Project 2

Conceptual Database Design

Written By

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A Report Submitted in Partial Fulfillment of

the Requirements for

ITCS413 Database Design

Faculty of Information and Communication Technology

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Introduction

Group Members:

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Group ID: 17

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AI Tools Used: No AI applied in this report

User Requirement Specifications

Changes from Previous Project

Change Area	Previous Model	Updated Conceptual Model
Admin Roles	Admin Roles name as Admin	Entity Admin change name as “Business Owner”
Staff Roles	Staff roles were stored as an attribute (position).	Used Superclass-Subclass: `Staff` as a superclass, with `Chef, Waiter, General Manager`, and `Inventory Manager` as subclasses.
Order-Staff Relationship	No relationship defined.	Defined M:M relationship: Orders can be handled by multiple staff members.
Menu-Ingredient Relationship	Ingredients were stored as a list inside the Menu.	Defined M:M relationship: `Menu "uses" Ingredients` to allow flexibility.
Payment Handling	No relationship defined.	1 Order = 1 Payment
Branch System	Not supported.	Added a "Branch" entity to support multi-branch operations.
Stock Management	No clear management structure for ordering ingredients.	Added "Stock Manager" entity to handle supplier orders.

Database Requirement Specification

User / Entity	Data
Branch	● `branch_id` (PK) – Unique identifier for each branch ● `branch_name` (Candidate key) – Each branch must have a unique name ● `branch_street` – street of the branch (e.g. Park Avenue, Oak Street) ● `Branch_city` – city of the branch (e.g. New York City, Las Vegas) ● `branch_postcode` – postcode of the branch (e.g. 10001, 30301, 48201) ● `branch_phone` – Contact number of the branch ● `branch_stockQuantity` – Total amount of stock available at the branch ● `branch_noOfEmployees` – Number of employees working at the branch
Customer	● `cus_id` (PK) – Unique identifier for each customer ● `cus_citizenID` (Candidate Key) – National identification number ● `cus_fname` – First name ● `cus_lname` – Last name ● `cus_contact` – Email or alternative contact ● `cus_phone` – Phone number ● `cus_gender` – Male/Female/Other ● `cus_created_at` – Timestamp when the customer was added
Staff (Superclass)	● `staff_id` (PK) – Unique identifier for each staff ● `staff_citizenID` (AK) – National identification number ● `staff_username` – Username ● `staff_password` – Password ● `staff_fname` – First name ● `staff_lname` – Last name ● `staff_position` – Job title (e.g. Chef, Waiter, Manager) ● `staff_gender` – Male/Female/Other ● `staff_created_at` – Timestamp when the staff was added
Chef (Subclass)	● `specialty` – Area of expertise (e.g. Pastry, Grilled Dishes)
Waiter (Subclass)	● `section` – Assigned area in the restaurant (e.g. Indoor, Outdoor)
General Manager (Subclass)	● `responsibility` – Department managed (e.g. Kitchen, Customer Service)
Inventory Manager (Subclass)	● `warehouse_section` – The stock area managed
Business Owner	● `bo_citizen_id` (Pk) – Unique identifier for business owner ● `bo_username` – Username

