Deciphering the Airline Customers' Emotion Landscape: A Sentiment Analysis on Online Reviews
Havayolu Müşterilerinin Duygu Haritasını Çözümleme: Çevrimiçi Değerlendirmeler Üzerine Bir Duygu Analizi

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Abstract
The airline industry, which has intense competition and high business value, is one of the industries where customer-brand relationships are essential, and consumer insights provide an advantage to the companies in the market. Digitalization and the popularity of online platforms make understanding consumers' reactions essential for brands. This study aims to evaluate the airline market from a sentiment perspective using online reviews. Unlike studies that examine the subject in specific sub-contexts, a comprehensive approach is presented that also addresses different airline types regions and user characteristics. The study follows a research framework consisting of three main sections: review, airlines, and passengers. For this purpose, 124.280 reviews from 210 airlines are collected from Skytrax's online review website. Using "Emotion English DistilRoBERTa-base", a transformative model for sentiment analysis, seven sentiment categories were evaluated based on airline types, airline regions, user travel types, user travel classes and user review rating categories. The study reveals the fundamental patterns of sentiment categories across the framework and highlights the critical role of sentiments in the market environment and user-brand communication.
Keywords: Airline Marketing, Sentiment Analysis, Word Of Mouth, Online Reviews

Öz
Yoğun rekabetin olduğu ve yüksek iş değerinin yaşandığı havayolu sektörü, müşteri-marka ilişkilerinin önemli olduğu sektörlerden biridir ve tüketici içgörüleri, pazardaki şirketlere avantaj sağlamaktadır. Dijitalleşme ve online platformların popülerliği, markalar için tüketicilerin tepkilerini anlamayı önemli hale getirmiştir. Çalışma çevrimiçi değerlendirmeleri kullanarak havayolu pazarını bir duygu perspektifinden değerlendirmeyi amaçlamaktadır. Konuyu belirli alt bağlamlarda inceleyen literatürdeki çalışmalardan farklı olarak, farklı havayolu türlerini ve bölgelerini ve kullanıcı özelliklerini de ele alan kapsamlı bir yaklaşım sunulmaktadır. Çalışma üç ana bölümden oluşan (değerlendirmeler, havayolları ve yolcular) bir araştırma çerçevesini takip etmektedir. Bu amaçla, Skytrax'ın çevrimiçi inceleme web sitesinden 210 havayolundan 124.280 değerlendirme verisi toplanmıştır. Duygu analizi için bir dönüştürücü (transformers) model olan "Emotion English DistilRoBERTa-base" kullanılarak yedi duygu kategorisi; havayolu türleri, havayolu bölgeleri, kullanıcı seyahat türleri, kullanıcı seyahat sınıfları ve kullanıcı inceleme derecelendirme kategorileri üzerinden değerlendirilmiştir. Çalışma, çerçeve genelinde duygu kategorilerinin temel örüntülerini ortaya koymakta ve duyguların pazar ortamında ve kullanıcı-marka iletişimindeki kritik rolünü vurgulamaktadır.
Anahtar Kelimeler: Havayolu Pazarlaması, Duygu Analizi, Kulaktan Kulağa Pazarlama, Çevrimiçi İncelemeler

Introduction

The airline industry, one of the significant sectors in business worldwide, is one of the sectors where competition is vital, with millions of passengers and hundreds of brands. In the sector, which has a significant impact both directly and in terms of the sectors it is related to, the interaction of consumers with brands is essential (Cheung et al., 2021). These interactions affect airline companies and the sector through consumers' decisions. According to a recent report by Hubspot (2024), 14% of marketers face challenges in understanding consumers and their needs. Today's consumers, who share their feelings, thoughts, and experiences with brands and other consumers through online channels, produce valuable

data for businesses in discovering customer insights. In their study, Boyd and Ellison (2007) stated that social networking sites allow internet users to access their profiles and networks through their friend lists. Therefore, today's consumers can have the chance to talk to their friends on social media about the products they want to buy and share information with them (Kozinets et al., 2010). For example, Dahka et al. (2020); in their study, they examined the relationship between the length of the content of the Tweet in X, the number of followers and following, and the impact of e-WOM, and as a result, it was determined that there is a strong relationship between the number of followers, following the length of the content, and the effectiveness of e-WOM.

Communication tools such as online user reviews, social media posts, and e-mails contain essential information about consumers' influence on each other, business decision-making, and understanding competition in marketing. Word of mouth between consumers are effective than commercial sources, as "people like me" effect take place (Allsop et al., 2007). According to a Nielsen report (Nielsen, 2021), 88% of respondents most trust recommendations of people they know. This reality signals the electronic version of word of mouth as eWOM to be effective in the digital era. For example, Hubspot's (2024) report indicates that social media is the first product discovery channel for generation Z and millennials customers. The second role of communication tools refers to business decision-making, since the customer insights discover in online platforms can be signals for improving the quality, understanding the competitiveness and the marketplace.

Kamel (2017), in his study examining online reputation management and its applications in Egyptian travel agencies, emphasized that Egyptian travel agency managers need to make a clear plan to determine and constantly update the policies and tactics of online reputation management. In the study conducted by Reyes-Menendez et al. (2020), which examined the relationships between various factors that will affect TripAdvisor users' adoption of e-WOM (e-WOM volume, source credibility, extremism rate, consumer participation and perceived e-WOM credibility), it was determined that four factors other than extremism rate have a significant impact on e-WOM perceived credibility and adoption. This result shows that e-WOM volume, source credibility, consumer participation and perceived e-WOM credibility are essential drivers of the perceived credibility of e-WOM. In the research of Wong and Wei (2018), which was developed as an online behavior analysis tool for customers based on segmenting high-value customers and analyzing online purchasing behaviors, it was determined that there was a significant relationship between flight duration and purchase lead time. Thus, the subsequent travel destinations of segmented high-value customers could be predicted according to travel patterns and the importance of relationships between destination pairs. Previous studies focusing on several contexts such as business intelligence (Xu et al., 2017), predicting customer satisfaction (Zhao et al., 2019), competitor identification (Ye et al., 2022) reveal the potential of online data for business decision-making and this study focuses on the online data available for evaluating the airline industry.

When the literature is reviewed; Sonnier et al. (2011) collected reviews from a technology company selling various products in the online marketplace. They expanded the scope of the analysis to include the impact of product type on the nature of customer emotions. The results found that positive, negative, and neutral online communications significantly impact daily sales performance. Tirunillai and Tellis (2012) examined whether user-generated content is related to stock market performance and relationship dynamics. The study found that negative product reviews and ratings (online chat) increase the volatility of returns and significantly affect trading volume. Lian et al. (2015) examine how different topics in online reviews affect app sales. They find that consumers' opinions about service quality have a more substantial impact on sales rankings than consumer reviews about product quality. Makarem and Jae (2016) investigated the motivations, reasons, and goals of consumer boycott behavior using content analysis of Twitter feeds. They concluded that non-instrumental motivations of consumer boycott messages have higher emotional intensity. Rambocas and Pacheco (2018) emphasized the uniqueness of online sentiment analysis in action-oriented marketing research in their review of the marketing literature on online sentiment analysis.

Airline industry and tourism research employ online data for understanding marketplace and decision-making. Previous

studies for airline industry focuses on several individual contexts such as low-cost airlines (Yee Liau & Pei Tan, 2014), airport quality and passenger types (Bunchongchit & Wattanacharoensil, 2021), Covid 19 context (Mumbower, 2022) or some limited contexts such as airlines in Middle East (Farzadnia & Vanani, 2022), airlines in Asia (Kwon et al., 2021) and Nordic airports (Arasli et al., 2023). The study seeks to have a broader sample perspective and utilize sentiment analysis approach to detect the emotions spectrum in airline marketing context. Answering the future research directions of previous studies that recommends inclusion of flight classes (Farzadnia & Vanani (2022), inclusion of different travel purposes (Kiliç & Çadirci, 2022), this study presents research questions as;

RQ1. What is the overall sentiment distribution in airline market and how has it evolved over time?

RQ2. How does sentiment distribution differ among airline star classifications, airline types and airline regions?

