

Reviewing Database Modelling

Examples of scenarios for ERD Practice



Remember to complete *any unfinished work after class in the PASS session* – ask questions if you don't understand something.

ITC556 / ITC114 Class Activities – ERD modelling and design



1) Modelling activity

- a) Review – 10 min
- b) Introductory Case – fisherman – 10 min
- c) Conference City scenario – 30 min
- d) Car Fleet scenario – 20 – 30 min
- e) Police scenario – 20–30 min
- f) Review for quiz
- g) Quiz 1 (20 min) – end of class

We will attempt to complete and discuss as many activities as possible in class ... **if time allows.**

Any activities not completed in class can be done in the **PASS session.**

REVIEW

Can you
give some
examples
of these?

Concept	Example
Required attribute	
Optional attribute	
Domain	
share a domain	
Composite attribute	
Simple attribute	
Single-value attribute	
Multivalued attributes	
Derived attribute	
Existence dependence	
Existence independence	
Weak entity	
Unary relationship	
Binary relationship	
Ternary relationship	
Associative (Composite)	
Entities	

Do you remember?



- ▶ What is a required attribute? Give an example
- ▶ What is cardinality? Give an example
- ▶ What is a weak entity? Give an example
- ▶ What is a weak relationship? Give an example
- ▶ What is a recursive relationship? Give an example.

Introductory Case

At the Bathurst Annual Fish-a-thon we need to store information on the fisherperson's id (a unique id given when entering the fish-a-thon), first name, surname, age and the number of fish caught. Also stored is the fish type code (C = carp, M = Murray Cod, T = Tench, R = Redfin), fish type (ie carp, etc), weight, length plus when caught and the type of lure used. Finally, there is the throw-back weight. A Carp of any weight can (and should be) kept, yet any Murray Cod below 2 kg needs to be thrown back, and any redfin below 300 gram.

Assumptions –

A fisherperson can only catch one fish at a time.

An individual fish can't be identified, so we never know whether a fish has been caught more than once.



Modify your ERD



- Now you need to resolve the M:N relationships
- Add the necessary entities and give appropriate names.

Add PK & FKs



- ▶ Now add your primary and foreign keys to each entity
- ▶ **Remember that the Foreign Key is placed on the many side of the relationship for each 1:N relationship.
- ▶ Add all other attributes.

A photograph of a Venetian canal. On the left, there are historic buildings with ornate facades, including balconies and arched windows with green awnings. Blue and white striped poles are visible along the water's edge. In the center, the canal water is greenish and shows some ripples. On the right, more historic buildings line the canal. A small white boat with people is visible in the distance. A portion of a car's side-view mirror is visible on the far right. A blue rounded rectangle with white text is overlaid in the lower right quadrant.

How are
we doing ?

1.5 B7 Car Fleet

Charles Sturt University maintains a car fleet that is available to staff who need to travel on official business. A database has been designed to record details of the cars, their usage, and maintenance that they receive.

Staff members requiring a vehicle must send a booking to the transport office at least 1 week in advance. This booking form shows the booking id, staff id and the staff member's name, their department, where they are going, when they want to collect the vehicle, and when they will return it. One week before the date of travel, the transport clerk assigns a vehicle for each booking. After the travel is complete, the clerk records the start and end odometer reading for the trip so that the relevant department can be charged.

Vehicles occasionally need repairs. For each repair, the date, details of what was done, and the cost of the repair are recorded.

Vehicles also need routine maintenance. The requirements here are the same for all vehicles of the same type (so, for example, all Holden sedans may need a grease and oil change at 20 000 km). Records need to be kept to show whether each vehicle has actually received the routine maintenance that it should have had.

The following reports are required (these will give an indication of the attributes which must be kept)

- Monthly charge-back report, showing for each trip taken during the month, start date and time, end date and time, vehicle registration number, vehicle type and associated charging rate, distance travelled, staff member name and department.
- Weekly bookings, showing for each booking for each day of the forthcoming week, how each vehicle will be used (it may be either booked, in which case the name of the staff member, departure and return times and destination will be shown, or it may be unbooked)
- Vehicle status report, showing, for each vehicle, the date purchased, the last recorded odometer reading and the registration number, repair date. For each repair it should show the details of what was done, where the repairs were done and the cost. For each routine maintenance that the vehicle should have received, the date received, the odometer reading when it was received, where it was done and the cost.



Modify your ERD



- Now you need to resolve the M:N relationships
- Add the necessary entities and give appropriate names.

Police Department Scenario

The Police Department, in an attempt to better track criminal activity has decided to set up a database to record details of criminals, and their offences.

Incidents are some type of possibly illegal activity. One or more police may be brought in, where they record any witnesses to the incident. The incident may involve one or more offenders, so the police regard each offender's role as an 'action.' For each action there may be charges laid. The offender may be arrested at some time on one or more charges.

Details to be recorded about include police-id, police-first-name, police-surname, police-rank, police-station, offender-id, offender-first-name, offender-surname, offender-address, description of offenders action, incident-id, date, time, location, witness-first-name, witness-surname, witness-address, witness-phone, charge-no, charge-description, charge-date, arrest-no, arrest-date, arresting-police-id, incident-description



Example 1 -- Car Rental Co. (CRC)



A database is to be designed for a Car Rental Co. (CRC). The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers.

Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details.

It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements.

Therefore the data about garages to be kept in the database includes garage names, addressees, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities.

Continued... -- Car Rental Co. (CRC)



Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc.

Similarly the cash inflow coming from all sources – car hire, car sales, insurance claims – must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided.

These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card.

All major credit cards are accepted. Personal details (such as name, address, telephone number, driving licence, number) about each customer are kept in the database.

Example 2 -- college



A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA(Hons) MSc, etc) within the framework of the modular system.

The college provides a number of module, each being characterised by its code , title, credit value, module leader, teaching staff and the department they come from. A module is co-ordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module.

Students are free to choose any module they wish but the following rules must be observed: some modules require pre-requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance (i.e. modules taken and examination results).

Example 3 – computer Co.



A relational database is to be designed for a medium sized Company dealing with industrial applications of computers.

The Company delivers various products to its customers ranging from a single application program through to complete installation of hardware with customized software.

The Company employs various experts, consultants and supporting staff. All personnel are employed on long-term basis, i.e. there are no short-term or temporary staff.

Continued... computer Co



Although the Company is somehow structured for administrative purposes (that is, it is divided into departments headed by department managers) all projects are carried out in an inter-disciplinary way.

For each project a project team is selected, grouping employees from different departments, and a Project Manager (also an employee of the Company) is appointed who is entirely and exclusively responsible for the control of the project, quite independently of the Company's hierarchy.

Example 4



A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject.

The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications. A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with one editor, but may submit another work for publication to be supervised by other editors.

To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject.

Example 5



A General Hospital consists of a number of specialized wards (such as Maternity, Paediatrics, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded.

A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient.

Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward.