

A Study on Sentiment Analysis on Airline Quality Services: A Conceptual Paper

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Abstract: Airline quality service is crucial for airlines to remain competitive in the industry. The quality of the services of these airlines must meet customer satisfaction and other aspects of the overall service experience. The levels of service quality in an airline service may impact satisfaction and loyalty which may influence customer sentiment. Concerning the importance of airline quality service, customer sentiment towards the service must be investigated and one of the ways to analyze it is by using sentiment analysis. Sentiment analysis is the chosen tool nowadays to analyze comments or reviews made on these services, which may be positive, negative, or neutral. Using sentiment analysis, will not only help potential customers to view the overall sentiment portrayed, but organizations can also use the findings to improve their organization to be more competitive. Thus, this paper will focus on reviewing several recent works related to sentiment analysis as a tool for assisting organizations in assessing the quality of services in the airline industry. As a result, a new framework for assessing the quality of service for the organizations, especially the airline company will be proposed.

Keywords: *Sentiment Analysis, Airline Quality Service, Customer Review*

1. Introduction

Every year, a significant number of individuals choose air travel as their preferred mode of transportation, relying on various airlines to facilitate their journeys. The level of customer satisfaction and loyalty is heavily influenced by the quality of airline services, making it a critical factor in an intensely competitive market. Therefore, airlines must comprehend customer sentiment and identify the key factors that shape it. To achieve this, sentiment analysis, a technique that examines textual data, such as customer reviews, can provide invaluable insights into the polarity of sentiment, whether it is positive, negative, or neutral. By leveraging sentiment analysis, potential customers, and airline companies, whether Full-Service Carriers (FSCs) or Low-Cost Carriers (LCCs), can develop a profound understanding of the strengths and weaknesses exhibited by different airlines and their services. The purpose of this paper is threefold. Firstly, it aims to conduct an extensive literature review on sentiment analysis in the airline industry. Secondly, it proposes a conceptual framework for assessing service quality using sentiment analysis. Lastly, it discusses the implications of the findings for various stakeholders. Four primary objectives have been established for this study:

- To provide an overview of the current state of research concerning sentiment analysis in the airline industry.
- To explore the benefits and challenges associated with utilizing sentiment analysis to evaluate service quality.
- To propose a conceptual framework specifically tailored to conducting sentiment analysis for airline services.
- To investigate the implications of the findings for airline companies, customers, and researchers.

The paper is structured as follows: Section 2 provides an extensive review of existing literature on sentiment analysis in the airline industry. Section 3 outlines the sentiment analysis process. Section 4 introduces a conceptual framework for assessing service quality and discusses the findings' implications. Finally, Section 5 concludes the paper by discussing its limitations and suggesting avenues for future research.

2. Literature Review

Overview of sentiment analysis: Sentiment analysis, also referred to as opinion mining, is a computational approach that aims to extract and analyze sentiments, opinions, and emotions expressed within textual data

(Hemmatian & Sohrabi, 2017). By utilizing natural language processing (NLP) and machine learning algorithms, sentiment analysis classifies text into positive, negative, or neutral sentiments, providing valuable insights into the overall sentiment conveyed in the text (Rumelli et al., 2019). The significance of sentiment analysis has been widely acknowledged in various industries, including the airline sector, due to its ability to effectively analyze large volumes of textual data and unveil customer sentiment (Kwon et al., 2021; Patel et al., 2023).

Sentiment analysis in the airline industry: Sentiment analysis has gained significant popularity in the airline industry as a means of understanding customer sentiment towards services and evaluating overall service quality (Kang et al., 2022; Kwon et al., 2021). Recent studies have examined sentiment in online reviews of airline services, establishing a strong link between customer sentiment, airline choice, and satisfaction (Ahmed & Rodríguez-Díaz, 2020; Lucini et al., 2019; Ractham, 2021). These findings highlight the importance of accurately assessing and comprehending customer sentiment in meeting expectations and improving perceptions of service quality.

To facilitate sentiment analysis in the airline industry, researchers have proposed various frameworks and methodologies. For instance, Lucini et al. (2019) developed a novel framework for measuring customer satisfaction in the airline industry using text mining of Online Customer Reviews (OCRs). Their analysis of over 55,000 OCRs identified 27 dimensions of satisfaction and provided recommendations for airline companies to enhance their competitiveness. Notably, customer service for first-class passengers, comfort for premium economy passengers, and luggage handling and waiting time for economy-class travellers emerged as crucial factors. Cabin staff, onboard service, and value for money were identified as the top three dimensions predicting airline recommendation.

