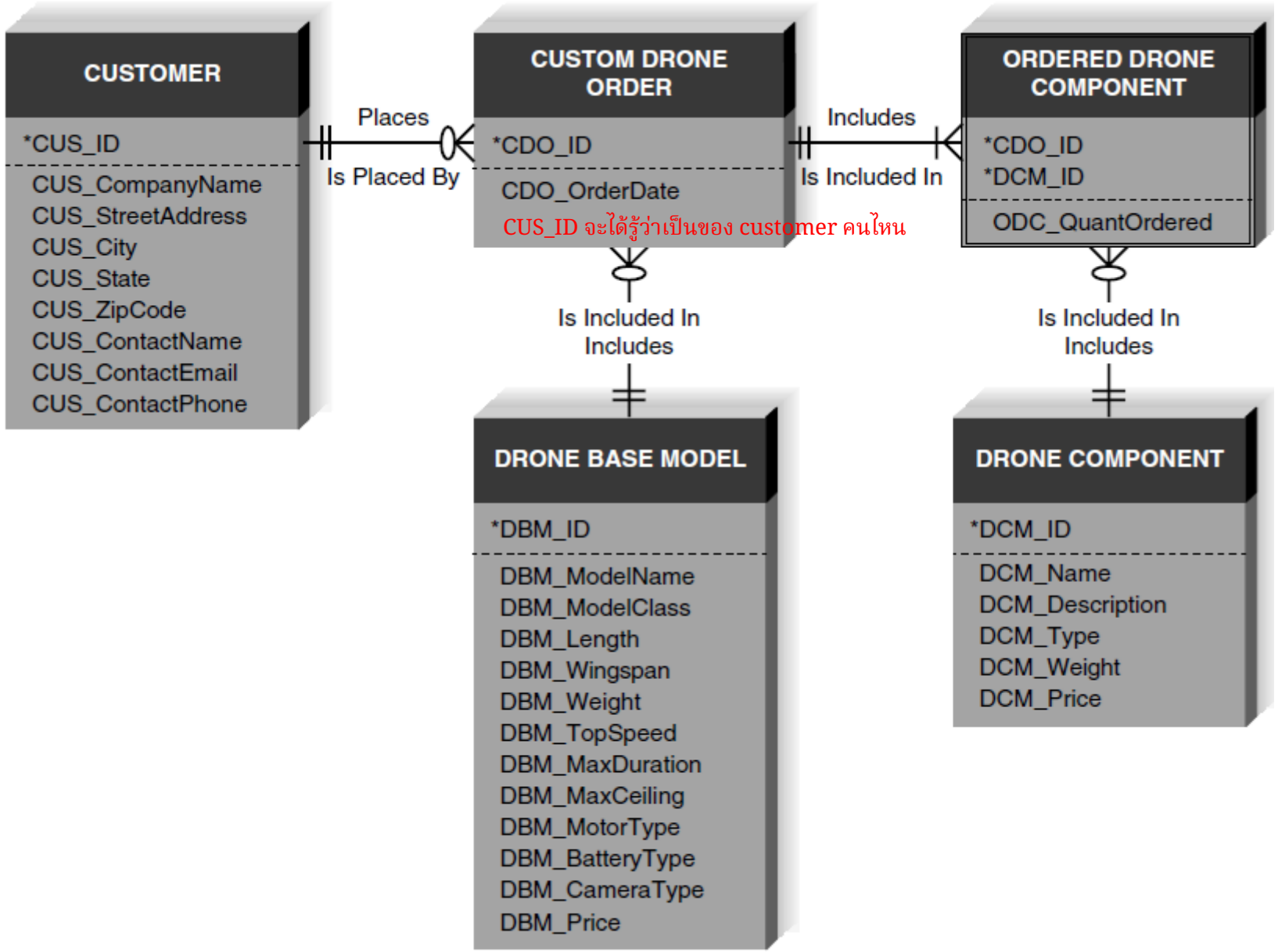
แก้ไขครั้งล่าสุดเมื่อวันที่ 17 กุมภาพันธ์ 2568

2301361

SYSTEMS ANALYSIS AND DESIGN

5
Data Modeling



Entity	person, place, event, thing
Instance	
Attribute	
Identifier	
Relationships	
Cardinality	1:1 1:N M:N
Modality	required, optional

FIGURE 5-1 Partial DrōnTeq sales system ERD.

