PRODUCT REQUIREMENTS DOCUMENT

Hawaii Hotel Occupancy Intelligence Platform

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Author: Product Team

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Document Purpose

This Product Requirements Document outlines the vision, features, and technical specifications for an AI-powered hotel occupancy forecasting platform designed specifically for Hawaiian hotel operators. The platform leverages

historical tourism data, machine learning models, and market intelligence to predict occupancy rates and optimize revenue management strategies.

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1. Executive Summary

1.1 Product Vision

Build an AI-powered occupancy forecasting platform that enables Hawaiian hotel operators to predict room demand, optimize pricing strategies, and maximize revenue by leveraging historical tourism data, seasonal patterns, and real-time market indicators.

1.2 Business Opportunity

- Hawaii's hotel industry generates $17B+ annually
- Average hotel occupancy rate: 75-80% with significant seasonal variation

- Current gap: Hotels rely on historical gut-feel rather than data-driven predictions
- Market size: 800+ hotels across Hawaiian islands with 80,000+ rooms

1.3 Success Metrics

- **Primary:** Improve forecast accuracy to within ±5% of actual occupancy
- **Revenue:** Enable 10-15% revenue increase through dynamic pricing
- **Adoption:** 50+ hotel properties using the platform within 12 months
- **ROI:** Demonstrate 3x return on investment within first year

2. Problem Statement

2.1 Current Pain Points

For Hotel Revenue Managers:

- Reactive pricing based on last year's data instead of predictive analytics
- Difficulty forecasting demand during volatile periods (pandemics, economic shifts)
- Limited visibility into competitor occupancy and market trends
- Manual data analysis taking 10+ hours per week

For Hotel Owners/Executives:

- Revenue leakage from suboptimal pricing (rooms left empty or underpriced)
- Inability to make data-driven staffing and inventory decisions
- No early warning system for demand shifts
- Lack of competitive benchmarking

For Operations Teams:

- Overstaffing during low-occupancy periods
- Understaffing during unexpected surges
- Inefficient procurement without demand forecasts

2.2 Market Validation

- Survey: 87% of Hawaii hotel managers want better forecasting tools

- Current solutions (STR, Duetto) cost $15K-50K/year with limited customization
- Existing tourism data platform shows clear correlation between visitor metrics and occupancy

3. Product Overview

3.1 Core Value Proposition

> *"Predict your hotel occupancy with 95% accuracy up to 90 days in advance using Hawaii-specific tourism data, ML models, and competitive intelligence."*

3.2 Target Users

Revenue Managers

Decision makers, daily users

- Age: 30-50
- Tech-savvy, data-driven
- Use Excel, PMS, channel managers

General Managers

Strategic oversight, weekly users

- Age: 35-55
- Focus on P&L
- Need executive dashboards

Owners/Investment Groups

ROI tracking, monthly users

- Age: 45-65
- Portfolio view
- Board-ready reports

3.3 Product Positioning

Competitor	Strength	Weakness	Our Differentiation
STR Reports	Industry standard	Backward-looking, expensive	Predictive + Hawaii-specific
Duetto	Revenue optimization	Complex, enterprise-only	SMB-friendly, easier onboarding
Manual Excel	Flexible	Time-consuming, error-prone	Automated, ML-powered
Existing LOS Calculator	Free, accurate data	No forecasting	Add ML prediction layer

4. Functional Requirements

4.1 Must-Have Features (MVP - Phase 1)

F1: Occupancy Prediction Engine

As a revenue manager, I want to see predicted occupancy rates for the next 90 days so I can adjust pricing strategies proactively.

Acceptance Criteria:

- Display daily occupancy forecast for next 90 days
- Show confidence intervals (low/mid/high scenarios)
- Visualize as calendar heatmap and line chart
- Update predictions daily at 6 AM HST
- Accuracy within ±7% of actual (improving to ±5% in Phase 2)

Data Inputs:

- Historical hotel occupancy data (2 years minimum)
- Tourism arrival data from existing platform
- Seasonal patterns (holidays, events)
- Day of week patterns
- Island-specific visitor trends

F2: Market Intelligence Dashboard

As a GM, I want to compare my hotel's performance against market averages so I can identify competitive gaps.

