

Principles of Data Management

Phase 1

Andrew Hamrick

Daniyal Iqbal

Oscar Lowry

Qasim Ali

February 24, 2018

1 Design

Our database was designed with a Retail environment in mind. The choices for entities and relations were made by considering what retail employees and stores would likely need to check or keep track of. The retail environment envisioned focuses on electronic devices. Currently our design supports Computers and TVs but can easily be expanded to other product types. We decided to focus on computers and TVs as that is an area of expertise for us.

Our database centers around the product entity as that is largely seen as the most important component of a retail environment. The other entities were chosen to track the flow of money in and out of the stores, or to support the product. Support for the products includes keeping track of current inventory, acquiring more of the product, and categorizing the product into product types.

2 ER Diagram

The Product entity is a major entity in our database. It has a relation with almost every entity. This makes sense for a retail database as retailers are generally focused on the products they sell. The major products sold at our establishment are TVs, Laptops, and Desktop computers. Our product types are Screen and Computer as those make up the two major groups of our products. These subgroups inherit identical attributes from parent entities. TV obviously inherits from Screen. As the screen is a major component of a laptop, laptop also inherits from Screen. Desktop obviously inherits from Computer, however because a laptop is also a computer, it inherits from Computer in addition to Screen.

The Tables for our database are:

- Product(UPC, Description, Brand);
- Laptop(UPC, Battery_Life);
- Brand(Name, Trademark, Vendor);
- Order(ID, Date_placed, Date_arrived, Cost, Tracking_number, Vendor_name, UPC, Quantity);
- Transaction(ID, Date, Total, Payment_Method, Customer_ID, Store_ID);
- Bought_Products(Product_UPC, Transaction_ID, Quantity, Price);
- Store(ID, Phone Number, Date Opened, Address);
- Stock(Store_ID, UPC, Inventory, Listed_Price);
- Desktop(UPC, Power Supply, Graphics Card);
- Computer(UPC, Ram Size, Processor, Hard Disk);
- TV(UPC, Smart Features, Mount Type);
- Screen(UPC, Size, Resolution, PPI, Panel Type);
- Customer(ID, Name, Email Address, Date Joined, Phone_Number_1, Phone_Number_2);
- Vendor(Name, Phone, Website);

2.1 Product

Product contains the attributes UPC and Description. UPC is a unique identifier to identify the product in the database. Description is a short description of the product for customer and employee benefit. All other attributes associated with a product specified by that products subtype. Our subtypes are Screen and Computer.

2.2 Screen

Screen was chosen as a product type due to our focus on electronics. A large number of electronics these days feature a screen. In addition, the screen is a major consideration in the purchase of an electronic device. Currently, the two product types that inherit from Screen are Laptops and TVs.

2.3 TV

TVs are one of the types of products represented by our database. There are few features of a TV that are considered apart from the screen. Two important aspects of a TV are any smart features it has, and the mount type available (e.g. Wall mounted, stand mount, etc.).

2.4 Computer

Computers are the other major section of the products represented by our database. Computers main common attributes among all types of computers are RAM size, the processor, and the Hard Drive size.

2.5 Laptop

Laptop inherits from both Computer and Screen because it fits well in both categories. All important parts of a Laptop are covered in either Screen or Computer, except for Battery Life.

2.6 Desktop

A desktop computer is just the tower. It does not include a keyboard, a mouse, or a monitor, therefore it does not inherit from Screen. Attributes that apply to desktops that don't apply to other computers (Laptops) are the Power Supply, and the Graphics Card.

2.7 Brand

Brand is an alternate way to group products together. The major aspects of Brand is the Name and the Trademark. While it is technically possible for two brands to have the same name, it is not possible for two brands to have the same Trademark. Trademark is included to prevent brand conflicts.

2.8 Vendor

A vendor represents a company that our stores purchase products from to sell to consumers. A vendor is represented by their company name, their phone number, and their website.

2.9 Order

Order represents an order placed by an employee to resupply a stores stock. The Order consists of a unique ID, the date it was placed, the date it arrived, the total cost of the order, the tracking number for the shipment, the vendor name, a UPC, and the quantity. The quantity and UPC are used to keep track of how many of each product was ordered. The vendor name is used to link the order with the vendor.

2.10 Bought_Products

A table was needed to handle the relation between Transaction and Product as multiple of the same product could be purchased in one transaction. Price also needed to be tracked as prices of a particular product change at different stores.

2.11 Store

Our database may need to track information about multiple stores. A store is represented by a unique ID, the store's phone number, the date the store opened, and the store's address.

2.12 Stock

A table is needed to manage interactions between Stores and Products. A store will sell multiple products, and a product may be stored at multiple stores. Stores will have varying inventory of a certain product, and may also vary the products type. Stock is represented by a store's unique ID, the UPC of a product, how much of that product is currently in the store, and the price the store is selling the product for.

2.13 Customer

Our stores offer a customer loyalty program. This allows customers to be tied to the purchases they make. A customer is represented by a unique ID, their name, their email address, the date they joined the program, and their phone number(s).

2.14 Transaction

A transaction consists of a unique ID, the date it was placed, the payment total, the method of payment (e.g. Credit Card, Debit Card, Cash, etc.), a customer ID (e.g. phone number, etc.), and the store ID. A transaction can be tied to a customer for the loyalty program. A transaction will not be tied to a customer if the customer is not a part of the loyalty program. Due to the loyalty program it is likely a customer will be tied to multiple transactions, but a single transaction will only be tied to a single customer.

3 Test Data

Our test data was generated to fit the tables made from our ER diagram. The data was mostly generated through a random data generator (<https://www.mockaroo.com/>) and manual construction. Data that was independent of other data (such as stores and customers) was generated by the random data generator. The rest of the data was generated manually and/or through the random data generator to maintain consistency across different tables.

4 User Interface

Our user interface is a command line application using straight forward commands. The current commands are as follows.

- Add: customer, transaction, store, product, order, vendor, brand

Examples:

- Add customer name="John Smith" email=john@gmail.com phone=5855551234
- Add transaction customer=123 product "Sony TV 52" 2

- Update: store, stock, price, customer

Examples:

- Update store 123 phone 1235557890
- Update product "Dell Laptop 15" price=1000 store=123

- Lowest Inventory:
 - Product
 - Number of low inventory products to show
 - Sort field: inventory number, expected days until out of stock
 - Search field: stores

Examples:

- Low 50 products store=123
- Low 5 days store=all

- Top/Bot: Number of top or bottom records
 - Search term: products, product type, stores, brand, vendor
 - Sort field: revenue, total items sold
 - Criteria: product type, month/year, store

Examples:

- Top 5 stores items year=2017
- Bot 10 computers revenue store=12
- Top 1 brand items product=computer
- Top 5 products revenue

- Compare:
 - Comparison of: store, state
 - Comparison term: brands, products, vendors
 - Comparison field: revenue, items sold

Examples:

- Compare stores products laptops computers revenue
- Compare states brands Dell HP items

- Track: Show items commonly bought together
 - Number of records to show
 - Products, product type

Examples:

- Track 2 Desktop
- Track 10 “LG TV 72”