



Hotel  
data  
insights

Project graduation

Cairo University

Faculty of Computers & Artificial Intelligence

Operations Research & Decision Support Dept.



جامعة القاهرة

كلية الحاسوبات و الذكاء الاصطناعي

قسم بحوث العمليات و دعم القرار

# PROJECT PROPOSAL

PROJECT TITLE	Hotel Data Insights		
SUBMITTED TO			
SUBMITTED BY	Abdelrahman Ahmad Barbary 20190282 Aya Aboelsood Hamdy 20200102 Reham Ashraf Fathy 20201079 Marwa Mahmoud Esmail 20201160 Mohamed Yousef Abdelfatah 20190791	PHONE/EMAIL	01284926550 <a href="mailto:abdelrahmanbarbari@gmail.com">abdelrahmanbarbari@gmail.com</a> 01125592969 <a href="mailto:ayaaboelsoodhamdy@gmail.com">ayaaboelsoodhamdy@gmail.com</a> 01090949403 <a href="mailto:Rehamashrf100@gmail.com">Rehamashrf100@gmail.com</a> 01225130098 <a href="mailto:marwamahmoud20022002@gmail.com">marwamahmoud20022002@gmail.com</a> 01153974647 <a href="mailto:mohamedyousiefo3@gmail.com">mohamedyousiefo3@gmail.com</a>
PROJECT SUPERVISOR (S)	Prof. Ehab Elkhodary	DATE OF PROPOSAL	8 JULY 2024
PROJECT START DATE	SECOUND TERM	PROJECT COMPLETION DATE	FIRST TERM

## Table of Contents

<b>I. PROJECT OVERVIEW .....</b>	3
<b>II. NEEDS/ISSUES .....</b>	3
i. <b>Needs .....</b>	3
ii. <b>Issues .....</b>	4
<b>I. OBJECTIVES .....</b>	4
i. <b>Customer Segmentation and Personalization.....</b>	4
ii. <b>Forecasting Demand and Pricing .....</b>	4
iii. <b>Identifying Influential Factors on ADR .....</b>	5
<b>II. SCOPE OF WORK.....</b>	5
i. <b>Introduction to Data Factors and Size .....</b>	5
ii. <b>Data Cleaning .....</b>	7
iii. <b>Data analysis and Visualization .....</b>	7
1. Customer Segmentation and Personalization.....	7
2. <b>Forecasting Demand .....</b>	14
3. <b>Identifying Influential Factors on ADR .....</b>	16
<b>III. Project Time Frame .....</b>	20
<b>IV. Activities.....</b>	21
<b>V. PROJECT's EXPECTED OUTPUTS .....</b>	22
<b>VI. BENEFICIARIES .....</b>	23
<b>VII. RELATED DOCUMENTS .....</b>	24

# I. PROJECT OVERVIEW

The hotel industry is a crucial component of the global hospitality sector, encompassing a wide range of establishments from luxury resorts to budget accommodations. Hotels provide lodging, meals, and other guest services to travelers, contributing significantly to tourism and local economies. With the rise of global travel and tourism, the industry has seen substantial growth, but it also faces increasing competition and evolving customer expectations.

As the hospitality industry becomes increasingly competitive, hotels must continuously seek ways to increase revenue and maintain a competitive edge. By leveraging advanced data analytics, hotels can:

- **Understand Customer Preferences:** Gain deeper insights into customer preferences and behavior patterns.
- **Optimize Pricing Strategies:** Implement dynamic pricing strategies that respond to market demand, maximizing revenue.
- **Improve Marketing Efforts:** Develop targeted marketing campaigns based on customer segmentation, leading to higher engagement and conversion rates.
- **Enhance Operational Efficiency:** Use accurate demand forecasts for better resource planning and management, reducing the risk of overbooking or underutilization

This project focuses on three key areas to help hotels enhance their operational efficiency and profitability:

## 1. Customer Segmentation and Personalization

Analyze the different customer segments within the hotel industry and gain a deeper understanding of the customer base and identify distinct groups based on various criteria such as demographics, behavior patterns, preferences, and past interactions with the hotel.

## 2. Forecasting Demand and Pricing

Build predictive models to forecast future hotel demand. The objective is to analyze historical data related to hotel bookings, market trends, seasonality, and other relevant factors that can predict future demand for hotel rooms.

## 3. Identifying Influential Factors on ADR

Investigate the factors that have the greatest impact on the average daily rate (ADR) in the hotel industry.

# II. NEEDS/ISSUES

## i. Needs

- **Understanding Customer Preferences:** The hotel industry needs to gain deeper insights into customer preferences and behavior patterns to enhance the customer experience and optimize operations.
- **Improving Marketing Efforts:** Hotels need to develop targeted marketing campaigns based on customer segmentation to drive higher engagement.
- **Enhancing Operational Efficiency:** Hotels need to use accurate demand forecasts for better resource planning and management, reducing the risk of overbooking or underutilization.

- **Increasing Revenue and Profitability:** As the hospitality industry becomes increasingly competitive, hotels need to continuously seek ways to increase revenue and maintain a competitive edge.

## ii. Issues

- **Evolving Customer Expectations:** With the rise of global travel and tourism, hotels are facing evolving customer expectations that they need to address.
- **Lack of Data-Driven Insights:** Hotels may not have a comprehensive understanding of their customer base and the factors influencing their performance, which hinders their ability to make informed decisions.
- **Operational Inefficiencies:** Hotels may face challenges in optimizing their resource planning and management, leading to issues like overbooking or underutilization of resources.

# I. OBJECTIVES

This project aims to harness the power of data analytics to provide hotels with the tools they need to thrive in a competitive market. By focusing on customer segmentation, demand forecasting, and identifying influential factors on ADR, the project seeks to deliver actionable insights that enhance revenue management and customer satisfaction.

## i. Customer Segmentation and Personalization

Market segmentation is a crucial strategy for hotels to better understand their target audience and optimize their offerings. By categorizing guests based on various criteria, hotels can gain valuable insights that inform their marketing, pricing, and customer experience strategies.

The key aspects of this objective include:

- Customer Segmentation:
  - Analyze guest data, such as demographics, booking channels, behavioral patterns, preferences, and past interactions.
  - Identify distinct customer segments based on common characteristics and behaviors.
  - Determine which guest segments are the most valuable in terms of revenue generation and loyalty.
- Personalization:
  - Leverage guest data and segment analysis to understand individual preferences and behaviors.
  - Develop personalized offers, promotions, and experiences tailored to each guest segment.
  - Continuously monitor and refine personalization efforts to enhance guest satisfaction and maximize revenue.

## ii. Forecasting Demand and Pricing

Accurate demand forecasting and dynamic pricing strategies are critical for hotels to maximize revenue and optimize their financial performance. By leveraging predictive analytics and integrating customer/operational data, hotels can make informed decisions to adjust rates, inventory, and marketing efforts in response to market conditions.

Key aspects of this objective include:

- Demand Forecasting:
  - Analyze historical data on occupancy rates, booking patterns, seasonality, and market trends to identify demand patterns.
  - Utilize advanced statistical models, machine learning algorithms, and data mining techniques to generate demand predictions.
  - Continuously monitor and refine the forecasting models to improve their predictive capabilities.
- Pricing Optimization:
  - Develop dynamic pricing strategies that adjust room rates in real-time based on demand forecasts and market conditions.
  - Leverage customer segmentation and personalization insights to optimize pricing for different guest profiles.
  - Continuously monitor the performance of pricing strategies and make adjustments to maximize revenue.

### iii. Identifying Influential Factors on ADR

Average Daily Rate (ADR) is a critical metric that measures the average revenue generated per occupied room per day. Accurately predicting and understanding the factors that influence ADR is essential for hotels to make informed decisions, optimize their pricing strategies, and improve financial performance.

Key aspects of this objective include:

- Defining ADR:
  - ADR encompasses all room rates, including discounted rates, group rates, best available rates, and other price points.
  - ADR provides a comprehensive view of the average revenue generated per occupied room, allowing hotels to evaluate their pricing strategies and financial performance.
- Predictive Analytics for ADR:
  - Utilize machine learning and advanced statistical models to predict future ADR trends and patterns.
  - Identify the key drivers and influential factors that impact ADR, such as:
    - Seasonality and market trends
    - Competitor pricing and market conditions
    - Guest segmentation and booking behaviors
    - Operational factors (occupancy, room availability, etc.)

