Chapter 8

Methodology
Logical Database Design
Transparencies

Chapter 8 - Objectives

- **How to map a local conceptual model to a local logical data model.**
- **How to derive relations from a local logical data model.**
- **How to validate a logical data model using the technique of normalization and against the transactions it is required to support.**

Chapter 8 - Objectives

- **How to merge local logical data models based on specific user views into a global logical data model of the enterprise.**
- **How to ensure that the resultant global model is a true and accurate representation of the part of the enterprise we are attempting to model.**

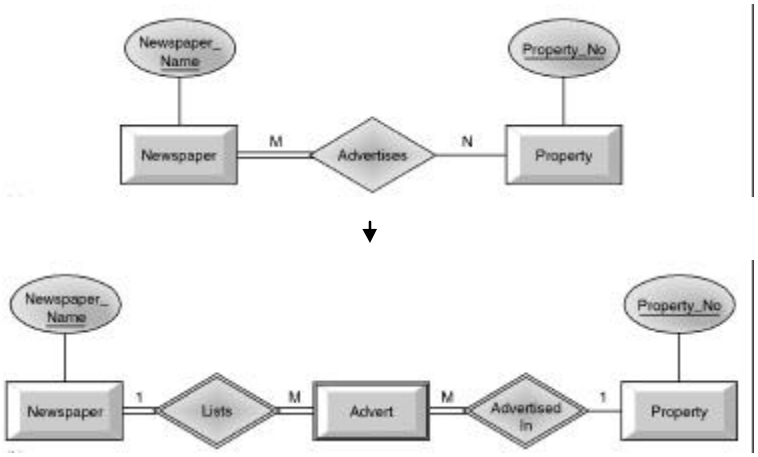
Step 2 Build and Validate Local Logical Data Model

- **Objective of this step is to build a logical data model based on the conceptual data model of the user's view of the enterprise and then to validate this model using the technique of normalization and against the required transactions.**

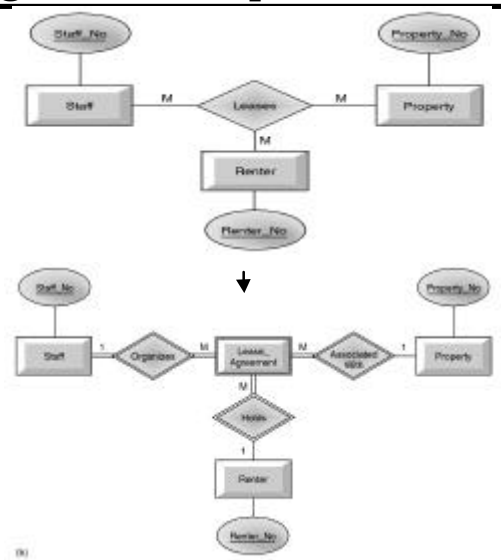
Step 2 Build and Validate Local Logical Data Model

- **Step 2.1 Map Local Conceptual Data Model to Local Logical Data Model**
  - **To refine the local conceptual data model to remove undesirable features and to map this model to a local logical data model. This involves:**
    - **(1) Remove M:N relationships.**
    - **(2) Remove complex relationships.**
    - **(3) Remove recursive relationships.**
    - **(4) Remove relationships with attributes.**
    - **(5) Remove multi-valued attributes.**
    - **(6) Re-examine 1:1 relationships.**
    - **(7) Remove redundant relationships.**

