



# INFO 90002

## Database Systems & Information Modelling

Week 01  
Designing a Database



- **Designing Databases**
  - homework: noun-verb analysis
  - the database life-cycle
  - modelling a database for an example business
    - conceptual model
    - logical model
    - physical model



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# Database Development Lifecycle

- Design the database

- data modelling, E-R diagrams

- Implement the database

- data definition language (DDL)

- Data access / programming

- data manipulation language (DML)

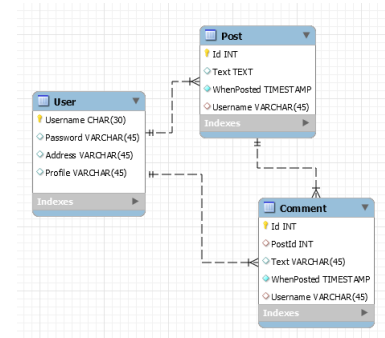
- Database administration

- data control language (DCL)

- Create
- Drop
- Alter
- Rename

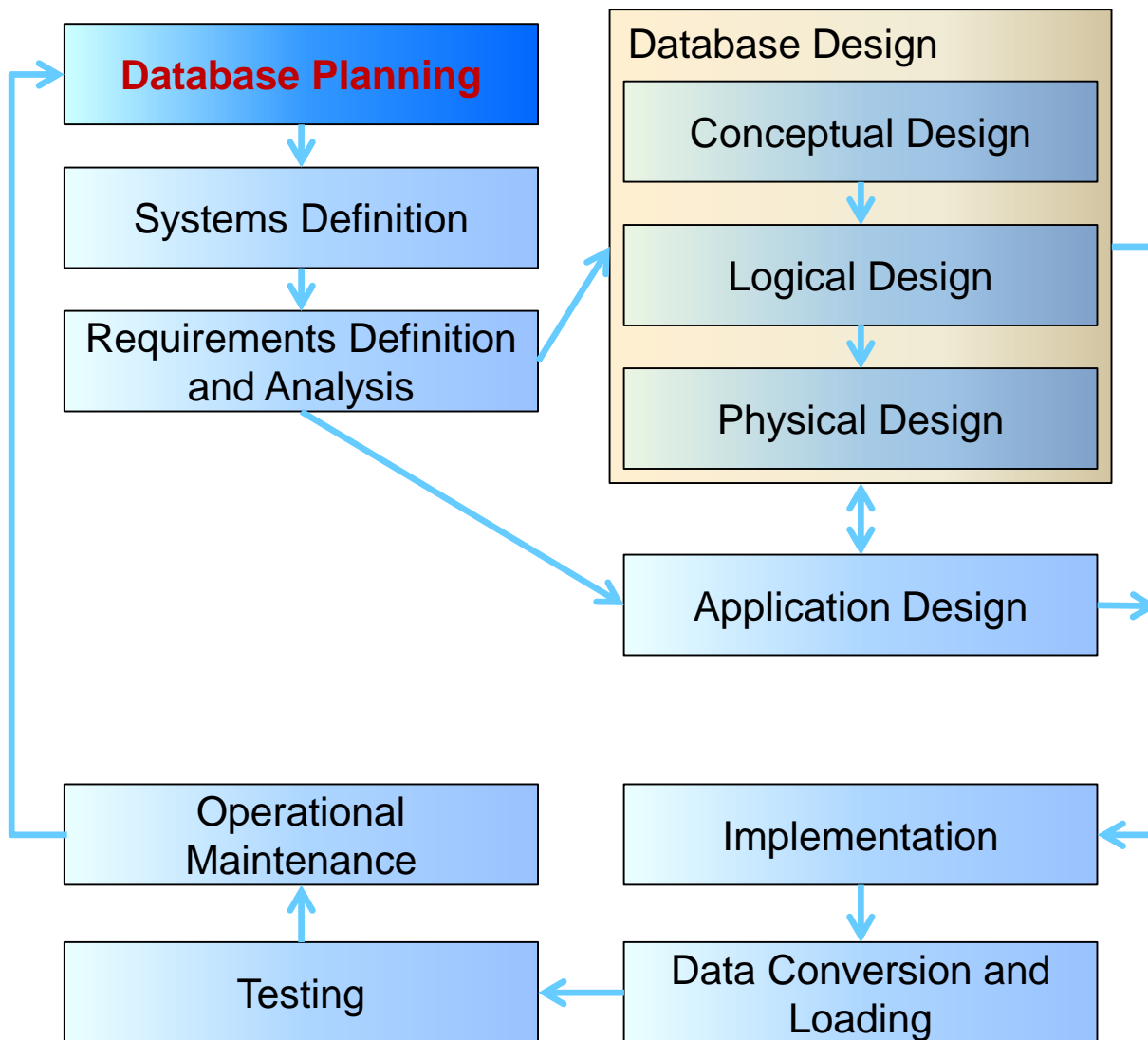
- Select
- Insert
- Update
- Delete

- Grant
- Revoke





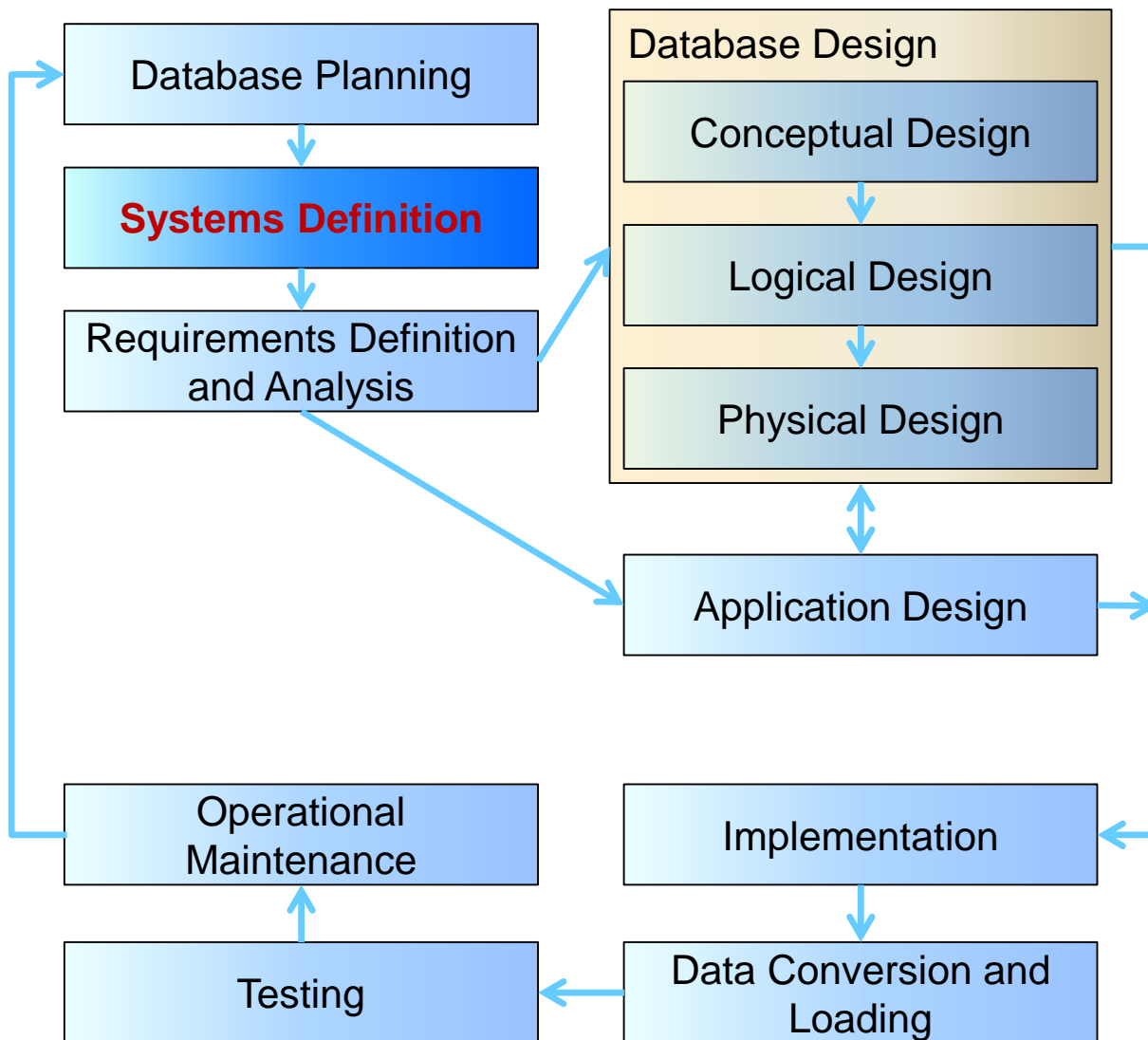
# Database Development Lifecycle



- Planning how to do the project.
  - How does the enterprise work
  - Enterprise data model
- How can the stages be completed efficiently and effectively.
- Outside scope of the course



