

DATA ANALYSIS PROJECT: PIZZA DELIVERY OPERATIONS

BUSINESS DATABASE CREATION, EXPLORATION AND VISUALIZATION

Tools utilized:

- **Excel:** Initial table structuring organization, and mockup creation.
- **Quick Database Diagrams:** Schema visualization and database relationships design.
- **SQL Server Management Studio (SMSS):** Utilized for database creation, administration, query execution, data editing, and database design and exploration.
- **Google Looker:** Used to present key insights in this project.

Scenario:

Client is establishing a new pizza delivery business, focusing explicitly on takeout and delivery services. The project brief involves creating a customized relational database tailored to capture essential business data. This database will facilitate the monitoring of business performance through dashboards.

Client Requirements and Resources:

1. Client's Requests:

- **Data Requirements:** Client specified essential database details, per specifications three essential tables are needed:

1.1 Orders tracking table: It encompasses crucial details for the orders, containing customer-related information, items and pricing. This table will serve for managing and analyzing overall orders, facilitating effective sales tracking and customer order management. Included crucial requirements for this table on the Client's brief:

"Item name, item price, quantity, customer name, and delivery address".

1.2 Stock control table: Fundamental table for monitoring ingredient quantities essential for product preparation. It will facilitate tracking existing stock levels and trigger automated stock replenishment. This table acts as a pivotal resource for maintaining ingredient inventory.

1.3 Staff management table: This table will serve the purpose of managing staff-related data. It will provide insights into staff scheduling, determining active working hours, and leveraging staff salary information. Additionally this data aids in calculating the cost per pizza, encompassing ingredient expenses, personnel wages and delivery costs.

- **Database Modifications:** Expanded database schema to incorporate crucial elements and normalize the data avoiding redundancy, improving efficiency making data more flexible and usable.

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Client Brief:

Requested Data from Client	Expanded Database
item name	row id
item price	order id
quantity	item name
customer name	item category
delivery address	item size
	item price
	quantity
	customer first name
	customer last name
	delivery address 1
	delivery address 2
	delivery city
	delivery zip code

2. Client-Provisioned Resources:

- **Restaurant Menu Integration:** Utilized the provided restaurant menu to extract various menu options, categorize products into distinct categories (e.g., special pizza, sides, signature pizza, beverages), and align these categories within the database schema.

(Fictional menu is available for visualization within the dedicated GitHub folder for this project)

- **Data Translation:** Transformed menu options into database entries to ensure comprehensive menu coverage within product categories.

3. Database Schema Enhancements:

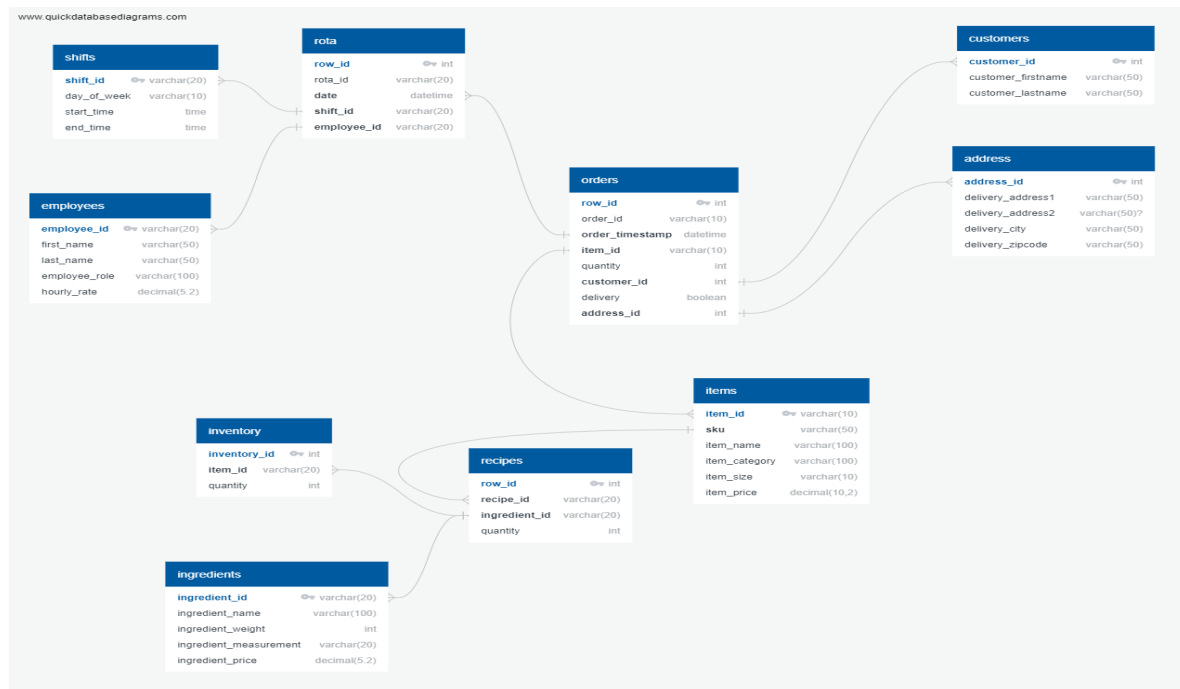
- **Diagram Expansion:** Incorporated additional table structures to meet client specifications and introduced tables augmenting the database design to accommodate requested data fields.

