Pizza Sales Analysis & Revenue Forecasting

Final Report

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Contents

1 Executive Summary **2**

2 Business Questions **3**

3 Dataset Overview **3**

4 Key Findings **4**

4.1 What are the peak hours for orders? 4

4.2 Which day of the week has the highest sales? 4

4.3 What is the best-selling pizza? 5

4.4 What is the most popular pizza size? 5

4.5 What is the average order value? 6

5 Revenue Forecast **7**

5.1 Daily Revenue Trend 7

5.2 7-Day Forecast Model 7

5.3 Forecast Accuracy 7

6 Lessons Learned **8**

6.1 Why the Forecast Missed 8

6.2 How to Improve 8

7 Summary of Recommendations **9**

8 Conclusion **9**

1 Executive Summary

This report analyzes one year of pizza restaurant sales data (2015) to understand customer behavior and forecast future revenue.

Key Findings:

- **Annual Revenue:** $817,860 from 21,350 orders
- **Peak Hours:** 12pm (lunch) and 5-7pm (dinner)
- **Best Day:** Friday generates the highest revenue
- **Top Seller:** The Classic Deluxe Pizza
- **Most Popular Size:** Large (46% of all sales)
- **Average Order Value:** $38.31

Forecast Performance:

The 7-day revenue forecast model performed well during typical weeks but struggled during the Christmas holiday period. This highlights the importance of incorporating seasonality and holiday effects into forecasting models.

Recommendations:

1. Staff fully during peak hours (12pm and 5-7pm)
2. Run promotions on slow days (Sunday)
3. Ensure Classic Deluxe ingredients are always stocked
4. Incorporate holiday calendar into future forecasting models

2 Business Questions

This analysis answers six key questions:

1. What will total sales revenue be for the next 7 days?
2. What are the peak hours for orders?
3. Which day of the week has the highest sales?
4. What is the best-selling pizza?
5. What is the most popular pizza size?
6. What is the average order value?

3 Dataset Overview

Source: Kaggle Pizza Restaurant Sales Dataset

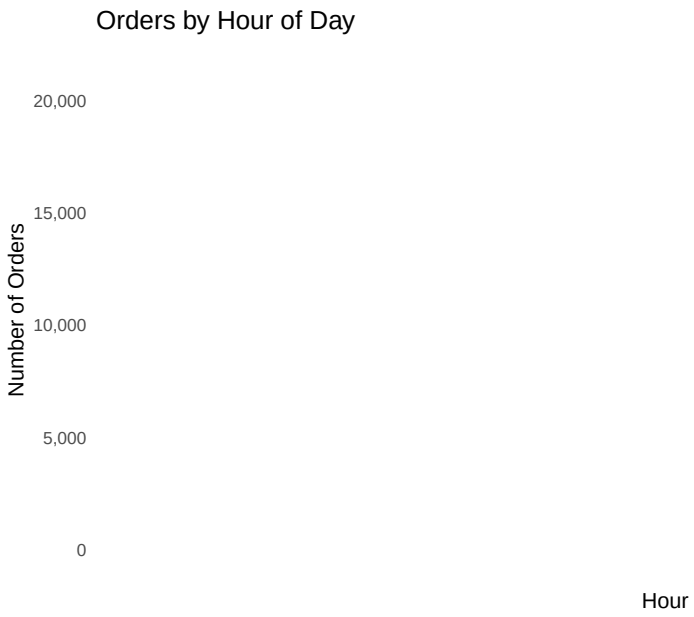
Period: January 1, 2015 - December 31, 2015

Size: 48,620 order line items

Metric	Value
Total Orders	21,350
Total Pizzas Sold	49,574
Total Revenue	$817,860
Unique Pizza Types	32