In Figure 5-1, we included words for both directions of the relationship line; the top words are read from parent to child, and the bottom words are read from child to parent.

The ERD also communicates high-level business rules. Business rules are constraints or guidelines that are followed during the operation of the system; they are rules such as "A payment can be cash, check, debit card, credit card, coupon(s), or food stamps," "A sale is paid for by one or more payments," or "A customer may place many orders." Over the course of a workday, people are constantly applying business rules to do their jobs, and they know the rules through training or knowing where to look them up. If a situation arises where the rules are not known, workers may have to refer to a policy guide or written procedure to determine the proper business rules.

Cardinality and ordinality

Cardinality refers to the maximum number of times an instance in one entity can relate to instances of another entity. Ordinality, on the other hand, is the minimum number of times an instance in one entity can be associated with an instance in the related entity. Cardinality and ordinality are shown by the styling of a line and its endpoint, according to the chosen notation style.

Crow's Foot Notation

One

one จะเป็น 0 ไม่ได้

Many

many จะเป็น 0 หรือ 1 ก็ได้

One (and only one)

Zero or one

One or many

many แต่เป็น 0 ไม่ได้

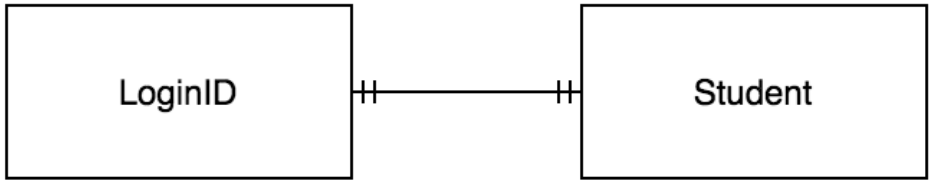
Zero or many

many แต่เป็น 1 ไม่ได้

ลองยกตัวอย่างความสัมพันธ์แต่ละแบบ ที่พบในชีวิตประจำวัน

https://www.lucidchart.com/pages/ER-diagram-symbols-and-meaning

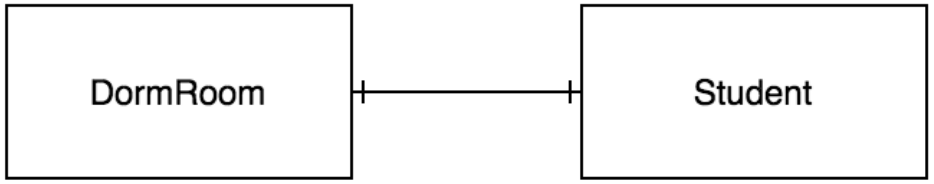
One and ONLY one



Alice can have one and only one login (e.g. a11235) and that login can only be assigned to Alice. When Alice graduates, no one else can be assigned the login a11235.

คล้าย ๆ if and only if

One



A student, Alice, can only have one dorm room at time. A dorm room can only house one student at a time (for the sake of this example). Next year, Alice will be assigned a new dorm room, and at that point her dorm room from this year will be assigned to a new student.

https://stackoverflow.com/questions/33781451/crows-feet-one-vs-one-and-only-one

CONCEPTS IN ACTION 5-A The User's Role in Data Modeling

I have two very different stories regarding data models. First, when I worked with First American Corporation, the head of Marketing kept a data model for the marketing systems hanging on a wall in her office. I thought this was a little unusual for a high-level executive, but she explained to me that data was critical for most of the initiatives that she puts in place. Before she can approve a marketing campaign or new strategy, she likes to confirm that the data exists in the systems and that it is accessible to her analysts. She has become very good at understanding ERDs over the years because they had been such an important communications tool for her to use with her own people and with IT.

