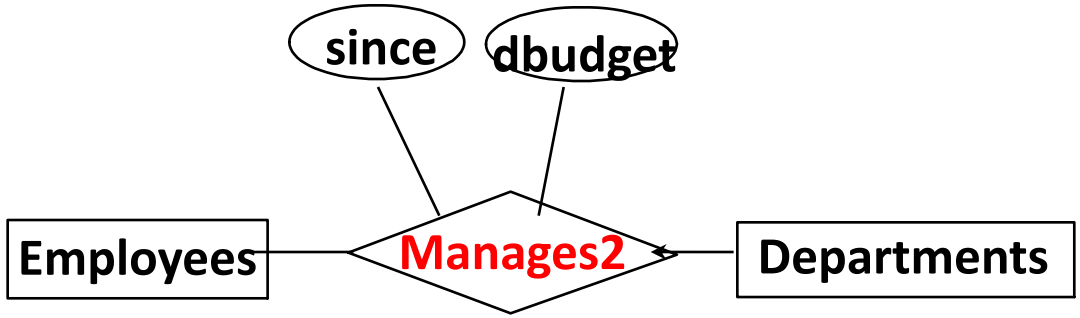
Review

- Basic issues of ER-diagram design
- Advanced issues of ER-diagram
  - Hierarchy
  - Aggregation
  - Design Issues of ER diagram

Conceptual Design Using the ER Model

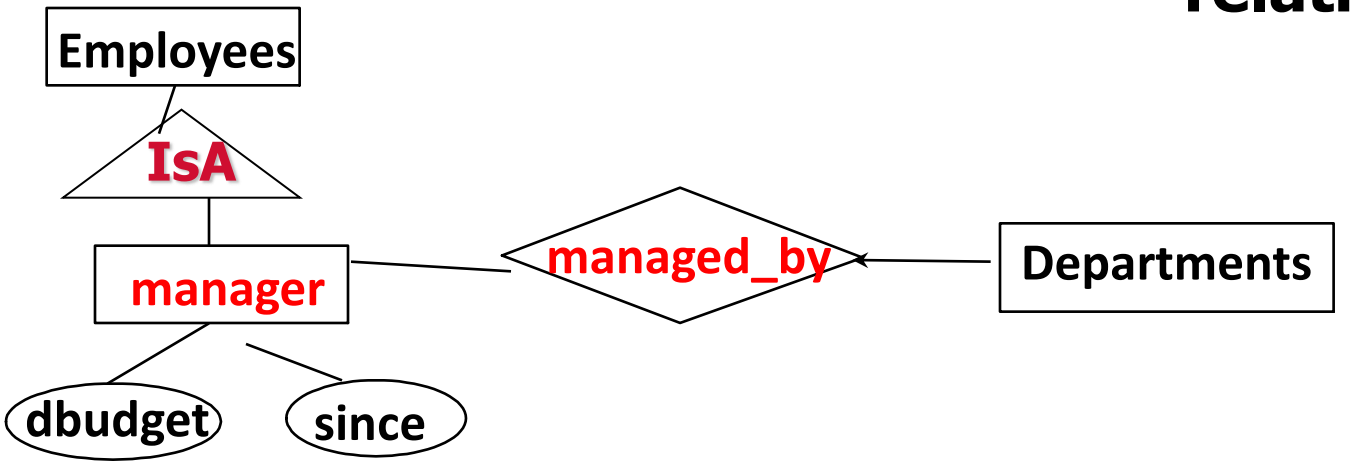
- **ER modeling can get tricky!**
- **Design choices:**
  1. Should a concept be modeled as an entity or an attribute?
  2. Should a concept be modeled as an entity or a relationship?
  3. Identifying relationships: Binary or ternary?

