Quisine Analytics

Refined Data Model Plan for Enhanced Operational Strategy & Ingredient Popularity Report

1. Executive Summary

Quisine Analytics has taken a significant step toward smarter, localized decision-making by refining its data models to generate a tailored Ingredient Popularity Report. Recognizing that customer preferences vary widely by region, the business transitioned from a generic forecasting model to one rooted in ingredient-level insights, sales behavior, and customer sentiment. This innovative approach enables each location to make data-informed decisions about what to stock, serve, and promote—reducing food waste, optimizing inventory, and elevating customer satisfaction.

Through the integration of structured sales data, review sentiment, and waste tracking, the model empowers Quisine Analytics to align its operations with real, regional demand, translating analytics into action across every restaurant.

2. Problem Overview

Generic forecasts were limiting Quisine Analytics' ability to:
- Reflect unique regional preferences
- Optimize inventory based on real ingredient usage
- Integrate customer sentiment or waste data

The result was underperformance of regionally popular dishes, potential overstocking, and less targeted menu design.

3. Refined Data Model Design

Table Name	Role & Purpose
Sales_Transactions	Tracks quantity, price, location, and channel
Ingredient_Map	Maps dishes to ingredients and prep methods
Customer_Reviews	Captures text feedback and sentiment per dish
Locations	Stores city, region, and foot traffic data
Dishes	Metadata about dish type, category, prep time
Ingredients	Cost and supplier information
Waste_Logs	Records ingredient-level waste and reasons

4. Entity Relationships and Cardinality

Relationship	Cardinality	Key Fields	Description
Sales_Transactions → Dishes	Many-to-One	Dish_ID	Each sales record references one dish; each dish appears in many transactions.
Sales_Transactions → Locations	Many-to-One	Location_ID	Each sale is linked to one location; locations have many sales.
Customer_Reviews → Dishes	Many-to-One	Dish_ID	Each review refers to one dish; dishes can have many reviews.
Customer_Reviews → Locations	Many-to-One	Location_ID	Each review is from one location; locations gather many reviews.
Ingredient_Map → Dishes	Many-to-One	Dish_ID	Each ingredient is mapped to one dish; dishes have multiple ingredients.
Ingredient_Map → Ingredients	Many-to-One	Ingredient_ID	Each mapping includes one ingredient; ingredients are used in multiple dishes.
Waste_Logs → Locations	Many-to-One	Location_ID	Waste is logged per location; locations report multiple entries.
Waste_Logs → Ingredients	Many-to-One	Ingredient_ID	Waste is tracked per ingredient; each ingredient may appear in multiple logs.

