AIRLINE PASSENGER SATISFACTION REPORT: A COMPREHENSIVE ANALYSIS BY AKOR DENNIS ENECHE

INTRODUCTION

In today's extremely competitive airline market, it is critical for airlines to comprehend and handle client happiness if they are to prosper. Travelers now have more refined expectations, anticipating flawless experiences from booking to arrival, thanks to the development of technology and growing globalization. Airlines must learn more about the preferences and problems of their passengers if they are to live up to these expectations.

With thorough analysis tools, this project seeks to explore the complex world of airline passenger satisfaction by identifying, evaluating, and prioritizing the critical aspects influencing passengers' experiences and views. This research aims to offer practical insights to improve overall passenger pleasure by examining many aspects of air travel, such as pre-flight processes, in-flight services, and post-flight interactions

PROBLEM STATEMENT

High passenger satisfaction rates are still difficult to achieve, even with the abundance of services and facilities provided by airlines. The available dataset offers insightful information on a variety of characteristics that impact passenger happiness, including aspects of the travel experience like flight amenities and service quality as well as demographic data like age and gender.

Nevertheless, amid all this data, the real challenge is figuring out which factors are most important in determining passenger pleasure and then coming up with ways to maximize these factors. Our goals are to find patterns, correlations, and trends in the dataset and answer the following questions.

PROJECT QUESTIONS

1. Which factors have the most significant impact on passenger satisfaction?

2. Are there demographic differences in satisfaction levels?
3. How can airlines leverage these insights to enhance the overall travel experience and improve customer loyalty?

AIM

By addressing these questions, we seek to provide actionable recommendations for airlines to enhance passenger satisfaction and maintain a competitive edge in the dynamic aviation landscape.

ABOUT THE DATASET

The dataset utilized in this project was sourced from Kaggle and originates from a survey conducted by airlines to gauge passenger/customer satisfaction across various factors. Comprising 25 columns, the dataset encompasses crucial parameters including Age, Gender, Travel class, Arrival and Departure delays, as well as pivotal elements influencing customer satisfaction such as On-board service, Cleanliness, Seat comfort, and Baggage handling, among others of particular significance is the presence of a column or feature labeled 'satisfaction', which delineates the overall satisfaction level of the customer. This feature serves as the cornerstone of the dataset, encapsulating the customer's holistic experience. Notably, the 'satisfaction' feature comprises two distinct values: neutral or dissatisfied' and 'satisfied'. Functioning as the label feature, it encapsulates the culmination of ratings across other features, thus providing a succinct portrayal of the customer's satisfaction level.

DATA EXPLORATION AND PREPROCESSING

DATA PREPROCESSING

To maximize a deep learning strategy and effectiveness, data preprocessing is an essential first step. This usually means controlling features that are redundant or useless, correcting missing values, handling outliers, and handling duplicates.

1. Upload/ preview of the dataset in jupyter notebook.

2. Checking for missing values

The 'Arrival Delay in Minutes' column in this project had 393 missing values. We enter the missing values with the means of the non-missing values in the same column to fix this. The data cleansing procedure was carried out using Python in a Jupiter notebook environment. The code excerpt that was utilized to find the mean value and substitute the missing data is shown below.

```
In [3]: nan_values=Airline_pas_satisfaction.isna().sum()
        nan_values

Out[3]: ID                                       0
        Gender                                   0
        Age                                      0
        Customer Type                            0
        Type of Travel                           0
        Class                                    0
        Flight Distance                          0
        Departure Delay                          0
        Arrival Delay                          393
        Departure and Arrival Time Convenience   0
        Ease of Online Booking                   0
        Check-in Service                         0
        Online Boarding                          0
        Gate Location                            0
        On-board Service                         0
        Seat Comfort                             0
        Leg Room Service                         0
        Cleanliness                              0
        Food and Drink                           0
        In-flight Service                        0
        In-flight Wifi Service                   0
        In-flight Entertainment                  0
        Baggage Handling                         0
        Satisfaction                             0
        dtype: int64
```

```
In [5]:  ▶| Airline_pas_satisfaction["Arrival Delay"].mean()

Out[5]: 15.09112883918849
```

```
In [6]:  ▶| Airline_pas_satisfaction["Arrival Delay"].isnull().sum()

Out[6]: 393
```

```
In [7]:  ▶| mean_values= Airline_pas_satisfaction["Arrival Delay"].mean()
         mean_values

Out[7]: 15.09112883918849
```

```
In [8]:  ▶| Airline_pas_satisfaction["Arrival Delay"].fillna(mean_values, inplace=True)
         Airline_pas_satisfaction
```

Out[8]:

	ID	Gender	Age	Customer Type	Type of Travel	Class	Flight Distance	Departure Delay	Arrival Delay	Departure and Arrival Time Convenience	...	On-board Service	Seat Comfort	Leg Room Service	Cleanliness	Fo a Dr
0	1	Male	48	First-time	Business	Business	821	2	5.0	3	...	3	5	2	5	
1	2	Female	35	Returning	Business	Business	821	26	39.0	2	...	5	4	5	5	
2	3	Male	41	Returning	Business	Business	853	0	0.0	4	...	3	5	3	5	
3	4	Male	50	Returning	Business	Business	1905	0	0.0	2	...	5	5	5	4	
4	5	Female	49	Returning	Business	Business	3470	0	1.0	3	...	3	4	4	5	
5	6	Male	43	Returning	Business	Business	3788	0	0.0	4	...	4	4	4	3	
6	7	Male	43	Returning	Business	Business	1963	0	0.0	3	...	5	5	5	4	
7	8	Female	60	Returning	Business	Business	853	0	3.0	3	...	3	4	4	4	
8	9	Male	50	Returning	Business	Business	2607	0	0.0	1	...	4	3	4	3	

```
In [8]: Airline_pas_satisfaction["Arrival Delay"].fillna(mean_values, inplace=True)
        Airline_pas_satisfaction
```

	ID	Gender	Age	Customer Type	Type of Travel	Class	Flight Distance	Departure Delay	Arrival Delay		...						
6	7	Male	45	Returning	Business	Business	1905	0	0.0	5	...	5	5	5	4	5
7	8	Female	60	Returning	Business	Business	853	0	3.0	3	...	3	4	4	4	4
8	9	Male	50	Returning	Business	Business	2607	0	0.0	1	...	4	3	4	3	3
9	10	Female	38	Returning	Business	Business	2822	13	0.0	2	...	5	4	5	4	2
10	11	Female	28	First-time	Business	Business	821	0	5.0	1	...	2	2	5	2	2
11	12	Female	27	First-time	Business	Business	421	20	21.0	2	...	2	2	5	1	1
12	13	Male	24	First-time	Business	Economy	453	16	30.0	2	...	2	5	4	5	5
13	14	Male	9	Returning	Personal	Business	853	68	76.0	5	...	4	5	3	5	5
14	15	Male	52	Returning	Personal	Economy	853	0	0.0	4	...	3	2	3	2	2

```
In [9]: Airline_pas_satisfaction["Arrival Delay"].isnull().sum()
Out[9]: 0
```