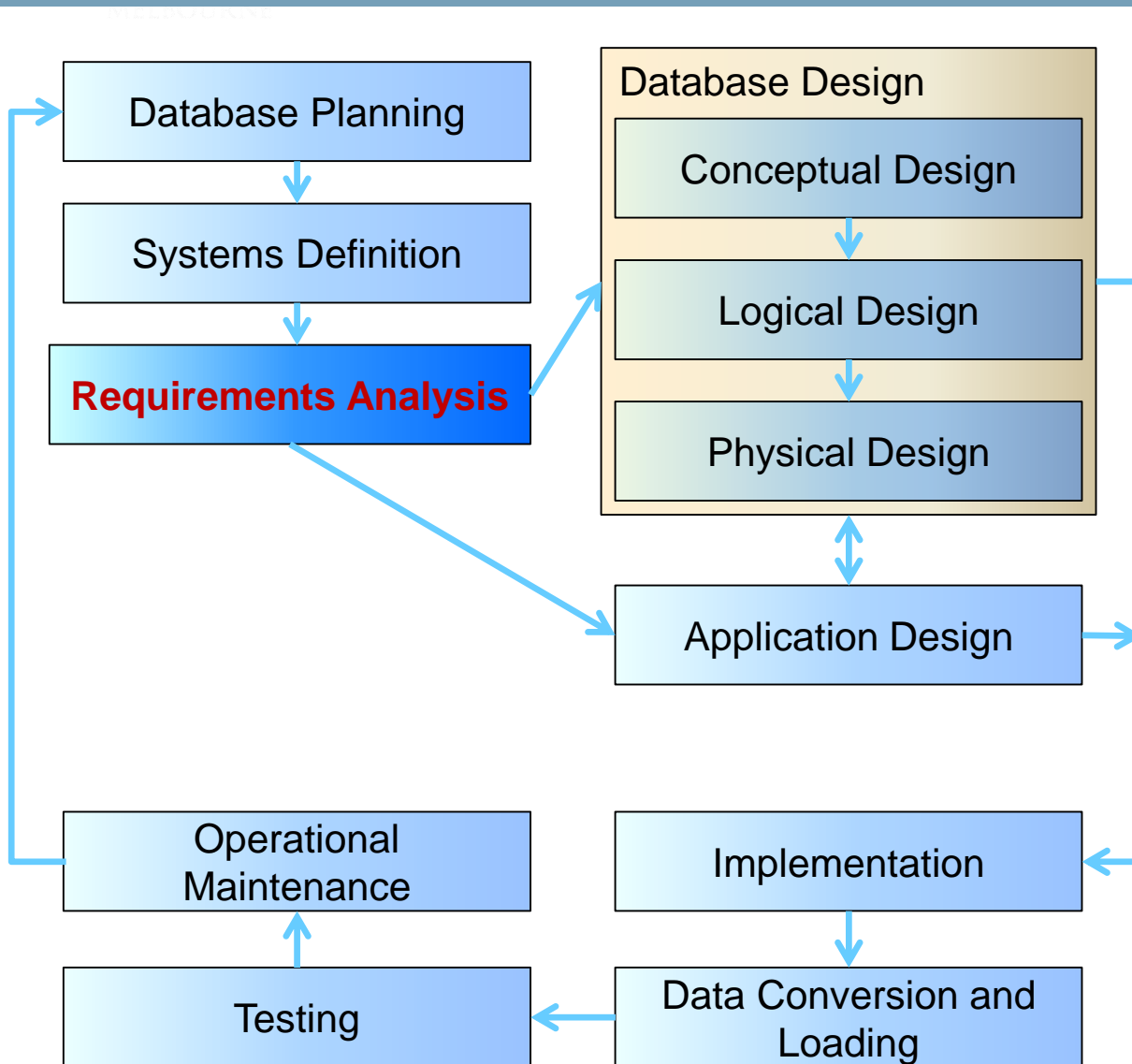
# Database Development Lifecycle



- Specifying scope and boundaries
  - Users
  - Major user views
  - Application areas
- How does it interact with other systems
- User views – how the system operates from differing perspectives
- Outside scope of the course (slightly)



