

Organizational business intelligence and decision making using big data analytics

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ABSTRACT

Business intelligence helps gather essential information from a wide variety of unstructured data and convert them into actionable information that allows firms to make informed policy decisions and improve business efficiency and productivity. The challenges facing any organization in business intelligence and decision-making include plan failure, lack of preparation, resource failure, and risk-taking capability. This paper proposes a framework of Optimized Data Management using Big Data Analytics (ODM-BDA) to increase the intelligent organizational effectiveness and decision-making analysis in organizations. A backtracking method is introduced in business intelligence and decision-making environments to enhance plan failure and risk-taking ability. The steep optimized strategy is incorporated in the ODM-BDA framework to improve the training plan and manage money. The research data provided an essential set of acceptance research for these models in increasing the relative level of effectiveness and performance. The simulation analysis is performed based on true positive analysis, performance analysis, error analysis, and accuracy analysis, proving the proposed framework's reliability.

1. Introduction to business intelligence

A firm's potential to effectively use the information gathered during day-to-day activities is business intelligence (BI) (Vidal-García, Vidal & Barros, 2019). By finding emerging opportunities, exposing possible risks, revealing more industry insights, and strengthening decision-making frameworks, the BI may play a significant role in optimizing organizational effectiveness (Zhao, Yu, Shakeel & Montenegro-Marin, 2021). Business Intelligence uses current and historical data, while Business Analytics uses previous data to extract insights and conduct business activities to drive customer requirements and increase productivity. BI systems currently rely primarily on centralized and internal business data. A great deal of helpful knowledge in unorganized and existing information could contribute to an imperfect view of the facts and a partial decision-making process (Gao, Wang & Shen, 2020, Nguyen et al., 2021). Without analysis and processing, data is useless. People need software, such as Hadoop, which will take care of us. To develop these solutions, programmers and engineers need more employment opportunities. This is a good effect for society from big data. Computer and Internet technology have created new needs and challenges for BI to gather essential data from various sources. These data are organized and unorganized, complicated and crucial (Bukhari et al., 2021). For example, about 1 million sales per hour are

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available to Wal-Mart (Manogaran, Chilamkurti, & Hsu, 2020). Each day, Twitter publishes over 600 million tweets. More than 786 million users are confirmed to be present every day (Do et al., 2020, Dash, Nguyen, Cengiz & Sharma, 2021). Almost 87% of the currently available information has been generated by increased social media usage like YouTube, Facebook, and Weibo.

The idea of "big data" was born with these incredibly vast and dynamic data (Zong, Yuan, Montenegro-Marin & Kadry, 2021, Hsu, Manogaran, Srivastava, & Chilamkurti, 2021). Big data now enables BI to provide insights that would allow companies to understand their customers better, improve marketing technology, make personalization possible and identify real-time problems and opportunities. Big data has received much interest in recent times, given its ability to create market value. In 2019, 39% of respondent entities practiced advanced analyses, and 84% used advanced examinations in four years, as per a study (Garmaroodi, Farivar, Haghighi, Shoorehdeli, & Jolfaei, 2020, Kumar et al., 2020). Then companies should review large amounts of data to know the present state of the market and systems, including customer conduct, that are continually changing. Big data analytics can address a large number of today's problems (Gao, Wang & Shen, 2020). Data analysis will produce smarter machines, as the computer is increasingly able to learn from data. In the future, automotive, space science, medicine, and even psychology will function because they will be reading emotions. Big data, especially data analytics potential and problems, are now the subject of current research (Manogaran et al., 2020). At the same time, relatively under-researched are the functional consequences of using big data in digital marketing (Pham et al., 2020). There is a lack of study on the operational effects of using big-data analysis for business intelligence specifically. Data gathered from social networks on big-data analysis for business intelligence is unique (Shamsi & Khojaye, 2018, Sun, Cegielski, Jia & Hall, 2018). Data analytics enables managers to decide according to statistical facts. These facts could be used to guide decisions on future company growth by assessing the market and competition in the long term. Data analysis allows managers to trickle all facts into decisive operational decisions. This article fills this awareness by studying data from social media in Beijing, the practical implications of big data analysis for business intelligence, and evaluating potential trends. Therefore, the research queries are developed as follows:

- 1 What are the consequences for business intelligence, particularly for information gathered from social networks of Big Data Analysis?
- 2 What are the potential paths for further advancement of market technology big data analysis?

This article is important since it examines a problem in a relatively unexplored field of science. The paper contributes:

- (1) It shall add to the collection of information on the role of big data analysis in BI and contribute to comprehending the effects of information technology on BI.
- (2) The findings would enhance the understanding of the industry and increase decision-making and productivity by management and business stakeholders in developing plans to use big data analysis.
- (3) The increasing use of social media is a good example of realizing how large social networking information can boost competitiveness and enhance the customer experience in Beijing.

The remaining structure of this paper is as follows. Section 2 describes the literature survey of big data analytics and business intelligence. The proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework is designed and applied in section 3. The results and discussion performance evaluation are analyzed in section 4. Finally, the conclusion and future scope are demonstrated in section 5.

2. Background to the business intelligence and big data analytics

2.1. Business intelligence

BI is an enterprise's ability to leverage the available data meaningfully. BI covers many sectors, including Competitive Intelligence, Consumer Intelligence, Industry Intelligence, Commodity Intelligence, and Operational Intelligence (Kumar & Babu, 2019). In 2018 Duan et al. quoted Thomson's study, which showed that the main advantages of BI were rapid and reliable reporting (76%), better market choice (75%), enhanced customer service (54%), and higher company revenues (42%) (Rikhardsson & Yigitbasiglu, 2018).