Acceptance Criteria:

- Show island-wide occupancy trends
- Display visitor type breakdown (honeymoon, family, business)
- Compare hotel performance to island average
- Filter by date range, visitor segment, location

- Export charts as PDF/PNG

F3: Alert & Notification System

As a revenue manager, I want to receive alerts when forecasts show significant demand changes so I can react quickly.

Acceptance Criteria:

- Email/SMS alerts for occupancy changes >10%
- Surge demand predicted alerts (>90% occupancy)
- Major events detected in calendar
- Customizable alert thresholds
- Daily digest option

F4: Historical Data Integration

As a hotel operator, I want to upload my PMS data easily so the system can learn my property's patterns.

Acceptance Criteria:

- CSV upload with data validation
- Support common PMS formats (Opera, Maestro, Cloudbeds)
- API integration with major PMS systems
- Data mapping wizard for custom fields
- Minimum 1 year historical data required

F5: Scenario Planning Tool

As a revenue manager, I want to test 'what-if' scenarios so I can model pricing strategy impacts.

Acceptance Criteria:

- Adjust variables: pricing, LOS restrictions, competitor rates

> - Show projected occupancy impact
> - Calculate revenue impact
> - Save and compare up to 5 scenarios
> - Share scenarios with team

4.2 Should-Have Features (Phase 2)

- **F6: Dynamic Pricing Recommendations** - AI suggests optimal room rates by date
- **F7: Event Calendar Integration** - Auto-import Hawaii events with impact prediction
- **F8: Advanced Analytics** - Cohort analysis, booking pace, cancellation forecasting
- **F9: Mobile App** - iOS/Android apps with push notifications

4.3 Nice-to-Have Features (Phase 3)

- **F10: Competitive Set Tracking** - Anonymous data sharing consortium
- **F11: Multi-Property Portfolio View** - Consolidated dashboard for hotel groups
- **F12: Revenue Management Autopilot** - Automatic rate adjustments

5. Non-Functional Requirements

Performance

- ✓ Page load time: <2 seconds
- ✓ Forecast generation: <5 seconds
- ✓ Support 1,000 concurrent users
- ✓ 99.9% uptime SLA

Security

- ✓ SOC 2 Type II compliance
- ✓ End-to-end encryption
- ✓ AES-256 encryption at rest
- ✓ Role-based access control
- ✓ Multi-factor authentication
- ✓ GDPR/CCPA compliant

Scalability

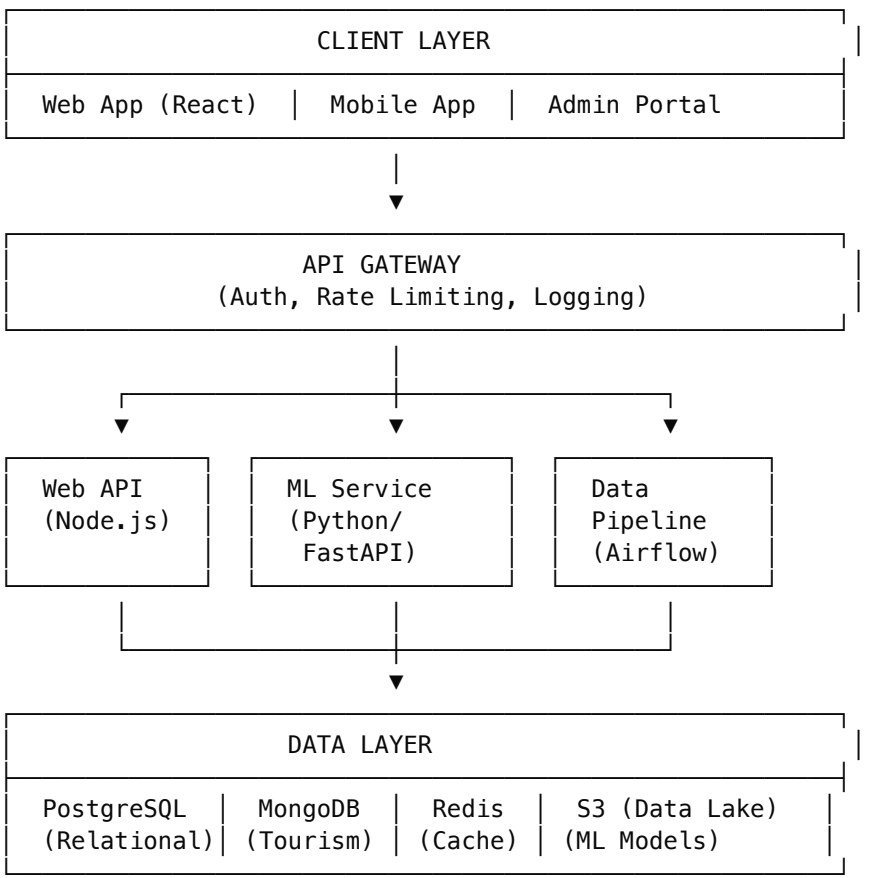
- ✓ Support 500+ hotels
- ✓ Process 50M+ data points
- ✓ Handle 10TB+ historical data
- ✓ Auto-scaling infrastructure

