

Business Intelligence for the Evaluation of Customer Satisfaction in E-Commerce Websites- A Case Study

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ABSTRACT

Background/Purpose: *Advancement of technology has been proven in every field. To establish a good business or any organization is very crucial nowadays. Businesses are moving tremendously and competitors also high in number. It is very important to take a good decision based on reviews and feedback of customer, etc. By combining the strength of technology and business knowledge, Business Intelligence allows you to make good decisions that are fully informed and stay one step ahead of the competition. With the help of business intelligence tools businesses can use their data in a better way. Business intelligence incorporates Data mining, Data Analytic, Data Visualization and Machine learning to help organization for the analysis of data. This article provides the analysis of Business intelligence and machine learning techniques used in e-commerce website and ABCD framework to inspect the key factors.*

Objective: *Analyses the business intelligence technology and sentiment analysis on E-commerce website.*

Design/Methodology/Approach: *The information and details for this case study is obtained from different scholarly articles published in various journals and company websites.*

Findings/Result: *The study of this paper delivers the importance of customer behavior and how it helps in growth of the industry using machine learning and business intelligence.*

Originality/Value/Novelty: *The result of this paper gives an explanation of business intelligence and machine learning approach for customer feedback in e-commerce companies and advantages of e-commerce websites.*

Paper Type: *Case study paper to study the advantages of business intelligence and machine learning for customer satisfaction.*

Keywords: Business intelligence, Sentiment Analysis, ABCD framework, Customer, Machine learning.

1. INTRODUCTION :

The term "Business Intelligence" (BI) was first used by Richard Millar Devens in the year 1865. Business intelligence is a technology that is used to gather data and analyzing it and finally transform it into useful information. After 1988 Business intelligence technology developed by introducing simplified BI tools. BI tools were easier and efficient [1]. Business Intelligence technically referred to as the process of extracting transforming and analyzing the data for decision making [2].

Earlier, businesses and government agencies could learn from the structured data that was collected through their internal business systems or organization's data. But in this generation the concept big data, to capture new economic opportunities brought about by advanced big data known as business intelligence and analytics (BI&A). The advantages of data analytics enable businesses to make precise and fast decisions by improving their understanding of their customers, market's trend, and various products [3]. Companies or organization can achieve their profit by integrating two areas business intelligence and customer demands. 'Customer' is the main centric for designing marketing strategies for a company. In this digital era deeper understanding of customer interest, new trends and behavior is

very essential. And also how effectively a product can be delivered to a customer in a very short period are also matters. Analyze how real-time high performance analytics, in particular, are enabling new marketing opportunities and improving marketing return on investment to determine why so many businesses are unable to reap the anticipated rewards from interactive marketing [4]. Digital marketing is more flexible and affordable compared to traditional marketing strategies. More important than what you sell is how you sell it. There are countless digital marketing companies or E Commerce companies, but the marketing strategies define how to improve the business.

2. RELATED RESEARCH WORK :

Table 1: Literature review on Business Intelligence listed on the below table

S. No	Field of Research	Focus	Outcome	Reference
1	Business Intelligence for online marketing	Focus on a solution for BI in commercial field	Utilizing administrative techniques and particular data analysis tools, it produces results that are invaluable for enhancing managerial decision-making.	Azvine B. et al. (2006) [5]
2	Concept of Business Intelligence	Focused on the function and necessity of real-time BI for companies	Examined the ideas behind business intelligence (BI), its elements, and advantages, technological needs, creating and implementing BI.	Ranjan T. (2009) [6]
3	Issues of current business intelligence	Technology that will help real-time business intelligence become a reality,	Detailed automated analytics and Intelligence data analysis	Chen H. et al. (2012) [7]
4	E commerce with Business Intelligence	New research direction and propose for an architecture to combine e commerce and BI	The suggested architecture allows for the transformation of consumer-generated raw data from online retailers.	Ferreira T. et al. (2017) [8]
5	Business Intelligence and Analytics	How to solve data related problems in business	Businesses and organizations acquire important insights from the structured data gathered by various enterprise systems	Gheorghe S. et al. (2017) [9]
6	Business Intelligence and digital marketing	Business intelligence's importance and value to digital marketing.	Business intelligence has been shown to pave the way for increased revenue.	Bhosale S. et al. (2020) [10]
7	Current state of Industry 4.0	business intelligence (BI) technology's current state	Business Intelligence, Big data and IoT assist business with decision making and prediction.	Javera Romeo et al. (2021) [11]
8	Data Visualization Framework	Focused on IoT based Data Visualization to analyze various data sources for BI in Business enterprises.	The improved performance with a quicker response time	Shao C. et al. (2022) [12]

3. OBJECTIVE OF THE STUDY :

- (1) An overview on top e-commerce industries.
- (2) To study and analyze Business Intelligence and Customer behavior.
- (3) To study the different sentiment analysis approach for customer feedback and review.
- (4) To study the impact of business intelligence on ecommerce websites using ABCD framework.

