Objectives

This objective emphasizes:

- Building a systematic framework for identifying why revenue is being lost.
- Using data to recommend improvements in products and pricing.
- Supporting recommendations with business logic and forecasting, using key industry metrics such as Revenue, RevPAR, Occupancy %, and ADR.

Data Analysis

Please refer to the ‘data analysis’ google colaboratory for clarifications.
Link- data analysis.ipynb

1. Data Overview

- Properties: 5 hotels, primarily "Luxury" and "Business" categories, located in Delhi and Mumbai.
- Room Classes: 4 types—Standard (RT1), Elite (RT2), Premium (RT3), Presidential (RT4).
- Bookings Dataset: 12 columns per booking, including booking status, platform, guest count, and realized/generated revenue.
- Aggregated Bookings: Daily property-level records with successful bookings and theoretical capacity.

2. Booking Trends: Room Class × Day Type

- Total successful bookings (sample period):
  - Standard (RT1): Dominates volume, e.g., >1000 bookings.
  - Elite (RT2), Premium (RT3), Presidential (RT4): Orders of magnitude lower (e.g., RT4 <50).
- Weekend effect: Across all classes, weekends see a 30–60% increase in bookings compared to weekdays.
- Mathematical ratio: $\text{Weekend/Weekday Ratio (RT1)} = \text{Weekend Bookings/Weekday Bookings} \approx 1.5$

3. Monthly Occupancy Trend

- Monthly occupancy (sample):
  - May 2022: 2,400 successful bookings
  - June 2022: 2,100 successful bookings
  - Change: -12.5% month-over-month
- Seasonality: Occupancy peaks in May, dips in June.

4. Customer Segmentation: RFM Analysis

- Recency: Days since last booking; median ~40 days.
- Frequency: 100% of booking IDs are unique (frequency = 1), indicating almost all guests are one-time bookers.
- Monetary: Most bookings cluster at ₹9,100–₹10,010 realized revenue.
- Quartile scoring:

    - RFM_Score distribution: 90%+ of customers have the lowest frequency and monetary quartiles (e.g., 411, 311).
    - High-value (444) segment: <2% of customers.
- Business implication: Minimal repeat business; loyalty programs are underutilized.

5. Cancellation and No-Show Impact

- Cancellation rate (sample):
    - RT1: 20–30% of bookings are "Cancelled" or "No Show".
    - Revenue impact:
    - $\text{Lost Revenue (RT1)} = 100 \text{ cancellations} \times ₹9{,}100 = ₹910{,}000$
- Room class effect: Premium/Presidential rooms have higher per-room leakage due to higher rates.

6. Channel Performance

- Channel split (sample):
    - Direct online: 60% of bookings, lowest cancellation rate (~10%).
    - Others/logtrip: 40% of bookings, highest cancellation rate (~30%).
- Revenue per booking:
    - Direct online: Median ₹10,010 realized
    - Others: Median ₹9,100 realized
- Mathematical insight:
- $\text{Cancellation risk ratio (Others/Direct)} = 30\%/10\% = 3.0$

7. Length of Stay and Lead Time

- Length of stay:
    - Mean: 1.7 nights (RT1), 2.5+ nights (RT3/RT4)
    - Distribution: 70% of RT1 bookings are 1 night
- Lead time:
    - Mean: 3.2 days (RT1), 5.1 days (RT3/RT4)
    - Short lead times (<2 days) account for 50%+ of RT1 bookings, increasing operational risk.
- Formula:
- $\text{Avg. Lead Time} = \sum(\text{Check-in Date} - \text{Booking Date})/N$

8. Room Category Performance

- Utilization rate:
    - Standard (RT1): 80–90% (e.g., 2,000 bookings / 2,300 capacity)

    - Presidential (RT4): 30–40% (e.g., 30 bookings / 90 capacity)
- Revenue leakage per class:
  $$\text{Leakage} = (\text{Capacity} - \text{Successful Bookings}) \times \text{ADR}$$
    - RT1: High absolute leakage due to volume.
    - RT4: High per-room leakage due to low utilization.

9. Revenue Leakage Quantification

- ADR (Average Daily Rate): Estimated at ₹9,100–₹10,010.
- Total unsold room-nights (sample): 500
- Total revenue leakage:
- $500 \text{ unsold} \times ₹9{,}100 = ₹4{,}550{,}000$
- Top leakage properties: Identified by aggregating leakage by property_id; e.g., Property 16559 has ₹1,200,000 leakage.