On a very different note, here is a story I received from a friend of mine who heads up an IT department:

"We were working on a business critical, time dependent development effort, and VERY senior management decided that the way to ensure success was to have the various teams do technical design walkthroughs to senior management on a weekly basis. My team was responsible for the data architecture and database design. How could senior management, none of whom probably had ever designed an Oracle architecture, evaluate the soundness of our work?

So, I had my staff prepare the following for the one (and only) design walkthrough our group was asked to do. First, we merged several existing data models and then duplicated each one . . . that is, every entity and relationship printed twice (imitating, if asked, the redundant architecture). Then we intricately color coded the model and printed the model out on a plotter and printed one copy of every inch of model documentation we had. On the day of the review, I simply wheeled in the documentation and stretched the plotted model across the executive boardroom table. 'Any questions,' I asked? 'Very impressive,' they replied. That was it! My designs were never questioned again." *Barbara Wixom*

Questions

1. From these two stories, what do you think is the user's role in data modeling?
2. When is it appropriate to involve users in the ERD creation process?
3. How can users help analysts create better ERDs?

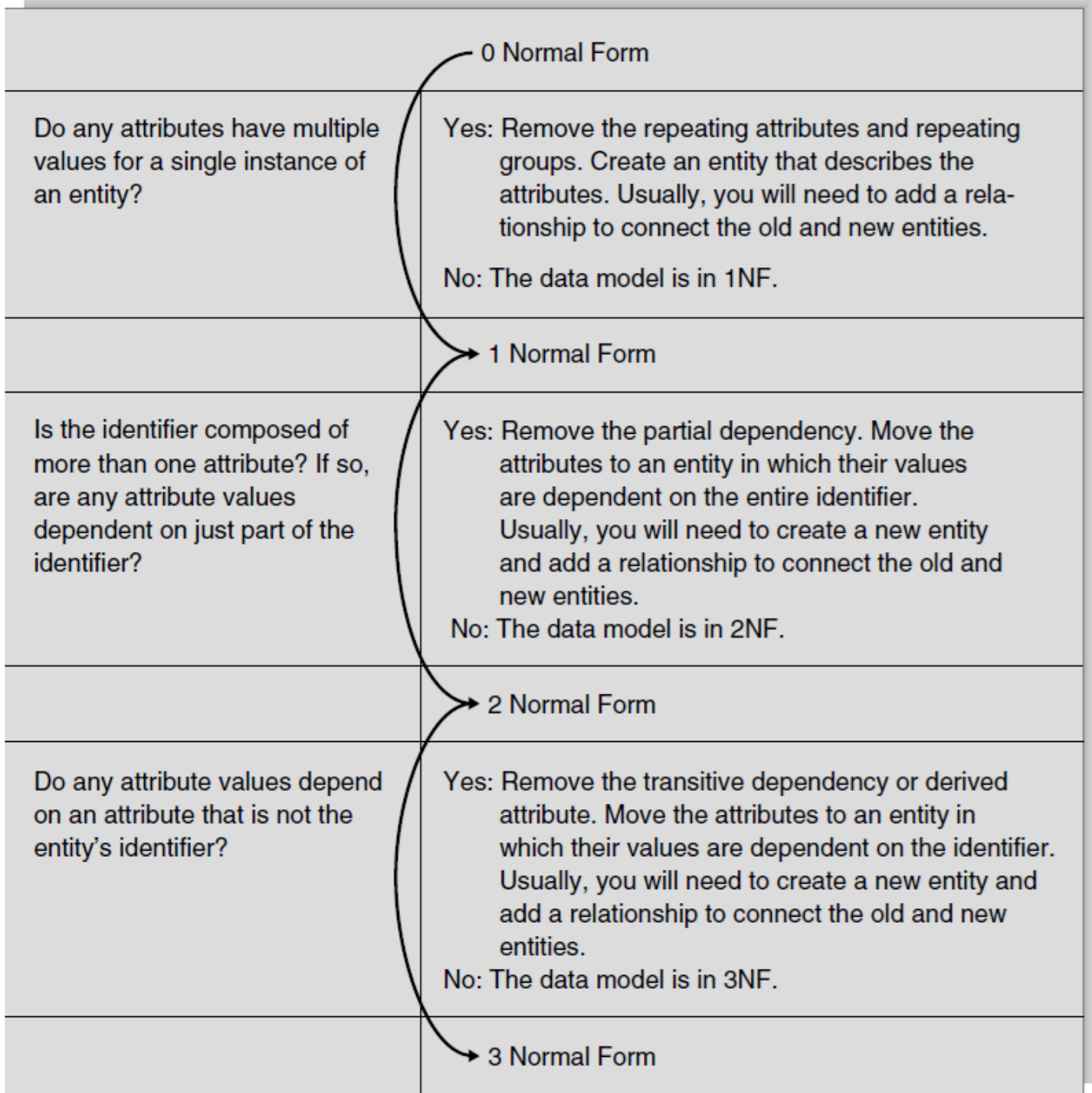


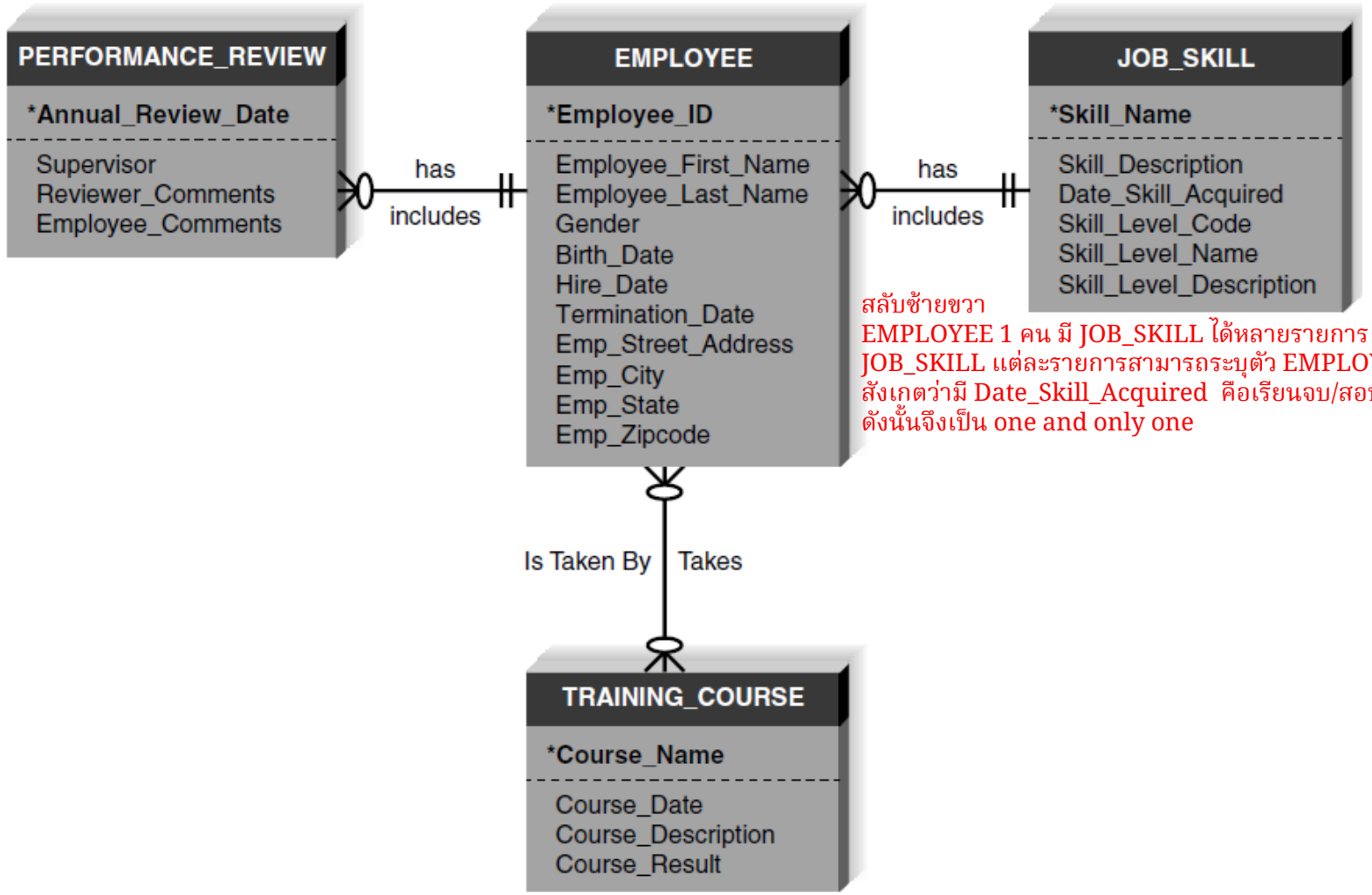
FIGURE 5A-1
Normalization steps.

