



Unit 6

View Design and View Integration

本單元目的

- What is view?
 - View 指某一使用者或一群使用者所看到的資料庫內容或應用程式的資料需求.
- View design
 - 抓住各使用者的需求物件, 把這些物件用 ER model 表現出整個系統的 conceptual schema.
- View integration
 - 把數個 conceptual schema 整合為一個 global conceptual schema, 以代表整個應用系統的需求.

Outline

- View Design From Natural Language Requirements
- View Design Starting From Forms
- View Integration in the Large
- Conflict Analysis and Resolution
- Merging of Views

View Design From Natural Language Requirements

- Step 1 Requirement analysis
- Step 2 Initial design
- Step 3 Schema design

View Design From Natural Language Requirements

Step 1. Requirement analysis

1.1. Analyze requirements and filter ambiguities

搞清楚敘述內容, 找出不明確的用語, 重新定義

1.2. Partition sentences into homogeneous sets

把敘述同一概念的句子放在同一組

Step 2. Initial design

2.1. Build a global skeleton schema

根據已分群的句子, 畫出 **schema** 初步架構, 原則上一群句子描述一個 **entity**.

Step 3. Schema design 對每個 concept, 反覆使用

Top-down primitives or bottom-up primitives or inside-out primitives 直到需求一一表達在 **concept schema** 之內.

An example of natural language description of requirement

Step 1: Requirement analysis

Line 1: In a university database, we represent data about

Line 2: students and professors. { For students, we

Line 3: represent last name, age, sex, city and state of

Line 4: birth, city and state of residence of their

Line 5: families, places and states where they lived before

Line 6: (with the period they lived there), courses that

Line 7: they have passed, with name, code, professor,

Line 8: grade, and date. } We also represent courses they

Line 9: are presently attending, and for each day, places

cities

In the
current year

number
of years

classroom

Example(cont.)

course

Line 10: and hours where classes are held (each course

Line 11: meets at most once in one day). For graduate

Line 12: students, we represent the name of the advisor

Line 13: and the total number of credits in the last year.

Line 14: For Ph.D. students, we represent the title and the
research area

professor

Line 15: of their thesis. For teachers, we represent last

Line 16: name, age, place and state of birth, name of the

Line 17: department they belong to, telephone number

Line 18: title, status, and topics of their research.

research
area

Example(cont.)

Filtering the ambiguities

Line	Term	New Term	Reason for the Correction
5	Places	Cities	Place is a generic word
6	Period	Number of years	Period is a generic word
9	Presently	In the current year	Presently is ambiguous
9	Day	Day of the week	More specific
9	Places	Rooms	Homonym for places in line 5
10	Classes	Courses	Synonym for courses in line 8
15	Teacher	Professor	Synonym for professor in line 2
16	Place	City	Same as in line 5
17	Telephone	Telephone of the department	More specific
18	Status	Marital status	Status is ambiguous
18	Topic	Research area	Synonym for research area at line 14

Partitioning of sentences into homogeneous groups

In a university database, we represent data about students and professors.

General sentences

For students, we represent last name, age, sex, city and state of birth, city and state of residence of their families, cities and states where they lived before (with the number of years they lived there), courses that they have passed, with name, code, professor, grade, and date.

Sentences on students

We also represent courses they are attending in the current year, and for each day of the week, rooms and hours where courses are held (each course meets at most once in one day).

Sentences on courses

For graduate students, we represent the name of the advisor and the total number of credits in the last year. For Ph.D. students, we represent the title and the research area of their thesis.

Sentences on specific types of students

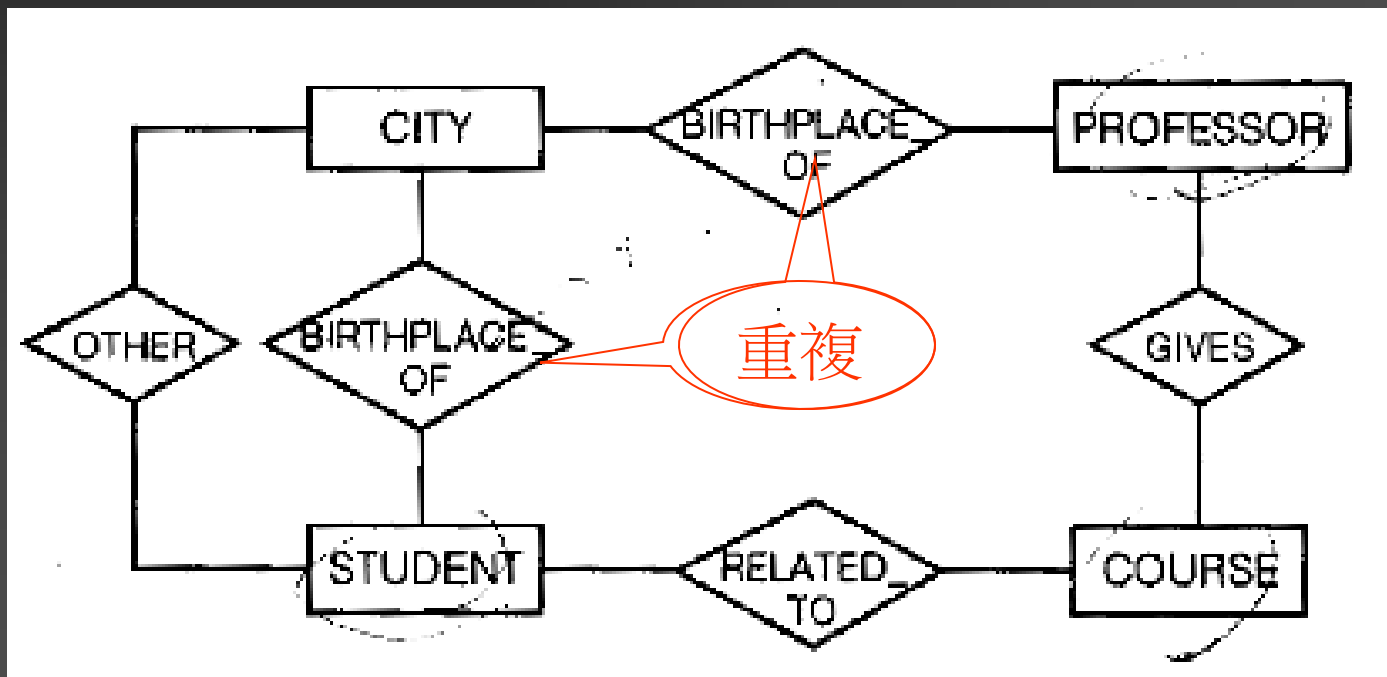
For professors, we represent their last name, age, city and state of birth, name of the department they belong to, telephone number of the department, title, marital status, and research area.

Sentences on professors

Example(cont.)

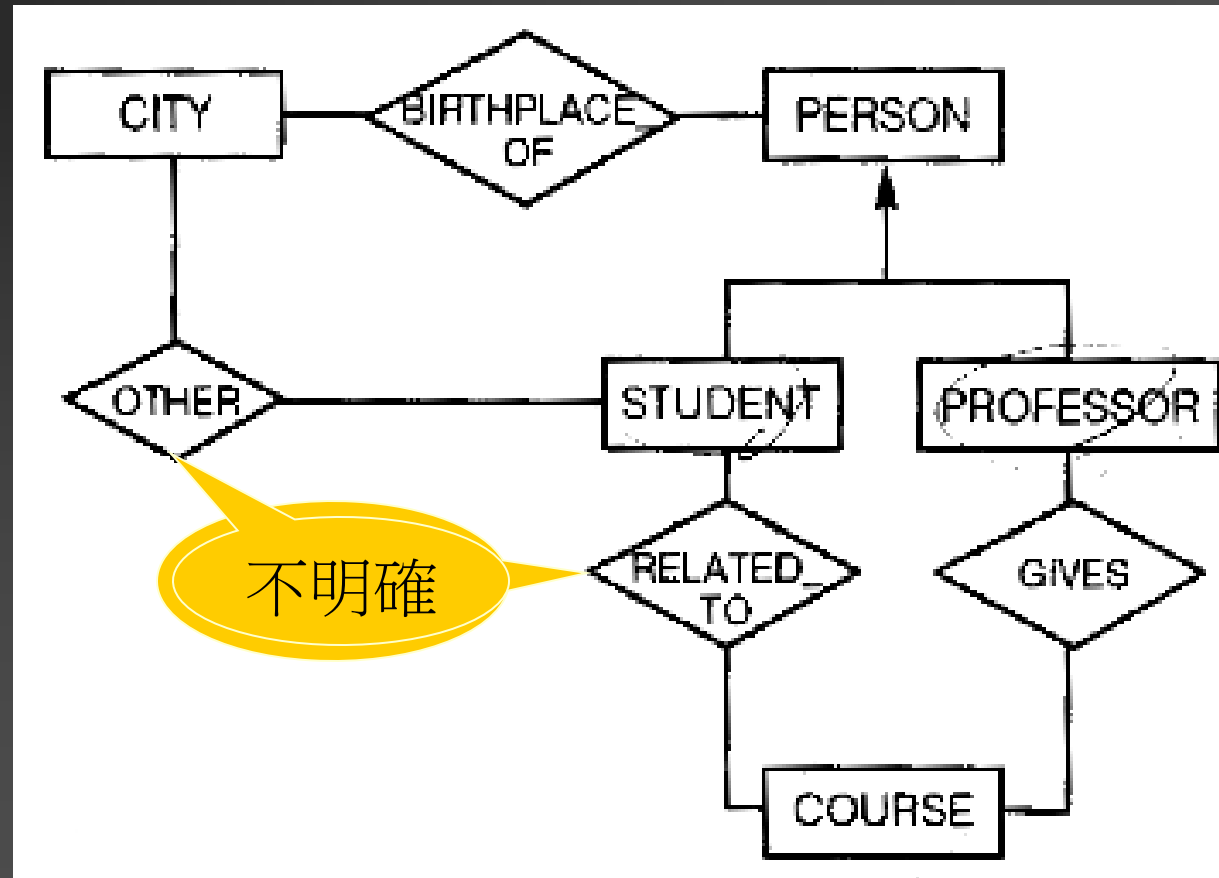
Step 2: Initial design

Find the first skeleton schema



Example(cont.)

Step 3: Schema refinement



Example(cont.)

