**A CLUSTERING APPROACH FOR ASSESSING SERVICE PERFORMANCE OF BRAND CHAINS' BRANCHES BASED ON GOOGLE REVIEWS:**

**A CASE STUDY IN FOOD AND BEVERAGE SERVICE SECTOR**

**Abstract**

In today's competitive food and beverage industry, understanding and enhancing service performance is crucial for maintaining customer satisfaction. (Bandara WMAH, 2020) Online review platforms like Google Reviews provide extensive customer feedback that can be used to assess and improve service quality. Traditional methods often fall short in capturing real-time customer sentiments, making innovative data-driven approaches essential for obtaining a comprehensive view of branch performance and identifying improvement areas. This study presents a novel clustering approach to assess the service performance of branches from five major food and beverage brand chains in Turkey, based on Google Reviews. We employ the k-means clustering method to analyze customer reviews and evaluate service quality across different locations. Key factors considered include the number of reviews, geographical distribution, and average review scores. The findings reveal significant regional variations in service quality, highlighting differences in customer satisfaction levels and overall branch performance. (G.S. Sureshchandar, 2002) This research provides valuable insights to assist large brand chains in optimizing service quality, enhancing customer satisfaction, and achieving strategic operational goals. (Nitin Rane, 2023) By leveraging Google Reviews data, this study contributes to a comprehensive understanding of customer feedback, facilitating informed decisions for operational improvements and strategic planning.

**Keywords:** Clustering, Google Reviews, Branch Analysis, Service Performance

## Introduction

The food and beverage industry in Turkey has a rapidly developing and diversifying structure in recent years. Restaurants, cafes, and fast-food chains are in intense competition, especially in big cities and touristic areas. The sector, which has a wide range from traditional Turkish cuisine to world cuisine, offers various examples from world cuisine as well as local delicacies. In addition to the increasing demand for healthy eating and organic products in recent years, fast food places such as fast food and fast casual have also gained popularity. The food and beverage industry in Turkey is constantly growing along with the developing economy and the tourism sector and maintains its feature of being a sector full of innovations. The demands of customers in this sector are constantly changing. These demands need to be analyzed well by businesses.

With the development of technology in recent years, measurable customer satisfaction has become very important for businesses. Reviews made especially on the internet and social media platforms play a decisive role in the reputation and customer experience of restaurants. While positive reviews increase a restaurant's popularity, negative reviews can negatively impact customer appeal. Businesses can evaluate their service quality and take steps to improve it by reviewing customer reviews and feedback on platforms such as Google Reviews. Thanks to the analysis of customer reviews, they can get ahead of their competitors strategically and operationally.

In the contemporary digital age, Google Reviews has become an indispensable tool for both consumers and businesses in the food and beverage industry. Consumers increasingly rely on these reviews to inform their dining choices, often prioritizing establishments with high ratings and positive feedback. For businesses, Google Reviews offer invaluable insights into customer preferences, areas of satisfaction, and points of dissatisfaction. By meticulously analyzing these reviews, businesses can discern patterns, refine their offerings, and enhance their service quality. This, in turn, fosters enhanced customer satisfaction and loyalty. The transparency, immediacy, and widespread accessibility of Google Reviews render them a potent instrument in shaping the competitive landscape of the industry. Consequently, businesses are compelled to innovate and excel in meeting customer expectations.

This study aims to analyze customer reviews on Google of 5 major food and beverage brands in Turkey and examine the effects of these comments on the reputation of the businesses, customer satisfaction, and service quality. By employing k-means cluster analysis, we can categorize and group similar customer feedback into distinct clusters, allowing us to identify key patterns and trends within the feedback. This method provides a nuanced understanding of customer sentiments, highlighting specific areas where businesses excel and where improvements are needed. This analysis will contribute to both academic literature and sectoral studies, guiding businesses in their strategic decision-making processes. By identifying key areas for improvement and understanding customer expectations, businesses can tailor their strategies to better meet market demands. Moreover, this research can serve as a benchmark for future studies aiming to explore the impact of online reviews in other sectors.

