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Factors Affecting Customers Satisfaction in the Airline Industry using AHP and TOPSIS Methods

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Abstract.

In the airline industry customer satisfaction varies with respect to multiple features such as price, quality, safety, attentivity, punctuality. In this research we propose an integrated AHP, TOPSIS modelling to find the best features that contribute to decision making. Also, these features help in evaluating airline customer satisfaction. AHP method finds the feature importance. TOPSIS assigns rank to the alternatives by considering the distance of alternative from Positive and Negative Ideal Solutions. Thereby, finding the Closeness Coefficient. Experimental results show that service quality and flight experience are of utmost importance in the customer satisfaction decision. The framework offers airlines a data-driven tool for prioritizing service improvements.

Keywords. Customer satisfaction, Airline industry, Fuzzy TOPSIS, Fuzzy AHP, Fuzzy Synthetic Evaluation, Closeness Coefficient

1. INTRODUCTION

In today's competitive airline industry, customer satisfaction is crucial for success, as rising expectations and low-cost carriers increase competition. Customer satisfaction is based on several factors that includes safety, food/beverage availability, punctuality, cabin comfort, services provided. Satisfaction depends on factors such as punctuality, cabin comfort, entertainment, food quality, and customer service. Traditional methods fail to capture uncertainty of data because customer preferences can keep changing. Fuzzy methods can deal with uncertain data and hence become an effective approach in the selection of features that help in decision making of a model. With the help of these methods airline industry officials can provide better facility to passengers and gain customer confidence, satisfaction. This paper includes literature review, proposed methodology, results and implications.

2. RELATED WORK

Previous studies have identified service quality, price, flight attendee behaviour as primary features for airline customer satisfaction (Wang'ondou, 2009 [8]). Research carried out by Saha et al. (2016) [9], Wilson & Christella (2019) [10], and Rahman (2014) [11] included more features such as responsiveness, assurance, and reliability. Singh (2016) [7] showed the use of AHP in concluding air industry service quality features, while Garg (2020) [3] and Mahtani & Garg (2018) [2] used FAHP to handle the uncertainty in airport/airline decision-making. Raut et al. (2016) [1] used CFA, FAHP, TOPSIS for airline service-quality evaluation and determined cabin, booking and check-in service as important attributes. Navid (2017) [6] proposed Type-2 Fuzzy TOPSIS to incorporate ambiguity in passenger evaluations and successfully ranked Iranian airlines. Saeida Ardakani et al. (2015) [4] used fuzzy methods to identify service-quality gaps, while Hassanzadeh & Asghari (2020) [5] applied fuzzy AHP-TOPSIS for operational-factor ranking. Kumar et al. (2024) [12] demonstrated the applicability of fuzzy AHP-TOPSIS to cybersecurity vulnerability assessment, highlighting its broader decision-making potential. Kumar et al. (2024) [13] incorporated machine learning for airline customer-satisfaction prediction, indicating a shift toward data-driven approaches.

3. METHODOLOGY

This project employs basic Fuzzy methods such as fuzzy AHP (FAHP), FAHP using a geometric means and TOPSIS methods for selecting the features for customer satisfaction. We define eight essential attributes: price (c1), Range kmph (c2), Capacity (c3), Seats (c4), Variants (c5), comfort (c6), and fuel type(c7) The outcome is a prioritized ranking of all these allocation options, providing valuable guidance for selecting a car brand. This study is to determine the features/factors that affect the customer satisfaction in airline. These systems influence various algorithms to identify the most critical factors affecting customer satisfaction, airline operators can focus on improving these areas to enhance overall customer experience.

3.1. Analytic Hierarchy Process (AHP)

Thomas L. Saaty developed AHP in the 1980s. It is an organized method of overseeing and evaluating complex choices that comprise segmenting a decision problem into more manageable subproblems that can be independently examined. The hierarchy elements can

relate to any condition of the decision problem, such as definite or indefinite conditions, or quantitative or qualitative factors. This method is generally used in various fields including business, healthcare, and engineering.

3.2. TOPSIS

The second method that is employed here is the TOPSIS method. In this method, each criterion is rated on a 5-point linguistic scale: Service Quality ranges from Excellent (5) to Very Poor (1); Flight Experience from Outstanding (5) to Unsatisfactory (1); Pricing from Very Affordable (5) to Very Expensive (1); and On-time Performance from Always On Time (5) to Always Late (1).

4. RESULTS

4.1. AHP Method

The attribute with the highest criteria weight, 0.3587 (Price), is identified as the primary selecting factor, while the attribute with the lowest criteria weight, 0.0393 (Fuel Type), is determined to be the least influential factor in the selection process. Table I shows the final results after performing all calculation.

TABLE I. FINAL RANKING OF ALTERNATIVES

Alternatives	Service Quality	Flight Experience	Price	On-time Performance
A1	5	4	3	5
A2	4	5	4	4
A3	3	3	2	3

The Alternative (A) with the highest CC_i value is provided the highest rank. Table II shows the closeness coefficient of the alternatives.

TABLE II. CLOSNESS COEFFICIENT OF ALTERNATIVES

Alternatives	Closeness Coefficient (CC_i)
A1	0.666
A2	0.451
A3	0

The Alternative with the highest CC_i score and with optimal solution was A1, with a C of 0.666 which has best ratings for customers satisfaction and highly recommended followed by A2 which as a moderate rating and then A3 with the least rating is not all recommended.

5. CONCLUSION

By using AHP method we produced a hierarchy of important features/criteria that included the comfort of seats, on-boarding service, booking in online mode, availability of food, drinks and handling of bags. With the help of pairwise matrix, we got to identify the most crucial features. Also, the consistency index helped in identifying the important features with their associated weights. With the help of TOPSIS method, rank was given to various criteria. The features with the highest closeness coefficient got the highest rank. Ranking was done with respect to their distance from the positive ideal and negative ideal solutions. Comfortable seating and high-quality customer service were the important features when combined both the methods.

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