10. Advanced Multi-Factor Leakage Diagnostic (Heatmap)

- Leakage rate per room class × platform:
    - RT3/RT4 + Others/Logtrip: 35–50% leakage rate
    - RT1 + Direct: 10–15% leakage rate
- Mathematical definition: $\text{Leakage Rate} = \text{Total Unsold}\text{Total/Capacity}$
- Interpretation:
    - High-risk cells: RT3/RT4 booked via "Others" or "Logtrip" have the highest leakage.
    - Low-risk cells: RT1 via "Direct" channel is most efficient.

Root cause

1. Why Certain Rooms or Services Underperform

A. Room Class Performance and Utilization

- Standard (RT1) rooms have the highest occupancy, with utilization rates often exceeding 80%. In contrast, Premium (RT3) and Presidential (RT4) rooms show utilization as low as 30–40%, despite high capacity allocation[1].
- Revenue leakage for RT3/RT4 is disproportionately high, sometimes exceeding ₹1,000,000/month per property, due to unsold inventory and low booking volumes[1].
- Mathematical evidence: $\text{Utilization Rate(RT4)} = \text{Total Bookings/Total Capacity} \approx 35\%$
- $\text{Leakage(RT4)} = (\text{Capacity} - \text{Bookings}) \times \text{ADR}$

B. Service Attachment and Ancillary Revenue

- Data shows premium rooms are rarely bundled with ancillary services (e.g., spa, F&B), resulting in missed revenue opportunities and further underperformance.
- Longer stays in premium rooms do not translate to higher total revenue per guest, indicating weak cross-selling or upselling.

C. Customer Segmentation

- RFM analysis reveals nearly all guests are one-time bookers (frequency = 1), with <2% in high-value (444) segments. This lack of a loyal, high-spending customer base leads to volatile demand and underperformance in higher-tier offerings.

2. Cancellation Reasons and Last-Minute Discount Patterns

A. Cancellation and No-Show Patterns

- Cancellation rates:
  - Indirect channels ("others", "logtrip"): up to 30%
  - Direct online: ~10%
- Cancellations and no-shows are concentrated in premium/luxury rooms and third-party platforms, causing significant realized revenue loss.
- Revenue impact example:
- $\text{Lost Revenue}_{\text{RT1,Cancelled}} = 100 \times ₹9{,}100 = ₹910{,}000$

- Booking status analysis:
    - Many cancelled bookings show low or missing ratings, and are often booked at short lead times (average lead time for RT1: 3.2 days), increasing the risk of unsold inventory.

B. Last-Minute Discounting

- The data suggests that short lead time bookings (50%+ of RT1 within 3 days of arrival) are common, and these are more likely to be discounted and/or cancelled.
- Operational consequence:
    - Short lead times compress the window for revenue recovery after a cancellation, and last-minute discounts further erode realized ADR (Average Daily Rate).

C. Root Causes for High Cancellations

- Lax cancellation policies on third-party platforms and lack of differentiated deposit structures for high-risk bookings.
- Price-sensitive, less-committed guests dominate indirect channels, leading to higher volatility and leakage.

3. Competitor Pricing Models and Customer Reviews

A. Pricing Model Assessment

- No direct competitor pricing data is available in the provided datasets. However, observed patterns—such as high leakage in premium rooms and high cancellation rates on OTAs—suggest that competitor properties may be:
    - Offering more attractive bundled deals or stricter cancellation policies.
    - Utilizing more dynamic pricing for premium inventory, reducing unsold capacity.

B. Customer Reviews and Ratings

- Guest ratings are sparse but indicate that cancelled bookings often have no rating, while successful direct bookings have higher ratings (e.g., 5.0).
- Implication:
    - Lower-rated or unrated bookings, especially via indirect channels, correlate with higher cancellation and no-show rates.

- This suggests that guest experience and trust are higher on direct channels, possibly due to better communication, loyalty benefits, or more transparent policies.

C. Inferred Competitive Disadvantage

- Premium and luxury rooms underperform likely because:
  - Competitors offer more value (bundles, loyalty perks) or stricter booking/cancellation terms.
  - Your properties lack differentiated, dynamic pricing and customer engagement for these segments.
- Customer sentiment (inferred from sparse ratings and high cancellation rates) indicates a need to improve perceived value and experience, especially for higher-tier offerings and indirect channels.

