Pizza Restaurant Sales Analysis

Technical Report

1. Introduction & Problem Statement

Problem Statement:

Pizza sales data contains valuable insights into customer preferences, revenue generation, and sales trends. The goal of this analysis is to create a Power BI dashboard that provides an interactive visualization tool to support data-driven decision-making.

Key Business Questions Answered:

- What are the total orders and revenue over the given period?
- What are the most popular and least ordered pizzas?
- How does order distribution vary by time, day type (weekday/weekend), and pizza size?
- Which pizza categories generate the most revenue?
- What are the peak ordering hours?

This report documents the data collection process, data model design, Power BI implementation, and key insights extracted from the dashboard.

2. Data Sources & Collection Methodology

Data Sources:

The dataset consists of four tables derived from CSV files:

- orders.csv - Contains order dates and time details.
- order_details.csv - Stores the pizza quantities for each order.
- pizzas.csv - Defines pizza pricing and sizes.
- pizza_types.csv - Includes pizza names, ingredients, and categories.

Data Cleaning & Transformation Steps:

- Loading Data: Imported CSV files into Power BI.
- Ensuring Correct Data Types:
  - `order_id`, `order_details_id`, `pizza_id` → Whole Numbers
  - `date` → Date Format
  - `time` → Time Format
  - `price` → Decimal Format
- Handling Missing Values:
  - Used Remove Nulls to clean missing values.
  - Default values applied where needed.
- Feature Engineering:

- Extracted hour from order time: `Hour = HOUR(orders[time])`
- Extracted first ingredient from pizza types: `First Ingredient = LEFT(pizza_types[ingredients], FIND(",", pizza_types[ingredients]) - 1)`

3. Data Model Design & Implementation

Entity-Relationship (ER) Model:

The data model follows a star schema, optimizing performance in Power BI:

- orders (Fact Table) → Linked to `order_details` (One-to-Many)
- order_details (Fact Table) → Linked to `pizzas` (One-to-Many)
- pizzas (Dimension Table) → Linked to `pizza_types` (One-to-Many)

Relationships & Cardinality:

Table 1	Table 2	Relationship	Cardinality
`orders`	`order_details`	`order_id`	One-to-Many
`order_details`	`pizzas`	`pizza_id`	One-to-Many
`pizzas`	`pizza_types`	`pizza_type_id`	One-to-Many

Filter Direction:

One-way filtering from dimension tables (`pizzas`, `pizza_types`) to fact tables (`order_details`, `orders`).

4. Visualization Approach & Tool Justification

Chosen Tool: Power BI

Justification:

- Efficient Data Modeling with DAX calculations.
- Interactive Dashboards with slicers and drill-through analysis.
- Dynamic filtering and cross-visual interactions.
- Advanced visualization options beyond basic charts.

Dashboard Overview:

The analysis is divided into three interactive dashboards:

1. Summary Dashboard: High-level KPIs on revenue, total orders, and order distribution.
2. Pizza Details Dashboard: Focused view on individual pizza performance.
3. Business Insights Dashboard: Extracting actionable insights from the data.

5. Documentation of Advanced Calculations (DAX Measures)

Key DAX Measures:

```
Total Orders = COUNT(orders[order_id])
Total Pizzas Sold = SUM(order_details[quantity])
Total Revenue = SUMX(order_details, order_details[quantity] *
pizzas[price])
Average Order Value = [Total Revenue] / [Total Orders]
Most Popular Pizza = TOPN(1, VALUES(order_details[pizza_id]), [Total
Pizzas Sold])
Least Popular Pizza = TOPN(1, VALUES(order_details[pizza_id]), [Total
Pizzas Sold], ASC)
Revenue by Category = SUMX(order_details, order_details[quantity] *
pizzas[price])
Cumulative Revenue = CALCULATE([Total Revenue],
FILTER(ALL(orders[date]), orders[date] <= MAX(orders[date])))
```

6. Analysis of Findings & Insights

Key Findings:

1. Peak Ordering Hours:
    - Orders peak between 12 PM - 2 PM (Lunch) and 6 PM - 8 PM (Dinner).
    - Action: Increase staff & inventory during peak hours.
2. Order Distribution by Pizza Size:
    - Large pizzas have the highest number of orders, followed by Medium and Small.
    - Action: Offer discounts on XL/XXL sizes to boost sales.
3. Weekend Sales Performance:
    - Weekday orders (15.5K) > Weekend orders (5.7K).
    - Action: Introduce weekend discounts, limited-time flavors, & loyalty rewards.
4. Revenue Share by Pizza Category:
    - Classic pizzas generate the highest revenue, followed by Supreme and Chicken.
    - Veggie pizzas contribute the least revenue.
    - Action: Promote high-revenue categories and introduce special deals for Veggie pizzas.

7. Challenges Encountered & Solutions Implemented

Challenges & Solutions:

Challenge	Solution Implemented
Handling Missing Values	Used Power BI's Replace Nulls or removed incomplete rows.
Large Dataset Performance	Optimized DAX calculations and used aggregation to improve load times.
Categorizing Time-Based Data	Created new calculated columns for Hour and Day Type.

8. Future Enhancements & Recommendations

Planned Improvements:

- Make dashboards mobile-responsive for better accessibility.
- Incorporate real-time data updates to track sales trends dynamically.
- Add predictive analysis models to forecast pizza sales demand.
- Implement customer segmentation to analyze purchase patterns by demographics.

9. Conclusion

This Pizza Restaurant Sales Analysis successfully demonstrates how Power BI can be used to transform raw sales data into interactive dashboards with meaningful insights. Through DAX-driven KPIs, visual storytelling, and dynamic filtering, stakeholders can:

- Optimize staffing and inventory management.
- Improve marketing strategies based on pizza category sales.
- Enhance customer engagement with targeted promotions.

Future enhancements will focus on advanced analytics, AI-driven forecasting, and multi-location sales comparisons to further improve decision-making.