

Database Design

Database Design

- Database Design is a collection of processes that facilitate the designing, development, implementation and maintenance of enterprise data management systems.
- Properly designed database are easy to maintain, improves data consistency and are cost effective in terms of disk storage space.
- The database designer decides how the data elements correlate and what data must be stored.
- The main objectives of database design in DBMS are to produce logical and physical designs models of the proposed database system.

Database Design

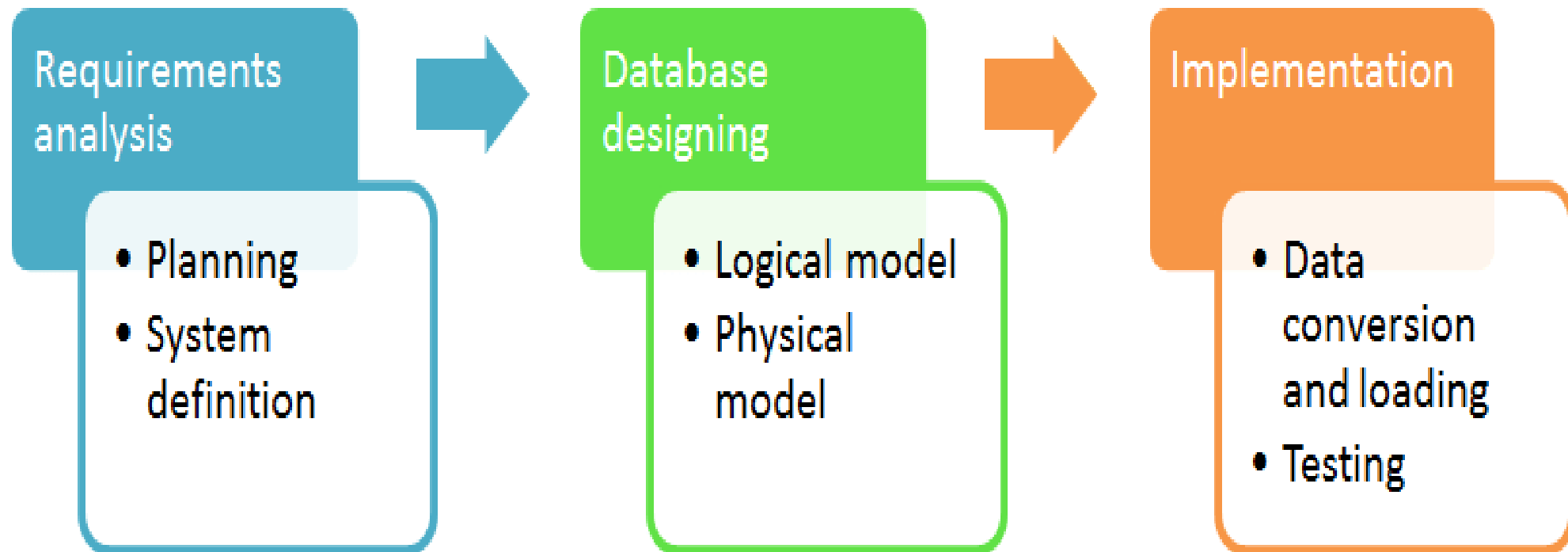
- The logical model concentrates on the data requirements and the data to be stored independent of physical considerations.
- It does not concern itself with how the data will be stored or where it will be stored physically.
- The physical data design model involves translating the logical DB design of the database onto physical media using hardware resources and software systems such as database management systems (DBMS).

Why is Database Design important?

It helps produce database systems

- That meet the requirements of the users
- Have high performance.
- Database design process in DBMS is crucial for high performance database system.
- Note, the genius of a database is in its design.
- Data operations using SQL is relatively simple

Database development life cycle



Database development life cycle

- The database development life cycle has a number of stages that are followed when developing database systems.
- The steps in the development life cycle do not necessarily have to be followed religiously in a sequential manner.
- On small database systems, the process of database design is usually very simple and does not involve a lot of steps.
- In order to fully appreciate the above diagram, let's look at the individual components listed in each step for overview of design process in DBMS.

Steps:

1.Requirements analysis

- **Planning** – This stages of database design concepts are concerned with planning of entire Database Development Life Cycle. It takes into consideration the Information Systems strategy of the organization.
- **System definition** – This stage defines the scope and boundaries of the proposed database system.

2.Database designing

- **Logical model** – This stage is concerned with developing a database model based on requirements. The entire design is on paper without any physical implementations or specific DBMS considerations.
- **Physical model** – This stage implements the logical model of the database taking into account the DBMS and physical implementation factors.

Steps:

3.Implementation

- **Data conversion and loading** – this stage of relational databases design is concerned with importing and converting data from the old system into the new database.
- **Testing** – this stage is concerned with the identification of errors in the newly implemented system. It checks the database against requirement specifications.

Two Types of Database Techniques

- **Normalization**
- **ER Modeling**

Database Design Process

- The process of designing a database carries various conceptual approaches that are needed to be kept in mind. An ideal and well-structured database design must be able to:
- Save disk space by eliminating redundant data.
- Maintains data integrity and accuracy.
- Provides data access in useful ways.
- Comparing Logical and Physical data models.

