# Analytics Startup Plan

**Synopsis: *This document provides a high-level walkthrough of the activities required to guide completion of the analysis.***

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| **Project** | **Airline Passenger Satisfaction Analysis** |
| **Requestor** | Jagjeet Singh Malhotra |
| **Date of Request** | July 5th, 2023 |
| **Target Quarter for Delivery** | 3rd, 2023 |
| **Business Impact** | The examination expects to recognize factors influencing traveler fulfillment and upgrade in general help, which can prompt better client experience, expanded client dependability, and an upper hand in the carrier business. |

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## 1.0 Business Opportunity Brief

In the dynamic landscape of the airline industry, a significant challenge lies in delivering a truly satisfying travel experience to passengers. Despite continuous efforts to enhance various aspects, including seat selection, travel class type, in-flight Wi-Fi, and food options, there remains room for improvement. The crux of this analysis is to unravel the crucial factors that contribute to passenger satisfaction, providing valuable insights that can empower airlines to optimize their services strategically.

With an abundance of variables at play, ranging from demographics to specific services, deciphering the driving forces behind passenger satisfaction requires a comprehensive analytical approach. The intricate relationships between various factors need to be deciphered, considering different demographics and types of travel, such as business, economy, and eco plus.

The analysis will delve into the demographic aspect, identifying potential variations in satisfaction levels based on factors like gender, age, and customer type. Understanding these distinctions will enable airlines to tailor their services to meet the unique needs and preferences of different passenger segments.

Ultimately, this endeavor is not just about dissecting data; it is about translating insights into actionable strategies. Armed with a profound understanding of passenger satisfaction drivers, airlines can embark on a transformative journey to elevate the travel experience they offer.

**The specific ask:**

This analysis represents an opportunity for airlines to gain a holistic perspective on passenger satisfaction, drive tangible improvements in their services, and secure a competitive advantage in a rapidly evolving industry. By unlocking the secrets of passenger contentment, airlines can chart a path towards excellence, leaving an indelible mark on the hearts and minds of their customers.

## 1.1 Supporting Insights

J.D. Power Airline Satisfaction Study (Effler, 2022), this renowned study provides valuable insights into customer satisfaction with different airlines. It evaluates factors such as in-flight services, boarding processes, and baggage handling, offering a benchmark for our analysis.

This study explores factors influencing airline customer satisfaction, particularly in-flight experiences and ancillary services. Passengers increasingly value entertainment options and Wi-Fi connectivity. Airlines with diverse entertainment and seamless internet access receive higher satisfaction ratings.

Comfortable seating arrangements and ample legroom are crucial for customer satisfaction. Airlines investing in ergonomic seating receive positive feedback.

Punctuality is critical for customer satisfaction. Airlines with on-time departures and arrivals build trust and loyalty.

Ancillary services like priority boarding, extra baggage allowance, and lounge access significantly impact customer satisfaction and generate additional revenue streams. Airlines should prioritize these services to enhance the overall travel experience. Reports from leading aviation research firms, like IATA and CAPA, offer a broader perspective on the industry's trends, challenges, and customer preferences. Integrating these reports will provide a comprehensive view of the market.

## 1.2 Project Gains

The successful execution of this analysis holds the promise of a multitude of gains for the airline company, transcending beyond mere data insights. These gains are centered on enhancing customer satisfaction and driving operational efficiency, ultimately contributing to the airline's competitiveness and success in the industry.

1. **Potential Revenue Gains:**

One of the most significant advantages that can be achieved through this analysis is the potential for increased customer loyalty and positive word-of-mouth. As passenger satisfaction levels rise, customers are more likely to choose the airline for their future travel needs. Satisfied customers tend to become loyal patrons, resulting in repeated bookings and a reliable stream of revenue. Additionally, positive word-of-mouth generated by happy customers can attract new clientele, further bolstering the airline's market presence and revenue potential.

