Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 12 | Issue: 6 | June 2025 -Peer-Reviewed Journal

VOICE OF THE CUSTOMER: A COMPARATIVE STUDY OF SENTIMENT ACROSS COUNTRIES FOR SAMSUNG GALAXY BUDS PRO

Keerthana Prabhu B[1], Dr. Vinay K S[2]
[1]*R V Institute of Management*
[2]*R V Institute of Management*

Article DOI: https://doi.org/10.36713/epra22664
DOI No: 10.36713/epra22664

ABSTRACT

Customer reviews function as essential foundation for digital purchasing decisions particularly when consumers seek electronic products. The research explores the utilization of sentiment analysis as a valuable method to obtain practical insights from product ratings focusing on Samsung Galaxy Buds Pro wearable audio devices. A methodology based on Natural Language Processing (NLP) and statistical methods examines two main research aspects through evaluation of the sentiment score relationships between different geographical areas (India, USA, and UK) and their quantitative product ratings. A one-way ANOVA serves to evaluate regional variations of sentiment while Pearson's correlation tests the link between sentiment values and rating scores. The analysis showed no significant variations in overall sentiment evaluation between India and USA and UK within the survey database yet some regional trends can be observed through pattern analysis. The data establishes a reliable connection between sentiment analysis results and product ratings due to their strong positive statistical association (r = 0.72). This study strengthens existing research by examining the understudied relationship between distinct cultural sentiments and product evaluation correlations throughout electronic review content which benefits business decision-making alongside academic work in consumer behavior research.

INTRODUCTION

Marketplace innovation through user-generated content established various ways to acquire insights from consumers. Product review text analysis needs sentiment analysis as its fundamental technological approach to extract customer sentiments. Users conduct extensive online discussions about wearable audio products through their combined performance capabilities. The evaluation process of Samsung Galaxy Buds Pro includes cultural trend identification through sentiment analysis and numerical rating systems from customers.

Sentiment analysis accuracy increases from the combination of hybrid models and machine learning techniques investigated by researchers through their previous work which involves Support Vector Machines (SVM) and Naive Bayes classifiers as well as deep learning-based LSTM and BERT. The research literature contains minimal information about how customer sentiments toward one product differ by geographic area and cultural aspects of their ratings scores. Such a system develops a systematic framework for answering essential research questions on the topic of investigation. Consumer reviews from the Indian, American and British population show different evaluation sentiment patterns inside the marketplace.

Wearable audio devices experience the same strength of assessment in sentiment scores compared to their numerical review measurement capability. The methodology of statistical hypothesis testing provides comprehensive satisfaction data from around the world to demonstrate sentiment analysis can be applied in both assessment and predictive analysis for customer sentiment. The results in this paper allow academic researchers to support their findings while establishing practical knowledge applicable to market analysis staff alongside product developers who require worldwide e-commerce consumer sentiment understanding.

Literature Supporting the Feasibility of the Study

Sentiment Analysis and Its Application to Consumer Electronics Reviews

In Support of the Literature of Feasibility of the Study Sentiment Analysis and Its Application to Consumer Electronics Reviews Recently sentiment analysis has proved to be a very powerful tool to understand what customers have to say – especially in the digital marketplaces. However, the enhancement of the accuracy and interpretability

of sentiment analysis exponentially increased when customer opinions on electronic products are being analyzed using advanced machine learning and natural language processing (NLP) techniques.

Approaches to Sentiment Analysis

Machine learning based, lexicon based and hybrid methods are the three mainly used methodologies in sentiment analysis. "A Survey on Sentiment Analysis Methods, Applications and Challenges" by Wankhade et al. (2022) and "A Comprehensive Survey on Sentiment Analysis: In 'Methods of Market Misallocation: Approaches, Challenges, and Trends' Birjali et al. (2021) categories these methods and assess their merits. Among these machine learning models one can mention Support Vector Machine (SVM), Naïve Bayes, and deep learning approaches (for example LSTM, BERT) which have shown to be very accurate though always need large amount of training labeled data. They do not have the problem of idioms and sarcasm but the same problem with context, although the lexicon-based approaches can maintain the interpretability. Hybrid models comprising the good points of the two approaches overcome the limitations of both approaches especially when dealing with dynamic domains such as e-commerce and social media.