EMPLOYEE

*Employee_ID

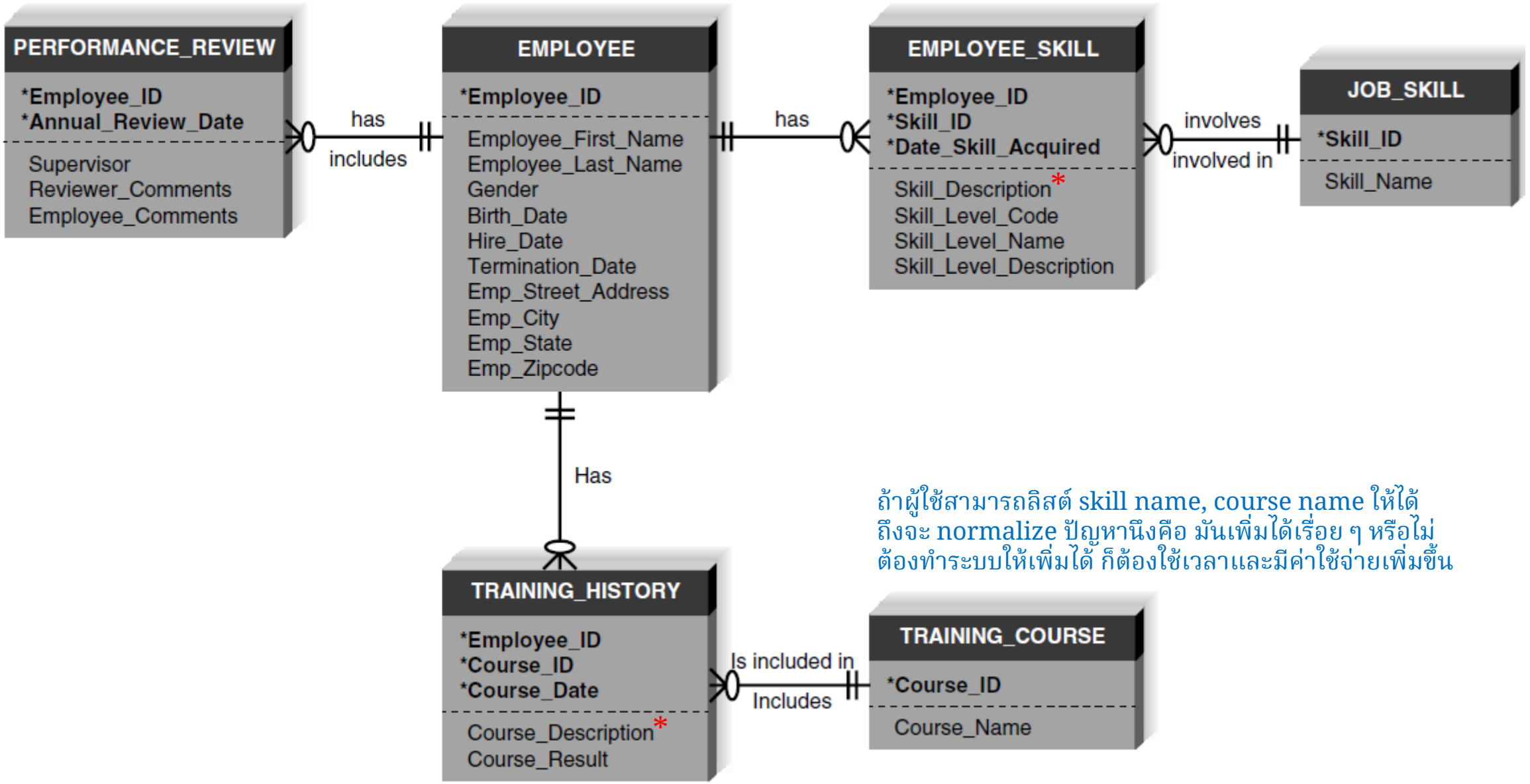
Employee_First_Name
Employee_Last_Name
Gender
Birth_Date
Hire_Date
Termination_Date
Employee_Home_Address
0 to 20 occurrences of:
    Annual_Review_Date
    Supervisor
    Reviewer_Comments
    Employee_Comments
0 to 10 occurrences of:
    Course_Name
    Course_Description
    Course_Date
    Course_Result
0 to 10 occurrences:
    Skill_Name
    Skill_Description
    Date_Skill_Acquired
    Skill_Level_Code
    Skill_Level_Name
    Skill_Level_Description