## II. SCOPE OF WORK

### i. Introduction to Data Factors and Size

The success of the customer segmentation, demand forecasting, and ADR analysis in this project heavily relies on the quality and richness of the hotel data available. The size and complexity of the data factors play a crucial role in determining the insights that can be extracted and the accuracy of the models developed.

In this project, the hotel data is derived from two hotels in Portugal, spanning three years: 2018, 2019, and 2020. The dataset includes:

- **2018:** 21,997 records
- **2019:** 79,265 records
- **2020:** 40,688 records

The dataset encompasses a wide range of features capturing different aspects of hotel operations, customer behavior, and market dynamics. These data factors can be categorized into several broad categories such as:

### **1. Booking details**

- hotel: The type of hotel, either "City Hotel" or "Resort Hotel."
- booking\_changes: Number of changes made to the booking before arrival.
- market\_segment: Market segment designation.
- distribution\_channel: Booking distribution channel.
- days\_in\_waiting\_list: Number of days the booking was on a waiting list before it was confirmed or canceled.
- agent: ID of the travel agency.
- company: ID of the company.

### **2. Guest information and history**

- customer\_type: Type of booking (transient, contract, group, etc.).
- adults, children, babies: Number of guests categorized by age groups
  - adults = Number of adults
  - children = Number of children
  - babies = Number infants
- country: Customer's conuntry of origin.
- is\_repeated\_guest: Binary value indicating whether the guest is a repeated guest or not.
- previous\_cancellations: Number of previous booking cancellations by a guest.
- previous\_bookings\_not\_canceled: Number of previous bookings not cancelled by a guest.

### **3. Reservation timing**

- arrival\_date\_year: The year of the arrival date
- arrival\_date\_month: The month of the arrival date
- arrival\_date\_week\_number: Week number of arrival date.
- arrival\_date\_day\_of\_month: The day of the month of the arrival date
- lead\_time: Number of days between booking date and arrival date.
- stays\_in\_weekend\_nights: Number of weekend nights stayed or booked to stay at the hotel
- stays\_in\_week\_nights: Number of week nights stayed or booked to stay at the hotel

### **4. Room and service information**

- meal: Type(s) food option(s) included in booking package.
- reserved\_room\_type : Type of room was originally reserved
- for each booking.
- assigned\_room\_type : type of room was finally assigned for each booking.
- required\_car\_parking\_spaces: Number of car parking spaces required.
- total\_of\_special\_requests: Number of special requests made.

## **5. Financial and Pricing**

- deposit\_type: Type of deposit made.
- adr: Average daily rate.

## **6. Reservation Status**

- is\_canceled: Binary value indicating whether the booking was cancelled or not.
- reservation\_status: Reservation last status.
- reservation\_status\_date: Date of the last status.

### **ii. Data Cleaning**

After collecting the hotel data from the years 2018, 2019, and 2020, the next crucial step is to clean the data. This ensures the dataset is ready for analysis by handling any missing or inconsistent values. In this project, four key factors contain null values, and the following steps were taken to address them:

#### **Handling Missing Values**

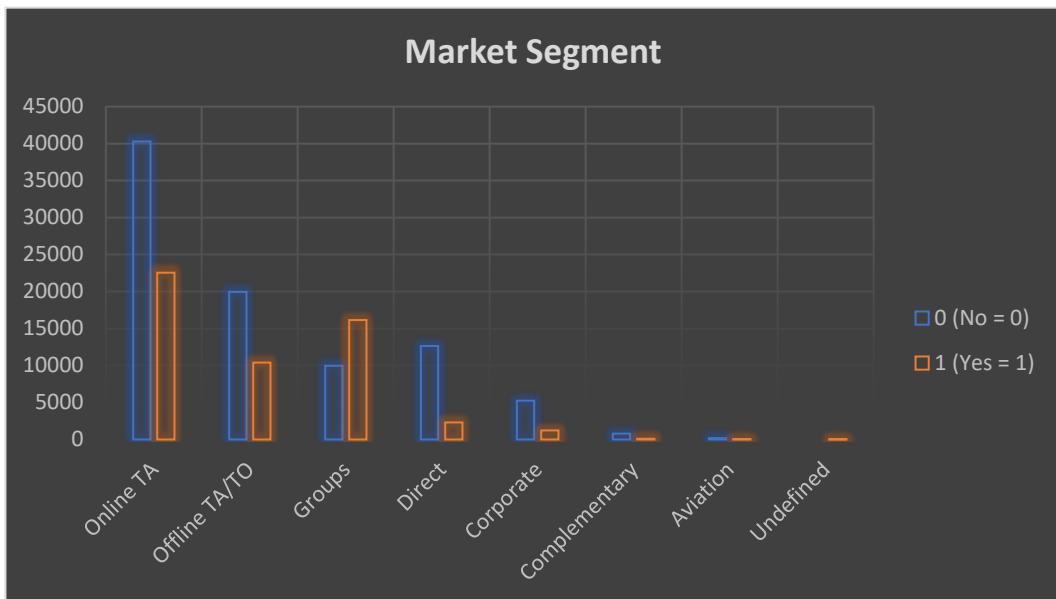
- **Children:**
  - Most customers did not bring any children, making zero the most common (mode) value.
  - **Action:** Replace all null values in the "children" column with zero (0).
- **Country:**
  - The majority of guests are from Portugal, with "PRT" being the most frequent value.
  - **Action:** Replace all null values in the "country" column with "PRT".
- **Agent:**
  - Some bookings do not have an agent ID, which should be represented by zero to indicate the absence of an agent.
  - **Action:** Replace all null values in the "agent" column with zero (0).
- **Company:**
  - Similar to the agent ID, bookings without a company ID should be indicated by zero.
  - **Action:** Replace all null values in the "company" column with zero (0).

Ensuring that missing values are appropriately handled allows for more accurate insights and predictions.

### **iii. Data analysis and Visualization**

#### **1. Customer Segmentation and Personalization**

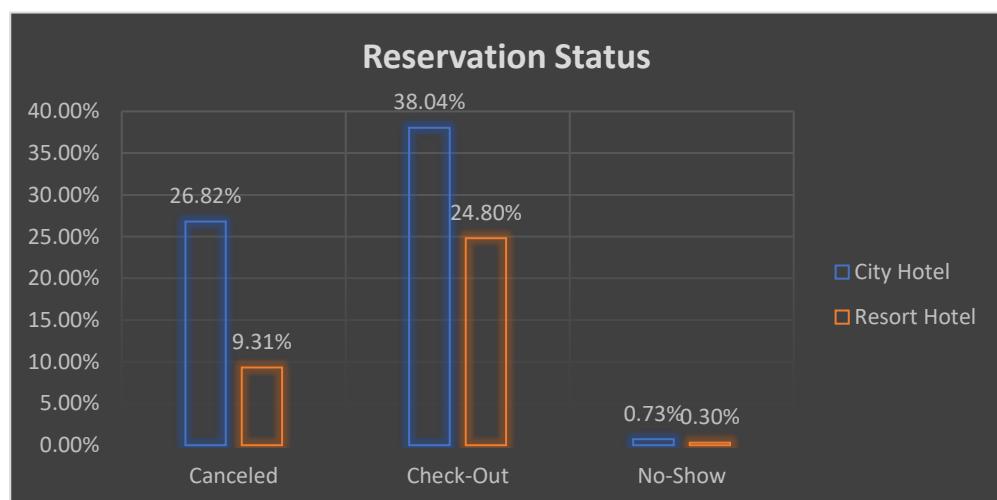
- **Market Segmentation and Cancellation**



- The bar chart illustrates the distribution of different market segments and their respective cancellation rates
- Online TA (Travel Agency) segment gives high amount of customers and then Offline TA/TO, Groups, Direct etc. respectively people rarely use complementary market segment for hotel booking.
- For market segment We can target our marketing area to be focus on these travel agencies website and work with them since majority of the visitors tend to reach out to them.

For the cancellation rates across market segments, the hotel can develop strategies to reduce cancellations, such as implementing stricter cancellation policies or offering incentives for non-cancellation.

