Weak Entity Types

An entity that does not have a key attribute

A weak entity must participate in an identifying relationship type with an owner or identifying entity type

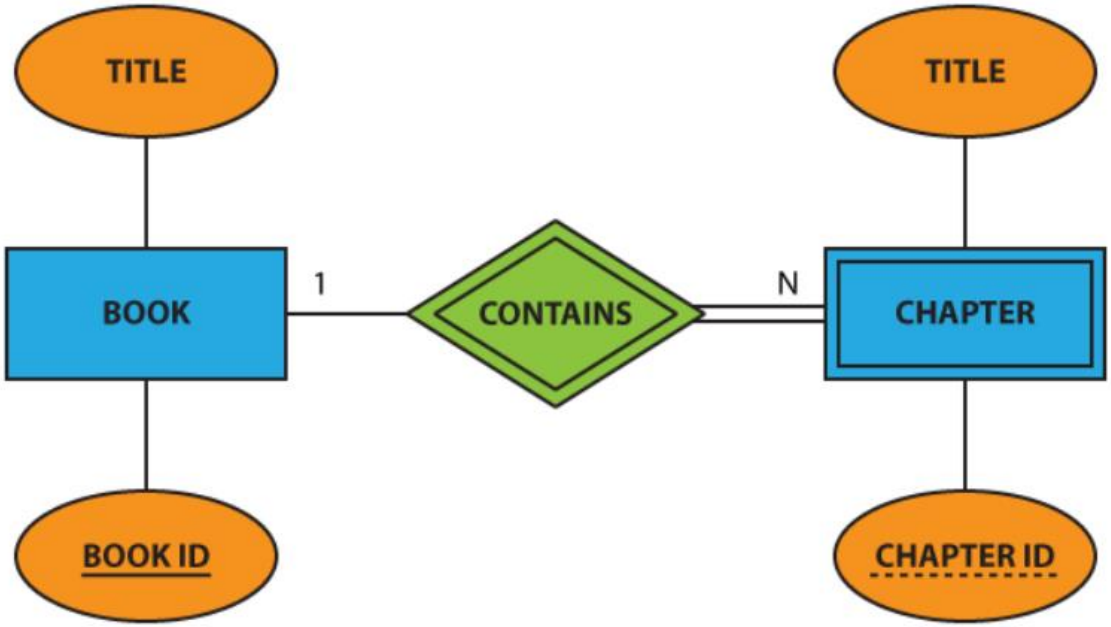
Entities are identified by the combination of:

- Partial key of the weak entity type
- The particular entity they are related to in the identifying entity type

Example: A DEPENDENT entity is identified by
- the dependent's first name (*partial key*), *and*
- the specific EMPLOYEE with whom the dependent is related

Weak Entity

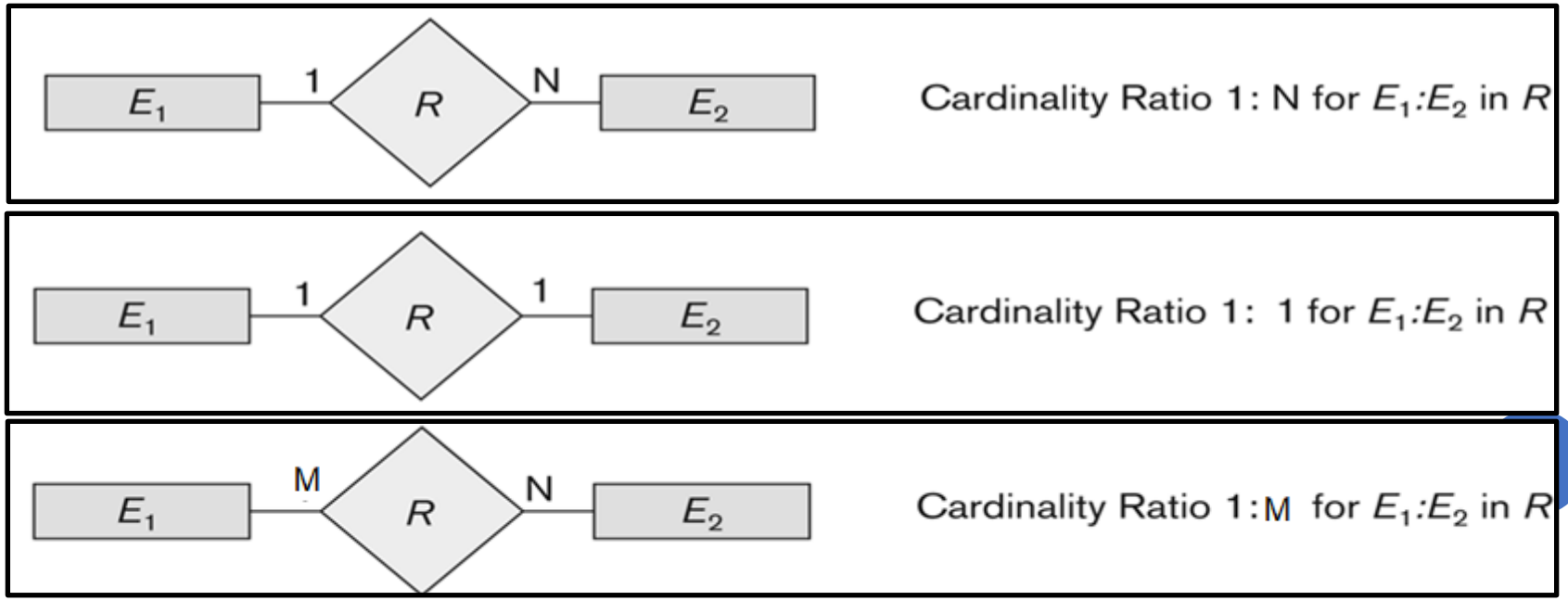
- An entity can be weak => when it does not have a key attribute



