Case Study Analysis Report

Case Study Title: Uncovering Patterns in Hotel Booking Data for Operational Efficiency and Revenue Growth

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Executive Summary

This report is all about analyzing hotel booking data. Imagine you're a hotel manager trying to understand who books, when they book, and how much they pay.

We looked at:

- When people book (early or late)
- Where they're from (countries)
- If they get room upgrades
- How many nights they stay
- What affects the price they pay per night (called ADR - *Average Daily Rate*)

We used some basic statistics and graphs to make sense of this. In the end, we gave suggestions to improve bookings and make more money.

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1. Introduction

We took a big table (dataset) full of hotel booking details like:

- Guest nationality
- Type of room they booked
- How long they stayed
- How much they paid

We cleaned up the data and used it to find useful patterns and trends.

2. Background / Context

This data was from two types of hotels — a **city hotel** and a **resort hotel**. We had over 100,000 bookings But, some parts of the data were messy:

1 Some columns had lots of missing values (so we removed or fixed them).

2 Date information was split into day, month, and year I combined it into one single date.

3. Analysis

We used different tools to understand the data:

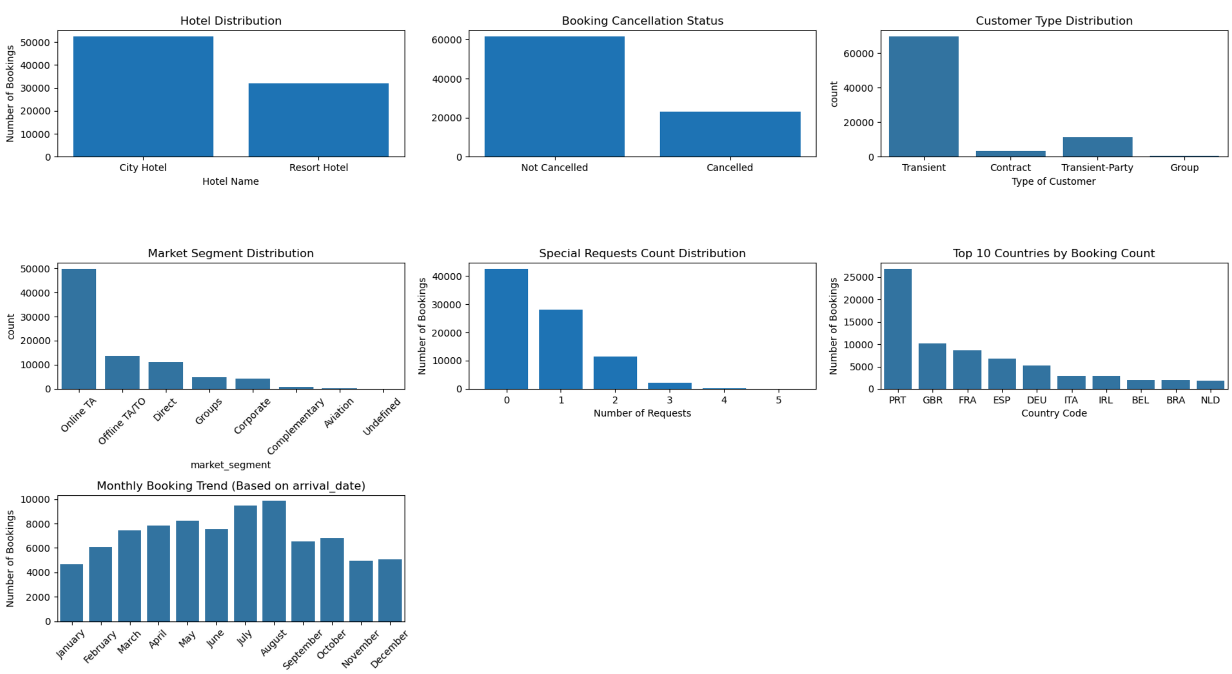
- **Univariate Analysis**:

  We looked at each column separately to understand basic patterns.
  For example:

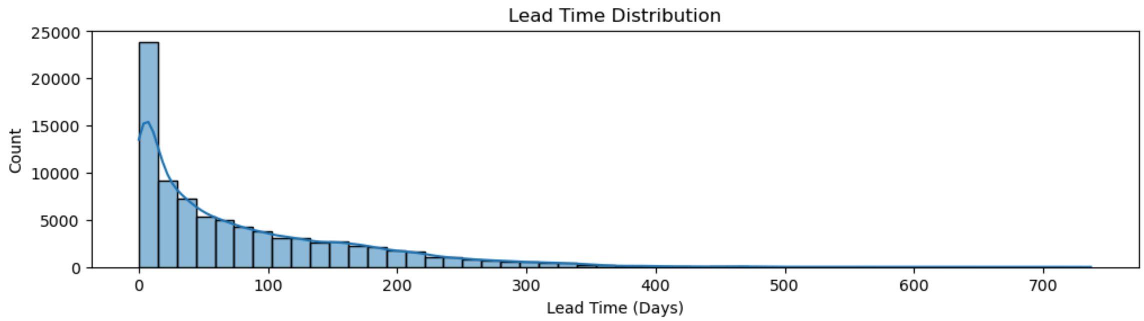
- How many bookings came from each country?
- Which room types were booked most often?
- What's the most common number of guests?

  This helped us get a feel for the data before comparing anything.

Barchart for categorical values for univariate analysis:

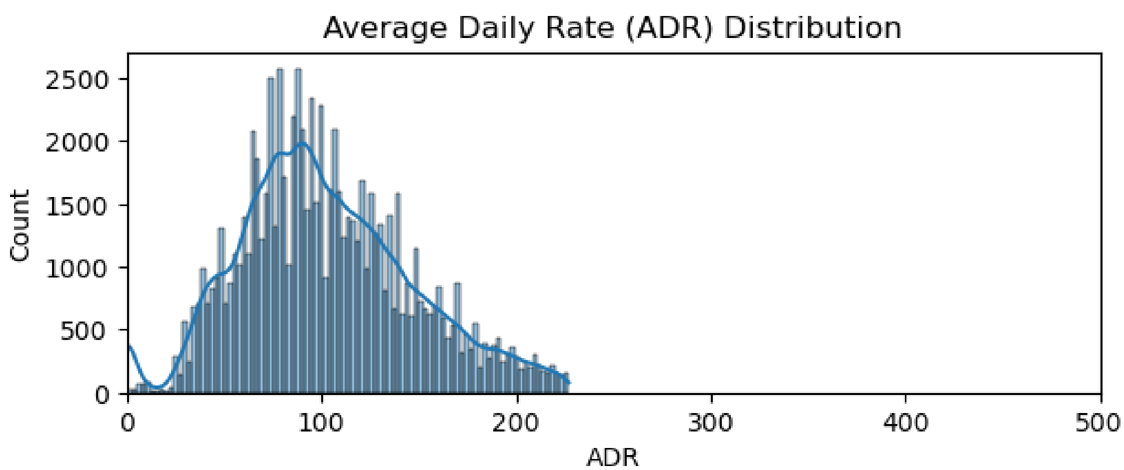


Created histogram for continuous and discrete column for univariate analysis:



This chart shows how many days in advance people book their hotel stays:

- Most people book very close to their stay date, especially within the first 0–20 days.
- As the number of days increases, the number of bookings drops sharply.
- Very few guests book more than 100 days in advance.



This chart shows how hotel room prices per night (ADR) are spread out:

- Most bookings are priced between 50 and 150 units.
- The peak is around 100, meaning that's the most common nightly rate.
- Prices above 200 are rare.

- **Bivariate/Multivariate Analysis**:

Next, we looked at how two or more things are related.
For example:

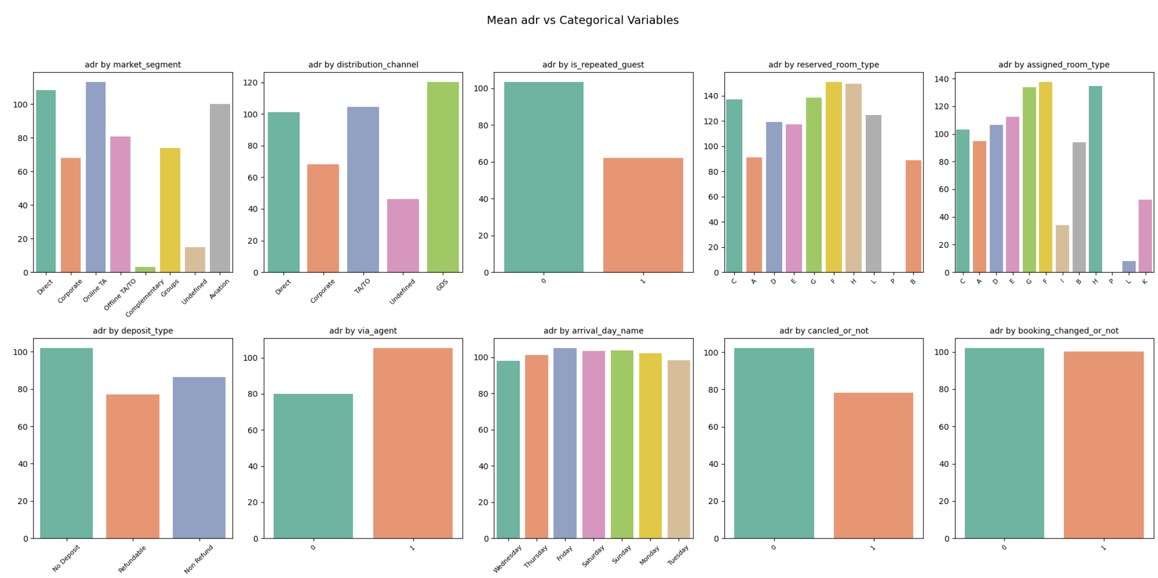
- Is there a connection between room type and price?
- Do guests from different countries pay more or less?
- Does lead time (how early someone books) affect cancellations?

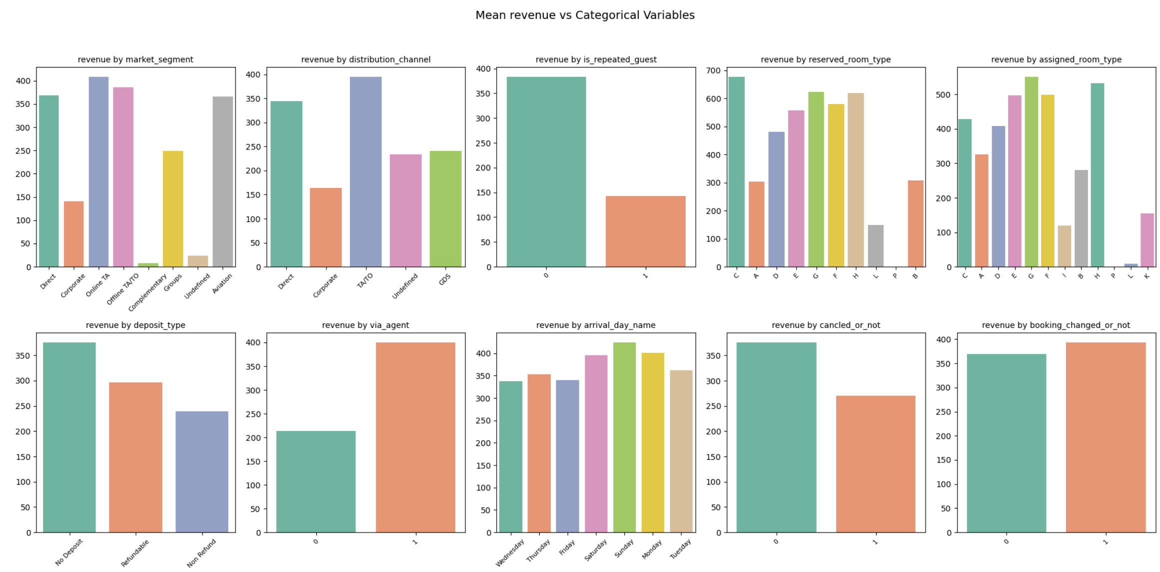
This helped us find relationships between columns.

Boxplot for bivariate analysis:

This chart shows how the average price per night (ADR) varies based on guest or booking characteristics.