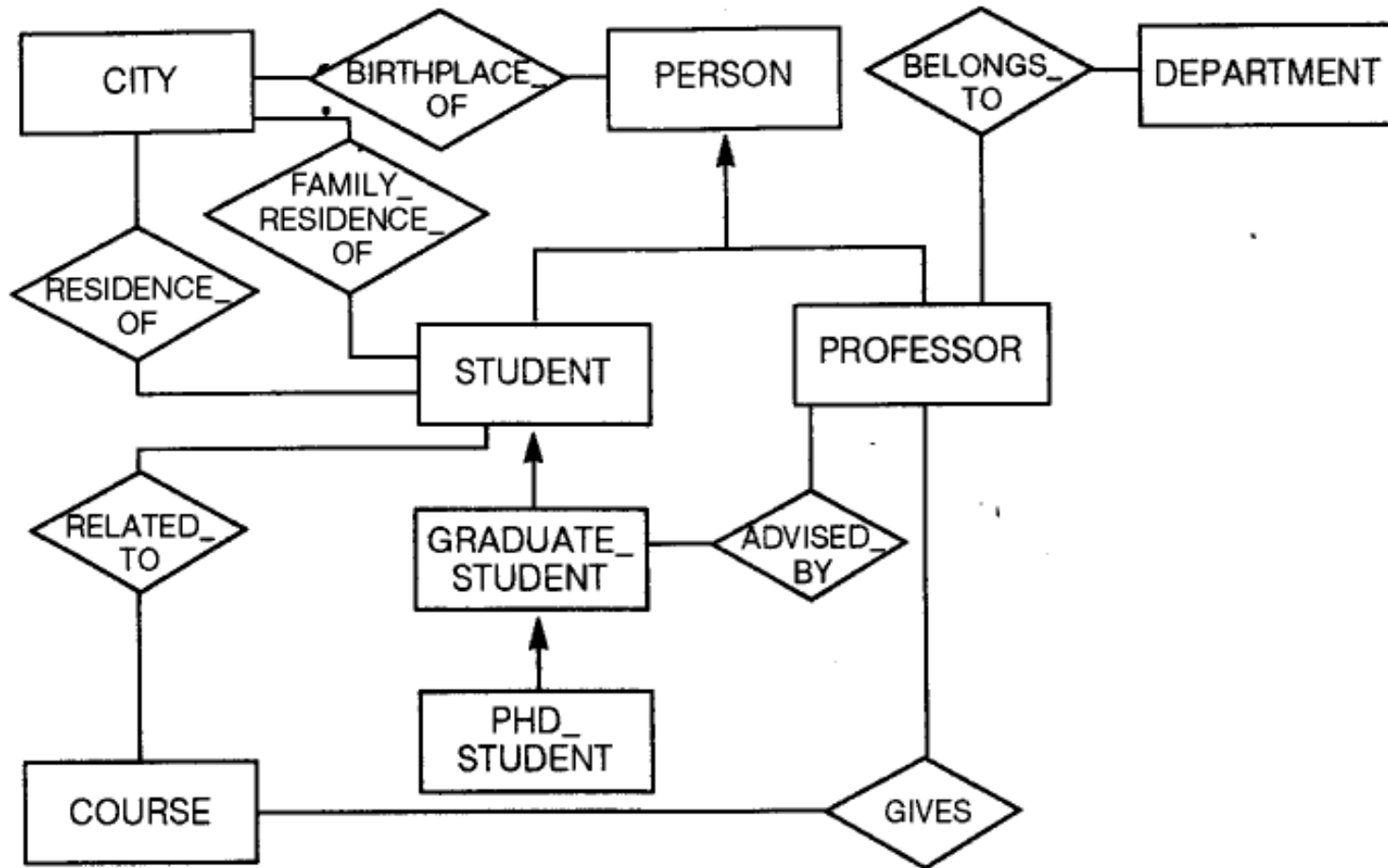


Figure 4.7 Refinement of the skeleton schema

Example(cont.)

Final schema

加上全部的
attribute 和
cardinality

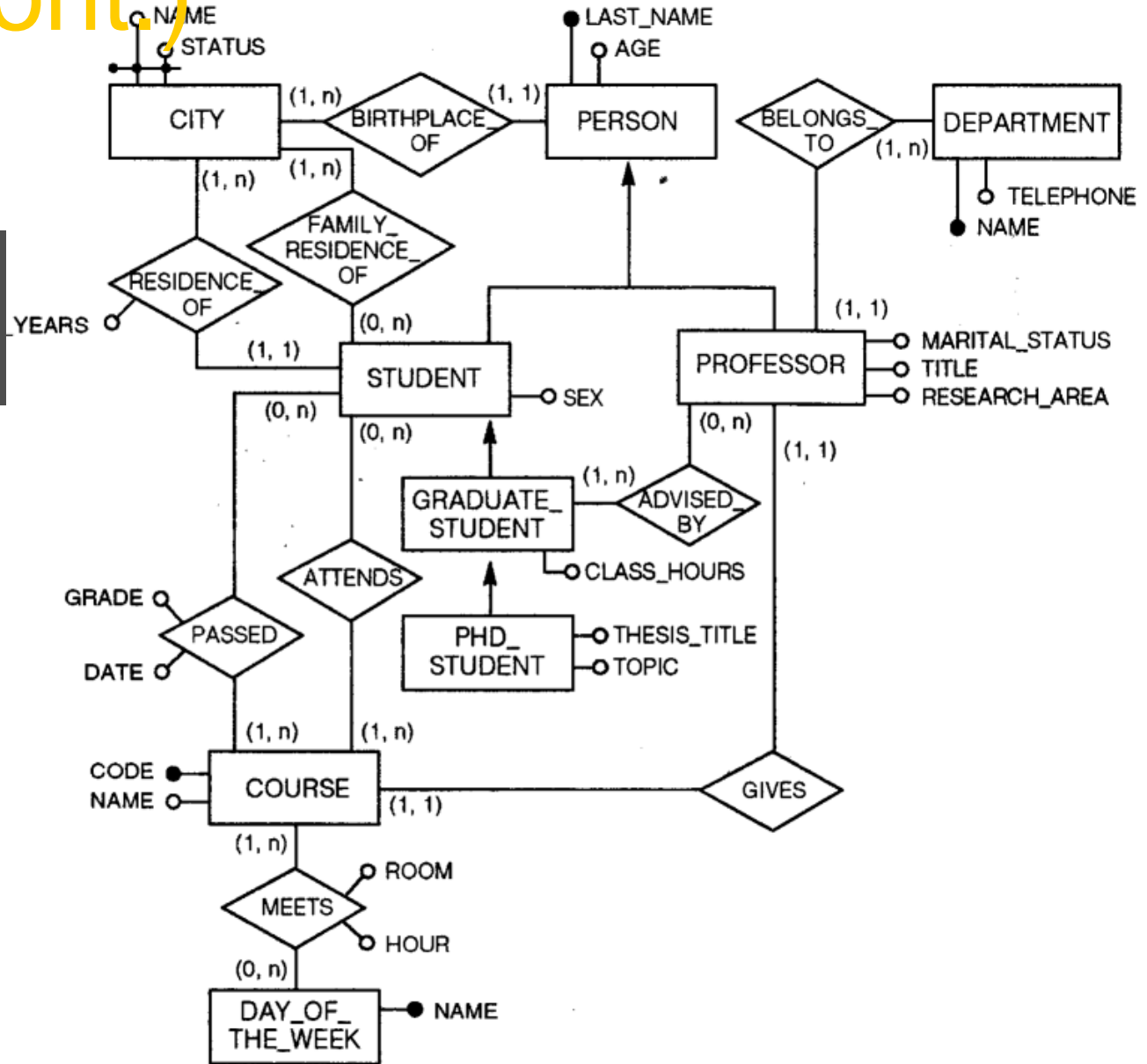


Figure 4.8 Final schema

View Design Starting From Forms

Step 1: Requirements analysis

1.1 Distinguish extensional, intensional and descriptive parts of the form

找出表格中的各部分

1.2 Select areas and subareas

選出表格中相關資料群

- 一張表格可分成四個部分
 - 簽名認證部分
 - 使用者填入內容(extension part)
 - 欄位名稱(intension part)
 - 說明指示部分(descriptive part)

View Design Starting From Forms

Step 2: Initial design

2.1 Build a global skeleton schema

建立初步架構圖

Step 3: Schema design for each area

3.1 Build the area schema

3.2 Merge the area schema

Example

Department of the Treasury Internal Revenue Service
1989

OMB No. 1545-0045

Step 1 Label
Use IRS label. Otherwise, please print or type.

Personal data

Your first name and initial: [redacted] Last name: [redacted]
 For joint return, spouse's first name and initial: [redacted] Last name: [redacted]
 Home address (number and street): [redacted] (If you have a P.O. box, see page 15 of the instructions.) Apt. no.: [redacted]
 City, town or post office, state and ZIP code: [redacted] (If you have a foreign address, see page 15.)

Your social security no.: [redacted]
 Spouse's social security no.: [redacted]

For Privacy Act and Paperwork Reduction Act Notice, see page 3.

Presidential Election Campaign Fund
 Do you want \$1 to go to this fund? Yes No
 If joint return, does your spouse want \$1 to go to this fund? Yes No

Note: Checking "Yes" will not change your tax or reduce your refund.

Step 2 Check your filing status
 (Check only one.)

1 Single (See if you can use Form 1040EZ.)
 2 Married filing joint return (even if only one had income)
 3 Married filing separate return. Enter spouse's social security number above and spouse's full name here.
 4 Head of household (with qualifying person). (See page 16.) If the qualifying person is your child but not your dependent, enter this child's name here.
 5 Qualifying widow(er) with dependent child (year spouse died ▶ 19 ____). (See page 17.)

Step 3 Figure your exemptions
 (See page 17 of instructions.)

If more than 7 dependents, see page 20.

6a Yourself (If someone (such as your parent) can claim you as a dependent on his or her tax return, do not check box 6a. But be sure to check the box on line 15b on page 2.)
6b Spouse

c Dependents:

1. Name (first, initial, and last name)	2. Check if under age 2	3. If age 2 or older, dependent's social security number	4. Relationship	5. No. of months lived in your home in 1989	6. No. of your children on tax who:
[redacted]	<input type="checkbox"/>	[redacted]	[redacted]	[redacted]	<input type="checkbox"/> lived with you <input type="checkbox"/> didn't live with you due to divorce or separation (see page 20)
[redacted]	<input type="checkbox"/>	[redacted]	[redacted]	[redacted]	No. of other dependents listed on line 6c

d If your child didn't live with you but is claimed as your dependent under a pre-1985 agreement, check here **e** Total number of exemptions claimed.

Add numbers entered on lines above

Step 4 Figure your total income
 Attach Copy B of Form(s) W-2 here

7 Wages, salaries, tips, etc. This should be shown in Box 10 of your W-2 form(s). (Attach Form(s) W-2.) **7**

8a Taxable interest income (see page 24). (If over \$400, also complete and attach Schedule 1, Part II.) **8a**

b Tax-exempt interest income (see page 24). (DO NOT include on line 8a.) **8b**

9 Dividends. (If over \$400, also complete and attach Schedule 1, Part III.) **9**

10 Unemployment compensation (insurance) from Form(s) 1099-G. **10**

Step 5 Figure your adjusted gross income
 Attach check or money order here

11 Add lines 7, 8a, 9, and 10. Enter the total. This is your total income. **▶ 11**

12a Your IRA deduction from applicable worksheet. Rules for IRAs begin on page 25. **12a**

b Spouse's IRA deduction from applicable worksheet. Rules for IRAs begin on page 25. **12b**