- **Reservation Status for Each Hotel**

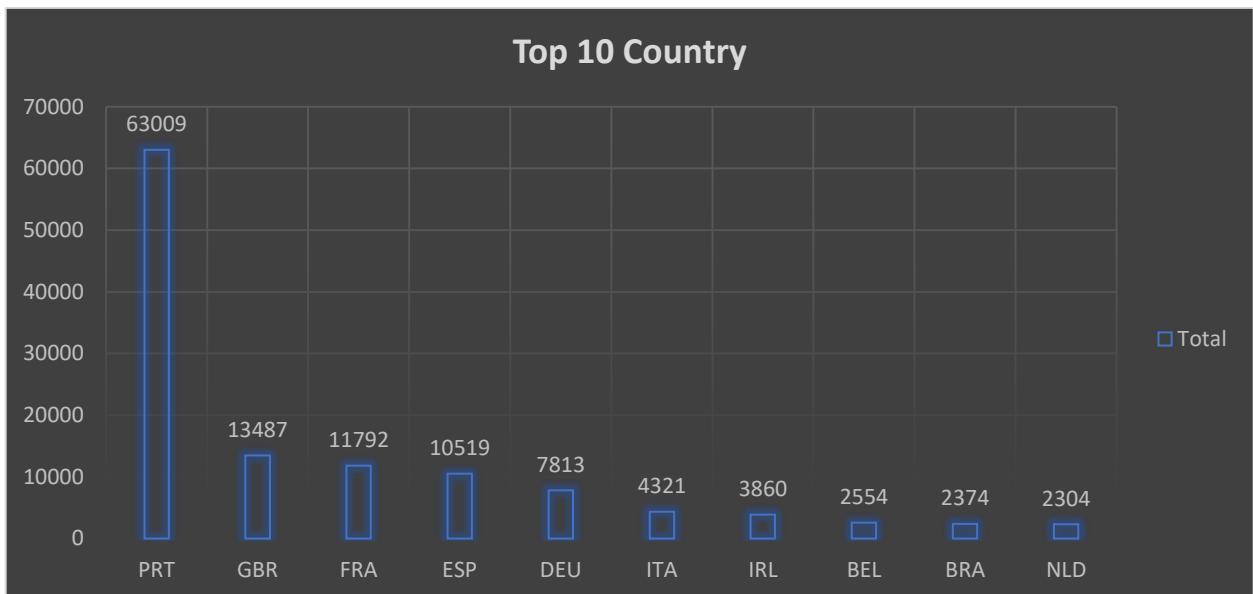


- the reservation status for each hotel, showing the proportion of bookings that are confirmed, canceled, or marked as no-shows.

- City hotel has more checkout reservation status than Resort hotel. However, City Hotel also has the most cancellation reservation status than Resort hotel.

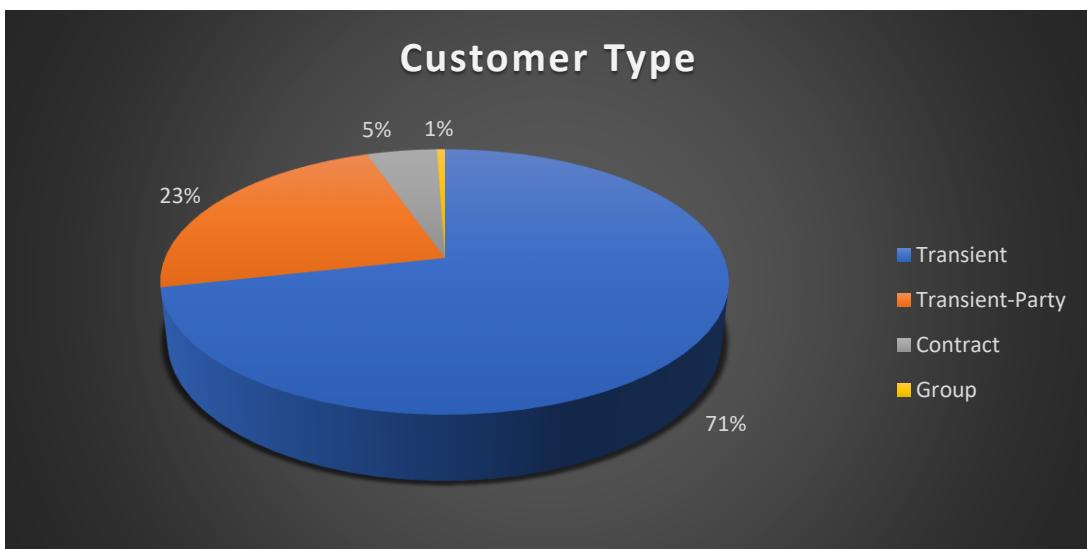
By Understanding reservation status we can help in identifying trends and improving booking policies

- **Top 10 Countries**



- This graph show information about the countries that have most bookings. Almost of 50% of guests came from Portugal (PRT), followed by United Kingdom (GBR) by 11%, then France (FRA) by 9%.

- **Customer Type**



- distribution of different customer types (e.g., transient, contract, group).

- Most customers are transient who are usually walk-in guests, last minute or bookers or simply people that require a very short term stay in the hotel and that represent about 71 % of customer and And 21% of customer is of transient-party type.

By Understanding customer types helps in tailoring marketing strategies and service offerings to meet the needs of different customer segments.

- **Customer Categories**

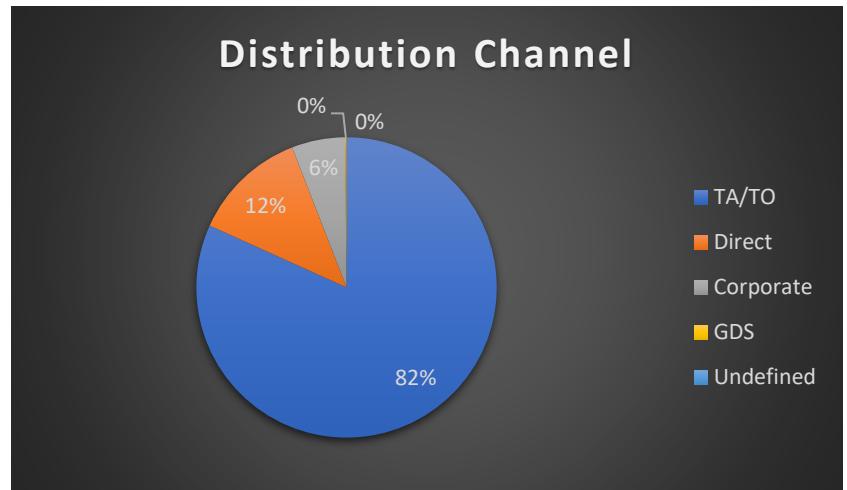


- distribution of adults, children, and babies among guests at each hotel.
- it is seen that most number of customer are containing 2 adults (probably newlyweds, or retirees), or 1 adult (probably single or a traveler).
- Most customer did not bring any child or baby for the hotel booking.
- City Hotel Primarily adult guests, with fewer children and babies However , Resort Hotel More family-oriented, with a higher proportion of children and babies.

This segmentation helps in customizing services and amenities to suit the demographic profile of the guests at each hotel.

- **Distribution Channels**

Row Labels	Count of distribution_channel
TA/TO	116042
Direct	17534
Corporate	8167
GDS	194
Undefined	10
<b>Grand Total</b>	<b>141947</b>



- the distribution of bookings across different channels (e.g., direct, OTA, travel agents).
- About 82% from the hotel reservation come from Tour Agents, and Tour Operators, followed by Direct bookings by 12% and Corporate booking by 6% .

By analyzing distribution channels, hotels can optimize their sales strategies and allocate resources to the most effective channels.