	● `bo_password` - Password ● `bo_fname` – First name ● `bo_lname` – Last name ● `bo_gender` – Male/Female/Other
Ingredient	● `ing_id` (PK) – Unique identifier for each ingredient ● `ing_name` – Name of the ingredient ● `ing_quantity` – Stock quantity available ● `ing_unit` – Measurement unit (e.g. kg, liters, pieces, etc.) ● `ing_price` – Cost per unit
Menu	● `menu_id` (PK) – Unique identifier for each menu item ● `menu_name` – Name of the dish ● `menu_description` – Brief description ● `menu_price` – Selling price ● `menu_category` – Type of food (e.g. Appetizer, Main Course, Dessert)
Order	● `order_id` (PK) – Unique identifier for each order ● `order_date` – Date and time of the order ● `order_totalPrice` – Total cost of the order ● `order_status` – Order status (Pending, Completed, Canceled) ● `order_deliveryType` - Type of order (e.g. Dine-in, Takeout, Delivery)
Payment	● `payment_id` (PK) – Unique identifier for each payment ● `payment_method` – Method of payment (e.g. Credit Card, Cash, Mobile Banking) ● `payment_status` – Status of payment transaction (e.g. Pending, Completed, Failed) ● `payment_transactionDate` – Timestamp
Feedback	● `feedback_id` (PK) – Unique identifier for each feedback ● `feedback_rating` – 1 to 5 stars ● `feedback_comment` – Customer’s comment
Promotion	● `pro_id` (PK) – Unique identifier for each promotion ● `pro_name` (Candidate Key) – Promotion title ● `pro_description` – Details of the promotion ● `pro_discounPercentage` – Discount applied ● `pro_startDate` – Promotion start date ● `pro_endDate` – Promotion end date

Supplier	● `sup_citizenID` (PK) - National identification number ● `sup_address` - Address of supplier ● `sup_fname` - First name of supplier ● `sup_lname` - Last name of supplier ● `sup_contact` - Contact of supplier

Entity Relationships and Cardinalities

Entities Involved	Relationship	Cardinality	Constraint	Description
Business Owner - Branch	Manage [1:M]	[1:M]	(1,M)	Each business owner can manage at least one branch.
		[1:1]	(1,1)	Each branch can be managed by at most one business owner.
Branch - Staff	Has [1:M]	[1:M]	(1,M)	Each branch can have at least one staff member.
		[1:1]	(1,1)	Each staff member can belong to at most one branch.
Staff - Order	Receive [1:M]	[1:M]	(0,M)	Each staff member may or may not receive orders.
		[1:1]	(1,1)	Each order can be received by exactly one staff member.
Order - Menu	Consist [M:N]	[1:M]	(1,M)	Each order can consist of at least one menu item.
		[1:M]	(0,M)	Each menu item may or may not belong to orders.
Order - Payment	Create [1:1]	[1:1]	(1,1)	Each order can have at least one payment.
		[1:1]	(1,1)	Each payment can belong to exactly one payment.
Customer - Order	Place [1:M]	[1:M]	(1,M)	Each customer can place at least one order.
		[1:1]	(1,1)	Each order can be placed by exactly one customer.
Customer - Feedback	Write [1:M]	[1:M]	(0,M)	Each customer may or may not submit feedback.
		[1:1]	(1,1)	Each feedback can be submitted by exactly one customer.
Customer - Promotion	Use [M:N]	[1:M]	(0,M)	Each customer may or may not use multiple promotions.
		[1:M]	(0,M)	Each promotion may or may not be used by multiple customers.

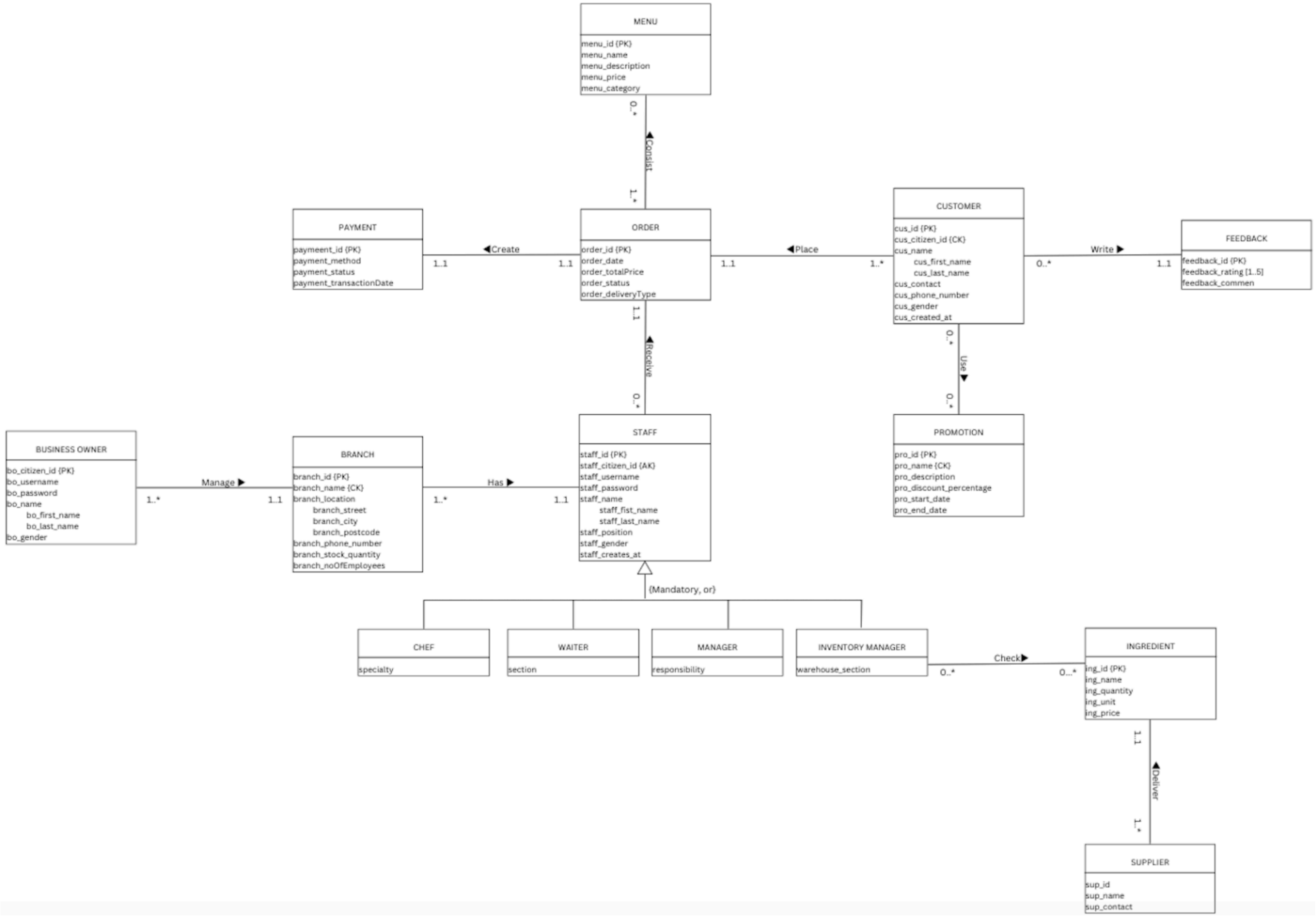
Inventory Manager - Ingredient	Check [M:N]	[1:M]	(0,M)	Each inventory manager may or may not check ingredients.
		[1:N]	(0,N)	Each ingredient may or may not be checked by inventory managers.
Supplier - Ingredient	Deliver	[1:M]	(1,M)	Each supplier can deliver at least one ingredient.
		[1:1]	(1,1)	Each ingredient can be delivered by exactly one supplier.

Transaction Requirements

User / Entity	Data Entry	Data Update/Deletion	Data Queries
Customer	Add a new customer (e.g., Register a new customer, Mr. Ronaldo, with citizen ID 123456789)	● Update a customer's contact information (e.g., Change the phone number of Mr. Ronaldo) ● Delete a customer record (e.g., Remove a customer who has not ordered in a year)	● Retrieve a list of all customers who have placed an order in the last 30 days ● Search for a customer by name ● List all male customers
Staff	Add a new staff member (e.g., Hire a new chef, Mr. Smith, for the restaurant)	● Update a staff member's position (e.g., Promote a waiter to manager) ● Remove a staff record (e.g., Delete a staff member who resigned)	● List all staff members with the position "Chef" ● Find all male staff members ● Retrieve all staff hired in the last 6 months
Admin	Register a new admin	● Update admin contact details ● Remove an admin account	● Retrieve admin details based on email ● List all active admins
Ingredient	Add a new ingredient to stock	● Update stock quantity for an ingredient ● Delete an expired ingredient	● List all ingredients with less than 5 units in stock ● Retrieve ingredients supplied by "FreshFarm
Menu	Add a new dish to the menu	● Update dish price ● Remove a discontinued dish	● List all menu items in the "Burger" category ● Find menu items below 100 Baht.
Order	Place a new order	● Update order status to "Completed" ● Cancel an order	● Retrieve orders placed by a specific customer ● Find all pending orders

