CS4.301 : Data and Applications

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Project Phase-1

SuperMarket

DataBase Designed to Manage the Operations in a Supermarket

Team Details

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Introduction to the MiniWorld

The Mini-World is about Managing a Supermarket. It includes all the Operations and other Functionalities that take place in a Supermarket ranging from the backend Inventory Management to Display Management.

Purpose of the DataBase

The Purpose of the Database is to store Information about the following :

- Inventory of each Item being sold in the Supermarket
- The Best and Worst Selling Products along with their Profit Percentage
- Maintain the Overall Profit or Loss of the Supermarket
- Helps in Ordering the Inventory based on the Sales of Different Products
- Helps in Releasing Various Offers for the Customers based on the Product Sales

Users of the DataBase

There are Various kind of Users of the Database :

- The Supermarket Owner sees the Overall Profit Earned by the Supermarket on a Daily Basis.
- The Store Manager manages the Product Sales and Orders more Inventory Accordingly.
- The Inventory Manager manages the Inventory of each Product and Updates them as Products Sell Out.
- The Customers of the Supermarket view the Various Schemes and Discounts being offered by the Supermarket on various Products.

Applications of the DataBase

- The Database stores Information about the Profit and Loss on a Daily Basis.
- The Database maintains Information regarding Product Sales.
- The Database stores Information about the Inventory of Each Product.
- The Database maintains the Ongoing Discounts and Schemes on Various Products being offered by the Supermarket.
- The Database can be used to Analyse the Sales of a Particular Product to Efficiently Display the Products on the Shelves.
- The Database also helps to Analyse the Product Inventory and Order More Products Accordingly.

DataBase Requirements

A. Strong Entity Types :

- **Product :**
    1. Product Name [VARCHAR(60) NOT NULL]
    2. Product ID [INT NOT NULL UNIQUE] **(Primary Key)**
    3. Manufacturing Date [DATE NOT NULL]
    4. Expiry Date [DATE NOT NULL]
    5. Maximum Retail Price [FLOAT NOT NULL]
    6. Cost Price [FLOAT NOT NULL]

7. Selling Price [FLOAT NOT NULL] **(Derived Attribute from MRP and Discount) (Default Value : MRP)**
8. Discount [FLOAT] **(Default Value : 0%)**
9. Quantity Available in Stock [INT NOT NULL]
10. Profit [FLOAT] **(Derived Attribute from Cost Price and Selling Price)**
11. Date of Last Ordering from the Supplier [DATE NOT NULL]
12. Amount Last Ordered from Supplier [INT NOT NULL]

- **Category :**
  1. Category Name [VARCHAR(60) NOT NULL UNIQUE] **(Primary Key)**
  2. Location [VARCHAR(60) NOT NULL] **(Multivalued Attribute) (Comma Separated)**
  3. Average Gross Margin [FLOAT] **(Derived Attribute from Profit of Products in the Same Category)**
  4. Hero Product [VARCHAR (60)] **(Derived Attribute from the Best Profit and Best Overall Sales of Each Product in the Same Category)**
- **Department :**
  1. Department Name [VARCHAR(60) NOT NULL UNIQUE] **(Primary Key)**
  2. Department Head Employee ID [INT NOT NULL UNIQUE] **(Second Primary Key)**
  3. Number of Employees [INT NOT NULL]
- **Employee :**
  1. Employee Name [VARCHAR (60) NOT NULL] **(Composite : First Name + Last Name)**
  2. Employee ID [INT NOT NULL UNIQUE] **(Primary Key)**
  3. Employee Dept [VARCHAR (60) NOT NULL]
  4. Phone Number [INT NOT NULL UNIQUE] **(Multivalued Attribute) (Comma Separated)**
  5. Salary [FLOAT NOT NULL]
  6. Date of Joining [DATE NOT NULL]
- **Customer :**
  1. Customer Name [VARCHAR (60) NOT NULL] **(Composite : First Name + Last Name)**
  2. Customer ID [INT NOT NULL UNIQUE] **(Primary Key)**
  3. Value Points Earned by the Customer [INT]
  4. Phone Number [INT NOT NULL UNIQUE] **(Multivalued Attribute) (Comma Separated)**

B. Weak Entity Types :

- **Cart :**
  1. Products [VARCHAR (200) NOT NULL] **(Multivalued Attribute) (Comma Separated)**
  2. Quantities of Each Product Sold [VARCHAR (200) NOT NULL] **(Multivalued Attribute) (Comma Separated)**
  3. Payment Method [VARCHAR (100) NOT NULL]
  4. Customer Name [VARCHAR(60) NOT NULL] **(Composite : First Name + Last Name) (Partial Key)**
- **Sales :**
  1. Product Name [VARCHAR (60) NOT NULL] **(Partial Key)**
  2. Total LifeTime Sales [INT NOT NULL]
- **Promotion :**
  1. Product Name [VARCHAR (60) NOT NULL] **(Partial Key)**

