Practical 3
ER Model

Learning objectives

For a given scenario,
1. Identify meaningful entities, attributes, and keys of the entities.
2. Identify meaningful relationships among entities.
3. Create suitable description for entities, attributes, relationships, and constraints among entities.
4. Draw an ER diagram using Chen's notation (on paper).

Setting-up

- You will create ER diagrams in this practical. You can draw them on a piece of paper (or you can use a Tablet and draw digitally)
- This practical will not use MySQL
- You can take photographs of your description and diagrams and add them to your /DBS/Prac3 directory.
- ED design is an iterative process. Therefore, you may revise your descriptions, diagrams several times until you get the best possible ER diagram.
- There can be more than one ER model for a given scenario, and you are encouraged to discuss with each other to see which answer is "better" than another and why you think so.
- Check your answers with tutors to verify your answers.
- **Make note of any assumptions you made, if sufficient information is not provided.**

1. A simple airport scenario

Design an ER model for an airport services company that handles **passengers departing from an airport**, given the following information:
- The database will include information about passengers (ticket number, name, phone number), flights (flight number, departure date, departure time), seats on the flights (class, seat number), and departure gates (gate number, intercom number).
- Each passenger taking a flight is identified by a unique ticket number, each seat on a flight by a unique seat number (but a given seat number can be present on many flights), and each gate by a unique gate number. Each flight has a flight number which is unique for the route travelled, but there can be a number of instances of this flight on any given day.
- The number of bags and the check in time are to be recorded for each passenger who has checked in for a flight.
- Each passenger taking a flight is assigned at most one seat on the flight and a seat can be assigned to at most one passenger at a given time. A particular flight on a given date departs from exactly one gate while several flights may depart from a gate on any given day.

Following the steps given below, design the ER model for the above scenario.

- Note 1: You may revise your work, come back and change entity sets, properties etc. while you are thinking about relationships. Be ready to revise

You may do step1 to step 3 in a computer file(document) or on paper. Step 4 and step 5 are to be done on paper.

Step 1. Identify the entity sets, their keys and attributes; record this information in a tabular form (similar to the table below).

Entity Sets	Keys	Other Attributes

Step 2. Identify the relationship sets, their participating entity sets and attributes if any in a tabular form (similar to the table below).

Relationship sets	Between which entity Sets	Attributes of relationship set (if any)

- Note 2: You may go back and revise your entities, if your thinking changes when identifying relationships.

Step 3. Identify the cardinality and participation constraints (e.g., one-many, many-many, etc., exactly one, one or more etc.); record this information in tabular form (similar to the tables below).

Relationship sets	Cardinality Constraints	Participation/other constraints

You may use two tables instead of one for cardinality and participation constraints.

Step 4. Using the identified information, draw an ER diagram using the Chen's notation (refer Lecture 3 for the notation).

Discuss your diagrams with the others/ tutor and check them to ensure their correctness.

2. Residents of a city

Consider the following information to be stored about the residents of a city:

- Each resident is identified by a citizen ID, and has name, gender, and date of birth.
- A resident is either born in this city or born elsewhere. For a resident born in this city, the birth registration number is to be stored; for anyone not born in this city, the place, state, and country of birth are to be stored, but not the birth registration number.
- Each resident belongs to one and only one family. A family is identified by a family ID, and has a name and an address. A family has one and only one head and may have zero or more other members.

Using the steps 1- 4 in the question 2 (Airport scenario), design an ER model for the above scenario.

3. Car racing competition

(This question is a revised scenario from the 2015 mid-semester test.)
The company 'Formula 30' is looking to start a new car racing competition. They hire you to design a database to track their race information. The following information is provided to you by Formula 30.

- The database will include information about drivers who are competing in races. Information such as first name, last name, web page, address, phone number and the racing licence number of each driver needs to be stored.
- Races would be held in different countries and each race has a name. Drivers play in teams and team name, sponsor, contact name, contact address, contact phone are to be recorded. Each car is identified by a unique number that must be clearly displayed on various positions on the car. Make of the car is also important. Races and teams have unique codes, specifically designed to identify them.
- Each team must have a contact person, who may be a driver but could be someone else associated with the team; each such contact must have their unique name, address and phone number recorded.

Using the steps 1- 4 in the question 2 (Airport scenario), design an ER model for the above scenario.

4. Additional task: using software tools to draw an ER diagram

There are many free tools/ tools with community edition available for creating ER diagrams. Following are some easy to use online tools

- diagrams.net (https://app.diagrams.net/) (Note: former draw.io application)

- Lucidcharts (https://www.lucidchart.com/)

- Visual paradigm (https://online.visual-paradigm.com/)

- MySQL Workbench

The notation use by these applications can be different than your notation. Use these or any other software tool to recreate at least one of your diagrams. There is no need to submit this work as part of your practical work.

5. Submitting your work

All preliminary work you have done (entity identification table, relationship identification table etc.) and the ER diagrams created are to be submitted as prac03 work.

Label each of your preliminary work and ER diagrams with the task name such as 'Task 1- ER of Airport scenario' and take photos of them. You may have many pages or workings.

Create a sub directory for each task under Prac03 directory and add the images related to the task to that directory.

Zip your Prac02 directory and upload it to Blackboard under Assessments/In class practical Submissions/Practical 3 link.

Note 3: Zip your directory

- Go to your DBS directory and type:
    ```
    > zip -r Prac03_<your student ID> Prac03
    ```

Note 4: Identifying entities and relationships

- Sometimes it's not obvious whether something is an entity or a relation.
- The first thing to check for is whether one of the attributes listed is itself another entity or relation. At the early design stage, we generally want to avoid having other entities as attributes. This means that if you have more than one attribute for an entity that matches another entity in the table, you have probably confused a relationship for an entity.
- One attribute from another relation possibly means that you have a weak relation. For example, if you have author as an attribute for Writes and also have an Authors relation, then Writes is probably a relationship rather than an entity. You may want to review the relevant parts of Lecture 3 and the textbook if you're not confident with this.

Note 5: Extracting only relevant information from a scenario

- Some of the questions come from mid-semester tests, and as such are good practice for you. However, the questions include some information that you don't yet need. Most English-language questions also contain irrelevant information, but that is also the case in tests and exams; you need to learn what parts are relevant. When talking to a client with little or no technical background, this skill will be very

Check whether you have achieved learning outcomes:

I am confident that, for a given scenario related to a real-world situation I can,

Identify entities and attributes,	✓
Identify weak entities and subtypes/supertypes,	
Identify relationships (unary, binary, ternary) and any attributes of them,	
Identify the cardinality (one-one, one-many, many-many) and the participation (fully or partial participation) constraints of relationships,	
Design a suitable ER diagram using Chen's notation	
Make realistic assumptions when managing incomplete information in my database designs.	

Please refer lecture slides, reading materials, and online resources and attempt again, if all the learning outcomes were not achieved. Ask your tutor and get help if you need any clarification.

It's always a good practise to try to finish the practical of a particular week, before attempting the next practical worksheet as your work will be building upon the previous week's tasks.