Mater Dei College
Tubigon, Bohol
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CC 202 – IM 1 (INFORMATION MANAGEMENT 1)

Topic 6 | Entity Relationship Diagram, Primary Key, Foreign Key

Every table in a database must be accessible. As values are stores at row-column intersections in tables. It's clear that a values location refers to a table, column, and row. You can identify a table or column by its unique name. Rows are unnamed and require a different identification mechanism called a primary key.

Primary Key is:

1. ***Required*** - every table must have at least one primary key. Remember that the relational model views a table as an unordered set of rows. Because there is no concept of a "next" or "previous" row, you can't identify rows by position. Without a primary key, some data would be inaccessible.
2. ***Unique*** - because a primary key identifies a single row in a table, no two rows in a table can have the same primary key value.
3. ***Simple or composite*** - a primary key comprises one or more columns in a table; a one-column key is called a simple-key, and a multi column key is called a composite key. Database designers prefer simple keys to composite keys.
4. ***Not null*** - a primary key value can't be empty. For composite keys, no column's value can be empty.
5. ***Stable*** - Once created, primary key value seldom change.
6. ***Not reusable*** - if you delete a row, you can't assign its primary-key value to a new row.
7. ***Minimal*** - a primary key includes only the column(s) necessary for uniqueness.

Foreign Keys

Information about different entity types is stores in different tables, so you must have a way to navigate between tables. The relational model provides a mechanism called a ***foreign key*** to associate two tables. This constraint identifies any column referencing the primary key in another table. It establishes a relationship between two columns in the same table or between different tables. For a column to be defined as a foreign key, it should be defined as a primary key in the table which it is referencing. One or more columns can be defined as foreign as foreign key.

Characteristics of a Foreign Key or Referential Integrity:

- it's a column or group of columns in a table whose values relate to, or reference, values in some other table.
- it ensures that rows in one table have corresponding rows in another table.
- the table that contains the foreign key is the referencing or child table. The other table is the referenced or parent table. Value in a foreign key column can be null.
- it establishes a direct relationship to the parent table's primary key, so foreign key values are restricted to parent key value that are exist. This constraint is called referential integrity.
- Integrity constraint is used to apply business rules for the database tables.
- the values in the foreign key have the same domains as the parent key
- may have a different column name than its parent key
- Foreign key values generally aren't unique in their own table.

Relationships

A relationship works by matching data in key fields - usually a field with the same name in both tables. In most cases, these matching fields are the primary key from one table, which provides a unique identifier for each record, and a foreign key in the other table. A foreign key (FK) is a column or combination of columns used to establish and enforce a link between the data in two tables. A link is created between two tables by adding the column or columns that hold one table's primary key values to the other table. This column becomes a foreign key in the second table.

Although the primary purpose of a foreign key is to control the data that can be stored in the foreign key table, it also controls changes to data in the primary key table. The constraint enforces referential integrity by ensuring that changes cannot be made to data in the primary key table if those changes invalidate the link to data in the foreign key table. If an attempt is made to delete the row in a primary key table or to change a primary key value, the action will fail if the deleted or changed primary key value corresponds to a value in the foreign key of another table.

To change or delete a row in a foreign key constraint successfully, you must first either delete the foreign key data in the foreign key table or change the foreign key data in the foreign key table, thereby linking the foreign key to different primary key data.

- **One-to-one relationships** occur when there is exactly one record in TableA that corresponds to exactly one record in TableB.
- **One-to-many relationships** occur when each record in TableA may have many linked records in TableB but each record in TableB may have only one corresponding record in TableA.
- **Many-to-many relationships** occur when each record in TableA may have many linked records in TableB and vice-versa.

Let's just think a scenario and determine the types of relationships necessary for our situation. We'll need to create the following relationships:

- A one-to-many relationship between the CustomerID in the Customers table and the CustomerID in the Orders table. This relationship indicates that each customer may be associated with multiple orders, but each order may only be associated with one customer.

- A one-to-many relationship between the OrderID in the Orders table and the OrderID in the OrderedItems table. This relationship indicates that each order may contain multiple items, but each OrderedItem record may only correspond to a single order.
- A one-to-many relationship between the ItemID in the Items table and the ItemID in the Ordered Items table. This relationship indicates that each item ordered corresponds to a single inventory record, but each item in inventory may be associated with many orders.

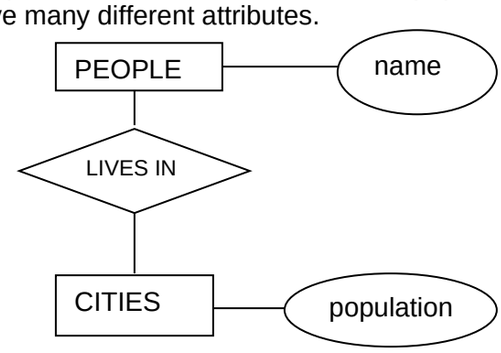
ENTITY-RELATIONSHIP DIAGRAM

An entity-relationship (ER) diagram is a specialized graphic that illustrates the interrelationships between entities in a database and the logical structure of a database. ER diagrams often use symbols to represent three different types of information. Boxes are commonly used to represent entities. Diamonds are normally used to represent relationships and ovals are used to represent attributes.

Also Known As: ER Diagram, E-R Diagram, entity-relationship model

Example

Consider the example of a database that contains information on the residents of a city. The ER diagram shown in the image above contains two entities -- people and cities. There is a single "Lives In" relationship. In our example, due to space constraints, there is only one attribute associated with each entity. People have names and cities have populations. In a real-world example, each one of these would likely have many different attributes.



Entity Relationship Diagram Notations

Peter Chen developed ERDs in 1976. Since then Charles Bachman and James Martin have added some sligh refinements to the basic ERD principles.

Entity

An entity is an object or concept about which you want to store information.

Weak Entity

A weak entity is an entity that must defined by a foreign key relationship with another entity as it cannot be uniquely identified by its own attributes alone.

Key attribute

A key attribute is the unique, distinguishing characteristic of the entity. For example, an employee's social security number might be the employee's key attribute.

Multivalued attribute

A multivalued attribute can have more than one value. For example, an employee entity can have multiple skill values.

Derived attribute

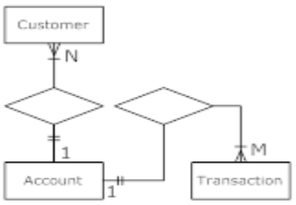
A derived attribute is based on another attribute. For example, an employee's monthly salary is based on the employee's annual salary.

Relationships

Relationships illustrate how two entities share information in the database structure.

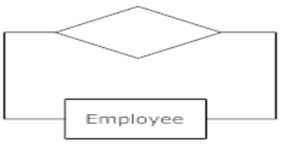
Cardinality

Cardinality specifies how many instances of an entity relate to one instance of another entity.
Ordinality is also closely linked to cardinality. While cardinality specifies the occurences of a relationship, ordinality describes the relationship as either mandatory or optional. In other words, cardinality specifies the maximum number of relationships and ordinality specifies the absolute minimum number of relationships.



Recursive relationship

In some cases, entities can be self-linked. For example, employees can supervise other employees.



Relational Model of Order Processing System (E.R. Codd)

INSTRUCTION:

1. Convert this model to E-R Diagram using the Peter Chen annotation.