



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** VIII **Month of publication:** August 2026

DOI: <https://doi.org/10.22214/ijraset.2026.84706>

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Sentiment Analysis of Online Customer Reviews to Optimize Marketing Strategies in the E-Commerce Industry

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Abstract: *The present study observes the ideas, feelings, and shopping experiences that shapes consumers decision through online reviews within the fast-expanding e-commerce space. These days, evaluations have a significant impact on consumer decisions, brand perception, and customer trust. The authors wanted to look beyond surface-level star ratings and try to understand the mood, the frustrations, and the small wins that shape how consumers feel about brands. Two major e commerce players were studied for this analysis viz, Flipkart, Meesho representing affordable items. Both of this player operates in a slightly different niche, yet both share the same challenge: earning trust in a market where loyalty shifts quickly. For the practical side of this study, author pulled product reviews and star ratings from a publicly available Kaggle dataset. The reviews which were focused on covered electronics, fashion, lifestyle products, and cosmetics. These categories were analysed because written feedback tends to influence how buyers make decisions in these segments- a single negative review about a phone's battery life or a foundation shade mismatch can genuinely push someone toward a competitor.*

Authors used Python for the sentiment analysis of reviews collected from Kaggle for the analysis. For data cleaning and manipulation, Pandas library was used to filter rows, handle missing values and reshape the columns. A lot of the early preprocessing work dropping duplicates, normalizing the review text, and cutting columns that weren't going to matter for the analysis happened directly in Pandas. TextBlob was used to generate polarity scores and then split each review into positive, neutral, or negative based on where the score landed. Matplotlib and Seaborn were used for analysis of sentiment percentages across five platforms. This study reinforces that sentiment analysis is genuinely useful online shoppers and retailers- who want to stay close to what their customers actually feel. Going through customer evaluations helps a business see what is working, where the product or service is falling short, and how marketing messages can be shaped to speak to real concerns rather than assumptions.

Keywords: *Sentiment Analysis, Online Customer Reviews, Natural Language Processing (NLP), Python, customer Sentiment, Customer Satisfaction, Marketing Strategies, Customer Targeting, Customer Behaviour, Product Quality, Pricing, Delivery, Customer Service.*

I. INTRODUCTION

Today's e-commerce landscape is far more layered than that early version. The space now covers several business models working alongside each other. B2C, or business-to-consumer, remains the most familiar-it is the Amazon or Flipkart model where a company sells directly to individual buyers. B2B transactions happen between businesses, often for raw materials or bulk supplies. C2C covers peer-to-peer selling, the kind of thing Meesho built its early growth on, where individuals sell to other individuals through a platform. D2C, or direct-to-consumer, is the newer entrant where brands cut out the marketplace middleman and build their own relationship with the buyer through their own website or app. Quick-commerce platforms promise deliveries in ten to fifteen minutes. Digital payment systems like UPI have made checkout almost frictionless. Logistics networks have expanded into tier-2 and tier-3 cities in ways that would have been unthinkable five years ago. Fintech solutions power everything from buy-now-pay-later offers to instant refunds. Worldwide e-commerce sector has experienced tremendous growth in the past ten years due to a number of factors, including an increase in the number of people using the internet, a rise in smartphone usage, ongoing technological developments, and the simplicity with which online payments may be made. Research says the global e commerce market stands at roughly \$39.7 trillion in 2026, growing at a compound annual rate near 21.6% through 2033. Estimates for the size of India's e-commerce market in 2026 range from around \$147 billion to \$163 billion. Most projections show it will converge somewhere between \$170 billion and \$350 billion by 2030. India is on track to become the world's third-largest e-commerce market, trailing only the United States and China.

