firms to spot trends, abnormalities, and patterns in real time.

Tiwari (2024) ^[10] pinpointed that by helping companies transform raw data into useful insights, data analytics is playing an increasingly important role in contemporary company decision-making. Machine learning, data mining, and predictive analytics allow companies to see trends, anticipate problems, and base choices on solid evidence. Improvements in operational efficiency, consumer engagement, and competitive advantages may be achieved via data analytics, according to this study. Additionally, the research stresses the significance of data-driven solutions for risk mitigation and resource optimization. At the end of the day, it shows how data analytics helps companies make smart choices in a world where data is king.

Tsaniyah, Faizah *et al.* (2024) opine that the data processing and analysis industries have been rocked by the IT revolution. Businesses rely on Big Data Analytics (BDA) to help them make better, more timely choices based on data. Big Data Analytics (BDA) and decision-making theory are explored in this study using a qualitative research technique. Since qualitative research allows for in-depth examination of complicated phenomena and a one's own context, it is well-suited to us. Dengan menggunakan wawasan yang akurat, tepat waktu, dan didukung oleh bukti, Big Data Analytics (BDA) secara signifikan berkontribusi pada pengambilan keputusan yang lebih baik. Menggunakan BDA untuk pemeliharaan prediktif dan pemantauan kualitas real-time adalah umum di industri industri.

The literature consistently confirms the key role of data analytics in improving business decision-making. By enabling efficient, customer-centric and evidence-based decisions, analytics has changed the way businesses operate. However, issues such as privacy, ethical issues, and the need for qualified professionals remain critical areas for future research and development.

Emerging Field of Data Analytics

"Data analytics" is the new buzzword these days. Every company and individual is turning towards analytics for one or the other reason. Almost all companies today are using data analytics for taking informed business decisions which in turn helps them towards business expansion, problem solving, and marketing and better customer retention. Data analytics has now become an indispensable part of the businesses and their decision-making process. Organisations across all the fields are acknowledging the immense value of utilising data analytics for gaining deeper

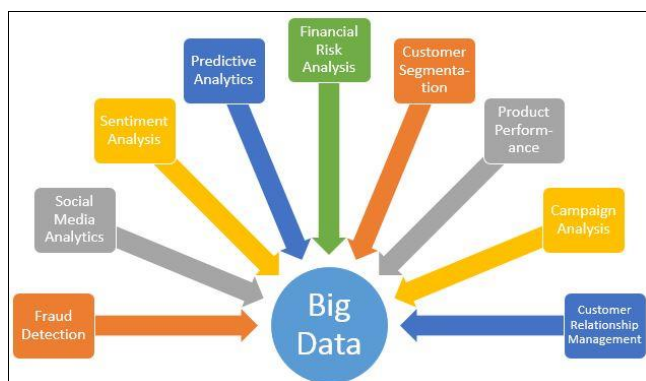
insights like never before. This also helps the industries to understand their customers better and closer. For example, E-commerce companies are using data analysis results to develop more personalised products and buying experiences for their customers. As the data continues to grow exponentially in volume, it has become increasingly important to leverage emerging technologies for effectively analysing and interpreting this abundant information. Another popular example for the use of big data are the online viewing platforms like Netflix, Youtube etc. These platforms implement the data mining techniques to understand user preferences and then recommend content to users (Goyal *et al.*, 2020).

The field of data analytics is experiencing growth at an unimaginable rate, which is leading to a strong demand for skilled professionals. These professionals are the ones who will derive meaningful insights from the vast amounts of data getting generated on a daily basis. As we progress into 2023, a number of emerging trends are reshaping the careers in data analytics.

Data analytics process comprises of the methods, algorithms and tools which help you to transform raw data into meaningful and organised insights and actionable recommendations. The major steps of the data analysis process involve collecting data, cleaning the data to make it more usable and then finally organizing and analysing this data to extract patterns, trends, and correlations that can guide decision making. This powerful tool has revolutionized the way businesses operate, helping them to make strategic decisions that are based on evidence and data-driven insights.

Increase in the use of internet has created a huge spike in the data volume all over the world. With this growing amount of data and its complexities in every field the traditional approaches used for data analytics are facing significant challenges. This is where emerging technologies come into play thus creating a need for continuous advances in technology. Emerging technologies like artificial intelligence (AI), machine learning (ML), augmented reality (AR), virtual Reality (VR), big data analytics, web and social media analytics, Internet of Things and natural language processing are completely changing the scenario of data analytics and driving its evolution for better.