Constraints on Relationships

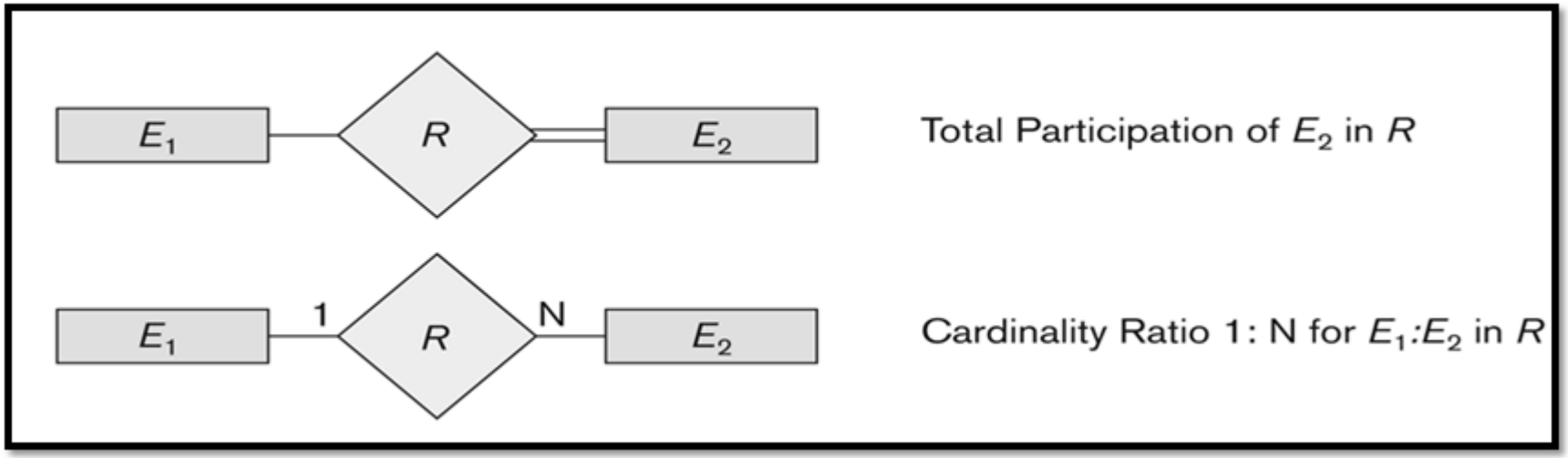
Cardinality Ratio Constraint:
specifies ***maximum*** participation

- One-to-one (1:1)
- One-to-many (1:N) or Many-to-one (N:1)
- Many-to-many (M:N)



RELATIONSHIP CONSTRAINTS

Derived from the knowledge of mini-world constraints



Constraints on Relationships

Cardinality Ratio Constraint

(specifies ***maximum*** participation)

- One-to-one (1:1)
- One-to-many (1:N) or Many-to-one (N:1)
- Many-to-many (M:N)

Existence Dependency Constraint or **Participation constraint**

(specifies ***minimum*** participation)

- zero (optional participation, not existence-dependent)
- one or more (mandatory participation, existence-dependent)

Company ER Model

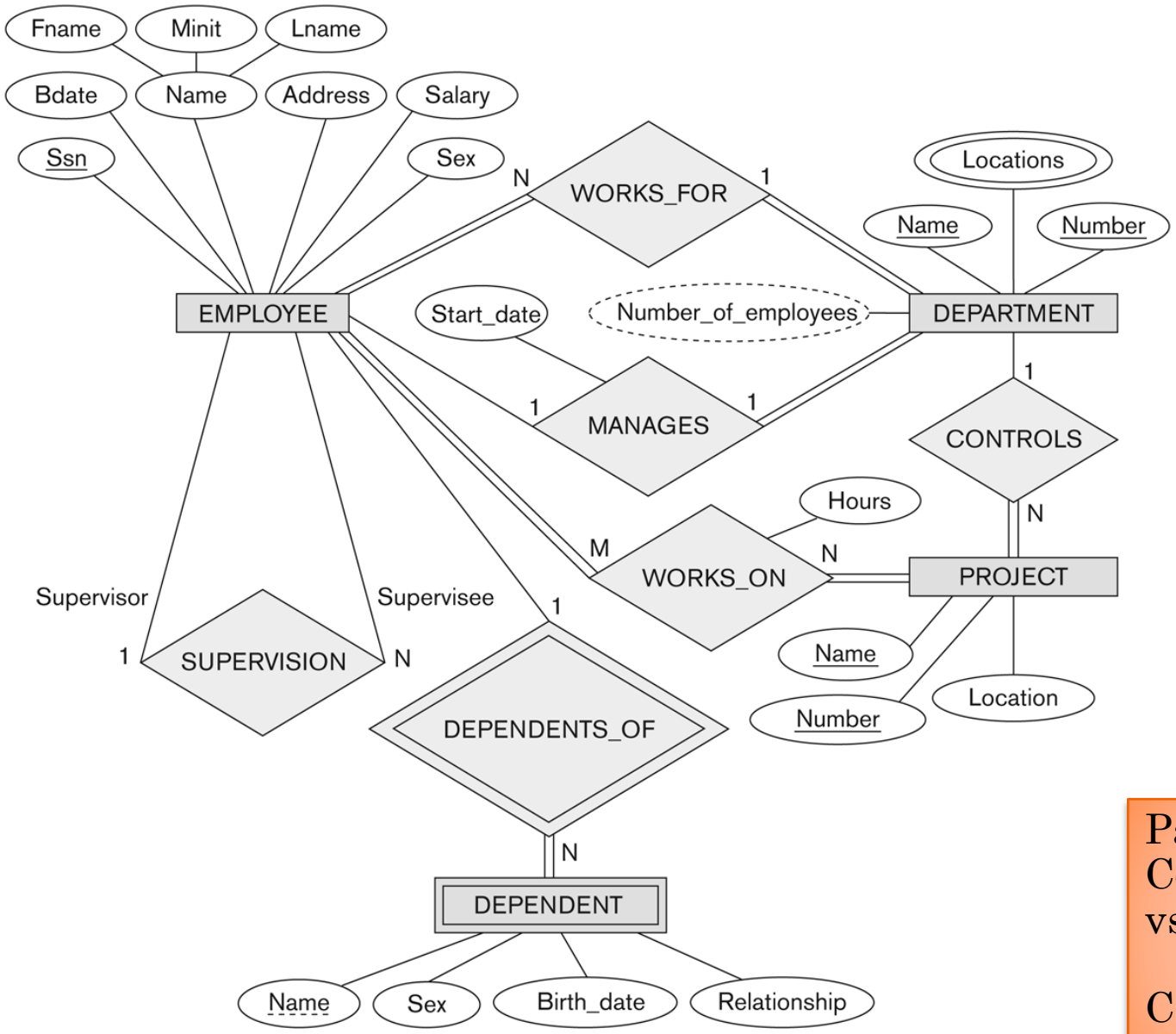


Figure 3.2

Participation Constraint : Total vs partial.

