Optimizing Decision-Making in E-Commerce using Machine Learning and Data Analytics through a Web-Enabled Predictive System

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Acknowledgment

This Power BI dashboard was developed independently using a dataset specific to the restaurant rating prediction system. While the data and analytical content are entirely original, the overall dashboard layout, visual styling, and use of icons were inspired by tutorials from the YouTube channel *The Developer*.

These video tutorials were used solely for learning purposes to understand how to effectively present data using Power BI features such as slicers, cards, DAX measures, and interactive elements. No content or data was directly copied; the implementation was done from scratch while applying the techniques learned.

Tutorials Referenced for Learning Purposes:

1. Power BI Project Tutorial from beginners to Advanced | Step-by-step guide
2. Power BI Project Tutorial from beginners to Advanced Part-2 | Step-by-step guide
3. Master Power BI Dashboard Icons: Elevate Your Visualizations

I would also like to express my appreciation for the freely available educational resources that support self-learning. The knowledge gained from these tutorials was instrumental in enhancing the presentation quality of this project while ensuring that the analysis, design decisions, and data remain entirely original and tailored to the problem statement.

— **Madiha Rahman**

Contents

1   Objective

This dashboard aims to analyze how customers interact with restaurants across various formats: dine-in, delivery, dessert parlors, cafes, and bars. It evaluates customer preferences for table booking and online ordering, examines the relationship between rating and cost, and highlights cuisine-based performance across locations. The ultimate goal is to help businesses make informed decisions regarding marketing, pricing, and service models.

2   Data Source

The dataset was sourced from Kaggle, which contains restaurant data originally scraped from Zomato. The dataset includes:

- Over **4 million total votes**
- **51.72K** individual customer ratings
- Thousands of restaurants categorized by type and cuisine

Attributes include:

- Restaurant type
- Cuisine
- Table booking availability
- Online ordering preference
- Average cost for two
- Rating
- Total number of votes
- Location
- Type of meal

3 Dashboard Overview

The Power BI dashboard is structured into multiple interactive sections:

3.1 Filters & Slicers:

- Type of meal
- Online Order (Yes/No)
- Table Booking (Yes/No)
- Cuisine Type
- Location (City/Area)
- Ratings

3.2 Interactivity and Dynamic Filtering:

All visualizations in the dashboard are fully interactive and dynamically respond to user input. By using slicers such as meal type, online ordering, table booking, cuisine, location, and rating filters, the charts update in real time to reflect the selected subset of data. This allows for granular and customized insights depending on specific business queries or user preferences.

The dashboard also includes interactive navigation buttons that allow users to move between different analytical pages. The first page contains button that direct the user to the main page. Each page is connected through these buttons, enabling the user to jump directly to the area of interest without manually navigating tabs.

3.3 Key Metrics:

- **Average Cost for Two:** Rs. 441.30
- **Average Rating:** 3.70
- **Total Votes:** 4M
- **Total Ratings:** 51.72K

3.4 Visualizations:

- Rating vs. Cost Analysis
- Number of votes per Rating
- User Preferences (Booking, Ordering)
- Cuisine-wise Cost and Rating Comparisons
- Location Filter for City-Level Insight
- Number of Restaurant type per Cuisine and Category
- Average Votes per Cuisine Type
- Total Ratings by Restaurant Type

4 Key Insights

4.1 Cost vs. Rating Trends:

- Highest cost (Rs. 828.85) is seen for restaurants rated less than **2.5**, suggesting a mismatch between pricing and customer satisfaction.
- Restaurants with around **4.5 rating** maintain a **moderate cost**, showing value and satisfaction can coexist.

4.2 Table Booking Preferences:

- Restaurants with **table booking** have a significantly **higher average cost** (Rs. 605.89) than non-booking ones (Rs. 417.86).
- Indicates booking-enabled restaurants cater to premium or fine-dining experiences.

4.3 Online Ordering Behavior:

- Clear preference for restaurants that offer **online ordering**, reflected in higher vote counts.
- Supports the trend of **digital convenience and remote dining**.

4.4 Restaurant Type Analysis:

- **Quick Bites** and **Casual Dining** lead in engagement and volume.
- **Dessert Parlors**, **Cafes**, and **Delivery** also show high interaction.

4.5 Cuisine-Based Insights:

- **Western Cuisine (3.93)** and **Seafood (3.89)** have high ratings and costs (~Rs. 580 - Rs. 585).
- **Fast Food** and **South Indian Cuisine** are budget-friendly (Rs. 328 - Rs. 347) yet well-rated (3.6-3.7).
- **Healthy & Vegan** (3.72, Rs. 512.18) shows growing popularity.
- **Fusion Contemporary Indian Cuisine** is cheapest (Rs. 227.65) but has average feedback (~3.63).

4.6 Votes Distribution Analysis:

The **Number of Votes per Rating** visualization shows that mid-to-high ratings (3.5–4.5) attract significantly more customer votes, while low-rated restaurants (<3.0) receive minimal engagement. This indicates that positive customer experiences drive more interaction and feedback.

5   Location-Based Insights

The dashboard includes a **location filter**, enabling location-wise data analysis.

Business value: Location-based filters support hyper local marketing and pricing strategies.

6   Trends and Patterns

- **High prices do not necessarily correlate with high ratings** - expensive restaurants can have low feedback.
- Table booking **suggests premium pricing**, but doesn't always improve satisfaction.
- **Fusion and healthy cuisines** are rising, but still evolving in customer perception.
- **Traditional cuisines** (Fast Food, North/South Indian) dominate in both volume and loyalty.

7   Business Implications

Restaurants should:

- Leverage online ordering and boost digital convenience.
- Promote high-rated, affordable cuisines to attract value-conscious segments.
- Investigate and improve under performing high-cost outlets.
- Push Western, Seafood, and Vegan offerings in premium areas.

8   Future Scope

- Integrating textual reviews could enable sentiment analysis and emotional tone detection.
- Adding time-based data would allow trend analysis over months or seasons.

9   Conclusion

This Power BI dashboard provides a **data-driven view** into restaurant customer behavior - what they eat, how they order, and what they value. By combining machine learning prediction with visual analysis, businesses gain actionable insights for pricing, promotion, and service improvement. The dashboard bridges decision-makers with real user data in a clear and interactive way.

10 Appendix

Below are the key visual elements from the Power BI dashboard that support the analytical insights discussed in this report.

FROM BOOKING TO RATING

zomato

🍽 Choose how you dine — comfort or experience, your call.

Book Table

No	Yes

Overview

Average Rating	Total Rating	Average Cost(2)	Total Votes
3.70	51.72K	441.30	4M

Rating

All ▾

Online Order Preference

Yes	
No	

0K 5K 10K 15K 20K 25K 30K 35K

Table Booking Availability

No	
Yes	

0K 10K 20K 30K 40K 50K

Number of Votes per Rating

10K

5K

0K
1.5   2.0   2.5   3.0   3.5   4.0   4.5   5.0

A WORLD OF FLAVOURS

Book Table

No	Yes

Online Order

No	Yes

Overview

Average Rating	Total Rating	Average Cost(2)	Total Votes
3.70	51.72K	441.30	4M

Cuisines

All ▾

grouped_cuisines	Average of rate	Average of cost2plates
Western Cuisine	3.93	580.89
West Indian Cuisine	3.81	523.72
South Indian Cuisine	3.63	328.49
Seafood	3.89	585.93
Other	3.65	471.78
North Indian Cuisine	3.65	482.40
Mughlai & Hyderabadi Cuisine	3.58	335.84
Healthy & Vegan	3.72	512.18
Fusion/Contemporary Indian Cuisine	3.63	227.65
Fusion & Miscellaneous	3.69	443.76
Fast Food & Street Food	3.64	347.97
East Indian Cuisine	3.69	456.83
Desserts & Beverages	3.77	352.87
Asian Cuisine	3.82	510.18

Average User Votes per Cuisine Type

100%

East Indian Cuisine	
West Indian Cuis...	
Western Cuisine	93.28
Asian Cuisine	
Seafood	79.03
North Indian Cui...	
Fusion/Contemp...	63.90
Healthy & Vegan	
Fusion & Miscell...	59.66
Desserts & Bever...	
Mughlai & Hyde...	53.90
Fast Food & Stre...	
South Indian Cui...	49.93
Other	3.80

3.1%

Number of Restaurant Types per Cuisine

grouped_...
- North I...
- Dessert...
- Wester...
- South I...
- Fast Fo...

1.9... (...) 21.4... (41...)
3... (7...)
5.01K (9.69%) 5.22K (10.09%)

Number of Restaurant Types for Each Category

category
- Delivery
- Dine-out
- Desserts
- Cafes
- Drinks ...

3.59K (6.9...)
17.78K (34.3...) 25... (50...)