3. To facilitate correlation analysis between various satisfaction factors and the overall satisfaction level, we encoded the 'satisfaction' column. We assigned the value 5 for 'satisfied' and the value 1 for 'dissatisfied'. This encoding scheme allows for a more straightforward interpretation of the relationship between individual satisfaction factors and the overall satisfaction rating.

```
In [14]: ▶ Airline_pas_satisfaction["Satisfaction code"]= Airline_pas_satisfaction["Satisfaction code"].replace({"Satisfied": 5, "Dissa
```

```
In [15]: ▶ Airline_pas_satisfaction
Out[15]:
```

	ID	Gender	Age	Customer Type	Type of Travel	Class	Flight Distance	Departure Delay	Arrival Delay	Departure and Arrival Time Convenience	...	Leg Room Service	Cleanliness	Food and Drink	In-flight Service	Inflight Wi Service
0	1	Male	48	First-time	Business	Business	821	2	5.0	3	...	2	5	5	5	
1	2	Female	35	Returning	Business	Business	821	26	39.0	2	...	5	5	3	5	
2	3	Male	41	Returning	Business	Business	853	0	0.0	4	...	3	5	5	3	
3	4	Male	50	Returning	Business	Business	1905	0	0.0	2	...	5	4	4	5	
4	5	Female	49	Returning	Business	Business	3470	0	1.0	3	...	4	5	4	3	
5	6	Male	42	Returning	Business	Business	3788	0	0.0	4	...	4	3	3	4	

4. We grouped the age column based on different age groups to categorize the age classes based on children, teens, adults, and elderly.

```
In [11]:  bins= [0, 20, 40, 60, 85 ]
          labels= ["<20", "20-39", "40-59","60-85"]

          Airline_pas_satisfaction["Age Group"] = pd.cut(Airline_pas_satisfaction["Age"], bins=bins, labels=labels, right=False)
          Airline_pas_satisfaction
```

Out[11]:

	ID	Gender	Age	Customer Type	Type of Travel	Class	Flight Distance	Departure Delay	Arrival Delay	Departure and Arrival Time Convenience	...	Seat Comfort	Leg Room Service	Cleanliness	Food and Drink	flig Servi
0	1	Male	48	First-time	Business	Business	821	2	5.0	3	...	5	2	5	5	
1	2	Female	35	Returning	Business	Business	821	26	39.0	2	...	4	5	5	3	
2	3	Male	41	Returning	Business	Business	853	0	0.0	4	...	5	3	5	5	
3	4	Male	50	Returning	Business	Business	1905	0	0.0	2	...	5	5	4	4	
4	5	Female	49	Returning	Business	Business	3470	0	1.0	3	...	4	4	5	4	
5	6	Male	43	Returning	Business	Business	3788	0	0.0	4	...	4	4	3	3	

DATA EXPLORATION USING SQL SERVER MANAGEMENT STUDIO

In the project, I utilize SQL for data exploration to unravel insights into airline passenger satisfaction. Through querying a comprehensive dataset encompassing passenger details, flight information, and satisfaction feedback, I aim to identify trends, patterns, and correlations. Our goal is to extract actionable insights that enable airlines to enhance the passenger experience and foster loyalty. And I started off by importing the excel file into the airline passenger project portfolio database.

STEPS: primary analysis of database by running different SQL queries and statement

1. A preview / background knowledge of the dataset.

2. To determine the total number of customers by gender.

Total customers by gender = male 63981 and female 65899

3. To find out the overall numbers of traveled customers (personal and business travelers).

Our travel type column comprises of two types of traveled customers which are;

- Personal travel type with the total number of 40187 trips.
- Business travel type with total number of 89693 trips.

4. To find out how many of our clients were dissatisfied overall with our services.
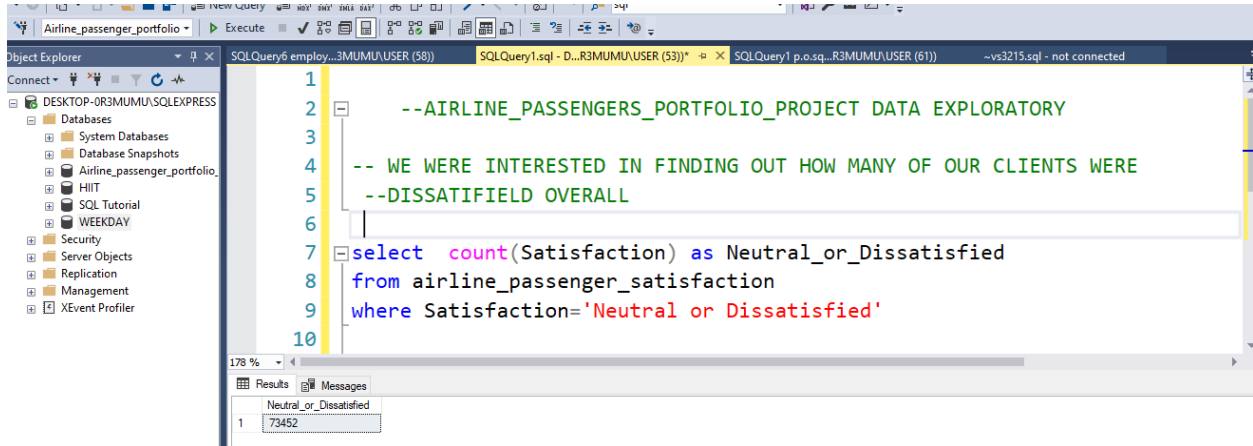
We discovered with the help of the COUNT function that most of our customers were not satisfied with our services, a total of 73452 dissatisfied customers.

5. To find out the number of satisfied customers
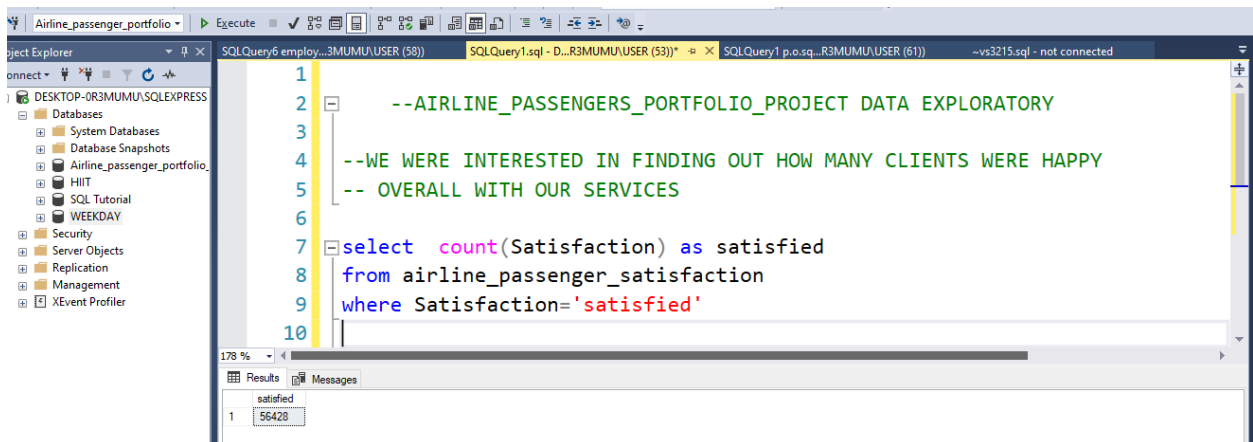
The total number of satisfied customers is 56426. Comparing these numbers with the dissatisfied customers we can see that we are not getting it right.

6. To find out total number of customers by gender
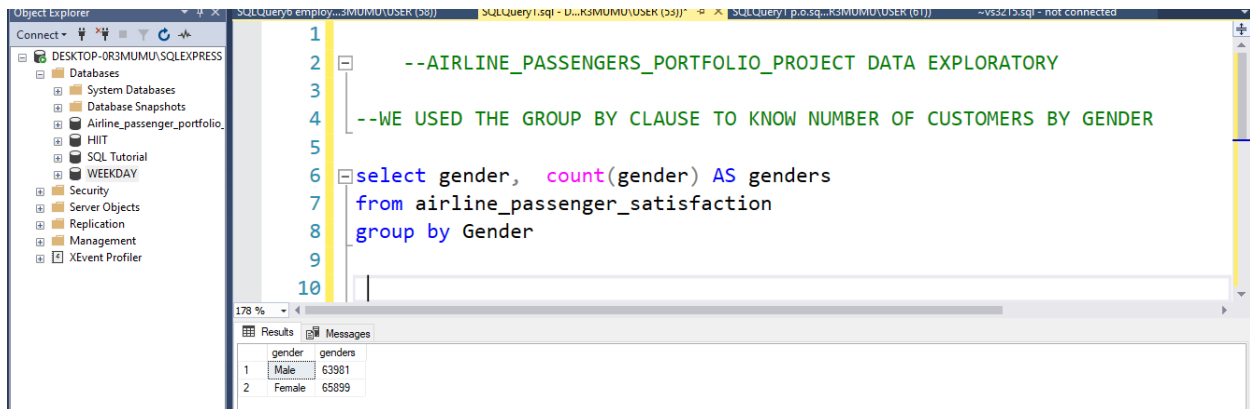
We discovered that we have more female customers compared with the male customers.

Female 65899 and male 63981

7. To find out the total number of customers by class (economy, economy plus and business class)

Customers by economy class = 58309

Customers by economy plus =9411

Customers by business class =62160

DATA VISUALIZATION

Data visualization is an essential tool for understanding datasets since it offers a clear picture before models are put into practice. The purpose of exploration data analysis is to learn more in-depth information about the dataset using power BI

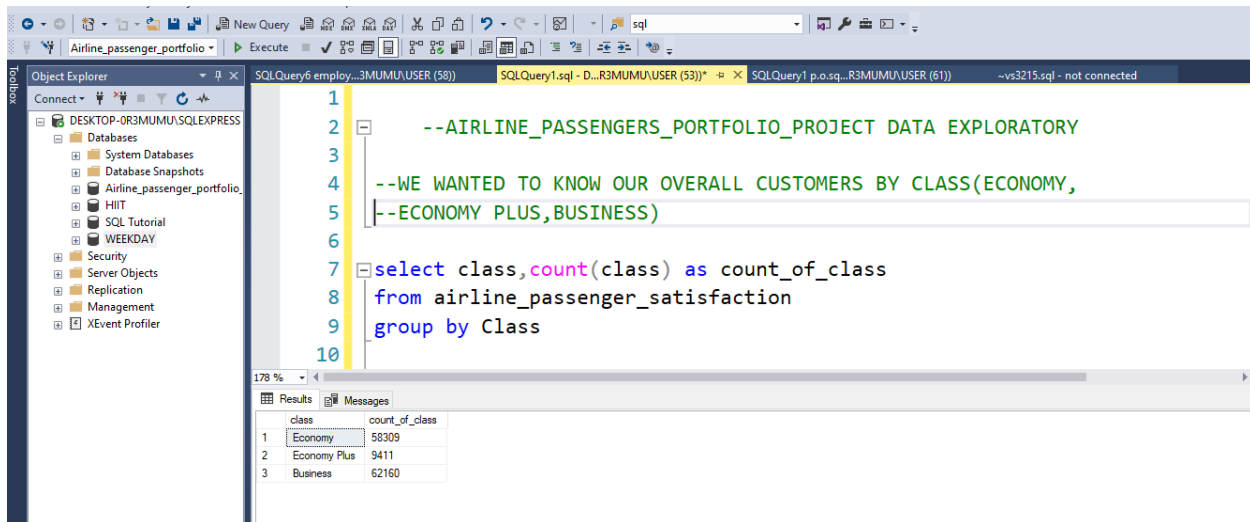In addition, an analysis was conducted to examine the correlation between various satisfaction factors and overall satisfaction rating using matplotlib in python.

