COMM1822

Term 2 2022

Introduction to Databases for Business Analytics

Week 3 Relational M

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UNSW Business School. (2022, May 7). *Acknowledgement of Country* [online video]. Retrieved from https://vimeo.com/369229957/d995d8087f

Chapter 3 I Database Model

Agenda

Relational Database Modelling

- Definition **relational model**
- Relational model **integrity**
- From **ER diagram** to entities to schema/tables)
- **Mapping ER relationships** in the model

Database Design: Overview

When designing database for an organisation, the processes are:

- Gather business requirements.
- **Develop conceptual mo technique (Weeks 1 and 2).**
- **Convert ER model to a model (Week 3).**
- Normalise the relations to remove any an eks 4 and 5).
- Implement the database by creating a table for each normalised relations.

Relational Model

- "A **relational model** represents data in a two-dimensional table called a relation."
- **Relational model** includes:
  - **Relations:** two-dimensional tables
  - **Attributes:** the column header
  - **Tuples:** the rows of a relation.
- The name of a **relation** (tab headers) are called a **schema** for the relation.
- The **set of schemas** for all relations in a design is called a **database schema** (metadata).
- The **data dictionary** describes the database schema.
- Usually implemented in a **RDBMS** (relational database management system) such as **Oracle**.

Example of a Relational Model

- **Relational schema** for the **relation "MOVIE"**
  - **MOVIE** (**TITLE**, YEAR, LENGTH)

- **Relation**
  - Every relation has a **u**
  - Every attribute value is **atomic.**
  - Every row is **unique**.
  - **Attributes** in tables have **unique names.**
  - The **order of the columns** is **irrelevant**.
  - The **order of the rows** is **irrelevant**.

Example of a Relational Model

Use this format for your assignment!

Relational schema:

PRODUCT (Prod_Code, Prod_Descript, Prod_Price, Prod_On_Hand, Vend_Code)

VENDOR (**Vend_Code**, Vend_Contact, Vend_AreaCode, Vend_Phone)

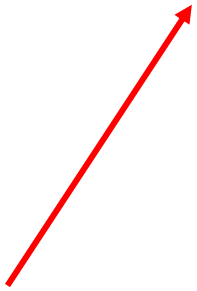
ANSI/ISO SQL Data Types

Data Type	Description
CHAR	Fixed-length character strings
VARCHAR	Variable-length character strings
INTEGER	
BIT	
NUMERIC	Decimal numbers
FLOAT	Floating point numbers
DATE	Calendar date
TIME	Clock time
TIMESTAMP	Date and time

Relational Database Keys

Example: STUDENT(zID, FName, LName, PassportNum)

e.g., zID, PassportNum, {zID, FName}, {zID, LName}, {zID, PassportNum}, …, {zID, FName, LName, PassportNum} (as long as the attribute(s) can uniquely identifies each row)



e.g., zID or PassportNum

e.g., zID

e.g., PassportNum

Integrity

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Integrity Rules

Three basic types of **database integrity constraints:**

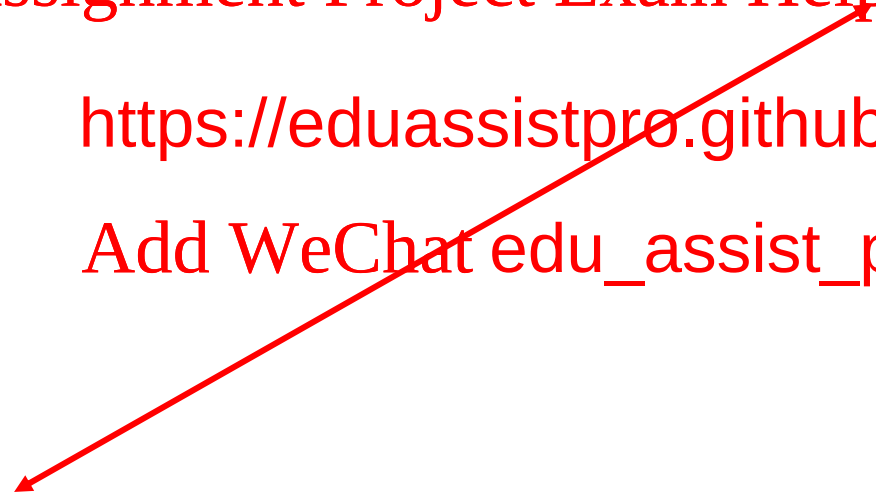
1) **Entity integrity:** Re table to have a **different primary key** value.

