Requirement Analysis, Conceptual Design and Logical Database Design for Popular Pizza

Part 1 – Requirements

*Data Requirements*

Order Processing

Order

Customer

Discount Program

* New orders will be received in-store or via the phone
* Completed orders will be finalised in-store or via delivery service
* The full details of the order will be stored in the database and a receipt/invoice offered to customers. This information will include:
  + what was ordered and how much
  + the type of order (delivery or pickup)
  + the name of the delivery driver (if applicable)
  + the cost of each item
  + a subtotal which includes tax paid and discounts applied (limit one per order)
* The current status of the order will be managed by the business and accessible by customers
* Customer data will be stored for confirmation of present and future orders
* Information regarding any discounts will also be stored – current promotions and their requirements.
* Order data:
  + OrderNo
  + DateOfOrder
  + CustomerId
  + NoOfItems
  + ItemQuantity
  + ItemPrice
  + DiscountProgram
  + Tax
  + Subtotal
  + PaymentMethod
  + PaymentApprovalNo
  + Status
  + OrderType
  + EmployeeNo
  + DriverNo
* Customer data:
  + CustomerId
  + CustomerName
  + CustomerAddress
  + CustomerPhone
* Discount program data:
  + DiscountCode
  + DiscountPercentage
  + StartDate
  + EndDate
  + Requirements

Menu Items, Ingredients and Suppliers

Supply Orders

Suppliers

Menu Items

Ingredients

* Menu items will be stored in the database – they will have a unique code, name, size, price, and a full list of the ingredients in each item and their quantities
* Ingredients will be carefully managed through weekly stocktakes, with information regarding:
  + The ingredient’s name, type (i.e. vegetable, meat) and identifying code
  + The current expected level of the ingredient
  + How much of the ingredient would be preferred
  + How much should be ordered next
  + Which suppliers deliver the ingredient
  + When the last stocktake was held
* Each individual supply order is separately stored, offering information such as:
  + The unique supply order number
  + Which supplier delivered the order and when
  + When the order was first submitted
  + The code and quantity of each ingredient
  + The total cost of the order
* The suppliers themselves will be stored with their name and useful information, the stock they carry and the identity of their sales representative.
* Menu items data:
  + ItemCode
  + ItemName
  + ItemSize
  + ItemPrice
  + IngredientCode
  + IngredientQuantity
* Ingredients data:
  + IngredientCode
  + IngredientName
  + IngredientType
  + DateOfLastStocktake
  + CurrentStock
  + SuggestedStock
  + StockToOrder
  + AvailableSuppliers
* Suppliers data:
  + SupplierName
  + SupplierAddress
  + SupplierABN
  + SupplierPhone
  + SupplierStock
  + SupplierRepInfo
* Supply order data:
  + SupplyOrderNo
  + Supplier
  + DateOrdered
  + DateDelivered
  + IngredientsCode
  + IngredientsQuantity
  + TotalCost

Employees

Shift Worked

Employee

* Useful employee information must be stored, including name, TFN and Id number, home address, phone, bank details, pay rate, job description and whether they are casual, part-time or full-time
* For each shift, the system must store which employee worked that shift and when, start and end times, what they were paid, what job they were required to perform (management, in-house or delivery) and, for delivery drivers, which orders were delivered
* Employee data:
  + EmployeeNo
  + EmployeeName
  + EmployeeType
  + EmployeeAddress
  + EmployeePhone
  + TFN
  + EmployeeBankCode
  + EmployeeBankName
  + EmployeeAccountNo
  + PayRate
  + WorkStatus
* Shift worked data:
  + ShiftNo
  + EmployeeNo
  + ShiftDate
  + ShiftType
  + StartTime
  + EndTime
  + OrdersDelivered
  + EmployeePayment

*Transaction Requirements*

Data Manipulation Operations

* Create/update relevant personal data for each customer
* Create/edit customer orders
* Add/delete/edit information about discount programs
* Edit menu items or prices
* Manage stocktake data – what was present as of the last stocktake, what should be present and what is needed
* Edit details of suppliers and their stock
* Add new supply order – what was ordered for what cost, when, from whom and for which date
* Add/edit/delete employee information
* Add shifts that each employee works – if delivery driver, details of deliveries
* Update the ongoing status of orders for staff and customers

Queries

* Access order status
* Search for applicable discount programs
* Search recommended/current stock levels for comparison
* Find information about suppliers/customers/employees

