

1814ict/2814ict/7003ict/1011ICT: Data Management/ Database Design/ Applied Computing

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Learning Outcomes

At the end of this lecture students will be able to know:

- Data **models** in Database **Design phase**
- **Relational** data **model**
- Entity Relationship Diagram (**ERD**)

Content

- Data **model** and its **importance**
- **Phases** in Database Life Cycle (DBLC)
- **Models** in Design phase

Outcome 1

- **Relational data model**
- Relation **properties**
- **Keys** in database
- Key **constraints**

Outcome 2

- Entity Relationship Diagram (**ERD**)

Outcome 3

Recap from Topic 1.1

Important Database Terms

Some important database terms:

- **Entities / Tables** – e.g., a **student**
- **Attributes / Fields / Columns headings** – e.g., **studentsName, studentPhone**)
- **Relationships** – e.g., a student may be enrolled in many courses, so keep student ID in Enrolment table.

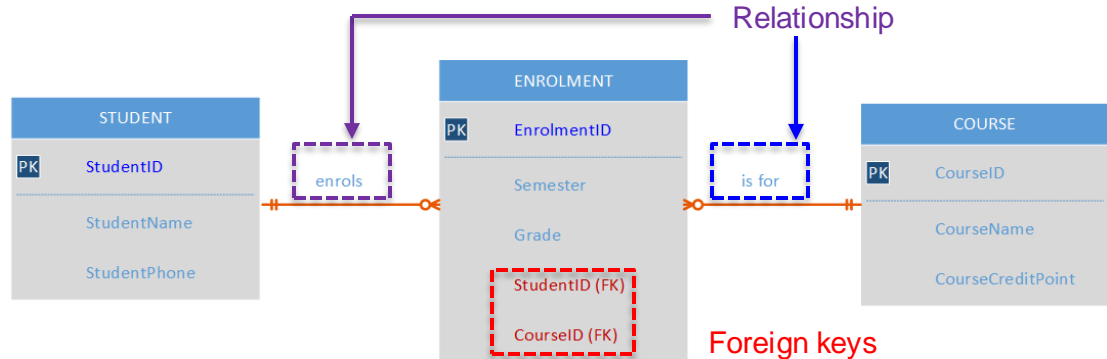
Entities (tables)

Attributes

StudentID	StudentName	StudentPho	Click to Add
S268786	Salim Malik	07 7851 7989	
S283345	Adam Gilchrist	07 5656 5656	
S787733	Sarah Jefferson	07 2573 7893	
S980980	Kylie Turnbull	07 7845 2945	
S989374	Sachin Deb	07 7845 2325	

Enrolment

EnrolmentN	StudentID	CourseID	Semester	Grade
1	S283345	1008ICT	Ss	3
2	S787733	2003BUS	Ss	4
3	S268786	3002ENG	Ss	0
4	S989374	4005MAT	Ss	5
5	S980980	5004ICT	Ss	2
6	S283345	6224BUS	Ss	3
7	S787733	3002ENG	Ss	1



Another example:

- Definitions

- Table
- Field or Column
- Record
- Data item

STUDENT Table

STUDENT-NUMBER	STUDENT-NAME	TOTAL-CREDITS	GPA	ADVISOR-NUMBER
1035	Linda Marie Anderson	14	3.214	49
3397	Sam Carr	9	3.000	49
4070	Kelly Horowitz	8	2.375	23

ADVISOR Table

ADVISOR-NUMBER	SOCIAL-SECURITY-NUMBER	ADVISOR-NAME
23	504931227	Alice Jones
49	036771990	Carlton Smith

COURSE Table

COURSE-ID	COURSE-DESCRIPTION	NUMBER-OF-CREDITS
CHM112	General Chemistry I	5
CSC151	Computer Science I	3
ENG101	English Composition	3
MKT212	Marketing Management	3

GRADE Table

STUDENT-NUMBER	COURSE-ID	GRADE
1035	CSC151	B
1035	MKT212	A
1035	ENG101	B
1035	CHM112	A
3397	ENG101	A
3397	MKT212	C
3397	CSC151	B
4070	CSC151	B
4070	CHM112	C

Data Model & Database Lifecycle

- A representation, usually **graphic**, of a complex “real-world” data structure.
- Integrated **collection of concepts** for describing **data**, **relationships** between data, and **constraints** on the data in an organisation.

- Why important?