4. Aligning Client Requests with Database Development:

- **Data Field Integration:** Ensured seamless integration of client-requested data fields (item name, price, quantity, customer details) within the expanded database schema.

- **Optimization Consideration:** Aligned database enhancements with client-centric objectives for streamlined data management and order processing.

Completed database structure using *Quick Database Diagrams*:



***Note:** The purpose of this image is for preliminary visualization. For a more detailed and interactive visualization of individual components within the database, higher-resolution images are available as separate files in the dedicated GitHub folder for this project. These files, located among the scripts and additional project documentation, offer a more in-depth exploration of the database structure and its elements.*

Database Design:

1. Database Design Process:

- **Normalization:** Each table is structured to minimize redundancy and ensure data integrity.
- **Referential integrity:** Foreign Keys enforce relationships between tables, ensuring data consistency.
- **Table Design:** Tables are designed to cater to specific entities (customers, orders, items...) and their relationships.

2. Table Descriptions:

- **Orders:** Stores data about each order placed, including timestamps, items, quantities, customers and delivery details.
- **Customers:** Contains customer details such as their names and unique identifiers.
- **Address:** Stores delivery address details from customer orders.
- **Items:** Represents the items available for purchase, including their names, category, size and prices.
- **Recipes:** Defines the relation between items and ingredients required for each item.
- **Ingredients:** Contains details about the ingredients needed for recipes.
- **Inventory:** Tracks available quantities for items.
- **Shifts:** Manages staff work shift details.
- **Employees:** Collects the personnel data.
- **Rota:** Connects orders with staff shifts based on timestamps.

2. Table Relationships:

****Orders Relationships****

- **(Orders) order_timestamp - date (Rota):** The *order_timestamp* in the **Orders** table establishes a relationship with the *date* field in the **Rota** table. This connection allows tracking orders against the scheduled work shifts.
- **(Orders) item_id - item_id (Items):** The *item_id* in **Orders** links to the *item_id* in the **Items** table, aiding in tracking specific items ordered by customers.
- **(Orders) customer_id - customer_id (Customers):** The *customer_id* in **Orders** connects to the *customer_id* in the **Customers** table, facilitating order association with specific customers.
- **(Orders) address_id - address_id (Address):** The *address_id* in **Orders** establishes a link to the *address_id* in the **Address** table, enabling the association of delivery addresses with orders.

****Rota Relationships****

- **(Rota) shift_id - shift_id (Shifts):** The *shift_id* in **Rota** connects to the *shift_id* in the **Shifts** table, allowing assignment of employees to specific work shifts.
- **(Rota) employee_id - employee_id (Employees):** The *employee_id* in **Rota** links to the *employee_id* in the **Employees table**, associating employees with scheduled shifts.