Existing literature in the airline industry consistently confirms the correlation between service quality, customer satisfaction, loyalty, and sentiment. Numerous studies have demonstrated a positive association between service quality and customer satisfaction, indicating that satisfied customers tend to express positive sentiments towards airline services (Agarwal & Gowda, 2020). For example, Agarwal and Gowda (2020) examined the impact of airline service quality on customer satisfaction and loyalty in India, finding that dimensions such as reliability, responsiveness, assurance, empathy, and tangibles positively influenced customer satisfaction, which in turn affected loyalty. Similarly, Law et al. (2022) investigated the relationship between airline service quality, customer satisfaction, and repurchase intention among Laotian air passengers, discovering that all dimensions of service quality had a positive effect on customer satisfaction and repurchase intention. Farooq et al. (2018) explored the impact of service quality on customer satisfaction in Malaysia Airlines, revealing a positive and significant influence of dimensions such as airline tangibles, terminal tangibles, personnel services, empathy, and image on customer satisfaction.

Furthermore, customer sentiment, as a significant emotional attitude, plays a crucial role in shaping customer loyalty and encouraging repeat business within the airline industry. Recent studies strongly support this notion, providing evidence of the intricate relationship involved (Lin et al., 2018). For example, Lin et al. (2018) examined the Malaysian airline industry and found that trust acts as a positive and influential factor that mediates the link between customer satisfaction and customer loyalty. This highlights the vital role of trust in building long-lasting relationships with customers. Similarly, Sukri et al. (2014) compared customer satisfaction and loyalty between Malaysia Airlines and Air Asia, identifying key factors such as service quality, price, and the overall customer experience as critical elements that influence customer satisfaction and loyalty. By understanding and addressing these factors, airlines can effectively shape customer sentiment, improve satisfaction levels, and ultimately cultivate strong customer loyalty. This is particularly important in the highly competitive airline industry, where long-term success depends on maintaining a loyal customer base.

In conclusion, sentiment analysis has proven to be a valuable tool for understanding customer sentiment in the airline industry. By analyzing textual data, sentiment analysis offers insights into customer opinions, attitudes, and emotions regarding airline services. Its application has led to the development of frameworks and methodologies for assessing service quality and enhancing customer satisfaction. The interplay between service quality, customer satisfaction, loyalty, and sentiment underscores the importance of effectively analyzing customer sentiment.

Studies on sentiment analysis of airline services: Studies on sentiment analysis of airline services employ natural language processing techniques to analyze and categorize customers' emotional responses towards airlines. This method can be applied to various sources of text, including reviews, comments, tweets, and blogs. Sentiment analysis in the airline industry aims to gain insights into customer satisfaction, loyalty, and word-of-mouth, enabling targeted improvements to enhance the overall service experience.

Several studies have explored sentiment analysis in the airline industry using different machine learning and deep learning techniques. For example, Patel et al. (2023) applied sentiment analysis to airline reviews using a range of machine learning and deep learning techniques. They compared the performance of Google's BERT algorithm with other methods, such as Naive Bayes, Support Vector Machine, Decision Tree, and Random Forest. The study demonstrated that BERT outperformed the other methods in terms of accuracy, precision, recall, and F1 score.

Aljedaani et al. (2022) conducted a research study to analyze sentiments expressed on Twitter in the US airline industry. Their hybrid approach combined lexicon-based methods with deep learning models like CNN, LSTM, GRU, and CNN-LSTM to improve sentiment accuracy. The study compared the impact of TextBlob with Afinn and VADER on classification accuracy, highlighting the effectiveness of their proposed methods in sentiment analysis. Gupta and Bhargav (2022) surveyed various machine-learning techniques for sentiment analysis in the airline industry and discussed their strengths and weaknesses.

Another research study introduced a new deep learning model that successfully integrated various word embeddings with deep learning techniques to analyze a dataset consisting of tweets related to six major US airlines. The study focused specifically on conducting multi-class sentiment analysis, which involves categorizing sentiments into multiple classes or categories (Hasib et al., 2021). Malik et al. (2020) discussed the application of a containerized microservice approach using Docker technology for airline sentiment analysis. They implemented and compared eight machine learning algorithms to analyze and classify tweets into positive, negative, and neutral sentiments. Experimental results using the Twitter US Airline Sentiment dataset demonstrated the superior performance of Support Vector Machine, Multinomial Naive Bayes, Stochastic Gradient Descent, and Random Forest algorithms compared to others.

These studies highlight the potential of sentiment analysis as a tool for evaluating service quality in the airline industry. By utilizing sentiment analysis, both customers and airlines can benefit from the insights derived from a large volume of online text data. Customers can make informed decisions based on collective sentiment, while airlines can use this feedback to improve service quality and foster customer loyalty. However, sentiment analysis faces challenges related to handling noisy data, sarcasm, irony, ambiguity, subjectivity, and contextual nuances. Thus, further research is necessary to address these concerns and advance the development of robust frameworks and methodologies tailored for sentiment analysis in the airline industry.

Existing frameworks and methodologies: Various frameworks and methodologies have been developed to analyze customer sentiment in the airline industry, providing structured approaches for extracting insights from textual data (Table 1). These frameworks play a crucial role in assessing the quality of airline services. For instance, Kwon et al. (2021) conducted sentiment analysis on Skytrax posts, using frequency analysis, latent Dirichlet allocation, and lexicon-based sentiment analysis to identify the main topics and sentiments in online reviews.