Design Issue #2: Entity vs. Relationship



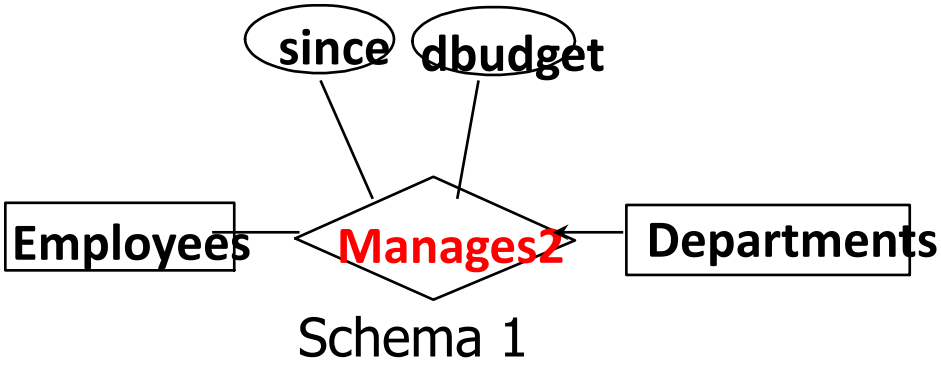
Schema 1

Should *Manages* be an entity or a relationship?



Schema 2

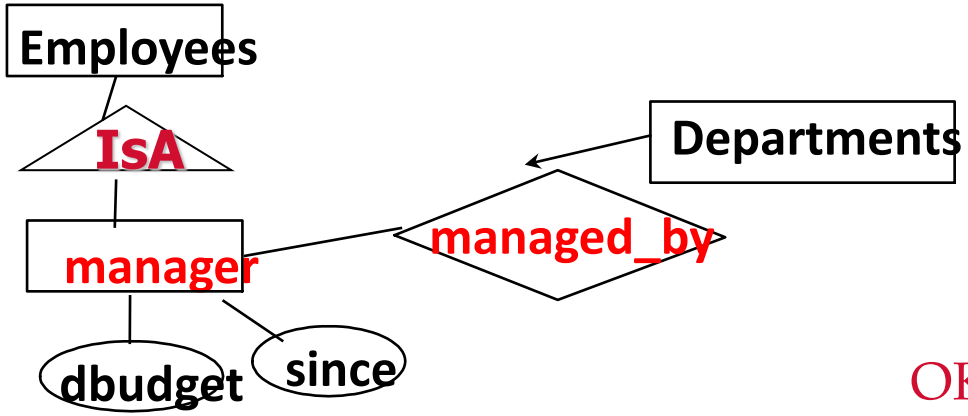
Design Issue #2: Entity vs. Relationship



Schema 1

- Schema 1: each manager can have **multiple** "since"/"dbudget" values, one for EACH department s/he manages.
  - E.g.,
    (Alice, HR, 1/1/2015, $30K)
    (Alice, IT, 1/1/2014, $100K)

OK if a manager gets a separate budget (*dbudget*) for each dept.