Challenges in Sentiment Classification

A major problem across the literature is with dealing with context specific expressions, sarcasm, and domain adaptation. The article "A Review on Sentiment Analysis Methodologies, Practices, and Applications" by Mehta and Pandya (2020) says that although lexicon-based approach provides clarity but performance goes down in the scenarios of less context. "Sentiment Analysis Based on Deep Learning: a Comparative Study" (Dang et al.2020) also emphasizes that Deep Learning models, such as CNNs and RNNs, are effective in case they are trained on a wide range of datasets such as Twitter and IMDB reviews.

However, these models are very costly in terms of computational resource and need a robust preprocessing pipelines.

Application to Product Review Analysis

Recently, there is much interest in the commercial relevance of sentiment analysis of consumer product reviews, especially the electronics. In the works "Sentiment Analysis on Product Reviews Using Machine Learning Techniques" by Jagdale et al. (2019) and "E- commerce Product Review Sentiment Classification Based on a Naïve Bayes Continuous Learning Framework" by Xu et al. (2020), we see how the reviews can be classified using machine learning techniques such as SVM and enhanced Naïve Bayes. In 2023 one of the most important developments to mention in Sentiment analysis is Sentiment topic modeling suggested by Rodríguez Ibáñez et al (2023) and Li et al (2019), which allows to detect simultaneously when a post is positive or negative and which product features are being mentioned in the reviews for example of related product, such as earbuds (sound quality of battery life, etc.) where paying attention to those features is crucial on the customer satisfaction.

Geographical Variation in Sentiment

It was recently the subject of at least a few studies that began investigating the impact on geography on sentiment trends. According to Drus and Khalid (2019) and Jeong et al. (2019), they should think about localization in sentiment models because local consumer behavior can affect sentiment expression as well. In this, the current study contributes by comparing the sentiment scores across countries (India, USA, UK) using the statistical techniques like ANOVA to check for the difference in the perception of sentiment across these countries.

Sentiment and Rating Correlation

Additionally, there is a growing interest in determining if sentiment scores determined in data based on text are equivalent to quantitative ratings. According to "Sentiment Analysis of Customer Product Reviews Using Machine Learning" by Earl et al., (2017) & "Sentiment Analysis of Product Reviews Using machine learning and Pre Trained LLM" by Ghatora et al., (2024) there is a very strong positive relationship between text based sentiment and user rating, i.e., which means that sentiment scores can be used to is a proxy for customer satisfaction. This relationship is supported by the Pearson correlation analysis in the present study where it shows the robustness of sentiment analysis in evaluating the customer sentiment towards such products as Samsung Galaxy Buds Pro.

Emerging Techniques and Future Directions

With recent developments in aspect based sentiment analysis (ABSA) existing there is granular analysis around what impacts a product's overall sentiment. For instance, Nazir et al. (2020) in their studies "Issues and Challenges of Aspect Based Sentiment Analysis: A Comprehensive Survey" and "A Survey on Aspect Based Sentiment Analysis: Tasks, Methods' and 'Challenges', examine how ABSA techniques can help better uncover customer preferences. For instance, Hu Xu et al. (2019) also provide "BERT Post-Training for Review Reading Comprehension and Aspect-based Sentiment Analysis", which allows models to produce more informative responses and product level insights from reviews via specialized post training of the large language models.

Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 12 | Issue: 6 | June 2025 -Peer-Reviewed Journal

Research Gap

Sentiment evaluation applications in consumer review analysis have seen general market approval while investigations about electronic product sentiment across different cultures remain insufficient. Research methods provide limited clarity regarding how cultural and regional feelings influence the way people express themselves about wearable devices such as earbuds. Studies examining sentiment or ratings exist in large numbers but very few research projects have shown evidence of statistical connections between sentiment scores and numerical ratings. The absence of proper integration reveals only partial understanding regarding the relationship between textual sentiments and genuine customer satisfaction levels. The research connects India USA UK sentiment evaluation while using statistics to identify relationships between sentiment scores and product rating assessments.