Table 1: Frameworks and Methodologies

Authors	Dataset	Framework
Kwon et al. (2021)	Skytrax	Frequency analysis, latent Dirichlet allocation, and lexicon-based sentiment analysis
Kumar and Zymbler (2019)	Airline tweets	Machine learning techniques - word embedding with the Glove dictionary approach and n-gram analysis
Kaur and Malik (2021)	Tweets from six major US airlines	Machine learning algorithms like SVM, Naive Bayes, and Random Forest

Similarly, Kumar and Zymbler (2019) employed machine learning techniques, such as word embedding with the Glove dictionary approach and n-gram analysis, to extract features from airline tweets. They utilized

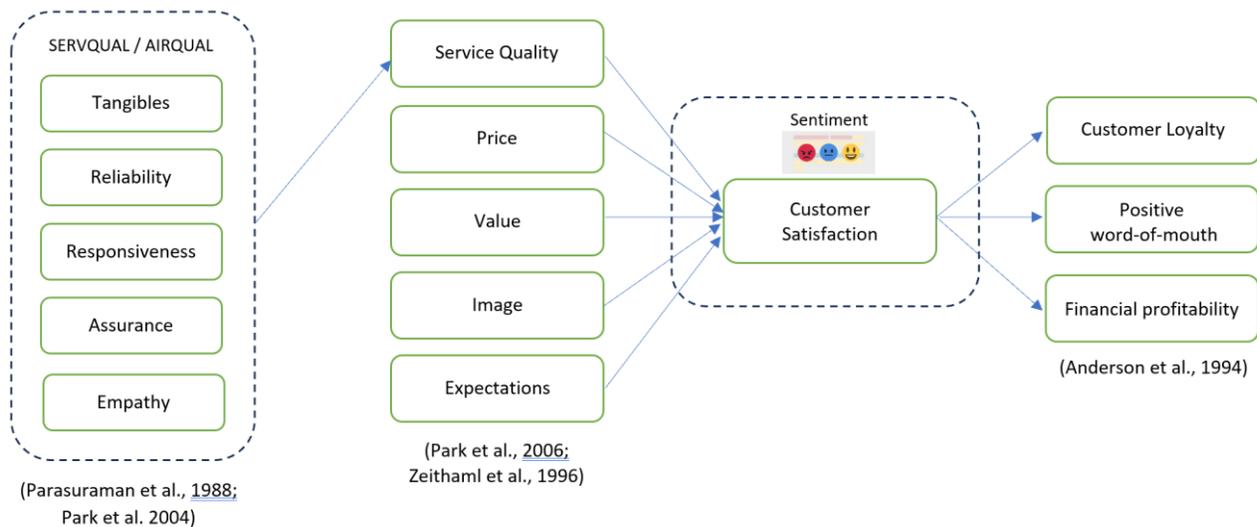
support vector machine (SVM) and artificial neural network (ANN) architectures to classify tweets into positive and negative categories. Additionally, they employed visualizations like word clouds and bar graphs to highlight reasons for negative comments. In another study, Kaur and Malik (2021) performed sentiment analysis on airline systems using machine learning algorithms like SVM, Naïve Bayes, and Random Forest. They focused on a dataset of tweets from six major US airlines and evaluated algorithm performance using metrics such as accuracy, precision, recall, and F1-score.

These frameworks demonstrate the potential of sentiment analysis as a tool for evaluating service quality in the airline industry. By leveraging sentiment analysis, both customers and airlines can benefit from the wealth of online text data. Customers can make informed decisions based on collective sentiment, while airlines can use the feedback to improve their services and foster customer loyalty. However, sentiment analysis faces challenges related to handling noisy data, sarcasm, irony, ambiguity, subjectivity, and contextual dependency. Future research should address these issues and develop more robust frameworks and methodologies for sentiment analysis in the airline industry.

Relationship between service quality, customer satisfaction, loyalty, and sentiment: Numerous studies have investigated the relationship between service quality, customer satisfaction, loyalty, and sentiment within the airline industry. These studies shed light on the crucial role of service quality in shaping customer satisfaction and loyalty which, in turn, influences the sentiment expressed by customers. Figure 1 shows the relationship between service quality, customer satisfaction and sentiment.

Service quality is a key factor that influences customer satisfaction and loyalty in the airline industry. It encompasses various dimensions such as tangibles, reliability, responsiveness, assurance, and empathy, which are measured using models like SERVQUAL or AIRQUAL (Parasuraman et al., 1988; Park et al. 2004). Customer satisfaction levels are influenced by multiple factors, including service quality, price, value, image, and expectations (Park et al., 2006; Zeithaml et al., 1996). Customer satisfaction, in turn, leads to favorable outcomes such as customer loyalty, positive word-of-mouth, and financial profitability (Anderson et al., 1994).

Figure 1: Relationship between service quality, customer satisfaction and sentiment



For instance, Vu (2021) conducted a study highlighting the critical relationship between service quality, customer satisfaction, and purchase intentions. The findings emphasize the importance of high service quality and customer satisfaction in shaping customers' intention to make purchases, thereby providing companies with valuable opportunities to gain long-term competitive advantages and enhance customer retention strategies. Similarly, Supriyanto et al. (2021) reinforce the substantial impact of service quality on customer satisfaction and loyalty, emphasizing the need for businesses to prioritize service quality in the airline industry.