5. Entity Relationship Diagram
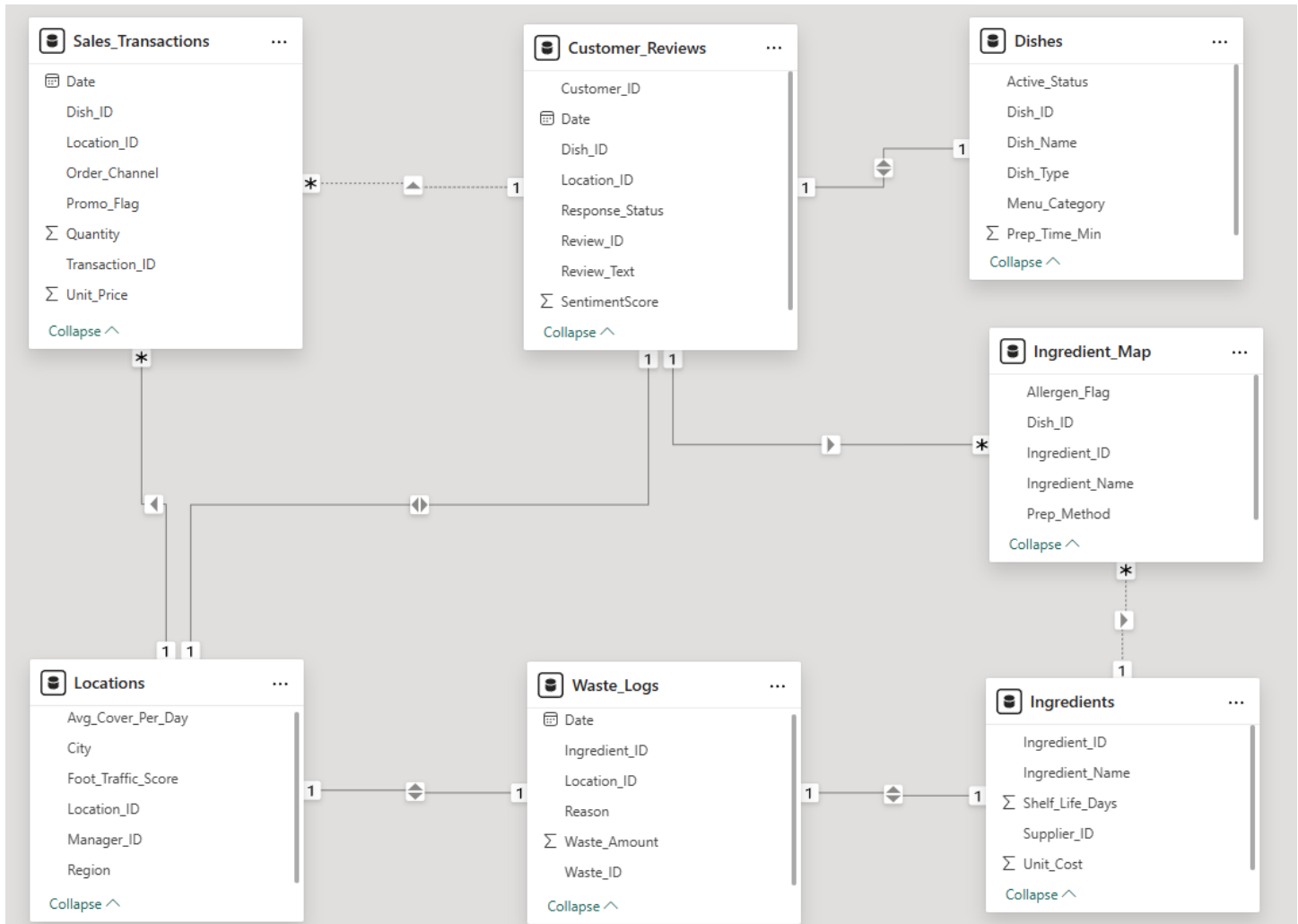
6. Ingredient Popularity Score (IPS)

The Ingredient Popularity Score (IPS) is a composite metric designed to capture the true demand and appeal of each ingredient at a specific location. It enables Quisine Analytics to make informed decisions about purchasing, menu planning, and regional customization.

Formula:

$$\text{IPS} = \Sigma(\text{Dish Quantity} \times (\text{Proportion} / 100)) + \text{Avg(Sentiment Score)} \times \text{Weight} + \text{Seasonal/Event Adjustment}$$

How IPS is Calculated

The score combines three components:

- **Sales Contribution:** Reflects the number of dishes sold, adjusted by how prominently the ingredient features in each recipe.
- **Customer Sentiment:** Based on average sentiment scores from customer reviews, scaled by a weighting factor.
- **Seasonal Adjustment:** An optional modifier to account for time-sensitive demand shifts such as promotions, or events.

Component Breakdown

- **Dish Quantity**: From Sales_Transactions — total number of dishes sold.
- **Proportion (%)**: From Ingredient_Map — percentage of how much of the dish is made up of that ingredient.
- **Sentiment Score × Weight**: From Customer_Reviews — average review score for dishes containing that ingredient at a specific location, multiplied by a custom weight (e.g., 0.2).
- **Seasonal Adjustment**: Optional modifier based on time/event-specific spikes in demand.

Example IPS Calculation

Let's calculate the IPS for Cheese Curds at Quebec City:

INPUTS Dish Sold: "Smoked Meat Poutine" (Dish ID: D001)   Ingredient Proportion: 40% (Cheese Curds in the dish)
Quantity Sold: 150   Average Sentiment Score: 4.5 (from reviews)   Sentiment Weight: 0.2
Seasonal Adjustment: 5 (e.g., winter promo boost)

IPS = (Dish Quantity × (Proportion / 100)) + Avg(Sentiment Score) × Weight + Seasonal Adjustment
= (150 × 0.40) + (4.5 × 0.2) + 5
= 60 + 0.9 + 5 = 65.9

An IPS of 65.9 for Cheese Curds in Quebec City indicates strong regional demand, positive customer sentiment, and current seasonal relevance. This means the ingredient is both frequently used and well-liked in a popular dish, likely boosted by a promotion or seasonal trend.

For managers, this score highlights the need to prioritize Cheese Curds in purchasing, ensure they're featured on the menu, and avoid understocking, especially during peak demand periods. IPS offers a clear signal for aligning ingredient planning with customer expectations.

7. Business Impact

Metric	Before	After Refinement (Target)
Inventory Overstock Rate	~12%	↓ to ≤5%
Food Waste %	4.80%	↓ to ~4.0%
Menu Alignment Score	~70%	↑ to ≥85%
Customer Satisfaction	8.5 / 10	↑ to ≥8.7

8. Implementation Steps

A.   Deploy Ingredient Popularity Dashboards per location using Power BI
B.   Schedule Monthly Auto-Refreshes for IPS with updated sales and reviews
C.   Train Branch Managers to use IPS for:
  o   Weekly ordering decisions
  o   Dish prioritization
  o   Waste control
D.   Use Waste Logs as a feedback loop to fine-tune ingredient-level forecasting

9. Conclusion

The refined data model enables Quisine Analytics to go beyond generic dish performance and unlock precise, ingredient-level insights per location. By connecting sales, sentiment, and waste into a unified framework, the business can improve profitability and meet evolving customer expectations with data-informed menu decisions.

Beyond the Ingredient Popularity Report, this data model also supports:
- **Dish Popularity Index (DPI)** by region, time, and channel (e.g., dine-in vs. delivery)
- **Customer Sentiment Trends** per dish, region, or ingredient
- **Waste-to-Sales Ratios** to flag inefficiencies or over-ordering
- **Ingredient Profitability** by comparing cost (from Ingredients) and revenue (from Sales_Transactions)
- **Campaign Impact Analysis** using Promo_Flag and Order_Channel
- **Menu Performance Scorecards** per location or manager
- **Supplier Impact Analysis** through integration of Supplier_ID

These metrics offer deep flexibility to Quisine Analytics for operations, marketing, and strategic planning—enabling data to not only explain the past, but to actively shape future decisions.