II. LITERATURE REVIEW

Sharma and Verma (2023), in their study “*Sentiment Analysis of Flipkart Product Reviews Using Machine Learning*,” apply TF-IDF with Naïve Bayes and SVM classifiers to identify positive and negative sentiments in product reviews, reporting that SVM achieved 85% accuracy. Similarly, Iyer and Reddy (2021), in “*Opinion Mining on Amazon India Reviews Using Hybrid Model*,” combine lexicon-based and machine learning approaches to improve classification performance, though they highlight limitations in sarcasm detection. Menon and Krishnan (2021) utilize CNN with GloVe embeddings in “*Sentiment Classification of Indian E-Commerce Reviews Using CNN*,” achieving 88% accuracy and demonstrating the superiority of deep learning over traditional ML models. Singh and Kulshreshtha (2023) further extend this work by comparing Naïve Bayes, SVM, and Random Forest for Amazon mobile reviews, identifying key sentiment-driving features such as battery and price. More recently, transformer-based approaches such as Mishra and Jain (2024) and Natarajan and Bose (2024) employ BERT and hybrid Transformer-LSTM architectures, achieving accuracy levels above 93%, thereby marking a transition from conventional ML to contextual deep learning models. Despite these advancements, most studies lack real-time deployment frameworks and multilingual robustness, indicating the need for scalable and production-ready sentiment engines.

Gupta and Nair (2022), in “*Consumer Purchase Intention Prediction in Indian E-Commerce Using Deep Learning*,” apply LSTM and ANN models to predict buying intentions, demonstrating 89% predictive accuracy but acknowledging the absence of sentiment-sales linkage. Malhotra and Arora (2022), through regression and sentiment scoring techniques, establish a strong positive relationship between online reviews and purchase intention. Agarwal and Sen (2022) further validate this relationship using Structural Equation Modeling, confirming that ratings significantly influence consumer decisions. Goyal and Nanda (2022), in their work on consumer trust modeling, identify trust as strongly correlated with positive sentiment and review transparency. Similarly, Sharma and Khan (2022) observe that discounts and ratings significantly shape buying behavior in the electronics segment. These studies collectively emphasize that sentiment, ratings, and trust mechanisms directly impact consumer behavior; however, limited integration of advanced predictive ML models and textual sentiment signals restricts a holistic understanding of trust-driven purchase dynamics.

Rao and Thomas (2024), in “*Deep Learning-Based Sentiment Analysis for Myntra Reviews*,” employ Bi-LSTM with Word2Vec embeddings and achieve 91% accuracy, demonstrating improved contextual understanding. Desai and Pillai (2024) enhance this further using attention mechanisms, reaching 92% accuracy. Kapoor and Sinha (2023), through aspect-based sentiment analysis, improve sentiment granularity by 20%, enabling fine-grained prediction of product attributes. Kaur and Bhatia (2022) apply XGBoost for predictive modeling of shopper behavior, achieving 91% accuracy, while Rajput and Iqbal (2022) compare SVM, ANN, and XGBoost for purchase intention prediction, identifying XGBoost as the most efficient model. Bhattacharya and Roy (2022) extend predictive analytics to churn modeling with 90% accuracy using XGBoost. Although these studies demonstrate high predictive performance, challenges such as computational cost, cross-domain validation, real-time adaptability, and integration of multilingual datasets remain prominent research gaps.

Joshi and Bansal (2023), in “*AI-Driven Marketing Intelligence in Indian E-Commerce*,” propose a hybrid ML framework integrated with business intelligence dashboards to improve campaign targeting efficiency. Krishnan and Dutta (2023) develop a marketing intelligence dashboard using sentiment analytics to enhance campaign performance monitoring, while Arora and Bedi (2023) demonstrate that sentiment-driven targeting improves click-through rates by 17%. Ghosh and Banerjee (2023) correlate sentiment scores with brand equity indices, showing that positive sentiment significantly enhances brand perception. Srivastava and Gupta (2023) analyze social commerce sentiment trends and emphasize the importance of linking engagement metrics with revenue conversion. However, most studies do not establish a concrete sentiment-to-revenue pipeline, lack predictive revenue modeling, and fail to integrate customer lifetime value metrics. Consequently, there is a growing need to develop integrated decision support systems that combine sentiment analytics, behavioral prediction, and financial performance indicators to enable strategic marketing decision-making in Indian e-commerce platforms.

III. RESEARCH GAP

Although extensive research has been conducted on sentiment classification, consumer purchase behavior, in Indian e-commerce, several critical gaps remain unaddressed. Most research focuses on improving model accuracy using techniques like SVM, CNN, LSTM, but it often stops at classification results without linking sentiment insights to real business outcomes such as revenue growth, customer lifetime value, or return on investment. In addition, areas like sarcasm detection and cross-platform validation receive limited attention, reducing the practical effectiveness of these models. Existing marketing intelligence systems also lack a complete decision-support pipeline that converts sentiment findings into clear, actionable strategies.