1. **Quality Improvements in the Overall Travel Experience:**

By uncovering the key drivers of passenger satisfaction, the airline company can implement targeted improvements to enhance the overall travel experience. The analysis will identify pain points and areas of dissatisfaction, enabling the airline to focus on addressing these critical issues. Consequently, passengers will experience improved services, greater comfort, and enhanced amenities, fostering a delightful travel experience that leaves a lasting positive impression.

1. **Cost Savings through Focused Resource Allocation:**

Understanding the factors that significantly impact passenger satisfaction allows the airline to prioritize its resources effectively. By allocating investments strategically to address key drivers of satisfaction, the company can avoid unnecessary expenditures on areas that do not contribute significantly to customer contentment. This optimized resource allocation leads to cost savings and an efficient utilization of available resources.

1. **Time Savings through Streamlined Processes:**

The insights derived from this analysis will enable the airline to streamline its operational processes for greater efficiency. Identifying bottlenecks and inefficiencies that hinder passenger satisfaction allows the company to implement targeted changes to streamline procedures. Reduced waiting times, smoother check-ins, and improved service delivery will lead to time savings for both passengers and staff, enhancing the overall travel experience.

1. **Improved Customer Perception and Satisfaction:**

By proactively addressing pain points and delivering a superior travel experience, the airline's reputation will soar among its customers. Satisfied passengers are more likely to provide positive feedback and recommend the airline to others, resulting in a virtuous cycle of improved customer perception. This positive brand image contributes to the airline's competitive edge, differentiating it from rivals and attracting a loyal customer base.

## 2.0 Analytics Objective

The objective of this analysis is to identify the key factors influencing passenger satisfaction in the airline industry. We aim to understand how different demographics, travel class types, flight distance, and specific services impact satisfaction. Additionally, we will address data assumptions and limitations to ensure the accuracy of the insights. The goal is to provide actionable recommendations that will enable the airline to enhance customer satisfaction and drive operational excellence.

#### Objectives:

1. Identify the main factors influencing passenger satisfaction within the airline industry.
2. Explore if passenger satisfaction varies among different demographics, such as gender, age, and customer type.
3. Assess the impact of different travel class types (business, economy, eco plus) on passenger satisfaction.
4. Investigate the relationship between flight distance and passenger satisfaction.
5. Determine the significance of specific services (inflight entertainment, cleanliness, food and drink) for overall passenger satisfaction.
6. Utilize predictive modeling to forecast passenger satisfaction trends and potential improvements.
7. Position the airline as a leader in the industry by consistently delivering exceptional travel experiences.

#### Questions:

1. What are the specific aspects of the travel experience that most significantly influence passenger satisfaction?
2. Do different demographic groups (gender, age, customer type) have distinct preferences and expectations regarding their travel experience?
3. How does passenger satisfaction differ between business, economy, and eco plus travel class types?
4. Is there a correlation between flight distance and passenger satisfaction, and if so, how does it impact the overall travel experience?
5. Which specific services, such as inflight entertainment, cleanliness, and food and drink options, have the most substantial impact on passenger satisfaction?
6. What changes can be made to the operating model to create a customer-centric approach based on data-driven insights?

## 2.1 Other related questions and Assumptions:

1. How does the overall customer journey, from booking to post-flight feedback, impact passenger satisfaction?
2. Are there any geographical or regional variations in passenger satisfaction levels, and if so, what factors contribute to these differences?
3. What are the potential cultural nuances that may influence passenger preferences and expectations?
4. How do external factors, such as global events or economic conditions, affect passenger satisfaction in the long term?
5. How can customer feedback mechanisms be optimized to capture real-time insights and enhance the responsiveness of the airline to customer needs?
6. What are the opportunities for partnerships or collaborations with other service providers to enhance the overall travel experience?

