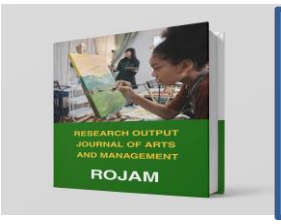

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The Role of Big Data Analytics in Decision Making and Strategy Formulation

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ABSTRACT

In an era marked by rapid societal and business changes, leveraging big data analytics has become crucial for effective decision-making and strategy formulation. This essay explores the multifaceted aspects of big data, including its definition, origins, potential beneficiaries, and the ways it aids decision-makers. It also examines the challenges and threats associated with big data analytics and anticipates future trends in this field. Through detailed discussions on applications in marketing, operations, supply chain management, finance, and risk management, the essay highlights how big data analytics enhances awareness, problem understanding, and strategic adjustments.

Keywords: Big data analytics, decision-making, strategy formulation, marketing insights, supply chain management.

INTRODUCTION

The society and the business are continuously changing, and the only way to keep up with this dynamic environment is by leveraging the wealth of data that is made available to decision makers when it is properly collected, prepared, processed, and presented. This essay discusses the role of big data analytics within this decision and strategy formulation lifecycle. The main aim of this essay is to discuss different important aspects of big data: what it is, where it is coming from, who could benefit from big data analytics, how big data analytics can help decision makers, what challenges and threats are associated with the use of big data analytics, and what the possible future trends are [1]. This essay is a broad and comprehensive introduction to big data analytics, and it is structured into five main sections focusing on multiple aspects of big data analytics. The first section provides an introduction to big data analytics and discusses the importance of data in today's digital society. The second section describes what big data is and highlights the major areas that big data is coming from. The third section delves into who can potentially benefit from big data analytics and what the potential applications and uses of big data analytics could be. The fourth section discusses the impacts of big data analytics in terms of how it might help decision makers increase their awareness, help them understand the problem, and how this will allow them to make changes. Finally, it considers some of the possible future trends of big data, including the standardization of big data and analytics, the automation of data collection, and the provision of data as a service [2].

UNDERSTANDING BIG DATA ANALYTICS

Big data analytics, or more commonly referred to as big data, is the common terminology used for data that is extremely large, diverse, and fast-growing. People working with big data have to capture, store, transform, analyze, and visualize large amounts of data that are structured, semi-structured, and unstructured. There are numerous state-of-the-art tools, frameworks, and platforms for the processing, analysis, and storage of big data. Hadoop, Hive, Pig, HBase, Cassandra, Cloudera, Hortonworks, and others are popular software technologies used to process big data. The most basic tools for the storage of big data include HDFS, S3, and GlusterFS as strong quantitative data. The R language is the most popular language for analyzing and designing large volumes of data [3, 4].

The concept of big data was introduced as a 3V model (volume, velocity, and variety) by Doug Laney in 2001. A fourth V, that is, Veracity, was added to its characteristics later to represent the mystery of the data and its uncertainty. Below are the descriptions of the capabilities of big data to handle data at multiple velocities, varieties, and volume levels. 'Volume' refers to the amount of data produced, saved, and processed. The volume can be determined by the amount stored or generated. 'Variety' refers to the various types of data that differ from enormous types of sources. 'Velocity' is the pace at which data flows in real-time, requiring timely processing. 'Veracity' addresses the nature of the data, including accuracy, precision, completeness, and consistency [5].

APPLICATIONS OF BIG DATA ANALYTICS IN DECISION MAKING

1. Marketing and customer insights: Marketers and researchers are using big data analysis to develop differentiated marketing and gather information for predicting market trends, personalizing online targeting using big data analytical technologies to enhance their understanding of the customer. Big data analytics is being used in customer behavior analysis, sentiment analysis, and online recommendation engines among others. Big data analytical tools are used to identify behavioral parameters from large databases to formulate strategies with respect to customer segmentation and targeting [6].
2. Operations including supply chain management: Big data is increasingly being used in managing supply chains, creating efficiencies, lowering costs, and making use of existing information within the supply chain. It provides an automated capability for monitoring the quality and suitability of raw materials before production and moving them through the preprocessed supply chain. Big data is used to optimize processes ranging from demand forecasting to managing materials, capacity planning, scheduling, and producing supply chains. By utilizing big data analysis techniques, companies can reduce management time, enhance analytical capabilities, optimize operational ability, increase scientific research output, and strengthen innovation capabilities [7].
3. Finance and financial management: Financial analysts are utilizing big data key performance indicators such as fraud rate, profitability rate, assets utilization rate, and collection rate, among others, to help in decision making. Financial analysts use operational data and combine it with high-speed real-time big data analytics information to expedite the traditional credit process. It can also be used for predicting performance and customer risk behavior, as well as several other applications in the realm of finance and accounting for making operational decisions, cash forecasting, analytics to support banks' day-to-day interaction with corporates, risk analytics/scoring, tools and models, and real-time monitoring of disbursement and installments, as well as defaults/overdues [8, 9].

