

Ch6: Data Normalization

→ Normalization

The process of decomposing bad relations by breaking up their attributes into smaller relations (well-structured relations)

→ Well-structured relations

A relation that contains minimal data redundancy and allows users to insert, delete, and update rows without causing data inconsistencies.

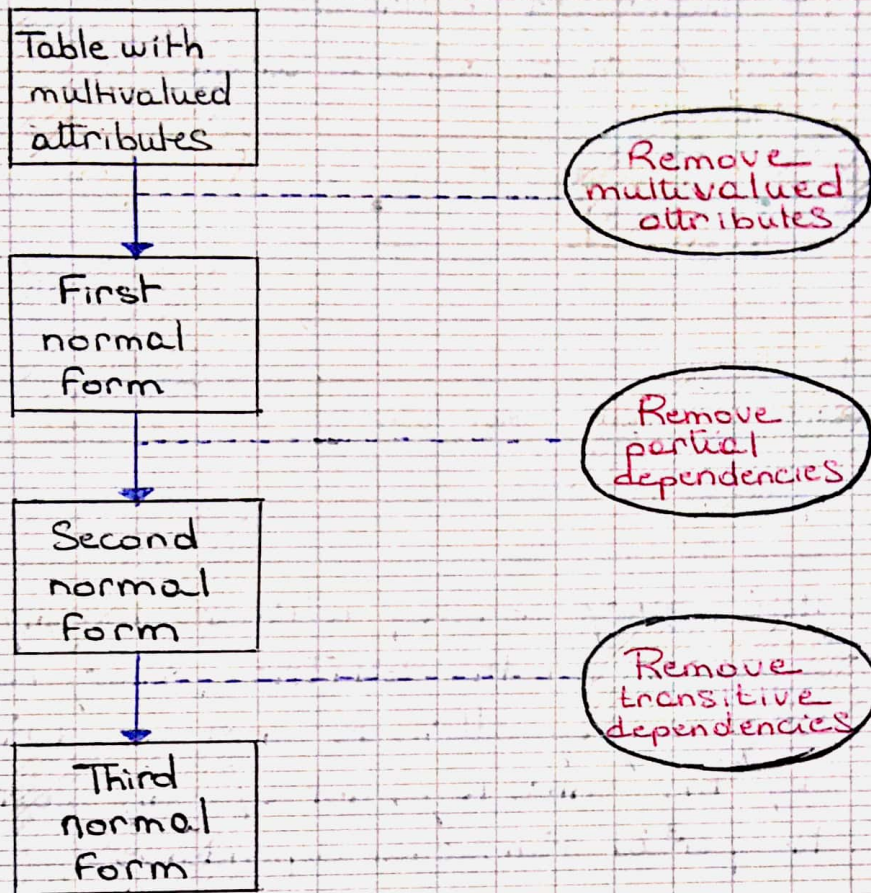
→ Goal is to avoid anomalies:

→ Insertion Anomaly: adding new rows forces user to create duplicate data.

→ Deletion Anomaly: deleting rows may cause a loss of data that would be needed for future rows

→ Modification Anomaly: Changing data in a row forces changes to other rows because of duplication.

→ Steps in normalization



→ Functional Dependencies

The value of one attribute (the determinant) determine the value of another attribute.

هي علاقة تربط بين Attribute وآخر في نفس الجدول
من خلال normalization سوف يجمع attributes التي يوجد
بينهم Functional Dependencies و نخرجهم في relation مفصلة.

→ First Normal Form

- No multivalued attributes
- Every attribute value is atomic

DEPARTMENT

Dname	Dnumber	Dmgr_ssn	Dlocation
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↑ multivalued attribute

Department

Dname	Dnumber	Dmgr_ssn
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Dept-locations

Dnumber	Dlocation
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→ Second Normal Form

- 1NF + every non-Key attribute is fully functionally dependent on the ENTIRE primary Key
- Every non-Key attribute must be defined by the entire Key, not by only part of the Key
- No partial functional dependencies.

<u>Stdno</u>	<u>Courseno</u>	Mark	Coursename	Stdname
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Full dependency (from Stdno, Courseno to Mark)

Partial dependency (from Stdno to Coursename)

Partial dependency (from Courseno to Stdname)

Std - Marks

<u>Stdno</u>	<u>Courseno</u>	Mark
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Full dependency (from Stdno, Courseno to Mark)

Student

<u>Stdno</u>	Stdname
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Full dependency (from Stdno to Stdname)

Course

<u>Courseno</u>	Course.name
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Full dependency (from Courseno to Course.name)

→ Third Normal Form

- 2NF + no transitive dependencies (Functional dependencies on non-primary-Key attribute)
- This is called transitive, because the primary Key is a determinant for another attribute which in turn is a determinant for a third (non-Key attribute dependant on another non-Key attr)
- Solution: Non-Key determinant with transitive dependencies go into a new table; non-Key determinant becomes primary Key in the new relation and stay as foreign Key in the old relation.

Customer_Order

<u>OrderID</u>	OrderDate	<u>Cust_ID</u>	Custname	Cust Address
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Transitive Dependency

ORDER

<u>OrderID</u>	OrderDate	<u>Cust_ID</u>
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Customer

<u>Cust ID</u>	Custname	Cust Address
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