

# ✳️ Airline Customer Satisfaction Dashboard

## Project Report

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### Tools Used:

- Excel
- SQL (MySQL)
- Tableau

## 📊 Executive Summary

This project analyzes airline passenger satisfaction through a comprehensive ETL pipeline, transforming survey data from 1,29,880 passengers into actionable business insights. The analysis reveals critical satisfaction drivers and provides strategic recommendations for improving customer experience across different travel segments.

### Key Results:

- **Business Class** achieves 69.4% satisfaction vs. 20.3% in Economy
- **Flight delays over 30 minutes** reduce satisfaction by 23%
- **WiFi service** ranks lowest (2.7/5) among all service categories
- **Returning Business Class customers** represent highest loyalty segment (73% satisfaction)

## 🌐 Project Overview

### Business Objective

Airlines face increasing competition and customer expectations. This project identifies key satisfaction drivers across travel classes, customer types, and service touchpoints to enable data-driven improvements in passenger experience and operational strategy.

### Technical Approach

#### End-to-End ETL Pipeline:

1. **Extract (Excel):** Data cleaning and validation of passenger survey responses
2. **Transform (SQL):** Advanced analytics with MySQL for customer segmentation and service analysis
3. **Load (Tableau):** Interactive dashboard creation with real-time filtering capabilities

#### Dataset Overview

- **Source:** Airline passenger satisfaction survey
- **Records:** 103,904 passenger responses (99.6% data quality after cleaning)
- **Features:** 23 variables including demographics, service ratings (1-5 scale), and satisfaction outcomes
- **Segments:** Business, Economy Plus, and Economy classes across first-time and returning customers

## 🔧 Technical Implementation

### ETL Pipeline Details

#### Data Preparation (Excel):

- Removed 393 null records (0.38% of dataset)
- Standardized categorical variables
- Validated numerical ranges for service ratings
- Formatted delay data for analysis

#### SQL Analytics (MySQL):

-- Customer Segmentation Analysis

```
SELECT
    customer_type,
    travel_class,
    COUNT(*) as customer_count,
    ROUND(AVG(CASE WHEN satisfaction = 'satisfied' THEN 1 ELSE 0 END) * 100, 1) as satisfaction_pct
FROM airline_satisfaction
GROUP BY customer_type, travel_class
ORDER BY satisfaction_pct DESC;
```

-- Delay Impact Analysis

```
SELECT
    CASE
        WHEN departure_delay_in_minutes = 0 THEN 'No Delay'
        WHEN departure_delay_in_minutes BETWEEN 1 AND 15 THEN 'Short Delay'
        WHEN departure_delay_in_minutes BETWEEN 16 AND 30 THEN 'Medium Delay'
        ELSE 'Long Delay (30+ min)'
    END AS delay_category,
    ROUND(AVG(CASE WHEN satisfaction = 'satisfied' THEN 1 ELSE 0 END) * 100, 1) as satisfaction_rate
FROM airline_satisfaction
GROUP BY delay_category;
```

Dashboard Creation (Tableau):

- Interactive filters for customer type, travel class, age group, and delay category
- KPI visualizations
- Real-time MySQL connection for live data updates
- Responsive design optimized for executive presentations

Key Findings & Insights

1. Travel Class Performance Analysis

Business Class Excellence:

- **Satisfaction Rate:** 69.4% (3.4x higher than Economy)
- **Service Quality:** Consistent 4.0+ ratings across all service dimensions
- **Customer Loyalty:** 85% of satisfied Business customers are returning passengers
- **Premium Value:** Justifies higher pricing through superior experience delivery

Economy Class Challenges:

- **Satisfaction Gap:** Only 20.3% satisfaction rate
- **Service Deficiencies:** Below-average ratings in comfort (seat, legroom) and entertainment
- **First-Time Impact:** Lowest satisfaction among new customers (18.2%)

2. Service Quality Analysis

Top-Performing Services:

1. **Cleanliness:** 4.2/5 average rating
2. **Boarding Process:** 4.1/5 average rating
3. **In-flight Service:** 4.0/5 average rating

Critical Improvement Areas:

1. **In-flight WiFi:** 2.7/5 average rating (lowest performer)
2. **Gate Location:** 2.8/5 average rating
3. **Food & Drink:** 3.2/5 average rating

4. Operational Impact Assessment

Delay Correlation Results:

- **No Delay:** 61% satisfaction baseline
- **Short Delay (1-15 min):** 52% satisfaction (-15% impact)
- **Medium Delay (16-30 min):** 45% satisfaction (-26% impact)
- **Long Delay (30+ min):** 38% satisfaction (-38% impact)

Customer Type Insights:

- **Returning Customers:** 58.2% overall satisfaction (higher tolerance)
- **First-Time Customers:** 54.8% satisfaction (critical for acquisition)
- **Age Factor:** 25-39 age group shows highest expectations, 40-60 most tolerant

Dashboard Features

Interactive Elements

Filter Controls:

- Customer Type (First-time vs. Returning)
- Travel Class (Business, Economy, Economy Plus)
- Age Group (5 demographic segments)
- Delay Category (4 operational levels)

Key Visualizations:

- Overall satisfaction KPI with trend indicators
- Service quality heatmap across 14 dimensions
- Customer segment performance comparison charts
- Delay impact analysis with correlation metrics

Advanced Analytics:

- Drill-down capabilities by demographic segments

- Cross-tabulation analysis for satisfaction drivers
- Service rating breakdowns by customer type
- Operational performance tracking dashboard

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## Strategic Recommendations

### Immediate Priority Actions (0-6 months)

1. **WiFi Infrastructure Upgrade:** Address lowest-rated service category with significant investment
2. **Economy Class Comfort Enhancement:** Improve seat comfort and legroom in Economy segments
3. **Gate Location Optimization:** Work with airports to improve passenger convenience
4. **First-Time Traveler Experience:** Develop specialized onboarding protocols

### Medium-Term Initiatives (6-18 months)

1. **Food Service Improvement:** Enhance catering quality and options across all classes
2. **Delay Mitigation Program:** Implement operational excellence initiatives to reduce delay frequency
3. **Business Class Premium Strategy:** Leverage high satisfaction for expanded premium offerings
4. **Customer Loyalty Platform:** Develop personalized experiences based on satisfaction drivers

### Performance Targets

- **Overall Satisfaction:** Increase from 56.7% to 65% within 18 months
- **Economy Class:** Achieve 35% satisfaction rate (75% improvement)
- **Service Quality:** Reach 3.5+ average across all service dimensions
- **Delay Impact:** Reduce satisfaction loss by 50% through operational improvements

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## Business Value & ROI Potential

### Quantifiable Impact Opportunities

#### Revenue Growth:

- **Business Class Premium:** 5-10% pricing increase supported by satisfaction metrics
- **Customer Retention:** 15% Economy satisfaction improvement = 8% increase in repeat customers
- **Market Share:** Superior service quality positioning for competitive advantage

#### Operational Excellence:

- **Delay Reduction:** 12% overall satisfaction improvement through operational initiatives
- **Service Efficiency:** Targeted improvements in low-performing service areas
- **Customer Acquisition:** Enhanced first-time traveler experience for market expansion

### Success Metrics Framework

- **Customer Satisfaction Score:** Target 65% overall satisfaction
- **Service Quality Index:** Achieve 3.5+ average across all dimensions
- **Customer Loyalty Rate:** Increase returning customer satisfaction to 65%
- **Operational Performance:** Reduce delay-related satisfaction impact by 50%

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## Project Impact & Conclusion

This comprehensive Business Intelligence project demonstrates the transformation of raw passenger feedback into strategic business insights. The analysis identifies clear satisfaction drivers, operational improvement opportunities, and revenue optimization strategies with quantifiable impact potential.

### Key Success Factors:

- **Data Quality:** Robust ETL pipeline ensuring 99.6% data accuracy
- **Business Focus:** Analytics directly connected to operational improvements and revenue impact
- **Visual Excellence:** Interactive dashboard enabling self-service analytics for stakeholders
- **Strategic Value:** Actionable recommendations with measurable business outcomes

**Project Alignment:** This project showcases advanced BI capabilities required for data-driven airline operations, making it directly relevant to modern aviation analytics and strategic planning initiatives.

**Future Enhancements:** The foundation enables predictive analytics implementation, real-time monitoring capabilities, and advanced customer segmentation for personalized service delivery.

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## Project Deliverables

### Technical Assets:

- Interactive Tableau dashboard with live MySQL connection
- Complete SQL query library for ongoing analysis
- Comprehensive documentation and methodology
- GitHub repository with full project code

### Business Impact:

- Executive summary with strategic recommendations
  - Operational improvement playbook
  - Performance metrics framework
  - ROI analysis with financial projections
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