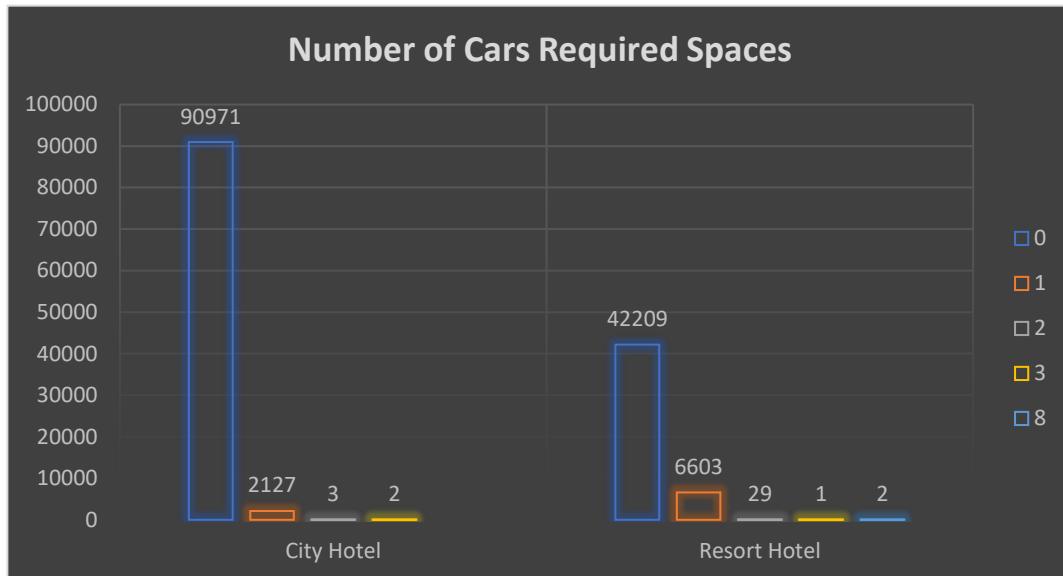
- **Number of Special Requests for Each Hotel**



- the total number of special requests made by guests at each hotel.
- From the above chart most of the customer didn't have any special request and about 27 % of them made a one special request and this represent the highest value

By analysis the above chart we can use this information for resource allocation and improving guest satisfaction by ensuring that commonly requested services are readily available.

- **Number of Car Parking Spaces Required for Each Hotel**



- the number of car parking spaces requested by guests at each hotel.
- Most of the customer didn't require any car parking and the highest of the requests is 1 with 6603 ,the resort have the highest request than city hotel

By Understanding parking space requirements helps in planning and managing parking facilities efficiently.

- **Check if Guests are Repeated for Each Hotel**

Row Labels	Count of is_repeated_guest	Column Labels	Grand Total	
	0 (No = 0)	1 (Yes = 1)	Total	
City Hotel	63.80%	1.79%	65.59%	
Resort Hotel	33.06%	1.35%	34.41%	
<b>Grand Total</b>	<b>96.86%</b>	<b>3.14%</b>	<b>100.00%</b>	

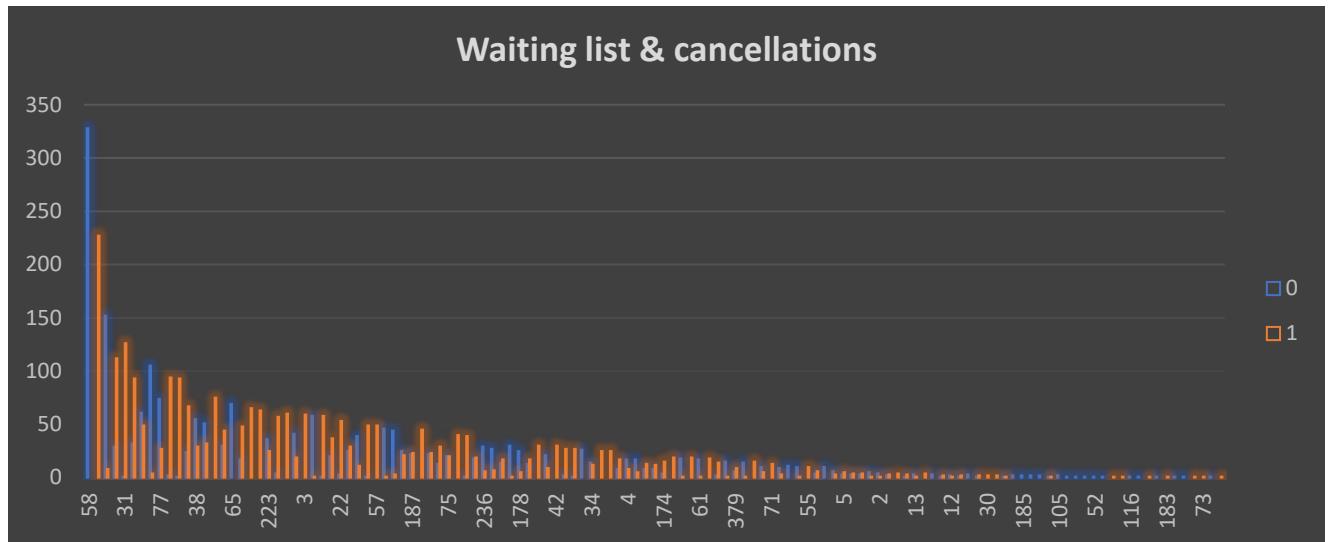


- the number of repeated guests versus new guests for each hotel.

- A higher percentage of new guests compared to repeated guests as the new guest represent 96 % and the repeated guest represent only 4%

By identifying repeat guests, hotels can enhance loyalty programs and personalize services to maintain high retention rates.

- **Waiting List and Cancellation**

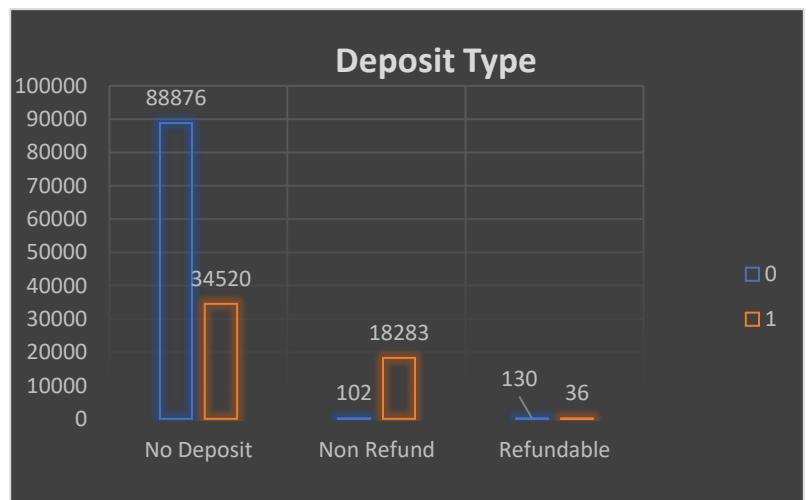


- This chart shows how many bookings were placed on a waiting list and subsequently canceled
- Most customers who booked are not in waiting list. But the most of the customer in waiting list canceled their booking

Understanding this relationship can help in optimizing booking policies and reducing cancellations from the waiting list.

- **Deposit Type and Cancellation**

Row Labels	Column Labels			Grand Total
	0	1	Total	
No Deposit	62.61%	24.32%	86.93%	
Non Refund	0.07%	12.88%	12.95%	
Refundable	0.09%	0.03%	0.12%	
<b>Grand Total</b>	<b>62.78%</b>	<b>37.22%</b>	<b>100.00%</b>	



- This chart for to analysis how different deposit types affect cancellation rates.
- Most customers booking for no deposit, and some booking for non-refundable deposit. It is rare for customer to book for refundable deposit.
- City Hotel has high cancellations for bookings with no deposit ,while resort hotel has lower cancellation in non refund .

As there is no deposit strategy, we can inform policies on deposit requirements to reduce cancellations and secure revenue.

## 2. Forecasting Demand

In order to forecast the demand, we should analyze and study our data well so here some important things that should be known.

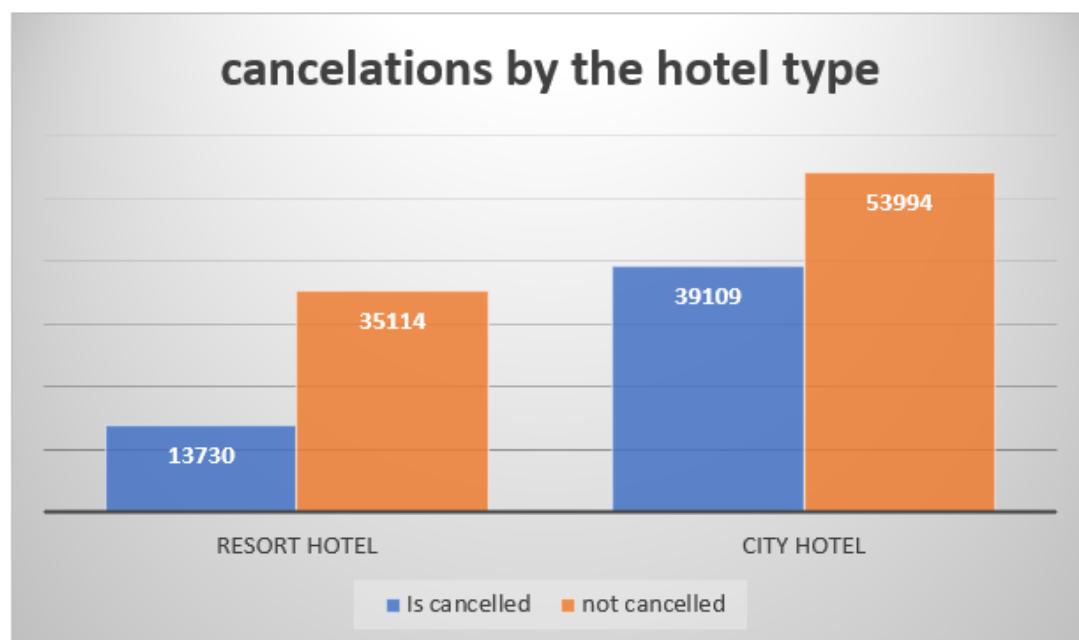
- **Number of guests in each hotel over the 3 years.**