2.2. Big data

Big data usually has three key features, namely length, variation, and speed. The three functions represent a huge amount of data, a variation of data sort, and a different speed of data generation (Duan, Edwards & Dwivedi, 2019). For example, Allam et al. produced around 400,000 rows of real-time information per minute from live views concerning data. They provided more than one million reports per month to analyze big data (Saura & Bennett, 2019). Big data analysis can help businesses offer knowledge from various viewpoints, including customer transactions, product tracking, video-based storage, advertising and relationships between consumers, revenue management, and investment information (Allam & Dhunny, 2019). In addition, big data analysis enhanced decision-making in actual time to allow the exchange of knowledge from local to national governments.

2.3. Big data analytics

Big data analytics tools may enable organizations to leverage big data to enhance customer loyalty, control the supply chain risk,

build strategic intelligence, conduct a credible market study to make important decisions (Božić & Dimovski, 2019). For example, much research showed that a retailer could efficiently leverage large information to boost 64 percent of profit margins by gaining a customer base over their opponents and taking advantage of accurate customer data. In addition, big data analysis may often contribute to decision-making (Grover, Chiang, Liang & Zhang, 2018). The efficient application of Big Data focuses on improving understanding of various operations and procedures for transferring information (Fombellida, Martín-Rubio, Torres-Alegre & Andina, 2018). For companies committed to analyzing big data in the decision-making process, reducing the error and data range should be an important objective.

Decision-makers and data scientists should work collaboratively to improve efficiency in Big Data and prudently manage decision-making procedures to decrease the differences in comprehension (Cockcroft & Russell, 2018). Furthermore, efficient and effective analytical methods must be established to utilize huge data in unstructured media like text and sound/visual. In the meantime, modern statistical analysis techniques for big hierarchical data were suggested by Araz et al. (Richards, Yeoh, Chong & Popović, 2019).

2.4. Big data analysis issues in business intelligence

While big data can allow firms to gain a strategic advantage over their competitors in many ways, big data analysis also faces a wide variety of issues. Big data analysis was challenged mainly by the lack of smart big data sources, the shortage of accessible real-time analysis capacities access to adequate network capacity for running apps (Araz, Choi, Olson & Salman, 2020). In addition, the need to increase network spans, data protection, and legislation on data protection, interoperability, disparate data fragmentation, and inadequate availability are analyzed (Mikalef, Pappas, Krogstie & Giannakos, 2018).

The conditions in the deployment of BI big-data exploration (BI-BDE) are problematic with costly tools, and considerable computer resources for research were suggested by Ain et al. (Tiwari, Wee & Daryanto, 2018). Especially Big Data includes storing huge amounts of heterogeneous cumulative data from various sources, attackers still target it. Regulation with regulatory standards, in particular data protection legislation, is critical (Ain, Vaia, DeLone & Waheed, 2019). Moreover, given that large-scale analytics is still in its infantile stages, there are no specific rules for preserving the safety of big data collection and analysis that could harm public confidence (Boulila, Al-Kmali, Farid & Mugahed, 2018). The problem is to create procedures to develop contractual limits on disclosure of information to unauthorized users, prohibit copying information, create a background search for staff who may have access to the report, and limit the use of such information in a contractual manner. The most intriguing element is to develop regulations on data protection to improve big data over the next four years. (Choi, Wallace & Wang, 2018). Ranjan, J et al. (Ferraris, Mazzoleni, Devalle, & Couturier, 2019) introduced Competitive Intelligence (CI) to take advantage of large-scale use and new technology to evaluate and acquire important insights into the decision-making process. This article examines large-scale data demands for CI processes inside organizations, examines how large-scale analytical organizations handle big data and provides a background for developing huge data frames and process models for CI in companies. Sanjay Mathrani et al. (Ferraris, Mazzoleni, Devalle, & Couturier, 2019) expressed the Big Data Analytic Framework for organizational development based on a new marketing strategy. Internet and sensing gadgets, corporate websites, and other information submitted by users generate tons of evidence. Three case studies of BDA users illustrate the methodology and possibilities of BDA in utilizing data. Big data applications service, system coordination, data source, and end-users are identified as four necessary elements of the BDA message complexity. Information value chains benefit from additional building blocks in data protection, confidentiality, and administration, which provide capabilities to the four dimensions of the BDA process. Yash Raj Shrestha et al. (Ranjan & Foropon, 2021) explored the deep learning-augmented decision-making (DLADM) for organizational decision-making with big data. The latest advancement in deep learning (DL) techniques, specifically, assure advantages for judgment within organizations, such as providing workers with information processing, thereby augmenting their processing skills and possibly helping them transition to more artistic activity. DLADM is the name we give to the decision-making process in companies supplemented by DL algorithm results. This paper contributes to the understanding and implementing deep learning for decision-making processes in organizations by (a) offering a comprehensible tutorial on DL algorithms and (b) showing DLADM with two case studies, including image processing and sentiment classification.

In addition to the privacy and safety concerns associated with big data, computing and security technologies are problems in hardware technologies that enable big data analysis. Firstly, a single computer configuration cannot be made available for real-time and portable analyses. Secondly, networking infrastructure fosters the gaps between networks, limiting the network's capacity to accommodate practical applications. Thirdly, the development of the storing power of magnetic disks is not well known. Optimized Data Management using Big Data Analytics (ODM-BDA) framework is proposed to overcome these problems.

3. Proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework

3.1. Models for cloud servicing

Cloud-based technologies are largely divided into four designs: Service Information, System Software, Service platform, and Infrastructure. Application as a service is a product that offers the consumer access to software previously developed in the database. Cloud customers have control, and cloud users do not handle the system's architecture, eliminating the requirement to reinstall the software on cloud services. Infrastructure as a service is a concept that allows users to build and run developed in-house software for programming environment utilities. Big data helps companies to provide enhanced client services that can contribute to increased profit. The primary goal of most companies is improved customer experience. Other objectives include improved target marketing, cost reductions, and improved process efficiency.

Fig. 1 shows the cloud architecture of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework. Organizations must manage and administer data while maintaining data compliance. Having up-to-date information available to employees and from any location is essential for any company's business agility. Big Data and Data Analytics are continuously growing industries, and as a result, companies are seeking increasingly important technologies to handle everyday data. The organization will benefit from a data center solution that reduces the number of shifts required in different business sections. For the advantage of the entire organization, this results in unified leadership and management and a stable governance style. IM should be allowed in an organization's Internet control solution if the organization must do business. Decreased latency and higher performance are the primary goals of content delivery networks. CDN technology, designed for companies that produce huge volumes of traffic, can seamlessly provide mission-critical apps, on-demand movies, and static pictures to users anywhere globally. Any link made from within the company and going outward to the World wide web is already a dangerous proposition for a corporate infrastructure's World wide web front door. In addition, most businesses lack the capabilities necessary to categorize and identify the programs and file types that are leaving their corporate network infrastructure. It contains client-side, corporate-side infrastructure, and cloud storage space, and data centers. The resources can include a computer system, a software programming environment, repositories, and web browsers. Data analytics enables managers to decide according to statistical facts. These facts could be used to guide decisions on future company growth by assessing the market and competition in the long term. Data analysis allows managers to trickle all facts into decisive operational decisions. The Service architecture is a model that offers the customer a network, such as platforms and data storage areas. Virtualization played an important role by enabling infrastructure as a service cloud employee to improve on-demand services extracted from their vast pools of built-in datacenters. Information as a service is a paradigm in which a cloud-based network can readily collect information. Data as a service is a modern way to view vital business data in an established datacentre. Globalization Financial complexity and various customers and staff, cost calculation and global price strategies, universal payment practises, and the monetary rate are key challenges faced and tried to better and better adapt to them.

3.2. Technologies in big data

Fig. 2 shows the big data formation steps. The framework provides a wide range of information. It allows companies to handle this information in a single format and migrate it to other preferred forms using comprehensive migration software.

Velocity: The framework can manage either low-speed data sources like sensor or inventory data or huge amounts of batch information at any speed.

Volume: The framework can manage large amounts of information remaining or broadcasting.

Standard data extraction involves identifying interesting trends from databases, while large-scale collection and data analysis are needed for big data analysis. Two of the common techniques for big data analysis are historically Hadoop and Redis. For big data analytics, there are more resources and technology available. Instances include the BI database system hosted by Amazon's velocity, the data processing services provided by Google, the big cloud network of IBM, and the information processing service of Amazon. In the present, big data would be hybrid with on-site and cloud substitutes. These are fast, increasingly common tools for many kinds of large data analytics implementations in conventionally related SQL repositories called NoSQL (Not just SQL) datastores. The importance of data is consistent and steadily growing in decision making. This enables companies to create new business opportunities and generate more income. It moreover helps to predict future trends. Thus, companies make or break data-driven business decisions.

In making predictions about future events, business intelligence operating systems must process large amounts of complex data. In addition to fraud detection and marketing, companies utilize predictive analytics technologies for risk assessment, management, and market research. Customer behavior and other future events may be predicted using predictive analytics, which develops models. In the actual world, both big data and marketing are valuable. If correctly harnessed, big data analytics hold the key to the future of marketing. Big data has always scratched the surface of advertising managers' knowledge, yet some firms have already achieved

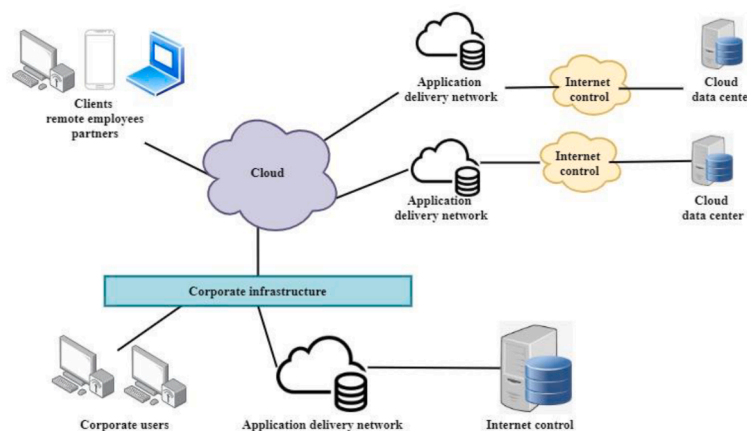


Fig. 1. Cloud architecture of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework.

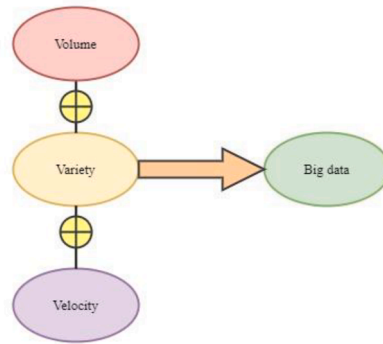


Fig. 2. Big data formation steps.

above-market growth. Five to six percent more productivity and profitability are achieved by businesses that employ big data.