The first part of this paper will focus on the importance and effects of customer reviews in the food and beverage industry. It will discuss the role of Google Reviews in shaping consumer choices and business strategies. Following this, the methodology and data collection process of this study will be explained, detailing how customer reviews were analyzed, and the factors considered in the clustering methodology. General information about the five analyzed brands will also be presented to provide context. Finally, the findings of the study will be discussed, along with strategic recommendations for businesses based on the analysis of Google Reviews. The potential contributions of this research to future studies on customer feedback and service quality in the food and beverage industry will also be considered. This revised introduction sets the stage for your study by emphasizing the importance of Google Reviews in the food and beverage sector, outlining the objectives, and providing a structured outline of the study's components. It connects the evolving demands of customers with the analytical approach of the study, highlighting its relevance and potential impact.

## Related works / Literature Review

In the realm of modern business evaluation, the analysis of customer feedback has emerged as a vital tool for assessing service performance and customer satisfaction. Leveraging online platforms such as Google reviews, businesses can gain valuable insights into the perceptions and experiences of their customers. This form of feedback provides a rich source of unstructured data, offering a nuanced understanding of the strengths and weaknesses of a business's service delivery.

Numerous studies have demonstrated the efficacy of mining online reviews for evaluating service quality across various industries. For instance, Korfiatis et al. (2018) utilized online reviews to extract service quality indicators and improve predictive models of customer satisfaction. Similarly, Lee and Yu (2018) employed sentiment analysis and topic modeling techniques on Google reviews to assess airport service quality, showcasing the complementary nature of online reviews with traditional survey methods.

By harnessing the power of data mining and artificial intelligence, we seek to extract meaningful insights from the wealth of information embedded within these reviews. Specifically, we use the k-means clustering method to analyze customer feedback for major food and beverage chains in Turkey. This approach helps identify patterns and trends in customer satisfaction and service quality across different regions and branches. Through this research, we endeavor to provide businesses with actionable insights derived from their online presence, enabling them to enhance their service offerings and better meet the needs of their customers. By bridging the gap between online feedback and real-world service delivery, our study aims to contribute to the ongoing evolution of performance evaluation methodologies in the digital age.

Other similar studies mentioned above and conducted in recent years are summarized in Table 1, providing a comprehensive overview of how various researchers have utilized online reviews to evaluate service quality across different industries and regions.

*Table 1: Literature review*

|  |  |  |  |
| --- | --- | --- | --- |
| **Article** | **Year** | **Methods** | **Data of the research** |
| Gurbuz, M., Surmeli, D., Taskin, K., & Cebeci, H. | 2024 | The study utilizes data scraping methods to collect customer comments from Otelpuan.com, focusing on hotels with a rating of 7 points or above. Machine learning-based classification approaches are employed to categorize the dataset into environmental and non-environmental comments. Subsequently, sentiment analysis is performed on the categorized data to evaluate the environmental perceptions of customers about these hotels. | The study utilizes data derived from user comments on Otelpuan.com. The dataset comprises comments from hotels with a rating of 7 points or above. |
| Suchithra Rajendran, S. B. (2021) | 2021 | This study employs a meta-analysis across six service sectors—healthcare, hotels, airlines, restaurants, online games, and online food/grocery delivery—by analyzing over 32 million customer reviews. The methodology involves using quality management tools such as Juran’s trilogy and critical-to-quality (CTQ) techniques. Additionally, the study applies Ensemble of Latent Dirichlet Allocation (E-LDA) for topic identification, bigram and trigram analysis for fundamental investigation, and sentiment analysis to interpret customer feedback. | The article employs a quantitative approach to analyze over 32 million online customer reviews from six sectors with the objective of improving service quality. |
| Vladimir Vargas‑Calderón, A. M. (2021) | 2021 | The study uses customer reviews from Booking.com for hotels in Bogotá and Madrid. Methods include data scraping, text preprocessing, topic discovery using Latent Dirichlet Allocation (LDA), and visualizing review data through dimensionality reduction techniques like UMAP. | This study made use of customer reviews from online hospitality platforms, with a particular focus on hotel reviews from Booking.com. The reviews were collected from hotels in two cities: Bogotá and Madrid. |
| Yalcinkaya, B. (2020) | 2020 | This study employs text mining and sentiment analysis to evaluate customer reviews. The methodology includes collecting 82,598 reviews from Google, cleaning and preprocessing the data, and applying multilevel multinomial models. | The dataset under examination is a collection of online reviews for a range of fast-food chains and small businesses, sourced from Google Reviews. The dataset includes reviews from a number of cities across the United States. |
| N.I. Yusupova, D. R. Bogdanova, N. P. Komendantova. | 2020 | The study uses text mining techniques and natural language processing (NLP) to analyze customer reviews. It involves collecting reviews from specialized internet portals, cleaning and preprocessing the data, and applying sentiment analysis with machine learning tools, including the Naive Bayesian classifier. Pattern recognition methods and fuzzy search tools are used to classify the emotions in customer reviews, focusing on six basic emotions: joy, surprise, sadness, fear, anger, and disgust. | The article presents an overview of the various types of data that have been studied, with a focus on their specific applications. In particular, sentiment analysis was conducted on data extracted from social media posts and trained on the Sentiment140 dataset. This analysis aimed to gain insights into the reactions of people from different cultures to a crisis, as well as their attitudes towards subsequent actions taken in different countries. |
| Kiljae Lee, C. Y. (2018) | 2018 | This study employs sentiment analysis and topic modeling techniques on 42,137 reviews collected from Google Maps. The methodology includes using the Latent Dirichlet Allocation (LDA) algorithm for topic extraction and comparing the results with the ASQ ratings from the Airports Council International. | The data for the study was collected from Google Maps. It focused on the top 100 airports in terms of passenger traffic volume that participated in the ASQ survey between 2013 and 2016. |
| Jian Dong, Li, H., & Zhang, X | 2014 | This study employs a detailed content analysis of reviews from daodao.com, an online platform affiliated with Tripadvisor. Data collection focused on reviews from 4- and 5-star hotels in Sanya, China, with a sample of 100 top star hotels generating a total of 24,051 reviews. The research involved categorizing and analyzing the reviews to identify key attributes of customer satisfaction, such as service quality, room amenities, and hotel location. | The data presented in these pages has been derived from online hotel reviews, written in particular by Chinese customers. The authors of this study have endeavored to analyze the online reviews using a Chinese language content mining software, ROST CM6.0; this software is capable of splitting, filtering, merging, and counting frequencies of Chinese words. |
|  |  |  |  |