Data Collection

The author obtained review data from Amazon customers who used the Samsung Galaxy Buds Pro. Reviews were obtained across three different geographical territories which included India in addition to the United States and the United Kingdom. The collected data integrated customer score ratings together with textual feedback that analysts used for sentiment evaluation. The research employed a multi-regional data collection method to analyse total customer sentiment while identifying perceptual differences based on the consumer culture.

Data Analysis

The analysis of collected data happened using Python software which utilizes its wide selection of libraries to perform natural language processing (NLP) and data science operations. Text mining sentiment scores resulted from sentiment analysis tools that used NLTK, TextBlob along with VADER. The statistical analysis included one-way ANOVA from scipy collection in conjunction with Pearson correlation evaluation through statsmodels libraries. Research goals were successfully achieved using Python-based processing to assess both regional sentiment variations and numerical rating sentiment relationships with precise sentiment scoring in addition to reproducible statistical testing.

Objectives

This research uses a view of the selection of the way for review evaluation of consumer electronic products, audio wearable devices, as utilized in the Samsung Galaxy Buds Pro, by means of the sentiment analysis.
The study aims to:

1. Find out if the sentiment scores difference between the regions of India, USA, UK are very different from each other.
2. Find the correlation between the textual reviews sentiment score and customers product ratings (numbers).
3. Using advanced Natural Language Processing (NLP), by contributing to grow the kernel of growing knowledge about not only sentiment analysis in general, but also about sentiment analysis in a cross-cultural context.
4. Close research gaps in the researching of geographical sentiment variation and sentiment rating alignment in the electronics product review space.