MARKETING AND CUSTOMER INSIGHTS

Organizations with the ability to harness and leverage the power of big data and predictive analytics to understand customer behavior, preferences, among others, have an edge over their rivals. To this end, a growing number of commercial organizations are utilizing big data analytics to understand consumer behavior and market trends, including those related to specific products and services. For instance, organizations are using it to create specific consumer cohorts or profiles for customized product and service marketing [10]. In this case, big data analysis is employed to determine the most populous times of the day for people working in different areas (e.g. Nairobi CBD or its outskirts) to use taxis. These statistical guidelines were then used to segment different times of the day into three categories, which were used to develop and tailor marketing strategies for different customer needs [11]. Big data analytics is used to identify trends based on user preferences on the OLX page. For instance, the average amount of time that users with smartphones spend on the site - being an e-commerce site. Furthermore, big data analytics enables an organization to learn the behavior difference between app and desktop users. Which browser do they use? Which of these people place ads and which are just browsers? With that information, one can then optimize the marketing campaign, target larger ad volumes towards app or desktop users, and allocate resources to target types of phones and OSs - based on the likelihood to submit a successful ad (through the use of predictive modeling) [12]. In addition, big data analytics has also been used to serve ads to people based on likely items they are interested in, considering what items are currently trending up, time of day, and type of app now served. Finally, the big data and analytics team also looked at what times of day user traffic peaks and slows down in order to get an understanding of when people are active and browsing the OLX site. This information has been used to optimize the timing of the ad served [13].

OPERATIONS AND SUPPLY CHAIN MANAGEMENT

The next domain where big data analytics has a huge impact on firms' actions is operations and supply chain management. Due to the data explosion and ease of creating and collecting more and more data, this data is now being used to optimize and improve different activities of the company's functioning. On

one hand, these data are used to improve the company's operations, while on the other hand, they are the final output of the company's operations. Nowadays, as data has become so prevalent, the use of advanced analytics is very feasible. Firms not only gain insights about their operations but also leverage these insights to improve future outcomes at the operating level. At the operational level, data can be used for various purposes, but the common usages are: (1) providing a positive customer experience, (2) providing the highest possible quality, and (3) fighting against price competition by delivering goods or services at the lowest cost possible to remain competitive [14]. A number of researchers have used data to gain insights about their daily activities in operations or supply chain. Among these activities, data has been used to streamline logistics, where operational patterns causing inefficiencies, such as long delays during port unloading or empty trucks on the road, have been identified. In addition to these activities, spare parts forecasting is also a major activity in operations where advanced analytics are being used. Such works in supply chain and operations are implemented to optimize inventory costs and create demand forecasts in order to serve and take necessary actions before events occur. Furthermore, big data can support operations beyond the firm's boundaries. This can be done by starting big data projects in supply chain management, for instance, focusing on designing an appropriate transport network, enhancing and incorporating big data analytics in production planning and scheduling to source rare earths according to their availability, or improving demand planning models for supply chain operations [15].

FINANCIAL ANALYSIS AND RISK MANAGEMENT

In financial analysis, assistant managers can use big data analytics tools to extract valuable information from the financial data database in order to investigate the company's performance and make investment decisions. There are some important aspects, such as detecting fraudulent activities or the individuals, businesses, banks, or organizations involved in crimes. Evaluating the liquidity, profitability, growth, solvency, and future development of a business is also crucial for making financially informed decisions and creating scorecards. Additionally, big data analytics can be used, especially in the area of financial investments, to mitigate and/or dismiss potential risks that can increase the chances of potential loss. This helps decision-makers in making informed investment decisions. There are no general rules on the activities that can be addressed using big data, with recent applications being specific to certain activities or sectors. These include exploring companies or financial markets, merging the use of big data analytics with the application of AI algorithms, deep learning, and machine learning. Integrating big data analytics in the processes for estimating financial variables and for risk management is also important [16]. Another application area within the activities with financial impact in companies is risk management. Risk management is now an integral part of the management process for any business. In simple words, risk management is a major business concern because a firm generally faces risks when making decisions related to the steps the business should take to maximize the wealth of suppliers and clients without compromising the firm's productivity, performance, and goodwill. Many firms find the use of financial derivatives to hedge their exposure to various market risks, and big data analytics can be manipulated to identify the risks associated with financial investments that can lead to losses. Consequently, risk managers may use big data to make more accurate forecasts of future financial asset prices and market risk more generally. Also, by using big data analytics in combination with machine learning or AI algorithms, risk managers can detect financial and market risks or enhance financial forecasting, creating a process that is kept under control. The entire process could be further improved by developing mechanisms for identifying and preventing potential threats or errors [17].