## Methodology

In this study, a data-driven approach to the quality-of-service performance as perceived by customers is applied. Using Google review data and k-means clustering method, the aim was to identify patterns and clusters within the dataset to understand the differences in service quality between different branches of five different brands.

### Data Collection and Feauters of Research

In this study, four main attributes were considered when classifying the branches of five major brand chains in terms of performance metrics. These attributes are critical for evaluating the performance and customer satisfaction levels of each branch. Table 2 presents all working attributes along with their definitions.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Table 2: Description of variables used in the dataset*   |  |  | | --- | --- | | Variable Name | Description | | Frequency | Indicates the total number of reviews received by the relevant branch since its inception on Google, reflecting its cumulative review history. | | Rating | Represents the average star rating received by the relevant branch out of 5 stars, encompassing all reviews submitted throughout its presence on Google Reviews. | | Recent Frequency | Reflects the number of comments received by the relevant branch within the last month, offering insight into recent customer feedback volume | | Recent Rating | Shows the average star rating received by the relevant branch out of 5 stars within the last month, providing an indication of its recent service quality performance. | |  |  |

The data for these features, namely Frequency, Rating, Recent Frequency, and Recent Rating was sourced from Google Reviews. To ensure consistency and reliability, the data collection was completed within a three-day period. This approach minimized potential temporal discrepancies, providing a consistent and accurate reflection of the branches' performance metrics during the data collection period. The collected data was then used for further analysis and clustering, allowing for the identification of patterns and the grouping of branches with similar performance profiles.

### Data Set Preparation and Descriptive Statistics

The preparation of the completion of data collection is the preparation of the data set, which involves the removal of missing and inconsistent values to ensure the accuracy and reliability of the data. This pivotal stage ensures that the data is free from any inconsistencies and is thus suitable for meaningful analysis. The service performance data set comprises detailed information from five major chain brands. In particular, the data set includes branch names, categories such as patisserie and bakery, coffeehouse, locations categorized by province and district, and whether the branches are situated in urban or rural settings. Furthermore, the data indicates whether the branches are in shopping malls. The data set includes several performance metrics, including total frequency, which represents the total number of reviews each branch has received; evaluation ratings, which is the average star rating each branch has achieved; recent frequency, which counts the number of reviews received in the last month; and recent evaluation ratings, which provide the average rating from the recent reviews. The data has been meticulously compiled into an Excel file, facilitating thorough analysis. The statistical values derived from this comprehensive data collection are presented in Table 3, which offers a detailed summary of the key performance indicators across different branches and brands.