2. Start Date [DATE NOT NULL]
3. End date [DATE NOT NULL]
4. How many Availed the Offer [INT]
5. Promo Name [VARCHAR (60) NOT NULL]
6. Festival Offer [BOOL]
7. Discount Percentage [FLOAT NOT NULL]

Relationship Types

- **Belongs to :**
  - Quaternary (4th degree relationship)
  - Relationship between Product , Cart , Promotion and Category
  - Cardinality ratio - **N : P : M : 1**
  - (Min , Max) ratio - **(1,N) : (0,P) : (0,M) : (1,1)**
  - Partial participation
- **Works for :**
  - Binary Relationship
  - Relationship between Employee and Department
  - Cardinality ratio - **N : 1**
  - (Min , Max) ratio - **(1,N) : (1,1)**
  - Total participation : Each Employee Works For some Department
- **Manages :**
  - Binary Relationship
  - Relationship between Department and Employee
  - Cardinality ratio - **1 : 1**
  - (Min , Max) ratio - **(1,1) : (1,1)**
  - Total participation : Each Department is Managed by some Employee
- **Total Sales :**
  - Binary Relationship tells us the Total Sales of a Particular Product
  - Relationship between Product and Sales
  - Cardinality ratio - **1 : 1**
  - (Min , Max) ratio - **(1,1) : (1,1)**
- **Supervises (Relationship Type with Same Participating Entity in Distinct Roles) :**
  - Binary Relationship
  - Self relationship on Employee. One Employee Supervises the Other Employees
  - Cardinality - **N : 1**
  - (Min , Max) ratio - **(0,N) : (0,1)**
  - Partial participation : Not every Employee has a Supervisor
- **Owns :**
  - Binary Relationship
  - Relationship between Customer and Cart
  - Cardinality - **1 : N**
  - (Min , Max) ratio - **(0,1) : (1,N)**

Functional Requirements

Modifications :

1. **Insert:**
   - Add Customer Details
   - Add Product Details
   - Add Employee Details
   - Add a New Category of Product
   - Add a New Department for Employees
   - Add a New Promo Codes Details
   - Add a New Cart Details
2. **Update :**
   - Update Promotion of Products according to Festive Season
   - Update Stock of Products after Every Purchase
   - Update Discount on a Product and Consequently the Selling Price and Profit of the Product
   - Update Mobile Number of a Customer or an Employee
   - Update Hero Product in a Category
3. **Delete :**
   - Delete Promotions that have Expired
   - Delete Discount on a Product
   - Delete Product Details
   - Delete Employee Details

Retrievals :

1. **Selection:**
   - Select Promotion Code for a Product if it is Valid
   - Select Products of a Category and Employees of a Department
   - Select all Product with Discount
   - Select Highest Selling Product
2. **Projection:**
   - "Query Name of all the products with discount more than 50% ”
   - "Query Name of category with average gross margin above 15% ”
3. **Aggregate:**
   - Various functions like AVERAGE GROSS MARGIN ,PROMOTION, DISCOUNT , MAX SALE AND MIN SALE can be implemented.
   - Example : “Find the Minimum sale category/product“
4. **Search:**
   - Search for Specific Products in Categories.
   - For example: Searching for Products having Same Discount Percentage.
   - Search for Product Name that have "Hajmola" in them.
5. **Analysis:**
   - **Frequency of Reordering of a Product from the Supplier :** Based on the Date of Last Ordering , Current Stock in the Inventory and Product Sales we find out the Frequency at which we should Reorder the Product from he Suppliers.

- **Redeem and Update of Value Points of a Customer :** Calculate the Total Value Points associated with Each Purchase of the Customer and Correspondingly Update them for Each of the Customer. Redeem the Value Points of the Customer if he/she wishes for the Particular Bill Amount.
- **Discount Percentage in Relation with the Expiration Date :** Update the Discount Percentage for the Product based on the Current and the Expiration Date. As the Expiration Dates gets near and the Product Inventory remain High the Product Discount Increases such that it doesn't increase our Profit Margins.

Summary

Our Database comprises of Various Entities and Relationships among them. We have tried to encompass all Known Type of Relationship Types and Entity Types (Strong and Weak Entity Types). We have also tried to include various types of Attributes like Single Valued , Multi-valued , Composite , Derived , etc. We have included various Operations for Updation , Deletion , etc. to be performed on our Database. We have also included the Analysis which Includes various Complex Operations which help in Managing the Real Life Situations which can be Encountered in a Supermarket Database.