

REAL-TIME POWER BI INTEGRATION FOR RETAIL STORE CHAIN MONITORING AND DECISION SUPPORT

1. Background and Problem Statement:

A national retail chain with over 100 stores faced challenges in tracking live sales, inventory, and operational metrics across regions. Store managers relied on daily end-of-day reports, while headquarters made decisions based on outdated weekly summaries. The company sought a **Power BI integration solution** to pull real-time data from its POS and retail management system into a unified dashboard, improving responsiveness to stockouts, pricing issues, and staff inefficiencies.

2. Objectives:

- To integrate Power BI with live POS and back-office retail systems across all stores
- To create real-time dashboards showing sales performance, inventory status, and staffing metrics
- To enable store managers and regional heads to take immediate actions based on visualized data
- To implement alerting mechanisms for operational exceptions (e.g., low stock, missed targets)

3. Methodology:

Data Sources and Integration:

- **POS System (via REST API):** Sales transactions, returns, product-level details
- **Store ERP (SQL Database):** Inventory, staffing rosters, regional hierarchies
- **Azure SQL Database:** Centralized data warehouse for historical records
- **Power BI Embedded and Power BI Service:** For on-premise access and real-time dashboards

Implementation Steps:

1. Real-Time API Integration:

- Established scheduled API pulls every 15 minutes from store-level POS endpoints

- Used Power Automate for batch updates and data cleanup

2. Data Modeling and Security:

- Developed unified data models for SKU, store, category, and staff
- Configured Row-Level Security (RLS) to restrict store managers to their respective outlets

3. Dashboard Design:

- **Sales Performance View:**
 - Live revenue per store/hour
 - Units sold per category
 - Discounted vs. full-price sales ratio
- **Inventory Monitor:**
 - Stock on hand vs. reorder threshold
 - Shrinkage % trends by location
- **Staffing Efficiency Page:**
 - Sales per employee per shift
 - Attendance and productivity metrics

4. Results:

- Store managers gained access to **15-minute refresh dashboards** for sales and stock
- Shrinkage alerts led to a **22% reduction in preventable loss** within 2 months
- Head office improved promotional effectiveness tracking using product-level sales impact
- Real-time dashboards helped identify **slow-moving SKUs 3x faster**, enabling proactive stock redistribution
- Staff scheduling improved using productivity heatmaps by shift and region

5. Interpretation and Insights:

- Time-of-day sales trends revealed specific underperforming shifts, guiding schedule optimization

- Category-wise stock mismatches were frequent in high-performing stores due to lack of automated stock alerts
- Dashboard usage increased collaboration between regional managers and store leads, reducing email-based reporting
- Live performance metrics motivated store staff and reduced sales goal misses by 17%

6. Recommendations:

- Extend dashboard access to visual merchandising and supply chain teams for better alignment
- Add predictive restocking based on moving average demand trends per SKU
- Create mobile dashboard versions for store managers to use on handheld devices
- Introduce gamification using dashboards for staff to boost daily sales performance

7. Future Work:

- Integrate CCTV-based footfall analytics with sales data for conversion optimization
- Build dynamic pricing dashboard based on competitor scraping and live demand
- Automate supplier reorder triggers directly from the inventory dashboard

8. Stakeholder Relevance:

Academic:

- Illustrates real-time analytics integration and decision automation in retail environments
- Useful in operations analytics, real-time BI, and retail management curriculum

Corporate:

- Demonstrates Power BI as a live control center for chain store operations
- Applicable to retailers seeking faster response to sales trends and stock variances