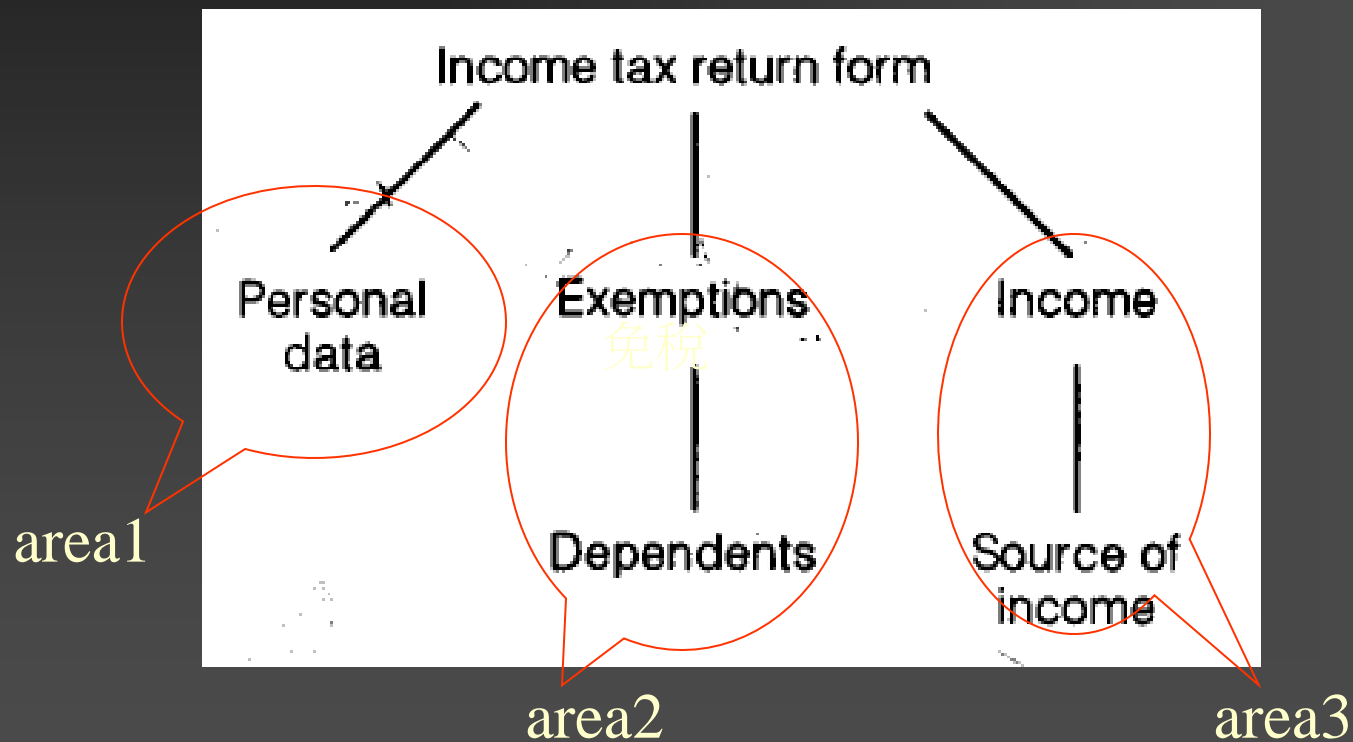
c Add lines 12a and 12b. Enter the total. These are your total adjustments. **12c**

13 Subtract line 12c from line 11. Enter the result. This is your adjusted gross income. (If this line is less than \$19,340 and a child lived with you, see "Earned Income Credit" (line 25b) on page 37 of instructions.) **▶ 13**

Income

Example (cont.)

Step 1: Find the areas and sub-areas.



Example (cont.)

Step 2: Build a global skeleton schema

將同一階層的概念抓下來當作 skeleton schema 的 entities.

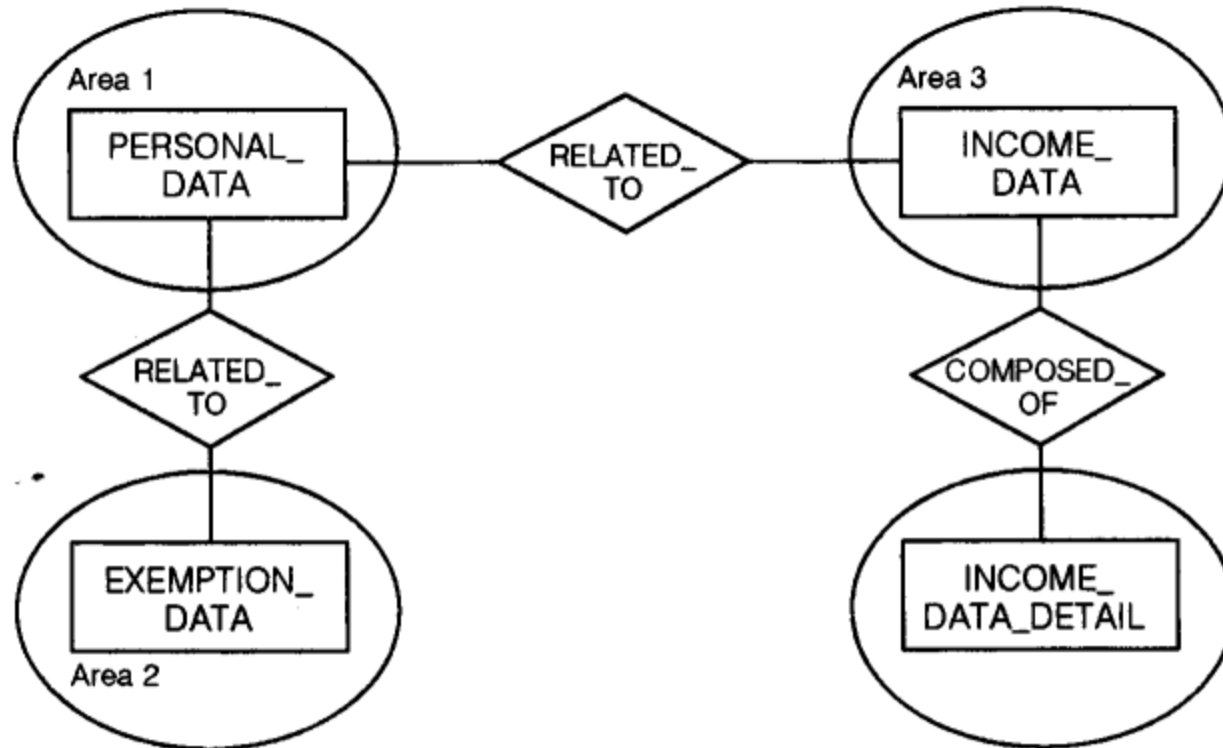


Figure 4.13 Skeleton schema of the database for the Income Tax Return Form

Example (cont.)

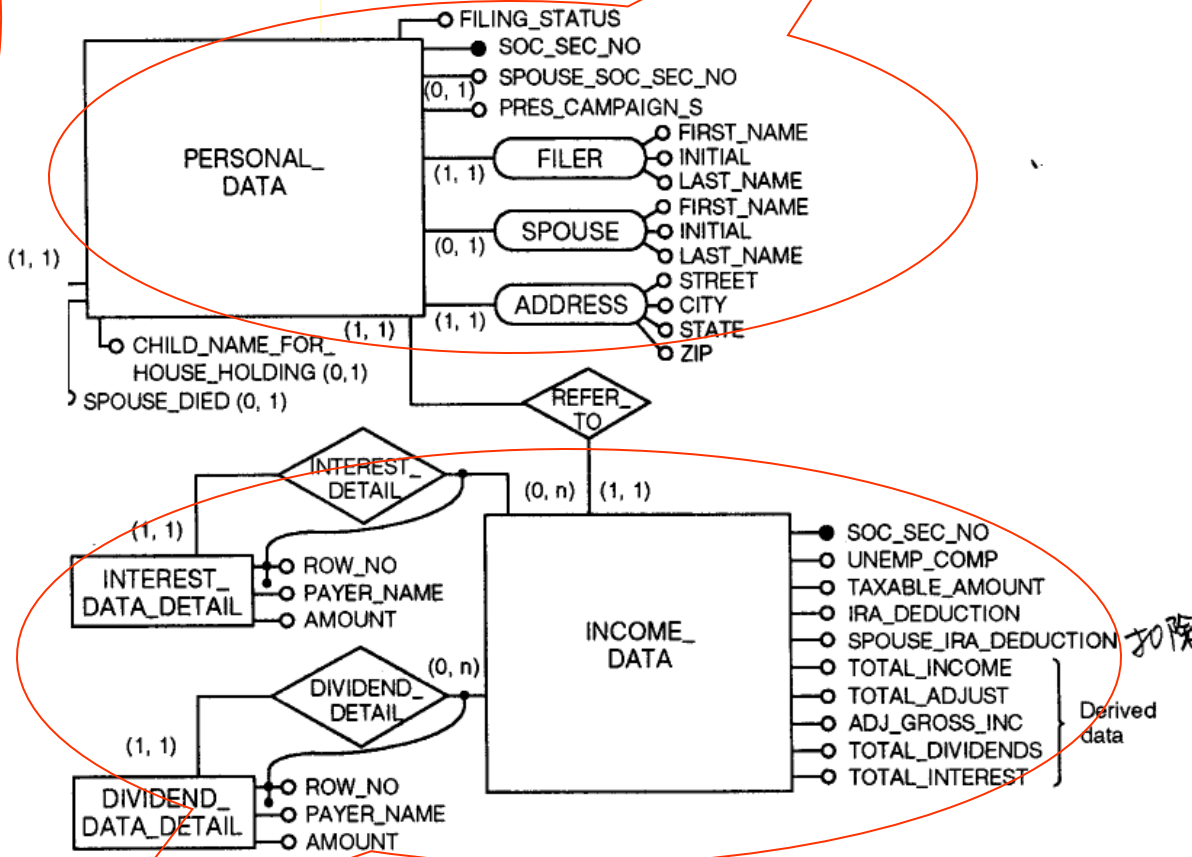
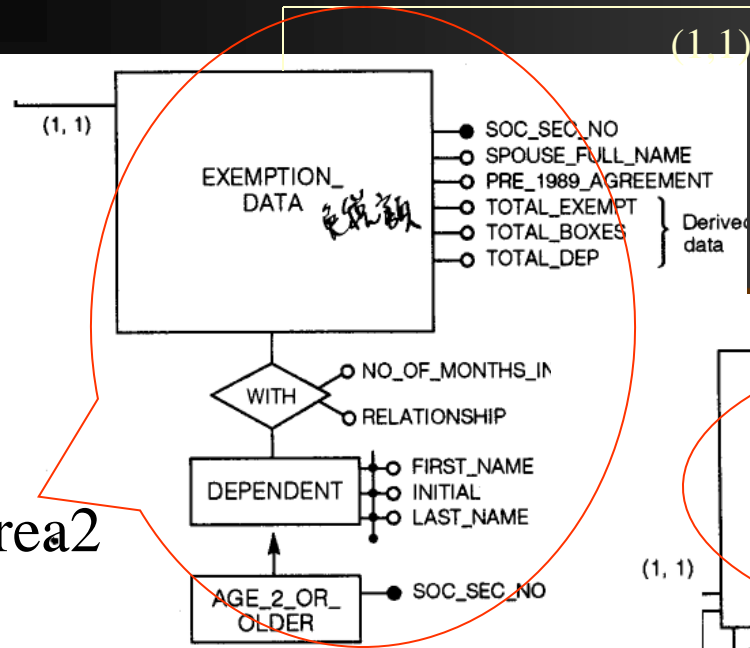
area1

area2

(1,1)

RELATED TO

(1,1)



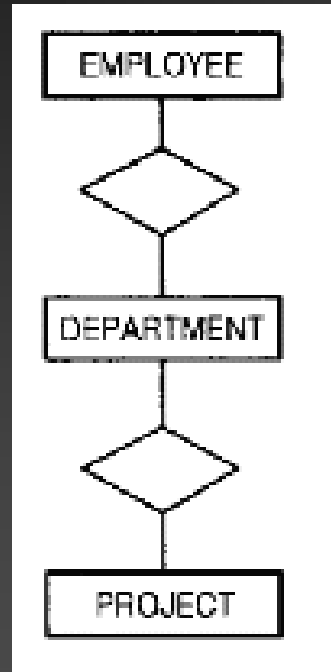
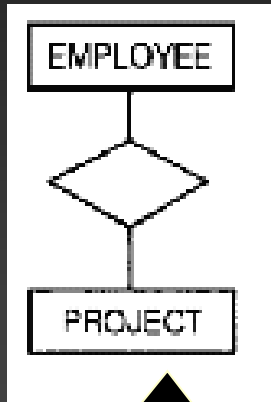
area3

