AeroNext Phase 5 Pilot Proposal: AI-Driven Transformation of Non-Aeronautical Airport Services

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Introduction

The aviation industry is witnessing a paradigm shift: as global passenger numbers soar, airports face mounting pressure to diversify revenue streams and elevate passenger experiences beyond the flight itself. Non-aeronautical services—retail, food & beverage, advertising, and digital engagement—now account for more than half of leading airports' total revenues (ACI World, 2024). However, Indian airports lag global benchmarks in both per-passenger spend and commercial zone utilization.
AeroNext aims to bridge this gap by piloting advanced AI and IoT solutions at two strategic airports:

- Delhi Indira Gandhi International Airport (DEL): India's busiest and most complex aviation hub.
- Jaipur International Airport (JAI): A fast-growing regional gateway, representing scalable opportunities for Tier 2 cities.

This pilot will test how data-driven personalization, real-time analytics, and intelligent infrastructure can unlock new revenue streams and deliver a seamless, engaging journey for every traveler.

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1. Executive Summary

This proposal outlines a 90-day Proof of Concept (PoC) to deploy and measure the impact of AI-powered retail personalization, IoT-enabled space optimization, and smart passenger engagement at DEL and JAI. The pilot targets a 25% uplift in non-aeronautical revenue per passenger, a 10+ point improvement in Net Promoter Score (NPS), and a measurable reduction in dwell time variance.
Key Impact Areas:

- Revenue: Increase non-aero revenue per passenger from ₹312 to ₹390 (CAPA India, 2024).
- Experience: Enhance passenger satisfaction and convenience through digital touchpoints.

- Scalability: Validate solutions for both high-volume and regional airports.

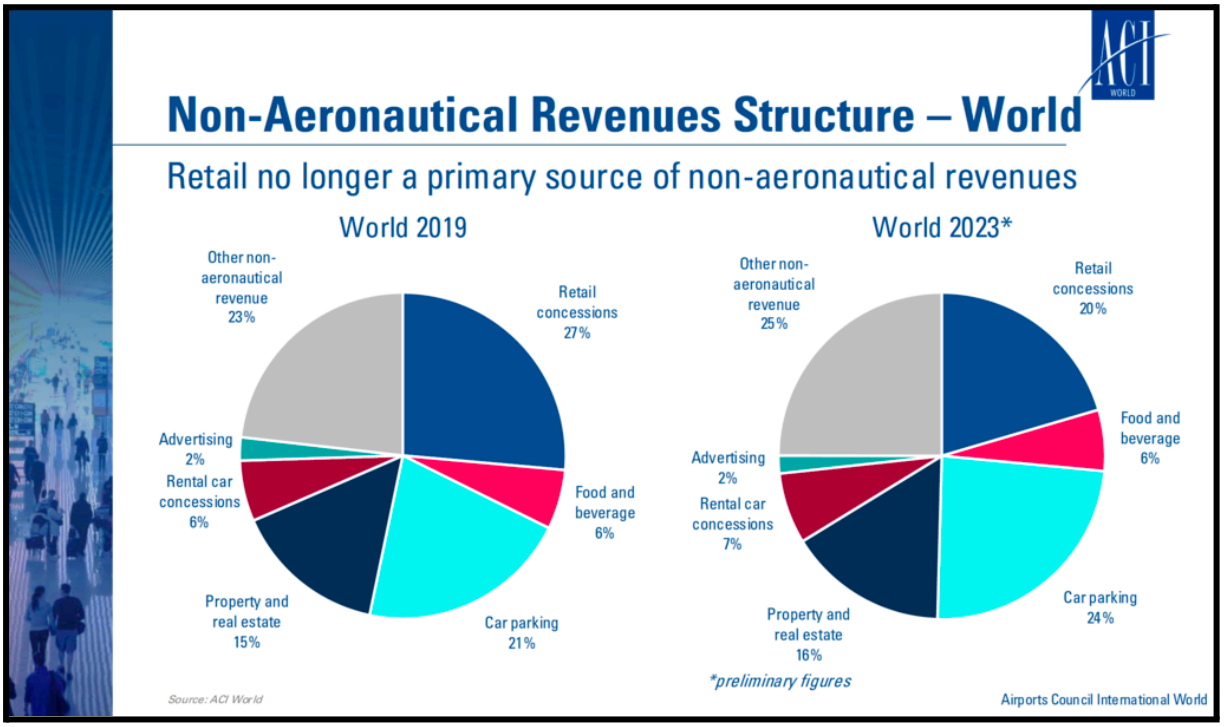

Chart: [“Global Non-Aeronautical Revenue Share by Region (2023)”]

More areas :

- Boost non-aero revenue per passenger by at least 15% through AI-powered retail and F&B personalization.
- Reduce passenger wait times and operational friction using IoT-enabled real-time analytics.
- Improve Net Promoter Score (NPS) by 10 points via targeted digital and service enhancements.