Feedback	Add a new feedback entry	● Update customer rating ● Delete inappropriate feedback	● Retrieve feedback for a specific menu item ● Find all feedback with a rating of 1 or 2 stars
Promotion	Add a new promotional offer	● Update discount percentage ● Remove expired promotions	● List all active promotions ● Find promotions with a discount of 20% or more

Conceptual data model



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Verification Pathway

1. Business Owner and Branch Management

- Each **Business Owner** manages at least one **Branch**.
- Each **Branch** must be assigned to a valid **Business Owner**.

Verification:

- When creating a new branch, the system ensures that a valid Business Owner exists before assigning the branch.
- Business Owners can retrieve admin details based on email and list all active admins to maintain accountability.

2. Staff Assignment and Management

- Each **Branch** must have at least one assigned **Staff** member.
- Each **Staff** member belongs to exactly one **Branch**.
- Staff can be **added, promoted, or removed**.

Verification:

- The system ensures that at least one staff member is assigned to each branch.
- When registering a new staff member, their role and credentials are validated before assignment.
- Updates to staff positions (e.g., promotions) are validated, ensuring data consistency.
- Staff removal is restricted to ensure a branch is not left without personnel.

3. Customer Management

- **Customers** can be added, updated, or removed.
- Customers can place orders and provide feedback.

Verification:

- A new customer record is validated before creation (e.g., unique ID, required fields).
- Updates to customer contact information are restricted to prevent invalid modifications.
- The system verifies customer activity before deletion (e.g., inactive for a year).
- Queries allow listing recent customers and searching by name.

4. Order Processing and Management

- **Customers** must place orders, and each order must contain at least one **Menu** item.
- Orders must be processed by a **Staff** member and linked to a **Payment** record.
- Orders can be updated (e.g., status change) or canceled.

Verification:

- Orders cannot be placed without at least one valid menu item.
- The system ensures that only assigned staff members process orders.
- An order is not confirmed until a valid payment is linked.
- Order queries allow retrieval by customer and status (e.g., pending orders).

5. Payment Handling

- Each **Order** must be linked to one **Payment** record before confirmation.
- Payments must include method, status, and timestamp.

Verification:

- The system verifies that an order is marked as "paid" before confirmation.
- Payment records are validated for completeness (method, status, timestamp).

6. Menu and Ingredient Management

- **Menu** items can be added, updated (e.g., price changes), or removed.
- **Ingredients** can be added, updated (e.g., stock quantity), or removed (e.g., expired items).
- Ingredients are sourced from **Suppliers**.

Verification:

- A new menu item must meet required fields before being added.
- The system validates pricing updates before applying changes
- Expired ingredients are automatically removed from stock.
- Queries allow filtering menu items by category and price, and listing low-stock ingredients.

7. Customer Interactions and Feedback

- Customers can provide **Feedback** on completed orders.
- Feedback can be updated (e.g., rating changes) or deleted if inappropriate.

Verification:

- Feedback is only accepted for completed orders.
- Ratings and comments are validated before submission.
- The system ensures that inappropriate feedback can be removed.
- Queries allow retrieving feedback based on menu items and ratings.