*Business Rules*

* Customers must be verified before orders are completed
* Conflicting or outdated customer information must be verified and updated
* Payment must be made as either cash, debit or credit card
* If paying by card, the PaymentApprovalNo must be stored with the order data
* No more than one discount program can be utilised per order
* Ingredient levels must be updated every time one is used
* Stocktake must be performed weekly
* When stock falls below the suggested level, it must be reordered
* When receiving stock, the stock must be accounted for and the database updated as soon as possible
* Employees must be employed as either a manager, in-store team member or delivery driver
* Employees must only be paid casual, part-time or full-time
* Delivery drivers must have a record of all of their past and current deliveries
* All employees must enter their start and finish times into the database

Part 2 – EER

EER Model

Discount Program

* DiscountCode {PK}
* DiscountPercentage
* StartDate
* EndDate
* Requirements

Customer

* CustomerId {PK}
* CustomerName
* CustomerAddress
* CustomerPhone

IngredientQuantity

IngredientQuantity

1..\*

1..\*

ItemQuantity

Ordered In

Contained In

1..\*

1..\*

1..\*

Contains

0..\*

1..1

Delivers

Menu Item

* ItemCode {PK}
* ItemName
* ItemSize
* ItemPrice

1..\*

1..1

0..1

Requested

Supplemented

Order

* OrderNo {PK}
* DateOfOrder
* NoOfItems
* ItemPrice
* Subtotal
* Status

0..\*

0..\*

PickUpOrder

WalkInOrder

PhoneOrder

DeliveryOrder

Delivered

0..\*

1..\*

OrdersDelivered

1..1

1..1

1..\*

WorkedBy

Driver

InHouse

Created

EmployeePayment

EmployeData

Shift Worked

* ShiftDate
* StartTime
* EndTime

1..\*

1..1

Employee

* EmployeeNo {PK}
* EmployeeName
* EmployeeAddress
* EmployeePhone
* TFN
* EmployeeBankCode
* EmployeeBankName
* EmployeeAccountNo
* WorkStatus

1..\*

1..1

WorkedBy

SupplierInfo

Ingredient

* IngredientCode {PK}
* IngredientName
* IngredientType
* DateOfLastStocktake
* CurrentStock
* SuggestedStock

Supplies

AvailableSuppliers

SupplierStock

1..\*

1..\*

Supplier

* SupplierABN {PK}
* SupplierName
* SupplierAddress
* SupplierPhone
* SupplierRepInfo

Supply Order

* SupplyOrderNo {PK}
* DateOrdered
* DateDelivered
* IngredientCode
* TotalCost

Documentation – Data Dictionary

Entities

|  |  |  |
| --- | --- | --- |
| Name | Relationship | Description |
| Order | Customer, Discount Program, Employee, Menu Item | A customer’s order for food |
| Customer | Order | A person that has placed an order |
| Discount Program | Order | Current promotion or discount for when certain requirements are filled |
| Menu Item | Order, Ingredient | An item that is available for customers to order |
| Supply Order | Supplier, Ingredient | An array of ingredients delivered by a supplier |
| Supplier | Supply Order | An organisation that delivers ingredients |
| Ingredient | Menu Item, Supply Order | A component of any number of menu items |
| Employee | Shift Worked, Order | A person who is employed by the business |
| Shift Worked | Employee | The details of a day worked by an employee |

Relationships

|  |  |  |
| --- | --- | --- |
| To | From | Description |
| Supply Order (0..\*) | Supplier (1..1) | One supplier delivers at most one supply order at a time to the business |
| Ingredient (1..\*) | Supplier (1..\*) | Many ingredients are offered by many different suppliers |
| Ingredient (1..\*) | Supply Order (1..\*) | One supply order can contain one or more ingredients to be delivered |
| Menu Item (1..\*) | Ingredient (1..\*) | Any amount of ingredients can be used to prepare any amount of menu items |
| Order (1..\*) | Menu Item (1..\*) | One order can consist of one or many items |
| Order (0..\*) | Discount Program (0..1) | An order can benefit from at most one discount program |
| Order (0..\*) | Customer (1..1) | A customer can have at most one active order |
| Order (1..\*) | Employee (1..1) | The team of employees can work on any amount of orders (within reason) |
| Employee (1..1) | Shift Worked (1..\*) | An employee will have all of their worked shifts in the database |