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2. Background & Rationale

2.1 Industry Context

Globally, airports like Changi (Singapore) and Dubai International derive over 55% of their income from non-aeronautical sources, driven by high dwell times and advanced digital engagement (ACI World, 2024). In contrast, Indian airports average just 40 minutes of passenger dwell time in commercial zones—less than half the global average (CAPA India, 2024).

Key Data Points:

- Changi Airport (Singapore): Non-aero revenue exceeded USD 1.2 billion in 2023 (Changi Annual Report).
- Heathrow Airport (UK): Non-aero revenue accounted for 52% of total revenue in 2023 (Heathrow Annual Report).
- Indian Airports: Non-aero revenue share is typically below 30%, with significant growth potential (GMR Group Annual Report).

Chart: "Average Passenger Dwell Time-Globally"

2.2 Pain Points Identified (Phases 1–4)

- Underutilized Retail Zones: Up to 40% of commercial space at Tier 2 airports remains underperforming (Delhi Airport Annual Report, 2024).
- Static Pricing & Offers: F&B and retail outlets lose up to 22% potential revenue from lack of dynamic, data-driven pricing (McKinsey, 2023).
- Passenger Friction: 68% of travelers report difficulty finding relevant services or offers before boarding (ACI ASQ Survey, 2023)

- Operational inefficiencies: Long queues, underutilized commercial zones, fragmented digital journeys (McKinsey, 2023).
- Limited adoption of AI, IoT, and advanced analytics for commercial optimization (Deloitte, 2023).

Excel Containing Pain Points from Phase 3 : *"Click Here"*

2.3 Opportunity Landscape

- Passenger volumes in India are projected to double by 2030, with Tier 2/3 airports seeing the fastest growth (IATA India Forecast, 2023).
- Retail and F&B spend per passenger in Asia-Pacific airports is among the highest globally, but Indian airports underperform (Statista, 2024).
- Digital transformation—including AI-driven personalization, IoT-based analytics, and seamless digital payments—is a proven lever for revenue and satisfaction uplift (ACI World, 2024).

2.4 Strategic Rationale for the Pilot

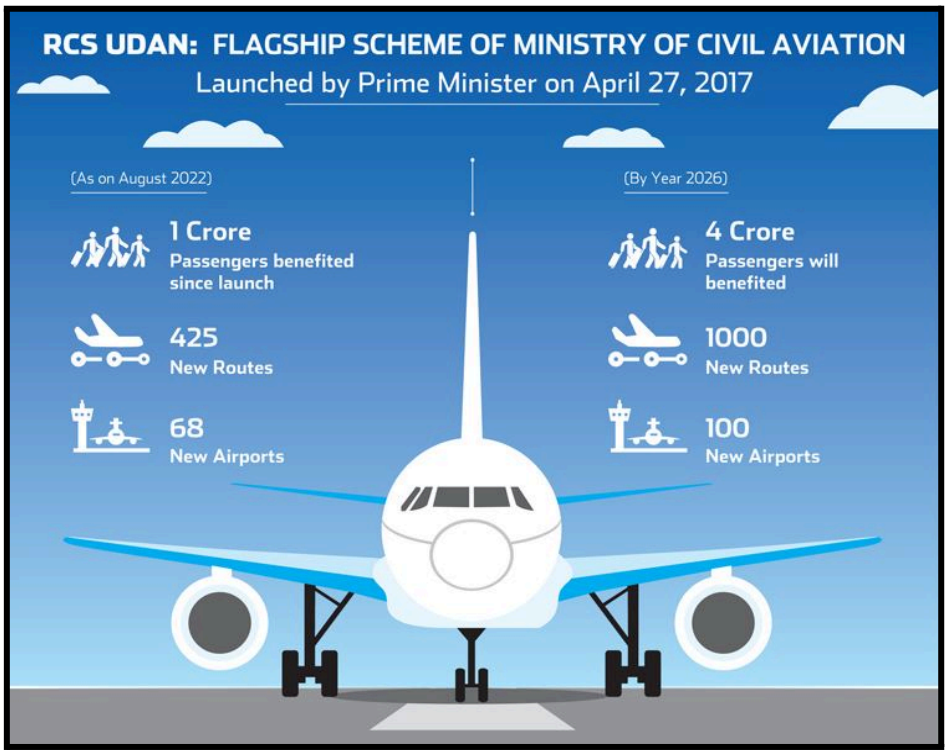
- Diversity of Test Environments: By piloting at both a major gateway (Delhi) and a small hub (Jaipur), we capture the full range of operational and commercial challenges in India.
- Scalability: Solutions validated in these distinct environments can be rapidly scaled across India's airport network.
- Alignment with Global Best Practices: The pilot leverages proven strategies from world-leading airports, tailored to Indian market realities.