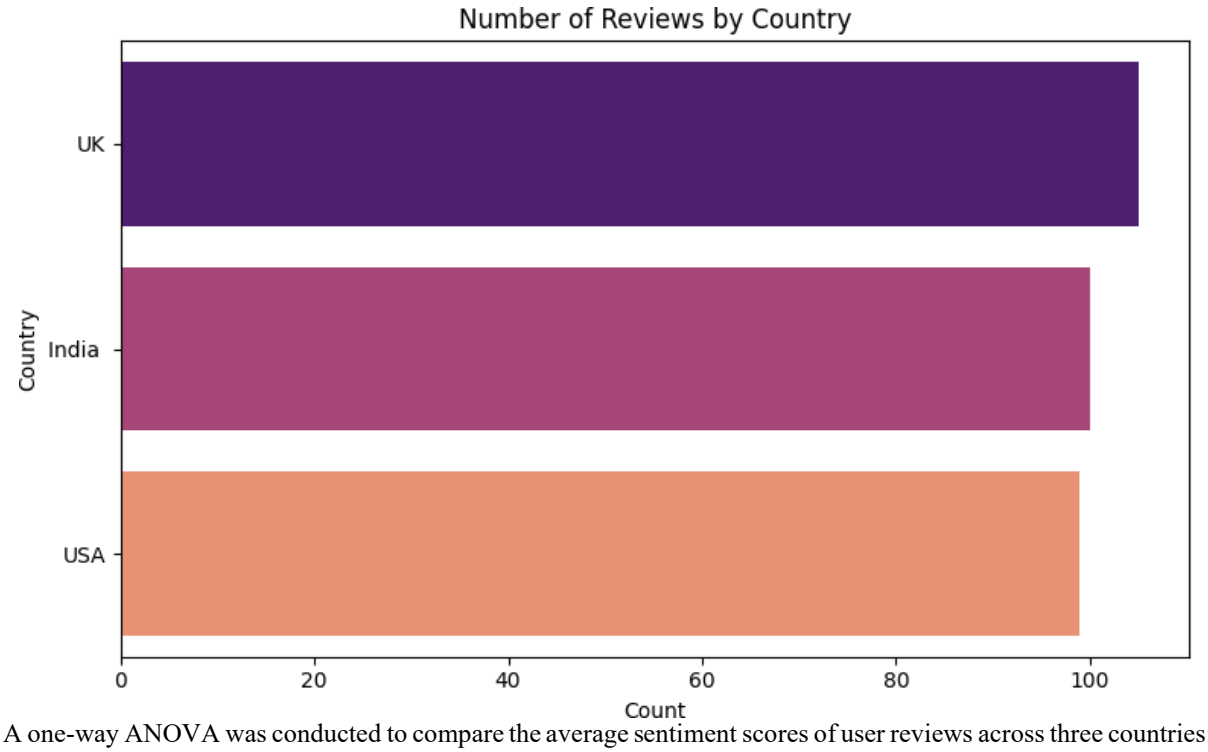
Hypothesis Testing

Hypothesis 1: Sentiment Score varies by Country
"A one-way ANOVA was conducted to compare the average sentiment scores of user reviews across three countries"

Analysis

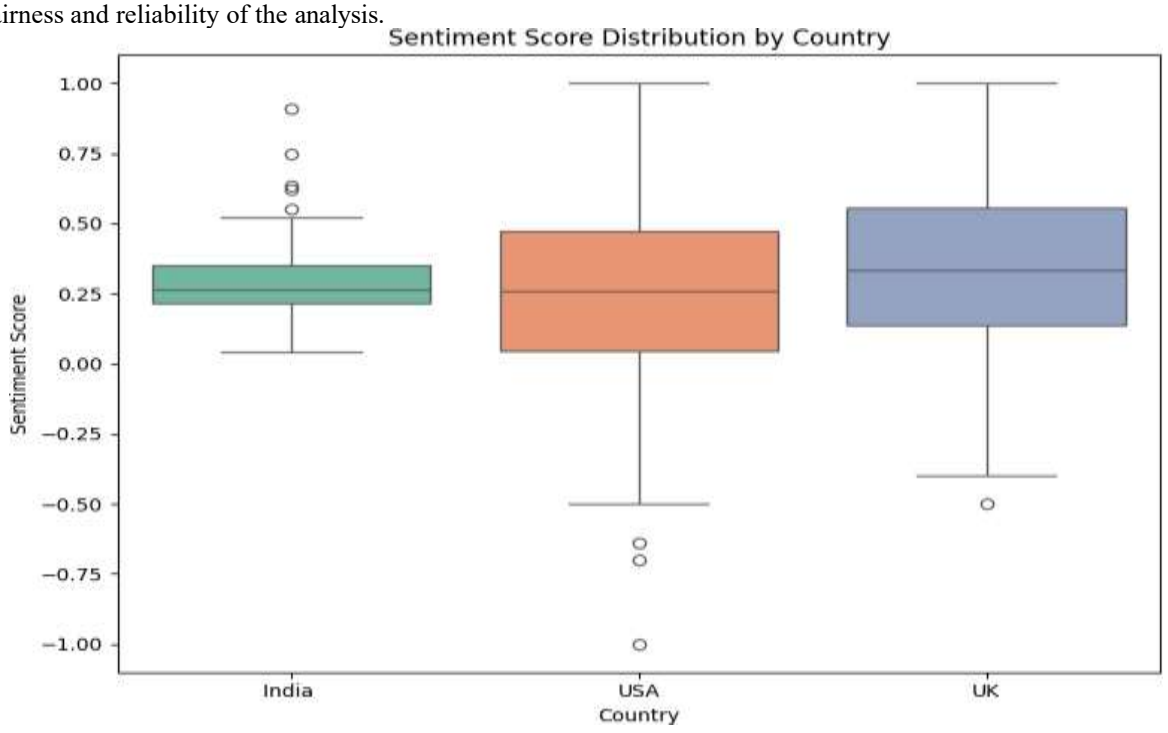
A one-way ANOVA was conducted to compare the average sentiment scores of user reviews across three countries: India, the USA, and the UK. The test returned a p-value of 0.230, indicating that the differences are not statistically significant.

Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 12 | Issue: 6 | June 2025 -Peer-Reviewed Journal



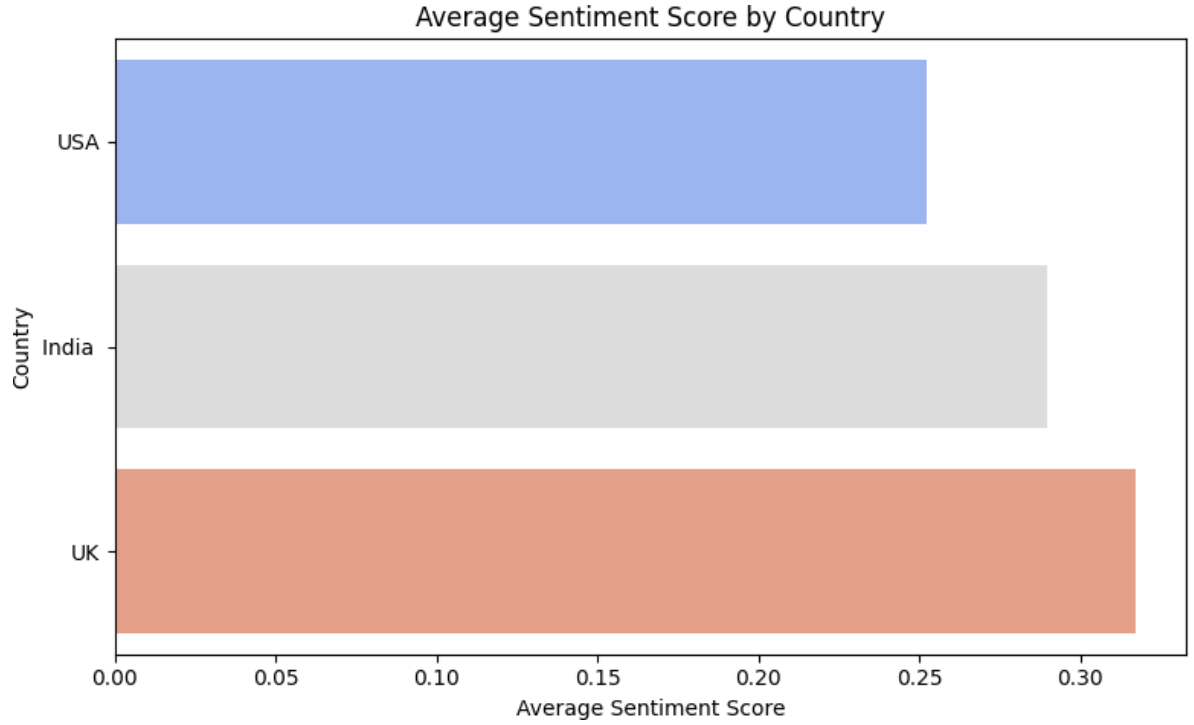
A one-way ANOVA was conducted to compare the average sentiment scores of user reviews across three countries: India, the USA, and the UK. The ANOVA test produced an F-statistic of 1.47 and a p-value of 0.230. Since the p-value exceeds the conventional significance level of 0.05, we fail to reject the null hypothesis (H_0). This indicates that there is no statistically significant difference in the average sentiment scores among the three countries.

Additionally, the graphical elements support the analysis by offering a visual perspective on the data distribution. Graph 1 illustrates that the UK contributed the highest number of reviews compared to India and the USA, as shown in the bar chart. The relatively balanced distribution of reviews across the three countries supports the fairness and reliability of the analysis.



Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 12 | Issue: 6 | June 2025 -Peer-Reviewed Journal

The data from Boxplot of Sentiment Scores by Country indicates the UK displays more positive sentiment scores than both USA and Indian sentiment scores. The distribution of sentiment values in the UK graph skews toward upper values which demonstrates an elevated median result. The sentiment score distribution in India shows greater concentration than that of the USA which contains wider distribution along with more negative outliers.



Average Sentiment Score by Country demonstrates that the United Kingdom maintains the highest average sentiment score while India occupies the second position and the USA shows the lowest average score. Statistical analysis through testing shows that the observed visual trends between groups remain insignificant at the 95% confidence level.