4. METHODOLOGY :

The study is based on information collected from various recourses like scholarly articles, conference papers, websites and articles.

5. TOP E-COMMERCE INDUSTRIES :

Amazon: Amazon began as an online bookseller. Amazon is the undisputed e-commerce leader and keeps expanding and getting creative, with around \$470 billion in global sales. A client-centered strategy is necessary for long-term progress. Amazon is achieving through reviews and feedbacks. Product recommendation based on the search makes the customer more attractive to the website. Decision making is completely based on what customer might want. Amazon offers user reviews and question and answer section. Because customer take decision based on positive comments and ratings [13].

Flipkart: Flipkart was established in 2007 as an online bookstore. Later, Flipkart had 261 million unit sales, 100,000+ merchants, and 54 million active users. The company introduced Cash on Delivery, it is an option where the customer could make the payment while receiving the product [14]

Snapdeal: Snapdeal is an Indian company, established in the year 2010. Snapdeal is one such platform that makes online shopping a boom with its exclusive deals, coupons and discounts for consumers. Around 15 million products are available for delivery. Timely notification is available on Snapdeal so that customers will not miss out on any offers.

Myntra: It is a website for fashion and lifestyle needs. It has the broadest selection of brands and goods on its site. The company was established in the year 2007, worth around 7.1 million. By permitting the autonomous design of its fashion products, Myntra seems to have gone one step further. They introduced T-shirts with entirely artificially created patterns. Two Myntra brands that produce clothing designs using artificial intelligence are Moda Rappido and Here and Now [15].

6. BUSINESS INTELLIGENCE AND CUSTOMER BEHAVIOUR :

Business intelligence is adopted by most of the business organization to improve their growth. Internet is becoming more widely available. As a result, there is a huge hike in the e-commerce business in all the fields like banking, health, textile industry, food and grocery, etc. The majority of the world population prefers online shopping and other e-commerce applications for their daily chores. A huge amount of data is accumulated due to various activities on internet. In the case of any business organization, either online or traditional, analyzing existing data or utilizing it for future prediction is possible. Since the amount of data generated is greater, it is not possible to analyze manually. Here it shows the importance of business intelligence and other technologies. Predicting the customer behavior and understanding them to improve business is the advantage of business intelligence. By integrating artificial intelligence and machine learning algorithms, BI tools make explicit past customer purchases. AI uses this data, together with other supplemental information, to predict client demands. With the aid of business information, developers can research their competitors before making a choice. BI encourages decisions to be fully connected with the preferences of the entire firm rather than limiting the marketer to only considering the product at hand [10]. Business intelligence can assist a company in better understanding its consumers so that it can better serve them. For example, it can help the company increase sales to exist customers and reduce the number of customers that leave the company, which would increase sales and revenue [16]. Business Intelligence is effective because of the following components:

- (1) **Online Analytical Processing (OLAP):** Companies regularly assemble information to carry out various analyses. To get a precise and trustworthy comprehension of the many parts of the data, they have a pressing need to gather all the data in one location. They can quickly obtain the findings of multi-dimensional analysis with the aid of OLAP.

- (2) Real Time Business Intelligence: When business data and operations need to be sorted and analyzed at the point of collection, real-time business intelligence (RTBI) is used.
- (3) Data Warehouse: Data warehouses are the main data storage system used in business intelligence. In order to inform everything from routine choices to organizational-wide switches in focus, business intelligence relies on complicated searches and comparing multiple sets of data [17]. The following figure shows the concept of Business Intelligence.

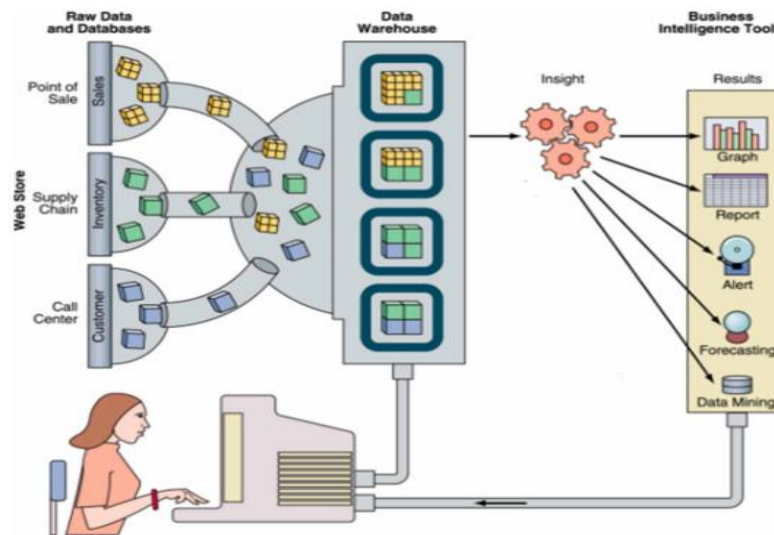


Fig. 1: Understanding the concept of BI [6].