Therefore, there is a strong need for a unified, real-time framework that integrates sentiment analysis with behavioral prediction and marketing performance analytics to support smarter strategic decision-making in Indian e-commerce.

IV. OBJECTIVES OF THE STUDY

- 1) To analyze online customer reviews in the e-commerce industry using sentiment analysis techniques to identify overall customer sentiment.
- 2) To assess how insights derived from customer sentiment can be used to optimize marketing strategies including customer target and service improvement in the e-commerce industry.

V. RESEARCH METHODOLOGY

A. Research Design

The study adopts a descriptive and analytical research design, focusing on understanding customer sentiment patterns and their implications for marketing strategies in the e-commerce industry. It incorporates both qualitative and quantitative research methods to ensure a comprehensive analysis. The qualitative approach is used to interpret textual customer reviews, identify recurring themes, and understand contextual meanings behind customer opinions. The quantitative approach is applied to measure frequency distribution, trend patterns, and statistical relationships between sentiment and key marketing variables.

B. Data Collection & Sampling Technique

Secondary data is used for the study. Online customer reviews are collected from Kaggle. Reviews related to products, services, delivery, and overall experience are considered. Convenience sampling is applied due to accessibility of online review data. A representative sample of customer reviews is selected for analysis.

C. Tools & Techniques Used

Sentiment analysis using text mining and Natural Language Processing (NLP) techniques. Reviews are classified into positive, neutral, and negative sentiments. Basic text preprocessing methods such as tokenization, stop-word removal, and sentiment scoring are applied.

VI. DATA ANALYSIS

Sentiment trends and patterns are analyzed to identify key drivers of customer satisfaction and dissatisfaction. Following code were used for analysis using Python Visual Studio.

```
df = pd.read_csv("Flipkart_cleaned_output.csv")  
df = pd.read_csv("Meesho_Final_cleaned_Output.csv")
```

Further following coding was applied which was same for both the companies:

A. Import Libraries

```
import pandas as pd  
    • Imports pandas library and renames it as pd.  
    • Used to read and handle dataset (DataFrame).  
from textblob import TextBlob  
    • Imports TextBlob for sentiment analysis.  
    • Helps calculate polarity (positive/negative score).  
import matplotlib.pyplot as plt  
    • Imports plotting library.  
    • plt is used to create graphs.
```

B. Load Dataset

```
df = pd.read_csv("Flipkart_cleaned_output.csv")  
    • Reads CSV file and stores it in variable df (DataFrame).  
print(df.head())
```

- Displays first 5 rows of dataset.
- Helps understand structure and columns.

C. Create Sentiment Function

def get_sentiment(text):

- Defines a function named get_sentiment.
- Takes review text as input.

analysis = TextBlob(str(text))

- Converts text into TextBlob object.
- str(text) ensures input is string.

return analysis.sentiment.polarity

- Returns polarity score:
 - o 4,5 → Positive
 - o 3 → Neutral
 - o 1,2 → Negative

D. Apply Sentiment Function

df['Sentiment Score'] = df['review'].apply(get_sentiment)

- Applies function to each review.
- Creates new column

E. Sentiment Score

Presented below is the graph of Flipkart and Meesho showing sentiment analysis of customer review “all_flipkart_product.csv” and “all_meesho_product.csv” for both the e commerce platforms.