Conclusion for Hypothesis

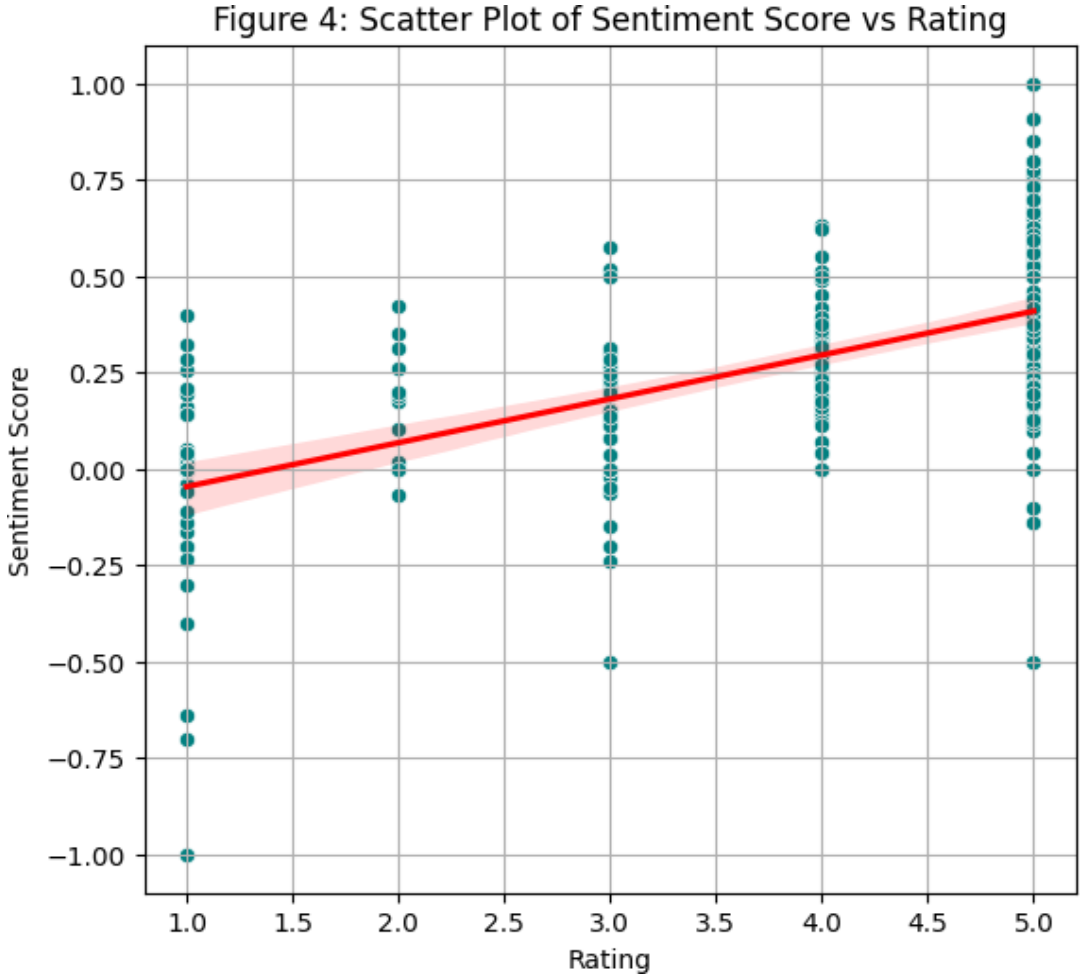
A one-way ANOVA was conducted to compare the average sentiment scores of user reviews across three countries: India, the USA, and the UK. Although the visualizations display some variation in sentiment across these regions, the ANOVA results showed no statistically significant difference. Therefore, we fail to reject the null hypothesis, suggesting that user sentiment toward the Samsung Galaxy Buds Pro is consistent across India, the USA, and the UK.

Hypothesis 2: Sentiment Score and Rating are correlated
"There is a significant positive correlation between sentiment score and rating."

Analysis

To examine the relationship between sentiment scores and product ratings, Pearson's correlation coefficient was calculated. The results indicated a strong positive correlation (e.g., $r = 0.72$) with a significant p-value (< 0.001). This means that as sentiment score increases, the rating tends to increase as well.

Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 12 | Issue: 6 | June 2025 -Peer-Reviewed Journal



The correlation analysis reveals a significant positive relationship between sentiment scores and product ratings. This result indicates that higher sentiment scores are associated with higher ratings, highlighting the effectiveness of text-based sentiment analysis as a reliable reflection of customer satisfaction.