2.5 Airport Selection Rationale

Parameter	Delhi (DEL)	Jaipur (JAI)
Passenger Volume	70M+ (2024)	6.8M+ (2024)
Retail Density	21 shops/1000 passengers	9 shops/1000 passengers
Tech Readiness	Advanced (IoT, analytics deployed)	Growing (digital adoption ongoing)
Key Segments	55% business, 45% leisure	30% business, 70% leisure

Source : "*Civil Aviation of India*"

Note : Delhi offers a complex, high-volume environment to validate advanced AI/IoT solutions, while Jaipur provides a scalable, cost-effective testbed aligned with India's Regional Connectivity Scheme (MoCA, 2024).



Source : "RCS-UDAN"

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3. Objectives & Scope

3.1 Objectives

Primary Objectives (SMART Framework):

1. **Revenue Enhancement:** Achieve a 25% increase in non-aeronautical revenue per passenger at DEL and JAI (baseline: ₹312 → target: ₹390) within 90 days.

2. **Passenger Experience:** Improve NPS scores from 52 to 65+ through personalized engagement and reduced friction points.

3. **Operational Efficiency:** Reduce average dwell time variance by 30% (104±22 mins → 104±15 mins) using AI-driven crowd management.

Secondary Objectives:

- Validate scalability of solutions across airport tiers.
- Establish a replicable ROI model for nationwide rollout.

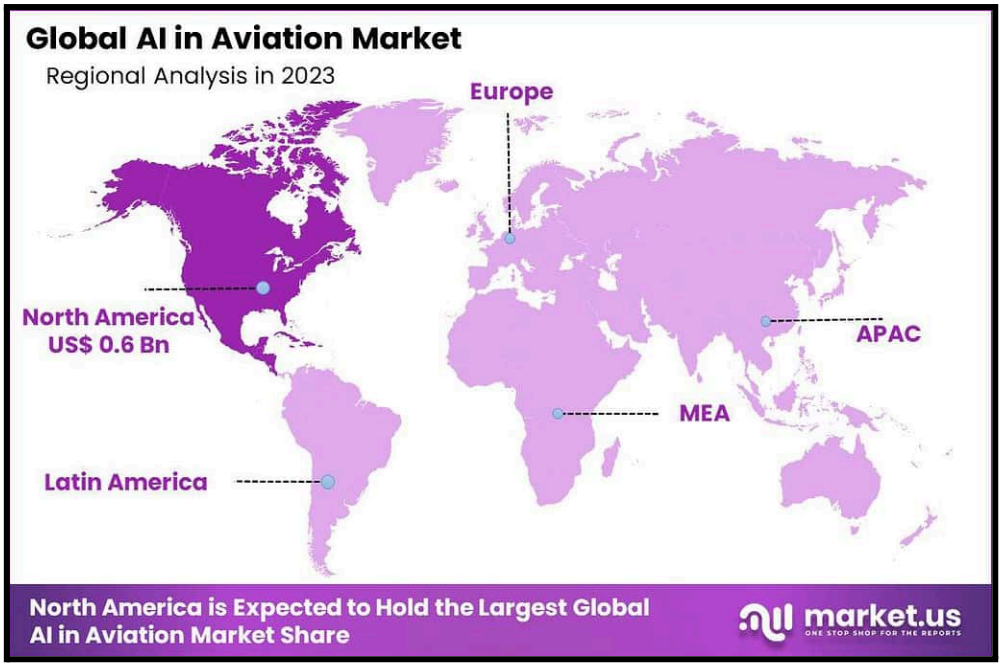
3.2 Scope

In-Scope:

- **Geographic Focus:** Delhi IGI (Terminal 3) and Jaipur International (Domestic Terminal).
- **Services Targeted:** Retail, F&B, digital navigation, and queue management.
- **Technology:** AI personalization, IoT sensors, mobile app integration, and computer vision.