Cardinality Ratio: 1:N, 1:1, N:M

Attributes of Relationship types

A relationship type can have attributes:

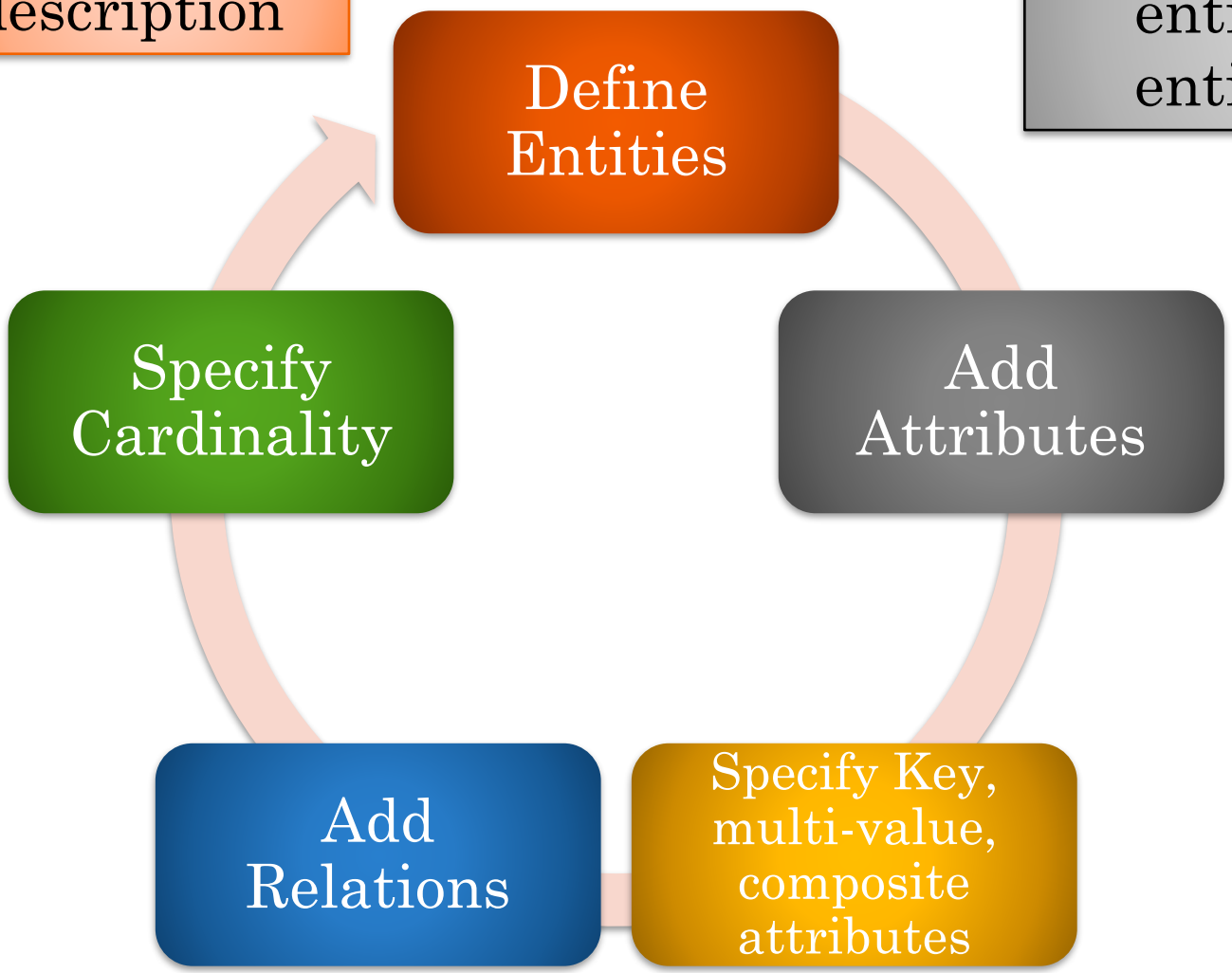
- For example, HoursPerWeek of WORKS_ON
- A value of HoursPerWeek depends on a particular (employee, project) combination

Most relationship attributes are used with M:N relationships

- In 1:N relationships, they can be transferred to the entity type on the N-side of the relationship

Steps to draw an ER diagram

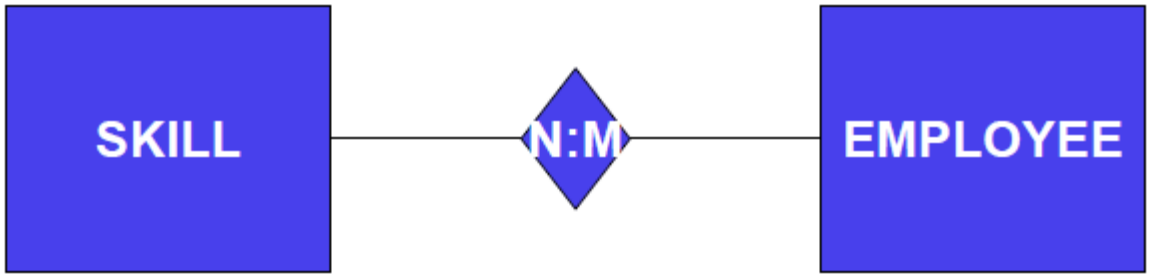
Get problem description



Identify if any entity is a weak entity (key?)

Example – ER-Model

- For each employee we record employee ID, name, SSN, gender, address and phone. An employee may have several skills such as communication, self-motivation, Technical literacy, Data analytics etc. A particular skill may be held by several employees of the company. An employee may have many teammates (current and previous).



Example – ER-Model

- An employee have to serve multiple clients. But a client deals with only one employee to avoid confusions in dealings. We keep track of client's business email, name and address to connect with them.

- A client can place many orders, but each order can be placed by one client only. An order is identified by order number and have a date and timestamp. Before placing an order the client must enter the credit card information. We need to verify client's credit-card information before processing his orders.