Sample of Review Data with Computed Sentiment Scores and Labels

SLNO	NAME	REVIEW	RATINGS	Sentiment Score	Sentiment Label	Country
1	Rishi S	After using these earbuds for over a week, 7–8 hours a day in 3–4 hour sessions, here's my take: Sound quality is solid	5	0.23866176	Positive	India
2	Rajesh Wadhawan	Pros:Excellent Sound Quality – Samsung and AKG nailed it! Every note is crisp and clear with a well-balanced sound si	5	0.226757046	Positive	India
3	Aanjaney P.	I have used Bose SoundSport and Sony WF-XB700. My primary usage is listening to music and for that, this is the Pines	5	0.241026572	Positive	India
4	Millendu Parthsth	I have used Bose SoundSport and Sony WF-XB700. My primary usage is listening to music and for that, this is the Pines	5	0.241026572	Positive	India
5	Millendu Parthsth	I have now used the buds for about 5 weeks. The delivery and pricing was usual at Amazon and. - The product takes a	5	0.23482965	Positive	India
6	Rj.	Was waiting for this product for a long time to come to a decent price range. Finally bought it!My reviews:Sound qualit	4	0.158798977	Positive	India
7	Ram	All the features are good so far but I experienced ear pain only while using ANC feature for 5hours continously. When	1	0.321851594	Positive	India
8	parijatgaur	Own and have been using Jabra elite 85t. My review mostly as compared to it.Type of music that I hear: Mostly Rock,	5	0.295591737	Positive	India
9	Vidhi Khinawat	My dad gifted me these and it has been a couple of years now and they still have the same sound quality. They look c	4	0.233333333	Positive	India
10	Saurabh kumar	Number 1 earbuds! Totally enjoyed it, worth every penny	5	0.4	Positive	India
11	Saravana Kumar	performance very good	5	0.91	Positive	India
12	Simanchala	I just recently purchased the Galaxy Buds Pro and the noise cancellation with it gives it is much better than airpod Pro	5	0.25	Positive	India
13	S. Biswas	Firstly I want to wholeheartedly thank Amazon for their unbelievable customer service. Let me tell you why: Even th	5	0.111489699	Positive	India
14	Anup Sharma	I've been using them for a few months now. Got them for ₹6,999/- only. Here are my points:Pros:1) Excellent Sound	4	0.346183261	Positive	India
15	Omkaar	Sound Quality: 5/5As a guy who switched from low end earphones to this, these leave little to be desired.Noise Can	4	0.228948415	Positive	India
16	HRITHIK	As I opened the package I was really very excited and I had great expectation as I am a samsung S series user which st	4	0.182371795	Positive	India
17	Arsen Kumar	These were my first expensive earbuds. In the beginning, I couldn't tell the difference in sound, but after comparing t	5	0.188652882	Positive	India
18	Tribhuvan Kanwar	I have had many earphones from B&O to a Boat rockers SOUND QUALITY - However, if we compare these with other fl	4	0.286973684	Positive	India
19	Abrar Shaikh	Right off the bat, this is the best sounding earphones I have ever purchased and I got it for ₹8000 including the Samsu	3	0.156128066	Positive	India
20	Shyam	Best BT headset pair for "GALAXY" series. Especially from S10 and above.For example, the 360° audio is not available t	4	0.239154782	Positive	India
21	Sushant	To be honest after reading about all the reviews about how uncomfortable they are, I was sceptical about buying thes	5	0.243469388	Positive	India
22	Chaitha	Fully recommended!Music and comfort - better than airpods1. Comfort - 9/10 better than airpods pro (might be specif	5	0.22297929	Positive	India
23	Nishtha Jain	The sound quality is amazing. I've found myself listening to music more often because of the sound quality and conve	4	0.333968333	Positive	India
24	Dushyant	Fantastic sound. Great utility. Decent NC. Have been my daily drivers for outdoor activities and even casual listening	5	0.285228095	Positive	India

The research evaluates the feedback on audio products from users situated in India as well as USA and UK. Each submission within the gathered dataset provides ratings and user reviews and sentiment scores and labels in addition to nationally recorded origins. The research investigates consumer satisfaction and sentiment variations alongside geographical perception differences through examination of text-based comments and numerical assessment. A multi-dimensional research method creates detailed knowledge about how international customers interact with each other.