RQ3. How do sentiment categories vary among passenger travel types, travel classes and recommendation statuses?

RQ4. What is the relationship between sentiment categories and numerical rating parameters in user reviews?

The research questions lead to synthesizing a research framework consisting of three main areas: review characteristics, airline characteristics, and user characteristics. The study uses the Skytrax rating classification to detect the sample airlines and scrapes 124.280 online reviews written for 210 airline companies for the study dataset. A novel sentiment analysis methodology using transformers model titled as "Emotion English DistilRoBERTa-base" (Hartmann, 2022) is employed in the study to detect the sentiment categories in reviews and results are presented in five sections through the study. The study starts with a literature review section containing eWOM and emotion concepts, presents the research framework in three main sections, and concludes the results in five sections to comprehensively understand the airline market. Insights generated in the finding can be helpful for airline marketing managers, social media managers in airline industry and industrial applications. Conclusion and future research directions are also included at the end of the study.

1. Literature Review

1.1. eWom and Airline Market

Word of mouth as defined by Westbrook (1987) as *"consist of informal communications directed at other consumers about the ownership, usage, or characteristics of particular goods and servicesand/or their sellers"* is one of the crucial phenomenon in consumer research in last decades. The main idea in word of mouth implies that other people's opinions are affective for consumers' decision-making (Cambria et al., 2013), and the decision can be affected by opinion leaders and also ordinary people (Feldman, 2013). Widespread adoption of technology and popularity of digital platforms enables transform the word of mouth concept to electronic word of mouth (eWOM) as one of the crucial determinants in the marketplace.

Consumer behavior concept has complex nature and today's digital consumers are affected by several factors including online channel information, their social circle, advertising messages. Several factors including online reviews argument quality (Zhang et al., 2014), consumers' trust and perceived risk (Kim et al., 2008) affect consumer behavior and notable theories such as source credibility theory (Ayeh, 2015), innovation diffusion theory (Agag & El-Masry, 2016), technology acceptance model (Oyman et al., 2022) and flow theory (Huang et al., 2023) are utilised to study consumer behavior in marketing research. The comprehensive structure of consumer behavior poses potential for different industries such as tourism (Cosma et al., 2012), banking (Szopiński, 2016), e-commerce (Gulfraz et al., 2022) and and airline industry with higher economic values are one of the industries significantly affected by consumer behavior and decision-making.

Airline marketing studies examine the marketplace in last decades through different perspectives including consumer choice (Hagmann et al., 2015; Yimga, 2017), service attributes (Park et al., 2020), service quality (Suki, 2014; Punel et al., 2019; Tahanisaz, 2020) and passenger/customer loyalty (Forgas et al., 2010; Akamavi et al., 2015). The consumer evaluation in airline studies follow two main approaches: survey-based studies and online data-based studies. The first stream of studies mostly uses survey data collection type and focus on the causal relationships between the consumer-related constructs (Suki, 2014; Akamavi et al., 2015). On the other hand; second stream of studies focuses on online available data and extracts the patterns through thematic analysis, topic modelling, sentiment analysis and other methodologies. The first stream focuses on the specific context by emphasizing the causal relationships through regression and structured equations model, while the latter one focuses on relatively larger size of data available on web and including the overall examination of the marketplace contexts (Ban & Kim, 2019; Bunchongchit & Wattanacharoensil, 2021; Farzadnia & Vanani, 2022; Arasli et al., 2023).

Online data provided by marketplace includes various types of components such as text, rating scores, photos and videos and the second stream in airline research focuses on identifying the patterns in the datasets. Web platforms like TripAdvisor and Skytrax (Airlinequality.com) provides users to write reviews regarding the companies (hotels, airline companies, airports) and the reviews are communicated to other users and companies as well. Available online data can be obtained through data-scraping techniques and it can be utilized for sensemaking of the marketplace (Pinarbasi & Kircova, 2021). Communication coming from customers refer to voice of customer provides opportunities for understanding customer needs, problems, sentiments to the businesses (Subramaniam et al., 2009). Decoding the voice of customer can rely on the content side of the textual data. For example, Yee Liau and Pei Tan (2014) utilize text mining methodology to study consumer opinions towards low-cost airline companies and identify four main topics from social media Tweets data. It can also rely on the sentiments underlying in the text data and it can be utilized by using a variation of text-mining methodology called as sentiment analysis. For example, Song et al. (2020) utilizes sentiment analysis to examine public opinion regarding flight delays and conclude significant negative relationship between flight delay experience and user's sentiments. Due to complexity of sentiments in consumer behavior and human psychology, evaluation of aspects of emotion is essential for online consumer data.

1.2. Sentiments in Online Reviews

Textual information consists of two main parts; one for facts - the objective expressions about entities and other things and one for the opinion - subjective expressions describing sentiments, appraisals towards entities and other things (Liu, 2010). Emotions -which are included in subjective expressions- are complicated concept due to subjectivity and intangible nature of the concept. Kleinginna and Kleinginna (1981) evaluate the 92 definitions and 9 skeptical statement in the literature to solve the terminological complexity and propose the definition for emotion. According to authors, *"Emotion is a complex set of interactions among subjective and objective factors, mediated by neural/hormonal systems, which can (a) give rise to affective experiences such as feelings of arousal, pleasure/displeasure; (b) generate cognitive processes such as emotionally relevant perceptual effects, appraisals, labeling processes; (c) activate widespread physiological adjustments to the arousing conditions; and (d) lead to behavior that is often, but not always, expressive, goaldirected, and adaptive"* (Kleinginna and Kleinginna (1981). Emotions and sentiments are close concepts, but they have conceptual differences. Munezero et al. (2014) conclude that sentiments are differentiated from emotions, and sentiments are formed and directed toward an object, while emotions are not taking place in that way. From this point of view, online reviews as a directed-component in the online data having sentiment attributes rather than emotions. Sentiments as defined by Frederickson (2001) "*multicomponent response tendencies that unfold over relatively short time spans*", and they are vital part of consumer decision-making and communication process for today's marketing. Studying sentiments in online data enable companies to gauge online customers' preferences (Bai, 2011), evaluate attitudes toward brands (Mostafa, 2013a), and understand service attributes (Luo et al., 2021). Evaluation of sentiments in consumer context is a challenging task for the studies. According to Faullant et al. (2011), there are two approaches for the consumption-related sentiments; the one including basic sentiments with a limited option, and the other including broad and general aggregations called as "dimensions". The first approach represented by main emotion categories and six-sentiments in Ekman's (1992) classical study is one of them. Ekman (1992) mentions of six sentiments namely: anger, fear, enjoyment, sadness, disgust and surprise. Ekman (1992)'s sentiment categories are also included in Wang et al. (2022)' study as categorical emotion model which specify the emotions into limited categories. The second approach focusing on broader aspect such as including the positive and negative affect concept (Watson et al., 1988). In their study, Laros and Steenkamp (2005) examine and present a hierarchy of consumer sentiments in a two-parts overall structure: negative affect and positive affect. Online available data consists of text and numerical rating data and the numerical rating scores such as overall rating scores from 1 to 5 or 1 to 10 and star-based rating scores represent the positive/negativity side mostly. The polarity of user reactions can be easily signalled through 5 stars, 1 stars and 3-stars reviews in the 1 to 5 stars review dataset. On the other hand, the first approach focuses on the individual sentiments which can be evaluated for consumer understanding.

Sentiment analysis as "*the computational study of people's opinions, attitudes and sentiments toward an entity*" (Medhat et al., 2014) is the one of core methodology used for online data for the sentiments concept. It uses pre-defined corpuses as lexicons (eg. positive words / negative words) or machine-learning methods to extract the sentiments -related items in a draft text. Several tasks are included in the scope of sentiment analysis such as subjectivity classification, sentiment classification, opinion spam detection, implicit language detection and aspect extraction (Wankhade et al., 2022). The main idea of sentiment analysis is examining the text with patterns or connections between words/sentences/structures and emotion/situation

connection. Customer review including "I love this airline, the foods and ground service are so cool" sentence can be emphasized by "love" and "cool" words in a lexicon-based sentiment analysis approach. In machine-learning approach with a more developed approach, the other words, two or three-words pairs, the order of the words can be signal of sentiments. This study employs a relatively novel approach in machine learning type as deep learning approach in the study.