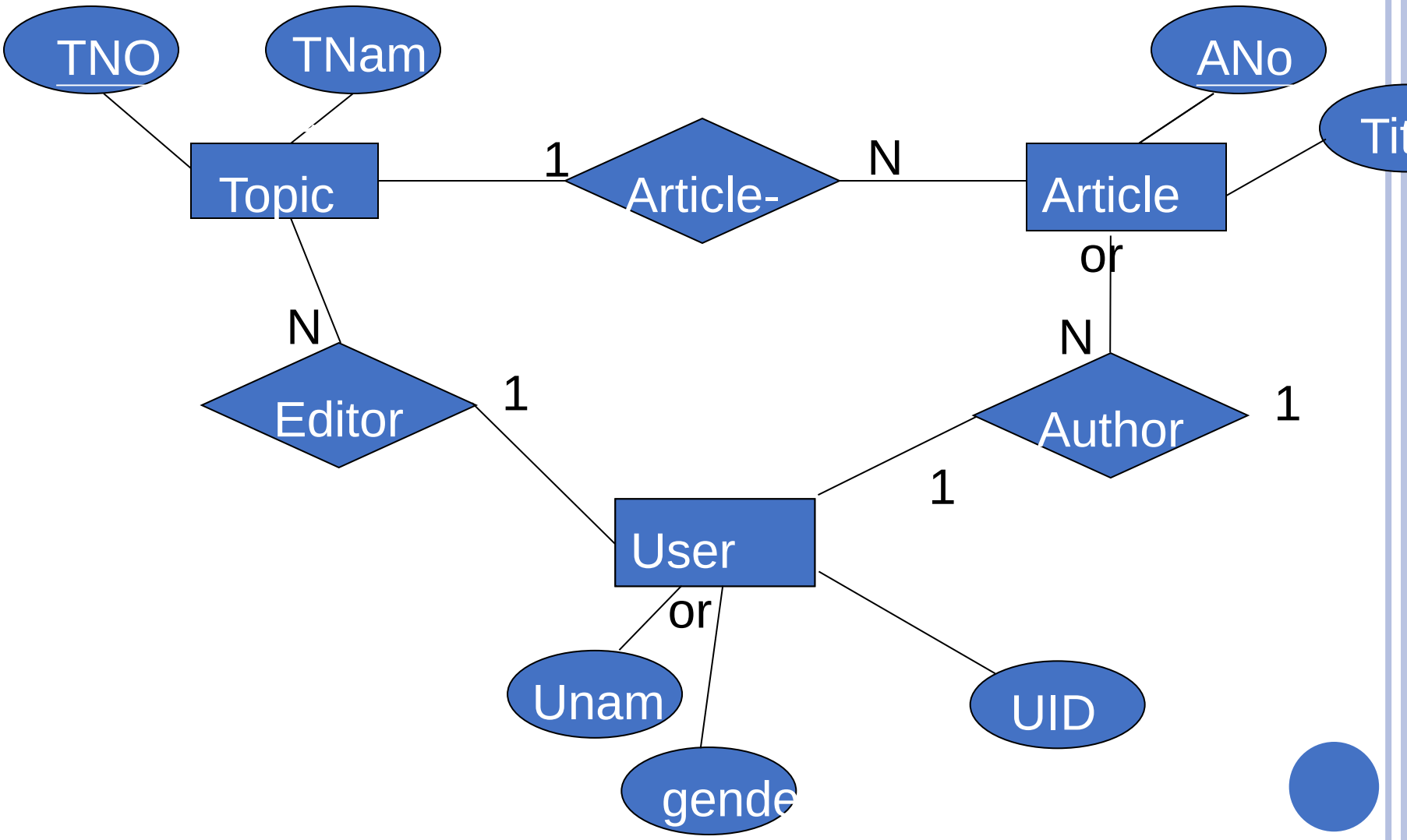
Example – ER-Model

- The company owns multiple buildings around the country. Each building has an id, name, and host many offices for carrying out different company operations and clients tasks. Each office within a building has a unique number and name.

- Each employee is associated with an office. An office can have multiple employees so we need to know the total number of employee in each office. All employees working in an office are considered to be colleagues.

- Each employee is allotted a cubicle to work and a locker to keep their stuff. A locker may only be accessible by one employee.