DASHBOARD WITH POWER BI
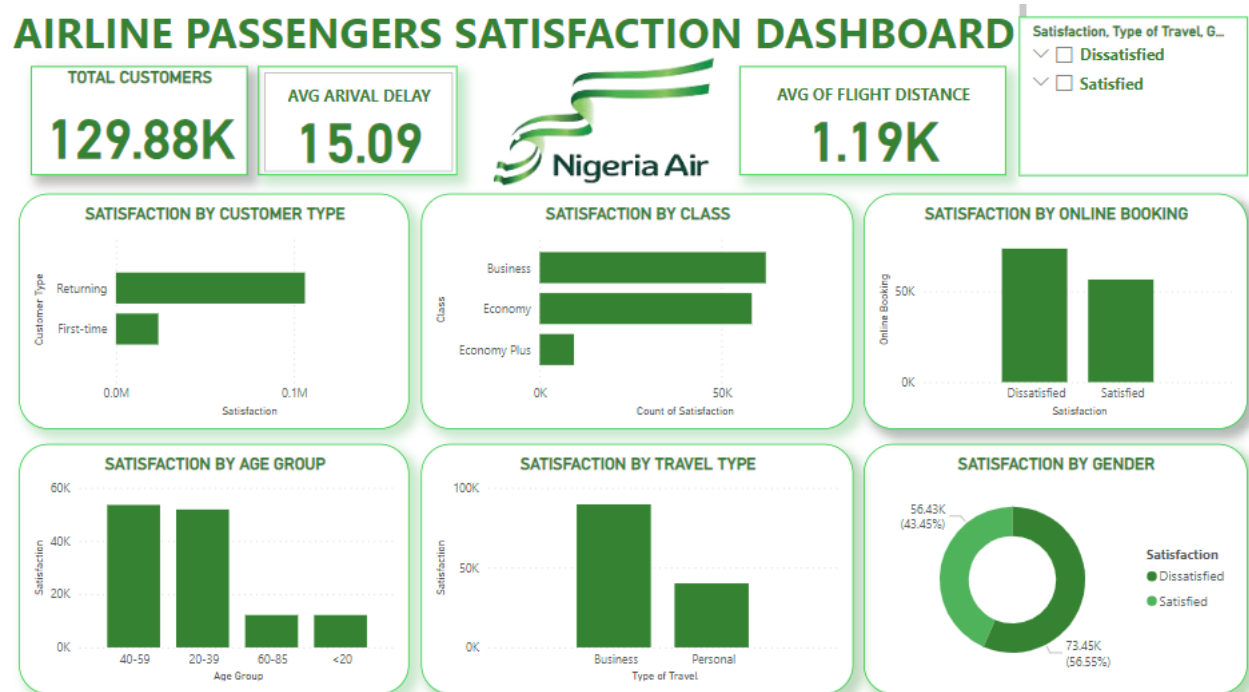
KEY INSIGHTS

I will extract valuable insights from the dashboard to inform and guide data-driven decisions by leveraging the comprehensive data visualization and analytics available. This process will empower me to capitalize on key trends, identify areas of improvement and enhance effective decision-making process.

1. TOTAL NUMBER OF SATISFIED AND UNSATISFIED CUSTOMERS
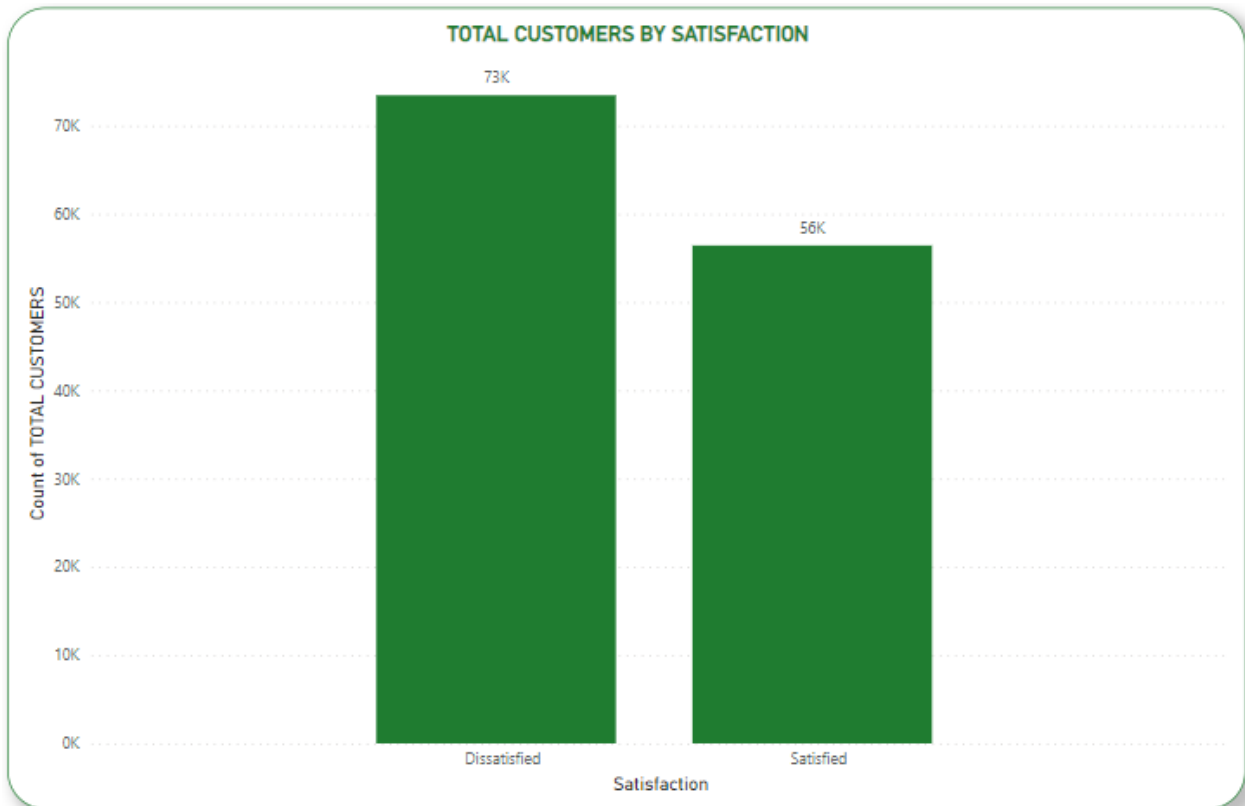
According to the chart, out of 129k consumers, 73k are unsatisfied customers (56%), while 56k are satisfied customers (44%). An area of possible problem in passenger satisfaction that requires attention is indicated by the larger percentage of unsatisfied consumers