2) **Referential integrity:** Requiring t ce of a corresponding primary key in another table for a **key** value.

3) **Domain integrity:** Restricting data in a column to its **predefined data** types.

Integrity Rules

Referential Integrity Example



From Conceptual Model to Relational Model

Conceptual Model to Relational Model

ER Model -> Relational Model -> Database

Conceptual Model to Relational Model

In general, **each entity will be converted to a relation**. The attributes of the entity become the attributes of relation.

- Eliminate **composite** **ributes.**
- Translate each **entity** .
- Translate appropriate **relationship** **lation** (others might just be a FK link).

Mapping Entities

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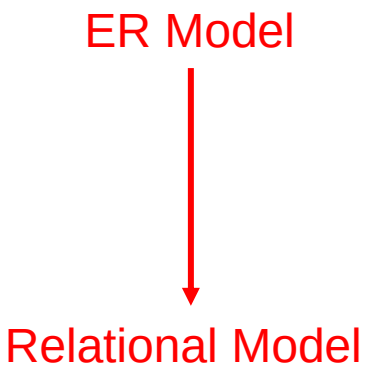
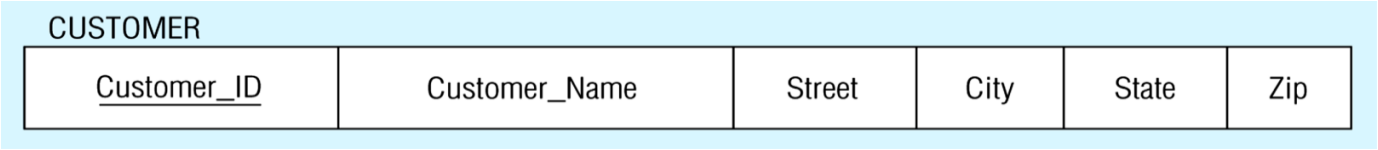
Mapping Entities



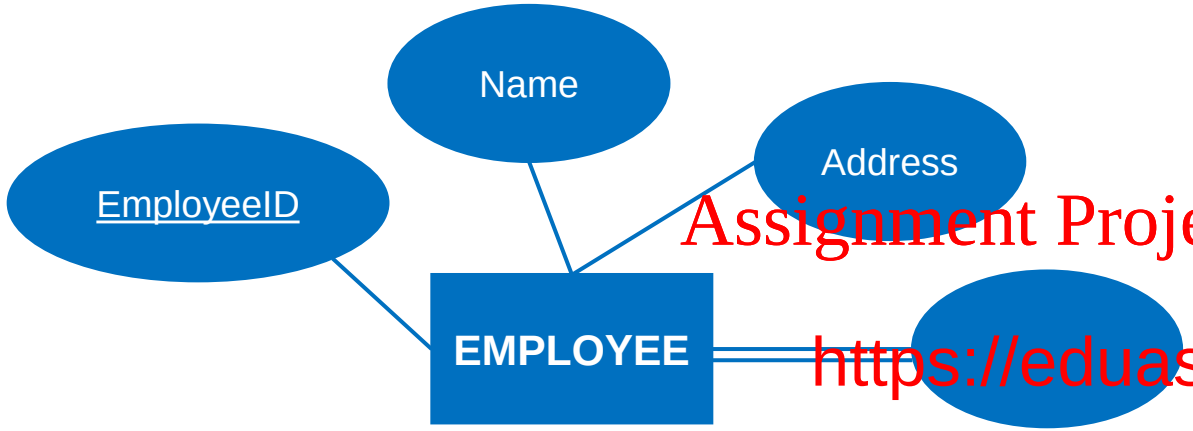
Map all regular entities to relations.