	2018	2019	2020
City Hotel	13682	51913	27508
Resort Hotel	8314	27351	13179



- The count of guests for city hotel is higher than the resort hotel guests count
- It could guide us to forecast the demand based on the previous years.
- **number of cancellations and successful reservations**

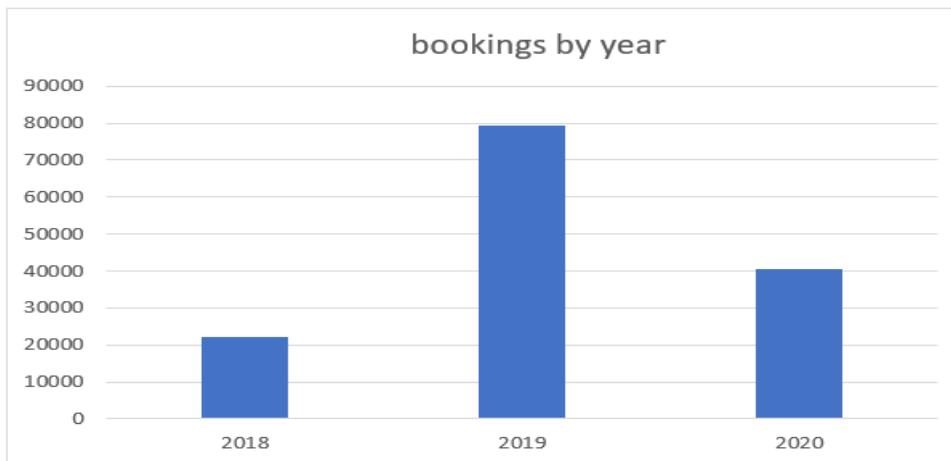
	Is cancelled	not cancelled
Resort Hotel	13730	35114
city hotel	39109	53994



- The number of cancellations of city hotel is high comparing with the number of cancellations in resort hotel.
- We could forecast the cancelled reservations in the future based on this and we could change the policy of the reservations to prevent the cancellations.

- Number of reservations over the 3 years

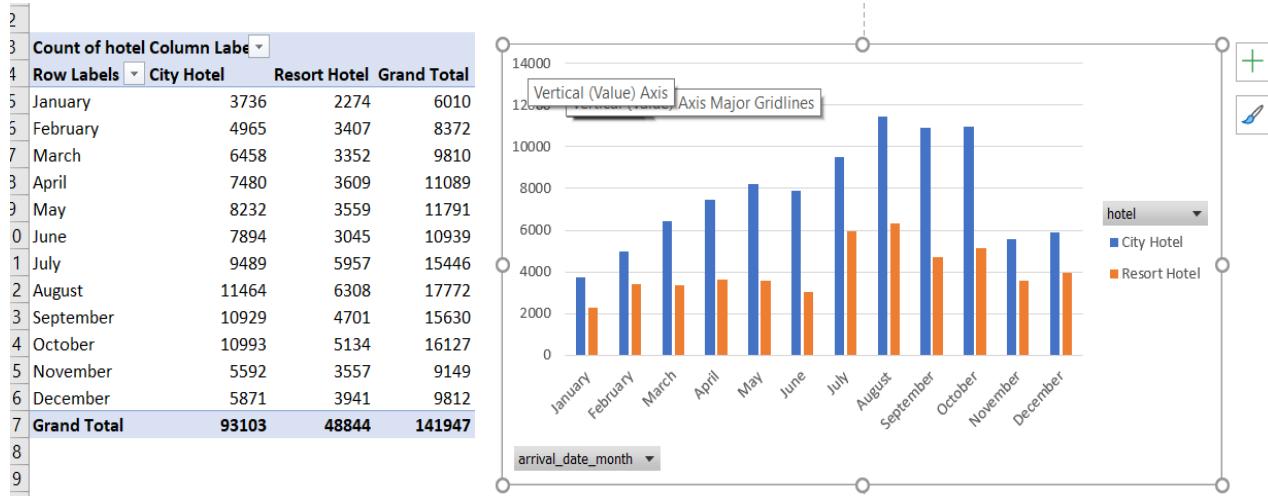
2018	2019	2020
21996	79264	40687



- 2019 is the most reserved year over the 3 years.
- 2020 has a better demand than 2018.

Based on this peak on this year we could study the factors that made this jump demand to enhance the demand then apply these factors and forecast the demand based on this year.

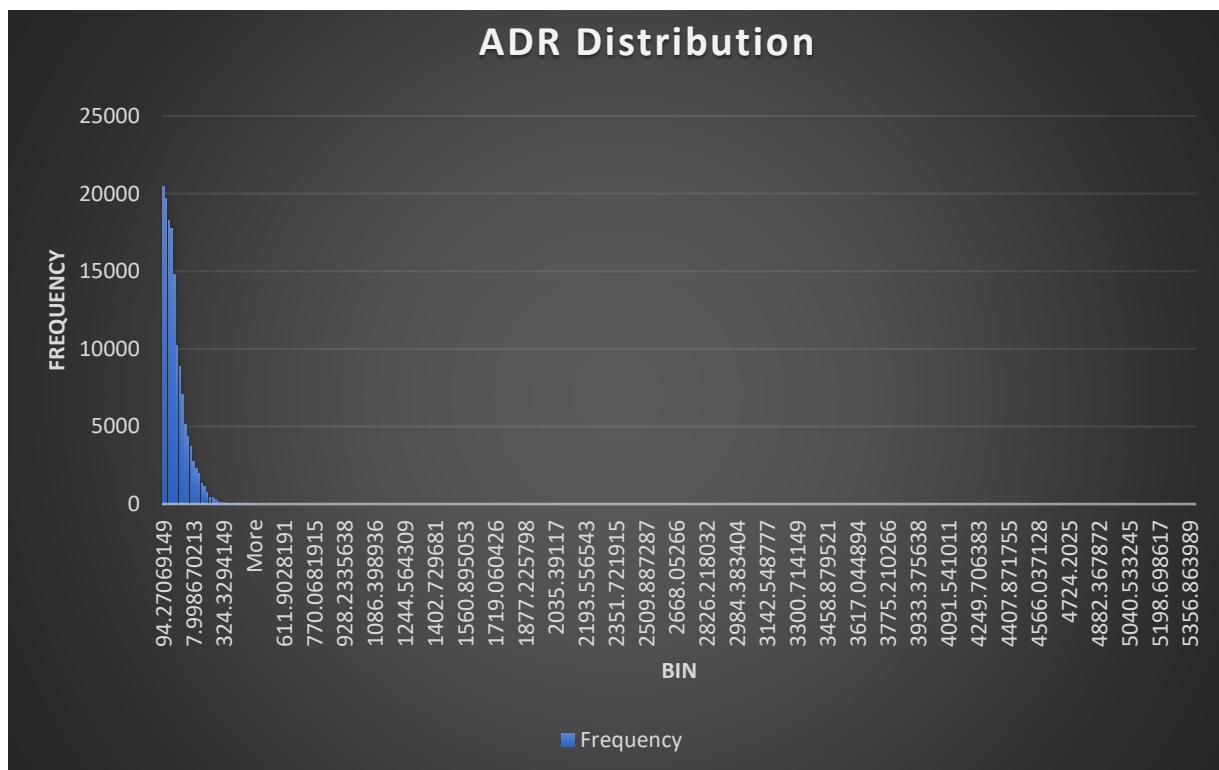
- Number of reservations each month



- Most months reserved are August and July for resort hotel
  - Most months reserved are July, August, September and October for city hotel.
- We can create a robust specific timed demand based on this chart.