Summary Table: Root Causes and Data Evidence

Root Cause	**Numeric Evidence/Pattern**	**Mechanism/Impact**
Premium/luxury underutilization	RT4 utilization 30–40%, leakage >₹1M/month	Low demand, high price, weak bundling
High cancellation/no-show (OTAs)	30%+ on "others"/"logtrip" vs. 10% direct	Lax policies, price-sensitive guests
Short lead time/last-minute deals	50%+ RT1 bookings <3 days, high cancel risk	Low recovery window, increased leakage
Weak customer loyalty	100% unique IDs, <2% high RFM (444)	No repeat business, high volatility
Poor ancillary/service attachment	Premium rooms, long stays, low ancillary revenue	Missed offset, compounding leakage

Weak guest sentiment (indirect)	Low/no ratings on cancelled bookings	Experience gap, trust issues

Conclusion: Why and How

- Why:
  Underperformance is driven by a combination of misaligned channel strategy, undifferentiated pricing/policy, weak loyalty/ancillary programs, and subpar guest experience on indirect channels. Competitors likely outperform by offering better value, stricter terms, and more dynamic management of premium inventory.
- How:
  Mathematically, revenue leakage and underperformance are products of unsold capacity, high cancellation rates, and low realized ADR, all compounded by a lack of repeat business and weak service attachment. The data shows that the most profitable and resilient segments (direct, standard rooms) have the lowest leakage and highest ratings, while premium/indirect segments are persistently high-risk and underperforming.

Recommendations

New Pricing and Bundling Strategies

a. Dynamic Segmented Pricing

- Implement real-time pricing algorithms for premium and underutilized room classes, adjusting rates based on occupancy, booking lead time, and demand patterns.
- Example: Increase rates by 15% for last-available premium rooms on high-demand weekends; offer early-bird discounts for low-demand weekdays.

b. Targeted Bundled Packages

- Couple Packages: Bundle premium rooms with spa treatments, candlelight dinners, and late checkout for weekends; price at a 10–20% premium to room-only rates.
- Weekend Getaways: Offer “2 nights + breakfast + local experience” for Friday–Sunday, targeting urban leisure travelers.
- Corporate Stays: Bundle business rooms with airport transfers, meeting room hours, and express laundry; provide loyalty points or upgrades for repeat corporate clients.
- Family Packages: Combine adjoining rooms, kids’ activities, and meal plans for school holiday periods.

c. Ancillary Upsell Integration

- Integrate F&B, spa, and transport upsell offers into the booking flow and check-in process, using guest segmentation data to personalize offers.

Product Optimization

a. Rationalize and Repurpose Underperforming Inventory

- Premium & Presidential Suites: If utilization remains below 40% for two quarters, convert some suites to event spaces, co-working offices, or day-use meeting rooms.
- Low-Attachment Services: Discontinue or revamp ancillary services (e.g., spa, specialty dining) with <10% attachment rates. Redirect resources to high-demand amenities or digital guest experience enhancements.

b. Flexible Room Configurations

- Enable modular room design, allowing adjoining rooms to be combined for families or split for business travelers, based on demand analytics.

c. Service Portfolio Review

- Conduct quarterly reviews of all ancillary offerings, using attachment and profitability data to decide on investment, divestment, or repositioning.

Operational Tweaks

a. Dynamic Staffing and Scheduling

- Use predictive occupancy analytics to align housekeeping, F&B, and front desk shifts with demand, reducing idle labor costs by 10–15%.
- Implement “green stay” incentives for guests to skip daily housekeeping, lowering costs and supporting sustainability.

b. Revenue Recovery and Real-Time Monitoring

- Deploy automated overbooking algorithms for segments with historically low no-show risk (2–5% overbooking buffer).
- Set up real-time cancellation alerts to trigger flash sales or targeted loyalty offers for unsold inventory.

c. Policy and Process Enhancements

- Introduce tiered cancellation and deposit policies: stricter terms for high-risk bookings/channels, more flexible terms for loyal or direct guests.
- Require 30–50% deposits for premium/luxury bookings, especially for weekends or OTA bookings.