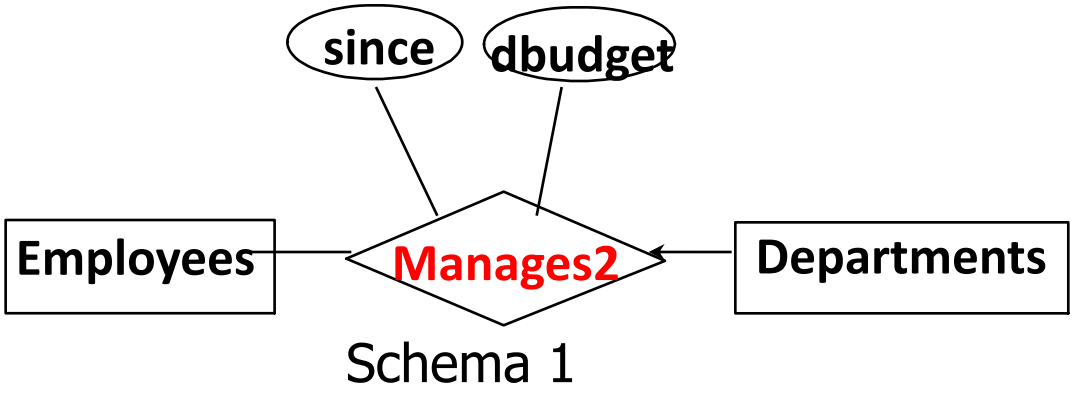


Schema 2

- Schema 2: each manager only can have one single "since"/"dbudget" value, regardless the number of departments s/he manages
  - E.g.,
    (Alice, HR, 1/1/2015, $30K)
    (Alice, IT, 1/1/2015, $30K)

OK if a manager gets single budget (*dbudget*) for all departments. Repeated values introduce redundancy though.

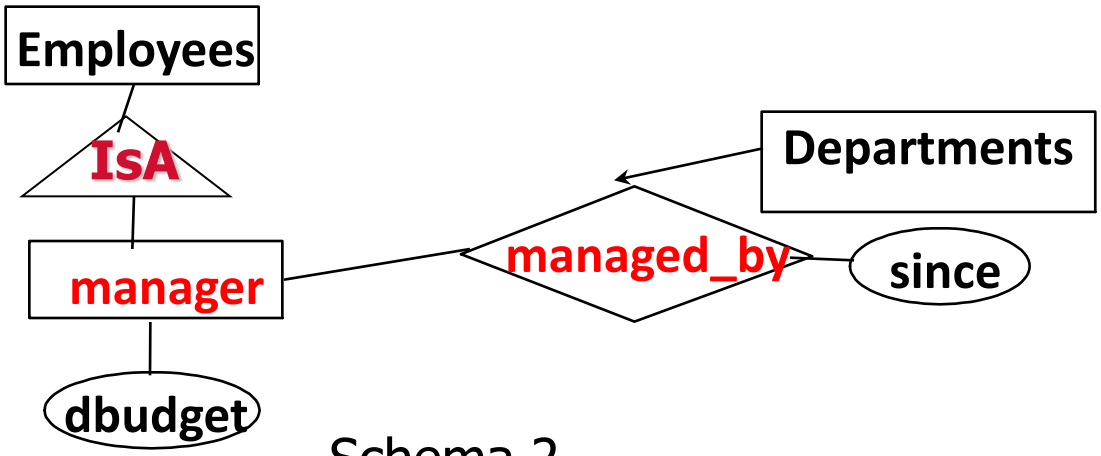
Design Issue #2: Entity vs. Relationship



Schema 1

- **Question:**

What if each manager can manage only one department? Are both schemas good?