2. Methodology

2.1. Research Design and Framework

The study's research questions are comprehensive, and a detailed research design is utilized to fulfill the research aims. The study has a three-section research framework (Figure 1), and the sections focus on reviews, airlines, and passengers.

Figure 1: Research Framework
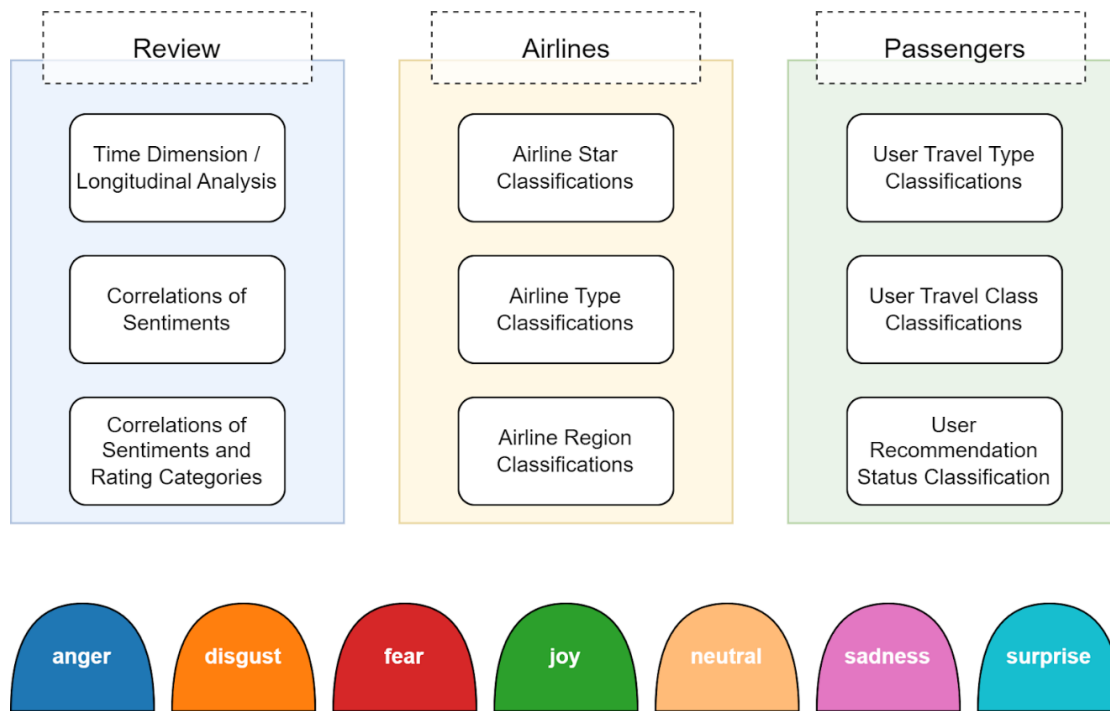
The first section focuses on the review content with a sentiment perspective and employs time dimension evaluation, sentiment categories, and rating categories scores. Second and third sections of the research framework consist of airline-related and passenger-related classifications due to significant characteristic information available in the marketplace. As previous airline marketing research studies examine the airline market through different classes (premium cabins / economy cabins) (Sezgen et al., 2019), different airline classes such as low-cost airlines (Yee Liau & Pei Tan, 2014) and passenger's types (Bunchongchit & Wattanacharoensil, 2021), this study presents an integrated approach combining different elements inside.

2.2. Data Collection

The study sample is obtained through AirlineQuality.com (Skytrax, 2024c), a website where users can post reviews about airlines and airports. User reviews for airline companies are included in the pages dedicated to airline reviews. Users can post reviews in free-text format, with numerical rating scores indicating numbers and star ratings. A sample review is included in Figure 2.

Figure 2: Review Sample in AirlineQuality.com

Python programming language on Google Colab platform is used for data scraping and analysis and the data collection takes place on 12-13 July 2024. Table 1 contains the sample information and review counts for each types of airlines.

Table 1. Study Sample

Category	Number of Airlines	Sample Size
2 stars airlines	9	737
3 stars airlines	129	64739
4 stars airlines	62	49228
5 stars airlines	10	9576
Total	210	124280

2.3. Data Analysis

Sentiment analysis methodology as defined by Liu (2022) "*the field of study that analyzes people's opinions, sentiments, evaluations, appraisals, attitudes, and sentiments towards entitites*" can be useful tool for evaluating the text content online. Online user reviews as a text and numerical content is a powerful source for marketing researchers to understand the consumer evaluations. Since the sentiment analysis has two main approaches (lexicon-based and machine-learning based approach), this study follows the machine-learning based approach by deep learning category. In this study, "Emotion English DistilRoBERTa-base" (Hartmann, 2022) model as a distilled version of DistilRoBERTa base (Santh et al., 2019) which was a distilled version of RoBerta (Liu et al., 2019) based on BERT Model (Devlin et al., 2018) - is employed for sentiment analysis. BERT-based approach is one of the recent methodological approaches in airline research stream, it is included within the Deep Learning category in supervised learning approaches in machine learning (Hasib et al., 2024). BERT-based approach is efficient approach comparing to other machine learning approaches (Patel et al., 2023) and a modified version of the approach is followed in the study.

In the first stage of the analysis, no pre-processing activity is implemented in the first stage of the analysis, due to the transformers-based methodology. For each review in the sample set, the model calculates the sentiment category scores for each sentiment category. As the review text in Skytrax website (2024c) consists of longer reviews relative to other websites, the sentiment scores for each review can have varying values between the sentiment categories. From this point of view, final sentiment column is populated and the decision of final sentiment is done by the maximum value of the sentiment categories. As indicated in Table 2, the review text has varying values among the sentiment categories, but the maximum value (0,968) leads to the decision of "neutral" category in the final sentiment.

Table 2. Sentiment Calculation Example

| Review Text	anger	disgust	fear	joy	neutral	sadness	surprise	Final sentiment
EasyJet for sure is a Low Cost Carrier. You get what you pay for. The flight from London to Munich was completely full and it's not particularly used for business traveling. Everyone is bringing a carry on bag and the EasyJet staff are very strict about their regulations (you get what you pay), they check it at the gate. The seats are quite narrow, but I'd say for short distance flights it's ok. Also the staff seems to be pretty young.	0,003	0,007	0,001	0,007	0,968	0,003	0,008	neutral

Due to length limits of the models, some of the reviews are dropped for sentiment analysis since they are long for sentiment analysis. Total dropped reviews are 2792 reviews (Two-Stars Category: 12, Three-Stars Category 1573, Four-Stars Category: 1085, Five-Stars Category: 122).

3. Results

The results section is grouped into five main sections consistent with the study's research questions. In the first of these, the general distribution of sentiments over the entire sample is included, thus revealing the general characteristic features of the sample. In the second stage, an examination was conducted over airline companies classified as 2-Stars, 3-Stars, 4-Stars, and 5-Stars in Skytrax classification. The third stage contains the examination of sentiments by airline types and airline regions, and the user-side of the reviews is examined through travel type, travel class, and recommendation status in the fourth stage. In the last stage of the results, sentiment categories were evaluated among themselves and the variables in the user review. The integrated approach, comprising five stages, comprehensively addresses the emotional spectrum of airline consumers in the study.

3.1. Sentiment Distribution and Evolution Over Time

The first stage contains two perspectives: an overview of sentiment distribution and the longitudinal side of sentiments. This stage contributes to an overall understanding of airline consumers' evaluations and reflects the starting point of the following stages. Figure 1 displays the sentiment distribution and indicates that the dominant sentiment category in the conversation is neutral category as 31360 reviews (25.8%) belong to this sentiment category. The neutral sentiment category can either include the neutral expressions or latent sentiments (relative to specific sentiment categories). On the other hand, remaining part (apprx 75%) as the majority of the reviews have dominant sentiment categories which signals the importance of emotion research in the context. Apprx ¾ reviews in the conversation have dominant sentiment categories which can contribute to accessing to consumer insights. The second dominant sentiment category is sadness that refers to 16.3% of reviews and it is followed by disgust (15.7%), joy (14.5%), surprise (9.6%), anger (9.3%) and fear (8.8%) categories.