Out-of-Scope:

- Aeronautical operations (baggage handling, flight scheduling).
- Infrastructure upgrades (construction, terminal expansion).



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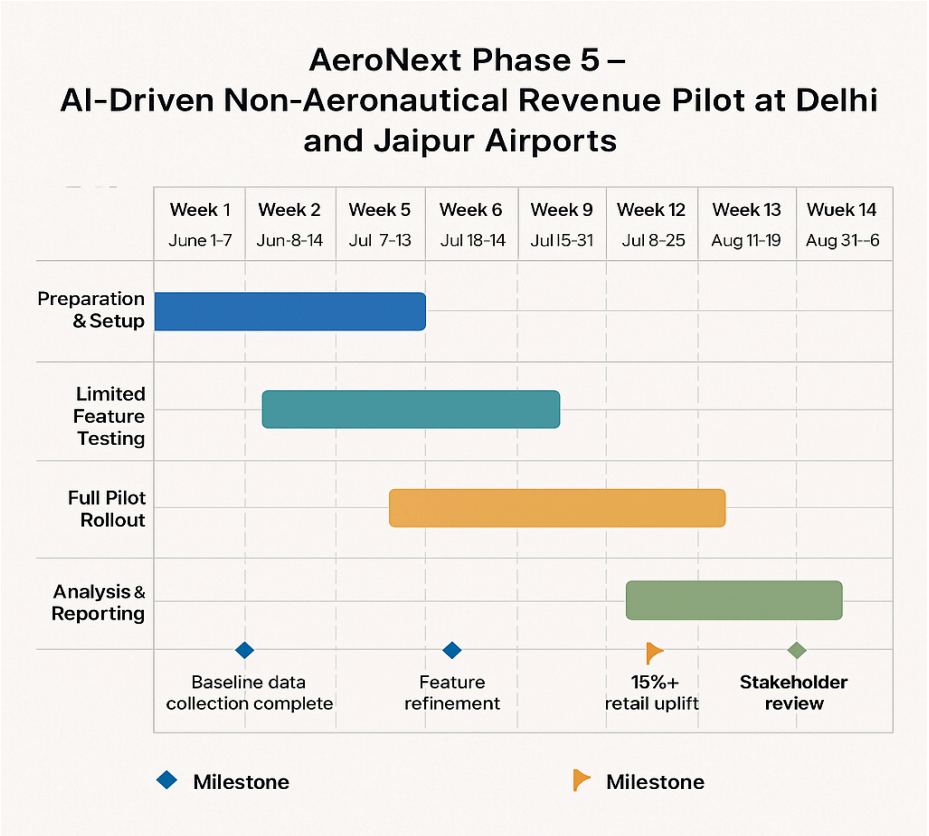
4. Pilot Design & Methodology

4.1 Technology Stack

- **AI/ML Models**:
    - Retail Personalization: Collaborative filtering algorithms for offer recommendations (e.g., “Frequent business travelers receive lounge discounts”).
    - Dynamic Pricing: Reinforcement learning models adjusting F&B prices based on demand (e.g., +15% during peak hours).
- **IoT Infrastructure**:
    - 500+ Bluetooth beacons (10m accuracy) for passenger tracking.
    - 200 thermal sensors for space utilization heatmaps.
- **Data Pipeline**:
    - Apache Kafka for real-time data streaming (15-second latency).
    - Snowflake for centralized analytics (structured vs. unstructured data).