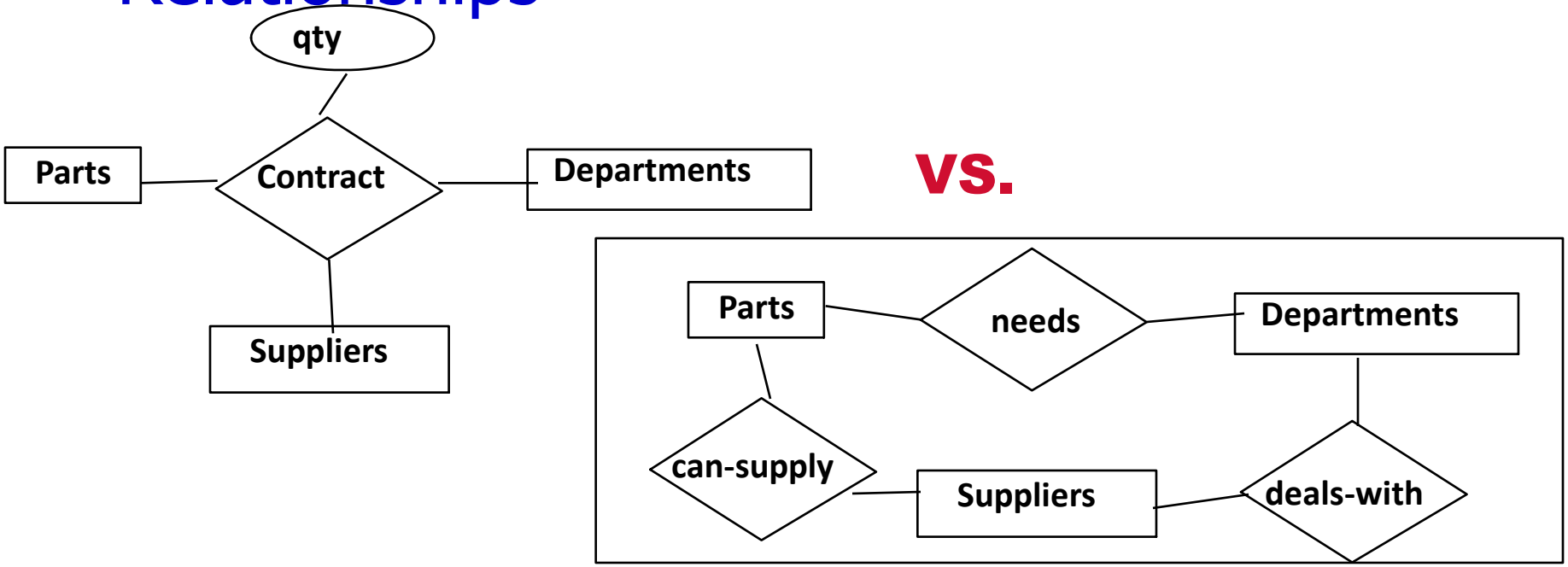
Schema 2

Design Issue #3: Binary vs. Ternary Relationships

- Are binary relationships always better than ternary relationship?

- Consider the following example
  - Design the ER diagram that describes the Contracts relationship that includes entity sets Parts, Departments and Suppliers.
  - The Contracts relationship should also record the *qty* information of which department agreed to buy how many parts from which Suppliers.

Design Issue #3: Binary vs. Ternary Relationships



- **Problems of binary relationships:**
  1. S "can-supply" P, D "needs" P, and D "deals-with" S does not imply that D has agreed to buy P from S.
  2. There is no way to record *qty*.
- **A Ternary relationship set is better as the Parts, Departments, and Suppliers entities participate in a single relationship.**