Figure 3. Sentiment Distribution in Sample Set
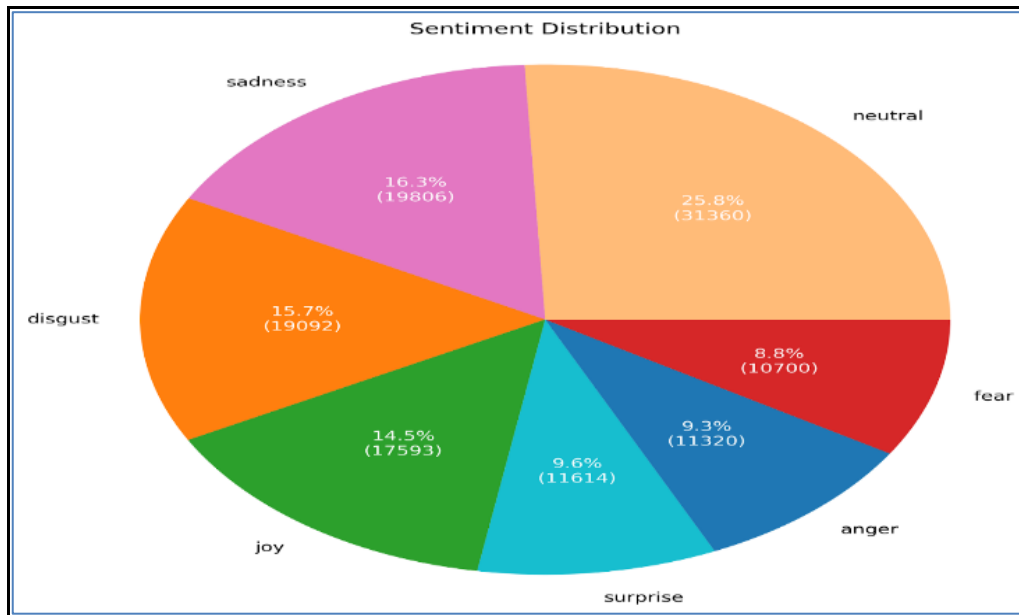
The distribution's close values among sentiment categories can be better evaluated by examination of individual sentiment categories, and other variables regarding airline companies, user characteristics and review variables. Table 3 elucidates the sample reviews for each sentiment category, while Figure 4 examines the correlation among the sentiment categories.

Table 3. Sample Reviews for Sentiment Categories

Sentiment Category	Score	Review Content
Neutral	0,968	"EasyJet for sure is a Low Cost Carrier. You get what you pay for. The flight from London to Munich was completely full and it's not particularly used for business traveling. Everyone is bringing a carry on bag and the EasyJet staff are very strict about their regulations (you get what you pay), they check it at the gate. The seats are quite narrow, but I'd say for short distance flights it's ok. Also the staff seems to be pretty young."
Sadness	0,989	"My flight was an hour late that made me skip my connection. After a lot of bouncing around the Amsterdam airport I have found T4. It was a machine that printed me out the tickets for tomorrow and a hotel voucher. At that point on some reason it felt like I didnt want to go to any hotel. It felt miserable. It took me couple hours just to calm myself down Some of my fellow unlucky passengers felt the same way because I've seen them sitting around not going to the hotel and talking how Bad it was. Just a miserable day"
Disgust	0,991	"The worst flight ever! Not even every other seat was packed like sardines! Charged me for two checked bags and then said it was warranted because one was overweight. I will never fly this airline ever again. Disgusted very disgusted. Especially in a pandemic."
Joy	0.993	"For a long time I have avoided taking British Airways due to it's poor past reputation. Yesterday I traveled on BA 34 from Kuala Lumpur to London Heathrow, I boarded the flight with an open mind, over 12 hours later I disembarked feeling very happy because it is always good to see an airline make visible improvements that deliver value to it's customers. A praise is due and I want to congratulate BA for such a pleasant experience, the flight departed on time and arrived half an hour early, the crew was not only professional but they did everything with a smile that made passengers feel welcomed, the plane was pristine new with delightful entertainment content, the food was way above the expectations of a seasoned economy class traveler. What more can I say? Enough to say that I will be traveling with BA again!"
Surprise	0.984	"Took OZ754 from Singapore to Seoul and was assigned a flight without any personal in-flight entertainment! I am very surprised at this. Service was so-so. Food portion and taste was also ok. The only good thing is that the leg room is wider. I will not consider taking

		Asiana again for my next Korea trip."
Anger	*0.991*	*"Having flown with Wizzair in the past and been happy with the experience even though the flight times were not great. I had planned to take another trip with them and went through the process of selecting flights and although not happy with their baggage rip off and the bad flight times I went to check out and discovered that although the flight prices were in GBP I had to choose a different currency to pay in and that is when the final rip off occurs. The conversion they use adds approximately 10% extra to the flight cost, I was furious, I hate hidden charges and did not proceed with booking and wanted to warn other people to be aware of this trick."*
Fear	*0.994*	*"CDC regulations are not being followed, no social distancing what so ever. Very crowded flight, sad to see elderly people being exposed to a very dangerous environment. I felt very unsafe"*

Figure 4 employs correlation test to present the relationships between sentiment categories to pairs of sentiment categories in the user reviews. The figure presents the positive correlations between anger and disgust (0.53), neutral and joy (0.53), fear and anger (0.34), surprise and joy (0.32) and surprise and neutral (0.32). On the other hand, negative correlations between disgust and joy (0.68), anger and joy (0.53), joy and fear (0.39), surprise and disgust (0.36) are also concluded in Figure 2. These sentiment category pairs includes consumer insights for airline decision-makers in marketing decision-making.

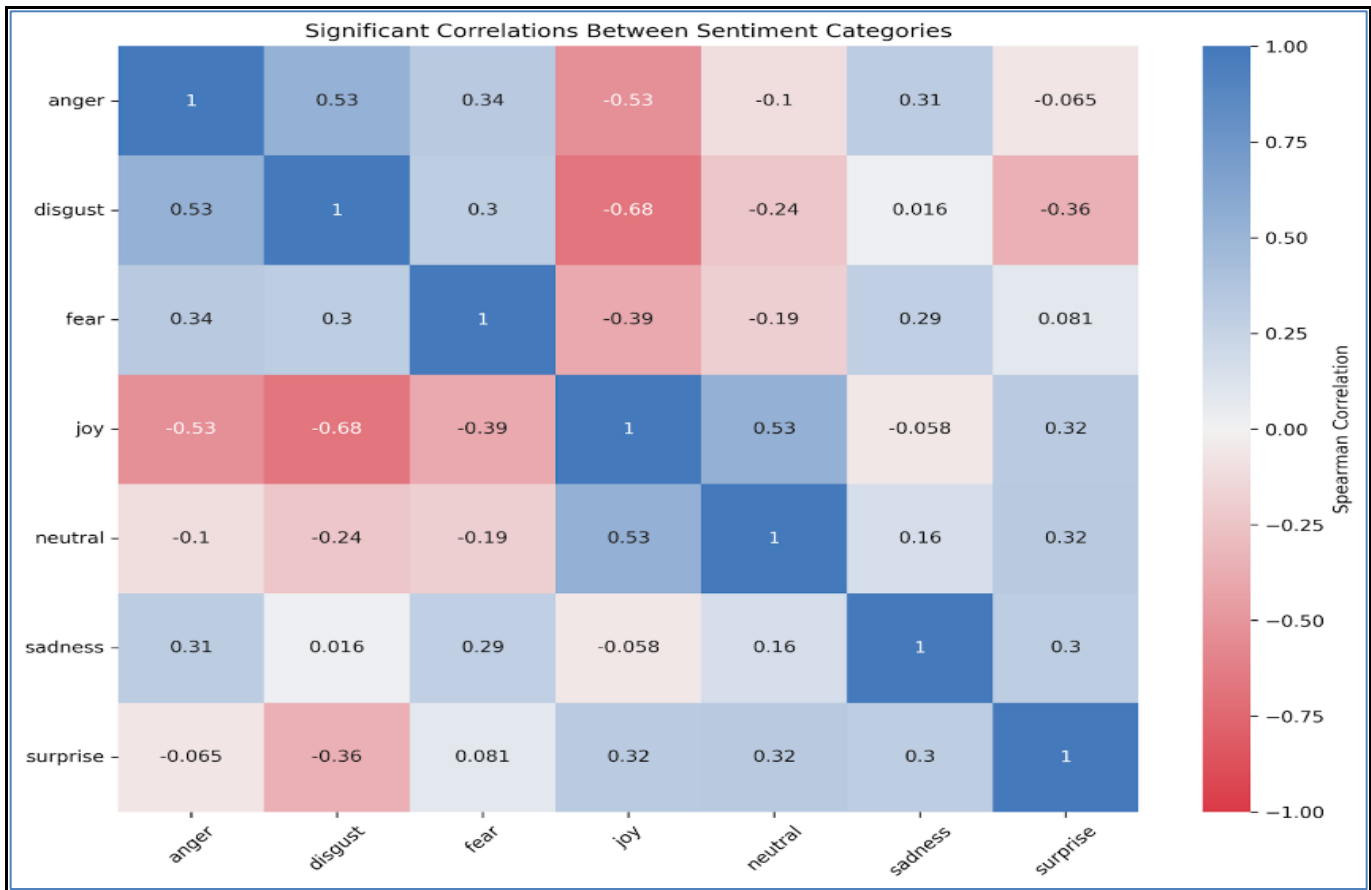**Figure 4.** Rating Elements and Sentiments Correlations