2. SATISFACTION BY CLASS
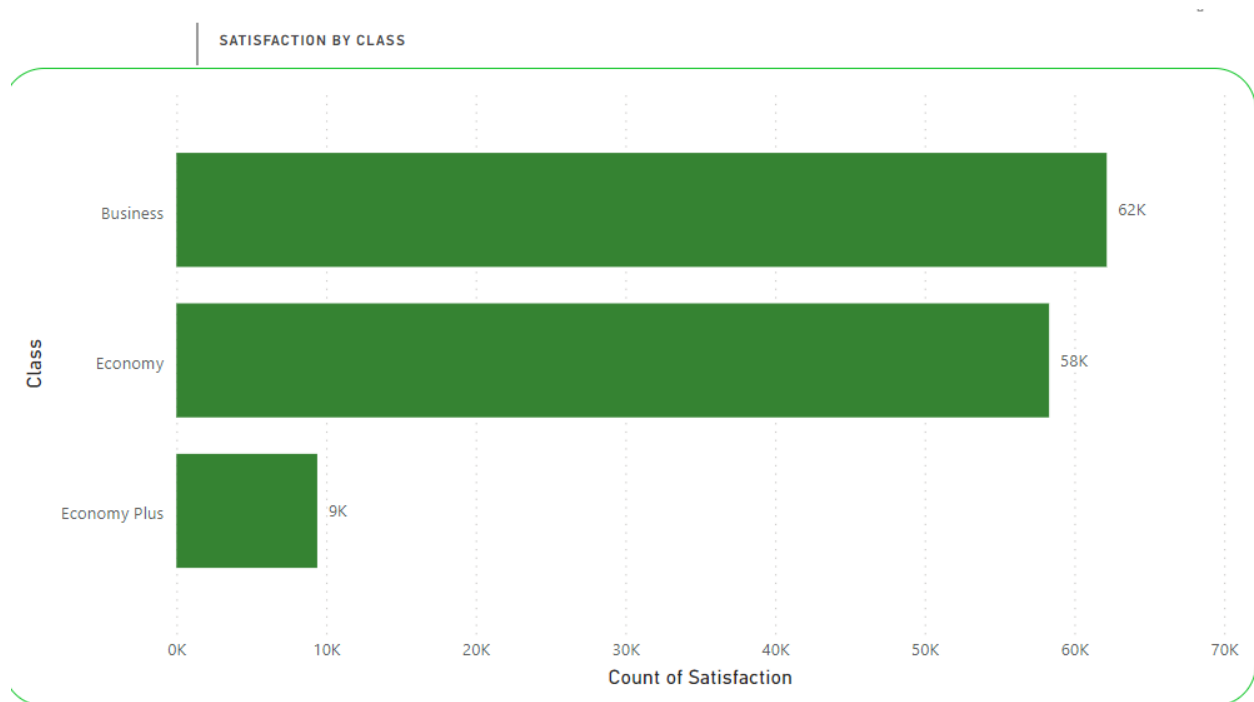
According to the class-by-class satisfaction chart, 65k passengers are in business class, 58k are in economy class, and 9k are in economy plus class. These passengers are the most satisfied overall. This shows that business class passengers are more satisfied than economy class and economy plus passengers, suggesting that the economy plus class may use some work to raise overall passenger satisfaction level across the board.

3. SATISFACTION BY CUSTOMER TYPE
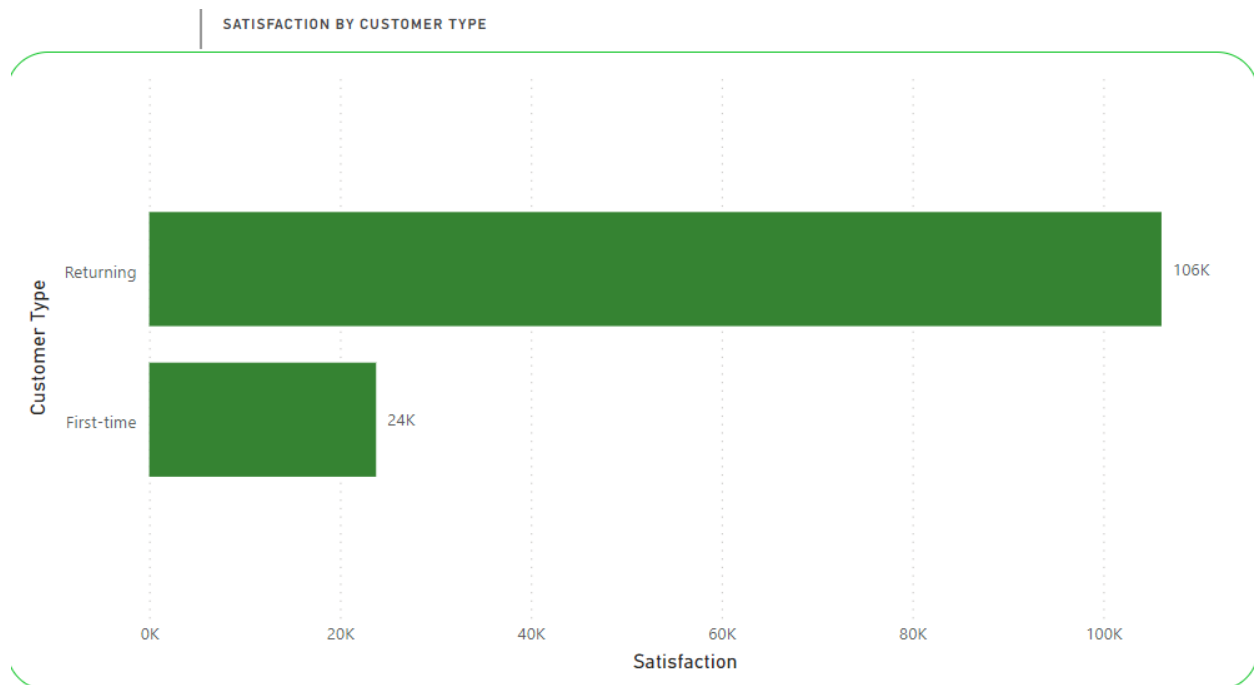
According to the satisfaction by customer type chart, there are far more returning customers 106k in total than 24k first-time customers. This implies that returning customers are more satisfied, highlighting the significance of loyalty and repeat business in preserving passenger satisfaction levels. It also emphasizes how important it is to concentrate on improving the first-time client experience to perhaps turn them into devoted consumers.

4. SATISFACTION BY ONLINE BOOKINGS
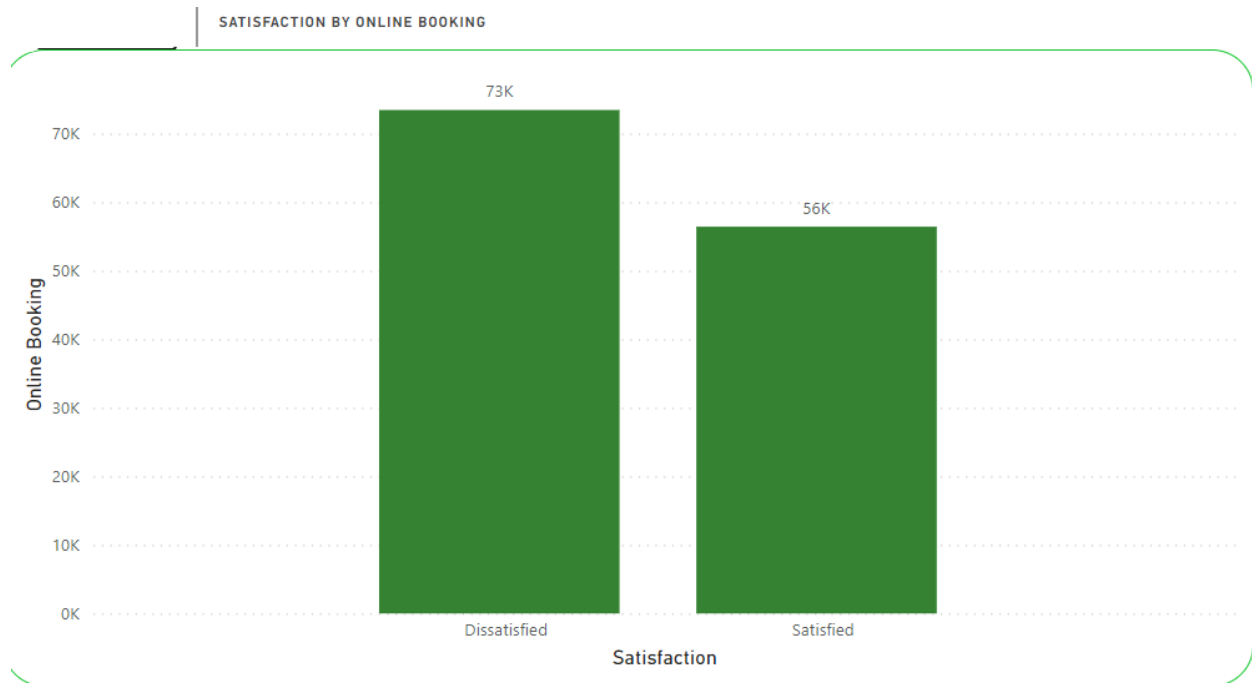
There are 73k unhappy customers compared to 56k delighted customers, according to the online booking satisfaction statistics. This raises the possibility that there are difficulties or problems with the online booking procedure, which could cause a decline in customer satisfaction. By addressing these issues, travelers who purchase their tickets online may be more satisfied.