3.3. Deploying large-scale cloud service analysis

Big data analysis based on the cloud is a business system that provides components of the Big Data analysis process across a cloud-based platform. It uses various methods and tools to collect and communicate data from vast data easily classified and easily accessible through a web browser. Such cloud-based information analysis software and utilities are usually sold under a price structure based on a contract or a pay-per-use plan. Cloud Computing is referred to as the software platform. Analysis can be readily accessed from a cloud storage network in this design. A cloud-based data analysis service would enable companies to simplify operations everywhere and anywhere. For example, managed data centers, business intelligence platforms, and cloud-based analysis provide such cloud-based analysis goods and services. Business analytics can allow companies to automate their entire decision-making process to provide responses in real-time if necessary. It can enable companies to reduce short-term and long-term risks if it helps them make the proper decisions based on accessible data, such as client preferences, trends.

Information collected in a cloud-based repository can help companies make decisions. Analysts use cloud-based big data to manage multiple records with many characteristics and provide more information to function. It enables predictability. Big data and information technology often allow researchers to analyze new data information, such as popular websites regularly.

3.4. Major business organizational benefits

The following details the various benefits of standard business organizations:

Facilities on demand: As the name states, companies can extend their space or facility without support by pressing the link. Big data systems can be built as soon as practicable by organizations.

Data and network information: Data can be provided on the internet in real-time from various devices, including a computer, a cell phone, iPads, etc.

Source pooling: Services suppliers are effectively clustered and utilized in a multi-lease model. Tools include space, data, virtual machines (VMs), etc. Rapid elasticity capabilities can be accurately and quickly enhanced or decreased over a short time. For any amount and at any period, shoppers can buy resources. Big data analytics allow firms to use their data to find new options. This turn leads to intelligent motions, more efficient operations, greater revenues and pleased clients.

Efficient cost: The use of resources may be tracked and paid on a use basis. It is a very straightforward framework that makes it easier to accept the supplier and the customer. Big data applications, including Hadoop and cloud-based computing, offer considerable cost benefits to maintaining vast data and identifying more effective business methods. Data analysis is more effective than ever and helps uncover new business possibilities that would have been ignored otherwise, such as untapped consumer categories. Through this process, growth and profits continue and intelligence is strengthened.

It is vital to building good consumer relationships. It wants to satisfy their customers' requirements and are still keen to get valuable insights for creativity. As a result, better sales efficiency and reliability can be obtained. This research aims to define consumer purchases based on the details they give to the company. When a consumer buys a service, it is necessary to note that different considerations influence consumers' decision-making capability. A person's actions normally represent his psychogenic properties. Companies worldwide are already using big data, but some have failed to make full use of it. Big data improvement can improve consumer awareness, improved management, and more effective operations with new innovative products & services.

A person's interest is the deepest wish, which he seeks to fulfill his unsatisfied desires. A quiet individual may opt for lonely activities such as painting, writing, baking, etc. Social people seem more prefer active activities to have interests. A manufacturer can create hobbies such as catering, farming, browsing, and much more. These options can be strengthened. The next segment discusses the platform's architecture that includes details about clients depending on the buy forecast activity sector. Big data enables small companies to gain significant insight into their customers' beliefs and shopping preferences. This information allows enterprises to

understand how to customize their products and services to provide customers with exactly what they want to generate further sales.

This article explores the related field of personal qualifications of consumers such as interest, profession, and age group. The function and the variable are referred to as areas. Instead of the term record, a client's collection of qualities/certificates is called a data history. Field terms, attributes, and parameters are employed in a gene sense rather than a field or function, and rather than a data log, the gene collection is referred to as a chromosome. The gene array is called chromatids. There are three key parts of the research methods:

- Projection method focused on correlations for consumer purchasing;
- Increase data in genetic algorithms
- Numerous versions of regression

3.5. Detection of the behavior of buying based on a correlation

The weights of production information areas are calculated using correlation technology. Consumers are grouped according to their interests. Groupings of various interests are created from the data obtained automatically. A group includes clients with a positive reaction, an additional hobby cooking group, other activities, a reading group, etc. These groups predict the new user visiting the web page for the first period to purchase service. It is allocated to a different group according to the psychosocial traits of the incoming client. Before buying the goods, the models forecast and prescribe what the consumer wants. The methodology of comparison is utilized to find the association between the two areas. The quality of the area is known as weight. Obtained from field significance, it can determine how interlinked they are. Business intelligence is aimed at promoting and facilitating better business decisions. BI helps organizations, including sales, finance, marketing and a wide range of other areas and departments, to access information critical to their success.

Highly associated fields are grouped and used to forecast. The existing research on the clustered, k-means method and range measuring formulae were used in the experimental data to render clusters. The similarity approach has been realized to have a different relationship with the data objects. According to the connection concept, the clustered reports give a good relationship, and less crowded documents provide a poor connection. For clustering, a statistical model weighed correlation approach is used. These weights calculate the importance and commitment of the sector when monitoring customers' intention to purchase the product. Similar data items, based on a clear connection, are collected together. Both transaction history fields must be assigned weights. In this research, the activity area is used, and then it finds the relationship between the activity and age range, activity and jobs, hobby and income groups, etc. Following is the test process:

$$D_s = n - R \quad (1)$$

Let the cumulative data of the entire database be n , and the discarded information is R after the first filtration; the remainder data D_s is displayed in Eq. (1). The discarded information is seen in Eq. (2) as a percentage

$$R = \frac{D_s}{n} 100 \quad (2)$$

For the next phase, the information in D_s are evaluated as the coefficient of correlation. Let's write this D_s as y_{ij} : Let there be only one database, and it is expressed in Eq. (3)