- **Case Study:** Ali Shah has designed a website to help students understand the concepts of the Database Systems. He calls his site 'Web-For-DB-Dummies'. The aim of the site is to have a good repository of easy and informative articles and tutorial on various topics of the Database. A website User can be Author, Editor or just a Reader. Any User can submit an article, after approval from an Editor (of the site) it will be uploaded.
- The user relation stores information such as user id, user name and gender of the website user. Ali records thetiltle and number of the different topics on which an article is written. Each topic has an associated editor who approves the article. Each article has article number, title, author id and the topic number.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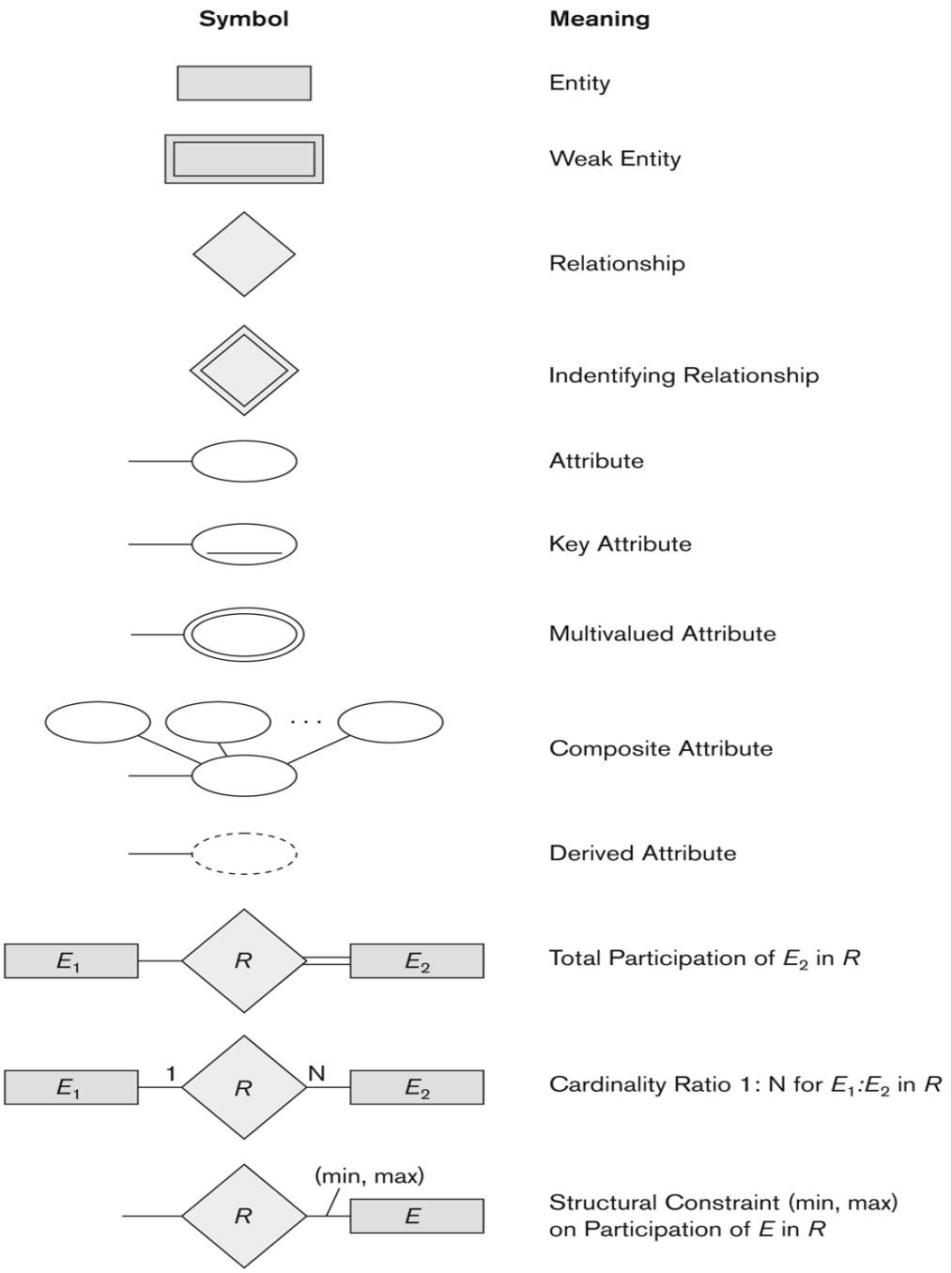
Notation for ER diagrams

Figure 3.14
Summary of the notation for ER diagrams.

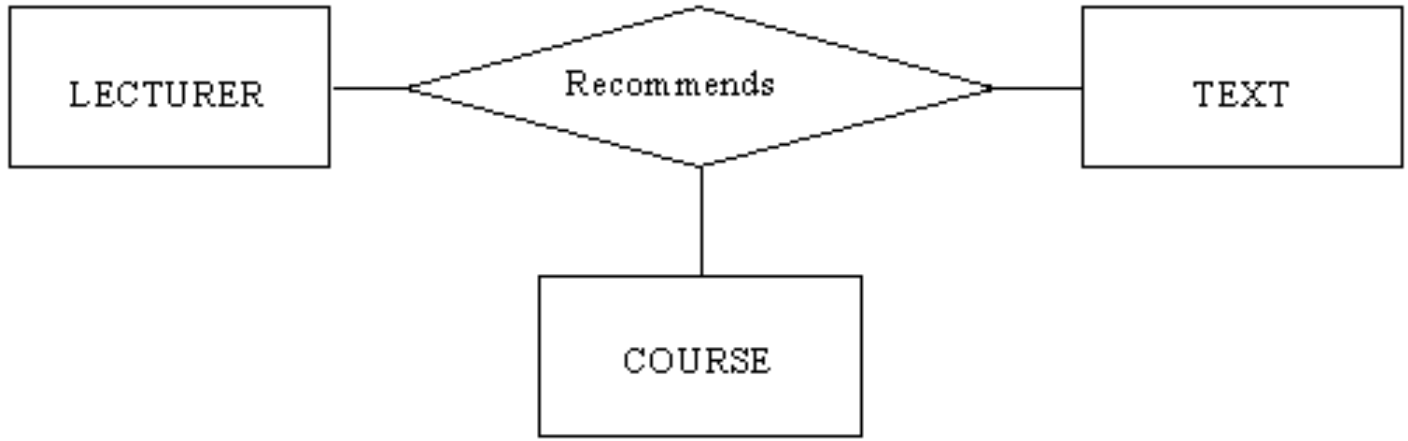


Relationships of Higher Degree

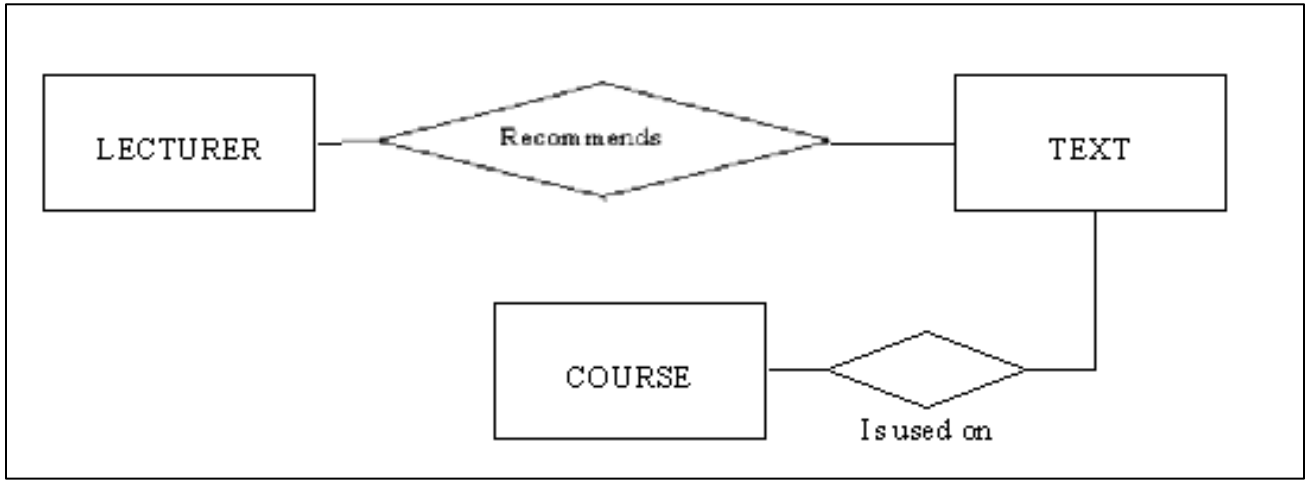
- Relationship types of degree 2 are called binary
- Relationship types of degree 3 are called ternary and of degree n are called n-ary
- Constraints are harder to specify for higher-degree relationships (n > 2) than for binary relationships