5. SATISFACTION BY AGE GROUP
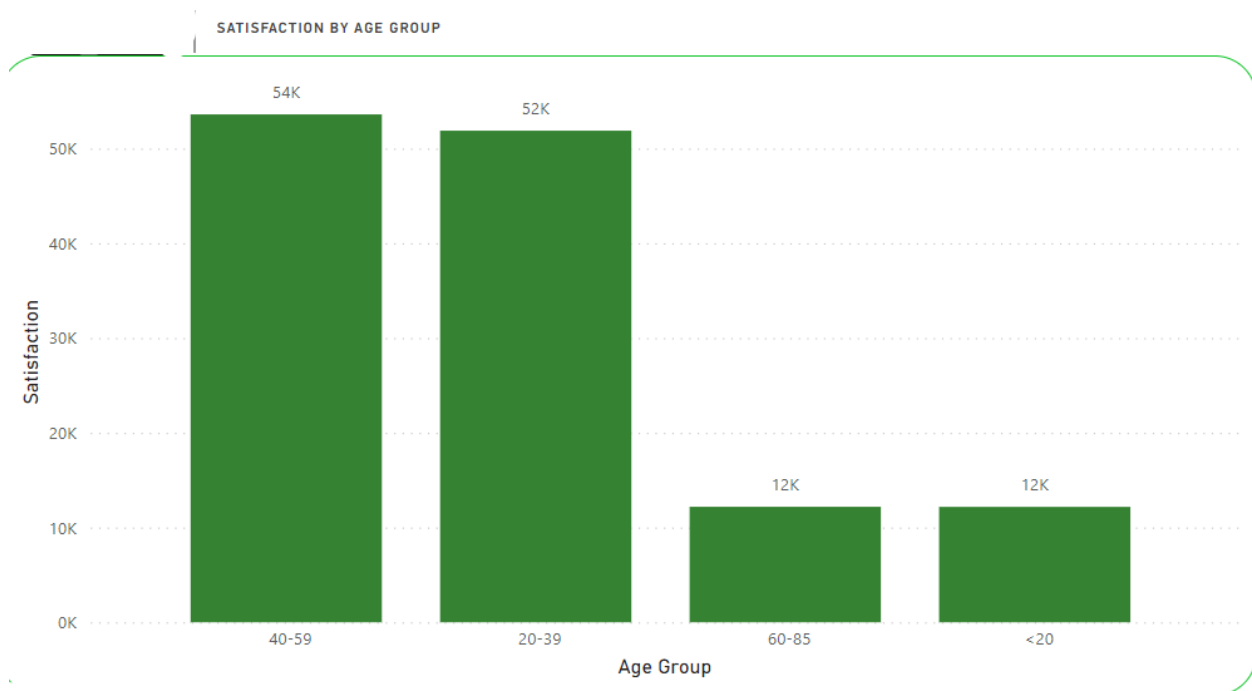
According to the age-group satisfaction chart, travelers between the ages of 40 and 59 had the highest satisfaction rating (54k). Passengers aged 20–39, who have a 52k satisfaction rating, are next in line. Passengers under 20 and those between the ages of 60 and 85, however, have lower satisfaction ratings—both reaching 12k. This implies that to increase overall happiness across all age groups, the airline may need to modify its offerings or communication tactics to better suit the requirements and preferences of travelers in different age ranges.

6. SATISFACTION BY GENDER

63.98K (49.26%)   65.9K (50.74%)
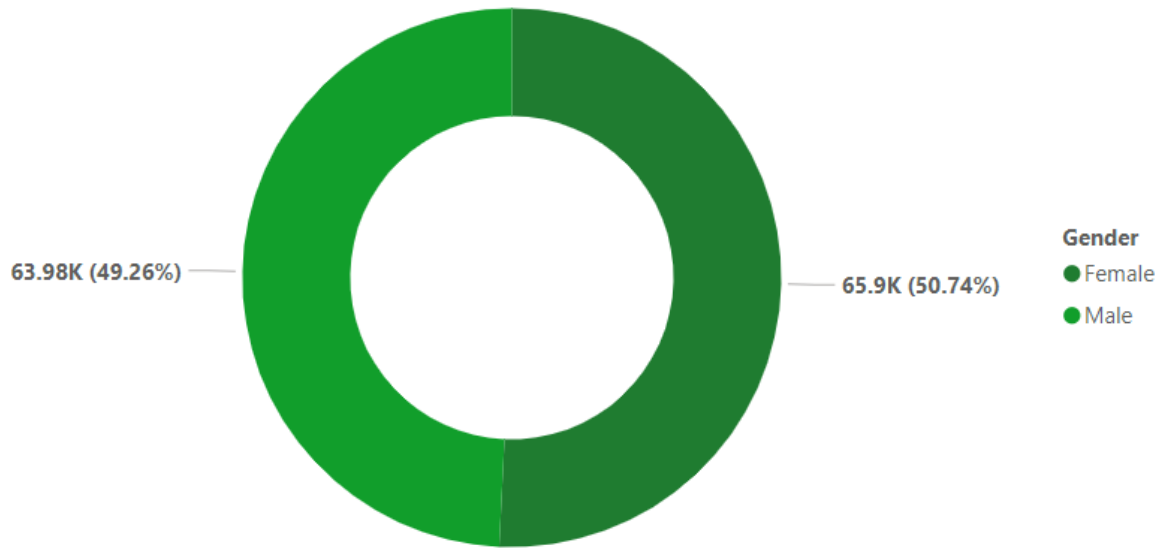
Gender
- Female
- Male

According to the satisfaction by gender chart, male and female customers have different satisfaction ratings: male customers have a satisfaction rating of 63.98k, or roughly 49.26% of the total, while female customers have a higher rating of 65.9k, or roughly 50.74% of the total. Based on this, it appears that female passengers are marginally more satisfied than male passengers. To find ways to improve passenger satisfaction for both genders and to understand the mechanisms influencing this discrepancy, more investigation might be conducted.