4 Key Findings

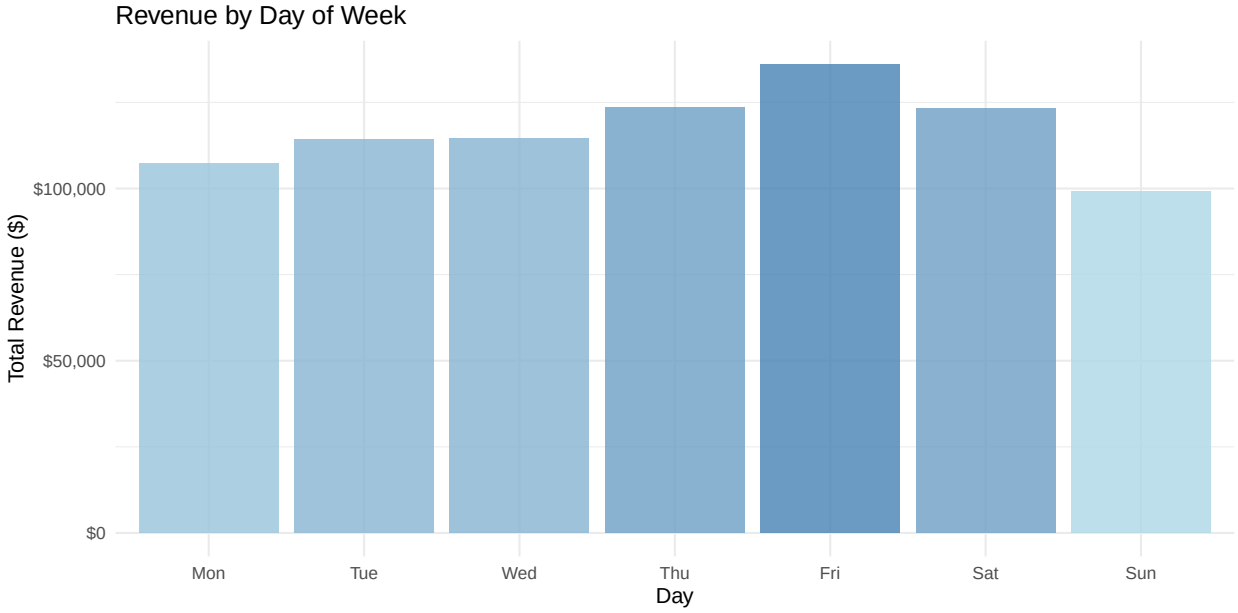
4.1 What are the peak hours for orders?



Answer: Peak hours are **12pm (lunch)** and **5-7pm (dinner)**.

Recommendation: Ensure full staffing during these windows.

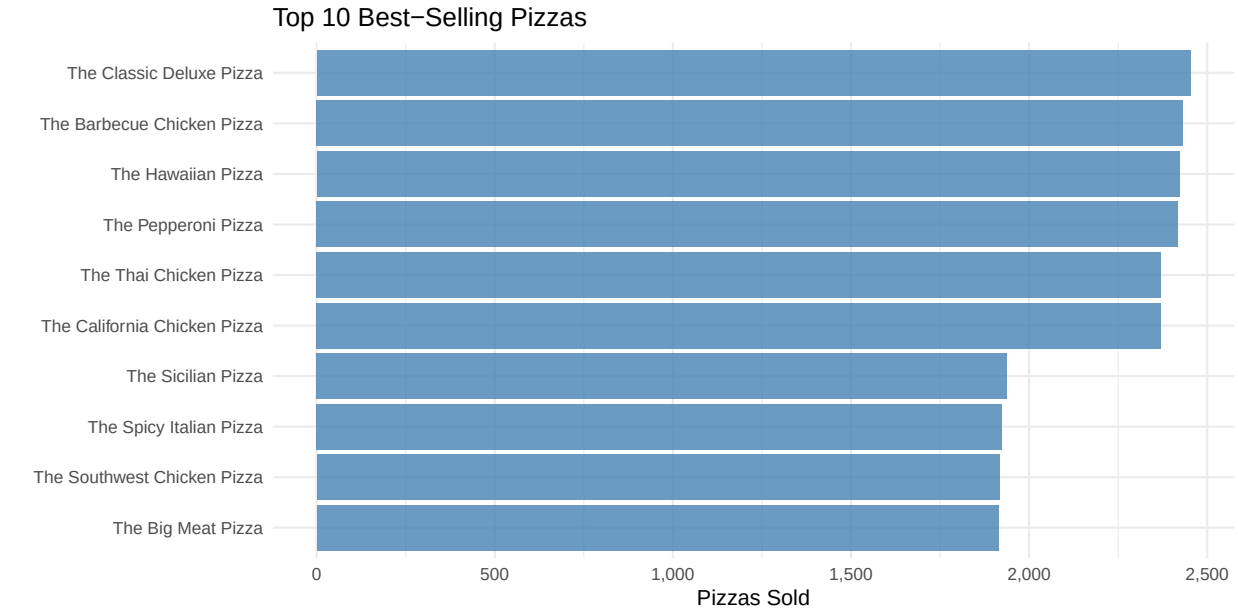
4.2 Which day of the week has the highest sales?