Customer loyalty is another vital outcome influenced by service quality, customer satisfaction, and other factors such as trust, perceived value, and switching costs (Hal et al., 2023). Rasheed and Abadi (2014) found that service quality, trust, and perceived value significantly influence customer loyalty in the Malaysian services sector. These findings underline the importance of focusing on service quality and building trust to enhance customer loyalty and gain a competitive edge. Suchánek and Králová (2019) examined the relationship between customer satisfaction, loyalty, product knowledge, and business competitiveness in the food industry. The research highlights the interplay between these factors and emphasizes the role of customer satisfaction in fostering customer loyalty and contributing to overall business competitiveness.

The relationship between service quality, customer satisfaction, and loyalty has been explored using various research methodologies. Law et al. (2022) utilized structural equation modeling (SEM) to investigate the influence of service quality on customer satisfaction and repurchase intention in the Laotian airline industry. Their findings demonstrate that service quality directly impacts customer satisfaction and, in turn, indirectly influences customer loyalty through customer satisfaction.

In addition, studies have examined service quality in the context of low-cost airlines. El Haddad (2019) focused on low-cost airlines and identified responsiveness as the most crucial dimension of service quality. This finding emphasizes the importance of promptly addressing customer needs and concerns in the low-cost carrier segment. Waramontri (2021) conducted a comparative study between traditional and low-cost airlines, revealing that passengers of traditional airlines perceive higher levels of service quality and customer satisfaction. These insights provide valuable information for industry practitioners and researchers in understanding customer perceptions and expectations in different types of airlines.

Furthermore, sentiment analysis has gained prominence as a tool to understand customer sentiment in the airline industry. Previous studies have investigated sentiment analysis in the context of airline services, proposed frameworks and methodologies, and established the relationship between service quality, customer satisfaction, loyalty, and sentiment. By incorporating sentiment analysis, airlines can gain insights into customer sentiments expressed through comments and reviews, enabling them to improve services and remain competitive in the industry.

In conclusion, the existing literature highlights the significant relationship between service quality, customer satisfaction, loyalty, and sentiment in the airline industry. The findings underscore the importance of service quality in enhancing customer satisfaction and loyalty, as well as the potential of sentiment analysis in understanding customer sentiments. However, challenges exist in measuring and managing service quality, including service heterogeneity, dynamic market conditions, and cultural disparities. Further research is needed to address these challenges and develop more effective frameworks and methodologies for enhancing service quality in the airline industry.

3. Sentiment Analysis Process

Sentiment analysis is a natural language processing technique that aims to extract subjective opinions and emotions expressed in text data. It helps identify the polarity (positive, negative, or neutral), intensity, and aspects of customer feedback and reviews. Sentiment analysis provides valuable insights for both potential customers and airline companies to understand service quality and customer satisfaction strengths and weaknesses (Patel et al., 2023).