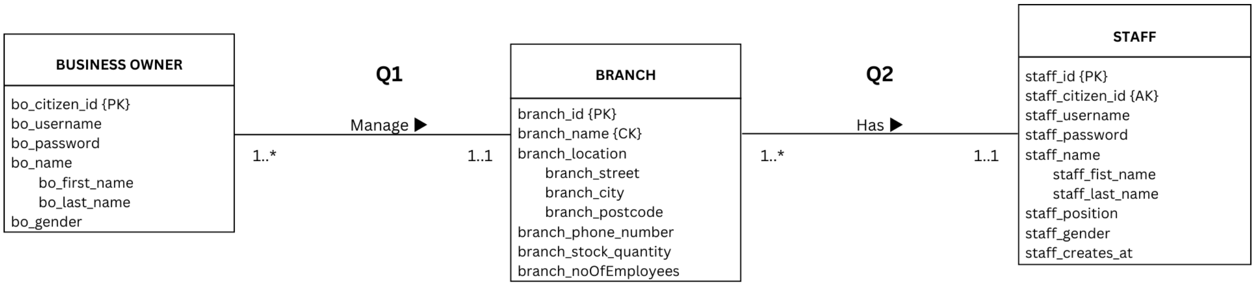
8. Promotions and Discounts

- **Promotions** can be added, updated (e.g., discount percentage), or removed.
- Customers can apply valid promotions to their orders.

Verification:

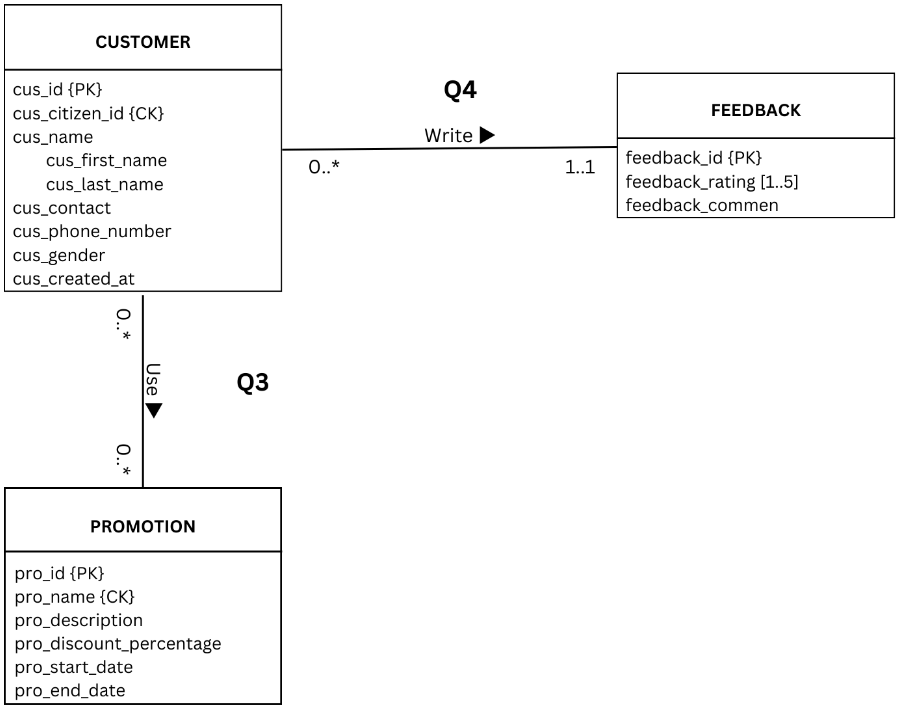
- The system validates that promotions are active before application.
- Expired promotions are removed automatically.
- Queries allow listing all active promotions and filtering by discount percentage.