Attributes

|  |  |  |
| --- | --- | --- |
| Name | Entity | Description |
| OrderNo {PK} | Order | Unique order identifying number |
| DateOfOrder | Order | When the order was processed |
| CustomerInfo | Order | The details of the customer entity |
| NoOfItems | Order | The number of different items on the order |
| ItemPrice | Order | The price of each item |
| Subtotal | Order | The total cost, plus tax, less any discount |
| Status | Order | The current state of the order – cooking, waiting (pickup only), en route, or arrived (delivery only) |
| CustomerId {PK} | Customer | Unique customer identifying number |
| CustomerName | Customer | Name of the customer |
| CustomerAddress | Customer | Address of the customer |
| CustomerPhone | Customer | Contact number of the customer |
| DiscountCode {PK} | Discount Program | Unique discount program number |
| DiscountPercentage | Discount Program | Percentage subtracted from the total cost |
| StartDate | Discount Program | When the discount program begins |
| EndDate | Discount Program | When the discount program ends |
| Requirements | Discount Program | What conditions are required to apply the discount |
| ItemCode {PK} | Menu Item | Unique menu item identifier |
| ItemName | Menu Item | Name of the item on the menu |
| ItemSize | Menu Item | Menu item size |
| ItemPrice | Menu Item | Menu item price |
| IngredientType | Menu Item | Type of ingredient in the menu item |
| SupplyOrderNo {PK} | Supply Order | Unique supply order identifier |
| DateOrdered | Supply Order | Date that the order was placed |
| DateDelivered | Supply Order | Date that the order was delivered |
| IngredientCode | Supply Order | Identifying code for ingredient |
| TotalCost | Supply Order | Cost of all ingredients |
| SupplierABN {PK} | Supplier | Business number of the supplier |
| SupplierName | Supplier | Name of the supplier |
| SupplierAddress | Supplier | Address of the supplier |
| SupplierPhone | Supplier | Contact number of the supplier |
| SupplierRepInfo | Supplier | Sales representative employed by supplier |
| IngredientCode {PK} | Ingredient | Unique ingredient identifier |
| IngredientName | Ingredient | Name of ingredient |
| IngredientType | Ingredient | Type of ingredient |
| DateOfLastStocktake | Ingredient | When stocktake was last performed |
| CurrentStock | Ingredient | Current stock levels |
| SuggestedStock | Ingredient | What stock should be based on projections |
| StockToOrder | Ingredient | How much stock needs to be ordered |
| EmployeeNo {PK} | Employee | Unique employee identifier |
| EmployeeName | Employee | Name of employee |
| EmployeeType | Employee | Type of employee |
| EmployeeAddress | Employee | Address of employee |
| EmployeePhone | Employee | Contact number of employee |
| TFN | Employee | Tax file number of employee |
| EmployeeBankCode | Employee | Employee’s bank information |
| EmployeeBankName | Employee | Name of employee’s bank |
| EmployeeAccountNo | Employee | Employee’s account number |
| PayRate | Employee | Employee’s hourly/weekly pay rate |
| WorkStatus | Employee | Employment status |
| EmployeeData | Shift Worked | Details of the relevant employee |
| ShiftDate | Shift Worked | The date of the shift |
| ShiftType | Shift Worked | Whether the shift involved in-house work, management or delivery |
| StartTime | Shift Worked | When the shift began |
| EndTime | Shift Worked | When the shift ended |
| EmployeePayment | Shift Worked | What the employee earned for the shift |