Final conceptual schema for Income Tax Return Form

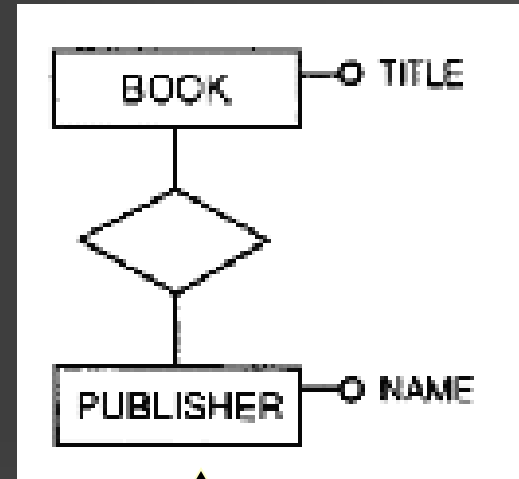
View Integration

- 把數個 conceptual schema 整合為一個 global conceptual schema, 以代表整個應用系統的需求.
- 常用在大型資訊系統或分散式資料庫
- 整合時發生同樣觀念不同表示法或是同一事件但解釋不同的現象稱為衝突 **conflict**.
- 整合時必須先把衝突的概念一一列出, 將互相衝突的概念一致化, 再行整合.
- 大型系統整合時,
 - 同時整合數個 schema 或是
 - 一次加入一個 schema

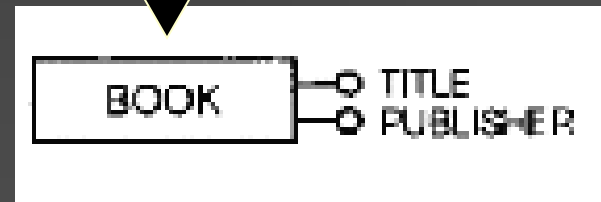
Conflicts



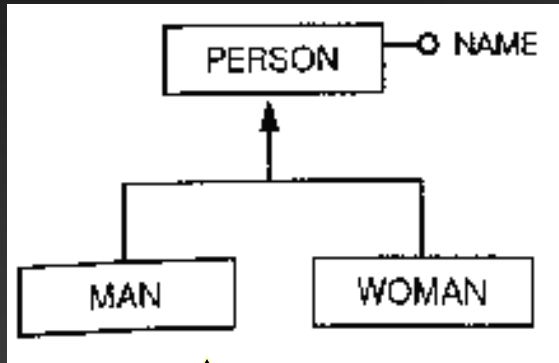
不同觀念



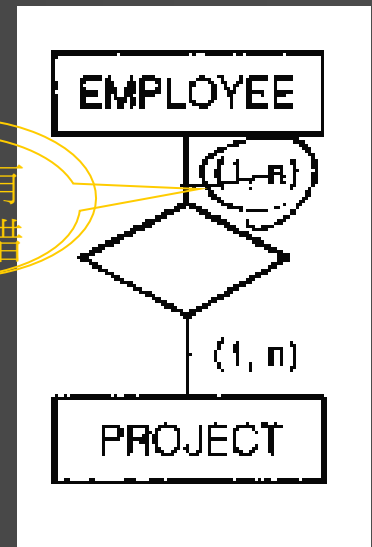
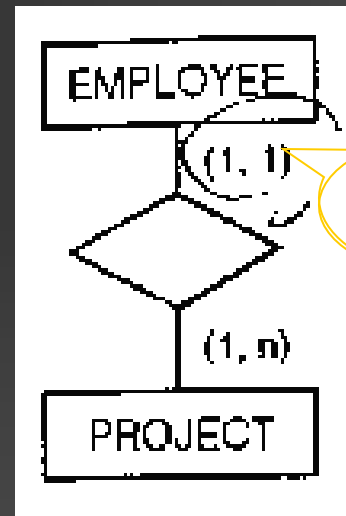
不同圖表達相同的概念