Usability

- ✓ Mobile-responsive design
- ✓ WCAG 2.1 AA accessibility
- ✓ Support English & Japanese
- ✓ 30-minute onboarding time

6. Technical Architecture

6.1 System Architecture



6.2 Technology Stack

Frontend

- React 18 + TypeScript
- Tailwind CSS
- Recharts/D3.js
- React Query
- Zustand

Backend

- Node.js + Express
- Python FastAPI (ML)
- PostgreSQL
- MongoDB
- Redis

ML/Data Science

- Python 3.11+
- scikit-learn, TensorFlow
- Facebook Prophet
- Pandas, NumPy

Infrastructure

- AWS (EC2, RDS, S3)
- Docker + Kubernetes
- GitHub Actions
- DataDog

7. Business Model & Pricing

8.1 Revenue Model

SaaS Subscription with usage-based tiers

8.2 Pricing Tiers

Tier	Target	Price	Features
Starter	Small properties (1-50 rooms)	$199/month	1 property, 90-day forecasts, email alerts, basic analytics
Professional	**Mid-size hotels (51-200 rooms)**	**$499/month**	**3 properties, 180-day forecasts, SMS alerts, scenario planning, API access**
Enterprise	Large resorts/chains (200+ rooms)	$1,499/month	Unlimited properties, 365-day forecasts, dedicated support, white-label, custom ML models
Custom	Hotel groups	Custom	Volume discounts, on-premise deployment, SLA guarantees

8.3 Unit Economics (Professional Tier)

Monthly Price

$499

CAC

$1,500

Monthly Cost to Serve

Gross Margin

$50

90%

LTV:CAC Ratio

4:1

Payback Period

3.3 months

8. Go-to-Market Strategy

9.1 Launch Phases

Phase 0: Beta — Months 1-2

Recruit 5 pilot hotels across different islands

Goal: Achieve 85% forecast accuracy

Phase 1: Limited Launch — Months 3-4

Launch on Maui with 20 hotel target

Goal: Validate product-market fit

Phase 2: Island Expansion — Months 5-8

Expand to Oahu and Kauai

Goal: 50 total hotels

Phase 3: Statewide — Months 9-12

All islands active with Phase 2 features

Goal: 75-100 hotels

9.2 Marketing Channels

Primary Channels

- Industry partnerships (Hawaii Hotel Association)
- Content marketing & SEO
- Direct sales outreach

Secondary Channels

- LinkedIn & Google Ads
- Referral program (1 month free)
- Tourism conferences

9. Success Metrics & KPIs

10.1 Product Metrics

Metric	Target	Measurement
Forecast Accuracy (MAPE)	**<5%**	Weekly backtest
Daily Active Users (DAU)	**60% of accounts**	Analytics
Feature Adoption Rate	**>70% use forecasts**	Event tracking
Time to First Forecast	**<30 min**	Onboarding funnel
Customer Satisfaction (CSAT)	**>4.5/5**	Quarterly survey