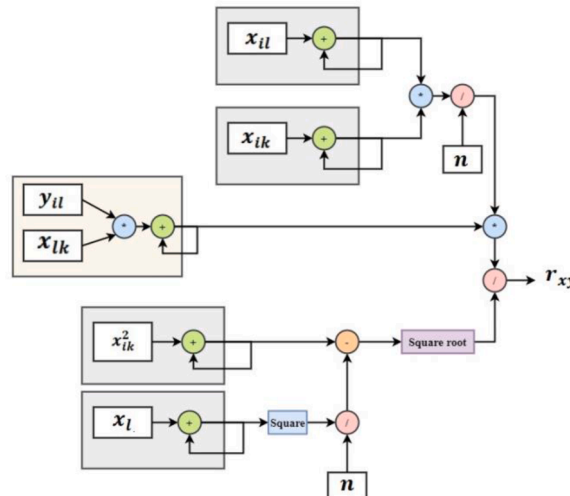


Fig. 3. Pictorial representation of r_{xy} .

$$D_s = y_{ij} = x_{ij}, y_{i1k}, y_{i2k}, \dots, y_{imk} \quad (3)$$

When i denote the value of the database set, which is $1, 2, \dots, n$ and m the number of parameters which are to be compared to the quality x_{ij} in which j is the second dimensional of the identify performance varying between 2 and j . Take into account n number of such databases for each y_{imk} . The correlation equations are obtained for these data set statistics using the continuity equation in Expression (4).

$$r_{xy} = \frac{\sum_{l=1}^n x_{lk} y_{il}}{\sqrt{\left(\sum_{l=1}^n x_{lk}^2 - \frac{(\sum_{l=1}^n x_{lk})^2}{n} \right) \left(\sum_{l=1}^n y_{il}^2 - \frac{(\sum_{l=1}^n y_{il})^2}{n} \right)}} \quad (4)$$

Where, r_{xy} reflects the x_{ik} regression function taking into account all y 's to the dataset number n . The dataset quantifies the association between the activity and other qualifications (e.g., profession, age range, income level, key specific product, subgroup, overall satisfaction, and advocacy rate), which are considered by activities as an x_{il} . This correlation function is the comparison relation between x_{il} and y_{il} . The k subgroups/classes are included in the y_{il} 's.

Fig. 3 shows the pictorial representation of r_{xy} . For both of the sub-groups of y_{il} the regression function must be mapped. The information is evaluated on the assumption of the incidence level of sub-groups, and the regression function is equally distributed. Let's assume that a y_{il} the division has a sub-group k . Rate of occurrence of any y_{ijk} so that it fulfills the status provided, the maximum sample group is expressed in Eq. (5).

$$\sum_{i=1}^k f_i = N \quad (5)$$

It is the maximum sample group number concerning the range of values that can be $f_1, f_2, \dots, f_k$. It refers to the representation of the association or weight of subcategory, and it follows the expression for r_{xyk} . Where $r_{xyk} = \frac{(r_{xy} \times f_k)}{N}$ is regarded as the value of the corresponding y_i results and expressed in Eq. (6).

$$r_{xy} = \sum_{i=0}^n r_{xyi} \quad (6)$$

This r_{xy} is often regarded as w_{xy} , where w is correspondingly regarded as weights is expressed in Eq. (7):

$$w_{xyk} = \left(\frac{w_{xy} \times f_k}{n} \right) w_{xy} = \left(\frac{w_{xy} \times f_k}{N} \right) w_{xy} \quad (7)$$

The weight of the two-dimensional system is denoted as w_{xy} , the number of nodes in a particular area is denoted as n , the maximum number of nodes in the subgroup is represented as N . The fuzzy function is defined as f_k . The preparation for the next phase is shown by assessing the frequency-based loads for each x_{ik} 's or activity, for each person and its subset y_{ijk} 's.

Fig. 4 shows the pictorial representation of w_{xyk} . In this step, each data collection is assessed by summarising the masses of each y_{ijk} as the shortening for each weighing, which is the masses between the x_i 's and y_i 's of the information collection is expressed in Eq. (8)

$$w_{dsj} = \sum_{j=1}^m w_{xyk} \quad (8)$$

Where w_{dsj} is denoted the cumulative weight for the specific sequence or database is defined. The next move is to group the original data according to maximal amounts of each classification of the information sequence. This study is assumed to be the top 12% of the total cumulative weights of individual databases. It can find the link r_{xy} the factor between user activities and the other qualities.

It proposes a model for analytical services. Independent business processes, as it remembers a memory. Data analysis systems,

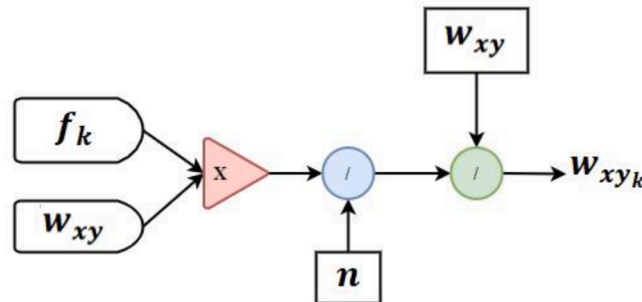


Fig. 4. Pictorial representation of w_{xyk} .

including key functions, Supply chain management (SCM) services, cloud services, and structures, can be incorporated into the suggested framework.