Logical

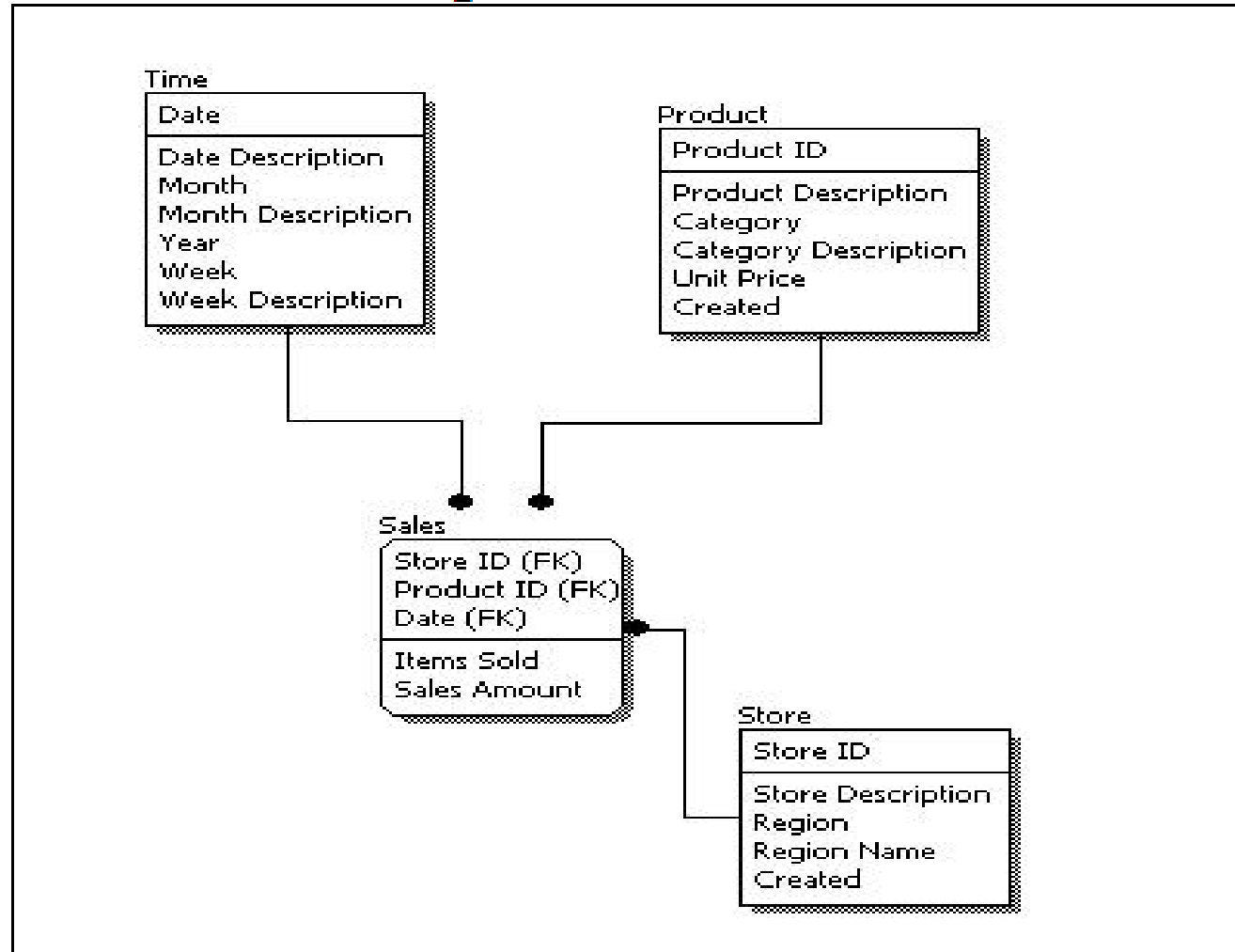
- A logical data model generally describes the data in as many details as possible, without having to be concerned about the physical implementations in the database. Features of logical data model might include:
- All the entities and relationships amongst them.
- Each entity has well-specified attributes.
- The primary key for each entity is specified.
- Foreign keys which are used to identify a relationship between different entities are specified.
- Normalization occurs at this level.

A logical model can be designed using the following approach:

- Specify all the entities with primary keys.
- Specify concurrent relationships between different entities.
- Figure out each entity attributes
- Resolve many-to-many relationships.
- Carry out the process of normalization.

To understand these points, see the image below to get a clear picture.

Logical Data Model



Physical

- A Physical data model generally represents how the approach or concept of designing the database. The main purpose of the physical data model is to show all the **structures** of the table including the **column name, column data type, constraints, keys(primary and foreign)**, and the relationship among tables. The following are the features of a physical data model:
- Specifies all the columns and tables.
- Specifies foreign keys that usually define the relationship between tables.
- Since the physical consideration is taken into account so there will straightforward reasons for difference than a logical model.
- Physical models might be different for different RDBMS. For example, the data type column may be different in MySQL and SQL Server.

While designing a physical data model, the following points should be taken into consideration:

- Convert the entities into tables.
- Convert the defined relationships into foreign keys.
- Convert the data attributes into columns.
- Modify the data model constraints based on physical requirements.

Physical Data Model

