# *Conceptual Design Using the ER Model*

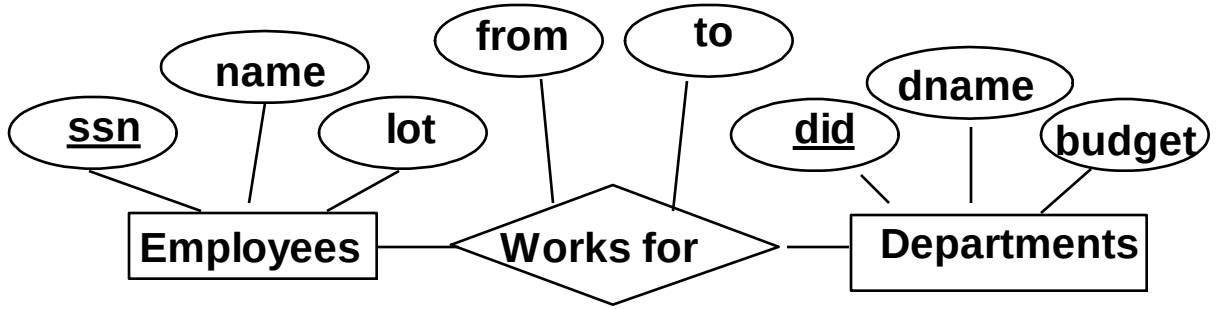
- Design choices:
  - Should a concept be modeled as an entity or an attribute?
  - Should a concept be modeled as an entity or a relationship?
  - Identifying relationships: Binary or ternary? Aggregation?
- Constraints in the ER Model:
  - A lot of data semantics can (and should) be captured.
  - But some constraints cannot be captured in ER diagrams.

# *Entity vs. Attribute*

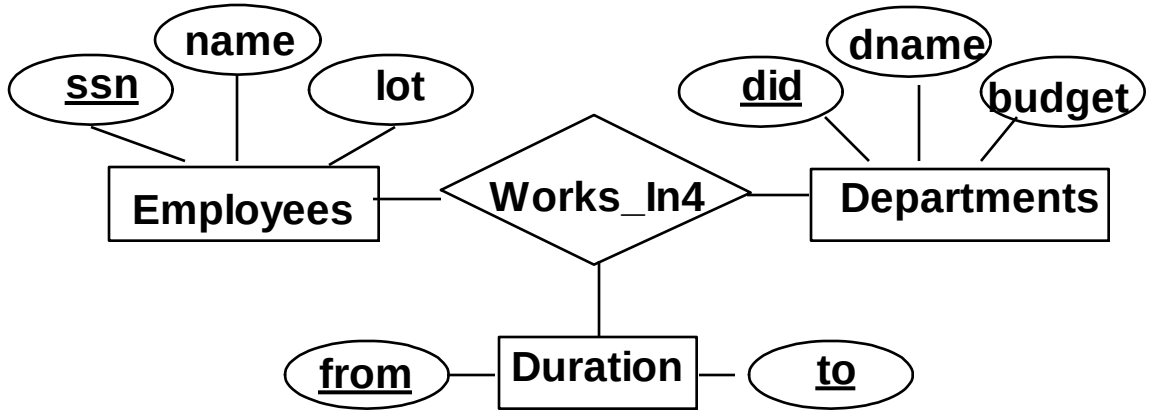
- Should *address* be an attribute of Employees or an entity (connected to Employees by a relationship)?
- Depends upon the use we want to make of address information, and the semantics of the data:
  - If we have several addresses per employee, *address* must be an entity (since attributes cannot be set-valued).
  - If the structure (city, street, etc.) is important, e.g., we want to retrieve employees in a given city, *address* must be modeled as an entity (since attribute values are atomic).

# *Entity vs. Attribute (Contd.)*

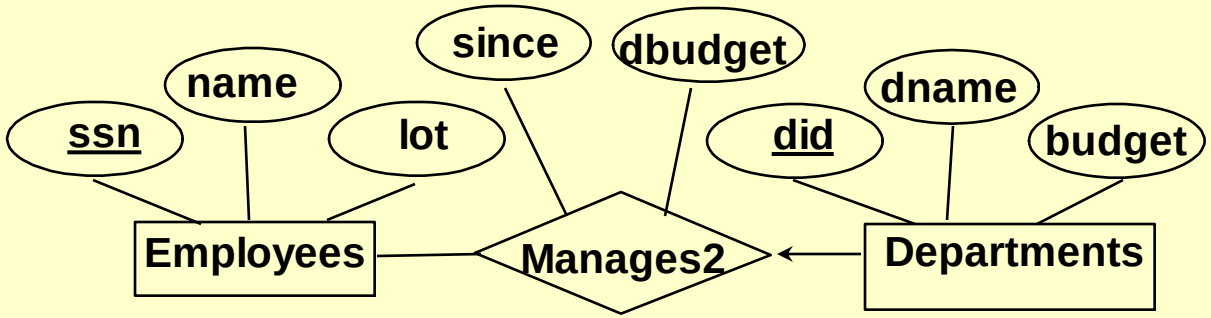
- Works_In4 does not allow an employee to work in a department for two or more periods.