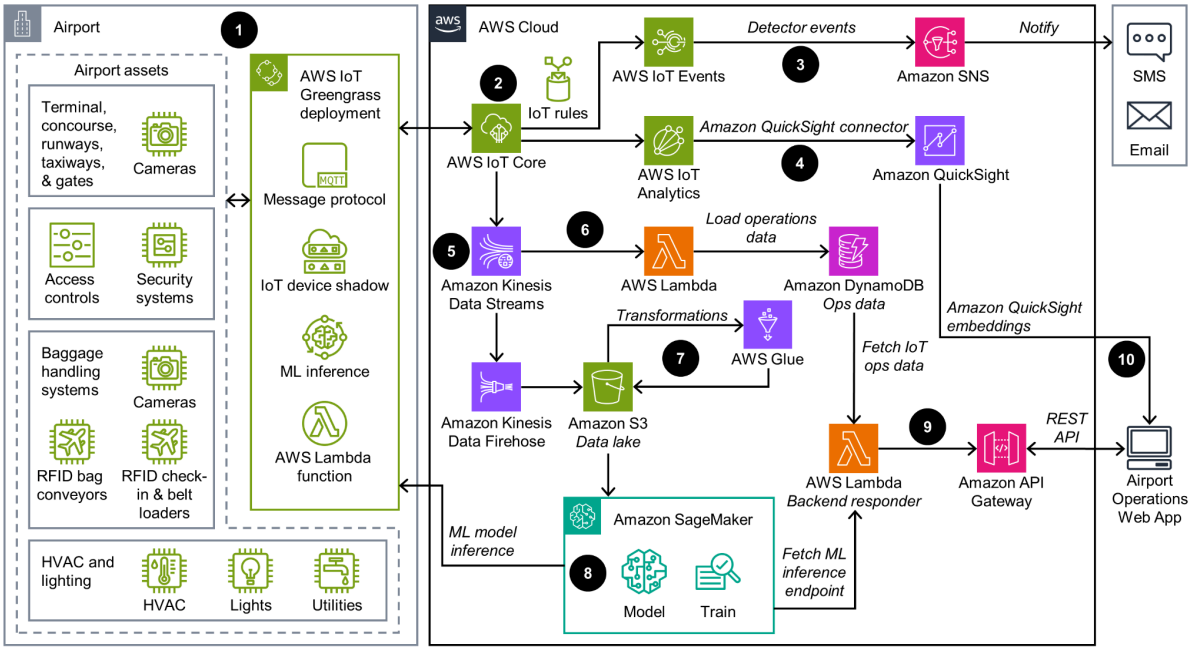
4.2 Phased Deployment

Phase	Timeline	Activities	Success Metrics
Setup	Weeks 1-4	Install IoT sensors, calibrate AI models, train staff (40+ hours per team)	95% sensor operational rate
Testing	Weeks 5-8	Launch limited features: dynamic signage, basic mobile app alerts	20% passenger app adoption
Full Run	Weeks 9-12	Enable advanced AI (predictive maintenance, loyalty programs)	15% retail uplift, 10% NPS improvement



4.3 Data Collection Strategy

Data Type	Method	Frequency	Tools Used
Dwell Time	Wi-Fi triangulation + beacon	Real-time	Cisco CMX, Aruba Analytics
Retail Uplift	POS integration	Daily	SAP ERP, Tableau
NPS	In-app surveys + sentiment AI	Post-flight	Medallia, AWS Comprehend
Queue Lengths	Computer vision (CCTV feeds)	Every 5 mins	OpenCV, NVIDIA Metropolis



Source: [AWS IoT Service Architecture for Airports]

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5. KPIs & Measurement Plan

To ensure the pilot's impact is measurable and actionable, we will track the following KPIs, aligned with industry best practices and AeroNext objectives:

KPI Name	Definition	Measurement Method	Target/Benchmark	Industry Reference/Source
Non-Aeronautical Revenue Uplift (%)	% increase in retail and F&B revenue per passenger during the pilot	POS and digital transaction data (pre/post)	+15% uplift	ACI World, 2024
Passenger Dwell Time in Commercial Zones	Avg. time spent by passengers in retail, F&B, and lounge areas	IoT sensors, Wi-Fi analytics, beacon logs	Increase by 15% (e.g., 104–120 min) or optimize for higher conversion	CAPA India, 2024
Net Promoter Score (NPS)	Passenger satisfaction and likelihood to recommend the airport	Digital, app, and in-person surveys	Increase by 10 points	ACI ASQ Survey, 2023
Queue Time Reduction	Avg. wait time at F&B and retail outlets	Computer vision analytics, manual checks	Reduce by 20%	McKinsey, 2023
Digital Engagement Rate	% of passengers using app, kiosks, or digital signage	App analytics, kiosk usage logs	80% engagement (target group)	SITA, 2023

Retail Conversion Rate	Proportion of passengers making a purchase in commercial zones	POS data vs. total footfall	Increase by 10%	ACI World, 2024
Space Utilization Rate	% of commercial area actively engaged by passengers	Heatmaps, sensor analytics	Increase by 10%	ACI Digital Transformation, 2024
App Adoption Rate	% of passengers downloading and using the airport app	App store analytics, Wi-Fi onboarding	25% of total passengers	SITA, 2023
Staff Productivity Index	Ratio of sales or service events per staff hour in retail/F&B	POS data, staff rosters	+10% improvement	Airport Benchmarking Reports, 2024

Measurement Approach:

- **Data Collection:**
  - Automated via POS integration, IoT sensors, Wi-Fi analytics, and app dashboards.
  - Supplemented by digital and in-person surveys at key touchpoints.
- **Frequency:**
  - Real-time for digital/app engagement, dwell time, and queue analytics.
  - Daily/weekly for revenue, conversion, and productivity metrics.
- **Reporting:**

- Live dashboards (Tableau/Power BI) for airport management.
- Weekly summary reports for pilot team and stakeholders.