CHALLENGES AND LIMITATIONS OF BIG DATA ANALYTICS

Data is not always readily available, and the cost of extracting the data may outweigh the realistic use of data analytics. The quality of data may also be difficult to verify, as data may not be initially collected with the use of analytics in pursuing the objective in which analytics are proposed to assist. Finally, the advanced tools and systems to effectively and efficiently collect, extract, compile, and process such large samples of data can be cost-prohibitive and technologically out of the reach of many organizations [18].

Apart from these challenges of capturing and processing large samples of data, ethical and privacy limitations further restrict the use of big data analytics. Ethics in the research process include respecting the privacy and dignity of individuals and animals, as well as having intellectual honesty, transparency of thought, and adherence to the law. With the increasing use of big data, there is increased potential that competitors may access confidential and proprietary business data [19]. The possible misuse of such data, for example, leaking data into the market, may provide competitors with secret information as to the state of a firm's condition ahead of, for example, a takeover approach. Consequently, there are potential legal and regulatory issues which are discussed in 201A.1 Connect stakeholders ensure compliance with a series of data protection and privacy laws when seeking to undertake analytics projects. It is often

considered as the biggest challenge in capturing, using, and archiving large samples of data. Data protection laws present the opportunity for violators to file lawsuits or formally object to further action. These laws, therefore, rise to potentially severe consequences for non-compliance. This could lead to penalties relating to financial, intellectual, and reputational capital and potentially the right to engage in ongoing and future business [20]. Common issues often found PA.API.1.0 Clearly and accurately define the challenge and related current complex issue in the initial information provisions offered by big data is to possibly infer that databases include concise and timely information or facts while, in many cases, they do not provide the temporal references necessary to understand a sequence of processes. Further, relying on data analytics insight may lead to cognitive biases. For example, social prejudices and social system biases may reflect "digital discrimination" and present serious conceptual limitations [21].

FUTURE TRENDS AND IMPLICATIONS

Naturally, big data analytics has and will continue to develop in a fast-paced change environment. In this section, we discuss new developments that have and will impact big data analytics. Furthermore, the practical implications are discussed. In the current data environment, big data techniques can help organizations search for meaning, propose theories, and find subgroups that are not known in literature. New big data technologies and methodologies have emerged since the beginning of our review in 2012, such as data stream mining, deep learning, in-memory analytics, and in-database analytics. However, all these new developments need to be critically reviewed before they can be used in the decision-making process of managers, as those new techniques are still under development [22]. However, it is not only important to discuss the adoption process; it is also valuable to look at practical implications for organizations and the business environment. As big data analytics takes a more dominant role in gaining strategic insights from the analysis of multiple data sources, the role of traditional data delivery activities will change. Organizations will increasingly ask for integrated data warehouses, but also for self-service analytics capabilities. The role of IT departments changes from delivering data to also deliver self-service tools and data experience consultants. Furthermore, big data analytics has the potential to increase the growth of "do-it-yourself" analytics to make use of the insights drawn from multiple data sources, as executional tools with business user interfaces increasingly use big data analytics algorithms. Tools will become more and more user-friendly. Where companies are mostly only using big data analytics for operational purposes, our study applies big data analytics for the first time to gain strategic insights. As the insights of big data do not need to follow a linear process, the adoption stages are moving fast. The insights phase explicitly combines literature and data engineering. Additionally, big data strategy will become increasingly important. Although not regarded in our study, we do see an increased number of scientific studies on this topic [23].

CONCLUSION

Big data analytics plays a pivotal role in transforming decision-making and strategy formulation across various sectors. By enabling detailed insights into customer behavior, optimizing supply chain operations, and enhancing financial and risk management, big data analytics provides a competitive edge. Despite challenges such as data quality, cost, ethical concerns, and privacy issues, the continuous evolution of big data technologies promises to address these limitations. The future of big data analytics lies in its ability to integrate seamlessly into strategic processes, offering more user-friendly and sophisticated tools that empower organizations to make informed and agile decisions.