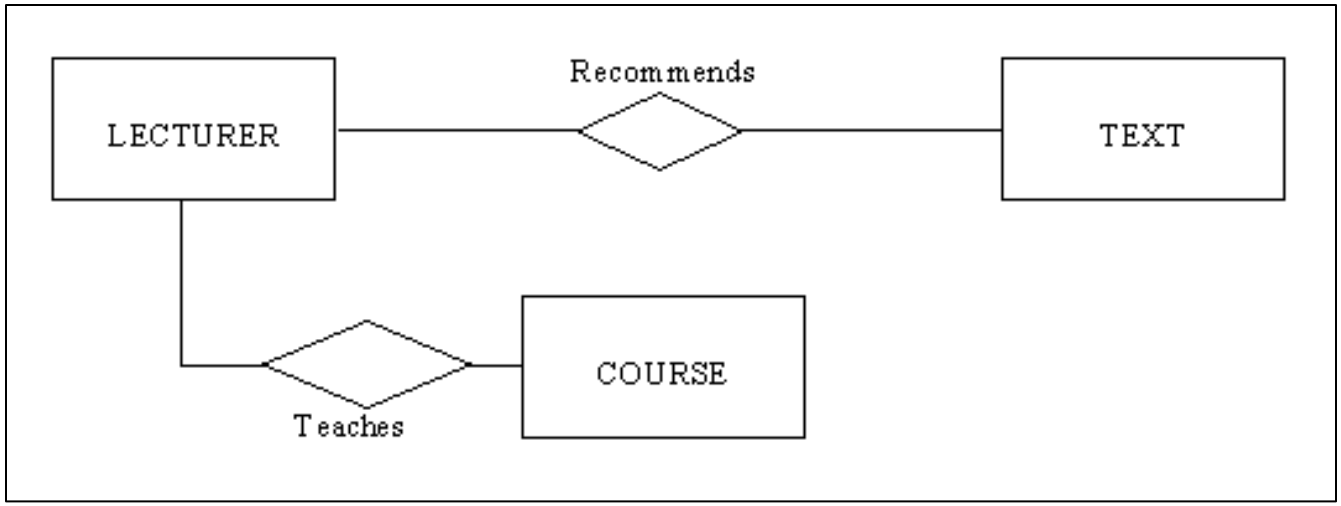
Example of a ternary relationship

(a)