- Corporate and Offline TA/TO guests tend to pay more.
- Guests who are repeated usually pay higher rates.
- Assigned and reserved room types affect ADR — some types are priced much higher.
- Bookings via agents or with deposits tend to have lower ADR.
- Cancellations lead to lower ADR, while booking changes don't affect ADR much.



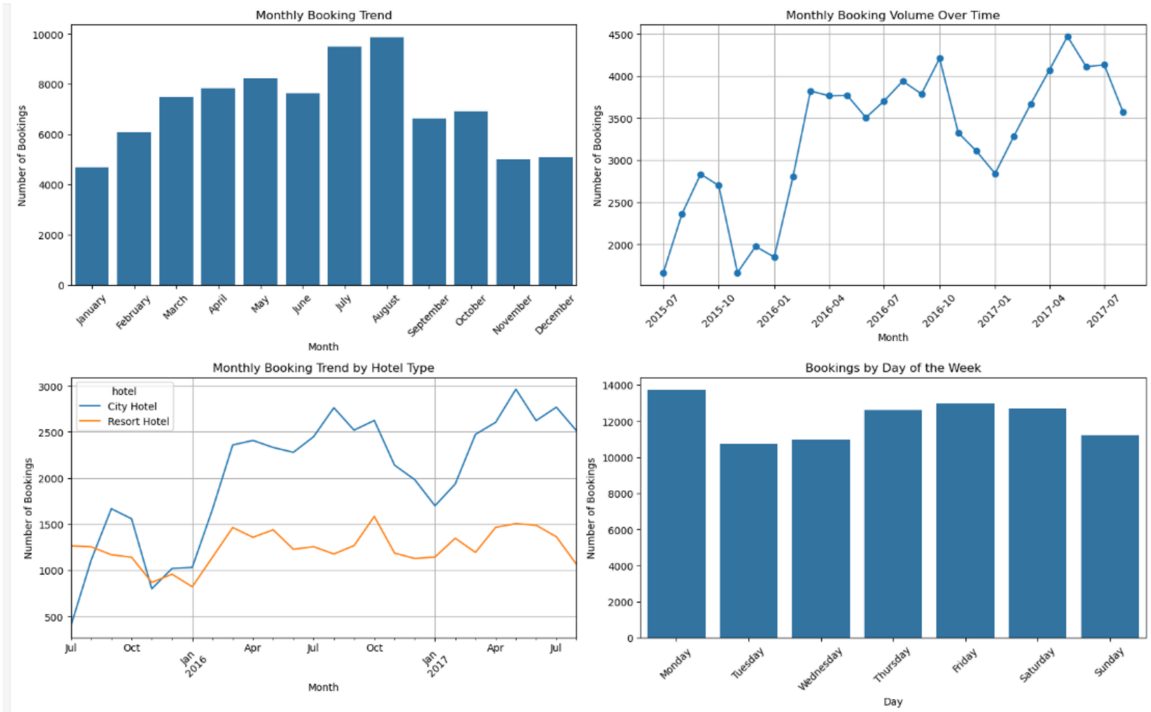


Time Series Analysis – Looking at Trends Over Time

We studied how bookings change across months and years.
For example:

- Are there more bookings in summer?
- Did prices increase or drop in certain months?

This helped us understand seasonal patterns in the data.



- Bookings peak in July and August, showing summer is the busiest time.
- City hotels consistently get more bookings than resort hotels throughout the year.
- Over time, total booking volume increased, showing growing business.
- Monday has the highest bookings, suggesting many people book after weekends.