Are a communication tool

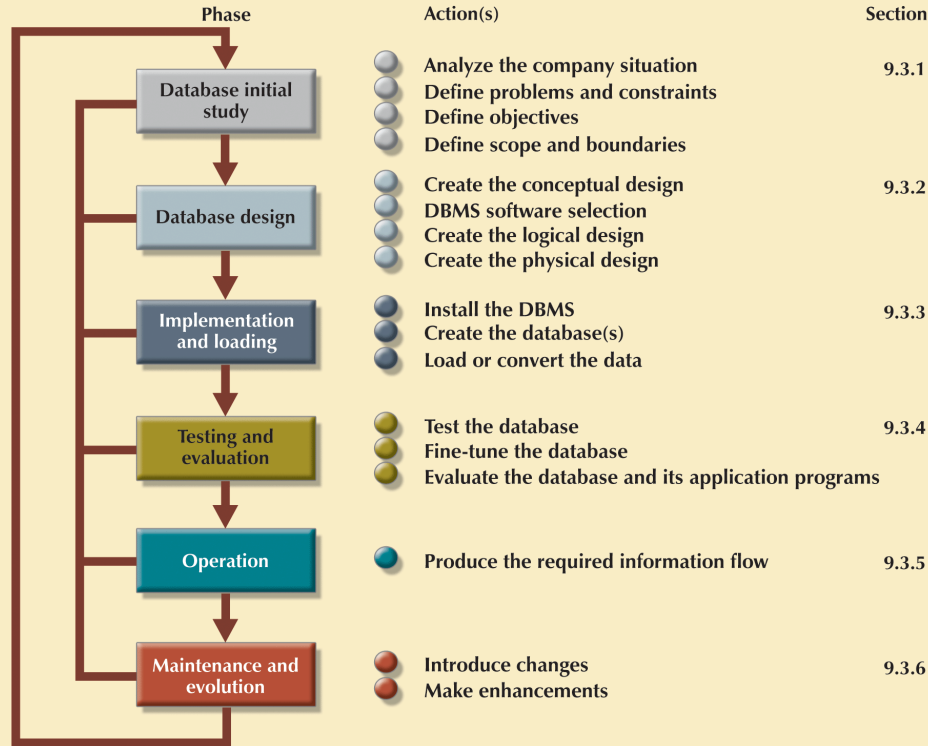
Give an overall view of the database

Organize data for various users

Are an abstraction for the creation of good database

The Database Life Cycle (DBLC)

FIGURE 9.3 The Database Life Cycle (DBLC)



Who are involved?

- End user
- Database Administrator
- Database Designer
- Application Programmers

The Database Life Cycle (DBLC)

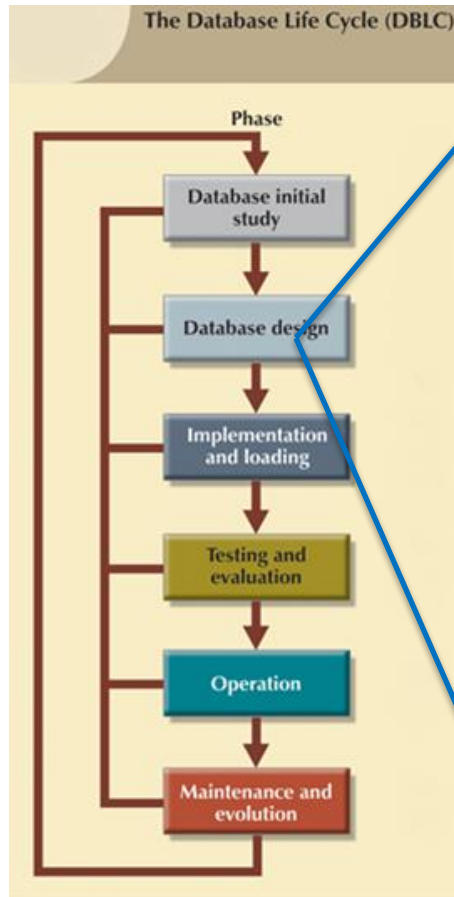
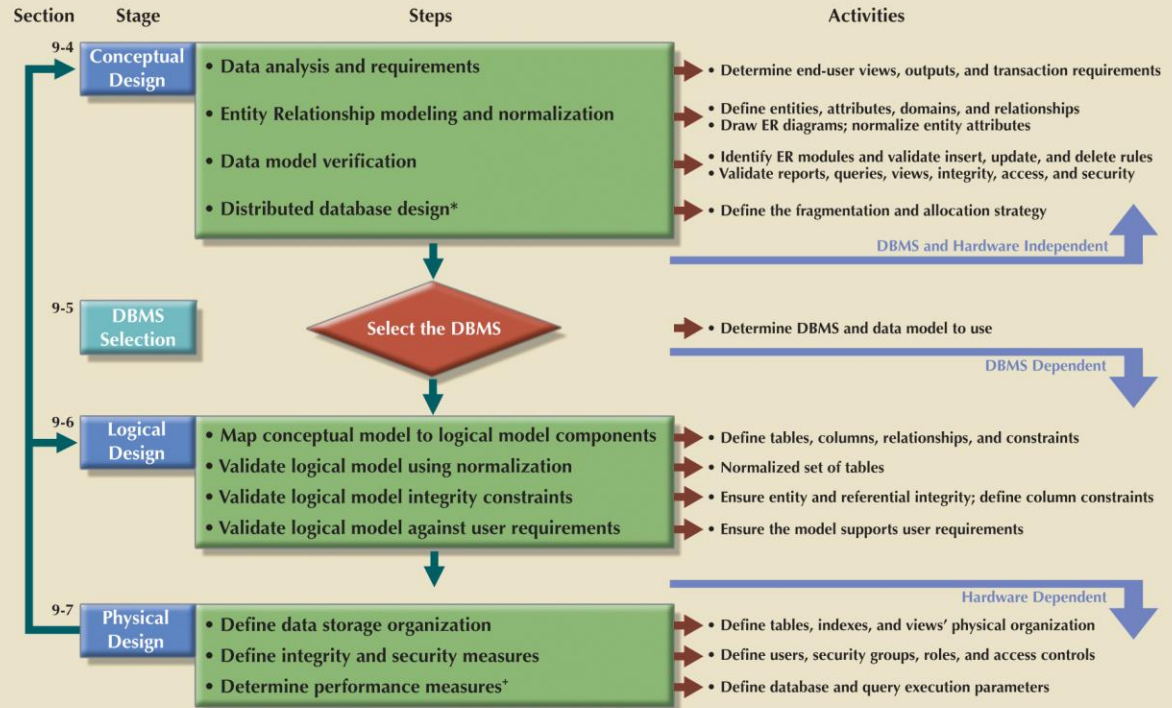