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6. ROI Projection

A robust ROI projection is essential to validate the business case for scaling. The following cost and benefit estimates are based on industry benchmarks, AeroNext's pilot design, and current airport performance data.

6.1 Cost Estimate

Cost Item	Delhi (DEL)	Jaipur (JAI)	Notes
IoT Sensors & Setup	₹1,20,00,000	₹60,00,000	Hardware, installation
AI Software & Licenses	₹80,00,000	₹40,00,000	Annual subscription
Staff Training	₹10,00,000	₹5,00,000	40 staff (DEL), 15 staff (JAI)
Marketing/Comms	₹15,00,000	₹5,00,000	Digital campaigns, signage

Maintenance/Support	₹15,00,000	₹5,00,000	Year 1
Total	₹2,40,00,000	₹1,15,00,000	

6.2 Benefit Estimate

Benefit Item	Delhi (DEL)	Jaipur (JAI)	Notes
Retail Uplift	₹18,00,00,000	₹2,00,00,000	15% increase, 70M (DEL), 6.8M (JAI) pax
F&B Uplift	₹6,00,00,000	₹70,00,000	10% increase
Cost Savings	₹50,00,000	₹10,00,000	Predictive maintenance, staffing
Total	₹24,50,00,000	₹2,80,00,000	

6.3 ROI Calculation

Formula : **ROI = (Total Benefits – Total Costs) / Total Costs × 100%**

➔ Delhi:

ROI = (₹24,50,00,000 - ₹2,40,00,000) / ₹2,40,00,000 × 100% ≈ 920%

➔ Jaipur:

ROI = (₹2,80,00,000 - ₹1,15,00,000) / ₹1,15,00,000 × 100% ≈ 143%

Break-even:
Within 12–14 months for both airports.