Interpretation (Based on Hypothesis Testing)

The researchers used two main hypotheses to fulfil the study requirements.

The analysis targeted to establish if national origins would affect the measurement of sentiment levels. Research analysts conducted a one-way ANOVA screening method to evaluate the mean sentiment scores between India and the United States and United Kingdom groups. The p-value amounting to 0.230 suggests sentiment scores between the three countries show no significant statistical differences in their values. A minor difference in sentiment scores existed between the UK and India and the USA yet it failed to establish significant meaningfulness. Customer feedback about the Samsung Galaxy Buds Pro shows no significant variations between India and the USA and the UK.

The research examined the connection between the evaluated product ratings and the recorded sentiment metrics. Research outcomes exposed a strong positive link between customer sentiment evaluation scores and product ratings through statistical calculation of Pearson's correlation equal to $r = 0.72$ ($p < 0.001$). The robust statistical connection shows that elevated product sentiment leads customers to provide increased ratings for the product. Sentiment analysis has proved to be a valid tool for assessing customer satisfaction based on the research findings.

DISCUSSION

The study shows how sentiment analysis effectively assists people in understanding customer feedback for wearable electronic devices. People from different cultures appear to express themselves differently in the visual data while statistical testing shows no substantial variations. Novel investigations need to investigate this phenomenon to reach deeper conclusions. The practical function of sentiment analysis proves strong enough to work either as an alternative metric or additional feedback component for product ratings since it directly represents customer satisfaction scores.

The application of hybrid models and machine learning algorithms in sentiment analysis is proven effective based on previous analysis yet models need geographical and cultural adjustments according to research done by Drus and Khalid (2019) and Jeong et al. (2019).

The study confirms sentiment analysis can aid both commercial operations and academic studies that involve world-wide products and outlines potential research directions for Aspect-Based Sentiment Analysis (ABSA).

REFERENCES

1. *Birjali, M., Kasri, M., & Beni-Hssane, A. (2021). A Comprehensive Survey on Sentiment Analysis: Methods, Applications, and Challenges. Methods of Market Misallocation: Approaches, Challenges, and Trends.*
2. *Dang, Y., Zhang, Y., Chen, H. (2020). Sentiment Analysis Based on Deep Learning: A Comparative Study.*
3. *Drus, S. M., & Khalid, H. (2019). Sentiment Analysis in social media and its Application in E-commerce: A Review.*
4. *Earl, M., et al. (2017). Sentiment Analysis of Customer Product Reviews Using Machine Learning.*
5. *Ghatora, H., et al. (2024). Sentiment Analysis of Product Reviews Using Machine Learning and Pre-Trained LLM.*
6. *Jagdale, R. S., Shirsath, S. S., & Deshmukh, S. N. (2019). Sentiment Analysis on Product Reviews Using Machine Learning Techniques.*
7. *Jeong, J., et al. (2019). Localization in Sentiment Models: Cultural and Geographic Influences.*
8. *Li, Q., et al. (2019). Sentiment Topic Modeling for Product Review Analysis.*
9. *Mehta, R., & Pandya, D. (2020). A Review on Sentiment Analysis Methodologies, Practices, and Applications.*
10. *Nazir, A., et al. (2020). Issues and Challenges of Aspect Based Sentiment Analysis: A Comprehensive Survey.*
11. *Rodríguez Ibáñez, J., et al. (2023). Advancements in Sentiment Topic Modeling.*
12. *Wankhade, K., et al. (2022). A Survey on Sentiment Analysis Methods, Applications and Challenges.*
13. *Xu, J., et al. (2020). E-commerce Product Review Sentiment Classification Based on a Naïve Bayes Continuous Learning Framework.*
14. *Xu, H., et al. (2019). BERT Post-Training for Review Reading Comprehension and Aspect-based Sentiment Analysis.*