## 2.2 Success measures/metrics

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|  | Success in this analysis will be determined by the tangible improvements observed in passenger satisfaction scores. To effectively gauge the impact of our efforts, we will focus on key performance indicators (KPIs) that capture various dimensions of passenger satisfaction. These KPIs include measuring passenger satisfaction rates based on different factors, such as travel class, type of travel (business, economy, eco plus), gender, and age.  Beyond mere scores, we will closely monitor changes in customer loyalty, as evidenced by an increase in repeat bookings and a growing base of loyal patrons. Additionally, we will actively seek and track positive feedback from passengers, which can provide valuable insights into the efficacy of our initiatives.  KPI’s:   * **Overall Passenger Satisfaction Index (OPSI):** The target for OPSI should be set at a minimum of 85%, indicating that at least 85% of passengers are satisfied with their overall travel experience. * **Net Promoter Score (NPS):** The target NPS should be set at +30 or higher, indicating a strong base of satisfied and loyal customers. * **On-time Performance:** On-time performance measures the percentage of flights that depart and arrive on time. The target for on-time performance should be set at 90% or higher, demonstrating a commitment to punctuality and reliability. * **Customer Complaint Resolution Rate:** This KPI measures the percentage of customer complaints successfully resolved within a specific timeframe. The target resolution rate should be set at 95% or higher, showcasing a responsive and efficient customer service approach. * **Customer Retention Rate:** The customer retention rate measures the percentage of repeat customers over a specific period. The target customer retention rate should be set at 30% or higher, indicating a loyal customer base and successful efforts to retain customers. |
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## 2.3 Methodology and Approach

**Type of Analysis**: In this analysis, we will employ various classification techniques to gain insights into the factors influencing passenger satisfaction within the airline industry. The chosen classification models include Naive Bayes, K-Nearest Neighbors (KNN), Classification and Regression Trees (CART) Decision Tree, C5.0 Algorithm, Random Forest, and Support Vector Machine (SVM).

**Methodology:**

To begin, we will preprocess the data, handling any missing values and ensuring the data is appropriately formatted for each model. We will split the data into training and testing sets to assess the models' performance accurately.

Next, we will apply Naive Bayes, KNN, and SVM to classify passenger satisfaction based on demographic and travel-related variables. We will evaluate each model's accuracy, precision, recall, and F1-score to determine the best-performing techniques.

Subsequently, we will implement decision tree-based models, including CART Decision Tree and C5.0 Algorithm, to explore nonlinear relationships and interactions between variables. This will provide valuable insights into the significant factors impacting passenger satisfaction.

Finally, we will deploy the Random Forest ensemble model, combining multiple decision trees, to enhance predictive accuracy and handle potential overfitting.

Throughout the process, we will fine-tune the model parameters using techniques like cross-validation to optimize performance. The models' outcomes will be interpreted, and feature importance analysis will be conducted to identify the most influential factors.

By employing this diverse set of classification techniques, we aim to create a comprehensive understanding of passenger satisfaction drivers and provide actionable recommendations to the airline company for optimizing their services and elevating customer experiences.

**Output:**

The output of the classification models will guide achieving the objective by providing valuable insights into factors influencing passenger satisfaction. Key variables contributing to satisfaction will be identified through feature importance analysis. The models will classify passengers by demographics and travel class, tailoring services to specific preferences. Performance metrics will assess models' accuracy, enhancing decision-making confidence. Customized recommendations will address specific services and pain points. Regular monitoring and improvement will ensure services align with customer expectations. This comprehensive output will serve as a roadmap for optimizing services, fostering customer loyalty, and establishing a customer-centric position in the competitive airline industry*.*

## 3.0 Population, Variable Selection, considerations

**Audience/population selection:** Airline passengers from the provided dataset.

**Observation window:** 2021-2022

**Inclusions:** All relevant variables related to passenger demographics, travel details, and satisfaction ratings.

**Exclusions:** Variables unrelated to passenger satisfaction in the provided dataset.

**Data Sources:**

KLEIN, T. (2020). *What factors lead to customer satisfaction for an Airline?* Retrieved from Kaggle: <https://www.kaggle.com/datasets/teejmahal20/airline-passenger-satisfaction>