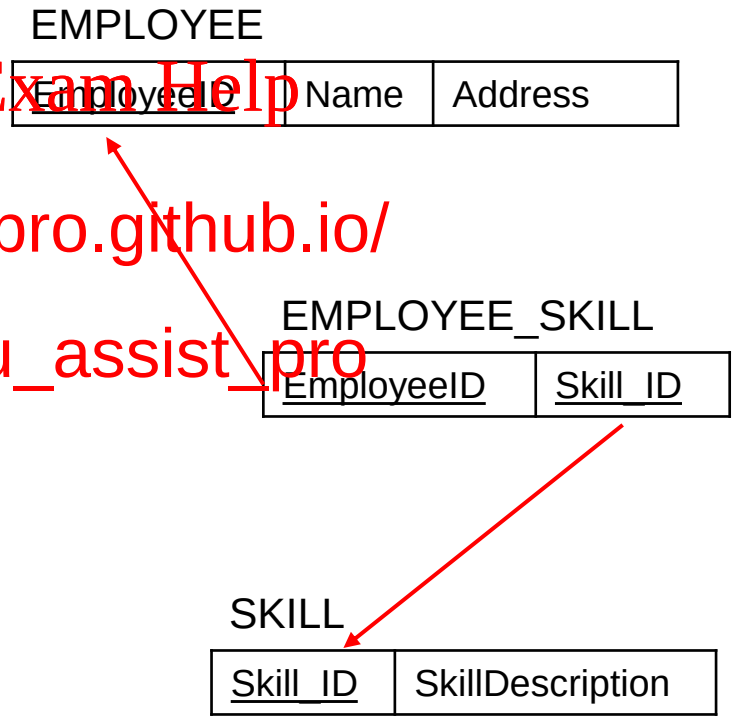
Mapping Composite Attributes

Composite Attribute



Mapping Multi-Valued Attributes





Multi-valued attribute becomes a second relation.

Mapping 1:1 Relationships

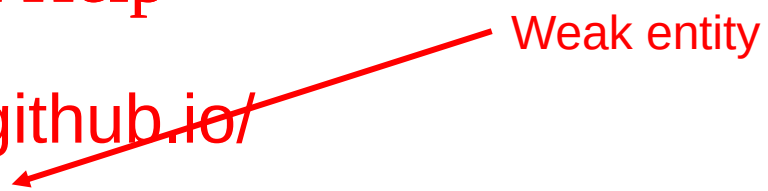
ER relationship is expressed through FK reference.

Mapping Weak Entities

ER relationship is expressed through FK reference (FK also a PK).

Mapping 1:M Relationships

ER relationship is expressed through FK reference.



Mapping an M:N Relationship

ER relationship forms a relation in itself.

Weak (composite) entity

Mapping 1:1 Recursive Relationships

ER relationship forms a relation in itself.

MARRIAGE (Emp_ID1, Emp_ID2, Date)
EMPLOYEE (Emp_ID, Emp_Name, DofB, …)

Mapping 1:M Recursive Relationships

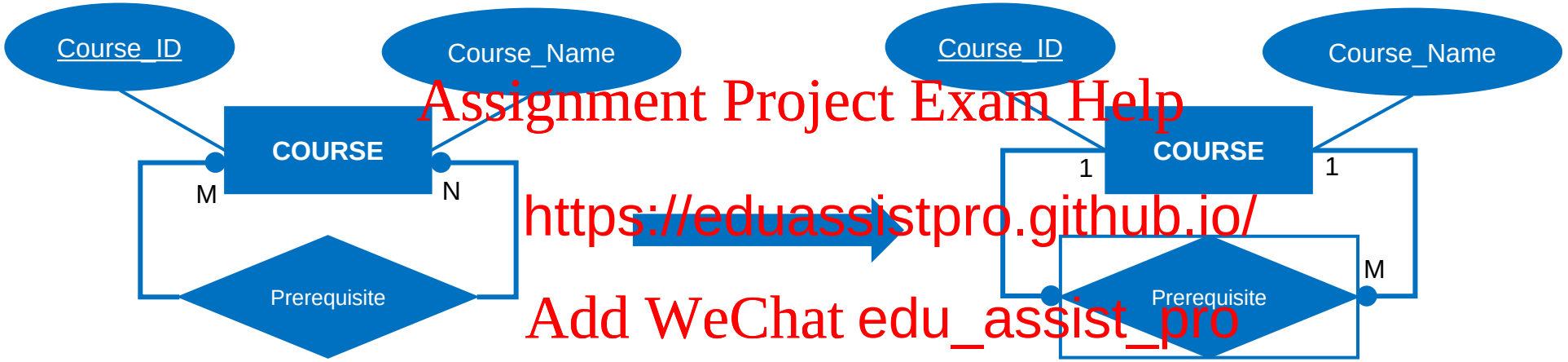
ER relationship forms a relation in itself.