Business intelligence's (BI) primary tenet is to recognize customer behavior and forecast their purchasing patterns in order to enhance both the business and the environment [18]. All businesses throughout history have been significantly impacted by changes in customer behavior. It is been important for any organization to concentrate more on customer behavior and adapting to new business strategies. Customers will always purchase products that are convenient and appealing to them. Companies always show interest in their customers' needs and keep a record of all customers.

7. SENTIMENT ANALYSIS APPROACHES FOR CUSTOMER FEEDBACK AND REVIEW :

The integration of business intelligence, data analytics, and machine learning is used to boost sales by tracking the search history of customers. E-commerce companies are using advanced machine learning to suggest products and online ads to their customers. Intelligence technologies are used to promote new products and offers to the relevant customers.

Amazon and Flipkart are the leading e-commerce companies, which use the best technologies to predict their customers' buying patterns. Both Amazon and Flipkart collect customer feedback on a regular basis and analyze it to find the best marketing strategies to boost their business. Users can review the products on the major e-commerce sites like Flipkart, Amazon, and many others. Consumers will research products before making purchases in order to gain a better grasp of how they operate. The interpretation will consist of a very straightforward product that has been polarized into positive, neutral, and negative Product checks. We might do this experiment using machine learning techniques. Consumers who are aware of a product reaction participate in research known as sentiment analysis. One can learn about a person's sentiments or opinions about a thing or a product using the computational technique known as sentiment analysis. By examining and evaluating customer reviews in online commerce, sentiment analysis or opinion mining can be valuable for determining customer behavior [19] Sentiment analysis can be used to classify the text as negative, positive and neutral. The sentiment analysis framework consists of the following stages:

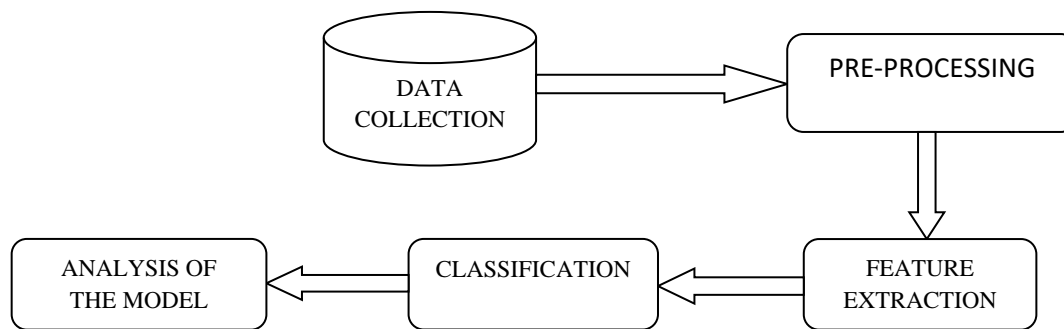


Fig 2: Stages of sentiment Analysis [20]

7.1 DATA COLLECTION:

Amazon and Flipkart are the most popular e-commerce websites where people buy different categories of products like electronics, clothes, home décor, etc. And they give feedbacks and reviews. A user must read product reviews in order to choose a helpful product, comprehend the product, and make a purchasing decision. When purchasing online, one of the first things a consumer does is read customer reviews of the item. A user places more trust in the opinions and experiences of other individuals. A consumer typically bases their decision to purchase or return a goods only on evaluations. Thus, it is evident to demonstrate the significance of reviews [20]. The dataset contains reviews and product information from Amazon and Flipkart. Which includes reviews like ratings, text, and votes. And product data like details, category, price, brand, and image. Important information are extracted from the dataset.

7.2 PRE-PROCESSING:

The procedure of cleaning and preparing the text for classification is known as pre-processing the data. Online writings typically have a lot of background noise and useless information such as HTML tags, scripts, and commercials. Noise will be removed with the help of preprocessing, so that classification procedure will be easier. Preprocessing includes online text cleaning, white space removal, extending abbreviations, stemming, stop word removal and feature selection [21].