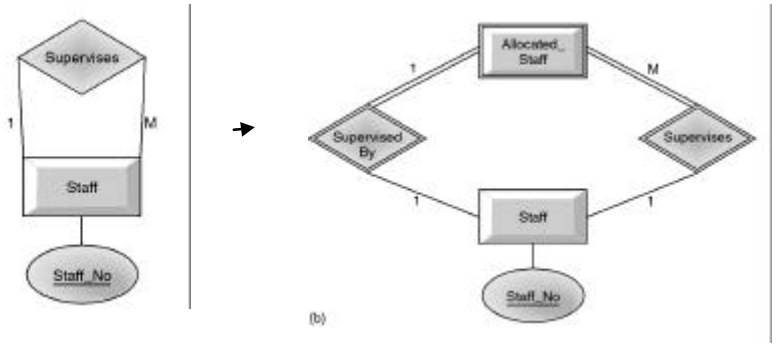
Removing *Advertises* M:N Relationship



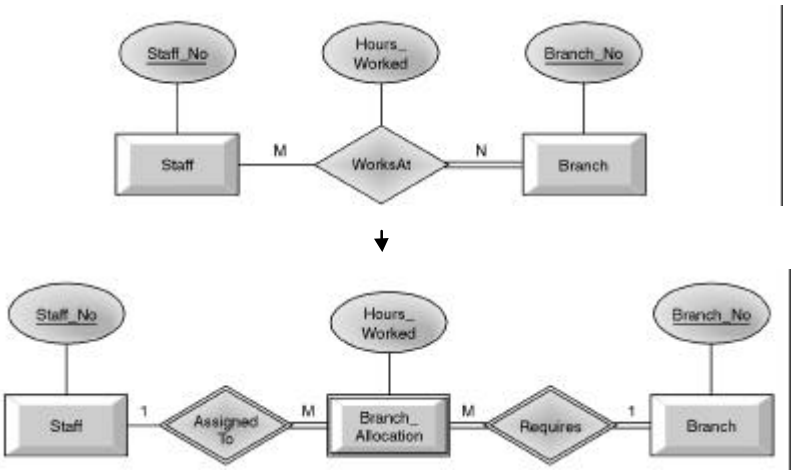
Removing *Leases* Complex Relationship



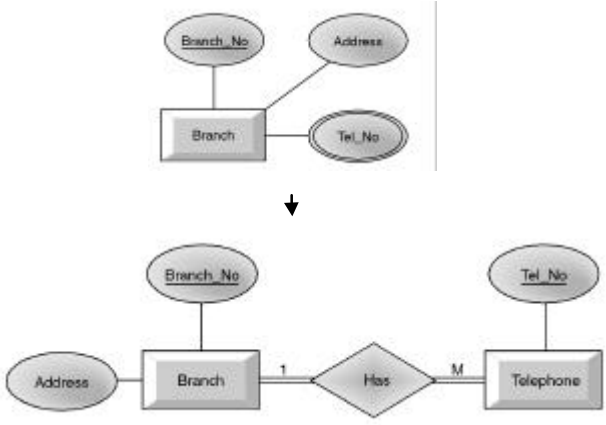
Removing *Supervises* Recursive Relationship



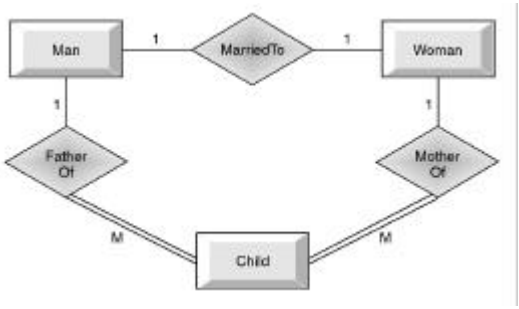
Removing *WorksAt* Relationship with Hours_Worked Attribute



Removing Tel_No Multi-valued Attribute



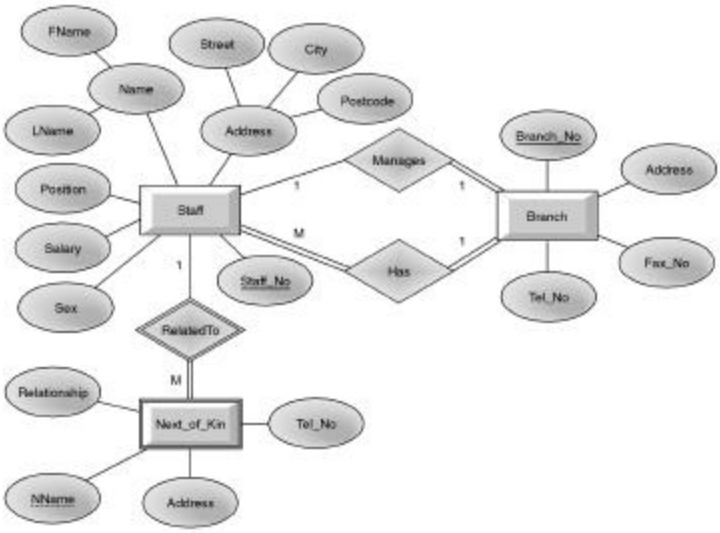
Non-Redundant Relationships



Step 2 Build and Validate Local Logical Data Model

- **Step 2.2 Derive Relations from Local Logical Data Model**
  - **To derive relations from the local logical data model and to document the composition of each relation including identifying any foreign keys.**
  - **Step 2.3 Validate Model using Normalization**
  - **To validate a local logical data model using the technique of normalization.**

