Walmart: Instore Inventory Management System

Changes:
The changes we made to the P2 ERD to account for professor's feedback are:

1. What is Product ID in Brand and Category?
   A: Product ID in Brand and Category is redundant so we removed the attribute.
2. Brand and Product relationship is many to many? How?
   A: We assumed the product to be one kind of a generic product so we used a many to many relation. But after discussion we concluded that it is better if the product represents a specific item which can be identified by its unique barcode. So, we modified the relationship to mandatory one to optional many from Brand to Product. As we changed the definition of the product all the corresponding many to many relations are also converted to the one to many relations from Shipment, Transaction, Category to Product.
3. How do you know which product exists in each store? Relationship is missing
   A: In the earlier diagram the product is connected to store through store entity but we missed to show it in the diagram. So, we added a one to many relation from store to categories. Now we can identify all the products in a store by getting all the category IDs with a specific store ID and getting all the products with those category IDs and further filtering the ones which are not sold.
4. Where are the shipments going to?
   A: The shipments had Transit locations attributes with all the locations. To make it single values and also to show it clearly we changed the attribute to destination and added a one to many relation from store to shipment which is foreign key mapped to the store Id letting us know where it's headed.

The additional changes we made to the above mentioned points are we removed foreign keys in places where they are not necessary. The existing entities are already in normalized form so we didn't have to add additional entities.

- We changed the definition of the department entity such that it should be a part of the store and employees working in a store come under any one of those departments.
- The relationship between supervisor and employer is changes from mandatory one to optional many to optional one to optional many as few employee don't have supervisors.
- Quantity sold associative entity is removed as the relation is changed from many to many to one to many so there is no need for a associative entity.

Updated Design Document:

The Entities in our system are

- Customer
- Employee
- Department
- Store
- Transaction
- Product
- Category
- Brand
- Shipment
- Supplier

Store, Department, Employee Relationship

- A store must have at least one department.
- Departments may include:
    - Cashier department
    - Customer Service department
    - Maintenance department
    - Quality control department
    - Electronics department
    - IT support department
    - Salon department
    - Tire department
    - Pharmacy department
    - Home improvement department
    - Hardware department
    - Beauty Department
    - Meat department
    - Bakery department
    - Jewelry department
    - Clothing department
    - Security department
    - Vision department
- A department must have at least one employee working for it.
- An employee must be associated with only one department.
- A store employee may supervise one or more employees of the same store.
- A store employee must be supervised by not more than one employee of the same store.

Store, Customer Relationship

- A store may have zero, one or more customers.

- A customer may purchase products from 1 or more stores.
    - A customer must be associated with at least 1 store.
- A particular transaction is associated with only one customer and one store.

Product, Transaction Relationship

- A product may or may not be involved in one particular transaction.
- A transaction must have at least one product but can have many products as well.
- An attribute of this relationship is the quantity of products that is sold to the customer.
- A transaction may be carried out using several payment methods such as cash, card, store credit, check, EBT, and money order.

Product, Brand Relationship

- A product must be associated with at least one brand but can be associated with many. For example, there might be different brands of milk (product).
- A brand must be associated with at least one product but it can also be associated with many products. For example, Johnson and Johnson (brand) might sell baby oil (product), baby lotion (product), band-aid (product) and several other products.

Product, Category Relationship

- A product must belong to one item category. For example, tomatoes (product) belong to fresh produce (category)
- A category must have at least one product but it may have any number of products.
- Categories can be further classified into various types such as perishables and non-perishables.

Product, Supplier Relationship

- A product must have at least one supplier but it can have many suppliers as well. For example, T-shirts (product) might be sold by different suppliers.
- A supplier must provide at least a product to the company, but it can certainly supply many products.
- A shipment (associative entity) is an attribute of the Supplier, Product relationship. Every shipment is associated with exactly one supplier and one or more products.
- A shipment may take place by different modes such as road, rail, maritime or air depending on the inventory need.

Foreign Key of Transaction

- For a transaction, we need to record the information of the Customer, the Store and the Product in it.
- The Product is the target of this transaction The Customer indicates who wants the product. The Store indicates where products are stored in.

Foreign Key of Product

- For a product, we need to record the information of the Brand, the Store, the Category, the Supplier and the Authorization.
- The Brand is to record where the product comes from. The Store indicates where products are stored in. The Category indicates which type the product belongs to. The Supplier record who supplied the product. The Authorization indicates transactions of this product had belonged to.

Shipment and its Foreign Keys

- Shipment has a primary key and it is related to product and supplier with foreign keys product serial number and supplier ID
- In addition to that it has the attributes of the ordered date, estimated delivery date, actual delivery date, volume, origin location, transit locations, distance, point of contact, shipment mode.
- The supplier ID gives the details of the supplier and a shipment can only have one supplier as each supplier ships only their products.
- The relation between shipment and product is many to many as the shipment can contain different products and same product can obtained from different suppliers and hence different shipments

Employee and its relations

- Employees have the attributes name, ssn, date of birth, home address, cell phone number, email id, last clock in time, last clock out time, designation.
- They may or may not have a single supervisor who can be obtained by the foreign key supervisor ID which refers to the employee ID of the supervisor. This is shown by the relation to itself in the diagram.