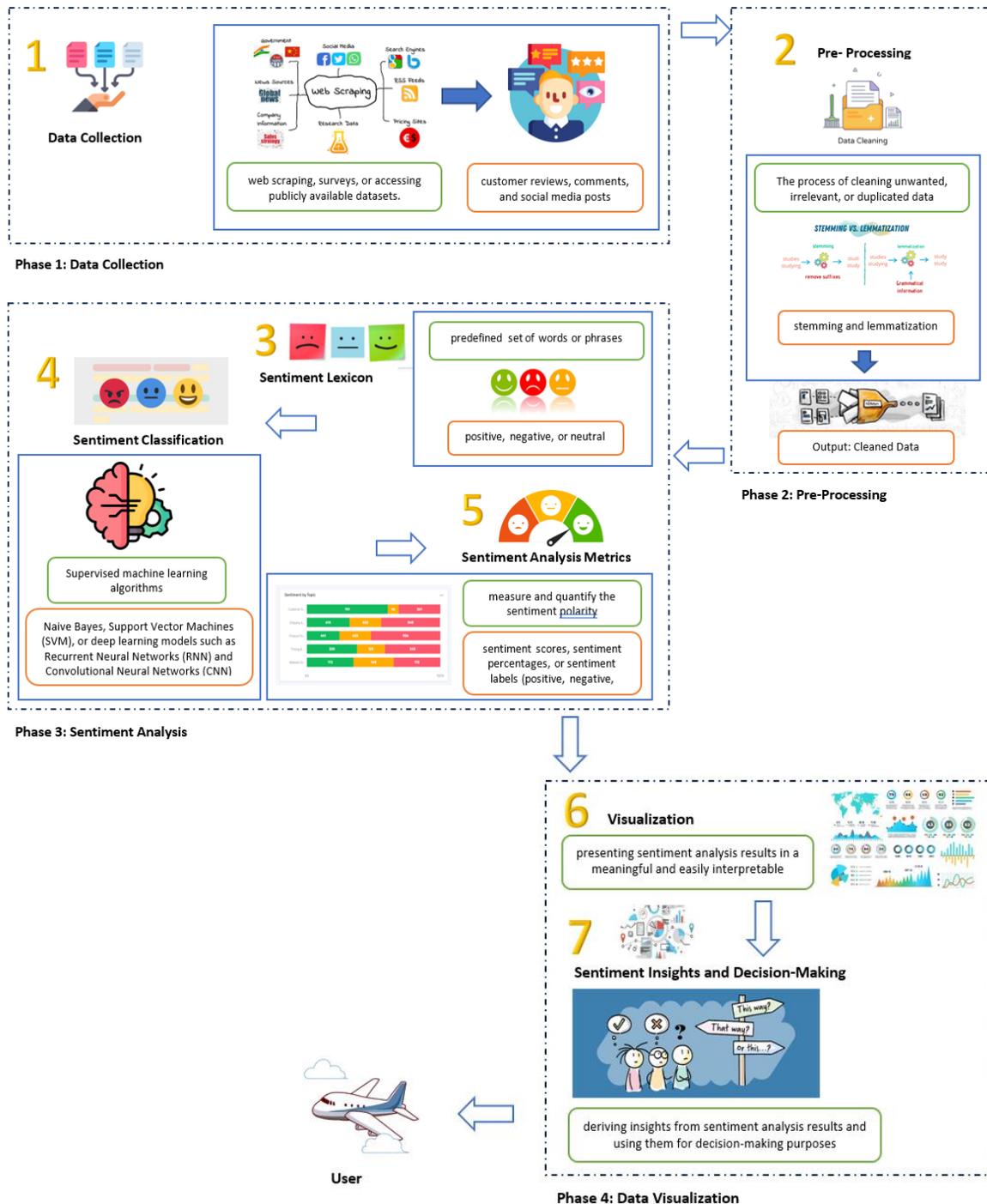
The process for sentiment analysis in airline services consists of key components contributing to understanding and analyzing customer sentiments (Patel et al., 2023). These components are essential for conducting comprehensive sentiment analysis and gaining valuable insights into customer perceptions and experiences. The sentiment analysis process components (Figure 2) include:

Data Collection: This component focuses on gathering relevant data, such as customer reviews, comments, and social media posts (Kumar and Zymbler, 2019; Shayaa et al., 2018), which serve as valuable sources for sentiment analysis. Data collection methods may involve web scraping, surveys, or accessing publicly available datasets.

Pre-processing: In this stage, collected data undergoes pre-processing to clean and prepare it for analysis (Duong & Nguyen-Thi, 2021; Symeonidis et al., 2018). Pre-processing techniques involve removing irrelevant information, handling missing data, and applying text normalization methods like stemming and lemmatization to standardize the text.

Sentiment Lexicon: A sentiment lexicon is a crucial component consisting of a predefined set of words or phrases associated with positive, negative, or neutral sentiments (Han et al., 2018; Seyler et al., 2020). It serves as a reference for sentiment analysis algorithms to classify the sentiment polarity of the text data.

Figure 2: Sentiment Analysis Process in Airline Services



Sentiment Classification: This component applies sentiment classification algorithms to assign sentiment labels to the collected data (Lighthart et al., 2021; Sudhir & Deshakulkarni Suresh, 2021). Supervised machine learning algorithms like Naive Bayes, Support Vector Machines (SVM), or deep learning models such as Recurrent Neural Networks (RNN) and Convolutional Neural Networks (CNN) can be used for sentiment classification.

Sentiment Analysis Metrics: Sentiment analysis metrics measure and quantify the sentiment polarity of the collected data (Lighthart et al., 2021; Puschmann & Powell, 2018). Commonly used metrics include sentiment scores, sentiment percentages, or sentiment labels (positive, negative, neutral). These metrics provide insights into the overall sentiment distribution and can track sentiment trends over time.

Visualization: Visualization techniques play a crucial role in presenting sentiment analysis results in a meaningful and easily interpretable manner (Vizcarra et al., 2021; Wang et al., 2023). Visualizations like word clouds, bar charts, or sentiment heatmaps help stakeholders grasp sentiment patterns and identify areas of improvement or strength in airline services.