7. SATISFACTION IN-FLIGHT SERVICES
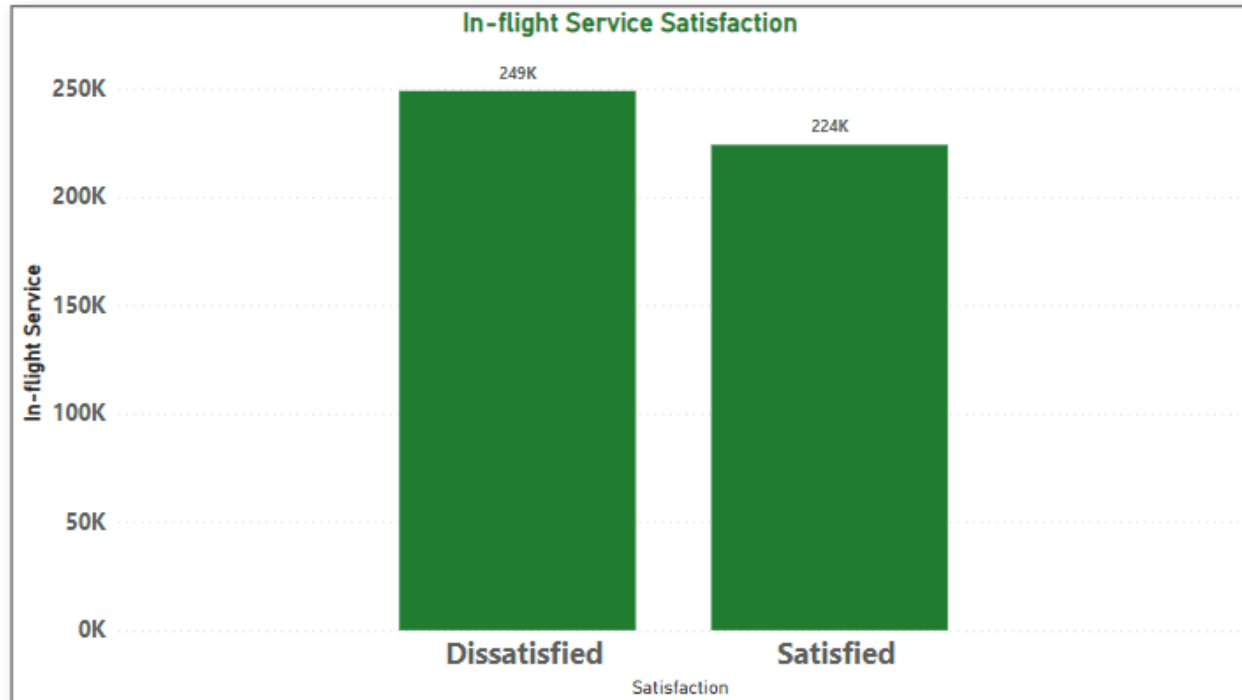
There are 249k unsatisfied and 224k satisfied ratings according to the in-flight service satisfaction chart. This suggests that there are more respondents who are unhappy with in-flight amenities than who are satisfied. To increase overall passenger happiness, it makes suggestions for possible areas for improvement in the caliber or availability of in-flight services. To successfully address consumer issues, it may be possible to identify specific parts of in-flight services that require attention through further investigation.

8. CORRELATION BETWEEN VARIOUS SATISACTION FACTORS USING MATPLOTLIB LIBRARY

```
In [17]:  correlation_matrix=Air_pass_satis_corr.corr()
          correlation_matrix
```

Out[17]:

	On-board Service	Seat Comfort	Cleanliness	Food and Drink	In-flight Service	In-flight Entertainment	Baggage Handling	Satisfaction code
On-board Service	1.000000	0.130545	0.122084	0.057404	0.551569	0.418574	0.520296	0.322205
Seat Comfort	0.130545	1.000000	0.679613	0.575846	0.068842	0.611837	0.074620	0.348829
Cleanliness	0.122084	0.679613	1.000000	0.658054	0.090356	0.692511	0.097071	0.307035
Food and Drink	0.057404	0.575846	0.658054	1.000000	0.035210	0.623461	0.035321	0.211340
In-flight Service	0.551569	0.068842	0.090356	0.035210	1.000000	0.406094	0.629237	0.244918
In-flight Entertainment	0.418574	0.611837	0.692511	0.623461	0.406094	1.000000	0.379123	0.398234
Baggage Handling	0.520296	0.074620	0.097071	0.035321	0.629237	0.379123	1.000000	0.248680
Satisfaction code	0.322205	0.348829	0.307035	0.211340	0.244918	0.398234	0.248680	1.000000

```
In [18]:  import matplotlib.pyplot as plt
          import seaborn as sns

          sns.set_style()
```

```
In [19]:  plt.figure(figsize=(10,8))
          sns.heatmap(correlation_matrix, annot=True, cmap="Blues", linewidths=0)
          plt.title("correlation between different satisfaction factors")
          plt.show()
```
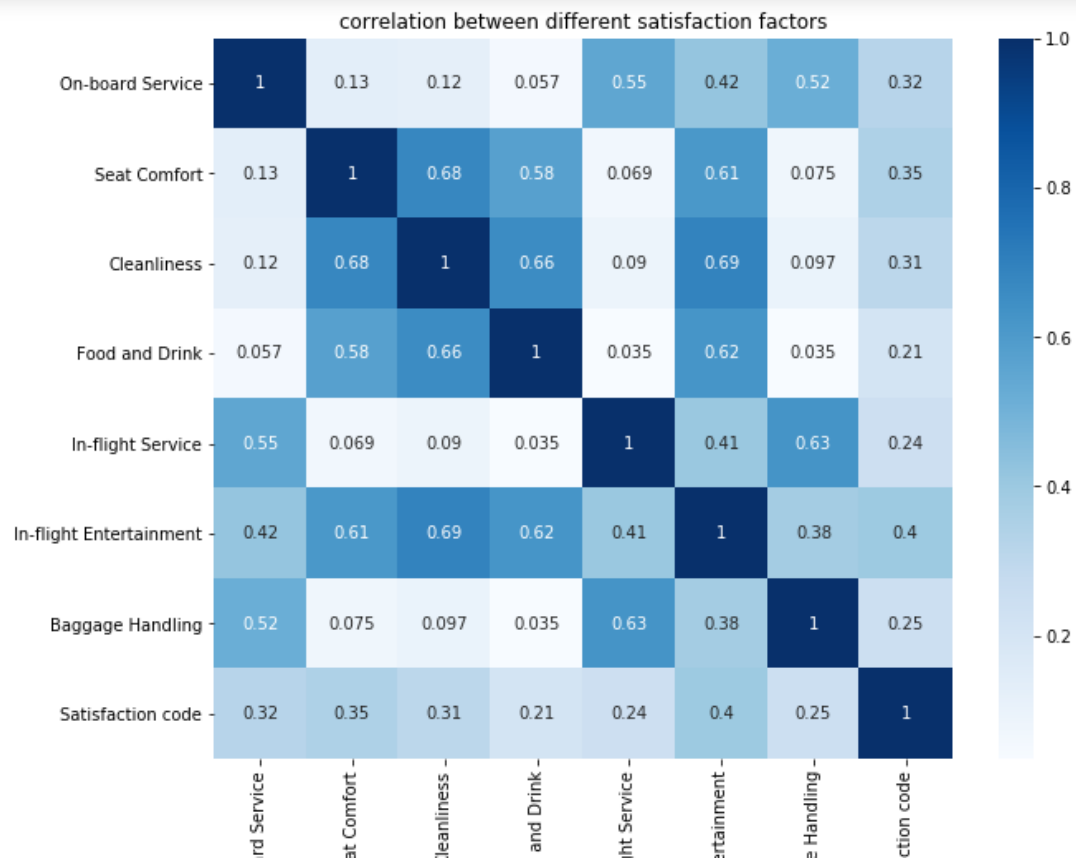

