

Normalization

- a process that involves the elimination of inappropriate functional dependencies in a relation
- it takes a relational schema through a series of tests to certify whether or not it belongs to a certain normal form
- functional dependency – denoted by $X \rightarrow Y$, is a relationship between attributes. The attribute Y is said to be functionally dependent on attribute X if the value of X determines the value of Y . (or if we know the value of X we will know the value of Y). Attribute X is called a determinant of attribute Y .

- EMPLOYEE (Employee_No, Name, Address, Date_Hired)
- Employee_No → Name, Address, Date_Hired

NORMAL FORMS

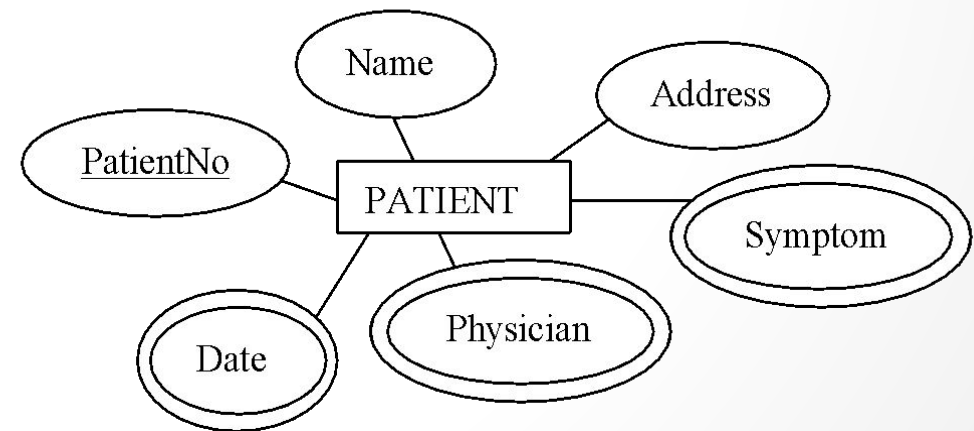
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- Dr. Edgar F. Codd, the originator of the relational model, proposed the three normal forms, which he called first, second and third

UNNORMALIZED FORM (UNF)

- The state prior to 1NF is called the Unnormalized Form (UNF).
- It is a table/relation that contains one or more repeating groups.
- A repeating group is an attribute or group of attributes within a table that occurs with multiple values (multivalued attributes) for a single occurrence of the nominated key attribute(s) for that table.

| Patient No.: 12345 | | |
|--|---------------------|-----------------|
| Patient Name: dela Cruz, Juan | | |
| Address: Dumaguete City, Negros Oriental | | |
| Date | Physician | Symptom |
| 07/15/08 | Dr. Pablo Reyes | Sore Eyes |
| 08/02/08 | Dr. Sebastian Cinco | Cough and Colds |
| 08/15/08 | Dr. Sebastian Cinco | Sore Throat |



First Normal Form (1NF)

- A relation in which the intersection of each row and column contains one and only one value
- It is considered to be part of the formal definition of a relation (disallowing multivalued attributes)
- To transform the UNF to 1NF, we need to identify and remove repeating groups within the table

DEPARTMENT

| Name | <u>DeptNo</u> | Location |
|----------------|---------------|----------------------------|
| Research | 5 | Alabang, Pampanga, Bulacan |
| Administration | 4 | Quezon City |
| Headquarters | 1 | Makati |

- Location is not allowed in 1NF because it is multivalued. To normalize, we break the relation into two relations:
- DEPARTMENT (Name, DeptNo)
- DEPT_LOCATIONS (DeptNo, Location)

SECOND NORMAL FORM (2NF)

- a relation is in 2NF if it is in 1NF and every non-key attribute is fully functionally dependent on the primary key
- a relation that is in 1NF will be in 2NF if any one of the following conditions apply:
 - the primary key consists of only one attribute
 - no non-key attribute exists in the relation (all attributes are keys)
 - every non-key attribute is functionally dependent on the full set of primary key attributes

- Example for No.1

EMPLOYEE (EmpNo, Name, Address, B_day, Age)

- Example for No.2

DEPT_LOCATIONS (DeptNo, Location)

- Example for No.3 (*does this example satisfy condition 3?*)

EMPLOYEE (EmpNo, Name, Department, Salary, Course,
Date_Completed)

THIRD NORMAL FORM

- a relation is in 3NF if it is in 2NF and no transitive dependencies exist
- transitive dependency is a functional dependency between two (or more) non-key attributes in a relation
- a functional dependency $X \rightarrow Y$ in a relation R is a transitive dependency if there is a set of attributes Z that is not a subset of any key of R , and both functional dependencies $X \rightarrow Z$ and $Z \rightarrow Y$ hold.

SALES (CustomerNo, Name, Salesperson)

SPERSON (Salesperson, Region)

- As a rule, to transform a relation in 3NF, we decompose the relation by separating the attributes that caused the transitive dependency to exist. Therefore, in the relation SALES, we removed the attributes Salesperson and Region, and grouped them together to compose a new relation. The attribute Salesperson was retained in the original relation and acts as a foreign key.

End of Presentation

References

- Modern Database Management, 6th Ed. By Jeffrey Hoffer, Mary Prescott and Fred McFadden
- Database Systems: A Practical Approach to Design, Implementation and Management by T. Connolly, et al.
- CMSC F: Database Management Systems (UPOU Manual)