**Audience Level:** Board of Directors

**Variable Selection:** Gender, Customer Type, Age, Type of Travel, Class, Flight Distance, Inflight wifi service, Departure/Arrival time convenient, Ease of Online booking, Gate location, Food and drink Online boarding

**Assumptions and data limitations:** Assumption have been listed in section 2.1 and Data Limited have been listed in section 4.0.

## 4.0 Dependencies and Risks

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| Risk | Likelihood (based on historical data) | Delay (based on historical data) | Impact |
| Limited Data Availability | Medium | Low | High  Insufficient or incomplete data may limit the analysis's scope and accuracy, affecting the ability to identify crucial factors influencing passenger satisfaction. |
| Data Quality Issues | Medium | Medium | Medium  Data inaccuracies or inconsistencies could lead to biased results and misinterpretation of passenger satisfaction drivers. |
| Model Overfitting | Medium | Medium | Medium  Complex models may overfit the data, resulting in high performance on training data but reduced accuracy on unseen data, leading to misleading conclusions. |
| Insufficient Feature Importance | Low | Low | Medium  Certain models may not effectively reveal the most influential variables affecting passenger satisfaction, potentially limiting the ability to prioritize improvements effectively. |
| Model Interpretability | Medium | Medium | Medium  Some complex models' lack of interpretability may hinder the clear understanding of how specific factors contribute to passenger satisfaction. |
| Dependency on Customer Feedback | High | Low | High  Reliance solely on customer feedback may lead to biases and may not capture the complete picture of passenger satisfaction, necessitating multiple data sources for a comprehensive analysis |

## 5.0 Deliverable Timelines

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| --- | --- | --- | --- | --- |
| Item | Major Events / Milestones | Description | Days | Date |
| 1. | Kick-off / Formal Request | Official project start | *3* | *July 4,2023* |
| 2. | *Data Collection and Preparation* | Gather and clean data | *7* | *July 12, 2023* |
| 3. | Data Exploration & Analysis   * Issues with duplicates * Issues with Spend data | Conduct data exploration to gain insights into the variables, relationships, and potential factors influencing passenger satisfaction. | *7* | *July 19, 2023* |
| 4. | Model Development | Train and validate classification models | *6* | *July 26, 2023* |
| 5. | Model Evaluation and Selection | Evaluate and select best-performing models | Assess model performance using appropriate evaluation metrics and select the most accurate and reliable models for passenger satisfaction prediction. | *3* | *July 30, 2023* |
| 6. | Recommendations and Insights | Generate actionable recommendations | Summarize insights, findings, and actionable recommendations based on the analysis results and feature importance analysis. | *2* | *August 1, 2023* |
| 7. | Report and Presentation Preparation | Compile final report and presentation Prepare a comprehensive report and presentation to communicate the analysis methodology, results, recommendations, and key insights to stakeholders. | *4* | *August 5, 2023* |
| 8. | Stakeholder Presentation | Present the analysis findings and recommendations to key stakeholders, addressing any questions or concerns. | *3* | *August 8, 2023* |
| 9. | Project Closure | Review and finalize project documentation, conduct project evaluation, and officially close the project. | *2* | *August 10, 2023* |

## References

Effler, G. (2022, 05 11). *North American Airline Passenger Satisfaction Declines: Here’s Why That’s Good News, Says J.D. Power*. Retrieved from J.D. Power: https://www.jdpower.com/business/press-releases/2022-north-america-airline-satisfaction-study

KLEIN, T. (2020). *What factors lead to customer satisfaction for an Airline?* Retrieved from Kaggle: https://www.kaggle.com/datasets/teejmahal20/airline-passenger-satisfaction