*Table 3: Descriptive Statistics Values for the Dataset*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Maks. | Min. | Avg | Std. Dev. |
| Frequency | 5747 | 20 | 491.69 | 618.63 |
| Rating | 4.7 | 1.8 | 3.64 | 0.46 |
| Recent Frequency | 101 | 1 | 11.74 | 12.63 |
| Recent Rating | 5 | 1 | 3.24 | 1.09 |

3.3. Clustering Analysis

In this study, branches of five major brand chains were grouped based on their performance metrics using the K-means clustering method. Initially, the data was standardised by centralising and scaling it through Z-score standardisation to ensure uniformity across all metrics. The optimal number of clusters (k) was determined using the Elbow method, a technique that identifies the most appropriate number of clusters based on the dataset by plotting the explained variation as a function of the number of clusters. (Saji, 2024) Subsequently, the K-means algorithm was applied to divide the data into three and seven distinct clusters, effectively grouping branches with similar performance characteristics. The findings, which included summary statistics and cluster assignments for each branch, were then exported into an Excel file. This provided a comprehensive overview of the performance characteristics of branches across these major brand chains, facilitating further analysis and strategic decision-making by highlighting key trends and differences among the clusters.

## Results

In this section, the application of the methods used, and the data obtained from the analyses are presented separately according to different k values. Specifically, we discuss the clustering outcomes for both three-cluster and seven-cluster solutions. The results include summary statistics, cluster assignments for each branch, and comparative analysis of performance characteristics across the clusters. By evaluating these outcomes, we aim to provide a comprehensive understanding of the service performance of branches within the major food and beverage brand chains studied. This dual approach, analyzing k-means with both three and seven clusters, enables us to capture both broad trends and more detailed variations in service quality and customer satisfaction.

### Cluster Method With K=3

The analysis conducted using the Elbow Method, depicted in Figure 1, determined that one of the suitable numbers of clusters for the dataset is 3. The K-means clustering algorithm was then applied with 𝑘 = 3, effectively grouping the branches into three distinct clusters based on their performance metrics. Each cluster represents a group of branches with similar characteristics in terms of service quality and customer satisfaction. The resulting clusters highlight broad trends in performance, enabling an overall comparison among the branches. The elbow method was utilized to determine the optimal number of clusters for our k-means clustering analysis in assessing the service performance of brand chains' branches based on Google reviews. Identifying three clusters allows for a more targeted approach to improving service performance. Detailed analysis of each cluster will reveal specific characteristics and performance metrics that differentiate the branches, facilitating tailored strategies for marketing, resource allocation, and operational enhancements. The clear elbow point at k = 3 validates the robustness of our clustering approach, providing actionable insights for better strategic decision-making. High-performing branches can be studied for best practices, while focused interventions can be developed for medium and low-performing branches to elevate their service levels, thereby improving overall performance across the brand chains.

A graph with a line

Description automatically generated

*Figure 1: Elbow Method for K=3*

The data in Table 4 are presented in a clustered distribution according to the visits and ratings of the branches of the five largest food and beverage chains in Turkey. Cluster 1 consists of 408 stores with an average frequency of 377.96 visits and a rating of 3.87. Recent data shows that these stores have a recent visit frequency of 9.86 and a recent rating of 3.87. Cluster 2 contains 248 branches with an average frequency of 308.10 visits and a lower rating of 3.22. These branches have a recent visit frequency of 7.62 and a recent rating of 2.10. Cluster 3, with only 79 branches, has the highest average frequency of 1,655.44 visits and a rating of 3.77. The recent frequency for these branches is significantly higher at 34.42 visits with a recent rating of 3.63.

