

[3] Firstly we talk about Database Design.

(ER Diagram Part)

[4] We consider four main needs of supermarkets and use four subsystems to construct our database, which includes product management system, product supply system, product sales system, and employee management system.

[5] This is the ER diagram for our design. We will discuss the four parts separately.

(Product management system)

[6] The product management system includes products, products variants, product management records and variant discounts. The relation schema is shown here, where the blue attributes with prefix pk are the primary keys, and the green attributes with prefix fk are the foreign keys referencing to the tables with color red.

[7] The product variants table is a weak entity and the product table is the identifying entity, we consider that each product has variants of different styles, product information is stored in the products table, and variant information is stored in product variants. For example, the product name can be organic red apples, and the variant name can be organic red apples bracket bag of 10, or single. They are the same products but different variants. And the product is counted or bought in unit variant.

[8] Then here is the product management records which stores the changing information of the warehouse and the shelf. And the variant discounts stores the discount information of each kind of variant.

(Product Supply System)

[9] The product supply system stores the information of supplying, in addition with the suppliers and the supplier contacts.

[10] Since one supplier records can be uniquely determined by a supplier, there is a foreign key to the supplier table. And since one supplier can have more than one contacts, we use an extra table to store the contacts information, and use a foreign key referencing to the supplier.

(Product Sales System)

[11] Next is the product sales system, including the transaction records, transaction details, customers, and the reduction promotions.

[12] The transaction details table is a weak entity depending on the transaction records table, where the pk_transaction_id is the foreign key referencing to the transaction records table. In transaction records, we store the transaction id and total amount, but in transaction details, we store the information that in each transaction, which and how many product variants is bought. For example, here this number add this number should be equal to the total number.

(Employee Management System)

[13] Last is the employee management system. It stores the information of employees.

(Analysis Part)

[14] Now we introduce the dependencies in our database. In our design, all the tables have only one primary key and no other candidate keys. We can guarantee that there is no transitive dependency or partial dependency. Therefore, all tables are at least in Third Normal Form. Take the transaction details as the example, here it only has the primary key composition (transaction_id, transaction_details_id), so that it is in 3NF. All the other tables are similar to the form of this table, hence omitted here. This shows that our database has a good design.