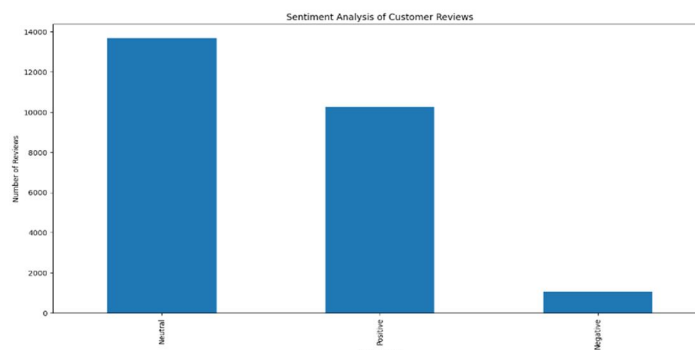


Figure VI.1: Flipkart Customer Review Sentiment Analysis

The bar graph titled "Sentiment Analysis of Customer Reviews of Flipkart" illustrates the distribution of customer reviews into three sentiment categories: Positive, Neutral, and Negative. Among these, the Neutral category has the highest number of reviews, with approximately 13,500 responses. The Positive category follows with around 10,000 reviews, while the Negative category has the lowest count, with nearly 1,000 reviews. The graph shows that most customers provide neutral feedback, while a significant number express positive opinions and only a small percentage report negative experience.

The sentiment analysis indicates that customers generally have a favorable perception of the platform, as positive reviews are much higher than negative reviews. The large number of neutral reviews suggests that many customers share factual or descriptive feedback without expressing strong positive or negative emotions. The relatively low number of negative reviews reflects a satisfactory customer experience and good overall service quality. These findings suggest that the platform has maintained a positive reputation among customers while also highlighting opportunities to further understand and convert neutral customer experiences into positive ones.

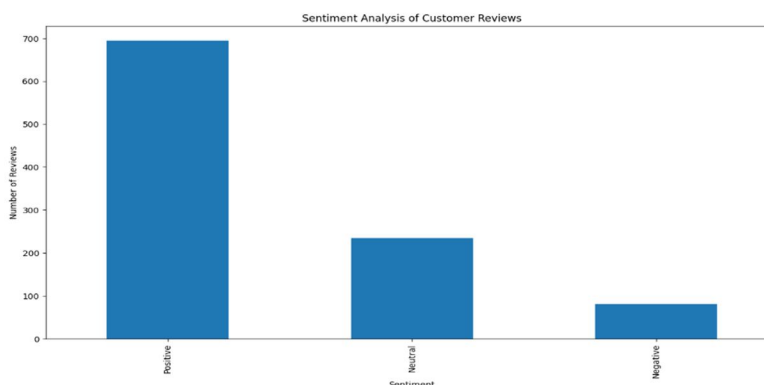


Figure VI.2: Meesho Customer Review Sentiment Analysis

The bar graph titled "Sentiment Analysis of Customer Reviews for Meesho" presents the distribution of customer reviews across three sentiment categories: Positive, Neutral, and Negative. The Positive category has the highest number of reviews, with 694 responses, indicating that most customers shared favorable opinions about their shopping experience. The Neutral category contains 234 reviews, representing customers who provided general or descriptive feedback without expressing strong emotions. The Negative category has the fewest reviews, with only 81 responses, showing that a relatively small number of customers reported dissatisfaction. Overall, the graph demonstrates that positive sentiment is the most dominant among Meesho customers.

Meesho has maintained a positive customer perception while still having opportunities to improve its services and convert neutral experiences into positive ones.

The sentiment analysis shows that Meesho has received an overall positive response from its customers. The large number of positive reviews indicates that customers are generally satisfied with the platform's products, pricing, and services. The presence of neutral reviews suggests that some customers shared their experiences without expressing strong positive or negative opinions. The comparatively low number of negative reviews reflects fewer customer complaints and indicates a satisfactory shopping experience. Overall, the findings suggest that Meesho has maintained a positive customer perception while still having opportunities to improve its services and convert neutral experiences into positive ones.

VII. CONCLUSION

The study found that sentiment analysis is an effective tool for understanding customer opinions and identifying factors that influence customer satisfaction, including product quality, pricing, delivery services, customer support, and overall shopping experience. Positive customer sentiment is mainly driven by timely delivery, affordable pricing, a wide variety of products, secure payment options, and efficient customer service. These factors help improve customer satisfaction, loyalty, and repeat purchases. Negative customer sentiment is generally associated with delayed deliveries, poor product quality, refund issues, misleading product descriptions, and inadequate customer support. These issues can reduce customer trust and negatively affect business performance. By analysing online customer reviews, businesses can identify customer expectations, evaluate service quality, improve product offerings, and make better marketing decisions based on customer feedback.