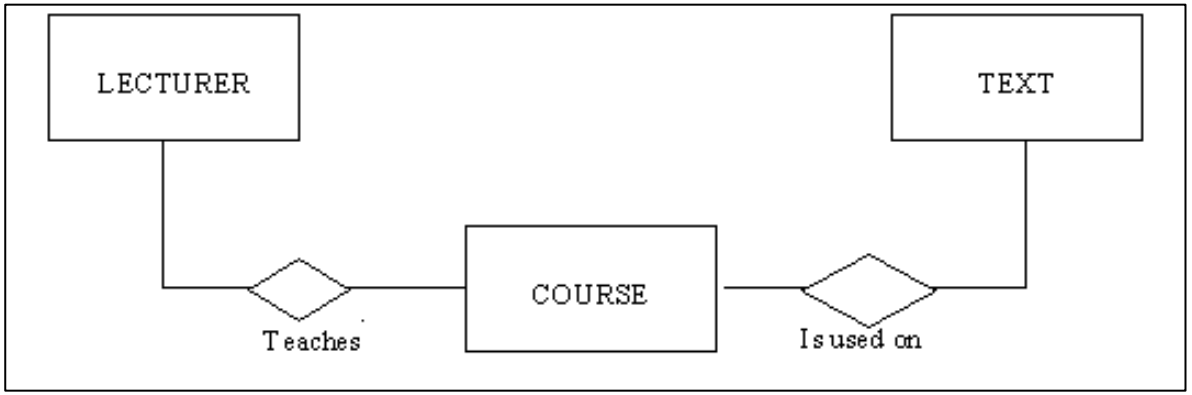


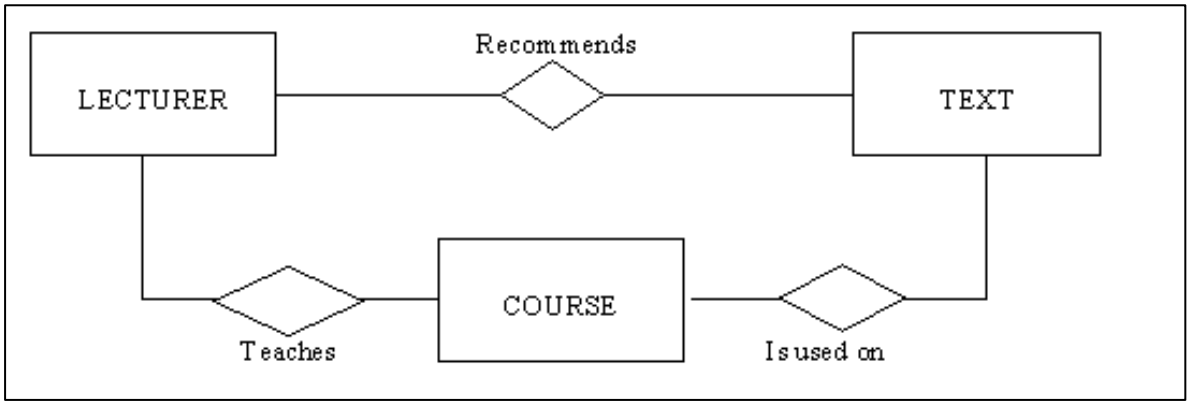
EXAMPLE OF A TERNARY RELATIONSHIP





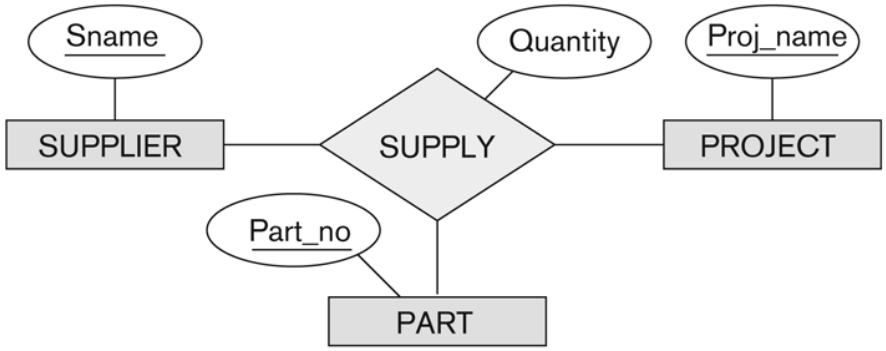
EXAMPLE OF A TERNARY RELATIONSHIP



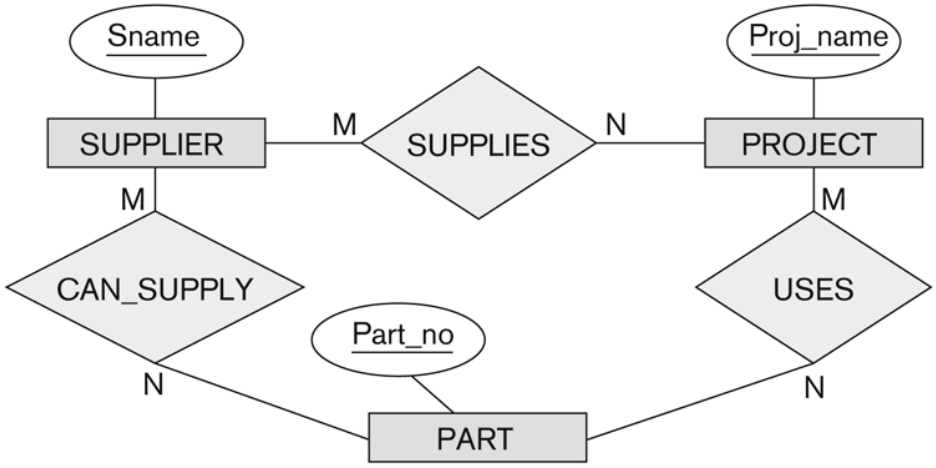


Example 2 of a ternary relationship

(a)

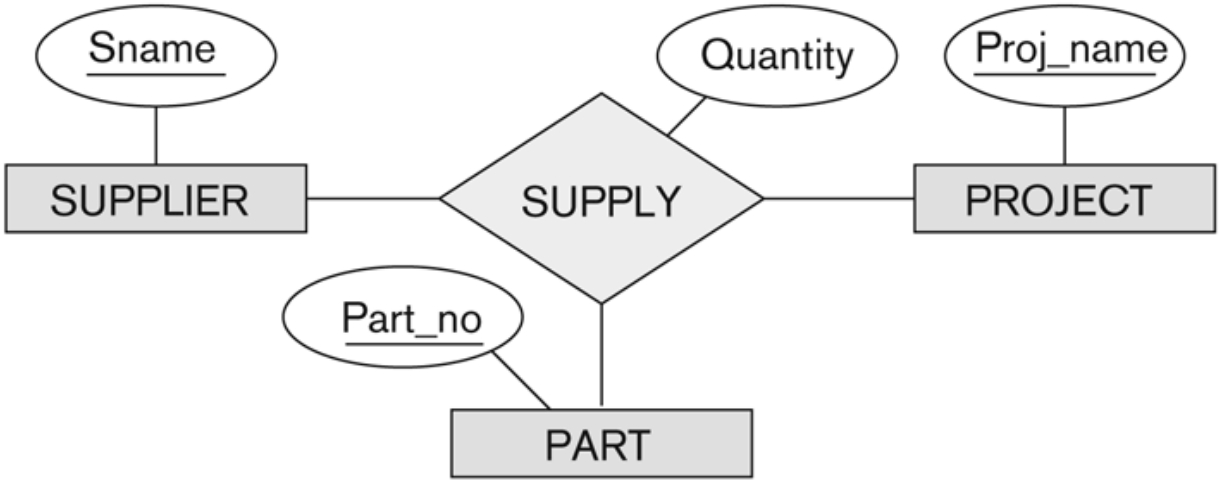


(b)



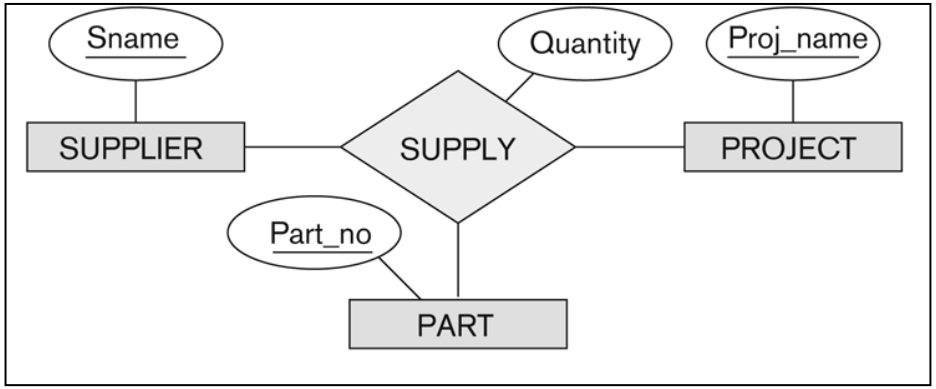
Cardinality for ternary relationship

Constraint: For a particular project-part combination, only one supplier will be used (only one supplier supplies a particular part to a particular project).