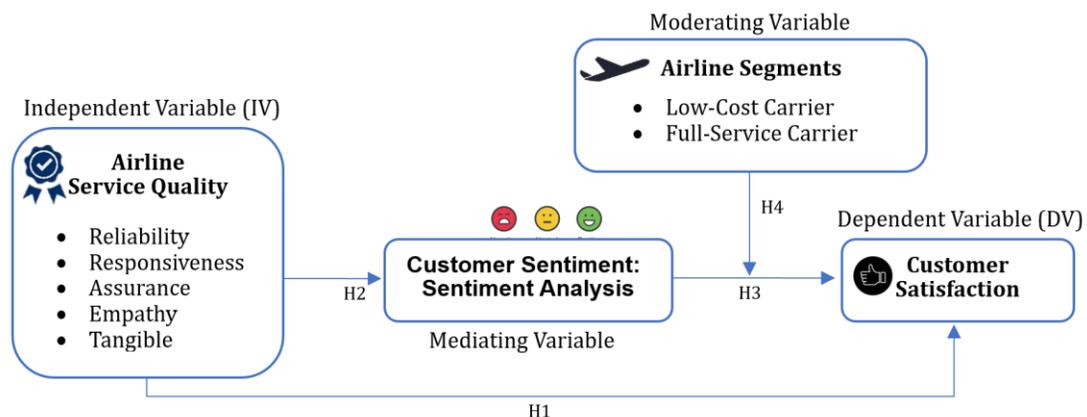
Sentiment Insights and Decision-Making: The final component involves deriving insights from sentiment analysis results and using them for decision-making purposes (Georgiadou et al., 2020). These insights guide airlines in identifying strengths and weaknesses in their services, improving customer experiences, and making informed business decisions to enhance customer satisfaction and loyalty.

The process offers a systematic and comprehensive approach to sentiment analysis in airline services. By utilizing sentiment analysis, airlines can gain valuable insights into customer preferences and needs (Farzadnia and Raeesi Vanani, 2022; Patel et al., 2023). They can also monitor service performance, assess customer satisfaction levels (Farzadnia and Raeesi Vanani, 2022), evaluate competitive positions by identifying strengths and weaknesses (Patel et al., 2023), and formulate effective strategies to enhance service quality and foster customer loyalty.

Incorporating these components into the sentiment analysis process enables airlines to analyze customer sentiments effectively, identify areas for improvement, and take proactive measures to address customer concerns. This enhances overall service quality and maintains a competitive edge in the airline industry.

Components of the Framework: The proposed framework aims to investigate the factors that influence customer satisfaction in airline services. It is grounded in established theories, particularly the theory of service quality, and centers on the relationships among service quality, customer sentiment, and different airline segments, such as Low-Cost Carriers (LCCs) and Full-Service Carriers (FSCs). Figure 3 illustrates the proposed conceptual framework.

Figure 3: Proposed Conceptual Framework for Sentiment Analysis on Airline Services



At its core, the primary aim is to grasp "Customer Satisfaction," reflecting passengers' overall evaluations of their airline experiences. "Airline Service Quality" assumes a central role, being the foremost determinant of customer satisfaction. This dimension encompasses various facets of airline service, including reliability, responsiveness, assurance, empathy, and tangible elements, as outlined in the theory developed by Parasuraman, Zeithaml, and Berry (1985).

What adds an intriguing dimension to this framework is the essential role played by "Sentiment" as the "Mediating Variable" (Wu, Park & Robertson, 2011). Service quality and customer sentiment interact to influence customer satisfaction within the airline industry. Sentiment captures passengers' emotions and opinions as expressed in their reviews and social media posts. It serves as a critical bridge, enhancing our understanding of how and why service quality shapes customer satisfaction. This is accomplished by scrutinizing the emotional tone, whether positive or negative, conveyed through passenger sentiment. Research has consistently demonstrated that customer sentiment strongly predicts customer satisfaction. For instance, a study by Net Promoter Score (2018) found that customers with positive sentiments are more likely to become repeat customers and recommend the company to others.

Additionally, the framework acknowledges the dynamic nature of the airline industry by introducing "Airline Segments" as the "Moderating Variable." This recognition signifies that the impact of service quality on sentiment and customer satisfaction may vary based on the specific airline segment, such as LCCs or FSCs, each offering distinct services and catering to unique passenger expectations. As highlighted by Ozuem et al. (2023) and Patel (2018) there are variations in the factors influencing customer satisfaction in LCCs and FSCs. Ozuem et al. (2023) for instance found that LCC customers are more forgiving of service quality issues than FSC customers. This is likely because LCC customers expect less from their travel experience in exchange for lower fares. FSC customers, on the other hand, expect a higher level of service quality and are more likely to be dissatisfied if they do not receive it. Patel (2018) also found that LCC customers are more likely to be satisfied with their travel experience if they can save money on their fares. On the other hand, FSC customers are more likely to be satisfied with their travel experience if they have a comfortable and enjoyable flight, even if they have to pay more for it. This conceptual framework incorporates the following hypotheses:

H1: Airline Service quality influences customer satisfaction.

H2: Airline Service quality influences customer sentiment.

H3: Customer sentiment mediates the relationship between airline service quality and customer satisfaction.

H4: Airline Segments moderate the relationship between customer sentiment and customer satisfaction.

In summary, the proposed conceptual framework explores factors impacting airline customer satisfaction, grounded in service quality theory. It examines service quality's influence on satisfaction through passenger sentiment, mediated by emotions expressed in reviews and social media. It recognizes airline segments' dynamic nature as moderators. Formulated hypotheses guide the structured approach to understanding and improving the passenger experience.

4. Application of the Framework in Assessing Airline Service Quality

The application of this conceptual framework within the area of sentiment analysis in airline services yields numerous benefits for airlines. By examining customer sentiments and perceptions, this framework provides valuable insights into the strengths and weaknesses of airline services, enabling airlines to make informed, data-driven decisions and enhance their overall service quality (Patel et al., 2023).