Conflicts



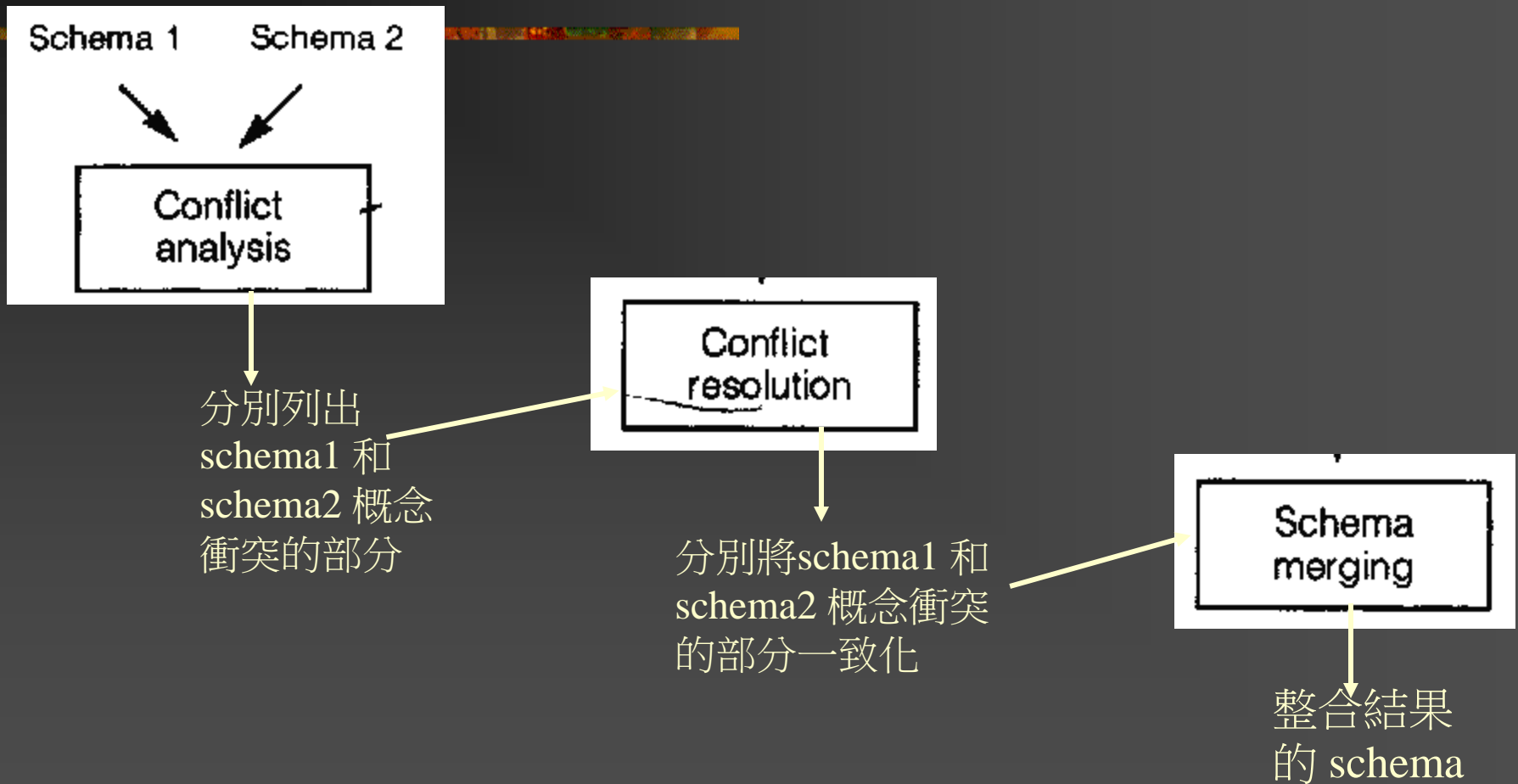
不同的圖表現相同的概念



一定有一個錯

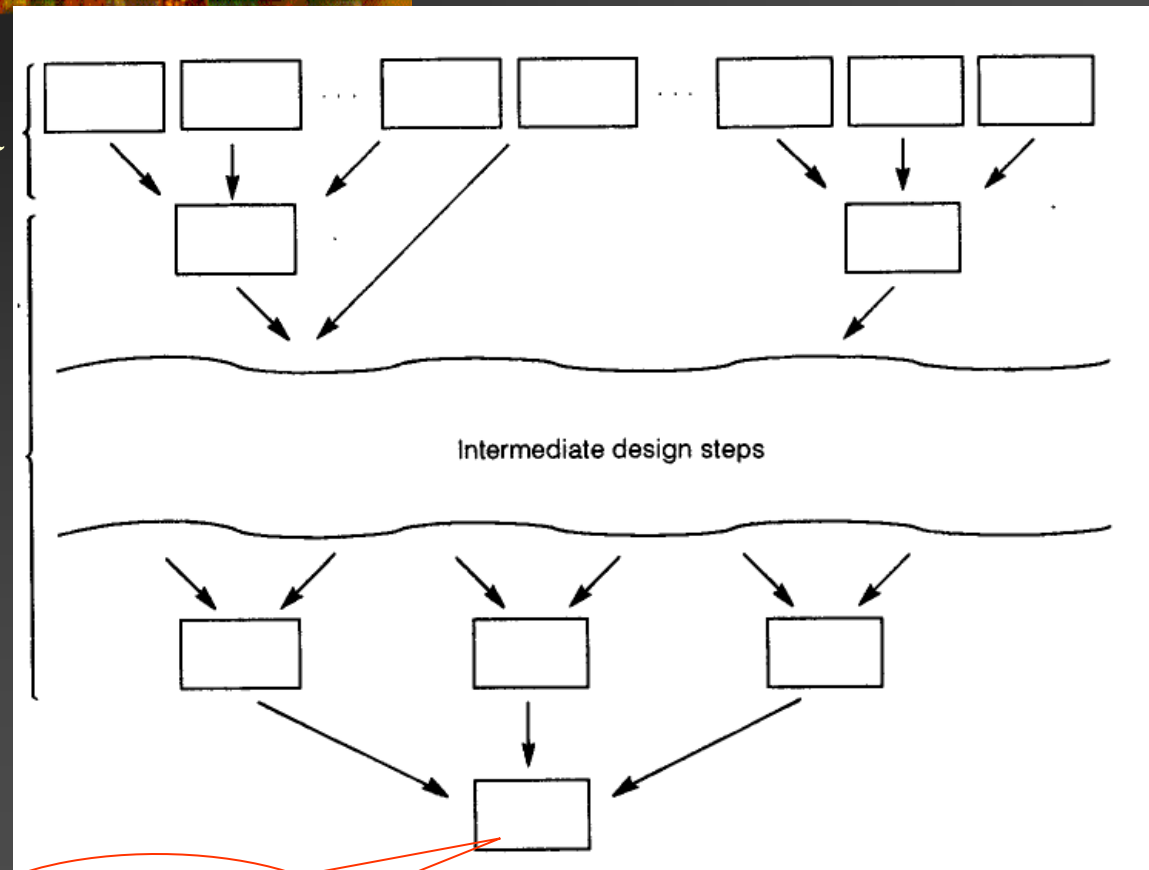
不相容的設計規格

Approach to View Integration



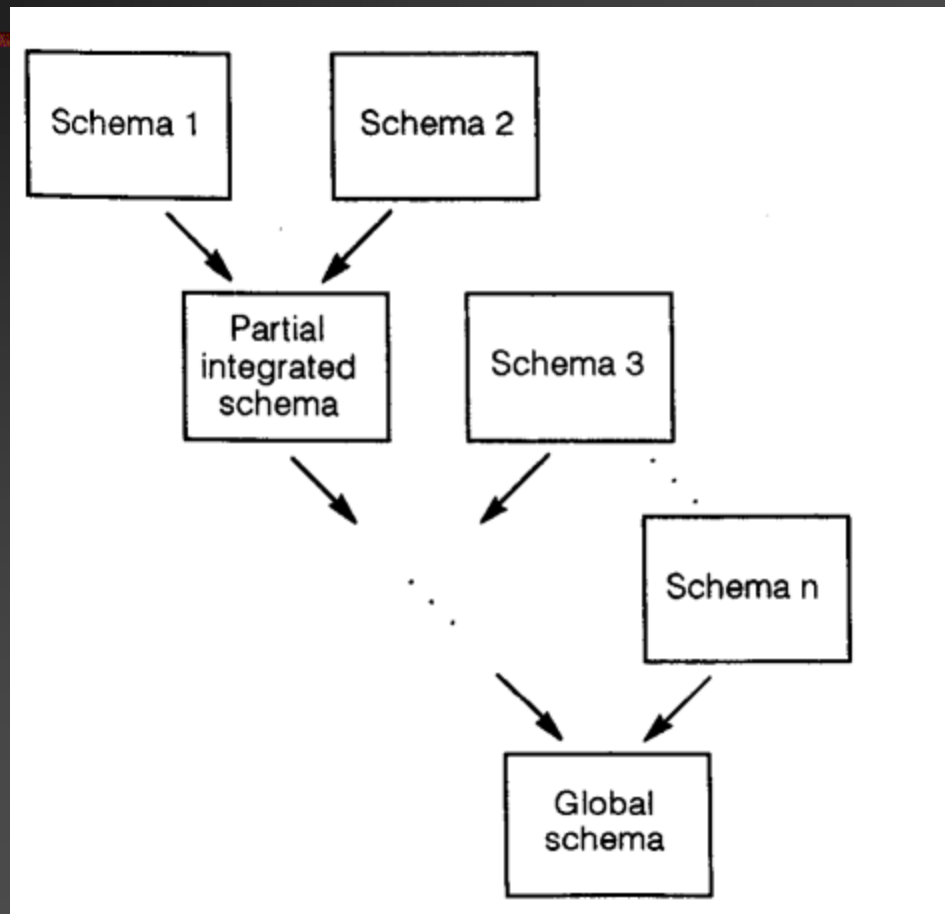
The most general approach to view integration

Initial schema



Final schema

The suggested sequence of view-integration activities

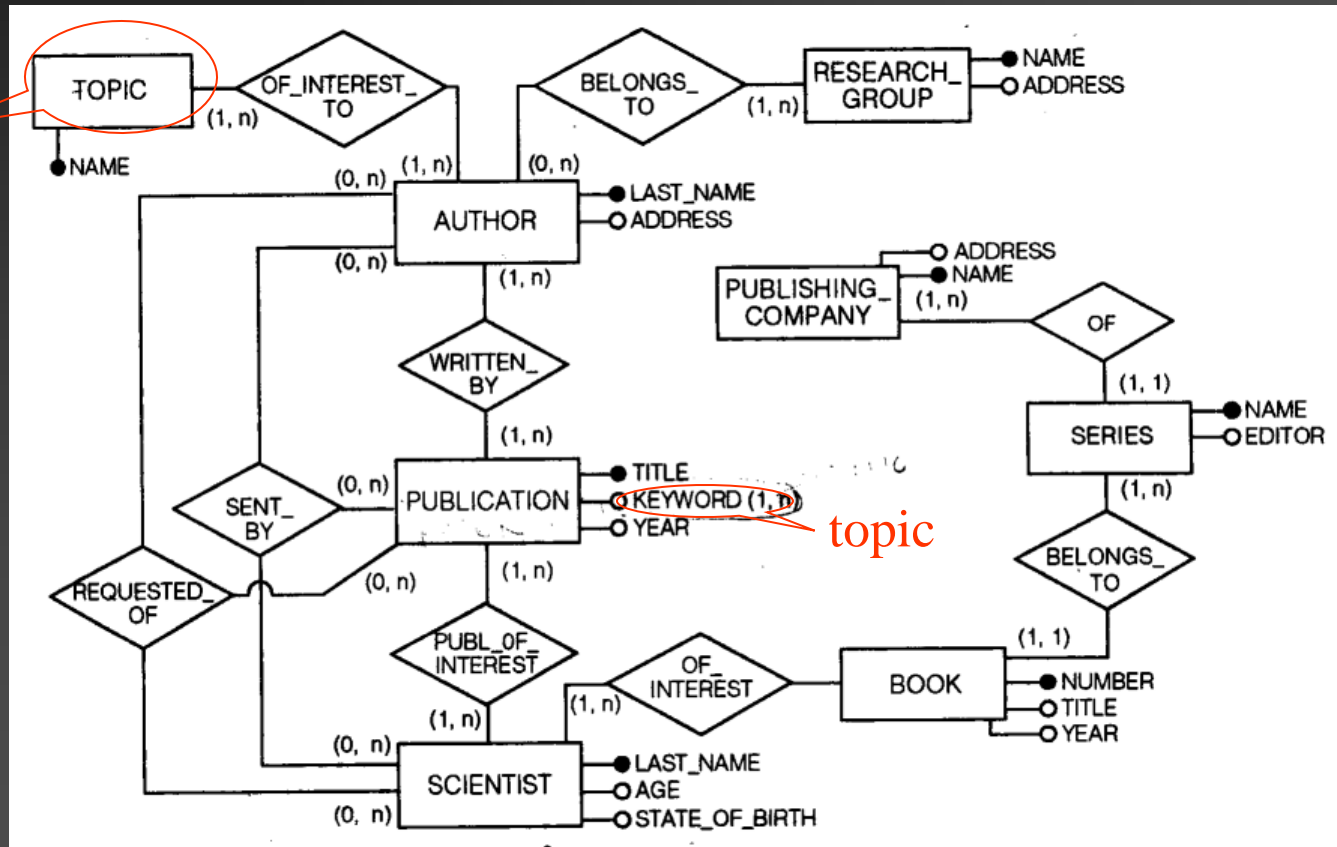


一次加入一個

Example of integrating two schemas

Scientist schema (Schema 1)

Research
area



Example of integrating two schemas

Librarian schema (Schema 2)

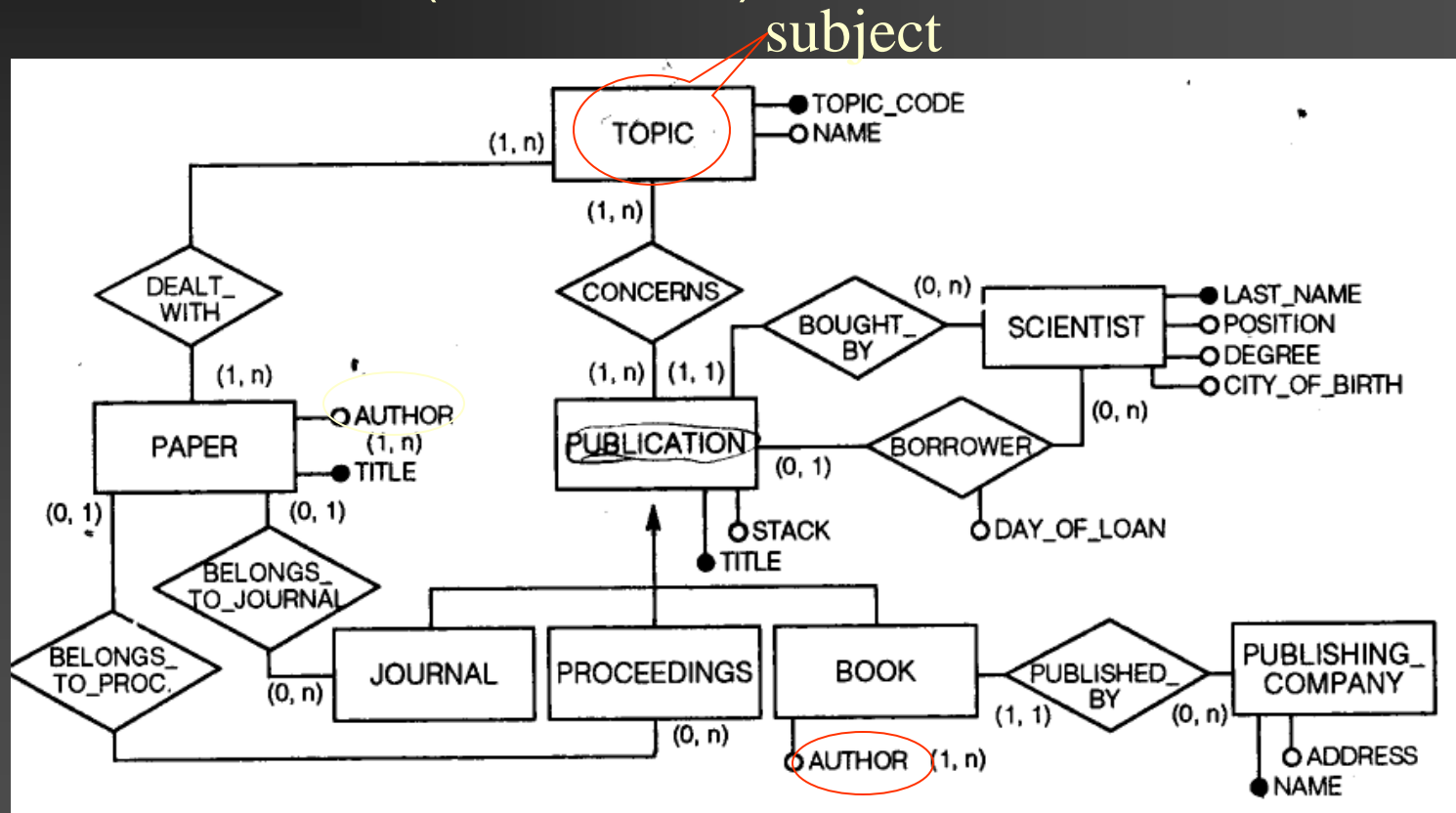


Table 5.1 Concepts in Schema 1 (Scientist Schema)

Name	Description
Author	Authors of publications of interest to scientists
Publication	Publications kept by scientists in their private cabinets; they are usually directly obtained by scientists from authors
Topic	Research areas of interest to authors
Requested of	Connects papers that have been requested by some scientist to the author of whom the request has been made
Sent by	Connects papers that have been sent by authors to scientists who have requested them

Table 5.2 Concepts in Schema 2 (Librarian Schema)

Name	Description
Publication	Publications presently kept in the library
Paper	Papers published in journals or proceedings kept in the library
Topic	Topics of papers
Bought by	Indicates which scientist is responsible for the grant used to purchase the publication