Figure 3, Table 2 and Figure 4 presents an overview of the dataset with a summarizing approach. However, longitudinal approach can be helpful for marketing decision-making as the review dataset consists of data from past years. Figure 5 presents the sentiment distribution through years by quarters, from 2013 Q1 to 2024 Q3.
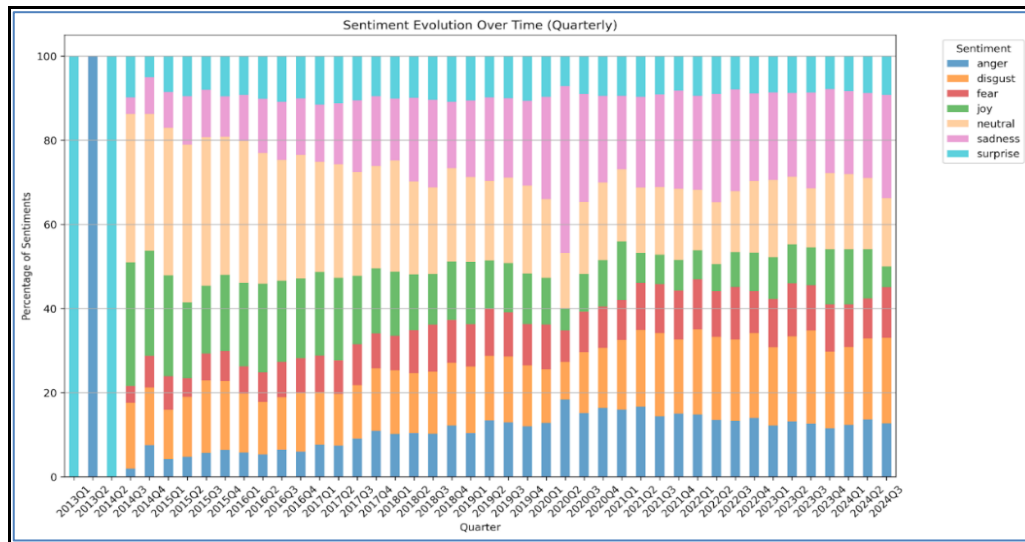
Figure 5. Sentiment Evolution Over Time

Figure 5 visualizing the evolution of sentiments over time presents that neutral sentiment category is continuously present in the conversation with some fluctuation. Anger, disgust and surprise have also continuous patterns over time. The major implication of time dimension evaluation refers to effect of Covid19 to airline industry. For example, Between 2014Q3 and 2019Q4, the joy sentiment is quite present in the distribution, however 2020Q2 has one of the lowest percentage for joy sentiment which is consistent to COVID19 pandemic around the world. This implication can be confirmed by the increase of sadness emotion to the largest proportion in the conversation at the same time period.

3.2. Airline Star Classification and Sentiment Categories

Following the overview and longitudinal examination of sentiment in the conversation, the section focuses on evaluating the airline companies with sentiment perspective. First part focuses on the stars-classification by Skytrax company which is evaluated each year published at Skytrax website (Skytrax, 2024a). According to Skytrax (2024b), Skytrax World Airline Star Rating by Skytrax is "*the prestigious, longest established and unique mark of Quality Achievement and a global benchmark of Airline Excellence*" which classifies the airline according to parameters. Since there is no 1-star airline company listed on the website, this study focuses on the star rating classification and evaluates 2-Stars, 3-Stars, 4-Stars and 5-Stars airline companies by sentiment perspective and Figure 6 depicts the distribution of sentiment categories across the stars classification.
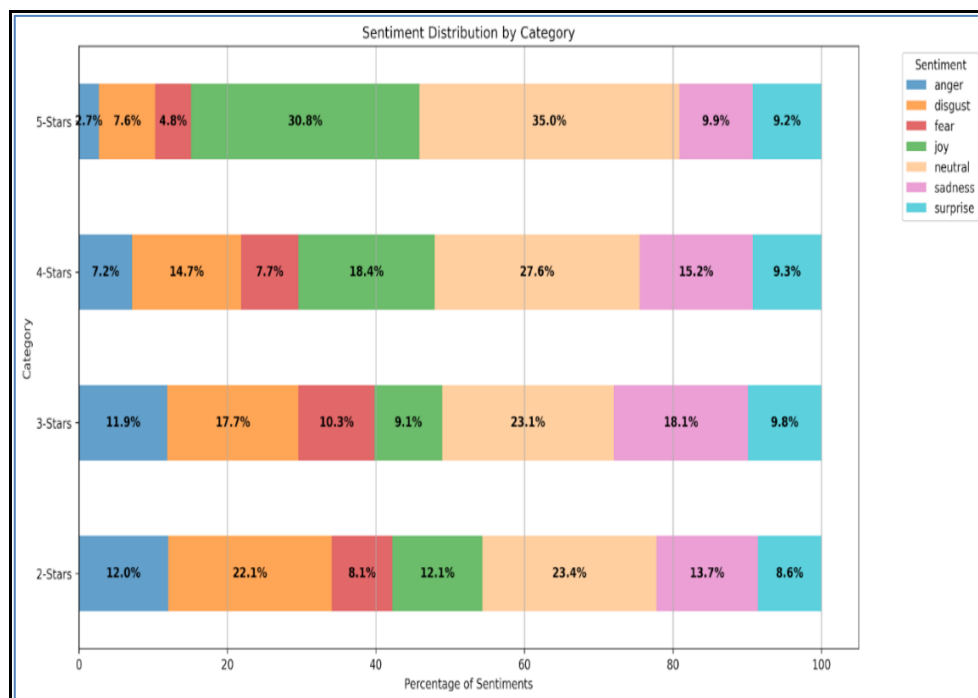
Figure 6. Sentiments and Polarities of Reviews

Figure 6 summarizes the sentiment category distribution among different stars airlines and it shows neutral and joy sentiments are the majority of the 5-stars ratings and joy sentiment has the highest percentage between other classes which confirms the "best" quality classification is reflected to user reviews. The figure also shows that anger and disgust sentiments are increasing in the lower-stars classifications and sadness is prominent in 4-stars, 3-stars and 2-stars airlines. It is also clear that surprise sentiment category is constant among the different star-levels.