These results highlight different performance categories among the branches. Cluster 1 represents a group with moderate visit frequency and consistently high ratings, indicating stable performance. Cluster 2, with lower visit frequency and ratings, identifies branches that may require targeted strategies to improve customer satisfaction and engagement. In contrast, Cluster 3, despite having fewer branches, shows exceptionally high visit frequency and relatively high ratings, suggesting that these branches are very popular and performing well. This segmentation enables more precise strategic interventions, allowing management to focus on maintaining high standards in Cluster 1, improving performance in Cluster 2 and understanding the success factors in Cluster 3 to replicate them in other branches.

*Table 4: Distribution of the branches of the 5 largest food and beverage chains in Turkey within the cluster according to their visits and ratings*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cluster | N | Frequency | Rating | Recent Frequency | Recent Rating |
| 1 | 408 | 377,96 | 3,87 | 9,86 | 3,87 |
| 2 | 248 | 308,10 | 3,22 | 7,62 | 2,10 |
| 3 | 79 | 1655,44 | 3,77 | 34,42 | 3,63 |
| Average |  | **491,69** | **3,64** | **11,74** | **3,24** |

Table 5 provides a detailed distribution categorized by various characteristics within each cluster. The clusters are evaluated based on their presence in shopping malls, sector distribution, and urban-rural rates.

Cluster 1 has 55% of its branches located in shopping malls, with a sector distribution showing 19% in coffeehouses, 37.5% in fast casual restaurants, 23.7% in fast-food restaurants, and 19.8% in patisseries and bakeries. These branches are predominantly urban (82%) with a smaller rural presence (18%).

Cluster 2 shows a higher percentage (66.5%) of branches in shopping malls. The sector distribution for this cluster includes 5.7% in coffeehouses, 46% in fast casual restaurants, 30.1% in fast-food restaurants, and 18.2% in patisseries and bakeries. This cluster also has a high urban presence (89.5%) with 10.5% of branches in rural areas.

Cluster 3 has the lowest percentage (21.5%) of branches in shopping malls. The sector distribution for Cluster 3 is 15.2% in coffeehouses, 25.3% in fast casual restaurants, 50.6% in fast-food restaurants, and 8.9% in patisseries and bakeries. This cluster, too, is predominantly urban (83.6%) with 16.4% of branches located in rural areas.

On average, 49.65% of branches are in shopping malls, with sector distribution showing 14% in coffeehouses, 39% in fast casual restaurants, 28.8% in fast-food restaurants, and 18.2% in patisseries and bakeries. The overall urban presence is 84.8%, with 15.2% of branches in rural areas.

These distributions highlight the different strategic placements and sector focuses of the branches within each cluster. Cluster 1 and 2’s strong presence in shopping malls suggests a strategy focused on high foot traffic locations, which is further supported by a substantial urban presence. Cluster 2, with the highest percentage in fast casual restaurants, indicates a possible trend towards more upscale dining experiences in mall settings. Cluster 3’s high representation in fast-food restaurants and lower presence in shopping malls might indicate a strategy focusing on standalone locations that cater to urban customers, aligning with their high visit frequencies observed previously. This detailed segmentation aids in understanding the strategic placement and sector focus of each cluster, providing a foundation for tailored marketing and operational strategies.

*Table 5: Distribution of branches of the 5 largest food and beverage chains in Turkey within the cluster according to their characteristics (in percentage)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster | | In the Shopping Mall? (%) | | Sector Distribution (%) | | | | Rate of Urban Rural (%) | |
|  |  | Yes | No | Coffeehouse | Fast Casual Restaurant | Fast-Food Restaurant | Patisserie &Bakery | Urban | Rural |
| 1 |  | 55 | 45 | 19 | 37,5 | 23,7 | 19,8 | 82 | 18 |
| 2 |  | 66,5 | 33,5 | 5,7 | 46 | 30,1 | 18,2 | 89,5 | 10,5 |
| 3 |  | 21,5 | 78,5 | 15,2 | 25,3 | 50,6 | 8,9 | 83,6 | 16,4 |
| Average | | **49,65** | **50,35** | **14** | **39** | **28,8** | **18,2** | **84,8** | **15,2** |

The scatter plot shown in Figure 2 provides a clear visualisation of the distribution of visit frequencies versus ratings for food and beverage chain stores, segmented into three distinct clusters.

Cluster 1 (red dots) consists of stores with moderate ratings, mostly between 3 and 4, and generally lower visit frequencies, mostly below 2000. This indicates that these outlets maintain a stable performance but do not stand out in terms of customer attraction or satisfaction.