Answer: Friday has the highest sales. Sunday has the lowest.

Recommendation: Run promotions on slow days (Sunday) to increase traffic.

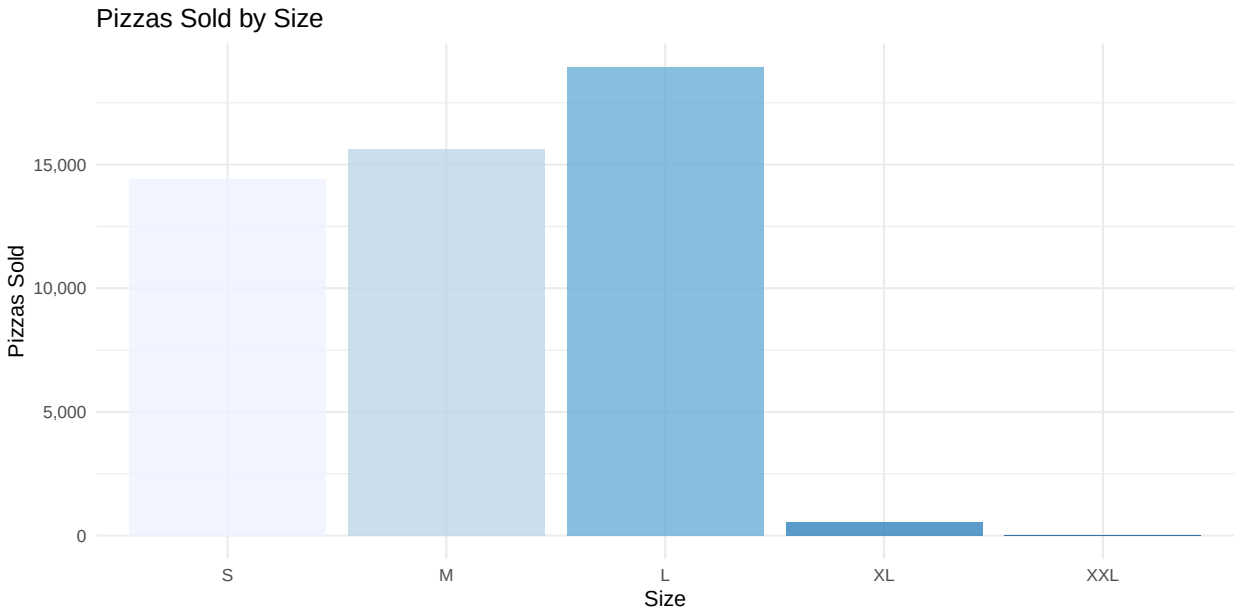
4.3 What is the best-selling pizza?



Answer: The Classic Deluxe Pizza is the best-seller.

Recommendation: Ensure ingredients for this pizza are always in stock.