- A **recursive FK** is a foreign key in a relation that references the primary key values of the same relation.

In the example, for some employees the manager_ID will be “NULL” because ey do not have a manager.

EMPLOYEE (Emp_ID, EmpName, DeptID, DOB, Manager_ID)

Mapping M:N Recursive Relationships



COURSE (Course_ID, Course_Name, …)
PREREQUISITE (Course_ID, PrerequisiteCourse_ID, …)

ER relationship forms a relation in itself.

Mapping Super/Subtype Relations (1)

EMPLOYEE (EmpID, Name, DofB, FlightNo, FlightHrs, SkillType, Salary, HourlyRate, ContractNo)

Create only one relation (for the supertype). Or…

Mapping Super/Subtype Relations (2)

PILOT (P_EmpID, Name, DofB, FlightNo, FlightHrs)
MECHANIC (M_EmpID, Name, DofB, SkillType, Salary)
ACCOUNTANT (A_Emp_ID, Name, DofB, HourlyRate, ContractNo)

Mapping Super/Subtype Relations (3)

EMPLOYEE (EmpID, Name, DofB, EmpType)
PILOT (P_EmpID, FlightNo, FlightHrs)
MECHANIC (M_EmpID, SkillType, Salary)
ACCOUNTANT (A_EmpID, HourlyRate, ContractNo)

Create separate relations for each subtype and the supertype.

Header – Details Relationship

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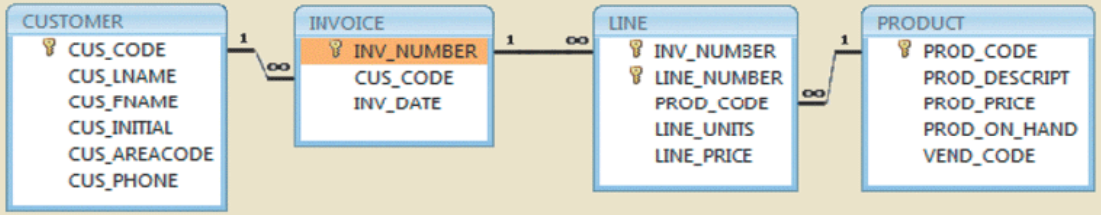
Referential Integrity May Bring in Cascading Integrity

FIGURE 3.30 THE RELATIONAL DIAGRAM FOR THE INVOICING SYSTEM



Summary of Most Important Rules

- ER **entity types** become relational **schemata** (relations).
- ER **relationships** become relational **schemata** OR **references with FKs** in the schemata/tables.
- ER **attributes** of an entit **lumn headers** in the schemata.
- **Entity instances** are the **rows** (tuples, r ances) in the actual tables.
- **Connectivity** and **cardinality** are indirectly expressed through existence of schema, references with FKs, **number of rows** going into any particular relation, settings such as NOT NULL for the FK columns in the data dictionary, etc.

Recap: W3 Learnings

- **Relational Database Modelling**
  - Definition **relational model**.
  - Relational model **int**
  - From **ER diagram t** entity types and entity instances to schemata and tables).
  - **Mapping** specific ER relationships al model.

Questions

Source: ealt.ca

Please email your question(s) to kf.cheung@unsw.edu.au!