3.3. Airline Types and Sentiment Categories

Skytrax (2024b) classification also includes three types of rating types namely as full service airline, low-cost airline and leisure airline. This study uses the classification of Skytrax (2024b) as a base and focuses on the similarities and differences in different types of airlines by sentiment perspective in Figure 7.

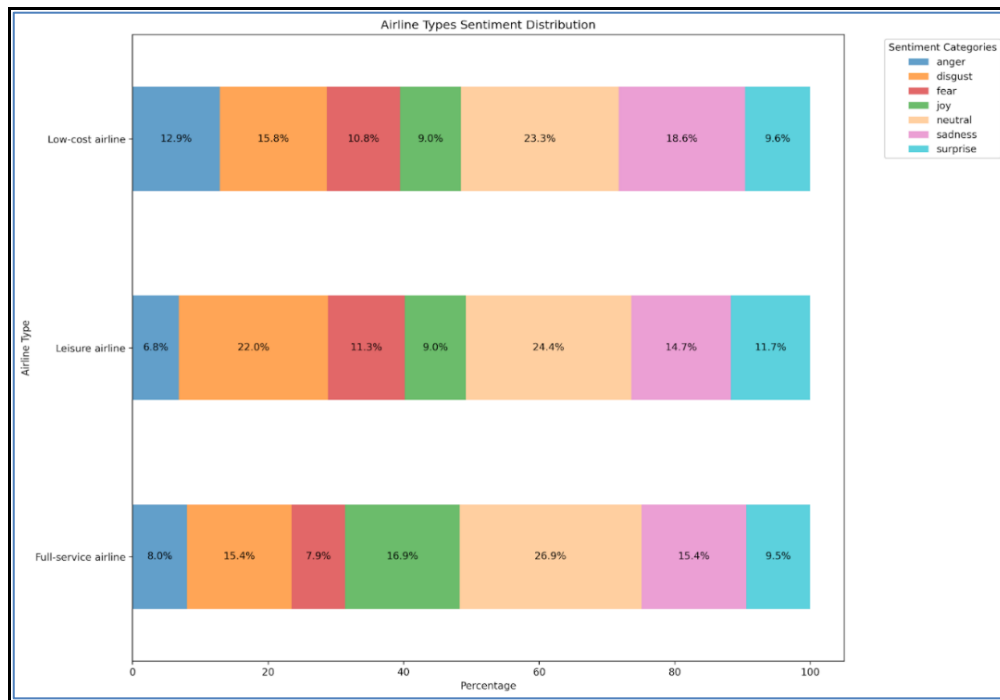**Figure 7.** Sentiment Distribution Among Airline Types

Figure 7 shows that neutral sentiment category is the most common category among the airline types and show the highest proportion in the full-service airline. Surprise, sadness and anger sentiment categories are stable among the different types of airlines, while disgust, fear, joy have some differences. For example, disgust is more prominent for leisure airlines which can be related to expectations of leisure airline passengers. Fear is least expressed in full-service airlines which can be indicator of higher performance or "full-service" nature for the customer experience. Finally, joy has the highest percentage among the airlines in the full-service airline. One of the notable implication of the Figure 7 is joy has the same percentage ratio in low-cost airlines and leisure airlines.

Skytrax website (2024a) classifies the airline companies by their region and name the regions as Africa, Asia, Australia / Pasific, Central America & Caribbean, Europe, Middle East, North America, Russia / CIS / Central Asia, South America. The website also uses "China" as a region, this analysis employs China in the Asia region. Figure 8 portrays the sentiment distribution among the different regions of airlines.
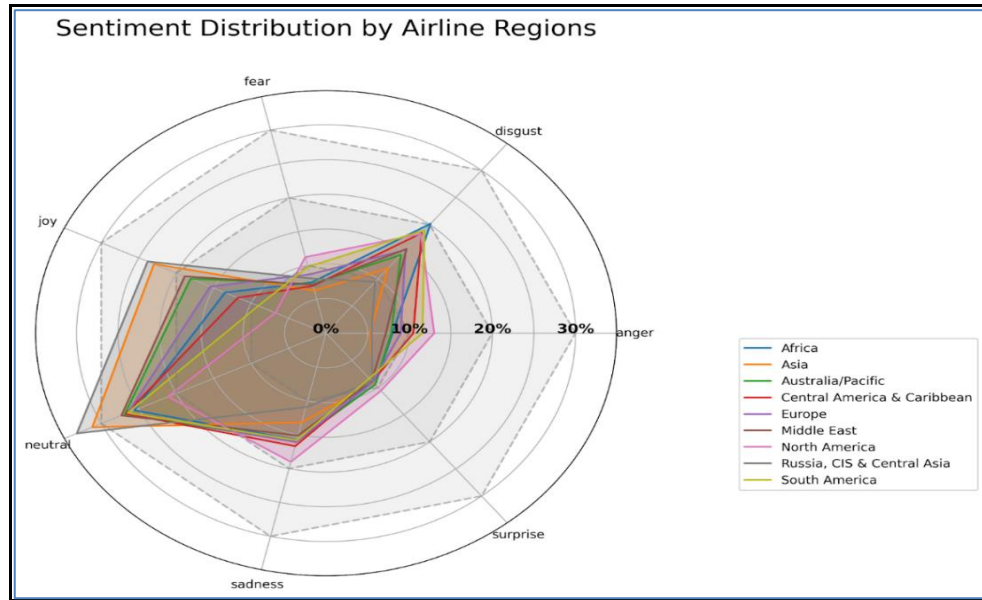
Figure 8. Sentiment Distribution Among Regional Airlines

Figure 8 presents the sentiment category distributions among the airlines in region-based structure. It is indicated that North America, South America and Central America & Caribbean region airlines has the anger percentages highest. Africa, Central America & Caribbean, North America and South America region airlines has the disgust sentiment percentage highest. North America and South America has fear category has highest; while in Russia, CIS & Central Asia, Asia, Middle East, and Australia / Pacific region airlines has the joy sentiment category highest. Russia, CIS & Central Asia and Asia has the highest neutral values; while North America has the highest sadness sentiment percentages. Finally, surprise sentiment category has similar percentages across different regions airlines.

3.4. User Types and Sentiment Categories

Research framework focuses on the passenger side of airline marketing in the third section. User ratings on airlinequality website contains information regarding the passenger's travel type, travel class and their recommendation status regarding the airline. This study examines the sentiments expressed in conversation by comparing travel types, travel classes and recommendation statuses.
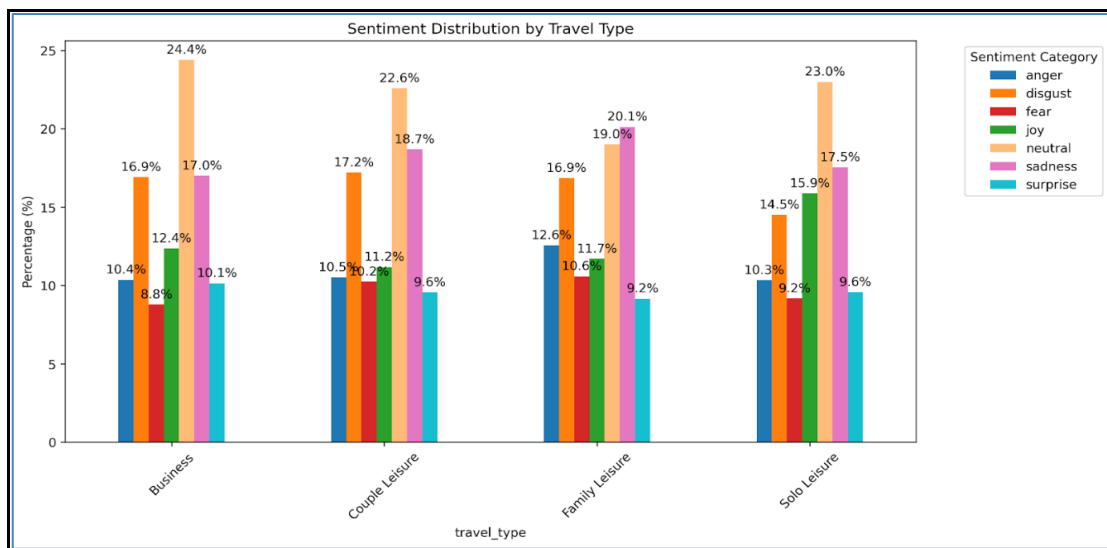
Figure 9. Sentiment Distribution Among Travel Types