Part 2 – EER to Relational Modelling

|  |
| --- |
| **Supplier** (SupplierABN, SupplierName, SupplierAddress, SupplierPhone, SupplierStock, SupplierRepInfo)  **Primary Key** SupplierABN  **Alternate Key** SupplierName |
| **SupplyOrder** (SupplyOrderNo, SupplierABN, DateOrdered, DateDelivered, IngredientCode, TotalCost)  **Primary Key** SupplyOrderNo  **Foreign Key** IngredientCode **references** Ingredient(IngredientCode)  **Foreign Key** SupplierABN **references** Supplier(SupplierABN) |
| **Ingredient** (IngredientCode, IngredientName, IngredientType, DateOfLastStocktake, CurrentStock, SuggestedStock)  **Primary Key** IngredientCode  **Alternate Key** IngredientName |
| **MenuItem** (ItemCode, ItemName, ItemSize, ItemPrice, IngredientType, IngredientCode)  **Primary Key** ItemCode  **Alternate Key** ItemName  **Foreign Key** IngredientCode **references** Ingredient(IngredientCode) |
| **Order** (OrderNo, EmployeeNo, DateOfOrder, CustomerId, NoOfItems, ItemPrice, Subtotal, DiscountCode, Status)  **Primary Key** OrderNo  **Foreign Key** DiscountCode **references** DiscountProgram(DiscountCode)  **Foreign Key** CustomerId **references** Customer(CustomerId)  **Foreign Key** EmployeeNo **references** Employee(EmployeeNo) |
| **PickupOrder** (OrderNo, EmployeeNo, DateOfOrder, CustomerId, NoOfItems, ItemPrice, Subtotal, DiscountCode, Status)  **Primary Key** OrderNo  **Foreign Key** DiscountCode **references** DiscountProgram(DiscountCode)  **Foreign Key** CustomerId **references** Customer(CustomerId)  **Foreign Key** EmployeeNo **references** Employee(EmployeeNo) |
| **DeliveryOrder** (OrderNo, EmployeeNo, DriverNo, DateOfOrder, CustomerId, NoOfItems, ItemPrice, Subtotal, DiscountCode, Status)  **Primary Key** OrderNo  **Foreign Key** DiscountCode **references** DiscountProgram(DiscountCode)  **Foreign Key** CustomerId **references** Customer(CustomerId)  **Foreign Key** EmployeeNo **references** Employee(EmployeeNo)  **Foreign Key** DriverNo **references** Driver(DriverNo) |
| **DiscountProgram** (DiscountCode, DiscountPercentage, StartDate, EndDate, Requirements)  **Primary Key** DiscountCode |
| **Customer** (CustomerId, CustomerName, CustomerAddress, CustomerPhone)  **Primary Key** CustomerId  **Alternate Key** CustomerName |
| **Employee** (EmployeeNo, EmployeeName, EmployeeAddress, EmployeePhone, TFN, EmployeeBankCode, EmployeeBankName, EmployeeAccountNo, WorkStatus, OrdersDelivered)  **Primary Key** EmployeeNo  **Alternate Key** EmployeeName |
| **ShiftWorked** (ShiftNo, EmployeeNo, ShiftDate, StartTime, EndTime)  **Primary Key** ShiftNo  **Foreign Key** EmployeeNo **references** Employee(EmployeeNo) |
| **Contains** (SupplyOrderNo, IngredientCode, IngredientQuantity)  **Primary Key** SupplyOrderNo, IngredientCode  **Foreign Key** SupplyOrderNo **references** SupplyOrder(SupplyOrderNo)  **Foreign Key** IngredientCode **references** Ingredient(IngredientCode) |
| **Contained In** (IngredientCode, ItemCode, IngredientQuantity)  **Primary Key** IngredientCode, ItemCode  **Foreign Key** ItemCode **references** MenuItem (ItemCode)  **Foreign Key** IngredientCode **references** Ingredient(IngredientCode) |
| **Ordered In** (ItemCode, OrderNo, ItemQuantity)  **Primary Key** ItemCode, OrderNo  **Foreign Key** ItemCode **references** MenuItem (ItemCode)  **Foreign Key** OrderNo **references** Order(OrderNo) |

Part 3 – Normalising to Boyce-Codd Normal Form (BCNF)

* 1st Normal Form: As there are no multiple value or composite keys, each key represents a single indivisible (atomic) value, and is therefore already in 1st Normal Form.
* 2nd Normal Form: The goal of 2nd normal form is to make all non-candidate keys fully functionally dependent on a candidate key.
* 3rd Normal Form: No non-candidate key is transitively dependent on a candidate key
* Boyce-Codd Normal Form: All functional dependencies are candidate keys
  + Supplier:
    - Supplier1(SupplierABN, SupplierName)
    - Supplier2 (SupplierABN, SupplierAddress, SupplierPhone, SupplierStock, SupplierRepInfo)
  + SupplyOrder:
    - (SupplyOrderNo, SupplierABN, DateOrdered, DateDelivered, IngredientCode, TotalCost)

SupplierABN, SupplierName, SupplierAddress, SupplierPhone, SupplierStock, SupplierRepInfo