Customer-Centric Insights and Service Quality Evaluation: One significant application of this framework lies in the identification of areas for improvement within airline services. By meticulously collecting and analyzing customer reviews and feedback, airlines can gain a nuanced understanding of the specific aspects of their services that positively or negatively impact customer satisfaction (Kumar and Zymbler, 2019). For instance, sentiment analysis can reveal if customers consistently express dissatisfaction with aspects such as flight delays, baggage handling, or in-flight amenities. Equipped with this information, airlines can prioritize their efforts and allocate resources effectively to address these specific areas, thus elevating service quality and aligning it with customer expectations.

Monitoring Sentiment Trends and Benchmarking: Moreover, the framework facilitates the recognition of patterns and trends in customer sentiments over time. By diligently analyzing sentiment metrics and visualizations, airlines can monitor changes in customer perceptions, pinpoint emerging issues, and assess the impact of service enhancements (Patel et al., 2023). For example, if sentiment analysis reveals an abrupt surge in negative sentiment concerning customer service, airlines can promptly investigate the underlying causes

and take appropriate measures to rectify the situation. This proactive approach ensures that airlines can adapt and improve their services based on real-time customer feedback, thereby enhancing service quality.

The framework additionally supports benchmarking and competitive analysis within the airline industry. By meticulously analyzing customer sentiments across different airlines, carriers can gain valuable insights into their positioning relative to competitors (Kwon et al., 2021). Sentiment analysis metrics such as sentiment scores or sentiment percentages can be employed to compare and evaluate the overall levels of customer satisfaction among different airlines. Armed with this information, airlines can identify best practices, draw inspiration from competitors, and formulate strategies to distinguish themselves by providing superior service quality and surpassing customer expectations.

Evaluating Service Improvement Initiatives: Furthermore, the application of this framework enables airlines to assess the efficacy of their service improvement initiatives. By measuring sentiment metrics both before and after the implementation of changes, airlines can gauge the impact of their actions on customer satisfaction (Aljedaani et al., 2022). For instance, if sentiment analysis indicates a positive shift in customer sentiments following the introduction of a new service feature or enhanced customer service training, it serves as validation for the effectiveness of the initiative, motivating airlines to continue investing in measures that elevate service quality.

In summary, the application of the proposed framework aligns seamlessly with its key components—customer satisfaction (DV), airline service quality (IV), customer sentiment (mediating), and airline segments (moderating). By applying this framework, airlines can gain in-depth insights into their service quality, tailor strategies to distinct segments, adapt to changing customer expectations, benchmark against competitors, and evaluate the impact of service improvements. This structured approach empowers airlines to continuously enhance their services, driving customer satisfaction, loyalty, and long-term success in the competitive airline industry.

Overall, the comprehensive application of the proposed conceptual framework for sentiment analysis in assessing airline service quality empowers airlines to gain invaluable insights into customer sentiments, identify areas necessitating improvement, track customer perceptions over time, benchmark against competitors, and assess the impact of service enhancement initiatives (Patel et al., 2023). By harnessing these insights, airlines can make well-informed decisions, elevate their service quality, and ultimately deliver exceptional customer experiences that drive satisfaction, loyalty, and long-term success in the fiercely competitive airline industry.

Potential Benefits and Challenges of Using the Proposed Framework: The application of the proposed sentiment analysis framework, which centers on customer satisfaction as the dependent variable (DV), airline service quality as the independent variable (IV), sentiment as the mediating variable, and airline segments as the moderating variable, holds several potential benefits and challenges that directly relate to these framework components. Among the benefits are:

Enhanced Service Quality Assessment: One of the primary advantages of this framework is its ability to provide airlines with a comprehensive understanding of service quality's impact on customer satisfaction. By analyzing customer sentiments through sentiment analysis, airlines can assess the effectiveness of their services, including key aspects like reliability, responsiveness, assurance, empathy, and tangible elements (Parasuraman, Zeithaml, & Berry, 1985). This insight empowers airlines to fine-tune their services strategically, addressing specific service quality dimensions that directly influence customer satisfaction.

Segment-Specific Insights: The framework's consideration of airline segments (e.g., Low-Cost Carriers and Full-Service Carriers) as moderating variables acknowledges the nuanced differences in service expectations (Ozuem et al., 2023; Patel, 2018). By examining sentiment analysis results in the context of these segments, airlines can gain segment-specific insights into service quality's impact on customer satisfaction. This segmentation allows airlines to tailor their strategies and service improvements to cater to the distinct needs and preferences of passengers within each segment.

Longitudinal Sentiment Trends: The framework's emphasis on tracking sentiment trends over time (Vizcarra et al., 2021) enables airlines to adapt to evolving customer expectations. Airlines can detect shifts in passenger sentiment, assess the impact of seasonal variations, and respond proactively to emerging

issues. By continuously monitoring sentiment metrics, airlines can maintain their competitiveness in the dynamic airline industry and ensure their services align with changing customer sentiments.