Cluster 2 (green dots) contains branches with lower ratings, mainly between 2.5 and 3.5, and visit frequencies typically below 1000. This suggests that these branches face challenges in attracting significant numbers of customers and achieving satisfactory ratings, highlighting potential areas for improvement.

Cluster 3 (blue dots) includes branches with a wider range of ratings from 3 to 5, with a significant number achieving ratings above 4. Visit frequencies for these branches are significantly higher, often exceeding 2000 and reaching up to 6000. This cluster indicates high performing branches that are able to attract large numbers of customers and achieve high satisfaction levels.

Overall, the scatterplot clearly shows the different levels of performance across the clusters, reinforcing the differences in customer engagement and satisfaction. Cluster 3 stands out as the most successful group, while Cluster 2 identifies branches that could benefit from targeted improvement strategies.

*metin, ekran görüntüsü, öykü gelişim çizgisi; kumpas; grafiğini çıkarma, diyagram içeren bir resim

Açıklama otomatik olarak oluşturulduFigure 2: Scatter Plot for K =3*

### Cluster Method With K=7

The Elbow Method, depicted in Figure 3, identified 7 as the optimal number of clusters for the dataset. Using k-means clustering with k=7, branches were grouped into distinct clusters based on performance metrics, highlighting trends in service quality and customer satisfaction. The scatter plot (Figure 2) shows customer ratings distribution across three clusters. Cluster 1 (Red) predominantly consists of moderate to good reviews, centered around a rating of 4. Cluster 2 (Green) contains lower to average reviews, with ratings from 2 to 4, indicating areas needing improvement. Cluster 3 (Blue) includes mainly high ratings, particularly around 5, reflecting high customer satisfaction. This clustering reveals patterns in customer feedback, with Cluster 3 indicating high satisfaction, Cluster 1 showing general positivity with some variability, and Cluster 2 highlighting areas of concern. These insights help businesses identify improvement areas and tailor strategies to enhance service quality and customer satisfaction.

metin, diyagram, çizgi, öykü gelişim çizgisi; kumpas; grafiğini çıkarma içeren bir resim

Açıklama otomatik olarak oluşturuldu

Figure 3: *Elbow for K=7*

The clustering analysis categorized the branches into seven distinct clusters based on their performance metrics, as detailed in table 6.

**Cluster 1**, consisting of 188 branches, shows moderate review frequency (317.11) and an average rating of 3.48. The recent frequency of reviews is 9.79, with a recent rating of 3.50, indicating stable but slightly below-average performance.

**Cluster 2** includes 92 branches with a high review frequency (1460.04) and a rating of 3.76. Despite the high engagement, recent ratings have dropped to 3.41, suggesting potential areas for improvement in customer satisfaction.

**Cluster 3** comprises only 6 branches but has the highest review frequency (4628.83). However, the rating is 3.68, with recent ratings declining to 3.33, indicating that while these branches receive significant attention, their recent performance has been subpar.

**Cluster 4**, with 131 branches, has moderate review counts (346.23) and a rating of 3.58. The recent frequency is 5.76, and the recent rating is notably low at 1.87, highlighting significant recent issues in customer satisfaction.

**Cluster 5** includes 24 branches with above-average review counts (526.50) and a rating of 3.81. The recent review frequency is 57.29, with a recent rating of 4.07, indicating high and improving performance.

**Cluster 6**, the largest with 221 branches, exhibits high ratings (4.06) with consistent recent performance (4.15) and a review frequency of 321.58. This cluster reflects branches with consistently high performance and customer satisfaction.

**Cluster 7** includes 73 branches with the lowest review frequency (145.55) and rating (2.69). The recent review frequency is 7.25, and the recent rating is critically low at 1.87, indicating persistent issues with service quality.

This clustering approach provides valuable insights, showing that Clusters 5 and 6 have strong performance and high customer satisfaction, while Clusters 3, 4, and 7 highlight areas needing immediate attention to improve service quality and customer satisfaction. Clusters 1 and 2 show average to slightly above-average performance with some areas for improvement. These findings enable businesses to tailor their strategies to optimize service quality and better meet customer expectations.