Figure 9 indicates that neutral sentiment category is the most common sentiment category across travel types. Sadness is particularly more common in family leisure travel type passengers, while joy is particularly more common in solo leisure travel type passengers. It is also concluded that fear and surprise are the least common sentiment categories among different travel types passengers.
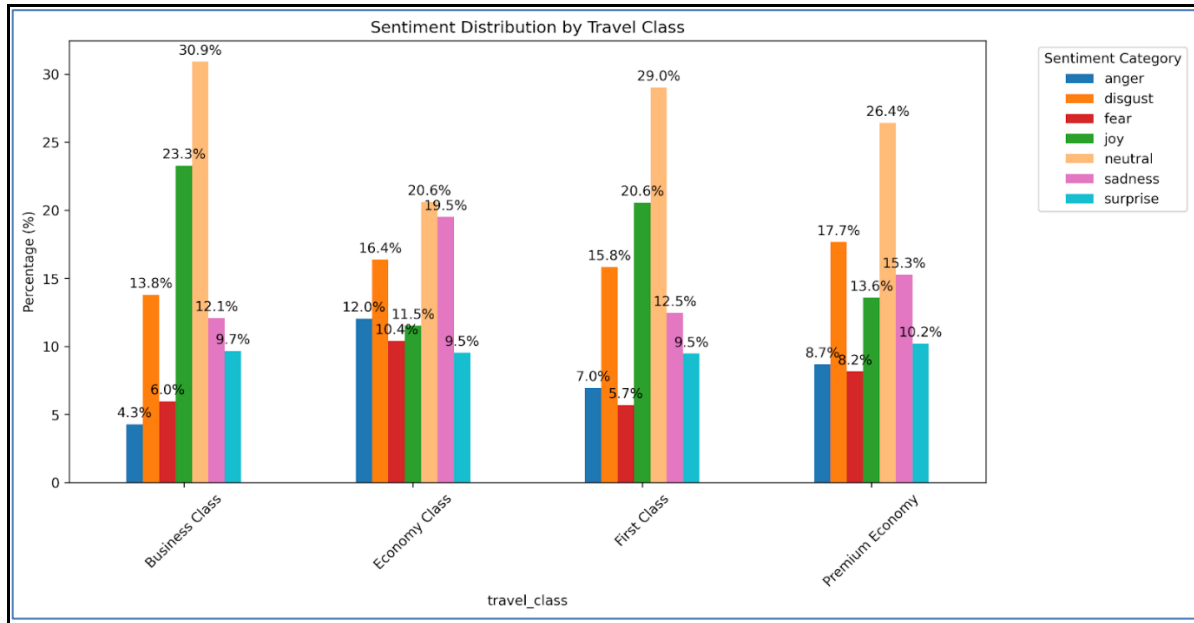
Figure 10. Sentiment Distribution Among Travel Types

Figure 10 portrays the different travel classes for passengers by sentiment perspective. It is concluded that neutral sentiment category is most common sentiment category across different travel classes. Joy sentiment category is significantly higher in business class and first class, while anger and fear sentiments are lowest ones in business class and first class. Economy class and premium economy class passengers have similar sentiment distributions, while slight differences take place in anger, neutral and sadness categories.

Figure 11. Sentiment Distribution Among Recommendation Status
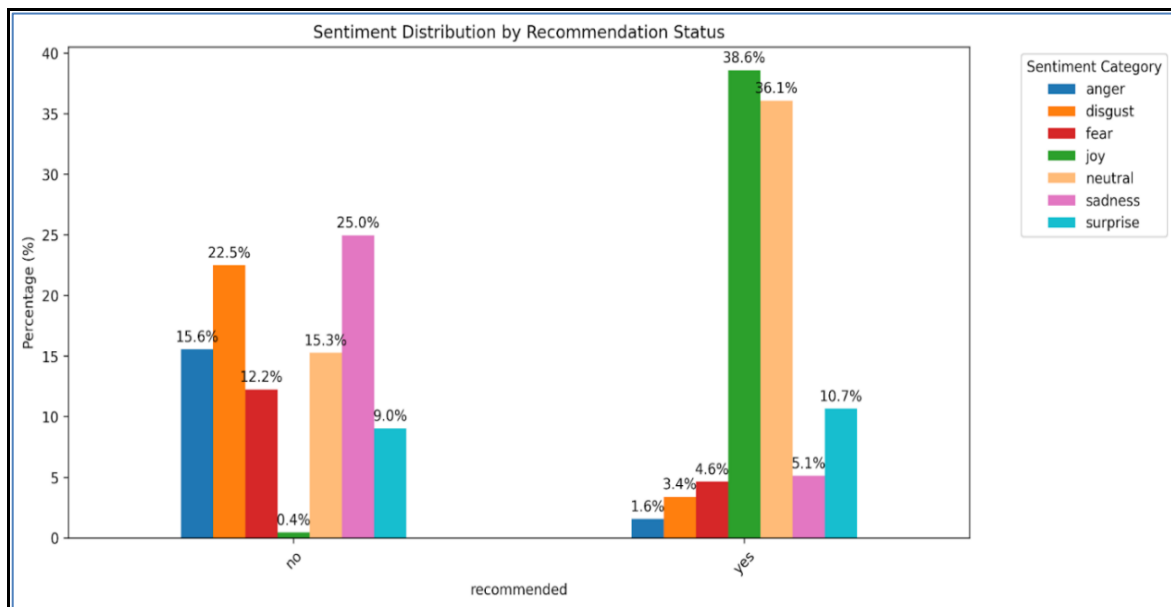
Final part of passenger analysis focuses on recommendation status of airline passengers and Figure 11 presents the sentiment distribution for not recommending passengers and recommending passengers. The first finding is the clear difference in joy sentiment which reflects the nature of "not recommendation" status for the joy sentiment category. The other side of classification -recommending passengers- have mostly the joy sentiment category. It is clear that recommendation phenomenon is related to joy, neutral and surprise categories which can be crucial signal for consumer insights. On the other hand, the signals of "not recommending" can be associated to sadness, disgust, anger, neutral and fear sentiments.

3.5. Rating Categories and Sentiment Categories

The final part of the results refer to user review parameters included in airlinequality.com reviews. Users have the ability to

rate the airline companies from 1 stars to 5 stars, in terms of several variables such as seat comfort, cabin staff service, food & beverages, inflight entertainment, wifi & connectivity, ground service, value for money. The users also rates the airline company overally from 1 to 10. The numerical expressions/feedback from the users can be enriched through inclusion of sentiment analysis. Figure 12 reveals the correlation results between the sentiment categories and numerical evaluations.