Conflict analysis and resolution

■ Name conflict analysis

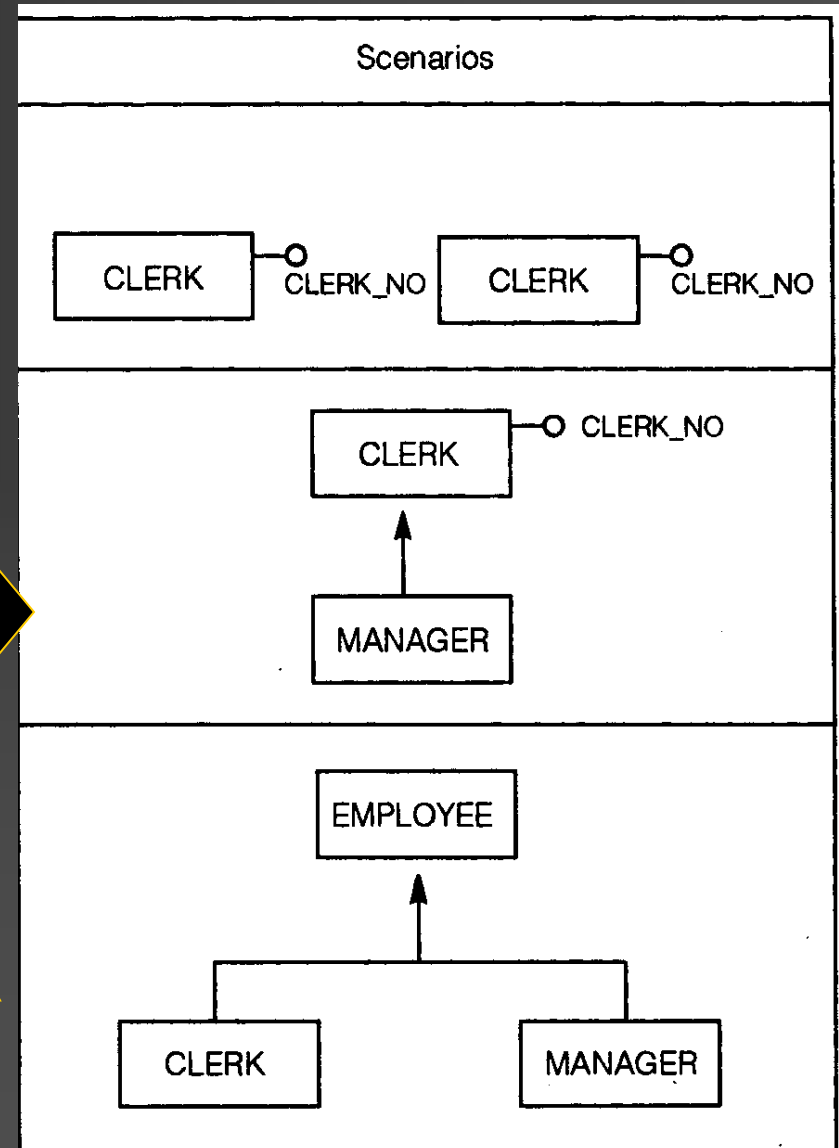
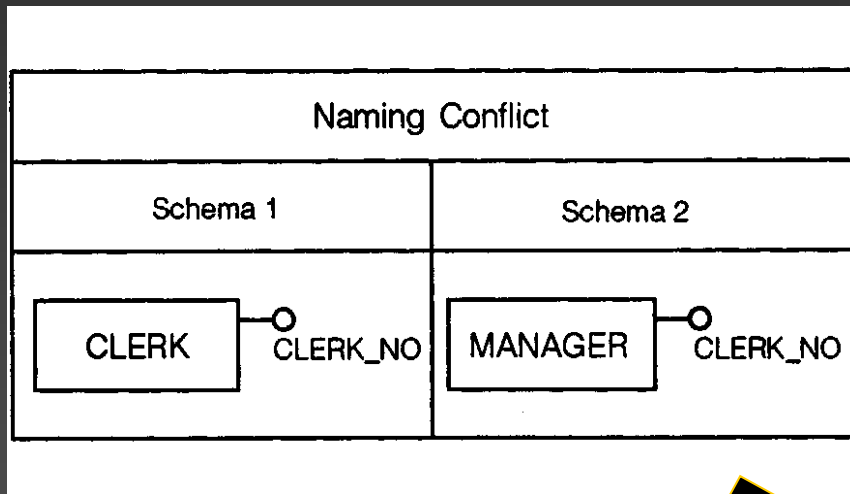
- 找出同名異義或異名同義者
- 找出在不同的 **schema** 中不同概念間有互相限制的關係存在 (inter-schema property)

■ Structural conflict analysis

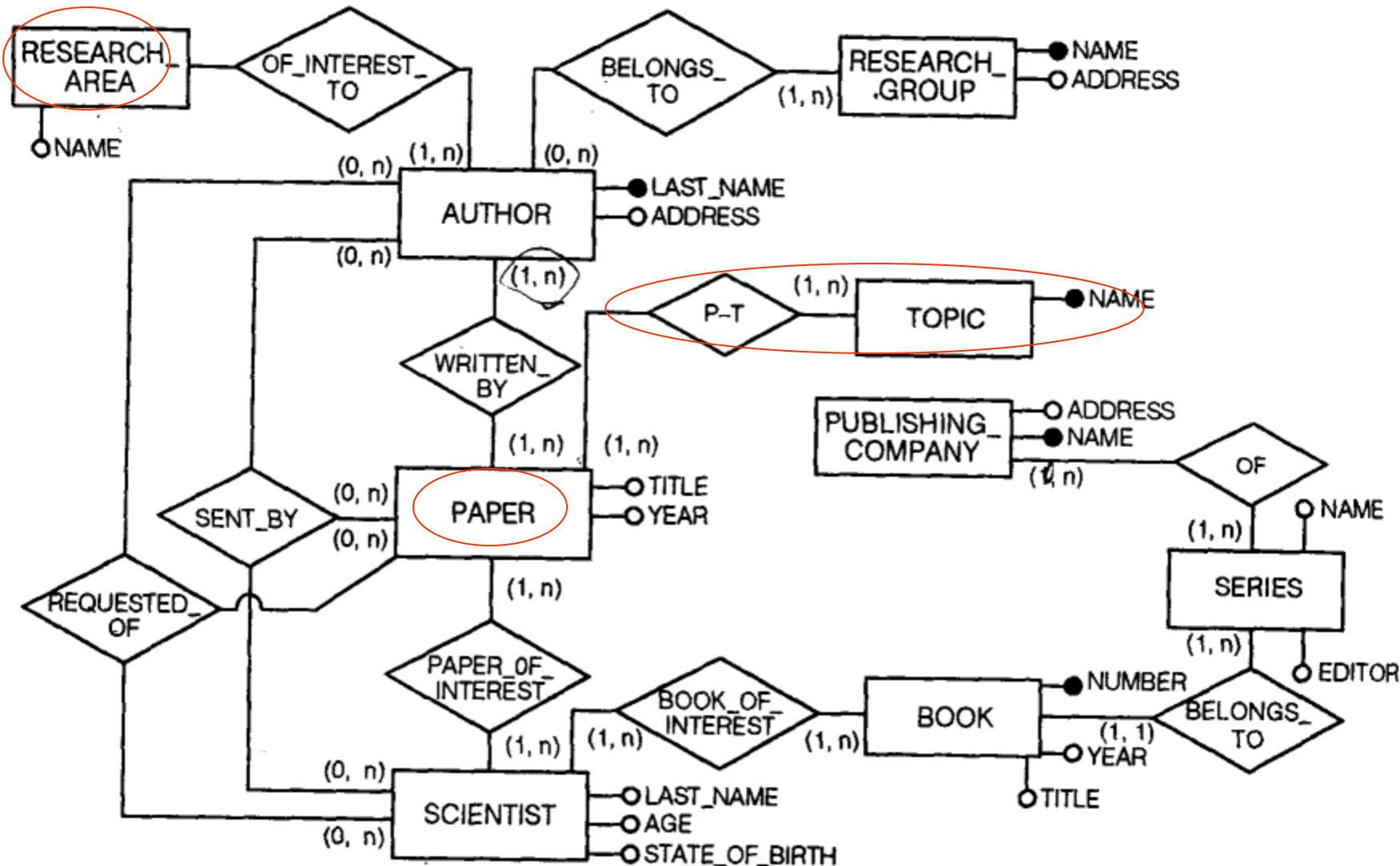
- 相同的概念, 用不同的 **schema** 表達
例: **AUTHOR** 在 **schema 1** 是 **entity**
在 **schema 2** 是 **attribute**

Conflict analysis and resolution

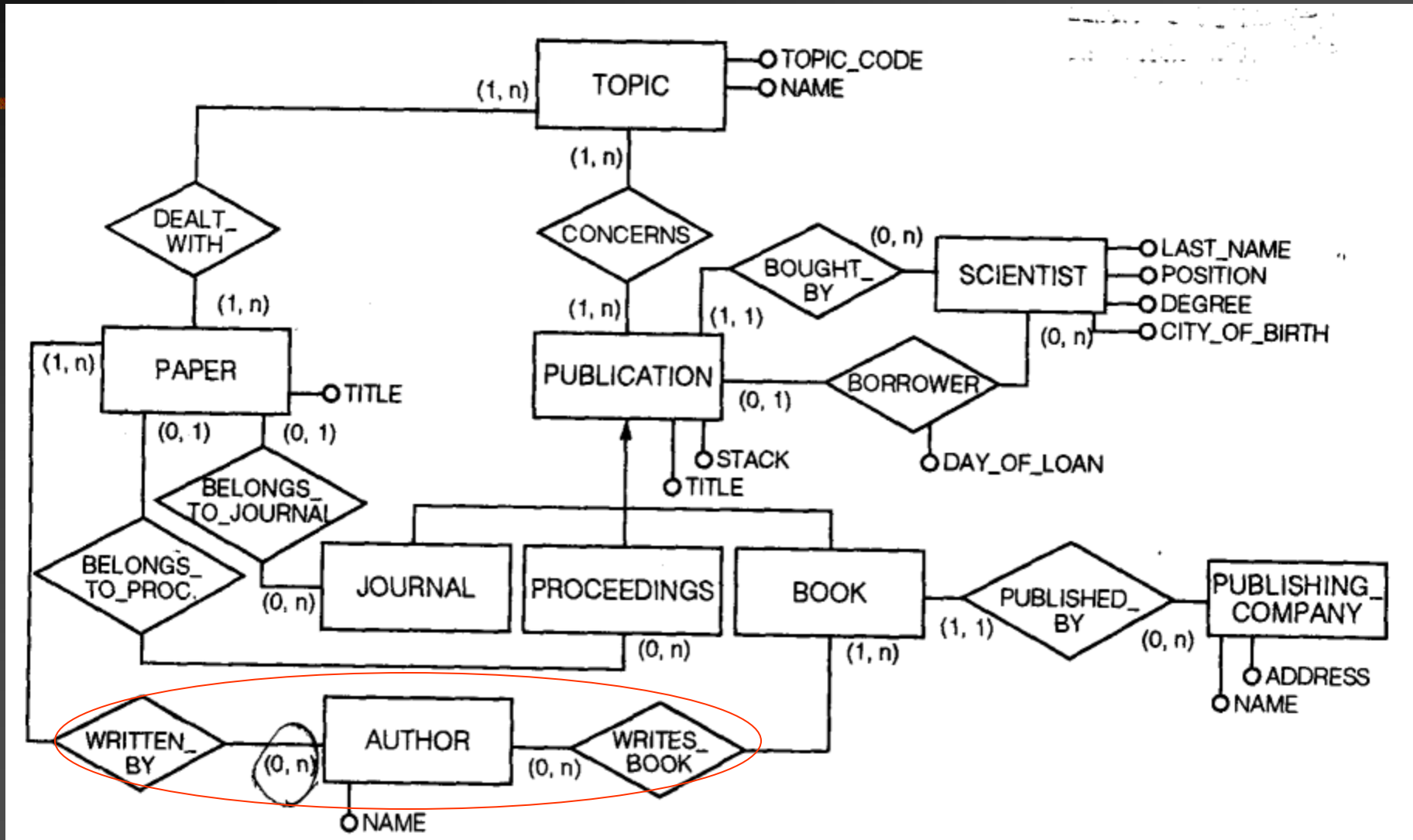
Three possible modification for a name conflict.