### 3. Identifying Influential Factors on ADR

- ADR Distribution

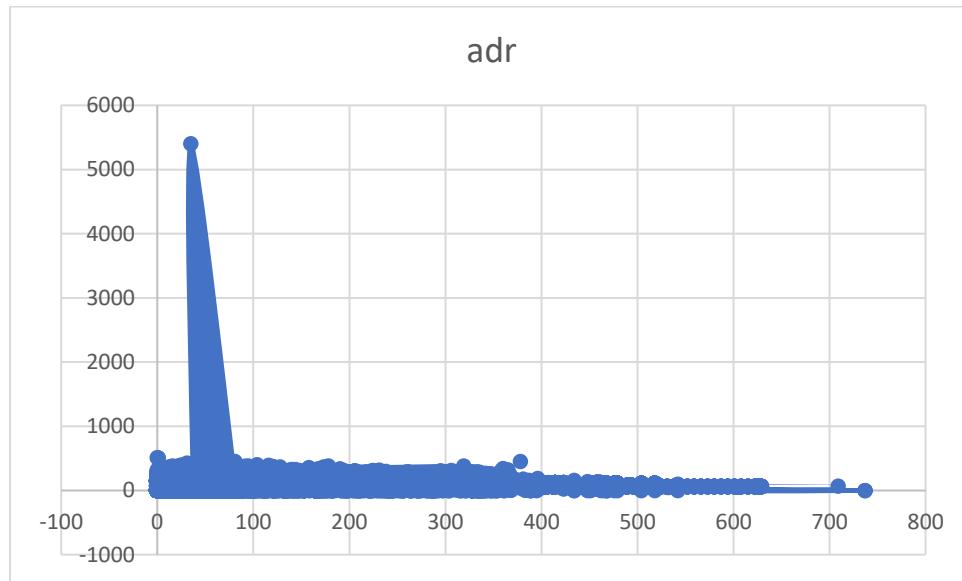


- The histogram illustrates the distribution of ADR values across all booking

- The chart Skewed indicate that fewer booking has high ADR and most booking has Lower ADR and most booking within a specific range .

By analysis the distribution of ADR values helps in identifying pricing strategies that can shift the distribution towards higher ADRs.

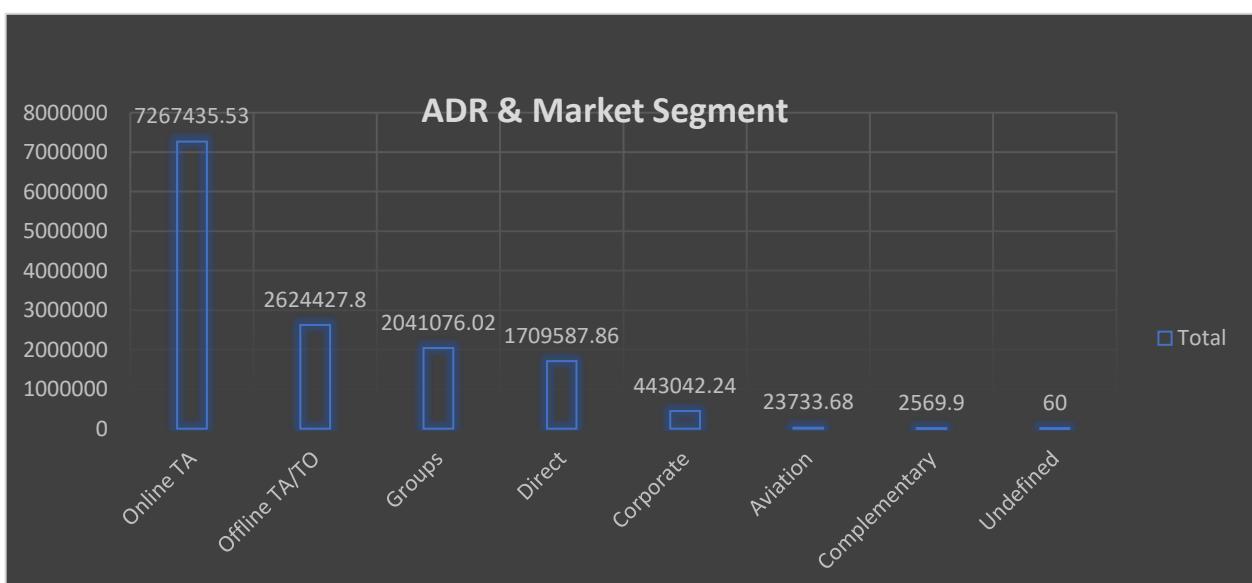
- ADR and Lead Time**



- The scatter plot shows how ADR varies with the lead time of bookings.
- This chart that there is a correlation between the ADR and lead time
- Short Lead Time led to Higher ADRs due to urgent demand ,Long Lead Time led to Lower ADRs for early bookings, offering discounts to secure early reservations.

By analyzing the relationship between ADR and lead time, the hotel can optimize pricing strategies to balance early bird discounts and last-minute premiums.

- ADR & Market Segment**



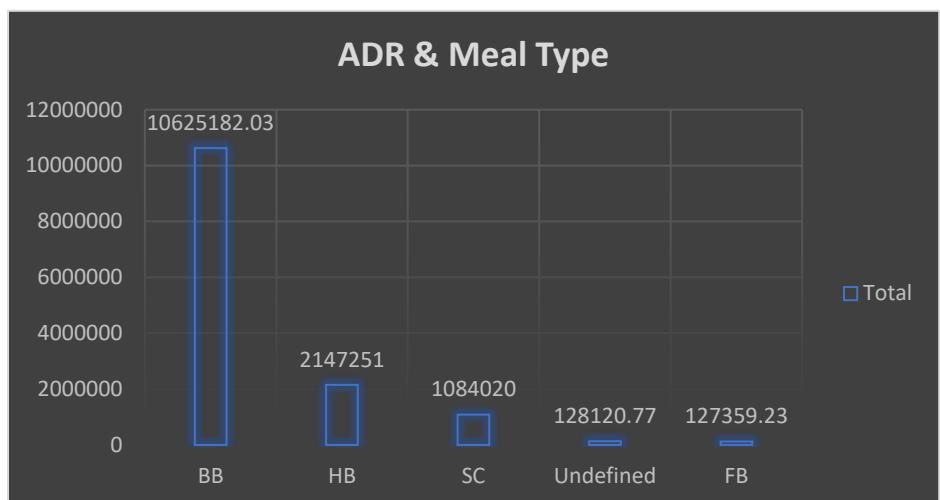
- This chart showing the Average Daily Rate (ADR) for different market segments.

- Online TA has a higher ADR and that indicating that guests from this segment are willing to pay more , offline TA has a intermediate of ADR ,and the Groups has lower ADR and that indicates more price-sensitive guests.

By understanding the ADR differences among market segments, the hotel can tailor its pricing and promotional strategies to maximize revenue from high-ADR segments while offering competitive rates to attract price-sensitive segments.

- ADR & Meal Type**

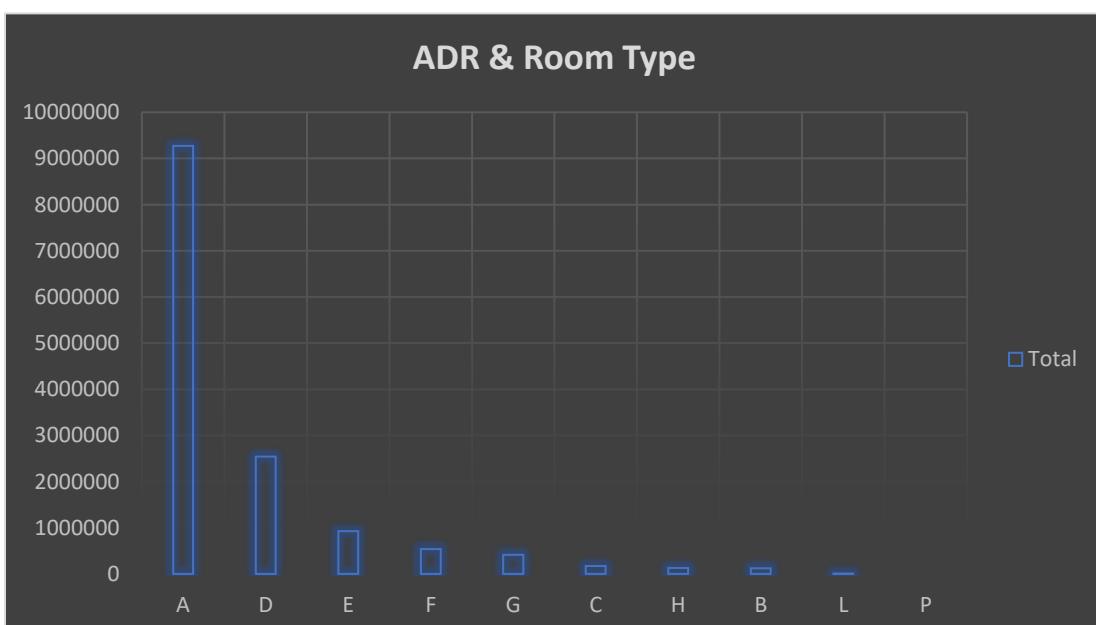
Row Labels	Sum of adr
BB	75.29%
HB	15.22%
SC	7.68%
Undefined	0.91%
FB	0.90%
<b>Grand Total</b>	<b>100.00%</b>