An Example Logical Data Model

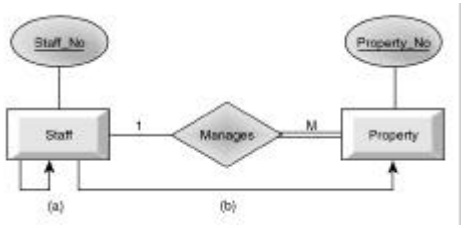


Step 2 Build and Validate Local Logical Data Model

- **Step 2.4 Validate Model against User Transactions**
  - **To ensure that the logical data model supports the transactions that are required by the user view.**
- **Step 2.5 Draw Entity-Relationship Diagram**
  - **To draw an Entity-Relationship (ER) diagram that is a logical representation of the data given in the user's view of the enterprise.**

Step 2.4 Validate Model against User Transactions

- **Example transactions**
  - **(a) Insert details for new members of staff.**
  - **(b) Delete details of a member of staff, given the staff number.**



Step 2 Build and Validate Local Logical Data Model

- **Step 2.6 Identify Integrity Constraints**
  - **To identify and document the integrity constraints given in the user's view of the enterprise. This includes identifying:**
    - **Required data**
    - **Referential integrity**
    - **Attribute domain constraints**
    - **Enterprise constraints**
    - **Entity integrity**

Step 2 Build and Validate Local Logical Data Model

- **Step 2.7 Review Local Logical Data Model with User**
  - **To ensure that the local logical data model is a true representation of the user's view.**

Step 3 Build and Validate Global Logical Data Model

- **The objective of this step is to combine the individual local logical data models into a single global logical data model that can be used to represent the part of the enterprise that we are interested in modeling.**

Step 3 Build and Validate Global Logical Data Model

- **Step 3.1 Merge Local Logical Data Models into Global Models**
  - **To merge the individual local logical data models into a single global logical data model of the enterprise.**

Step 3 Build and Validate Global Logical Data Model

- **Typically includes**
  - **(1) Review the names of entities and their primary keys.**
  - **(2) Review the names of relationships.**
  - **(3) Merge entities from the local views.**
  - **(4) Include (without merging) entities unique to each local view.**
  - **(5) Merge relationships from the local views.**
  - **(6) Include (without merging) relationships unique to each local view.**
  - **(7) Check for missing entities and relationships.**
  - **(8) Check foreign keys.**
  - **(9) Check Integrity Constraints.**
  - **(10) Draw the global logical data model.**
  - **(11) Update the documentation.**

Step 3.1 Merge Local Logical Data Models into Global Models

(View 1)

Staff (Staff_No, Name, Position, Sex, Salary, Branch_No)
Primary Key Staff_No
Foreign Key Branch_No **references** Branch(Branch_No)

(View 2)

Staff (Staff_No, FName, LName, Address, Branch_No)
Primary Key Staff_No
Foreign Key Branch_No **references** Branch(Branch_No)

(Global View)

Staff (Staff_No, FName, LName, Address, Position, Sex, Salary, Branch_No)
Primary Key Staff_No
Foreign Key Branch_No **references** Branch(Branch_No)

Step 3 Build and Validate Global Logical Data Model

- **Step 3.2 Validate Global Logical Data Model**
  - **To validate the global logical data model using normalization and against the required transactions, if necessary.**
- **Step 3.3 Check for Future Growth**
  - **To determine whether there are any significant changes likely in the foreseeable future and to assess whether the global logical data model can accommodate these changes.**

Step 3 Build and Validate Global Logical Data Model

- **Step 3.4 Draw Final Entity-Relationship Diagram**
  - **To draw an Entity-Relationship (ER) diagram that represents the global logical data model of the enterprise.**
- **Step 3.5 Review Global Logical Data Model with Users**
  - **To ensure that the global logical data model is a true representation of the enterprise.**