REFERENCES

1. Zhang H, Zang Z, Zhu H, Uddin MI, Amin MA. Big data-assisted social media analytics for business model for business decision making system competitive analysis. Information Processing & Management. 2022 Jan 1;59(1):102762. [HTML]
2. Bag S, Gupta S, Kumar A, Sivarajah U. An integrated artificial intelligence framework for knowledge creation and B2B marketing rational decision making for improving firm performance. Industrial marketing management. 2021. sciencedirect.com
3. Misra NN, Dixit Y, Al-Mallahi A, Bhullar MS, Upadhyay R, Martynenko A. IoT, big data, and artificial intelligence in agriculture and food industry. IEEE Internet of things Journal. 2020 May 29;9(9):6305-24. figshare.com
4. Sestino A, Prete MI, Piper L, Guido G. Internet of Things and Big Data as enablers for business digitalization strategies. Technovation. 2020. nih.gov
5. Naqvi R, Soomro TR, Alzoubi HM, Ghazal TM, Alshurideh MT. The nexus between big data and decision-making: A study of big data techniques and technologies. InThe international conference on artificial intelligence and computer vision 2021 May 29 (pp. 838-853). Cham: Springer International Publishing. [HTML]

6. Kaur R, Gabrijelčič D. Behavior segmentation of electricity consumption patterns: A cluster analytical approach. Knowledge-Based Systems. 2022. sciencedirect.com
7. Seyedan M, Mafakheri F. Predictive big data analytics for supply chain demand forecasting: methods, applications, and research opportunities. Journal of Big Data. 2020. springer.com
8. Yasmin M, Tatoglu E, Kilic HS, Zaim S, Delen D. Big data analytics capabilities and firm performance: An integrated MCDM approach. Journal of Business Research. 2020 Jun 1;114:1-5. academia.edu
9. Gupta S, Drave VA, Dwivedi YK, Baabdullah AM, Ismagilova E. Achieving superior organizational performance via big data predictive analytics: A dynamic capability view. Industrial Marketing Management. 2020 Oct 1;90:581-92. brad.ac.uk
10. Bharadiya JP. A comparative study of business intelligence and artificial intelligence with big data analytics. American Journal of Artificial Intelligence. 2023. researchgate.net
11. Bauer GS, Zheng C, Shaheen S, Kammen DM. Leveraging big data and coordinated charging for effective taxi fleet electrification: The 100% EV conversion of shenzhen, China. IEEE Transactions on Intelligent Transportation Systems. 2021 Aug 10;23(8):10343-53. escholarship.org
12. Taneja B. The digital edge for M-commerce to replace E-commerce. InEmerging challenges, solutions, and best practices for digital enterprise transformation 2021 (pp. 299-318). IGI Global. [HTML]
13. Mariani MM, Wamba SF. Exploring how consumer goods companies innovate in the digital age: The role of big data analytics companies. Journal of Business Research. 2020. reading.ac.uk
14. Ghasemaghaei M. Improving organizational performance through the use of big data. Journal of Computer Information Systems. 2020. academia.edu
15. Odimarha AC, Ayodeji SA, Abaku EA. Machine learning's influence on supply chain and logistics optimization in the oil and gas sector: a comprehensive analysis. Computer Science & IT Research Journal. 2024 Mar 28;5(3):725-40. fepbl.com
16. Ciampi F, Demi S, Magrini A, Marzi G, Papa A. Exploring the impact of big data analytics capabilities on business model innovation: The mediating role of entrepreneurial orientation. Journal of Business Research. 2021 Feb 1;123:1-3. units.it
17. Kumar S, Sharma D, Rao S, Lim WM, Mangla SK. Past, present, and future of sustainable finance: insights from big data analytics through machine learning of scholarly research. Annals of Operations Research. 2022 Jan 4:1-44. springer.com
18. Berisha B, Mëziu E, Shabani I. Big data analytics in Cloud computing: an overview. Journal of Cloud Computing. 2022. springer.com
19. Cappa F, Oriani R, Peruffo E, McCarthy I. Big data for creating and capturing value in the digitalized environment: unpacking the effects of volume, variety, and veracity on firm performance. Journal of Product Innovation Management. 2021 Jan;38(1):49-67. [HTML]
20. Breyer SG, Stewart RB, Sunstein CR, Vermeule A, Herz M. Administrative Law and Regulatory Policy: Problems, Text, and Cases [Connected eBook with Study Center]. Aspen Publishing; 2022 Feb 25. [HTML]
21. Favaretto M, De Clercq E, Schneble CO, Elger BS. What is your definition of Big Data? Researchers' understanding of the phenomenon of the decade. PloS one. 2020. plos.org
22. Kushwaha AK, Kar AK, Dwivedi YK. Applications of big data in emerging management disciplines: A literature review using text mining. International Journal of Information Management Data Insights. 2021 Nov 1;1(2):100017. sciencedirect.com
23. Mohammadpoor M, Torabi F. Big Data analytics in oil and gas industry: An emerging trend. Petroleum. 2020. sciencedirect.com

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