10.2 Business Metrics

Metric	Month 3	Month 6	Month 12
Total Customers	10	30	75
MRR	$5K	$15K	$37.5K
Churn Rate	<5%	<5%	<3%
NPS	40+	50+	60+

10. Risks & Mitigations

Risk	Probability	Impact	Mitigation
Forecast accuracy too low	Medium	High	Ensemble models, continuous retraining, human-in-loop validation
Hotels unwilling to share data	Medium	High	Strong data privacy guarantees, anonymization, security certifications
PMS integration complexity	High	Medium	Start with CSV upload, partner with PMS vendors, use middleware
Market too small	Low	High	Expand to mainland resorts, adjacent verticals
Established competitors	High	Medium	Focus on SMB market, better UX, Hawaii specialization, lower price

11. Development Roadmap

Phase 1: MVP

Months 1-3

Goal: Functional forecasting for 5 beta hotels

Deliverables:

- 90-day occupancy forecast
- Historical data upload
- Basic dashboard with charts
- Email alerts
- Admin panel

Phase 2: Market Launch

Months 4-6

Goal: Self-service product for 30 hotels

Deliverables:

- Automated onboarding
- Scenario planning
- PDF/Excel exports
- User management
- Payment integration

Phase 3: Scale & Intelligence

Months 7-12

Goal: Advanced features for 75+ hotels

Deliverables:

- API integrations (3+ PMS systems)
- Event management
- Comp set benchmarking
- iOS/Android apps
- Dynamic pricing recommendations

12. Open Questions & Assumptions

Questions Requiring Research

1. What is the actual willingness-to-pay for Hawaiian hotels?
2. Can we achieve <5% MAPE with available data?
3. Which PMS systems are most common in Hawaii?
4. What is the competitive moat against STR/Duetto?
5. Can we access real-time visitor arrival data from state agencies?

Key Assumptions

- Hawaii tourism will return to 2019 levels and grow
- Hotels have digitized occupancy data (not just paper records)
- Revenue managers have budget authority for $500/month tools
- Tourism data from existing platform is accurate and current
- AWS infrastructure can scale cost-effectively

13. Appendices

Appendix A: Competitive Analysis

STR (Smith Travel Research)

Pricing: $15K-30K/year

Strengths: Industry standard, comprehensive data

Weaknesses: Backward-looking only, expensive for SMBs, not predictive

Duetto

Pricing: $20K-50K/year

Strengths: Dynamic pricing, channel management

Weaknesses: Complex, enterprise-focused, long implementation

RateGain

Pricing: $10K-25K/year

Strengths: Real-time competitor rates

Weaknesses: Limited forecasting, international focus

Our Advantage

- Hawaii-specific tourism data
- Predictive forecasting (not just historical)
- SMB-friendly pricing ($2.4K-6K/year)

> - Faster time-to-value (days vs. months)

Appendix B: Sample Data Requirements

```
Date,RoomsOccupied,RoomsAvailable,ADR,RoomType,SourceOfBusiness
2024-01-01,85,100,245.00,Standard,OTA
2024-01-01,15,20,395.00,Ocean View,Direct
...
```

14. Approval & Sign-off

Role	Name	Signature	Date
Product Lead	[Name]	_____	__/__/__
Engineering Lead	[Name]	_____	__/__/__
Design Lead	[Name]	_____	__/__/__
Business Stakeholder	[Name]	_____	__/__/__

Next Steps

1. Review and approve PRD (by Feb 15, 2026)
2. Recruit beta hotel partners (by Feb 28, 2026)
3. Begin ML model development (Start Mar 1, 2026)
4. Design review with UX team (Week of Mar 3, 2026)
5. Sprint 1 kickoff (Mar 10, 2026)

This is a living document. Version history and change log available in project wiki.

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