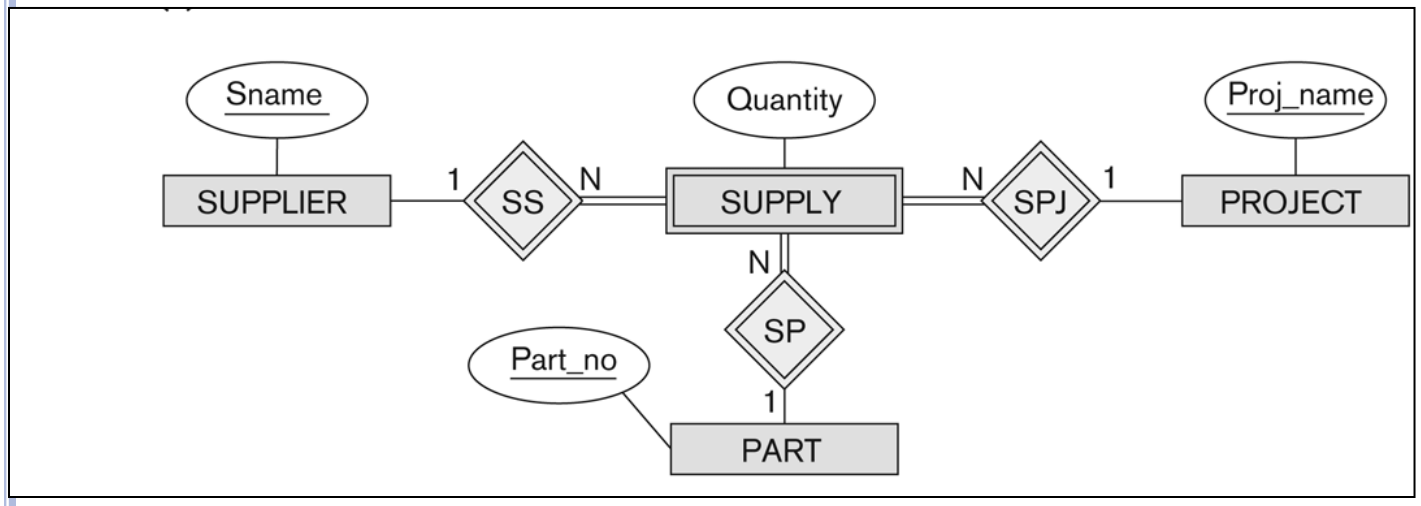


N-ARY RELATIONSHIPS (N > 2)

- Three binary relationships represents different information than a single ternary relationship

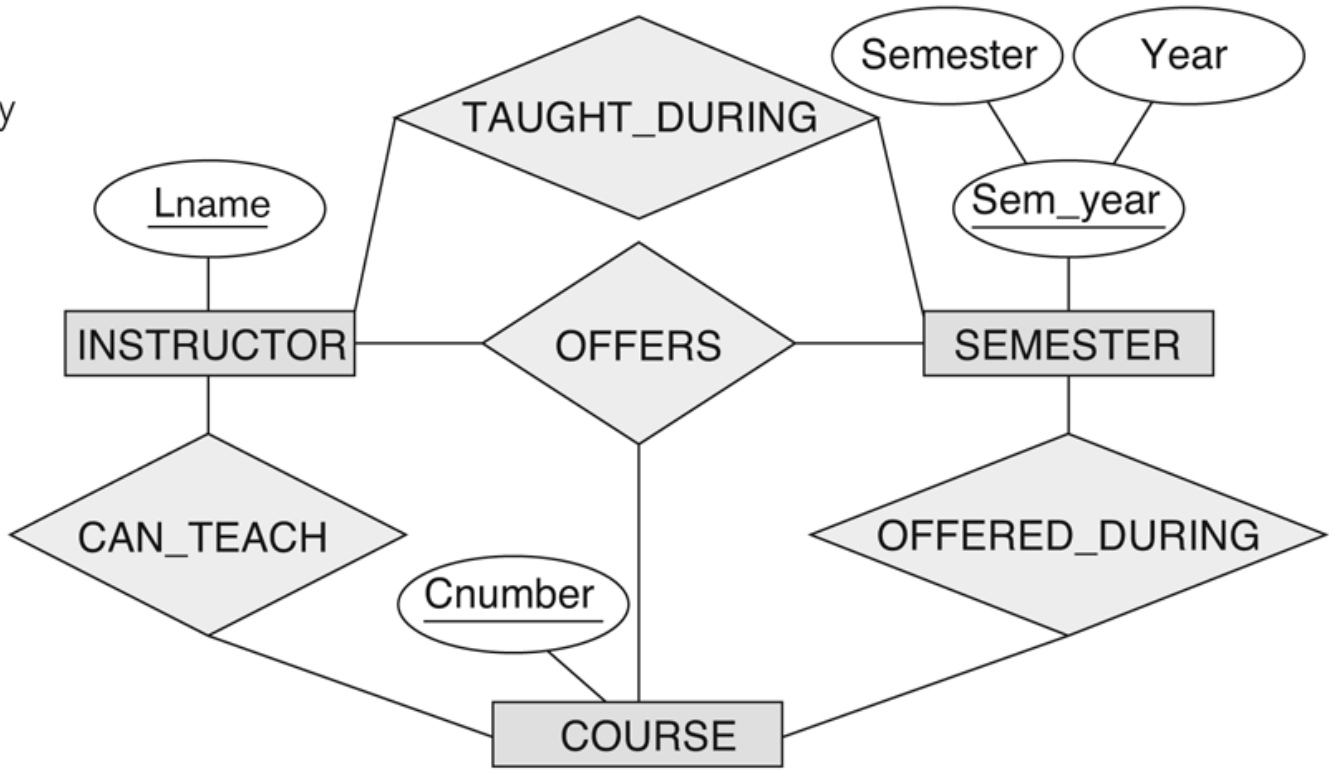


In some cases, a ternary relationship can be represented as a weak



Example 3 of a ternary relationship

Figure 3.18
Another example of ternary versus binary relationship types.



If a particular binary relationship can be derived from a higher-degree relationship at all times, then it is redundant

Activity: ER for Notown Records

Each musician has an SSN, name, address, phone. Poor musicians often share the same address, and no address has more than one phone.

Each instrument that is used in songs recorded at Notown has a name (e.g., guitar, flute) and a musical key (e.g., C, B-flat).

Each album has a title, a copyright date, a format (e.g., CD or MC), and an album identifier.

Each song recorded at Notown has a title and an author.

Each musician may play several instruments, and an instrument may be played by several musicians.

Each album has a number of songs on it, but no song may appear on more than one album.

Each song is performed by one or more musicians and *we keep track of the instrument used by each musician*. A musician may perform a number of songs.

Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.