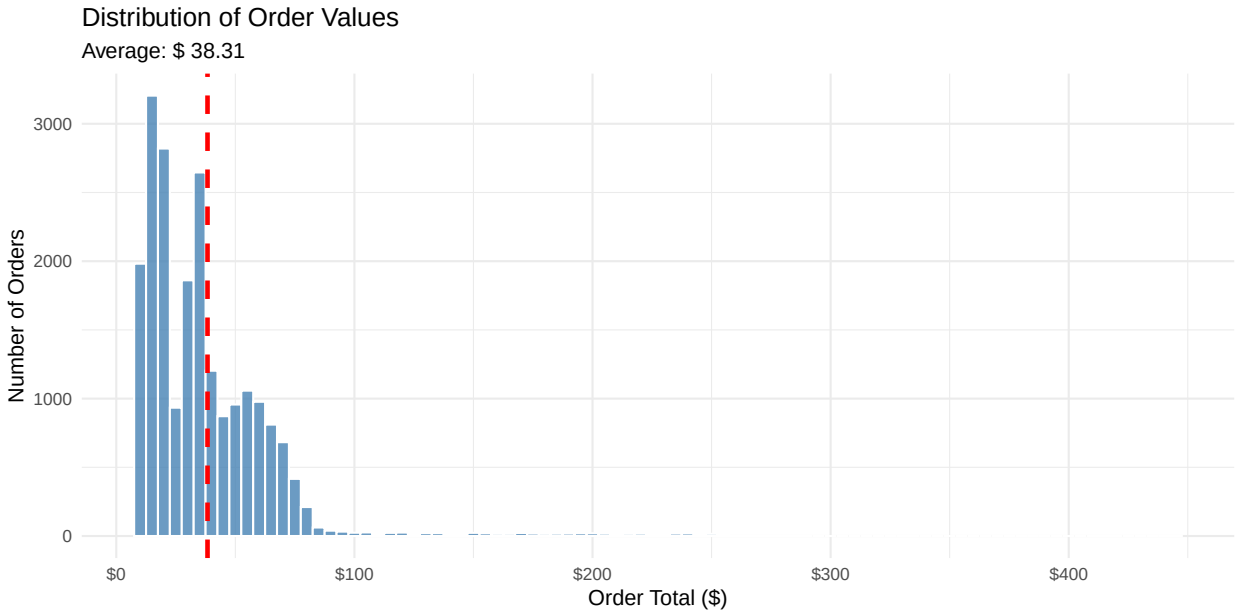
4.4 What is the most popular pizza size?



Answer: Large (L) is the most popular size, accounting for **46%** of all sales.

Recommendation: Optimize pricing and inventory around Large pizzas.