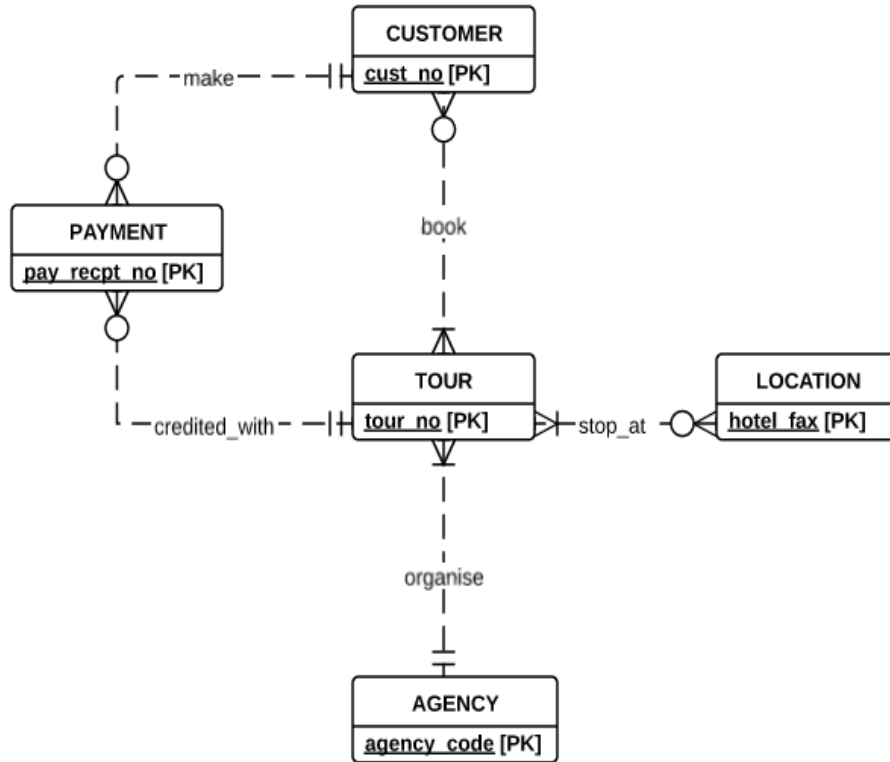
FIGURE 9.6 DATABASE DESIGN PROCESS



* See Chapter 12, Distributed Database Management Systems

* See Chapter 11, Database Performance Tuning and Query Optimization

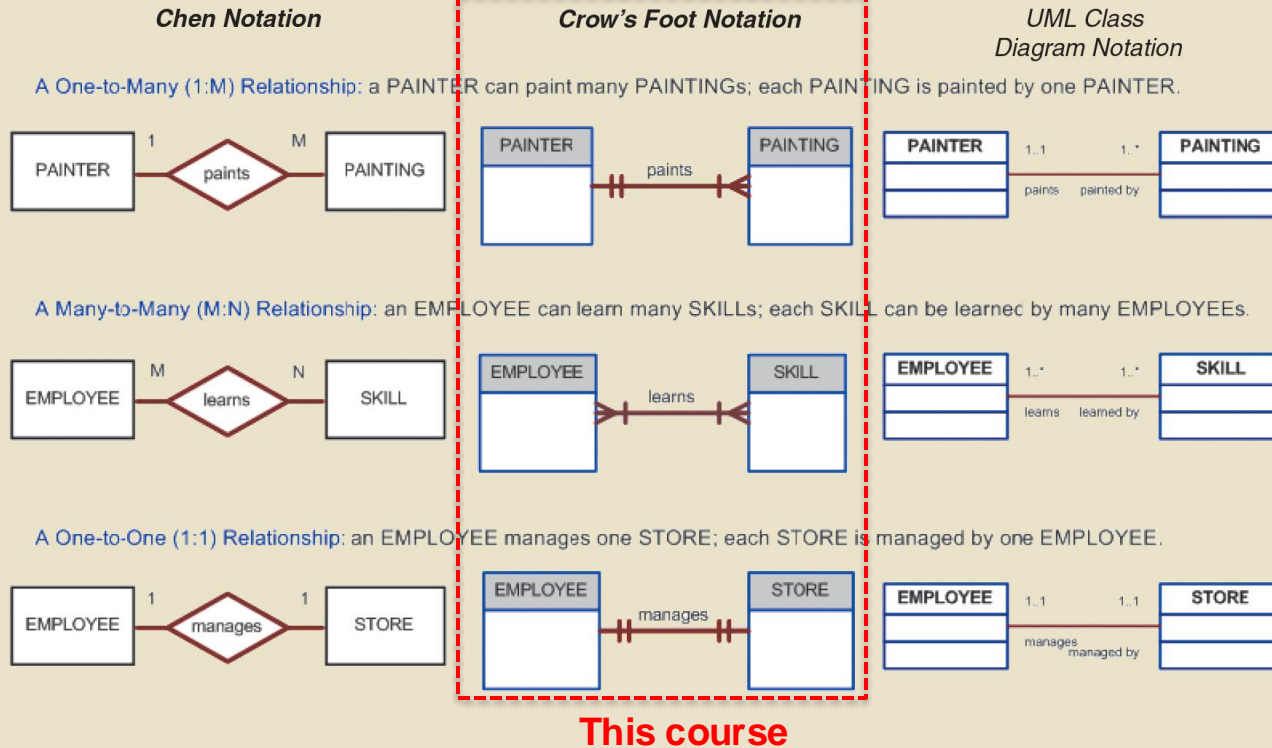
Stage 1: Conceptual Model