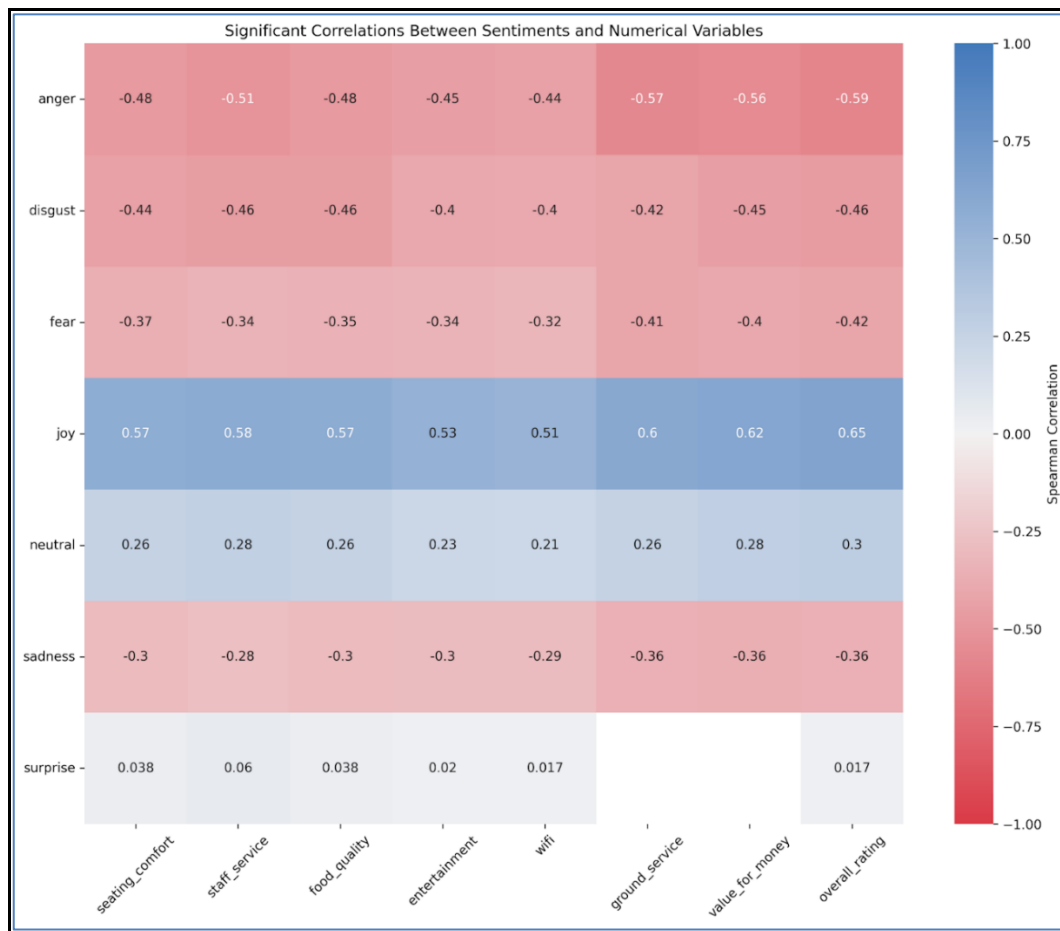**Figure 12.** Correlation of Sentiment Categories and Numerical Rating Categories

Figure 12 depicts three relationship types between sentiment categories and numerical evaluations. The first part refers to positive moderate correlation indicated by joy sentiment category. Joy sentiment category is mostly correlated with overall rating, value for money and ground service. The second part - positive low correlation- is found for neutral and surprise categories. Neutral category has weak correlations with all numerical ratings, while surprise category has lowest relationships for most of them and no statistically significant correlations with ground service and value for money. The final part refers to negative correlations indicated as red boxes in Figure 10. Anger, disgust, fear and sadness has the negative correlations with all numerical values. Anger and overall rating (0.59), anger and ground service (0.57), anger and value for money (0.56) are the most powerful correlations which signals that if the users have angry expressions in the comments, their numerical ratings are decreasing.

Conclusion

The study set out to examine airline customer reviews through a sentiment analysis perspective -as a powerful perspective to understand consumer evaluations (Liu, 2022) - and employs user reviews to extract sentiments. The research framework is designed consistent to the research questions on overall distribution, airline star classifications, airline types and regions, and other variables. Therefore it consists of multi-faceted aspects of airline customers, such as the reviews, airline companies, and passengers' characteristics. Employing a larger dataset, the study extends the previous literature with lower sample sizes (Ban & Kim, 2019; Kwon et al., 2021; Ray et al., 2021). Distinct and significant patterns regarding airline companies, passengers, and sentiment categories are concluded in the study, and novel and integrated findings are included in the methodology section.

The first part of the analysis focuses on the overview of the sentiment categories in the dataset. The fact that approximately 3/4 of the user reviews contain dominant sentiments other than neutral sentiments highlights the potential of sentiment analysis

in airline consumer research. According to the results of this study, the sentiment categories of sadness, disgust, and joy follow the neutral category. The specific individual categories are crucial since they represent the antecedents of several consumer attitudes and behaviors. Longitudinal analysis of sentiments reveals relatively stable sentiment rates and changes for airline marketing decision-makers. Neutral, anger, disgust, and surprise sentiment categories are currently more stable sentiments in user-airline interactions. On the other hand, the finding related to joy and sadness unusual high with a pandemic like COVID-19 that affects business world and airline market (Donthu & Gustafsson, 2020; Mumbower, 2022; Nikbin et al., 2022) in the study, can be also indicator of the sentiment analysis potential regarding consumer insights in airline marketing.

The second part of the analysis focusing on star-ratings classifications reveals the differentiating and stable sentiment categories across the different types of airlines. It is revealed that surprise sentiment category has stable values leading to undifferentiated sentiment in the conversation, while joy category for 5-stars airlines and anger and disgust categories for other airline types are differentiating sentiment categories. This leads to conclusion that specific future research focusing on different star-rating airlines can focus on specific sentiment categories. In the third stage of examination focusing on different airline types indicates that surprise, sadness and anger sentiment categories are more stable between different types of airlines, while disgust, fear, joy have some differences. Following analysis in the third stage highlights the similarities and differences between different regional airlines. It is stated that Asia, Russia, CIS & Central Asia and Australia / Pacific region has the positive side, while South America, North America and other regions are more close to the negative side.

The fourth part of the research framework examines the sentiment spectrum from the passengers perspective by employing the data included in user reviews such as travel type, travel class and recommendation status. Different from previous company perspective, this perspective contributes to understanding of consumers by users perspective. Travel types findings indicate pairs of sadness sentiment category & family leisure type, joy sentiment category & solo leisure travel types. Travel classes findings implies the dominance of neutral sentiment category. After that, business class and first class passengers have mostly joy sentiment categories, while they have anger and fear sentiments as lowest percentages. The recommendation status findings presents the positive side (recommending passengers) is related to joy, neutral and surprise sentiment categories and the negative side is related to sadness, disgust, anger, neutral and fear sentiment categories. The study contributes to current literature that examines different passenger types (Bunchongchit & Wattanacharoensil, 2021) by evaluating the passenger types and sentiment categories together.

The final part complements the previous analysis regarding numerical ratings expressed by users in the reviews. This part concludes the relationship between sentiment categories and numerical ratings included in user reviews. The positive correlation indicated by the joy sentiment category is found with all numerical ratings, and the highest correlation is found with the overall rating. This customer insight reveals the antecedent side of overall ratings in terms of consumer understanding. On the other hand, the negative correlation side is crucial for better understanding the "content" side of negativeness in the user reviews. According to correlation results, the anger sentiment category is mainly correlated with ground service, value for money, and staff service, in addition to overall rating. The finding contributes to previous literature studies concluding several pairs of parameters and customer-related constructs such as cabin-staff & onboard service & value for money and customer satisfaction (Lucini et al., 2020), staff service and customer satisfaction (Kwon et al., 2021), online/mobile onboarding & inflight wi-fi service & baggage handling & inflight entertainment and passenger satisfaction (Noviantoro & Huang, 2022). For the overall rating side, disgust, fear, and sadness are the followers of the anger sentiment category in terms of correlation.

In the theoretical side, this study follows the emotion-approach based studies in previous literature (Mostafa, 2013b; Herjanto et al., 2022). On the other hand, the study contributes to the conceptual side of airline marketing by extending the sentimental perspective to a broader level of examination, including review, airline, and passenger side. The study extends the current literature with the previous studies with relatively smaller sample size (Ban & Kim, 2019) and limited scope such as flight delays (Song et al., 2020). It exhibits a deductive approach to understanding emotional phenomena in airline marketing using a novel transformers-model-based sentiment analysis approach, and the larger sample size is included on the Skytrax website.

The study's managerial implication relates to discovering patterns/pairs between sentiment categories and several characteristics included in the research framework. The framework signals the first steps of understanding consumer phenomenon in airline marketing with the different aspects regarding customer experience, customer satisfaction, and customer loyalty. Since the study focuses on the emotional side, extending the research focus to the content side that employs methodologies like topic modeling and text mining has potential for future research direct directions.

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