Data analytics initiatives can help businesses increase revenues, improve operational efficiency, optimize marketing campaigns and customer service efforts, respond faster to emerging market trends and gain a competitive edge over rivals all with the goal of making businesses smarter. With nearly two out of three companies now adopting data analytics, the process is strongly shaping the modern business world and is something most brands want to utilize.



Data that is analysed can consist of either historical records or new information that is getting generated continually or continuously. It could come from within the organizations or from external sources. It could be structured or unstructured.

Being proactive, however, is key. Traditional reporting and BI is gradually maturing into advanced analytics. It's no longer enough to retro-actively analyse what happened and why. Instead, systems and partnerships need to be put in place which leverage high quality data and interpret the data to make predictions around what is likely to happen next, with concrete evidence to back up the claims.

The rapid growth in the use of big data and analytics since 2010 has driven the intense need for different emerging technologies in data analytics field. A large number of fields and subjects, ranging from everyday life to traditional research fields (i.e., geography and transportation, biology and chemistry, medicine and rehabilitation), involve big data problems (Lv *et al.*, 2017). "Big Data" is defined as the huge volumes of structured and unstructured data. These data are generated by multiple organisations and individuals on a daily basis. Big data analytics helps to achieve patterns, trends and correlations in the data which in turn helps businesses and organisations to take well informed decisions. These emerging technologies offer scalable solutions, unlocking valuable insights that were previously untapped. With the ability to quickly process and analyse large datasets, organizations can acquire a deeper understanding of customer behaviour patterns, improve their operational efficiency, and make data-driven decisions in real-time. Use of big data tools and methodologies is seen in almost every field now. For example, Big data plays a pivotal role in the field of Supply chain management, logistics management and inventory management (Maheshwari *et al.*, 2021). Big data analytics helps to optimize these business processes by helping to analyse customer behaviour. Big data also plays an important role in the field of knowledge management market. The increasing need for big data professionals puts forward the requirement for training a new generation of KM professionals who are capable of understanding and implementing big data tools and technologies (Chang *et al.*, 2019).

Key Components of Big Data Analytics

Big data analytics is the linchpin that bridges the gap between the immense volume, variety, and velocity of big data and its application in decision-making. It represents a transformative discipline that encompasses a range of methodologies and tools designed to extract valuable insights from large and complex datasets. In this section, we will explore the fundamental concepts and principles of big data analytics and its pivotal role in the decision-making process.

At the core of big data analytics are several key components viz.

- **Data Collection:** Big data analytics begins with the collection of data from a variety of sources. This may include structured data from databases, unstructured text, images, videos, and real-time data streams. The process of data collection must be systematic and comprehensive to ensure that no valuable information is overlooked.

- **Data Pre-processing:** Once data is collected, it often requires pre-processing. This includes cleaning, organizing, and transforming the data to make it suitable for analysis. Data pre-processing helps address issues related to data quality and consistency.
- **Data Storage:** Managing the vast amounts of data is a crucial aspect of big data analytics. Specialized storage solutions, such as distributed file systems and NoSQL databases, are often employed to accommodate the size and complexity of big data.
- **Data Analysis:** The heart of big data analytics is the process of data analysis, which involves applying various techniques to uncover patterns, trends, and insights within the data. This can range from basic statistical analysis to advanced machine learning and data mining algorithms.
- **Data Visualization:** Effective data visualization is essential for conveying the results of data analysis to decision-makers. Visualizations, such as charts, graphs, and dashboards, provide an intuitive way to communicate complex findings.

The role of big data analytics in decision-making is pivotal. By processing and analyzing vast datasets, it empowers organizations and individuals to make informed choices, optimize processes, and gain a competitive edge. The insights derived from big data analytics offer a deeper understanding of markets, customer behaviour, operational efficiency, and more.

