Database Design for Online Retail Store
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Chapter 1

Defining the Problem

1.1 Objective

The goal is to design a database management system for an online retail store, similar to Big Bazaar, Flipkart and Amazon. Our project models on Grofers (now BlinkIt), a fast grocery marketplace for consumers to purchase day-to-day goods from.

1.2 Problem Statement

The ER diagrams and the relational schema that follow are based on the following (rudimentary) problem statement:

The online retail store serves many customers. The customers are required to hold an account on the platofrm to be able to purchase items. They can create an account by specifying their name, email address, phone number, and address. Customers add products to a shopping cart. They apply coupons on the shopping cart; the coupons have a coupon code and an associated discount percentage.
Customers order items by checking out the items on their shopping cart. The order is placed once the transaction is confirmed. The order is delivered to the customer only, they cannot have the order delivered to other addresses.
A product can belong to various categories and has specifications and a cost. Each product is obtained from a vendor which the store transacts with. After being purchased from the vendor, the products are stored in a warehouse. Warehouse employees are responsible for packing and preparing orders. The readied order is then delivered to the customer by a delivery agent.

In case of any lapses with an order, the customer complains to support staff who create a complaint number against the order. They send out the details regarding the complaint to the customer.

1.3 Stakeholders

Notable stakeholders of this problem include:

1. Customer
2. Employees
3. Suppliers
4. Vendors

Other stakeholders include manufacturers, warehousing service providers

1.4 Assumptions

1. The retail store would be operated in one country only. Therefore, there isn't an option to change the country.
2. There will be a shopping cart associated with the customer's account. They won't be able to add item to cart without being logged in.
3. The delivery would be taken care of by the company itself; items will be shipped from one warehouse only (Similar to Blinkit, erstwhile Grofers).
4. Coupons would be applied on the order, not the cart. Coupon would be applied during the checkout process.
5. Coupons would be applied using the coupon code, which is a unique alphanumeric value. A coupon cannot be reused.
6. Employees will be divided into delivery partners (responsible for delivering the order), warehouse workers (tasked with preparation of orders) and service employees (responsible for conflict resolution).
7. Vendors have only one account number and will be based only in India.

8. Employees have only one email address.
9. There won't be any wishlisting features, nor any saved-items feature like the ones offered by Amazon.
10. Employees' performance would be graded on a scale from 1 to 10 (for ease of data entry) with decimal values being permissible.

Chapter 2

ER Diagram

2.1 Entities

1. Customer
    (a) Customer ID: Primary key
    (b) Phone Number: Multivalued
    (c) Name: composite
        i. First Name
        ii. Last Name
    (d) Address: composite
        i. House Number
        ii. Locality
        iii. City
        iv. State
        v. Pin Code
    (e) Email Address
    (f) Password
2. Product
    (a) Product ID: Primary key
    (b) Specifications
        i. Expiry date

ii. Manufacture date
iii. Country of manufacture
iv. Weight
v. Dimensions

(c) Price
(d) Category
(e) Discount Percentage
(f) GST
(g) Rating : Multivalued
(h) Photos: Multivalued

3. Orders

(a) Order ID
(b) Cost of products
(c) Taxes
(d) Discount Percentage

4. Vendor

(a) Vendor ID
(b) Address
i. Plot number
ii. City
iii. State
iv. Pin code
(c) Name
(d) Phone number

5. Coupon

(a) Coupon Code: Primary key
(b) Discount Percentage
(c) Validity

6. Warehouse
    (a) Warehouse ID
    (b) Address: composite
        i. Plot number
        ii. City
        iii. State
        iv. Pin Code
    (c) Telephone Number: multivalued
7. Employee:
    (a) Employee ID: Primary key
    (b) Date of Joining
    (c) Position
    (d) Department
    (e) Email Address
    (f) Name: composite
        i. First Name
        ii. Last Name
    (g) Residential Address: composite
        i. House number
        ii. Locality
        iii. City
        iv. State
        v. Pin Code
    (h) Date of Joining
    (i) Performance
    (j) Salary
    (k) Gender
    (l) Date of Birth
    (m) Age : derived

Employees can be specialised into:

- Delivery Partner:
  (a) Vehicle ID
  (b) Vehicle Type
- Warehouse Worker: no additional attributes
- Service Employee: no additional attributes

8. Shopping Cart (Weak entity)
   (a) Customer ID,Product ID: Primary Key
   (b) Customer ID: Foreign Key (references Customer)
   (c) Product ID: Foreign Key (references Product)
   (d) Quantity
   (e) Total cost: Derived attribute

2.2 Relations

1. Supplies: between vendor and product
   (a) Vendor ID, Product ID: Primary Key
   (b) Vendor ID: Foreign Key (references Vendor)
   (c) Product ID: Foreign Key (references Product)
   (d) Quantity: attribute
2. Includes: between product and order to show which order contained what products
   (a) Order ID, Product ID: Primary Key
   (b) Order ID: Foreign Key (references Order)
   (c) Product ID: Foreign Key (references Product)
   (d) Quantity: attribute
3. Stores: between warehouse and product to show which warehouse contains what products.

   (a) Warehouse ID, Product ID: Primary Key
   (b) Warehouse ID: Foreign Key (references Warehouse)
   (c) Product ID: Foreign Key (references Product)
   (d) Stocks: attribute

4. Delivery: Quarternary relation between warehouse, order, delivery partner and customer to represent delivery.
   (a) Order ID: Primary Key
   (b) Order ID: Foreign Key (references Order)
   (c) Employee ID: Foreign Key (references Employee)
   (d) Customer ID: Foreign Key (references Customer)
   (e) Warehouse ID: Foreign Key (references Warehouse)

5. Transaction: Relation between customer and their cart, order and coupon code.
   (a) Order ID: Primary Key
   (b) Customer ID: Foreign Key (references Customer)
   (c) Payment Method
   (d) Transaction Status
   (e) Transaction Time
   (f) Coupon Code: Foreign Key (references Coupon)

6. Complains: between service employees (specialisation), customer and order to indicate a dispute.
   (a) Complaint Number: Primary Key
   (b) Customer ID: Foreign Key (references Customer)
   (c) Order ID: Foreign Key (references Order)
   (d) Service Employee ID: Foreign Key (references Employee)

7. Works in: between Warehouse Worker and warehouse.
   (a) Employee ID, Warehouse ID: Primary key

8. Has: relation between customer and shopping cart (weak entity).

(a) Customer ID: Primary key

9. Contains: relation between shopping cart and product to indicate that shopping cart contains the item.

   (a) Quantity

   (b) Cost of items in the cart: Derived quantity.

Chapter 3

Relational Schema

The ER diagram was reduced by noting multiplicities and the following relation schema resulted.