Fig. 5 shows the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework. The supply chain (SC) implementation structures are known as SCM systems. Sales, advertising, and products are primarily part of programs. A framework consists mainly of creating, capturing, refining, storing, managing, distributing, and sharing information. The suggested framework involves SC preparation, SC management analysis, marketing analysis, sales analysis, servicing analysis, and Big Data analysis to analyze information. Master data store comprises mainly selling, promotion, facilities, clients, SC preparation, and SC implementation from marketing divisions, human capital, and other departmental data. Based on corporate expertise, internet, call center, mailings, e-mail, retail, and customer/partner data and experience are provided. Big data analysis is built and offers relevant revenue analysis, marketing analysis, service analysis, SC scheduling, and SC performance insights data and details. Through big data, BI can now provide organizations with insights that allow them to understand their consumers better, enhance marketing tactics, personalize communications, and detect challenges and opportunities that arise in real-time. Strategie development and execution does not have to be an act of blind faith anymore

SC strategy analysis, SC scheduling analysis, marketing analysis, operation analytics, consumer analysis, big data business intelligence, and information analytics are all mechanisms of the analysis engine. In addition, the analysis report has soft computation, deep learning, artificial neural network networking, random forest, stochastic models, data processing, predictive modeling, optimization, visualization applications, and other information and data analytical tools.

4. Software analysis and performance evaluation

The simulation parameters used in the analysis are considered shown below

- Operating system – Ubuntu 14, 32 bits
- RAM – 8GB, eight-core
- Presentation control: DatastaxOperationsCenterInventiveness
- Windows stage: DatastaxDeviceCenter2.5.0 Cassandra framework

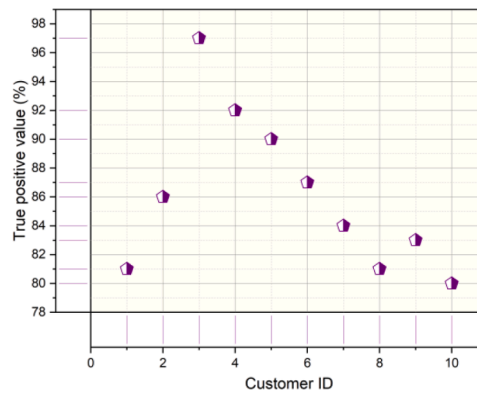
The suggested ODM-BDA framework is developed and deployed. The simulation results are shown, such as precision, efficiency, delay, a genuine positive rate, error rate and results.

Fig. 6(a) and 6(b) shows the true positive result analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework and the existing BI-BDE framework, respectively. There is a total of 10 customers considered for the simulation analysis. The next purchase is predicted and compared with the actual value based on their purchasing history and interest history. The real positive value determined is shown in the figures above. The results reveal the largest real beneficial impact in the proposed ODM-BDA framework.

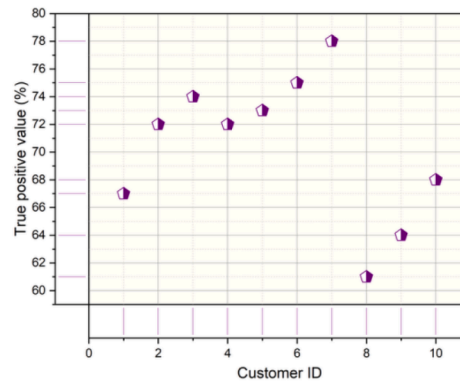
Table 1 shows the proposed Optimized Data Management performance using Big Data Analytics (ODM-BDA) framework. The simulation is carried out by varying the number of iterations in the simulation from 10 to 100 with a step size of 100. The performance, such as precision and efficiency of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework, are



Fig. 5. Data analytics architecture of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework.



(a). True positive result analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework



(b). True positive result analysis of the existing BI-BDE framework

Fig. 6. (a). True positive result analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework (b). True positive result analysis of the existing BI-BDE framework.

Table 1

Performance analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework.

Iterations	Precision (%)	Efficiency (%)
10	73	74
20	79	76
30	81	82
40	83	85
50	85	88
60	88	90
70	91	92
80	93	94
90	95	96
100	96	97

measured and tabulated in the above table. The results show that the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework has the highest performance.

Fig. 7(a) and 7(b) shows the error rate of the existing BI-BDE framework and the suggested Optimized Data Management using Big

Data Analytics (ODM-BDA) framework, respectively. The system's actual error and predicted error results show that the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework has the highest performance than the existing BI-BDE frame in terms of low error rate.

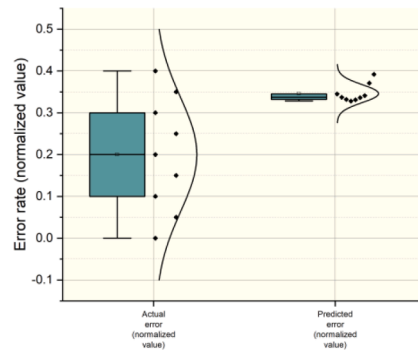
Table 2 shows the performance analysis of the proposed Optimized Data Management using the Big Data Analytics (ODM-BDA) framework. The simulation is carried out by varying the number of iterations in the simulation from 10 to 100 with a step size of 100. The performance, such as delay and accuracy of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework, is estimated and tabulated in the above table. The findings indicate the maximum performance of the proposed ODM-BDA framework.

Fig. 8(a) and 8(b) shows the accuracy and efficiency analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework, respectively. The simulation is carried out by varying the number of iterations in the simulation from 10 to 100 with a step size of 100. The performance, such as accuracy and efficiency of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework figures above are measured and traced. The findings indicate the maximum performance of the proposed ODM-BDA framework.