Types of Data Analytics

Data has always been an enabler of the decision-making process. However, with the advent of big data, data analytics has taken accelerated growth for business decision-making. It is important to understand the type of analytics to find a suitable fit for the data generated and the required objective. There are four main types of data analytics employed by businesses which can be understood better with an example of a toy store:

1. **Descriptive Analytics:** In the beginning, businesses used descriptive analytics to understand what happened in the past. They had limited data and tools. For example, toy stores use descriptive analytics to see which toys sold well last year and they investigate data like sales and customer reviews to understand what happened in the past.
2. **Diagnostic Analytics:** As technology improved and more data became available, businesses started using diagnostic analytics to figure out why things happened. They dug deeper into data and used techniques like data exploration and data mining. For example, as the business grows, toy stores may want to know why some toys were sold better than others. It will perform diagnostic analytics to discover the latest trends for children's toys or identify toys' preferences age-wise.
3. **Predictive Analytics:** With big data and better statistical models, predictive analytics started predicting future outcomes based on past data. Businesses found it valuable for forecasting trends. For example, if the toy

store has collected more data over time, so it may use predictive analytics. It would analyse past sales and customer behavior to predict which toy might do well next year and plan the inventory accordingly.

4. **Prescriptive Analytics:** The most advanced analytics, prescriptive analytics, not only predicts what will happen but also suggests actions for the best results. This is possible due to technological advancements like machine learning and AI. For example, the toy store may implement prescriptive analytics based on predictive data and suggest the best time to roll out discounts or limited-time offers to maximize profits.

Applications of Data Analytics in Organizations

Data analytics has become a critical tool for organizations across industries, helping them optimize operations, improve decision-making, and enhance the customer experience. By analyzing large volumes of data, businesses can gain insights that drive innovation, increase efficiency and increase profitability. Below are some key applications of data analytics in organizations along with examples:

Customer Statistics and Customization

Organizations use data analytics to better understand their customers' preferences, behaviours and needs. By analyzing purchase history, browsing patterns and social media interactions, companies can segment customers and offer personalized products or services.

Example: Netflix uses data analytics to recommend shows and movies to users based on their viewing history and preferences, increasing customer satisfaction and retention.

Operational Efficiency

Data analysis helps businesses streamline their operations by identifying bottlenecks, inefficiencies and areas for cost reduction. By analyzing supply chain data, production processes or employee performance, organizations can optimize their workflows and resource allocation.

Example: UPS uses data analytics to optimize delivery routes, saving millions of miles and reducing fuel consumption, increasing efficiency and reducing costs.

Predictive Maintenance

In industries such as manufacturing, data analytics can be used to predict when machines or equipment are likely to fail, enabling preventative maintenance. This reduces downtime, increases productivity and saves on repair costs.

Example: GE uses data analytics in its industrial IoT platforms to monitor machines and predict potential failures, minimizing costly downtime.

Risk Management

Financial institutions use data analytics to assess and manage risk. By analyzing credit scores, transaction history and market data, they can make more informed lending decisions and detect fraudulent activity.

Example: Banks use analytical models to detect unusual transactions that may indicate fraudulent activity, increase security and protect customer assets.

Marketing Optimization

Data analysis enables organizations to optimize marketing campaigns by identifying the most effective channels, messages and strategies.

Example: Coca-Cola uses data analytics to tailor marketing campaigns to specific audiences based on their behavior, resulting in more targeted and effective advertising.

These applications demonstrate the transformative power of data analytics in modern organizations, helping them become more competitive and efficient.

All enterprises are

- **Collecting data** in marketing, finance, sales, entertainment, human resources, payroll, risk, operations etc. Some of this even happens automatically e.g. Google Analytics on a company's web site, items in your Inbox, or click-throughs on a newsletter.
- **Storing data.** Much of a company's data is held in database systems, ERP systems, spreadsheets, disparate cloud systems, text files etc.

Every enterprise collects and stores data.

Opportunities and Challenges

The integration of emerging technologies in data analytics brings along numerous opportunities for companies as well as individuals. However, it also poses certain challenges that need to be addressed. Let's explore both aspects:

Opportunities

Enhanced decision-making: Emerging technologies enable organizations to make data-driven decisions, leading to improved outcome predictions, increased efficiency, and improved competitiveness.

Personalization: By leveraging AI, machine learning, and big data analytics, organizations can provide personalized experiences and offerings to customers, leading to increased customer satisfaction and loyalty.

Operational optimization: Advanced analytics techniques allow organizations to optimize various business processes, such as supply chain management, resource allocation, and production planning, resulting in cost savings and improved efficiency.