4.5 What is the average order value?

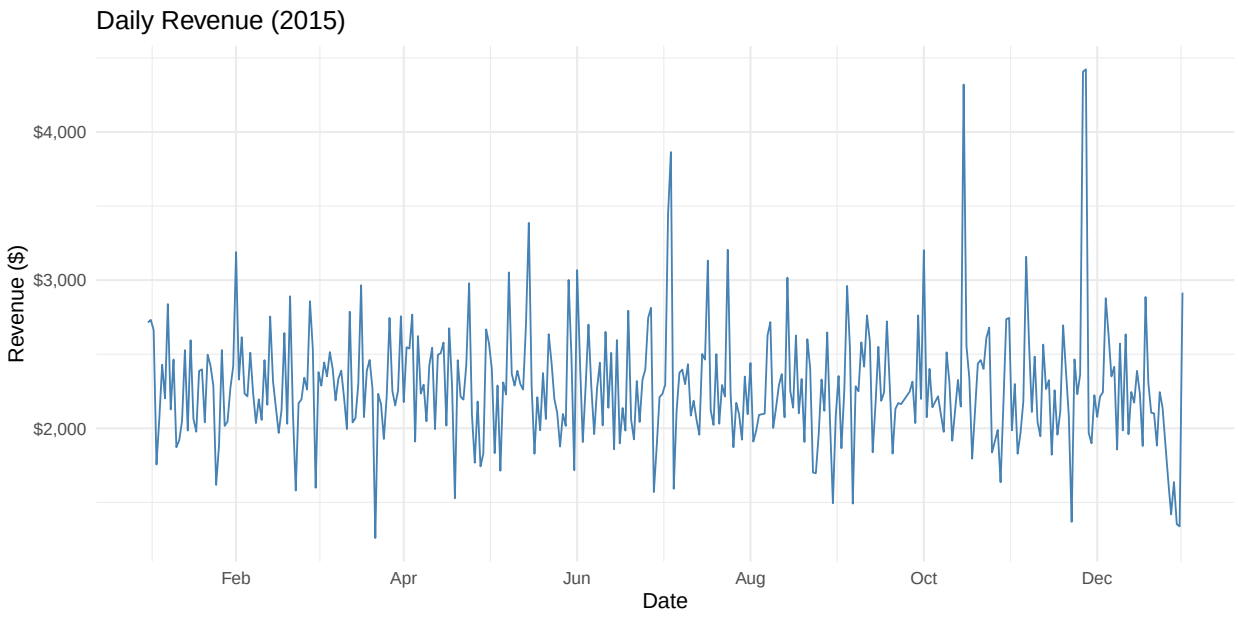


Answer: The average order value is **$38.31**.

Recommendation: Set delivery minimum at $35-40 to optimize operations.

5 Revenue Forecast

5.1 Daily Revenue Trend



5.2 7-Day Forecast Model

We used an ARIMA model trained on 358 days of data to predict the final 7 days of the year.

Date	Forecast ($)	Actual ($)	Error ($)
2015-12-24	2112	2138	26
2015-12-26	2519	1643	-876
2015-12-27	2224	1419	-805
2015-12-28	2235	1637	-597
2015-12-29	2218	1353	-865
2015-12-30	2208	1338	-870
2015-12-31	2268	2916	648

5.3 Forecast Accuracy

Metric	Value
MAE (Mean Absolute Error)	$670
MAPE (Mean Absolute % Error)	42.7%

6 Lessons Learned

6.1 Why the Forecast Missed

The model significantly underperformed during the test period. Upon investigation, the reason is clear: **the test period was Christmas week (December 25-31)**.

What happened:

1. **Christmas Day closure** — Revenue dropped to zero when the restaurant was closed
2. **Post-holiday behavior** — Customers ate homemade food with family instead of ordering pizza
3. **Atypical demand** — The week between Christmas and New Year is not representative of normal business

Why the model couldn't predict this:

- The model learned patterns from "typical" weeks throughout the year
- It had no information about holidays or special events
- Christmas only occurs once in the training data, so the model couldn't learn this pattern

6.2 How to Improve

For a production forecasting system, I would:

1. **Add a holiday calendar** — Flag holidays as a feature in the model
2. **Exclude anomalies** — Train on typical weeks, handle holidays separately
3. **Use a model designed for seasonality** — Facebook Prophet handles holidays explicitly
4. **Incorporate external data** — Weather, local events, promotions

This experience demonstrates that **understanding your data's context is as important as the technical modeling.**

7 Summary of Recommendations

Finding	Recommended Action
Peak hours: 12pm, 5-7pm	Full staffing during peaks
Friday is best day	Maximize Friday capacity
Sunday is slowest day	Run Sunday promotions
Classic Deluxe is #1	Stock Classic Deluxe ingredients
Large is most popular	Optimize Large pizza pricing
AOV is $38.31	Set $35-40 delivery minimum
Forecast missed holidays	Add holiday features to model

8 Conclusion

This analysis provided actionable insights into pizza restaurant operations:

- Clear identification of peak hours and days for staffing optimization
- Product performance data for inventory management
- Average order value for pricing and promotion strategy
- A forecasting model with documented limitations and improvement path

The forecast's failure during Christmas week turned into a valuable learning opportunity, demonstrating the importance of domain knowledge and contextual understanding in data analysis.

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