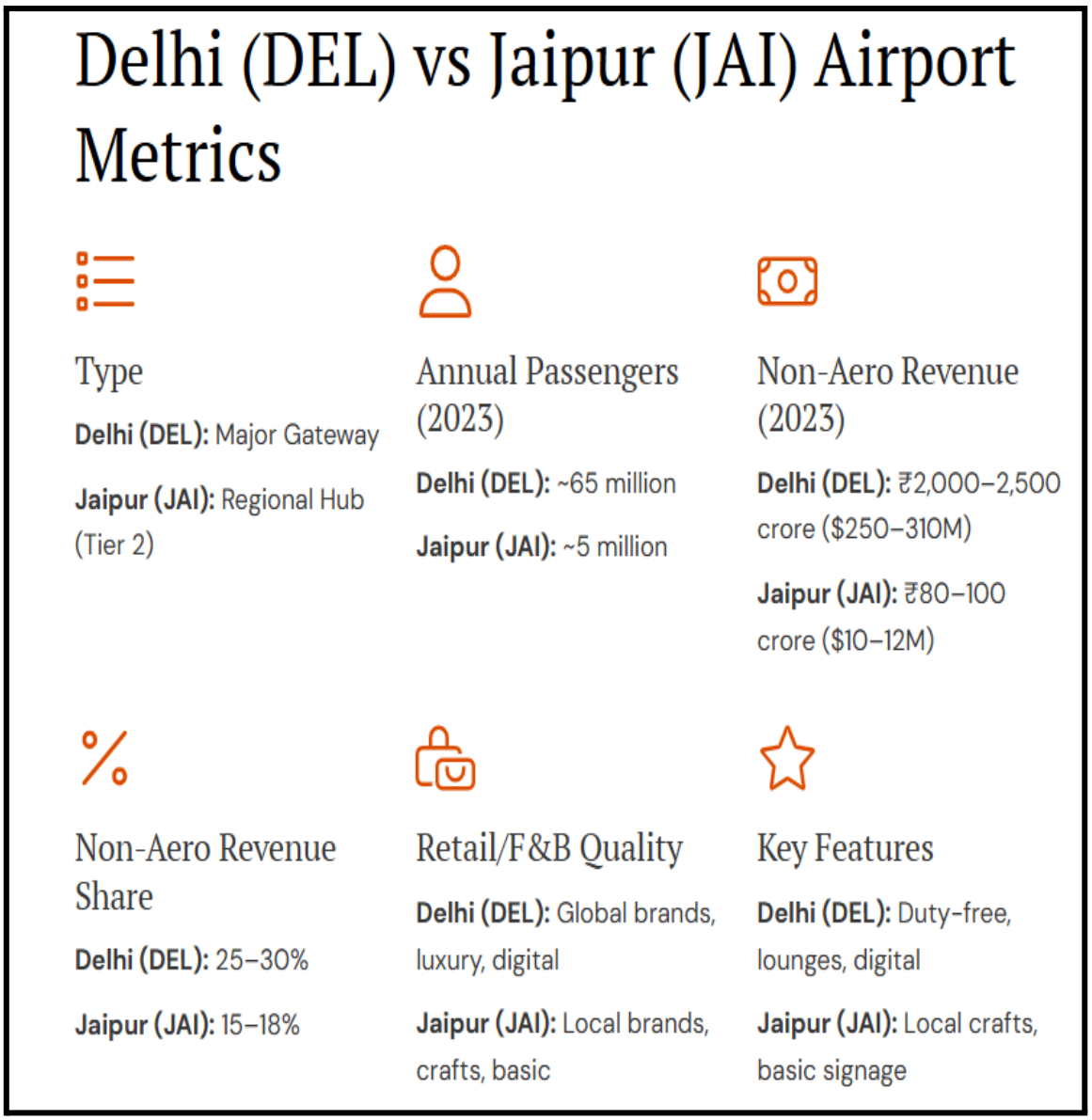
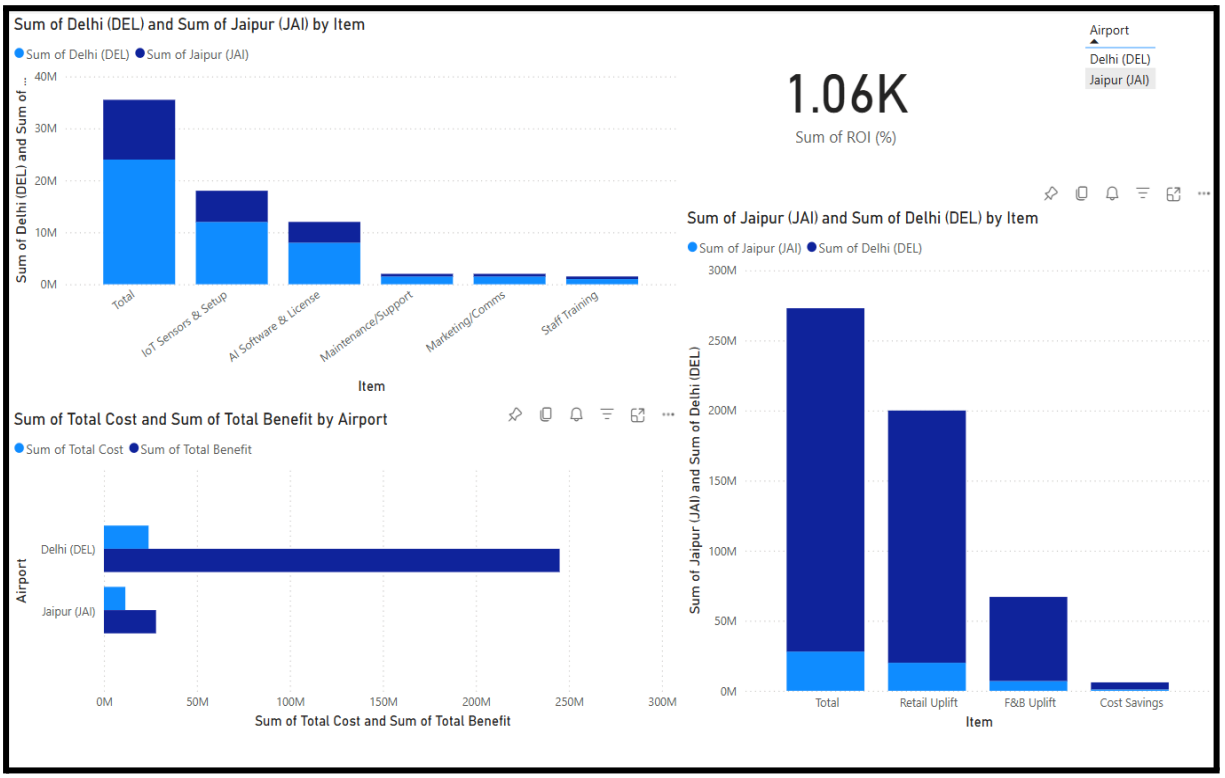