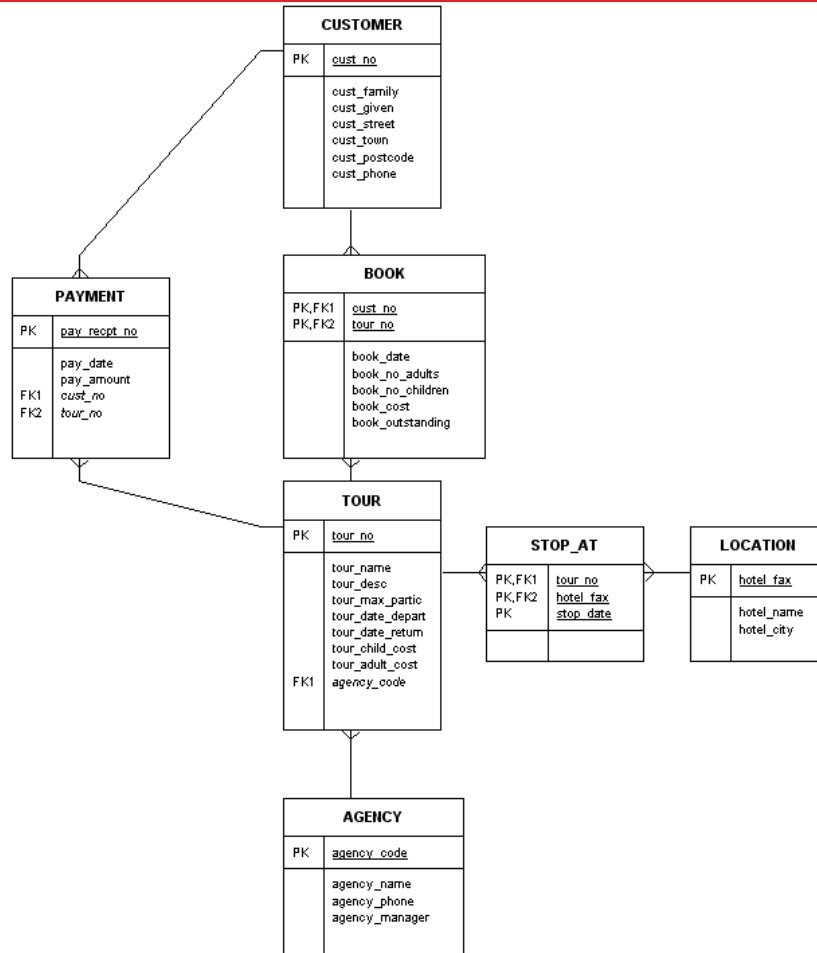
- Expressed via **Entity Relationship Diagram (ERD)**
- **Primary keys** are included
- Sometimes **non-key attributes** are also shown
- **Representation:** *generalised, non implementation model specific (eg. No FK's) and non-DBMS specific*