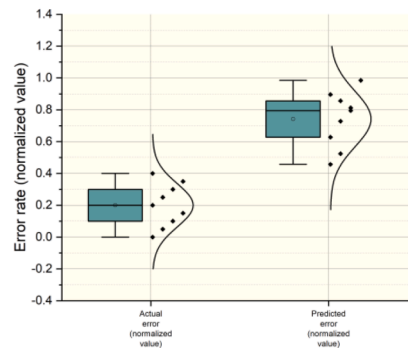
The proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework is designed and implemented. The simulation results are shown, such as precision, efficiency, delay, a genuine positive rate, error rate and results. The results reveal that the suggested ODM-BDA architecture for performing the most highly.

5. Conclusion and findings

Companies have used data analysis for a long time to improve their plan, maximize profitability, and promote their decision-making methods. Cloud computation and big data technology are now generally acknowledged as two prevailing innovations that



(a). Error analysis if the existing BI-BDE framework



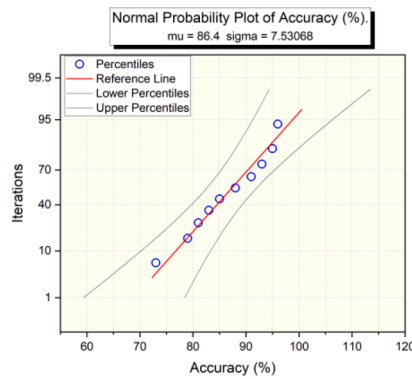
(b). The error rate of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework

Fig. 7. (a). Error analysis if the existing BI-BDE framework (b). The error rate of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework.

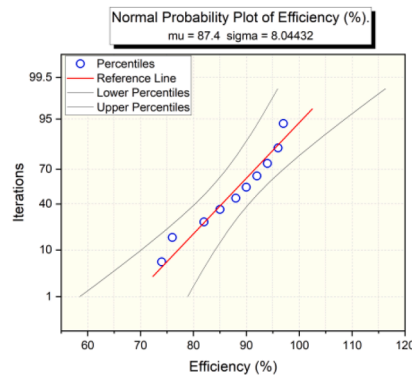
Table 2

Performance analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework.

Iterations	Delay (ms)	Accuracy (%)
10	17	81
20	21	83
30	28	86
40	34	87
50	39	90
60	41	92
70	43	93
80	46	95
90	49	96
100	52	96



(a). Accuracy analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework



(b). Efficiency analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework

Fig. 8. (a). Accuracy analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework (b). Efficiency analysis of the proposed Optimized Data Management using Big Data Analytics (ODM-BDA) framework.

can transform the corporate landscape. Cloud isn't just a storage space anymore – it's a function that affects every aspect of the software field. Big data innovations available through cloud infrastructure allow enterprises to make strategic decisions based on information to forecast future thoughts and trends. In addition, enterprises can archive their information from everywhere and at any time to obtain data.

Optimized Data Management using Big Data Analytics (ODM-BDA) framework is proposed in this article. Cloud-based data analysis includes the framework that organizations can have to construct from scratch instead. Cloud storage can remain competitive in addition to data processing, offering several advantages, for example, cost efficiency, pooling of resources, on-demand support, rapid elasticity, and easy setup. Despite its benefits, there are some difficulties and disadvantages, especially as regards privacy and protection. Organization requirements to thoroughly comprehend the scope of what is required before engaging in cloud-based business intelligence. A company can benefit from investment in cloud analysis, and it is important to ensure that adequate preparation covers all stages of analytical elements. Thus the experimental results show our proposed method ODM-BDA has a value of accuracy ratio of 96.1%, a low error rate of 0.66%, an efficiency ratio of 97.2%, the precision ratio of 96.3%, a true positive rate of 80.6%, and less delay ratio of 52.8%.