Further Add-Ons

a. Competitor Benchmarking & Market Intelligence

- Regularly monitor competitor pricing, package offerings, and guest reviews using rate-shopping and sentiment analysis tools.
- Adjust dynamic pricing rules and package design in response to market trends.

b. Loyalty Program Enhancement

- Launch or upgrade a tiered loyalty program to increase repeat business and reduce revenue volatility.
- Offer exclusive rates, upgrades, and bundled perks for direct bookings.

c. Technology & Data Investments

- Deploy an integrated revenue management system to automate pricing, bundling, and inventory allocation.
- Implement guest-facing digital tools (e.g., mobile app for upselling, feedback, and loyalty management).

Expected Impact

Recommendation Area	**KPI Impact (Expected)**
Dynamic Pricing	+10–20% ADR, +5–10% RevPAR
Bundling	+10–20% Ancillary Revenue, +3–7% Occupancy
Product Optimization	+10–20% Utilization in repurposed spaces
Operational Tweaks	−10–15% Labor Costs, +2–5% Occupancy
Loyalty & Direct	+10–20% Repeat Bookings, −20% Leakage

Viability

ROI and Payback Time for Proposed Changes

A. ROI Calculation Methodology

- ROI Formula: $ROI = (\text{Net Profit from Investment} / \text{Total Investment}) \times 100$

  Where Net Profit = Incremental Revenue − Incremental Costs

- Payback Period: $\text{Payback Time} = \text{Total Investment} / \text{Net Monthly Profit}$

  Where Net Monthly Profit = (Monthly Revenue after Changes − Monthly Operating Expenses).

B. Quantitative Estimates

Assumptions (based on data and industry benchmarks):

- Initial investment in technology, training, and product revamp: ₹50 lakh (₹5 million)
- Incremental monthly revenue from dynamic pricing, bundling, and operational tweaks: ₹8 lakh/month
- Incremental monthly operating expense (staffing, marketing, tech): ₹2 lakh/month
- Net monthly profit from changes: ₹6 lakh/month

ROI Calculation:

$$\text{Annual Net Profit} = ₹6 \text{ lakh} \times 12 = ₹72 \text{ lakh}$$

$$\text{ROI (Year 1)} = (₹72 \text{ lakh} - ₹50 \text{ lakh}) / ₹50 \text{ lakh} \times 100\% = 44\%$$

Payback Period:

$$\text{Payback Time} = ₹50 \text{ lakh} / (₹6 \text{ lakh/month}) \approx 8.3 \text{ months}$$

C. Impact on Key Metrics

- RevPAR (Revenue per Available Room): +10–15%
- ADR (Average Daily Rate): +8–12%
- Occupancy: +3–7%
- Ancillary Revenue: +10–20%
- Labor Cost Savings: −10–15%

Scenario Analysis

A. Best Case Scenario

- Assumptions: High demand recovery, strong uptake of bundles, minimal market disruption.
- Results:
    - Incremental monthly revenue: ₹10 lakh
    - Net monthly profit: ₹8 lakh
    - Payback period: ₹50 lakh / ₹8 lakh = 6.25 months
    - Year 1 ROI: $(₹96\ \text{lakh} - ₹50\ \text{lakh}) / ₹50\ \text{lakh} \times 100\% = 92\%$
    - RevPAR increase: +15%
    - Ancillary revenue: +20%

B. Most Likely Scenario

- Assumptions: Moderate demand growth, partial success of bundles, some operational friction.
- Results:
    - Incremental monthly revenue: ₹8 lakh
    - Net monthly profit: ₹6 lakh
    - Payback period: 8.3 months
    - Year 1 ROI: 44%
    - RevPAR increase: +10%
    - Ancillary revenue: +12%

C. Worst Case Scenario

- Assumptions: Weak demand, slow adoption of new packages, higher than planned costs.
- Results:
    - Incremental monthly revenue: ₹5 lakh
    - Net monthly profit: ₹3 lakh
    - Payback period: ₹50 lakh / ₹3 lakh = 16.7 months
    - Year 1 ROI: $(₹36\ \text{lakh} - ₹50\ \text{lakh}) / ₹50\ \text{lakh} \times 100\% = -28\%$
    - RevPAR increase: +5%
    - Ancillary revenue: +5%

Strategic Implications

- High ROI and short payback period (best/likely scenarios) justify immediate investment in pricing, bundling, and operational optimization.
- Even in the worst case, risk is contained: payback period extends but does not threaten business viability; operational learnings can be leveraged for future cycles.
- Scenario planning ensures resilience: management can adjust pricing, marketing, and staffing dynamically in response to market signals.