*Table 6:Distribution of the branches of the 5 largest food and beverage chains in Turkey within the cluster according to their visits and ratings*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cluster | N | Frequency | Rating | Recent Frequency | Recent Rating |
| 1 | 188 | 317,11 | 3,48 | 9,79 | 3,50 |
| 2 | 92 | 1460,04 | 3,76 | 19,33 | 3,41 |
| 3 | 6 | 4628,83 | 3,68 | 44,33 | 3,33 |
| 4 | 131 | 346,23 | 3,58 | 5,76 | 1,87 |
| 5 | 24 | 526,50 | 3,81 | 57,29 | 4,07 |
| 6 | 221 | 321,58 | 4,06 | 9,46 | 4,15 |
| 7 | 73 | 145,55 | 2,69 | 7,25 | 1,87 |
| Average |  | **491,69** | **3,64** | **11,74** | **3,24** |

The percentage distribution of the 5 largest food and beverage chains in Turkey according to the characteristics of their branches within the cluster is shown. The clustering analysis revealed distinct characteristics and distribution patterns among the branches. Cluster 1 has 52% of its branches in shopping malls and a balanced distribution across sectors, with a significant presence in urban areas (87%). Cluster 2 is primarily located outside shopping malls (81%), with a focus on fast-food restaurants (62%), and an urban presence of 82%. Cluster 3 is also mostly outside malls (83%), dominated by fast-food restaurants (83%), and has an urban presence of 83%. Cluster 4 shows a strong presence in shopping malls (65%), with a mix of fast casual (46%) and fast-food restaurants (39%) and is largely urban (88%). Cluster 5 has 37.5% of its branches in malls, mainly in fast casual restaurants (75%), and an urban presence of 87.5%. Cluster 6 features 45% of its branches in malls, with a diverse sector distribution including coffeehouses (23%) and patisseries (26%), and an urban presence of 81%. Cluster 7 stands out with 80% of its branches in shopping malls, primarily in fast casual restaurants (45%), and has the highest urban presence (90.5%). Overall, the analysis highlights the prevalence of urban branches and sector-specific distributions, providing insights for strategic decision-making to enhance service quality and customer satisfaction.

*Table 7: Distribution of branches of the 5 largest food and beverage chains in Turkey within the cluster according to their characteristics (in percentage)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster | | In the Shopping Mall? (%) | | Sector Distribution (%) | | | | | Rate of Urban Rural (%) | |
|  |  | Yes | No | Coffeehouse | | Fast Casual Restaurant | Fast-Food Restaurant | Patisserie &Bakery | Urban | Rural |
| 1 |  | 52 | 48 | 10 | | 40 | 35 | 15 | 87 | 13 |
| 2 |  | 11 | 81 | 19 | | 8 | 62 | 11 | 82 | 18 |
| 3 |  | 17 | 83 | 0 | | 17 | 83 | 0 | 83 | 17 |
| 4 |  | 65 | 35 | 5 | | 46 | 39 | 10 | 88 | 12 |
| 5 |  | 37,5 | 62,5 | 4,5 | | 75 | 12,5 | 8 | 87,5 | 12,5 |
| 6 |  | 45 | 55 | 23 | | 41 | 10 | 26 | 81 | 19 |
| 7 |  | 80 | 20 | 8 | | 45 | 23 | 24 | 90,5 | 9,5 |
| Average | | **49,65** | **50,35** | **14** | **39** | | **28,8** | **18,2** | **84,8** | **15,2** |

Likewise, the scatter plot in Figure 4 illustrates the distribution of data points across clusters for k=7. Once again, clusters characterized by high popularity and customer satisfaction stand out prominently. Notably, cluster 3 also showcases elevated popularity and customer satisfaction metrics in this configuration, suggesting a consistent performance trend across different cluster configurations. The scatter plot illustrates the distribution of customer ratings across these three clusters. The x-axis represents the rating scores given by customers, ranging from 1 to 5, while the y-axis shows the frequency of these ratings. The clusters are color-coded: Cluster 1 is represented in red, Cluster 2 in green, and Cluster 3 in blue.

Cluster 1 (Red): This cluster predominantly consists of moderate to good reviews, with a higher concentration around the rating of 4. The presence of reviews across various ratings in this cluster suggests that these customers generally have a positive perception of the service, although there are some mixed opinions.