- This chart showing the ADR associated with different meal types.
- BB has a high ADR by 75 % and the lower is FB by 0.90 %

By analyzing ADR by meal type, the hotel can design attractive packages that cater to different guest preferences and maximize revenue from meal-inclusive bookings.

- ADR & Room Type**



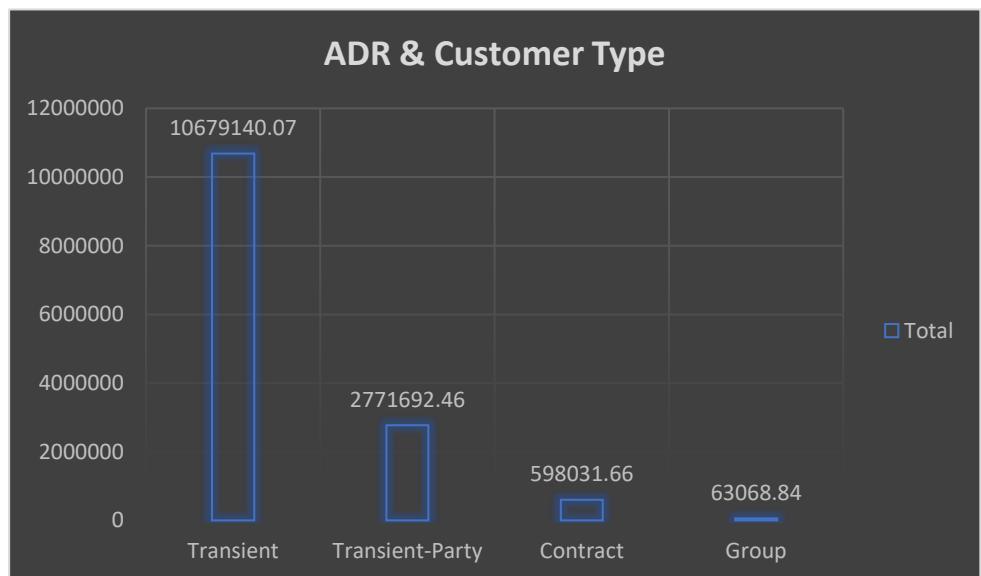
- This chart showing the ADR for different room types.

- The charts show that Room A has a high ADR and D has intermediate the Room type P has zero ADR

Analysis ADR by room type allows the hotel to optimize room pricing strategies and promote upgrades to higher room categories.

- ADR & Customer Type**

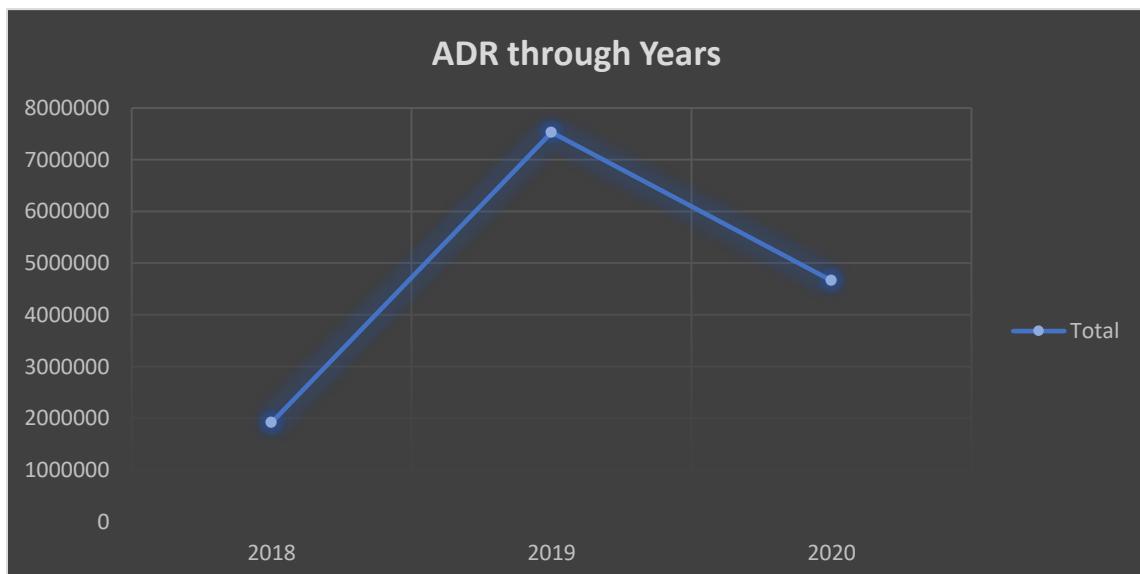
Row Labels	Sum of adr
Transient	75.67%
Transient-Party	19.64%
Contract	4.24%
Group	0.45%
<b>Grand Total</b>	<b>100.00%</b>



- ADR for different customer types (e.g., transient, contract, group).
- Transient has highest ADR, indicating willingness to pay more for short-term stays.

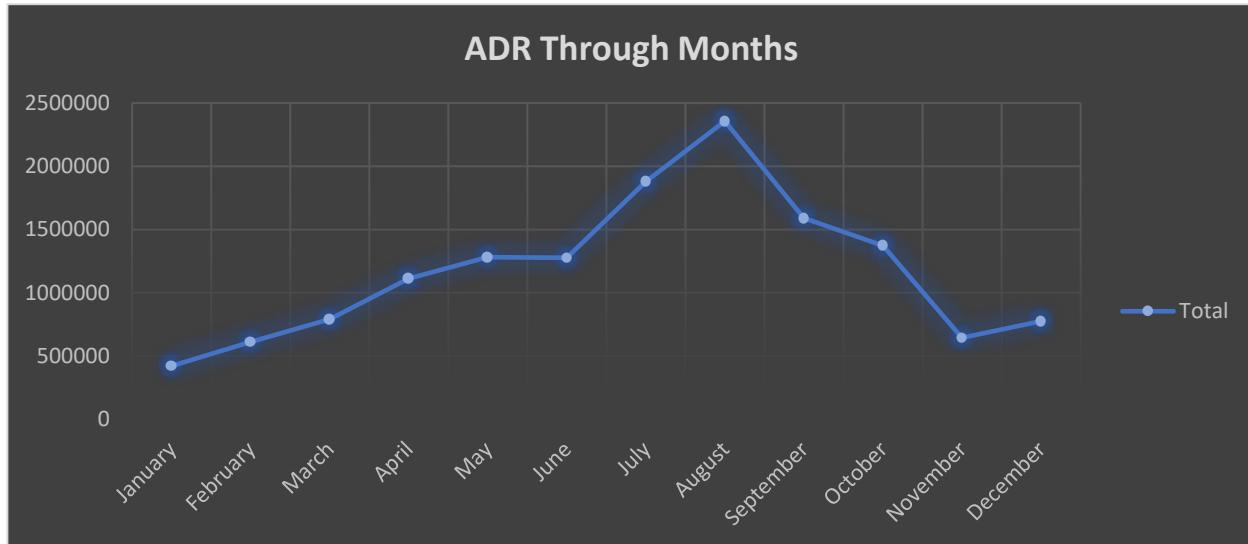
This analysis helps in understanding the profitability of different customer types and designing targeted marketing strategies accordingly.