FIGURE 5A-2 Initial existing HRM system file layout.



สลับซ้ายขวา
EMPLOYEE 1 คน มี JOB_SKILL ได้หลายรายการ
JOB_SKILL แต่ละรายการสามารถระบุตัว EMPLOYEE ได้
สังเกตว่ามี Date_Skill_Acquired คือเรียนจบ/สอบผ่านวันไหน
ดังนั้นจึงเป็น one and only one

FIGURE 5A-3a
First normal form.



ถ้าผู้ใช้สามารถลิสต์ skill name, course name ให้ได้ ถึงจะ normalize ปัญหานึงคือ มันเพิ่มได้เรื่อย ๆ หรือไม่ ต้องทำระบบให้เพิ่มได้ ก็ต้องใช้เวลาและมีค่าใช้จ่ายเพิ่มขึ้น

FIGURE 5A-3b First normal form with M:N relationships resolved.

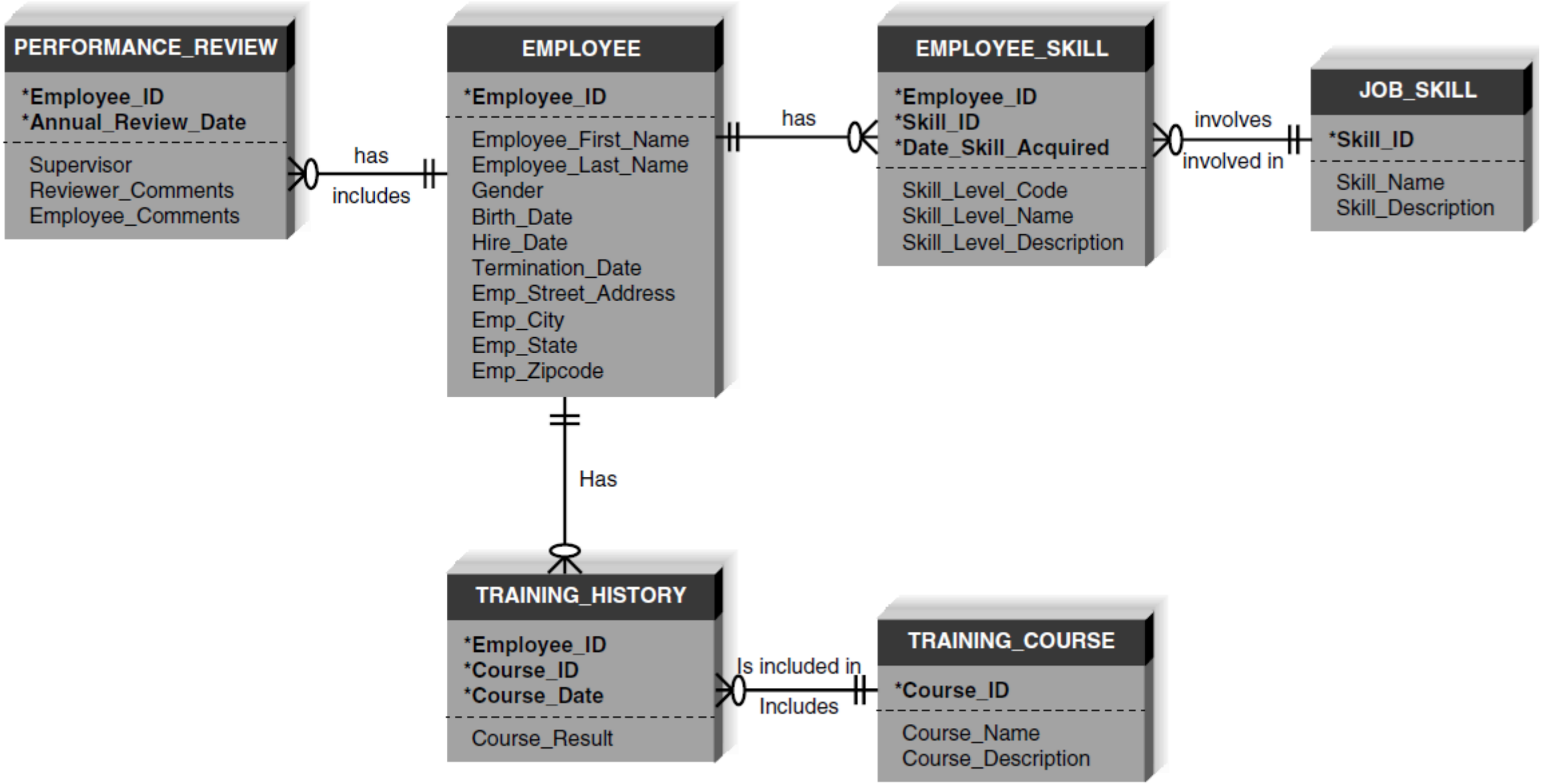


FIGURE 5A-4 Second normal form.

Third normal form

YOUR TURN 5-8 Boat Charter Company

A charter company owns boats that are used for charter trips to islands. The company has created a computer system to track the boats it owns, including each boat's ID number, name, and seating capacity. The company also tracks information about the various islands, such as their names and population. Every time a boat is chartered, it is important to know the date that the trip is to take place and the number of people on the trip. The company also keeps information about each captain, such as Social Security number, name, birthdate, and contact information for next of kin. Boats travel to only one island per visit.

Questions

1. Create a data model. Include entities, attributes, identifiers, and relationships.
2. Which entities are dependent? Which are independent?
3. [Optional] Use the steps of normalization to put your data model in 3NF. Describe how you know that it is in 3NF.

ให้นิสิตวาด ERD ของระบบลงทะเบียนเรียน