Cluster 2 (Green): This cluster primarily comprises lower to average reviews, with ratings spanning from 2 to 4. The distribution of these reviews indicates areas where customer satisfaction is lower, highlighting potential issues that may need to be addressed by the business.

Cluster 3 (Blue): This cluster includes mainly high-rating reviews, particularly around the rating of 5. The high frequency of reviews in this cluster reflects a segment of customers who are highly satisfied with the service provided.

The analysis reveals significant patterns in customer feedback. Cluster 3, with the highest concentration of reviews at the top end of the rating scale, indicates a group of customers who are very satisfied with their experiences. Cluster 1 shows a balanced distribution of generally positive reviews but with some variability, suggesting that while the overall perception is positive, there are aspects that could be improved. Cluster 2 indicates areas of concern, as it predominantly contains lower ratings, pointing to specific issues that need to be addressed to improve customer satisfaction.

This clustering approach provides valuable insights for businesses, enabling them to identify key areas for improvement and tailor their strategies accordingly. By understanding the distinct characteristics of each cluster, businesses can make informed decisions to optimize service quality and better meet customer expectations. This data-driven approach can significantly enhance strategic decision-making processes, ultimately leading to improved customer satisfaction and service performance.

metin, ekran görüntüsü, öykü gelişim çizgisi; kumpas; grafiğini çıkarma, diyagram içeren bir resim

Açıklama otomatik olarak oluşturuldu

*Figure 4: Scatter Plot for K = 7*

## Conclusion

In the digital age, online customer reviews, particularly on platforms like Google Reviews, play a pivotal role in shaping consumer choices and influencing business strategies. (Sunil Sharma, 2023) Positive reviews can significantly enhance a restaurant's reputation and attract more customers, while negative feedback can deter potential patrons. (Graves, 2024) Leveraging these reviews for strategic insights is essential for businesses aiming to optimize their service quality and customer satisfaction. This study employed a clustering methodology based on Google review data to evaluate the service performance of branches from five major brand chains in Turkey's food and beverage sector. By analyzing factors such as the number of reviews, average ratings, recent review frequency, and recent ratings, we identified patterns and differences in service quality among branches across various provinces and districts.

The k-means clustering analysis revealed significant insights. The elbow method was employed to ascertain the optimal number of clusters, with results indicating that configurations of three and seven clusters were most appropriate. For the k=3 configuration, branches were grouped based on their review frequency and ratings, revealing distinct patterns. Cluster 1 branches, typically in shopping malls, exhibited moderate visit frequencies and high satisfaction. Cluster 2, also in shopping malls, had lower satisfaction scores. Cluster 3 branches, often in rural areas, exhibited high visit frequencies and satisfaction. The k=7 configuration provided a more detailed segmentation, showing a wider range of visit frequencies and satisfaction levels, with notable distinctions in branch locations and types of restaurants.

The findings of this study offer valuable insights for both academic and practical applications. By examining customer feedback from Google reviews, businesses can enhance their service quality, increase customer satisfaction, and refine their strategic operations. The study underscores the importance of leveraging online reviews to gain a competitive advantage and meet evolving customer expectations. In practical terms, this research provides a framework for businesses in the Turkish food and beverage sector to evaluate their branch performance effectively. By understanding the factors influencing customer satisfaction, businesses can tailor their services to better meet customer needs, thereby boosting customer loyalty and improving their market position. This study also contributes to academic literature by focusing on a specific and underexplored context, offering a basis for future research to further investigate and expand on these findings across different regions and sectors.

Despite the insights gained, this study has several limitations that should be considered. The data used in this research was limited to Google reviews over a specific period, which may not capture long-term trends or seasonal variations. Additionally, the k-means clustering method assumes a predefined number of clusters, and different methods or cluster numbers could yield different results. Furthermore, factors such as local economic conditions, specific marketing campaigns, and other external influences were not included in the analysis but may affect service quality. Lastly, the study focused solely on five major brand chains in Turkey, which may limit the generalizability of the findings to other countries or different sectors.

In conclusion, the analysis of customer feedback through Google reviews represents a crucial tool for enhancing service quality and customer satisfaction in the food and beverage industry. By adopting a data-driven approach, businesses can achieve better operational efficiency and remain competitive in a dynamic market. Future research could explore additional variables and broader geographical areas to deepen the understanding of customer behavior and service quality assessment.

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