RECOMMENDATIONS

The above recommendations are based on data indicating a greater proportion of unsatisfied than satisfied ratings for in-flight services**:**

- Collect Detailed input: Hold focus groups, interviews, or questionnaires to get more in-depth input from travelers regarding their experiences using in-flight amenities. This can assist in prioritizing actions and identifying certain areas that want improvement.
- Identify Pain Points: Find frequent complaints or reoccurring problems with in-flight services by examining trends and patterns in dissatisfaction ratings. Prioritize resolving these issues to raise general passenger happiness.
- Staff Training*: Train airline employees to improve their customer service abilities and make sure they are prepared to attend to the requirements and expectations of passengers when they are in flight. This can involve conflict resolution, problem-solving, and communication training.

Here are some recommendations based on the data from the overall customer satisfaction analysis, which indicates that there are more unsatisfied clients than satisfied ones:

- Identify Pain Points: Find out why clients are unhappy by conducting surveys or interviews. Identify the features of the product or service that are upsetting you.
- Address Common Complaints: After determining the areas of discomfort, give the most frequent complaints top priority. This might entail refining product features, optimizing procedures, or raising the caliber of services provided.
- Improve Communication: Make communication channels better to get real-time client input. This can assist in resolving problems quickly and averting more unhappiness.
- Employee Training: Make sure staff members have the abilities and know-how to deliver top-notch customer service by funding training initiatives. Joyful and informed

To resolve the considerable differential in satisfaction levels between returning passengers and first-time passengers, a thorough analysis is required to determine the underlying causes of this difference. The following recommendations are made to bridge the gap and increase the happiness of both returning and first-time passengers.

- Segmented Analysis: Conduct a segmented analysis of the feedback collected to identify specific areas where satisfaction levels differ between returning and first-time passengers. This may involve examining factors such as service quality, onboard amenities, booking process, and overall travel experience.
- Personalized Services: Tailor services and amenities to meet the unique needs and preferences of returning passengers, acknowledging their loyalty and frequent patronage. Similarly, focus on creating a memorable experience for first-time passengers by offering personal assistance, special promotions, and welcome gestures.
- Onboarding Experience: Pay special attention to the onboarding experience for first-time passengers, ensuring clear communication, guidance, and support throughout the journey. Provide information on facilities, amenities, and procedures to alleviate any anxiety or confusion associated with the travel process.

To address the high rate of unhappiness in the Economy Plus class and improve the overall experience and contentment of passengers in this segment, consider the following recommendations:

- Identify pain points: Conduct a detailed analysis to determine the precise issues of unhappiness among Economy Plus passengers. This could include gathering input through surveys, focus groups, or direct communication channels to identify areas for improvement.
-
- Review of Pricing plan: Make sure the premium charged for Economy Plus seats is commensurate with the experience's perceived value and quality by analyzing the pricing plan. To encourage uptake and draw passengers to this class, think about changing pricing tiers or providing promotional discounts.
- Service Improvement: Take specific action to improve the amenities and services provided in the Economy Plus class, bringing them closer to the needs and desires of travelers. This could involve upgrades to the comfort of the seats, the menu, the entertainment options, and the onboard facilities.

There may be difficulties or problems with the online booking process affecting overall customer happiness given the difference between the number of dissatisfied customers (73k) and happy customers (56k) in the online booking satisfaction data. The following suggestions are meant to alleviate these problems and raise the level of satisfaction among tourists who buy tickets online:

- Simplify the Reservations Process: Make the online reservation procedure easier to understand and more user-friendly by streamlining it. Minimize the steps needed to finish a reservation and make sure the user interface is simple to use.
- Boost the functionality of your website: Improve the booking website's functionality to guarantee quick loads and a seamless browsing experience. Reduce the number of technical issues and downtime that can annoy customers when they are making a reservation.
- Enhance Mobile Experience: With the increasing trend of mobile bookings, prioritize optimizing the booking platform for mobile devices. Ensure that the website is responsive and functions seamlessly across different screen sizes and devices.
- Offer Assistance and Support: Provide accessible customer support channels, such as live chat or helplines, to assist customers with any questions or issues they encounter during the booking process. Promptly address inquiries and resolve problems to improve overall satisfaction.

The following recommendation is based on the age-group satisfaction chart and aims to raise general happiness in all age groups:

- Tailor Services: Service and facility offerings should be customized to meet the specific needs and tastes of various age groups. For instance, think of providing senior citizens with exclusive discounts or benefits, family-friendly accommodations for families traveling with kids, and customized experiences for younger passengers.
- Techniques of Communication: Adapt communication strategies to interact and reach tourists of varying age groups. This could entail tailoring the tone and content of messaging to appeal to each age group and utilizing a variety of platforms, including social media, email newsletters, and traditional advertising

CHALLENGES

The challenges of airline passenger satisfaction analysis include data quality assurance, subjective feedback interpretation, accurate identification of key drivers, sample bias management, privacy compliance, real-time analysis, and benchmarking against industry standards.

CONCLUSION

Working together with teammates like Anita and Azeez was an amazing experience to gain important insights into service quality and the factors influencing passengers' trips, we looked at airline passenger satisfaction. Through comprehensive data analysis and feedback collection, we identified areas of strength and improvement for things like in-flight amenities, online booking, customer service, and general comfort. Airlines can enhance travel experiences and foster loyalty by tailoring their products based on passengers' preferences. In the fast-paced aviation industry, maintaining competitiveness and growth requires a strong emphasis on passenger happiness.