VIII. LIMITATIONS OF THE STUDY

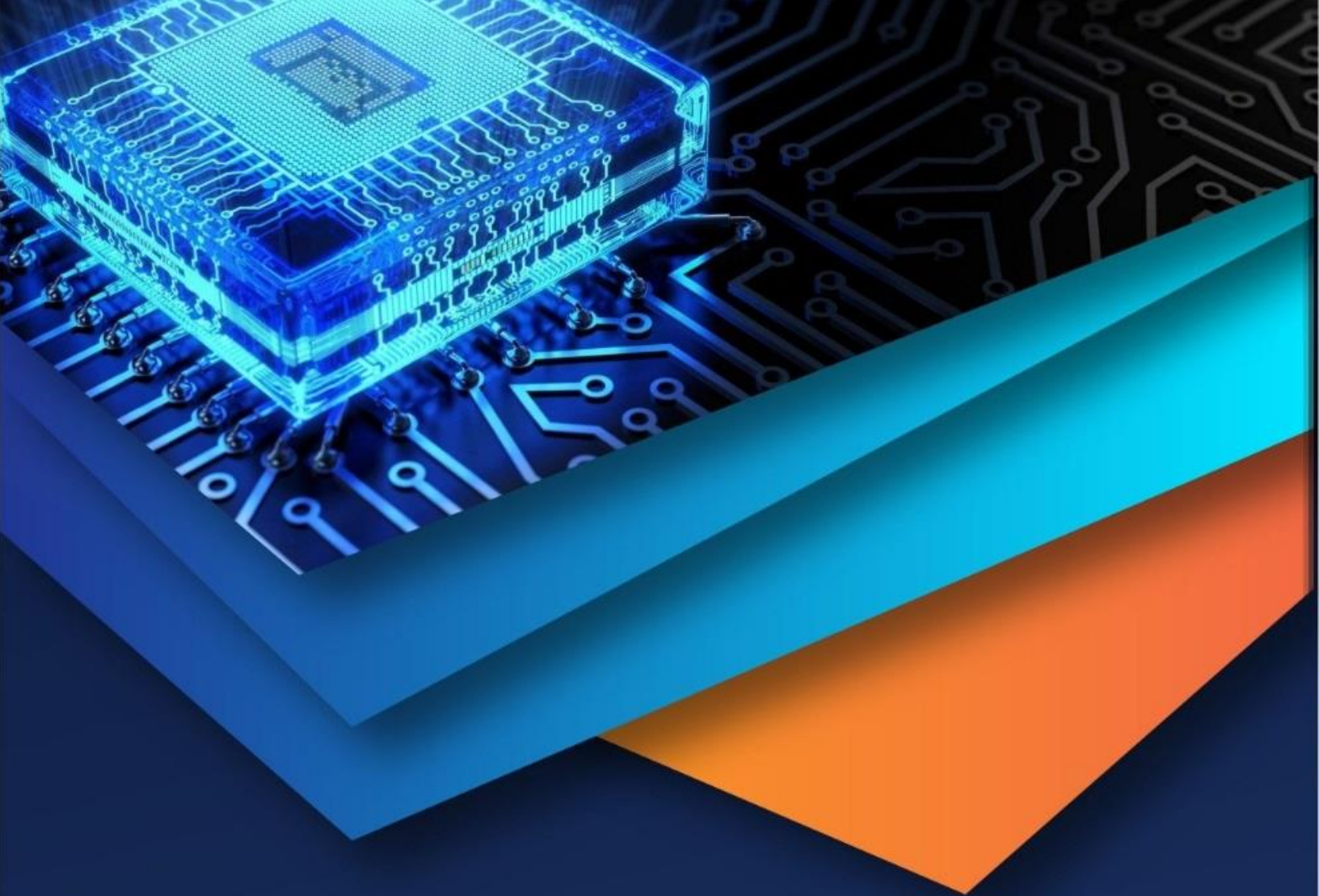
The study relies solely on **secondary data**, which may include biased or fake reviews. Sentiment analysis may not fully capture sarcasm, irony, or contextual meanings in customer reviews. The study is limited to textual review data and does not include numerical ratings or direct customer surveys. Language diversity in reviews may affect accuracy if multilingual sentiment analysis is not fully applied.

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