- ADR through Years**



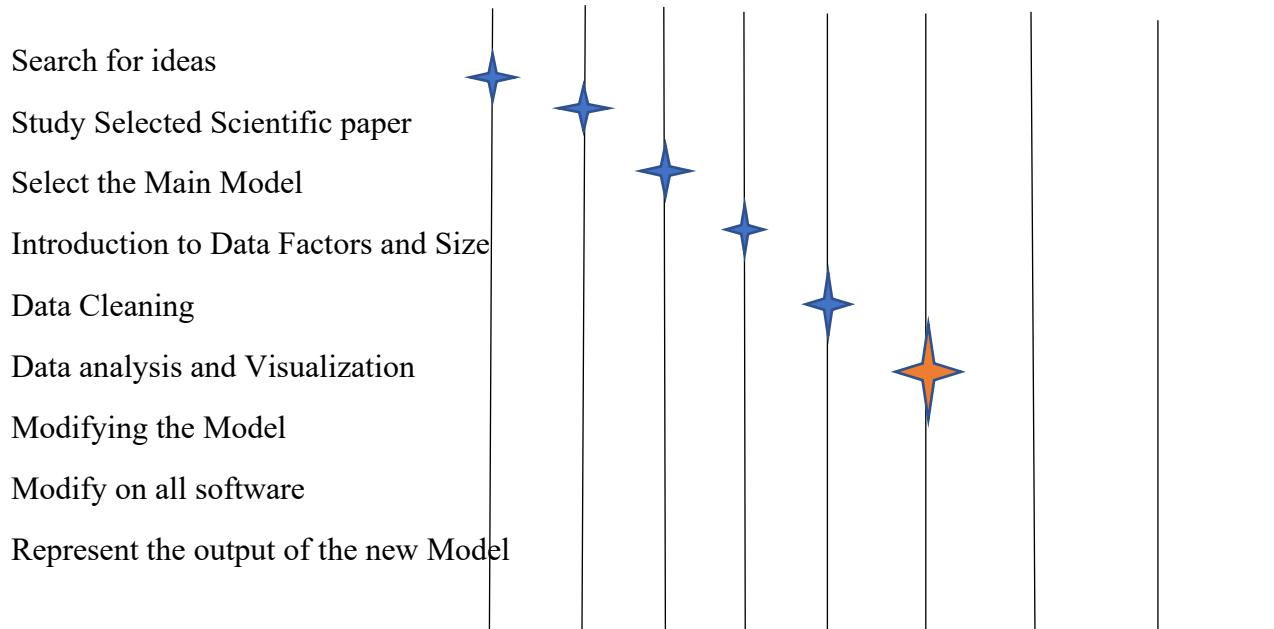
- This line chart indicate that the highest ADR is lower in 2019 and increase in 2019 that indicate a highest ADR and decrease again in 2020 .

- **ADR through Months**



- This chart indicates that the ADR increase start from January for may and stable in may to the middle of June after that increase again until august and decrease after that

### III. Project Time Frame



Activity	Status
Search for ideas	Complete
Study Selected Scientific paper	Complete
Select the Main Model	Complete
Introduction to Data Factors and Size	Complete
Data Cleaning	Complete
Data analysis and Visualization	In progress
Modifying the Model	Not started yet
Modify on all software	Not started yet
Represent the output of the new Model	Not started yet

## IV. Activities

### 1) Search for ideas:

- We spend a good amount of time searching for a high-quality scientific paper that contain suitable data about Hotel Data Insights.
- We find a huge amount of paper, but we choose only one main paper to work with its model and modify this model for new features, and use the other papers take some additional hints and deep understandings for the problem.

### 2) Study Selected Scientific paper:

- We spent a period approaching a month to read more than 15 scientific papers in depth, to understand all aspects of the problem and understand the idea of Hotel Data Insights.

### 3) Select the Main Model:

- We spent a period approaching a month to read more than 15 scientific papers in depth, to understand all aspects of the problem and understand the idea of Hotel Data Insights.
- We collect more data from a real-world case to more understanding for this system.

### 4) Introduction to Data Factors and Size:

- We used hotel data available to do customer segmentation, demand forecasting and ADR analysis. The size and complexity of the data factors play a crucial role in determining the insights that can be extracted and the accuracy of the models developed.
- We justified this point in 6 small points, Booking details, Guest information and history, Reservation timing, Room and service information, financial and pricing and reservation status.

**5) Data Cleaning:**

- We cleaned hotel data available by handling missing values with replacing all null values in the “children” column with zero (0), “country” column with “PRT”, “agent” column with zero (0) and “company” column with zero (0).

**6) Data analysis and Visualization:**

- We identified this point in 3 small points are Customer Segmentation and Personalization, Forecasting demand and pricing and Identifying influential factors on ADR.
- Customer segmentation and personalization representing by (Market segmentation and cancellation), (Reservation status for each hotel), (Top 10 countries), (customer type and customer categories), (Distribution channels), (number of special requests for each hotel), (number of car parking spaces required for each hotel) and (Check if guests are repeated for each hotel).
- Forecasting demand and pricing representing by (number of guests in each hotel over the 3 years), (number of cancellations and successful reservations) and (number of reservations each month).
- Identifying influential factors on ADR represent by (ADR distribution) and (ADR and lead time)

**7) Modifying the Model:**

- In this task we will add the new features or features not exist but are in another model.
- Initially we focus on adding (maintenance feature) but can increase the added features.

**8) Modify on all software:**

- In this case we will modify the expansion software for the new modified model.
- Modifying the solver software to be suitable for the new modified model.

**9) Represent the output of the new Model:**

- In this case we will represent the output of the new model and make a comparison between the old model and the new model and show how the modified model is much more powerful than the old model.

## **V. PROJECT's EXPECTED OUTPUTS**

- **Customer Segmentation**
  - Segmented groups of customers based on their booking behaviors, preferences, demographics, etc.
  - Detailed profiles for each customer segment (e.g., business travelers, leisure travelers, family groups).
  - Insights into the characteristics and needs of each segment.
- **Cancellation Prediction**
  - A predictive model that estimates the likelihood of a booking being canceled.
  - Accuracy metrics of the prediction model

- **Demand Prediction**
  - Forecasted demand for hotel rooms over a given period (daily, weekly, monthly).
  - Identification of peak and off-peak periods.
  - Impact of various factors on demand (e.g., seasonality, special events, holidays).
  - Accuracy metrics of the demand prediction model.
- **Business Insights and Recommendations**
  - Strategies for targeted marketing and personalized offers based on customer segments.
  - Recommendations to reduce cancellation rates (e.g., flexible booking options, cancellation penalties).
  - Suggestions for enhancing customer satisfaction and loyalty based on segment preferences.
- **Visualizations and Reports**
  - Interactive dashboards showcasing key metrics and trends.
  - Graphs and charts depicting segmentation, cancellation rates, and demand forecasts.
  - Summary reports for stakeholders with actionable insights and data-driven recommendations.

## **VI. BENEFICIARIES**

- **Hotel Management**
  - Improved decision-making regarding pricing, and marketing strategies.
  - Enhanced ability to optimize occupancy rates and revenue.
- **Marketing Teams**
  - More effective targeted marketing campaigns based on customer segments.
  - Better allocation of marketing resources to attract and retain high-value customers.
- **Revenue Management Teams**
  - Increased accuracy in demand forecasting leading to better revenue management strategies.
- **Customer Service Teams**
  - Improved customer retention by understanding and addressing specific needs of different segments.
- **Operations Teams**
  - Better planning for peak and off-peak periods.
- **Hotel Guests**
  - More personalized and satisfactory booking experiences.
  - Availability of tailored offers and services that meet their specific needs and preferences.
- **Hotel Owners and Investors**
  - Improved profitability and return on investment through optimized business operations.

## VII. RELATED DOCUMENTS

<https://shabakehonline.ir/wp-content/uploads/2022/05/ref1.pdf>

<https://www.projectionhub.com/post/adr-for-hotels-everything-you-need-to-know>

<https://crrhospitality.com/blog/financial-forecasting-in-the-hospitality-industry-a-deep-dive/>

<https://moldstud.com/articles/p-utilizing-predictive-analytics-for-demand-forecasting-in-hotels>

<https://www.siteminder.com/r/hotel-forecasting/>

<https://www.altexsoft.com/blog/average-daily-rate/>

<https://www.mews.com/en/blog/hotel-market-segmentation>