****Items Relationship****

- **(Items) sku - recipe_id (Recipes):** The *sku* in **Items** establishes a relationship with the *recipe_id* in the **Recipes** table, assisting in identifying recipes associated with specific items.

****Recipes Relationships****

- **(Recipes) ingredient_id - inventory_id (Inventory):** The *ingredient_id* in **Recipes** connects to the *inventory_id* in the **Inventory** table, aiding in tracking ingredients available in the inventory.
- **(Recipes) ingredient_id - ingredient_id (Ingredients):** The *ingredient_id* in **Recipes** links to the *ingredient_id* in the **Ingredients** table, allowing the association of ingredients with recipes.

(Scripts for table creations and relationship assignment are available in two separate documents located within the GitHub folder for this project.)

Data Exploration and Analysis:

In the data exploration phase, thorough research was conducted focusing into order activity and inventory management. This encompassed analyzing total quantities by ingredients, assessing total ingredient cost, and calculating the overall pizza cost. Additionally, a detailed evaluation of the remaining stock by ingredient percentage was performed, generating a list of items requiring reorder based on current inventory levels.

The purpose of this data analysis is to provide clear visualizations of the data explored to the Client.

1. Visualization for Orders:

- **Total Orders and Sales Revenue:** Analyzed the total number of orders made and the generated sales revenue.
- **Items Ordered and Average Order Value:** Explored the overall count of items ordered and computed the average order value.
- **Delivery vs. Pickup:** Displayed a comparison chart showcasing the preference between delivery and pickup options for orders.
- **Sales of Food Items:** Evaluated the total sales of food items (excluding beverages) to identify the best-selling products.
- **Category Preferences:** Represented a categorical analysis highlighting the most ordered categories within the business.
- **Sales vs. Orders:** Illustrated a line chart that contrasts total sales against the count of orders.

- **Geographical Orders:** Displayed a map chart indicating the geographical regions where orders were placed, despite using random data resulting in the inclusion of multiple countries, which may not align with the small business context.

2. Staff and Cost Analysis for Orders:

- **Staff Cost Calculation:** Calculated the total staff cost associated with orders and the cumulative hours worked by the staff.
- **Inventory Analysis:** Analyzed the total quantity of ingredients on stock to give support on the restocking decisions.
- **Ingredient Costs:** Analyzed the overall ingredient costs and the total quantity used/purchased.
- **Stock Replenishment:** Utilized color-coded indicators to signal when ingredients are low in stock or nearing the restocking threshold. Employed red for critical restock, yellow for nearing restocking levels, and no highlighting for adequately stocked items.
- **Cost per Pizza Calculation:** Derived the cost incurred per pizza, integrating ingredient expenses, labor, and other associated costs.

Note: Please note that I used fictional data for this project, which may lead to unusual results and random geographical locations in the visualization maps, not reflective of a small business's typical operation.

Conclusion:

The database design and analysis process provided valuable insights into the operations of the pizzeria delivery business. By meticulously organizing and interconnecting the database tables, a robust foundation was established to effectively manage orders, inventory, staff, and customer-related data.

The comprehensive exploration into data visualization offered critical perspectives on order trends, sales patterns, and inventory management. Despite initial challenges with table relationships and certain implementation issues, the endeavor led to a comprehensive understanding of the business's dynamics.

Future Enhancements - Scalability and Improvements:

Moving forward, there's a clear focus on refining the table relationships to ensure smoother operations and minimize potential errors. The intention is to optimize the database structure further, learning from initial challenges encountered in the relationship schema and column implementation.

Moreover, while exploring different visualization tools, encountering initial challenges with Google Looker was part of the journey. Considering future improvements, I'm likely to revisit these visualizations using PowerBI, a tool I feel more confident and comfortable working with. This project has been an adventure in exploring various visualization tools, and although I don't regret the experience, I believe I'll save time and feel more confident utilizing a familiar tool like PowerBI in the future.