Stage 1: Conceptual Model

FIGURE 2.3 THE ER MODEL NOTATIONS



Stage 2: Logical Model



- **Representation:** now specific to an implementation model, here Relational (*FK's have been added*) but *specific to a particular DBMS* (e.g., Oracle or MySQL)
- Expressed visually via Extended Bachman diagram (shown here) or **ERD like structures**

This course: e.g., Assignment Part 1

Stage 3: Physical Model

Expressed as a

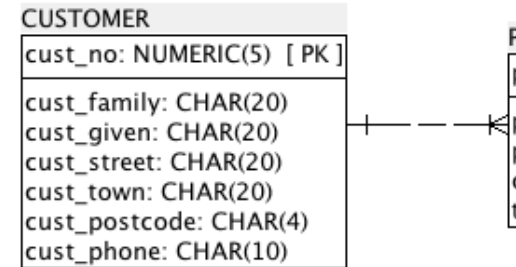
DBMS Schema:

```
CREATE TABLE CUSTOMER (  
  cust_no      INT(5) NOT NULL,  
  cust_family  CHAR(20) NOT NULL,  
  cust_given   CHAR(20) NOT NULL,  
  cust_street  CHAR(20) NOT NULL,  
  cust_town    CHAR(20) NOT NULL,  
  cust_postcode CHAR(4) NOT NULL,  
  cust_phone   CHAR(10),  
  CONSTRAINT pk_CUSTOMER PRIMARY KEY  
  (cust_no)); ...etc
```

This course: e.g., Assignment Part 2
(Given to students to implement)

Or,

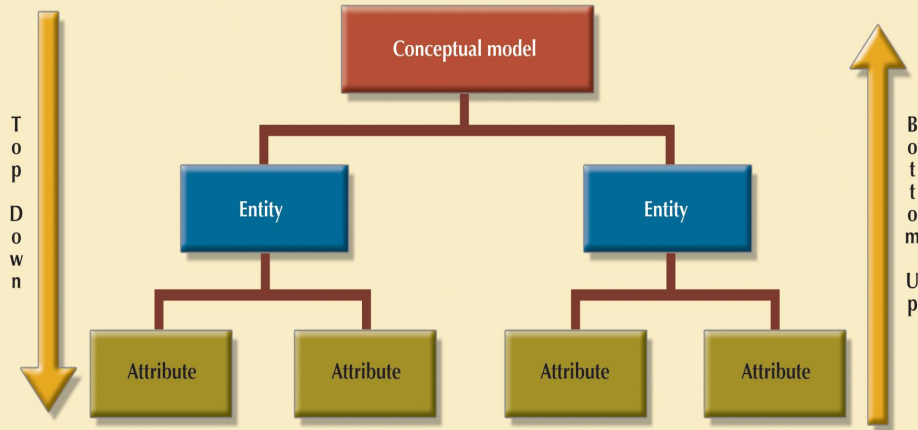
Visually using ERD like structures:



- Representation now *specific to a particular relational DBMS*, here *MySQL*. Schema file can be run against database to create table structures

Database Design – 2 classical strategies

FIGURE 9.14 Top-down vs. bottom-up design sequencing



- **Top-down design** This course
 - Identifies data sets
 - Defines data elements for each of those sets
 - Involves the identification of different entity types and the definition of each entity's attributes
- **Bottom-up design**
 - Identifies data elements (items)
 - Groups them together in data sets
 - First defines the attributes and then groups them to form entities

Thank you.