However, certain challenges are also intrinsic to the framework:

Data Collection Complexity: Collecting high-quality, representative data from various sources can be challenging (Wankhade et al., 2022). Ensuring that data accurately reflects passenger sentiments and experiences is crucial for meaningful sentiment analysis. Airlines may need to employ a variety of data collection methods to obtain comprehensive insights, including customer reviews, comments, and social media posts (Kumar & Zymbler, 2019).

Data Preprocessing Overheads: The preprocessing of extensive volumes of unstructured text data (Duong & Nguyen-Thi, 2021) can be resource-intensive. Addressing issues such as missing data, and irrelevant information, and applying text normalization techniques like stemming and lemmatization requires careful handling. Adequate resources and tools are necessary to manage this preprocessing phase effectively.

Sentiment Classification Accuracy: Accurately classifying sentiment within the context of airline services can be challenging (Majumder et al., 2019). Fine-tuning sentiment classification algorithms to account for nuances like sarcasm, context, and linguistic intricacies is essential. Ensuring that sentiment analysis algorithms align with the specific airline context is crucial for obtaining reliable results.

In conclusion, the alignment of potential benefits and challenges with the proposed framework emphasizes the framework's utility in assessing service quality's impact on customer satisfaction within the airline industry. Addressing these challenges while leveraging the framework's benefits empowers airlines to enhance their services strategically, adapt to changing customer expectations, and ultimately drive customer satisfaction and loyalty.

5. Conclusion and Recommendations

This paper presents a comprehensive framework for conducting sentiment analysis on airline services, offering a structured approach to evaluate and enhance service quality within the airline industry. The framework centers on customer satisfaction (DV) as the ultimate measure of success, with airline service quality (IV) being the primary influencer. Customer sentiment (mediating) and airline segments (moderating) play crucial roles in bridging service quality and satisfaction.

The key insights from the proposed framework emphasize the importance of service quality in shaping customer satisfaction. Satisfied customers tend to exhibit loyalty and express positive sentiments, contributing to the overall success and competitiveness of airlines. Customer sentiment reflects customers' overall perception of airline performance and value, making it crucial to understand and analyze sentiment to enhance service quality.

The sentiment analysis process in airline services comprises four fundamental components: data collection, data pre-processing, sentiment analysis techniques and tools, and data visualization. This systematic process evaluates airline service quality by assessing customer sentiment toward different service aspects.

The proposed conceptual framework for sentiment analysis in airline services offers a structured approach to evaluate and enhance service quality within the airline industry. By applying this framework, airlines can gain in-depth insights into their service quality, tailor strategies to distinct segments, adapt to changing customer expectations, benchmark against competitors, and evaluate the impact of service improvements. This structured approach empowers airlines to continuously enhance their services, driving customer satisfaction, loyalty, and long-term success in the competitive airline industry.

The potential benefits of using the framework include gaining customer-centric insights, evaluating service quality comprehensively, tailoring strategies to airline segments, monitoring sentiment trends, benchmarking, and assessing service improvement initiatives. Challenges in implementing the framework relate to issues like data availability, data quality, and the accuracy of sentiment classification.

In conclusion, the proposed conceptual framework provides a systematic approach for assessing service quality and customer satisfaction in the airline industry. By applying the framework, airlines can gain valuable insights into customer sentiment, identify areas for improvement, and enhance service quality and customer satisfaction levels. This structured approach empowers airlines to adapt to changing customer needs, benchmark against competitors, and continuously improve their services in the highly competitive airline industry, fostering long-term success and customer loyalty.

Recommendations for Future Research: Future research in the airline industry should delve into critical areas that can enhance our understanding of customer satisfaction factors. Firstly, conducting cross-industry comparative analyses would shed light on whether the relationships between service quality, customer sentiment, and satisfaction are unique to airlines or universal across service-oriented sectors like hospitality, healthcare, and retail. This broader perspective could reveal industry-specific nuances and common patterns in customer satisfaction dynamics.

Secondly, a detailed examination of the specific components of service quality, such as reliability, responsiveness, and assurance, is essential. Identifying which aspects have the most significant impact on customer sentiment and satisfaction can guide airlines in prioritizing improvement efforts effectively. This micro-level analysis can uncover hidden strengths or vulnerabilities within airline services.

Moreover, considering the segmentation of airlines, such as Low-Cost Carriers (LCCs) and Full-Service Carriers (FSCs), is crucial. Investigating whether passenger sentiment and the drivers of satisfaction differ between these segments could provide valuable insights for segment-specific strategies and service enhancements. Additionally, the temporal aspect of sentiment analysis is significant. Examining sentiment trends over different periods, especially during peak travel seasons or global events like pandemics, can unveil the influence of external factors on passenger sentiment. Understanding these temporal patterns is essential for adaptive service strategies.

In conclusion, these research directions can refine our comprehension of the complex interplay between service quality, customer sentiment, and satisfaction in the airline industry. They offer practical insights for airlines to optimize their services, tailor strategies to different segments, and adapt to changing customer expectations over time.

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