Modified Scientist Schema



Modified Librarian Schema



Merging of views

- 把完全相同的 **entity** 直接放入 **result schema**.
 - 例: PUBLISHING-COMPANY
- 相同的 **entity**, 但不同的 **attributes**, 將之聯集起來, 找出 **identifier**.
 - 例: SCIENTIST
- 若有 **generalization** 表現出 **inter-schema properties**, 加入 **result schema**.
 - 例: TOPIC and RESEARCH_AREA 用 CONCERNS 相連
- 當全部的 **entities** 皆放入 **result schema** 之後, 加入 **relationships & generalization**.

Resulting Schema

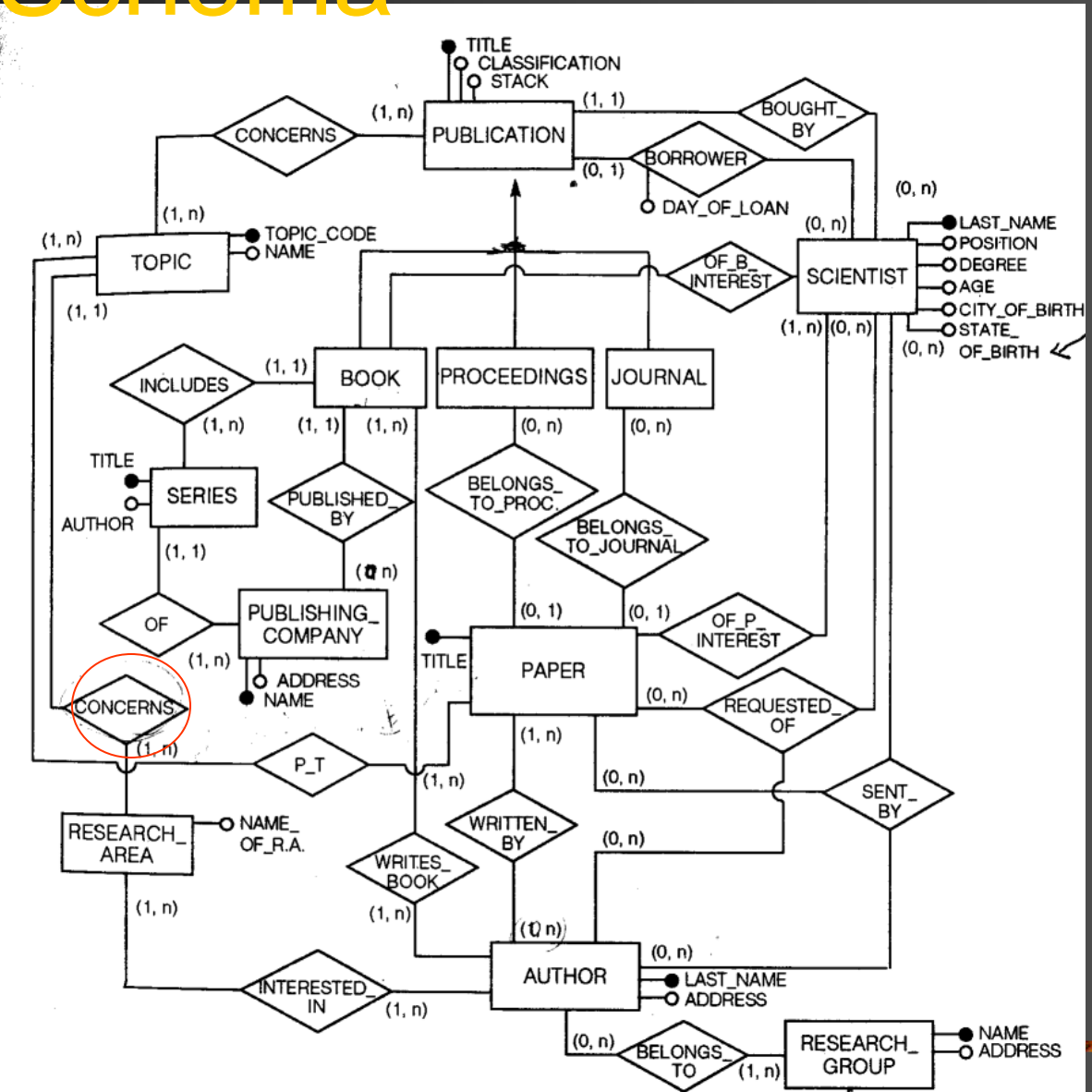


Figure 5.8 Global schema after merging

Exercise 1

Build a conceptual schema for the following natural language description.

Design a database system for managing information about routes supported by a bus company. Each route served by the company has a starting place and an ending place, but it can go through several intermediate stops. The company is distributed over several branches. Not all the cities where the buses stop have a branch; however, each branch must be at a city located along the bus routes. There can be multiple branches in the same city and also multiple stops in the same city. One bus is assigned by the company to one route; some routes can have multiple buses. Each bus has a driver and an assistant, who are assigned to the bus for the day.

Exercise 2

Build a conceptual schema for the following natural language description.

Design the database for the administration and reservation office of a bus company. Each passenger can book a seat on a given portion of the routes served by each bus; routes have a starting place, an ending place, and several intermediate places. Passengers can specify whether they want to be in the smoking or nonsmoking section. Some passengers can get in the bus even if they do not have a reservation, when some seats are left empty. With each reservation, the last name, initials, and telephone number of the passenger is stored. Sometimes, trips are not made because of bad weather conditions; in this case, passengers holding reservations are notified. At the end of the trip, the driver's assistant reports to the company the total amount of tickets purchased on the bus by passengers and reports this amount to the administrative office of the branch at the route's destination.

Exercise 3

Build a conceptual schema that contains all data mentioned in the following form.

東吳大學「專任教師」排課意願調查表(大學部)

系別：_____ 姓名：_____ 教師代碼：_____

電話：(8) _____ (0) _____

授課科目：_____

科數	系級	科目名稱	必選修	學分數		時數		需常用三槍(請✓)
				上	下	上	下	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

【預選表填寫注意事項】

1. 依本校教師聘約規定：「專任教師授課時間由教務處排定」，本表僅供排課單位參考之用。
2. 下列預選表請專任老師至多選擇(請打×)不能至晚上課之3個半天(半天：係指一個上午或一個下午)，務請教師協助。教師亦可於晚間時段(AB堂)排課，請於晚上框格中打✓，請教師多加利用。
3. 三小時之科目，排課節次以三、四、中午堂；中午、五、六堂；七、八、九堂；九、A、B堂之方式安排為原則。週六亦為正常排課日。
4. 目前兩校區每間教室皆安裝電視機(或三槍)、錄放影機及銀幕，故需用電化教學者，無須特別註明。惟裝設三槍投影教學數量較少，若為期需使用三槍投影電化設備者，請勾選於上列該科目後；然頻率較少者，可於上課前一週向課務組借用。

節次	時間	星期					
		一	二	三	四	五	六
1	08:10~09:00						
	09:10~10:00						
	10:10~11:00						
	11:10~12:00						
E	12:10~13:20						
	01:30~02:20						
6	02:30~03:20						
	03:30~04:20						
8	04:30~05:20						
	05:30~06:20						
A	06:25~07:15						
	07:20~08:10						

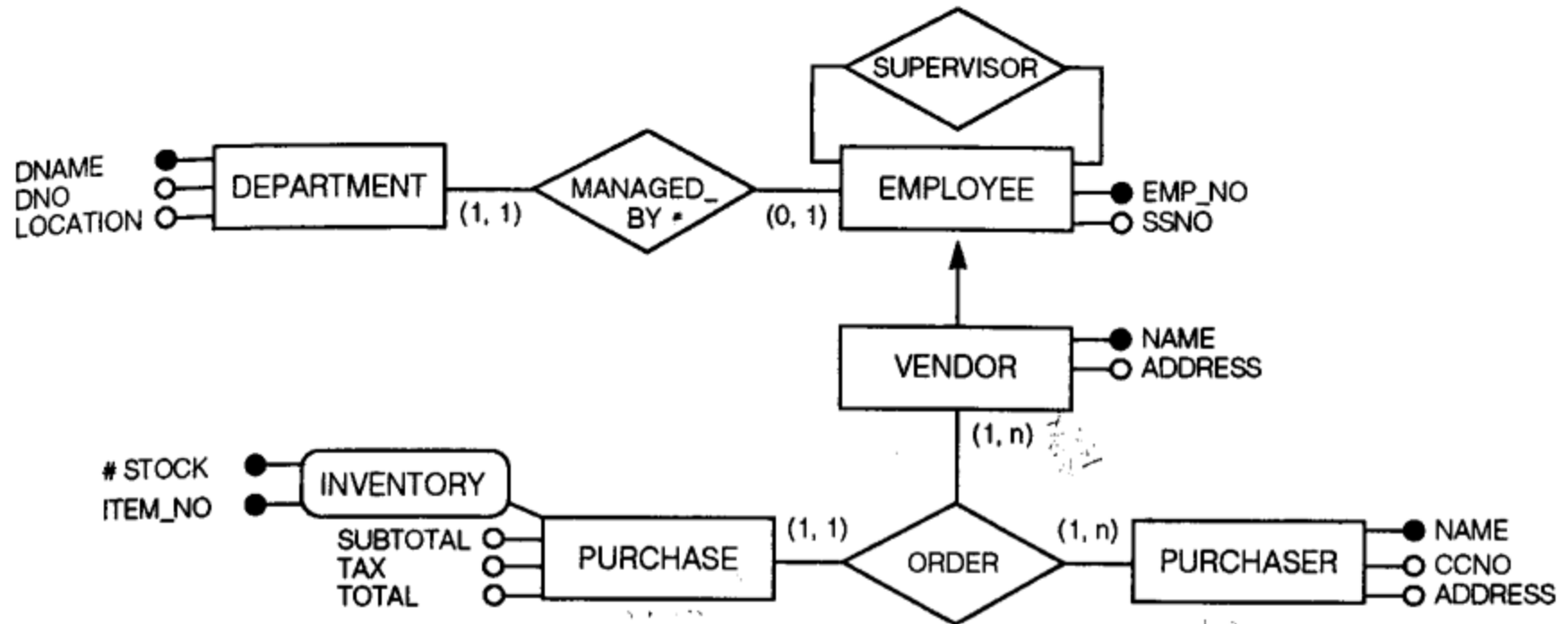
填表者簽名：_____

年 月 日 以上時間皆可(請打✓)