Innovation and product development: Emerging technologies can provide organizations with insights into customer preferences, market trends, and emerging technologies, driving innovation and enabling the development of new products and services.

Challenges

Emerging technologies in the field of data analytics offer humungous opportunities for businesses and organisations to gain meaningful and impactful insights from data. This in turn helps to make well informed decisions and stay ahead in this competitive world. However, all this is not a piece of cake. It comes with several challenges that are crucial to be addressed. Some of the key challenges in emerging technologies of data analytics are:

- **Data Privacy and Security:** With the increasing volume of data being collected and analysed, the risk of

data breaches and privacy violations has grown significantly (AbdulRaheem *et al.*, 2023). It is very important to ensure the security of sensitive data and comply with regulations like GDPR and HIPAA.

- **Data Quality:** Low data quality can lead to inaccurate insights and decisions. Ensuring data accuracy, completeness, and consistency is a significant challenge, especially when dealing with diverse and large datasets.
- **Scalability of data:** Many emerging technologies, such as big data platforms and cloud-based analytics, require scalability to handle vast amounts of data. Ensuring systems can scale effectively while maintaining performance is a challenge.
- **Skill Gap:** There's a shortage of skilled professionals who can work with emerging technologies like machine learning, AI, and advanced analytics. Bridging this skill gap is essential for leveraging these technologies effectively.
- **Integration:** Implementing emerging technologies often involves integrating them into existing systems and workflows. Ensuring seamless integration without disrupting day-to-day operations can be challenging.
- **Interpretability and Explainability:** Complex machine learning and AI models can be challenging to interpret, making it difficult to explain the rationale behind decisions. This is particularly important in regulated industries and applications.
- **Ethical Concerns:** Using data analytics and emerging technologies raises ethical issues, such as algorithmic bias and discrimination. Addressing these concerns and ensuring fairness in decision-making is a challenge.
- **Data Governance:** Developing effective data governance policies and practices to manage data throughout its lifecycle, including data retention, archiving, and deletion, is essential but challenging.
- **Regulatory Compliance:** Adhering to ever-evolving data privacy and compliance regulations is a significant challenge. Non-compliance can result in legal consequences and reputational damage.
- **Cost and Return on Investment (ROI):** Implementing emerging technologies can be costly, and organizations need to justify these investments with measurable returns on analytics initiatives.
- **Rapid Technological Changes:** The pace of change in emerging technologies is fast. Staying current with the latest tools and methodologies can be challenging for organizations.

To address these challenges, organizations must develop comprehensive data governance strategies, invest in staff training, prioritize data security and privacy, and continually adapt to the evolving landscape of emerging technologies in data analytics.

The field of data analytics and data science is driven by all the upcoming and emerging technologies and trends. New tools are emerging every day leading to enhanced ways of data processing. To utilise all this information effectively requires us to understand future trends and technologies to stay ahead of the curve and utilise full potential of these tools and technologies.

Conclusion

We live in a data driven world where organizations, irrespective of their size or area of operations, cannot ignore the impact of data analytics in the way they run their businesses. Whether it is to improve customer experience or managing resources better, data analytics is being used at every level of the organization to make informed decisions. This is true, of course, only for organizations that have already started on their digital transformation journey. Others who have not adapted will soon realize that they have missed the bus to the next era of decision-making. When organizations invest in formal training, communities to foster continued learning, and certifications to measure data literacy, people can thrive with data and make a greater impact on the business better prepared to be agile as digital transformation demands data literacy at all levels.

Data Analytics aids an organization to tackle the data and utilize it to find new opportunities. This leads to more smart business moves, higher profits, efficient operations, and happy customers. The idea is to share the business prospects in a better way in the future and to use it with analytics concept. Data is increasing at a rapid speed and the rate of growth of information is very high. Data generation occurs through many users, industries, and businesses. It is crucial to amalgamate this data that have been generated through the business. If it gets wasted, lots of valuable information will be lost.

Previously, skilled analysts were required for processing the data but these days there are tools used for high-speed data and this helps in incorporating the data analytics at the time of making decisions. As far as the audience is concerned you can make different decisions. Social media has enhanced data growth in the organization and thus changes can be made based on that.

Hence, we may conclude that Companies can secure a more robust and prosperous future by gathering and evaluating data in order to make well-informed decisions, lower their environmental effect, save expenses, and satisfy the increasing demand for sustainable practices.

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