Figure - Delhi vs Jaipur Non-Aero Revenue

6.4 Dashboard Reference

- For visual ROI tracking, use:



[Sample Power BI Airport ROI Dashboard]

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7. Risk Assessment & Mitigation

Every transformation project faces hurdles. For AeroNext, we've anticipated the most likely risks and designed practical strategies to address them:

Risk	Mitigation Approach
Data Privacy & Compliance	All passenger data anonymized; systems comply with India's DPDP Act and GDPR.

Integration Delays	Phased rollout; keep legacy systems running in parallel; weekly progress reviews.
Low Passenger Adoption	Incentivize app downloads (discounts, fast-lane offers); clear wayfinding and signage.
Stakeholder Resistance	Early workshops, regular demos, transparent KPI dashboards for all partners.
Technical Downtime	Redundant cloud backups; 24/7 support; rapid incident response plan.

By proactively managing these risks, we ensure the pilot remains resilient, passenger-centric, and compliant with all regulations.

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8. Stakeholder Engagement Plan

Delivering impact at an airport is a team sport. Here's how we'll keep every stakeholder involved and empowered:

- Airport Management:
  - Bi-weekly steering meetings
  - Access to live BI dashboards
  - Monthly executive summaries
- Retail & F&B Partners:
  - Onboarding sessions for AI/IoT tools
  - Weekly performance updates
  - Feedback channels for rapid iteration
- IT & Operations Teams:
  - Joint tech sprints
  - Troubleshooting workshops
  - Shared documentation repository
- Passengers:
  - In-app surveys and NPS prompts
  - Visible signage about pilot features

- Real-time feedback via mobile app

This engagement approach ensures buy-in, rapid troubleshooting, and a culture of co-creation—setting the stage for long-term success.

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9. Reporting & Handover

Transparency and knowledge transfer are key.
At the end of the pilot, we will:

- Deliver a comprehensive Final Pilot Report:
  - Executive summary, data analysis, KPI achievement, lessons learned, and recommendations for scale-up.
- Conduct a handover workshop with airport digital/IT teams:
  - Walkthrough of dashboards, data collection methods, and maintenance guides.
  - Q&A and troubleshooting session.
- Provide all supporting materials:
  - Data templates, process documentation, and a digital copy of the ROI dashboard.

This ensures the airport team is fully equipped to sustain and expand the solution beyond the pilot phase.

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10. References & Appendices

References:

- ACI World Airport Traffic Report 2024: aci.aero
- CAPA India Airport Outlook 2024: capaindia.com
- SITA Air Transport IT Insights: sita.aero
- McKinsey Airport Retail Insights: mckinsey.com
- Ministry of Civil Aviation, India (UDAN): civilaviation.gov.in

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11. Conclusion

The AeroNext “Airports of Tomorrow” project, led by Team Pitch Perfect, demonstrates the transformative power of integrating AI, data science, and design thinking into non-aeronautical airport services. Our research confirms that while global leaders like Changi and Heathrow have set benchmarks in non-aero revenue and passenger experience, Indian airports—particularly regional hubs like Jaipur—have immense untapped potential.

Through a rigorous, phased approach, we analyzed the global landscape, benchmarked key competitors, mapped partnership opportunities, and identified operational pain points unique to the Indian context. Our pilot proposal, contrasting Delhi’s world-class commercial ecosystem with Jaipur’s emerging market, highlights the critical role of digital innovation and local adaptation in driving revenue and passenger satisfaction.

By focusing on measurable KPIs—such as retail uplift, dwell time reduction, and NPS improvement—and leveraging technologies like AI-driven personalization and IoT analytics, our PoC offers a scalable blueprint for airports nationwide. The projected ROI and operational insights underscore the commercial viability and strategic importance of this transformation.

In summary, Team Pitch Perfect’s work paves the way for Indian airports to not only close the gap with global leaders but also set new standards in passenger-centric, revenue-driven airport experiences. The future of Indian aviation lies in smart, data-driven, and human-centered commercial strategies—and we are proud to lead that journey.