- Similar to the problem of wanting to record several addresses for an employee: We want to record *several values of the descriptive attributes for each instance of this relationship.* Accomplished by introducing new entity set, Duration.

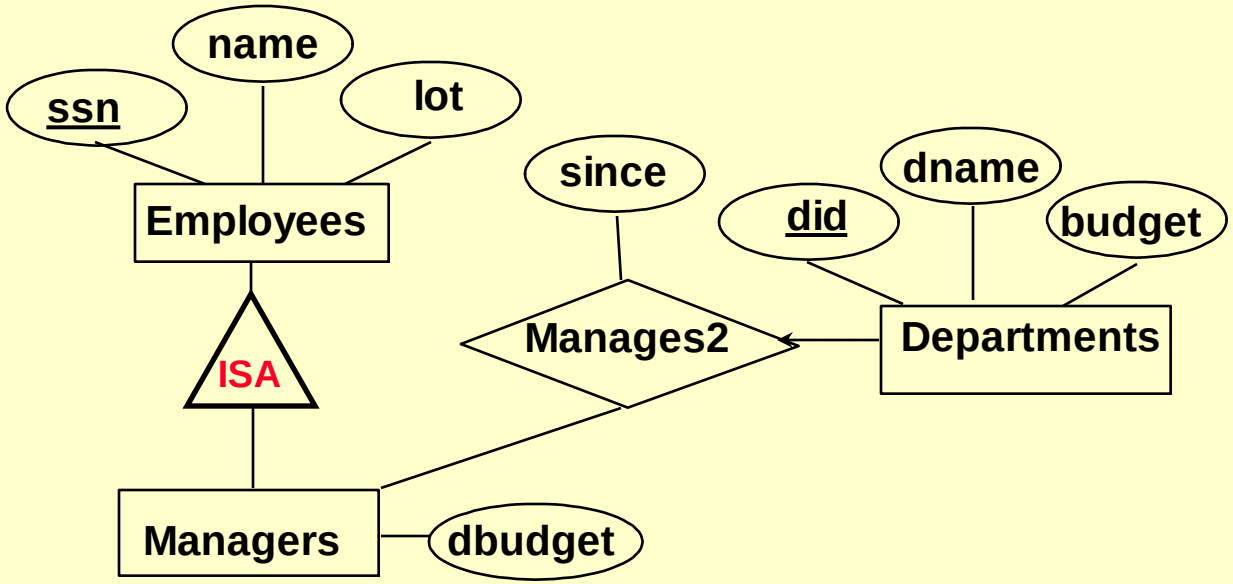


# *Entity vs. Relationship*

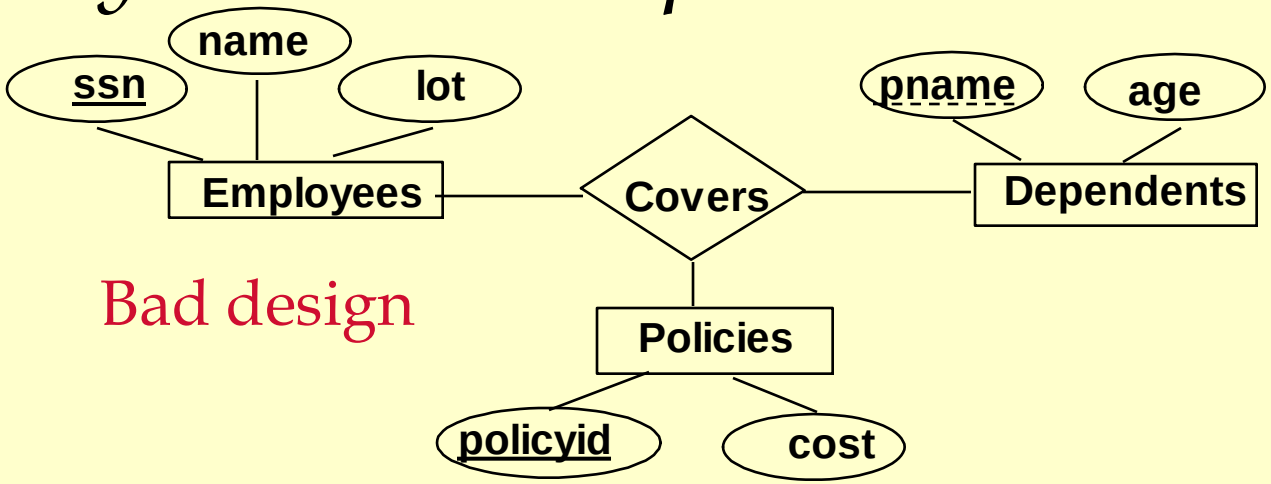



- ER diagram OK if a manager gets a separate discretionary budget for each dept.
- What if a manager gets a discretionary budget that covers *all* managed depts?
  - Redundancy: *dbudget* stored for each dept managed by manager.
  - Misleading: Suggests *dbudget* associated with department-mgr combination.

# This fixes the problem!



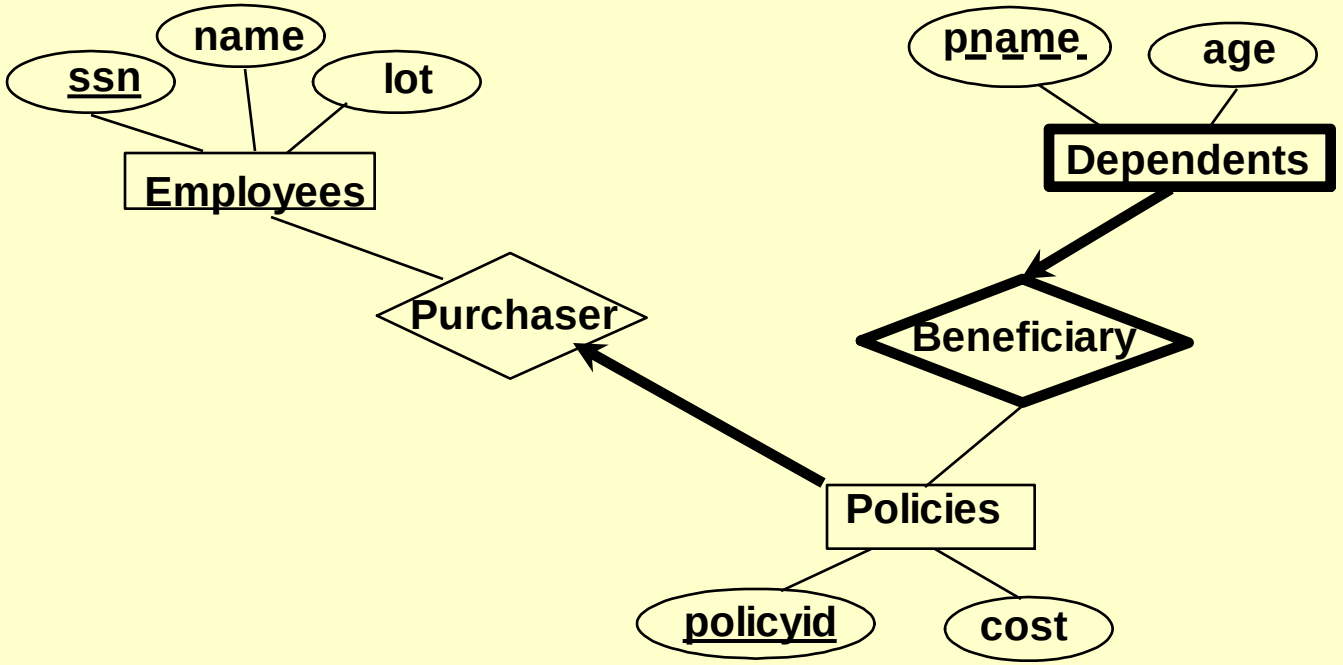
# *Binary vs. Ternary Relationships*




Bad design

- If each policy is owned by just 1 employee, and each dependent is tied to the covering policy, first diagram is inaccurate.
- What are the additional constraints do we need?

# Better design




- Key constraint
- Total participation of policies in purchaser relationship

# *Binary vs. Ternary Relationships (Contd.)*

- Previous example illustrated a case when two binary relationships were better than one ternary relationship.
- An example in the other direction: a ternary relation Contracts relates entity sets Parts, Departments and Suppliers, and has descriptive attribute *qty*. No combination of binary relationships is an adequate substitute:
  - S "can-supply" P, D "needs" P, and D "deals-with" S does not imply that D has agreed to buy P from S.