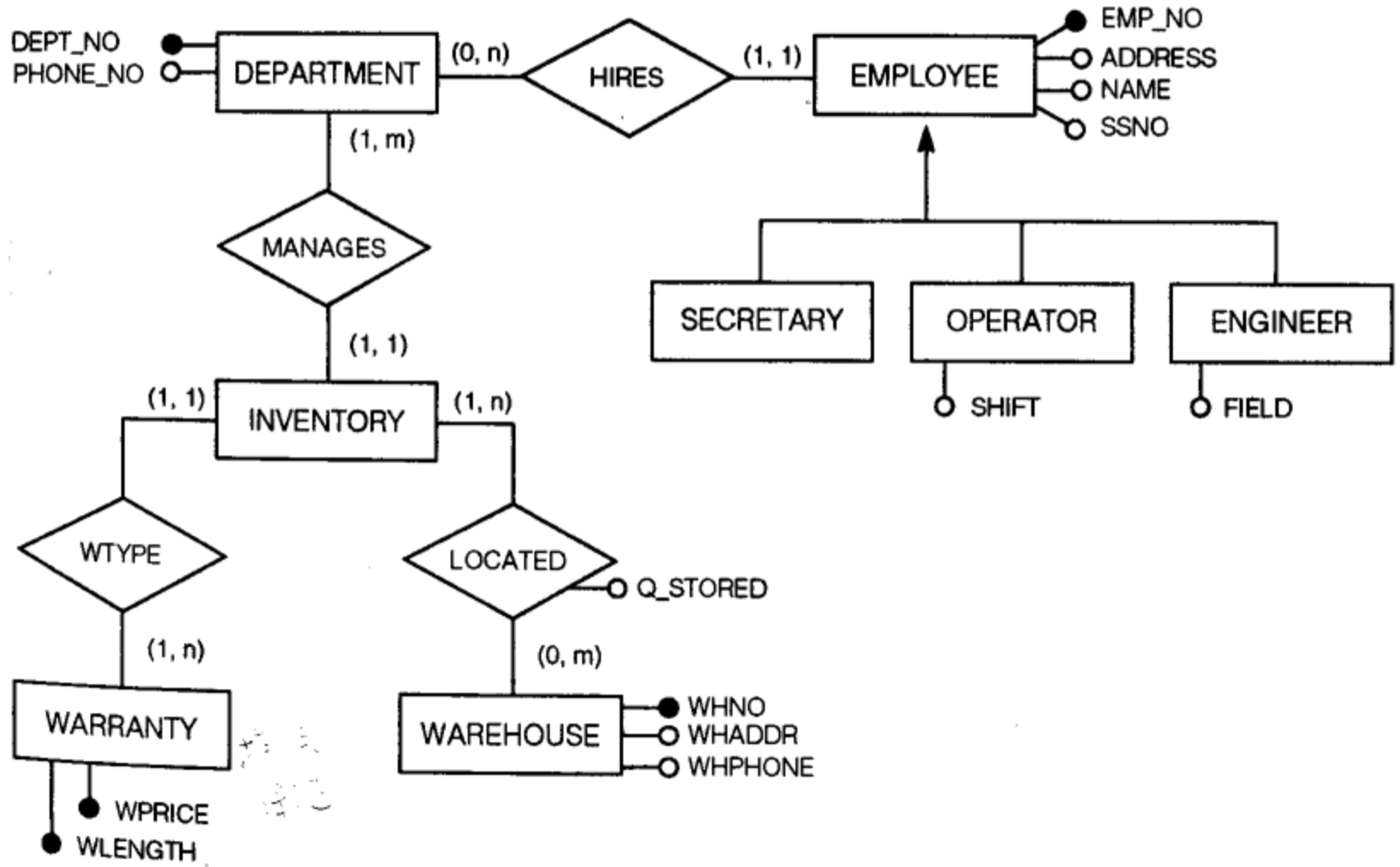
© 請於 月 日以前送交學系辦公室彙整。

Exercise 4

4. Integrate the two schemas, which represent sales in a company and the structure of its departments and personnel, producing a single schema.



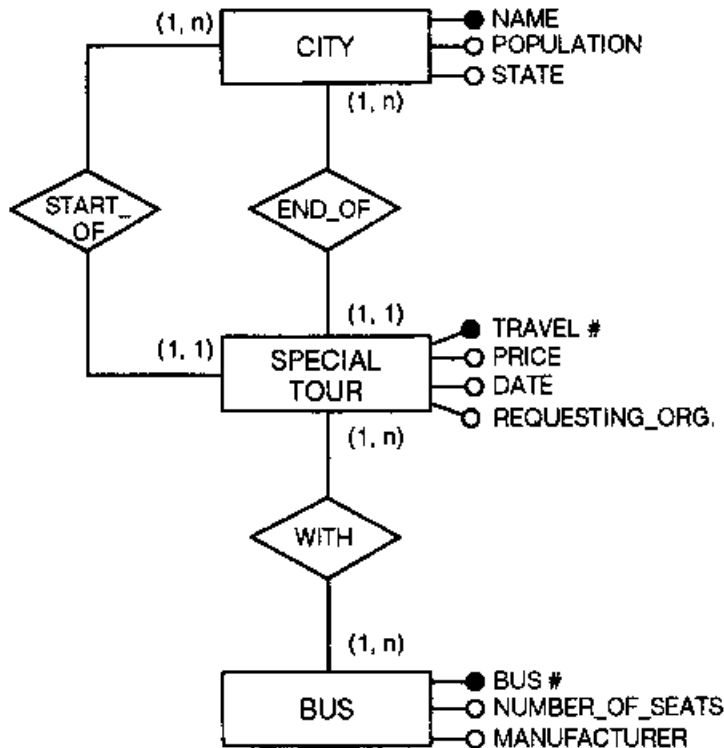
(a) First schema



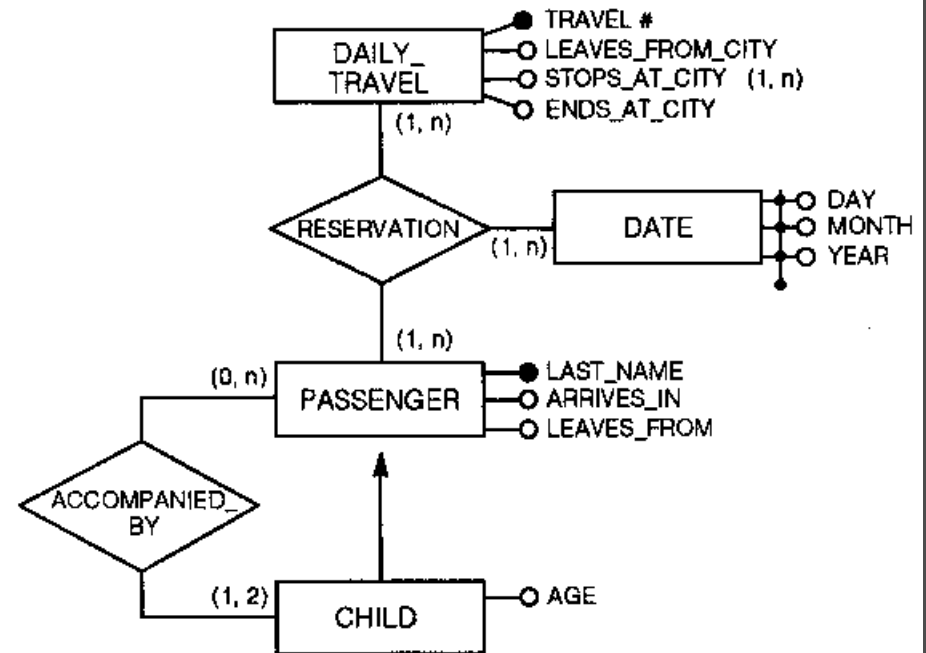
(b) Second schema

Exercise 5

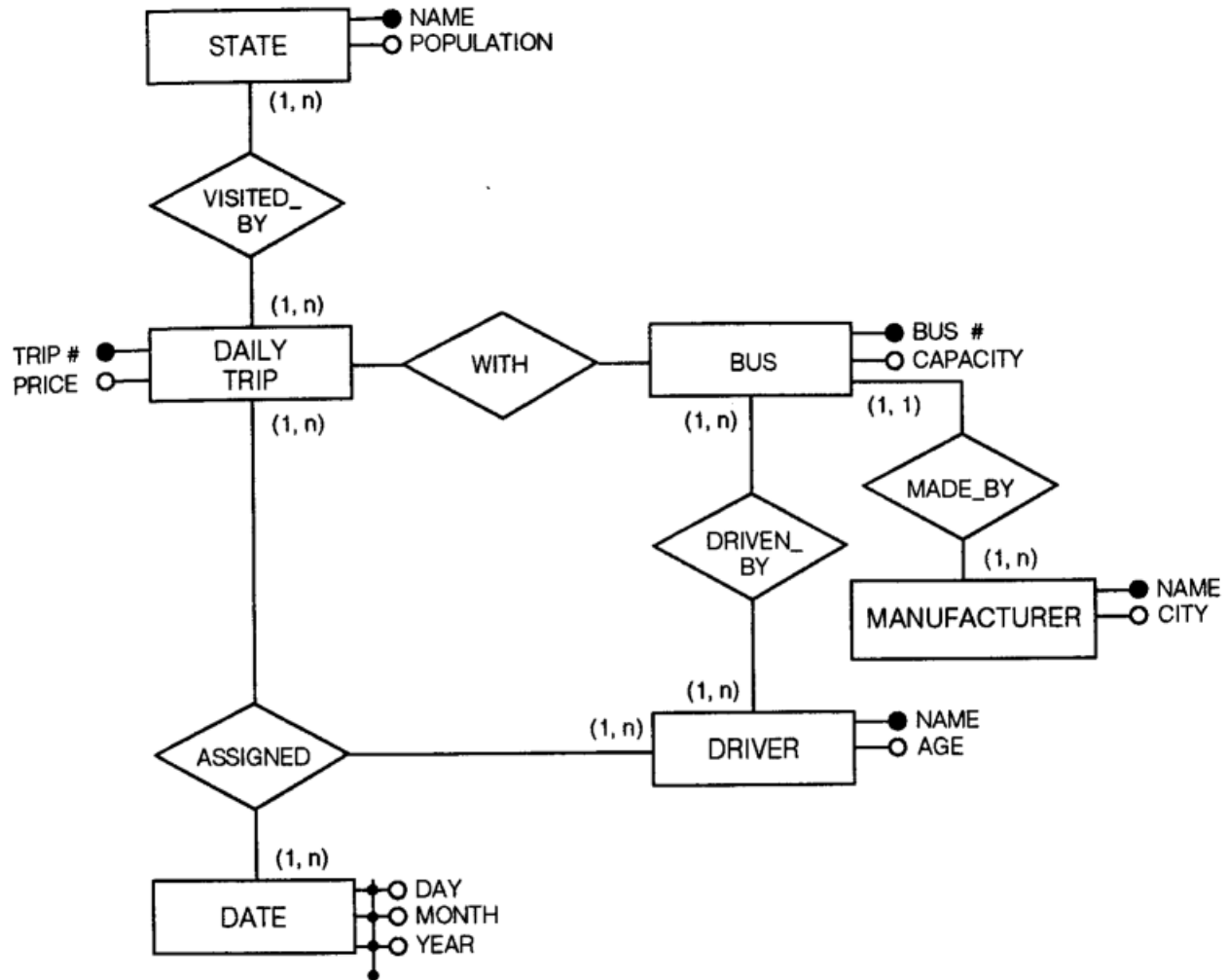
Integrate the following three schemas which represent special tours, daily travels, and reservations for daily travels, producing a single schema.



(a) First schema



(b) Second schema



(c) Third schema

Figure 5.10 (cont'd) Trip database