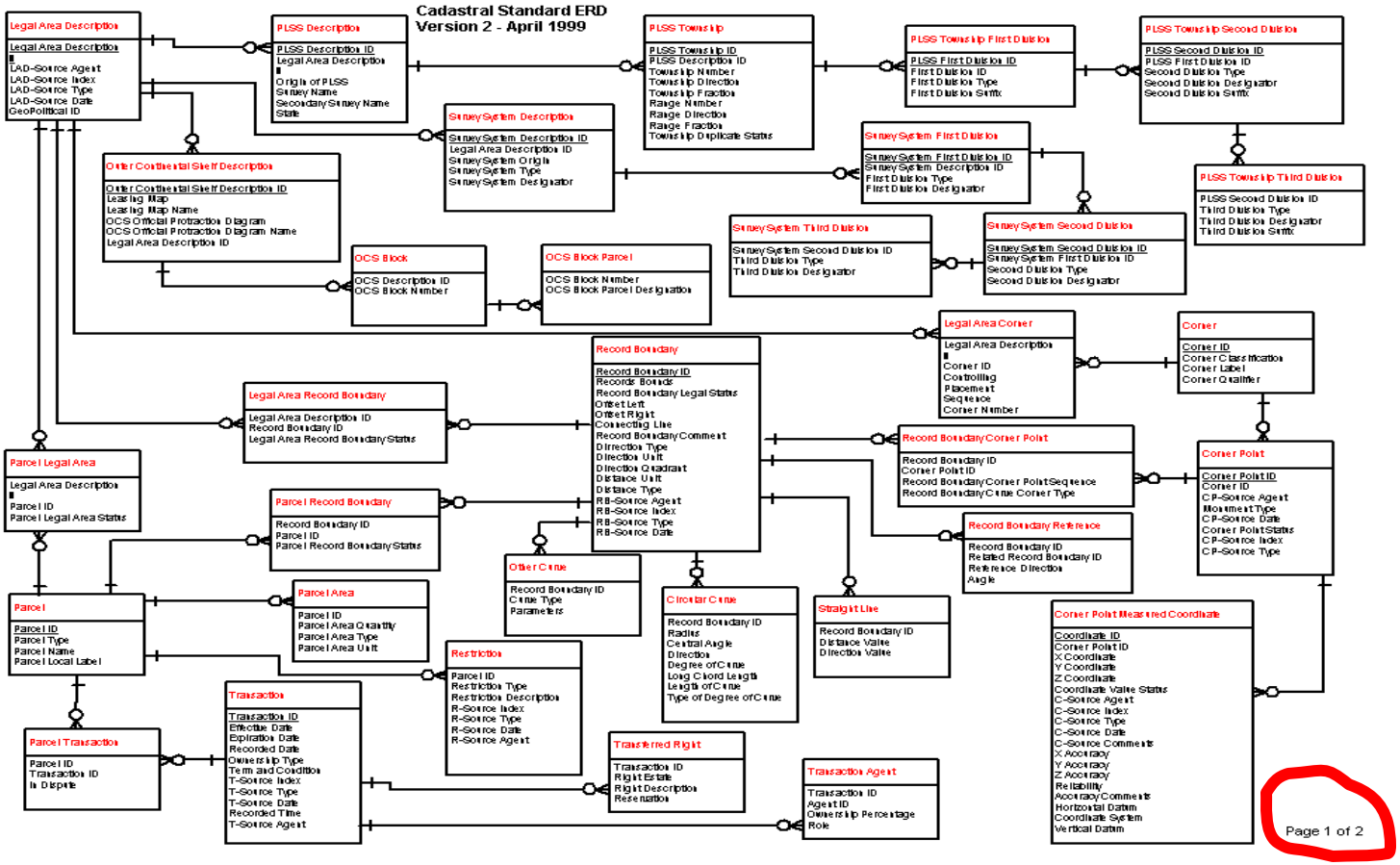
Exercise: Binary or Ternary?

- There are three entity sets Person, Bar and Drink.
- Design the relationship(s) that record the information of who drank at which bar and when.

These things get pretty hairy!

- **Many E-R diagrams cover entire walls!**
- **A modest example:**

A Cadastral E-R Diagram



cadastral: showing or recording property boundaries, subdivision lines, buildings, and related details

Source: US Dept. Interior Bureau of Land Management, Federal Geographic Data Committee Cadastral Subcommittee
http://www.fairview-industries.com/standardmodule/cad-erd.htm

Review: Basic Guidelines

- **Entity sets vs. attributes**
  Choice mainly depends on the structure of the enterprise being modeled, and on the semantics associated with the attribute in question.
- **Entity sets vs. relationship sets**
  Designate a relationship set to describe an action that occurs between entities
- **Binary versus n-ary relationship sets**
  Use a *n*-ary relationship set if several entities participate in a single relationship.

Summary

- **ER design is *subjective*.**
  - There are often many ways to model a given scenario!
  - Many choices:
    - Entity vs. attribute,
    - Entity vs. relationship,
    - Binary or n-ary relationship,
    - Whether or not to use ISA hierarchies,
    - Whether or not to use aggregation.
  - Suggestions
    - Collect as many data information from the client as possible.
    - Think of the cardinality constraints besides entities and relationships

The Entity-Relationship Diagram

Exercise
(see Handout 1)