Pathway



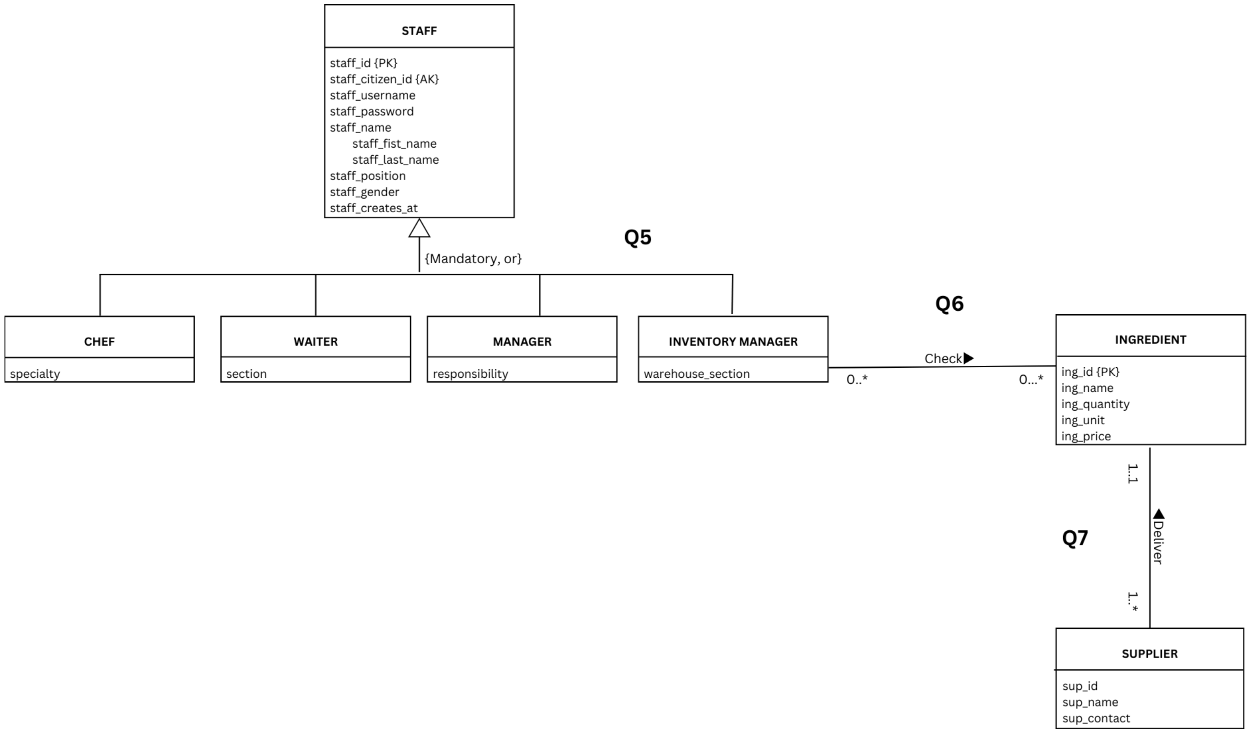
Q1: List queries related to business owners and the branches they manage. The "1..*" relationship means that one business owner can oversee at least one branch, but each branch is managed by at most one business owner.

Q2: List queries related to branches and the staff that manage them. The "1..*" relationship indicates that each branch can have at least one staff member, but each staff member belongs to exactly one branch.



Q3: This query involves the "Customer" entity and its relationship with "Promotions". 0...* (on both sides) means that a customer may or may not use promotions, and each promotion may or may not be used by customers.