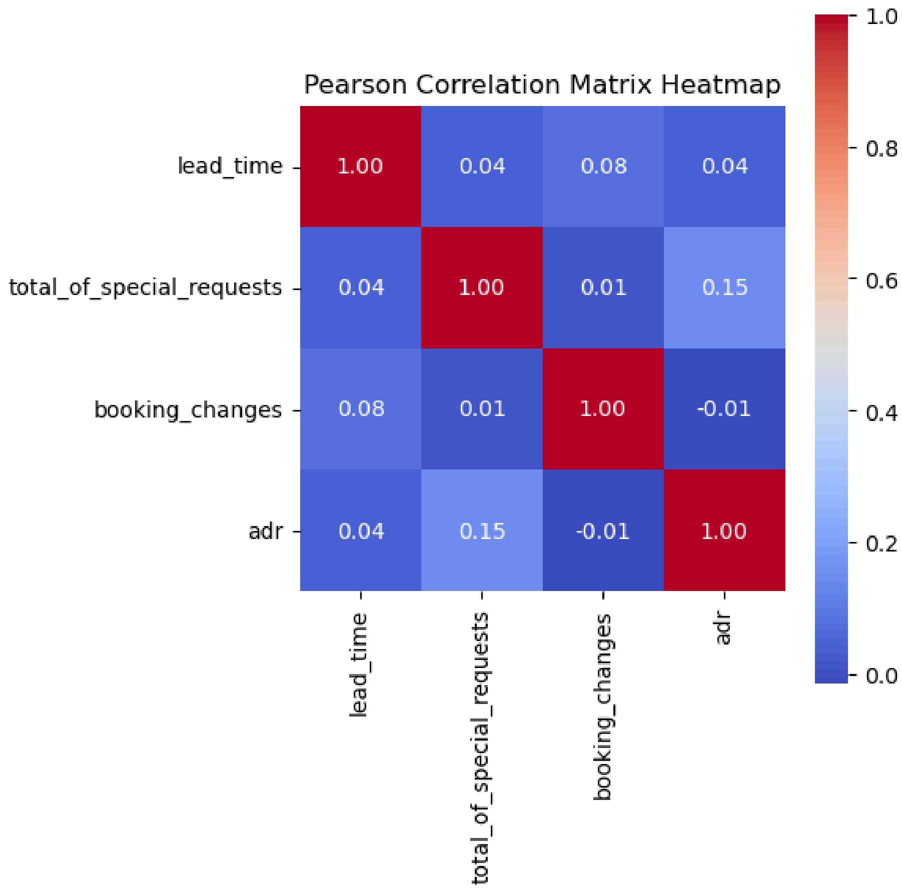
These insights help hotels plan staffing, marketing, and pricing.

Correlation – Are Things Related?

We used correlation to check how strongly different factors move together.
For example:

- If a guest books earlier, do they usually pay more?
- Do longer stays mean higher total prices?

Correlation helps us find what affects what, even if it's not obvious.



- total_of_special_requests and adr (average price per night) have a slight positive correlation (0.15) — guests who pay more tend to make more requests.
- Other features like lead_time, booking_changes, and adr show very weak or no strong relationship.
- Nothing here is highly correlated, meaning no variable strongly predicts another in this small selection.

Hypothesis Testing – Are Our Guesses Statistically True?

Sometimes we have a gut feeling (like "guests who book early cancel less").
We used hypothesis testing to check if these guesses are true using math.

It's like A/B testing — we compare groups and check if the difference is real or just by chance.

Cleaning the Data – Fixing the Mess

Before analyzing, we had to clean up the messy parts of the data:

Removed the "company" column

- The “company” column had too many missing values, so we deleted it.
- It didn’t give us useful information, so we dropped it to avoid confusion.

Filled Missing Values

For some important columns, we filled in the blanks:

- "Agent": Filled with the most common agent ID.
- "Country": Filled missing countries with the one that appeared the most.
- "Children": If the number of children was missing, we assumed it was zero or the most common number.

This way, we avoided errors or gaps in our analysis.

7. Conclusion

Through our detailed analysis of the hotel booking dataset, we gained valuable insights into customer behavior, booking patterns, and factors that influence revenue. Here's what we concluded:

- Pricing (ADR) is most influenced by the hotel type, customer type, and lead time. Guests who book earlier or belong to certain customer groups tend to pay more.
- Transient guests and international travelers usually book earlier and stay for shorter durations, but contribute significantly to revenue.
- There are noticeable differences in booking habits by country—for example, UK and France guests book earlier, while Portuguese guests stay for shorter durations.
- Special requests and booking modifications are more common among high-paying guests.
- Guests who have their room upgraded or reassigned are less likely to cancel, and about 1 in 4 bookings involve such changes.
- Certain market segments, like corporate or direct bookings, are more reliable—they cancel less and pay more.
- Data cleaning was crucial. We filled missing values smartly and removed irrelevant columns to keep the analysis accurate.