7.3 FEATURE EXTRACTION:

Feature extraction is the process of extracting information from unstructured data and eliminating all irrelevant aspects [19]. Customers that shop online look for products based on specific attributes. For e-tailers and marketplaces, the ability to quickly and easily identify the ideal product can be a key difference in the market that influences sales and conversions. Various methods are used in feature extraction. Feature pattern mining with association rule, finding similar patterns allows us to group items with a high degree of correlation and quickly spot shared traits and correlations. Term Document Matrix, in Term Document Matrix text data will be converted into mathematical matrices. In which the rows represents the sentences and columns represents the word. From the matrix it is easy to get the occurrence of each word. The importance of word can be selected with the help of TF-IDF. The TF-IDF assists in counting the word's occurrences and concentrates on the term's relevance. Researchers can exclude terms with low scores by isolating the most frequent words.

7.4 CLASSIFICATION ALGORITHMS :

LOGISTIC REGRESSION: Logistic regression is a machine learning algorithm, and it is under the category of supervised learning techniques. An approach for predictive analysis used for categorization issues is logistic regression. The idea of probability serves as its foundation. It can be used to classify positive and negative comments from the feedback. From the input of term frequency integer vectors, the function logistic regression () can be used to forecast the precision of sentiment categorization [22].

NAIVE BAYERS: It operates according to the Bayes theorem's definition of conditional probability. Basically, the Bayes theorem determines the conditional probability of an event occurring based on

knowledge of possible conditions that may be connected to the event. Customer buying patterns can be predicted with the help of Naïve bayes in e-commerce websites.

RANDOM FOREST: A popular ensemble of decision trees used in classification is called Random Forest. Random Forest frequently displayed a strong performance that surpasses that of many other classification methods. RF must build numerous separate decision trees to function as a decision tree ensemble. Each tree is constructed with a bootstrap sample set of the initial training data in mind to achieve that. This entails building a new set sampling from the previous set's replacement instances until the size of the original training data is obtained. A random tree is created using one of the training data's bootstrap sample sets [23].

8. THE IMPACT OF BUSINESS INTELLIGENCE ON E-COMMERCE WEBSITE USING ABCD FRAMEWORK :

E-commerce has made doing business more affordable. The benefit of an e-commerce website is that it can reach more customers, regardless of time or distance constraints. Better decision-making is the goal of business intelligence. Business intelligence makes it possible for web designers and users to understand the insights of e-commerce online apps. Any business model's ability to be successful depends on how a company determines its place in the value chain and how it generates profits. As a result, enterprises are currently challenged with finding viable business models that will increase customer value and create money. Advantages, Benefits, Constraints, and Disadvantages are abbreviated as ABCD [24]. The most effective way to learn new lessons needed to recognise, comprehend, and resolve issues that arise during the process of managing and leading firms is said to be through company analysis. ABCD analysis can be used as a research methodology in company analysis [25]. ABCD frameworks can be used efficiently in various fields of research [26-29].

ADVANTAGES: There has been a surge in electronic commerce, sometimes known as e-commerce, as a result of increased Internet usage. The challenge of such e-commerce companies is to find relevant information from a huge amount of data. Leading e-commerce websites like Amazon and Flipkart are accumulating large amounts of customer data like feedback, reviews, product descriptions, etc. Finding a positive response is very essential to taking any decision. The combination of business intelligence and machine learning techniques makes it easier. The combination of e-commerce and business intelligence are a very potent combination that aids website owners in a variety of tasks, including defining consumer-targeted marketing campaigns, identifying market trends, locating buying habits, and predicting customer behavior [8].

BENEFITS: Financial stability of the industry can be improved by applying Business Intelligence techniques. It is possible by tracking customers and their interest. Suggesting products based on customer interest can be attained with the help of business intelligence. It is possible to find out which product and service combinations clients are most likely to buy, and when. Additionally, it can enhance customer satisfaction by enabling prompt and appropriate responses to client concerns and priorities [6].

CONSTRAINTS: For many firms, the expense of setting up a sizable data warehouse to support a BI system is still prohibitive [30]. Data utilization and capacity to store more data can be achieved by integrating BI with the cloud storage concept.

DISADVANTAGES: Filtering data from a large dataset is difficult. Gathering data with respect to time and resources is tedious. It is possible to manipulate data in a way that distorts the truth. The daily operations of the modern organization involve the extraction of enormous amounts of data from a wide range of databases and business applications, both on-premise and in the cloud. This makes data integration extremely challenging for users.

9. CONCLUSION :

There are many e-commerce websites like Amazon, Flipkart, Snapdeal, etc. As the number of users increased due to the wide availability of the internet, the companies started attracting their customers in various ways. Business intelligence and machine learning make it easier. Almost all businesses use business intelligence because of its decision-making capabilities. Growth of the industry is completely based on what customers might want and their buying patterns.

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