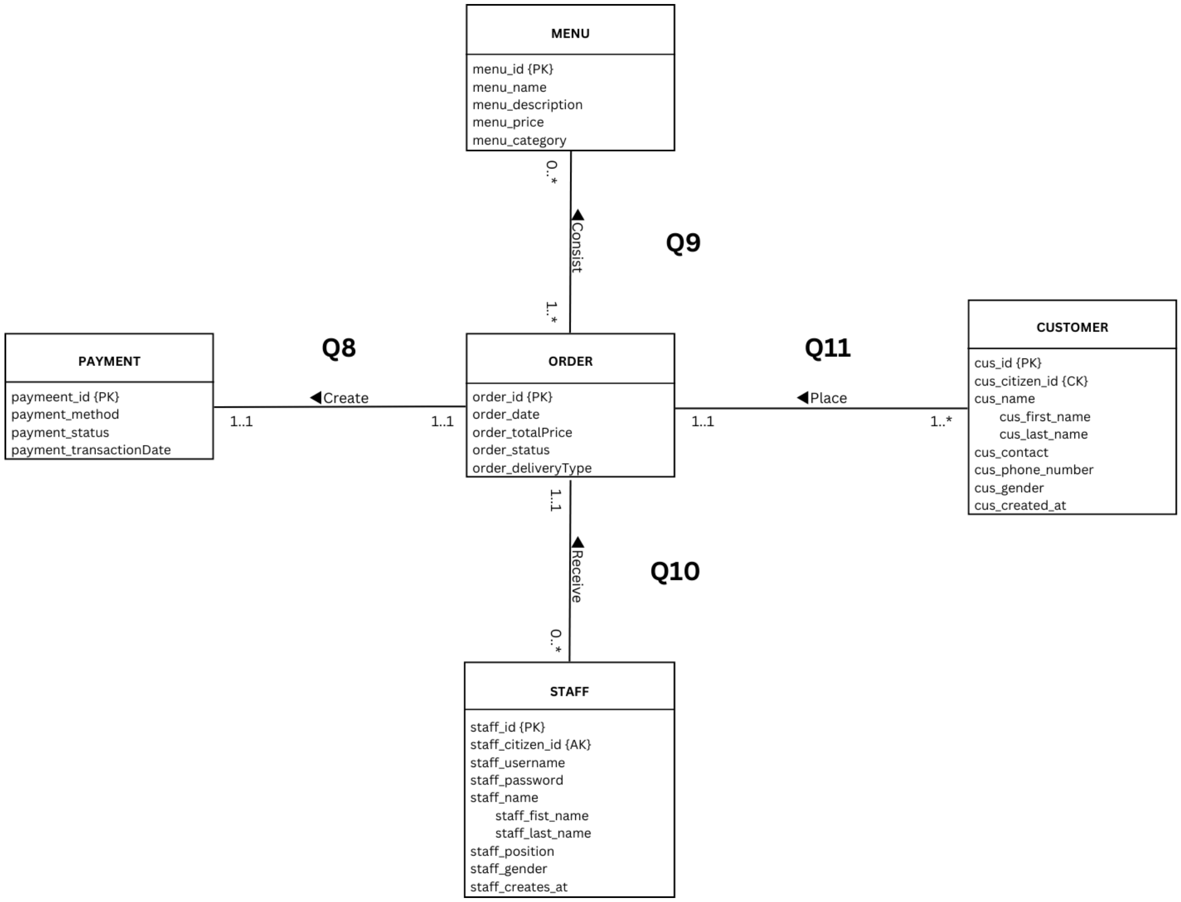
Q4: List queries related to customers and their feedback. The relationship means that a customer may not write any feedback or may write multiple feedback entries, and each feedback entry must be associated with exactly one customer (it cannot exist without a customer).



Q5: Identify the relationship between the "Staff" entity and the "Chef", "Waiter", "Manager", and "Inventory Manager" entities. The system requires each staff member to have exactly one role either Chef, Waiter, Manager, or Inventory Manager.

Q6: List queries related to inventory managers and the ingredients they check. The relationship means that an inventory manager may check multiple ingredients, or they may not check any at all. Similarly, an ingredient may be checked by multiple inventory managers or may not be checked at all.

Q7: List queries related to suppliers and the ingredients they deliver. The relationship means that each supplier must deliver at least one ingredient. Each ingredient must be delivered with exactly one supplier (it cannot exist without a supplier).



Q8: List queries related to orders and their payments. The relationship means that each order must be linked to exactly one payment, and each payment must be associated with exactly one order. An order cannot exist without a corresponding payment, and a payment cannot exist without being linked to an order.

Q9: List queries related to orders and the menu items they consist of. The relationship means that each order must contain at least one menu item, and each menu item can be part of multiple orders. However, a menu item can exist in the system even if it has never been included in any order.

Q10: List queries related to customers and the orders they place. The relationship means that each customer must place at least one order, and each order must be associated with exactly one customer. A customer cannot exist in the system without placing an order.

Q11: List queries related to staff and the orders they receive. The relationship means that each order must be received by exactly one staff member, but a staff member may or may not receive orders. This allows staff members to exist in the system even if they have not yet received any orders.

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