Author Statement

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References

- Vidal-García, J., Vidal, M., & Barros, R. H. (2019). Computational business intelligence, big data, and their role in business decisions in the age of the internet of things. In *Web Services: Concepts, Methodologies, Tools, and Applications* (pp. 1048–1067). IGI Global.
- Zhao, Y., Yu, Y., Shakeel, P. M., & Montenegro-Marin, C. E. (2021). Research on operational research-based financial model based on e-commerce platform. *Information Systems and e-Business Management*, 1–17.
- Gao, J., Wang, H., & Shen, H. (2020). Task failure prediction in cloud data centers using deep learning. *IEEE Transactions on Services Computing*.
- Nguyen, CH, Pham, TL, Nguyen, TN, Ho, CH, & Nguyen, TA. (2021). The linguistic summarization and the interpretability, scalability of fuzzy representations of multilevel semantic structures of word domains. *Microprocessors and Microsystems*, 81, Article 103641. Mar 1.
- Bukhari, S. A. C., Dar, H. S., Lali, M. I., Keshtkar, F., Malik, K. M., & Kadry, S. (2021). Frameworks for querying databases using natural language: A literature review–NLP-to-DB querying frameworks. *International Journal of Data Warehousing and Mining (IJDWM)*, 17(2), 21–38.
- Do, D. T., Le, T. A., Nguyen, T. N., Li, X., & Rabie, K. M. (2020). Joint impacts of imperfect CSI and imperfect SIC in cognitive radio-assisted NOMA-V2X communications. *IEEE Access*, 8, 128629–128645.
- Dash, R. K., Nguyen, T. N., Cengiz, K., & Sharma, A. (2021). Fine-tuned support vector regression model for stock predictions. *Neural Computing and Applications*, 1–15.
- Zong, K., Yuan, Y., Montenegro-Marin, C. E., & Kadry, S. N. (2021). Or-based intelligent decision support system for E-commerce. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(4), 1150–1164.
- Hsu, C. H., Manogaran, G., Srivastava, G., & Chilamkurti, N. (2021). 6G-enabled network in box (NIB) for industrial applications and services. *IEEE Transactions on Industrial Informatics*, 17, 7141–7144.
- Kumar, G., Saha, R., Buchanan, W. J., Geetha, G., Thomas, R., Rai, M. K., & Alazab, M. (2020). Decentralized accessibility of e-commerce products through blockchain technology. *Sustainable Cities and Society*, 62, Article 102361.
- Gao, J., Wang, H., & Shen, H. (2020). Smartly handling renewable energy instability in supporting a cloud datacenter. In *2020 IEEE international parallel and distributed processing symposium (IPDPS)* (pp. 769–778). IEEE.
- Manogaran, G., Baskar, S., Hsu, C. H., Kadry, S. N., Sundarasekar, R., Kumar, P. M., & Muthu, B. A. (2020). FDM: Fuzzy-optimized data management technique for improving big data analytics. *IEEE Transactions on Fuzzy Systems*, 29, 177–185.
- Pham, D. V., Nguyen, G. L., Nguyen, T. N., Pham, C. V., & Nguyen, A. V. (2020). Multi-topic misinformation blocking with budget constraint on online social networks. *IEEE Access*, 8, 78879–78889.
- Shamsi, J. A., & Khojaye, M. A. (2018). Understanding privacy violations in big data systems. *IT Professional*, 20(3), 73–81.
- Sun, S., Cegielski, C. G., Jia, L., & Hall, D. J. (2018). Understanding the factors affecting the organizational adoption of big data. *Journal of Computer Information Systems*, 58(3), 193–203.
- Kumar, C. P., & Babu, L. D. (2019). Review on big data and its impact on business intelligence. In *Information Systems Design and Intelligent Applications* (pp. 93–109). Springer, Singapore.
- Rikhardsson, P., & Yigitbasiglu, O. (2018). Business intelligence & analytics in management accounting research: Status and future focus. *International Journal of Accounting Information Systems*, 29, 37–58.
- Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of big data–evolution, challenges, and research agenda. *International Journal of Information Management*, 48, 63–71.
- Saura, J. R., & Bennett, D. R. (2019). A three-stage method for data text mining: Using UGC in business intelligence analysis. *Symmetry*, 11(4), 519.
- Allam, Z., & Dhunny, Z. A. (2019). On big data, artificial intelligence, and smart cities. *Cities*, 89, 80–91.
- Božić, K., & Dimovski, V. (2019). Business intelligence and analytics for value creation: The role of absorptive capacity. *International Journal of Information Management*, 46, 93–103.
- Garmaroodi, M. S. S., Farivar, F., Haghighi, M. S., Shoorehdeli, M. A., & Jolfaei, A. (2020). Detection of anomalies in industrial iot systems by data mining: Study of CHRIST osmotron water purification system. *IEEE Internet of Things Journal*, 8, 10280–10287.
- Grover, V., Chiang, R. H., Liang, T. P., & Zhang, D. (2018). Creating strategic business value from big data analytics: A research framework. *Journal of Management Information Systems*, 35(2), 388–423.
- Ferraris, A., Mazzoleni, A., Devalle, A., & Couturier, J. (2019). Big data analytics capabilities and knowledge management: Impact on firm performance. *Management Decision*, 57, 1923–1936.

- Fombellida, J., Martín-Rubio, I., Torres-Alegre, S., & Andina, D. (2018). Tackling business intelligence with bioinspired deep learning. *Neural Computing and Applications*, 1–8.
- Cockcroft, S., & Russell, M. (2018). Big data opportunities for accounting and finance practice and research. *Australian Accounting Review*, 28(3), 323–333.
- Richards, G., Yeoh, W., Chong, A. Y. L., & Popović, A. (2019). Business intelligence effectiveness and corporate performance management: An empirical analysis. *Journal of Computer Information Systems*, 59(2), 188–196.
- Araz, O. M., Choi, T. M., Olson, D. L., & Salman, F. S. (2020). Role of analytics for operational risk management in the era of big data. *Decision Sciences*, 51(6), 1320–1346.
- Manogaran, G., Chilamkurti, N., & Hsu, C. H. (2020). Editorial Note: Machine Learning for Visual Analysis of Multimedia Data. *Multimedia Tools and Applications*, 79, 5003.
- Mikalef, P., Pappas, I. O., Krogstie, J., & Giannakos, M. (2018). Big data analytics capabilities: A systematic literature review and research agenda. *Information Systems and e-Business Management*, 16(3), 547–578.
- Tiwari, S., Wee, H. M., & Daryanto, Y. (2018). Big data analytics in supply chain management between 2010 and 2016: Insights to industries. *Computers & Industrial Engineering*, 115, 319–330.
- Ain, N., Vaia, G., DeLone, W. H., & Waheed, M. (2019). Two decades of research on business intelligence system adoption, utilization, and success—a systematic literature review. *Decision Support Systems*, 125, Article 113113.
- Boulila, W., Al-Kmali, M., Farid, M., & Mugahed, H. (2018). A business intelligence-based solution to support academic affairs: The case of Taibah University. *Wireless Networks*, 1–8.
- Choi, T. M., Wallace, S. W., & Wang, Y. (2018). *Big data analytics in operations management*, 27 pp. 1868–1883). Production and Operations Management.
- Ranjan, J., & Foropon, C. (2021). Big data analytics in building the competitive intelligence of organizations. *International Journal of Information Management*, 56, Article 102231.