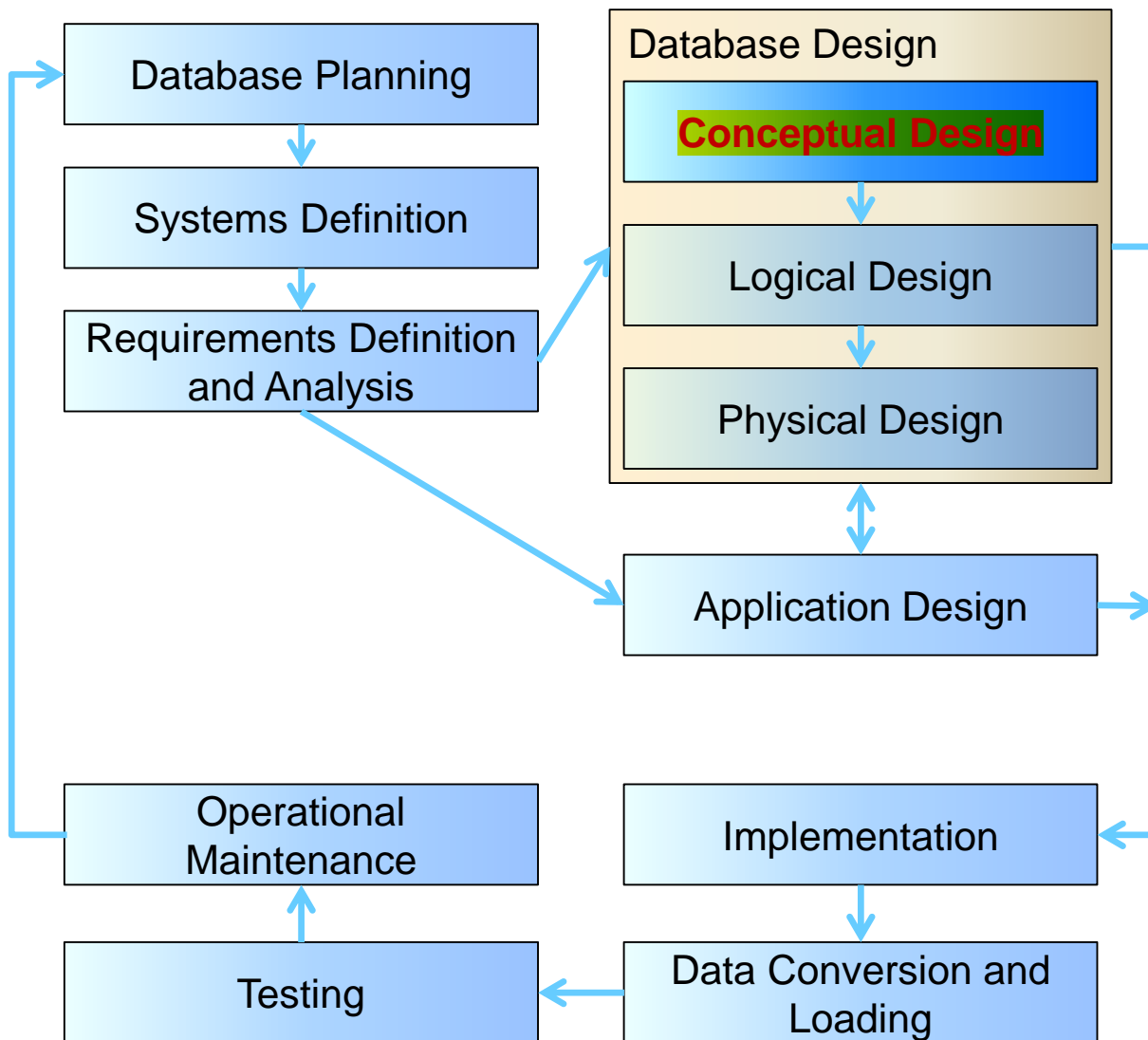
# Database Development Lifecycle



- Collection and analysis of requirements for the new system



# Database Development Lifecycle

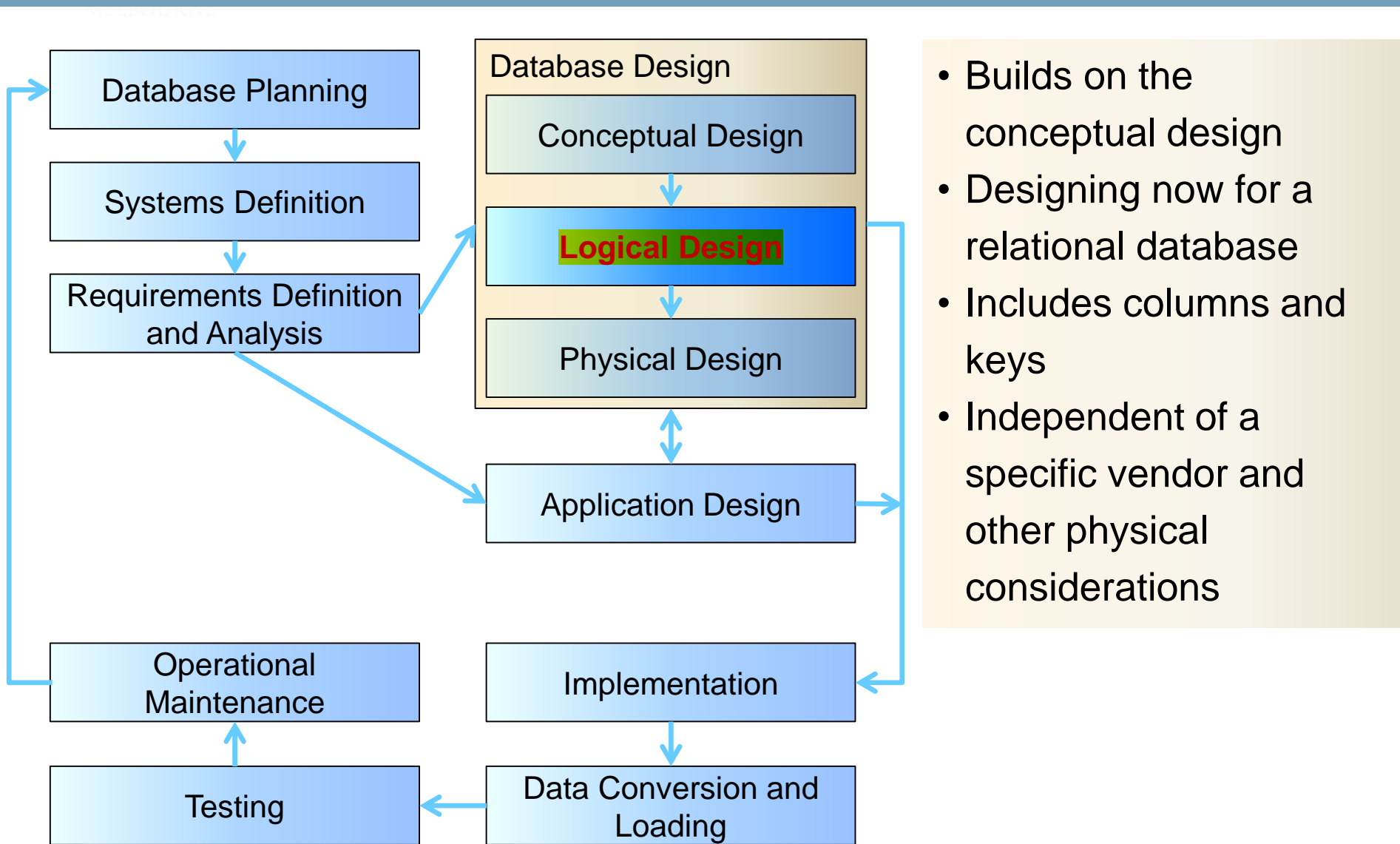


- High-level, first-pass model of entities and their connections
- Typically omits attributes
- Could potentially be implemented in a non-relational database
- Thus can include many-to-many relationships, repeating groups, composite attributes



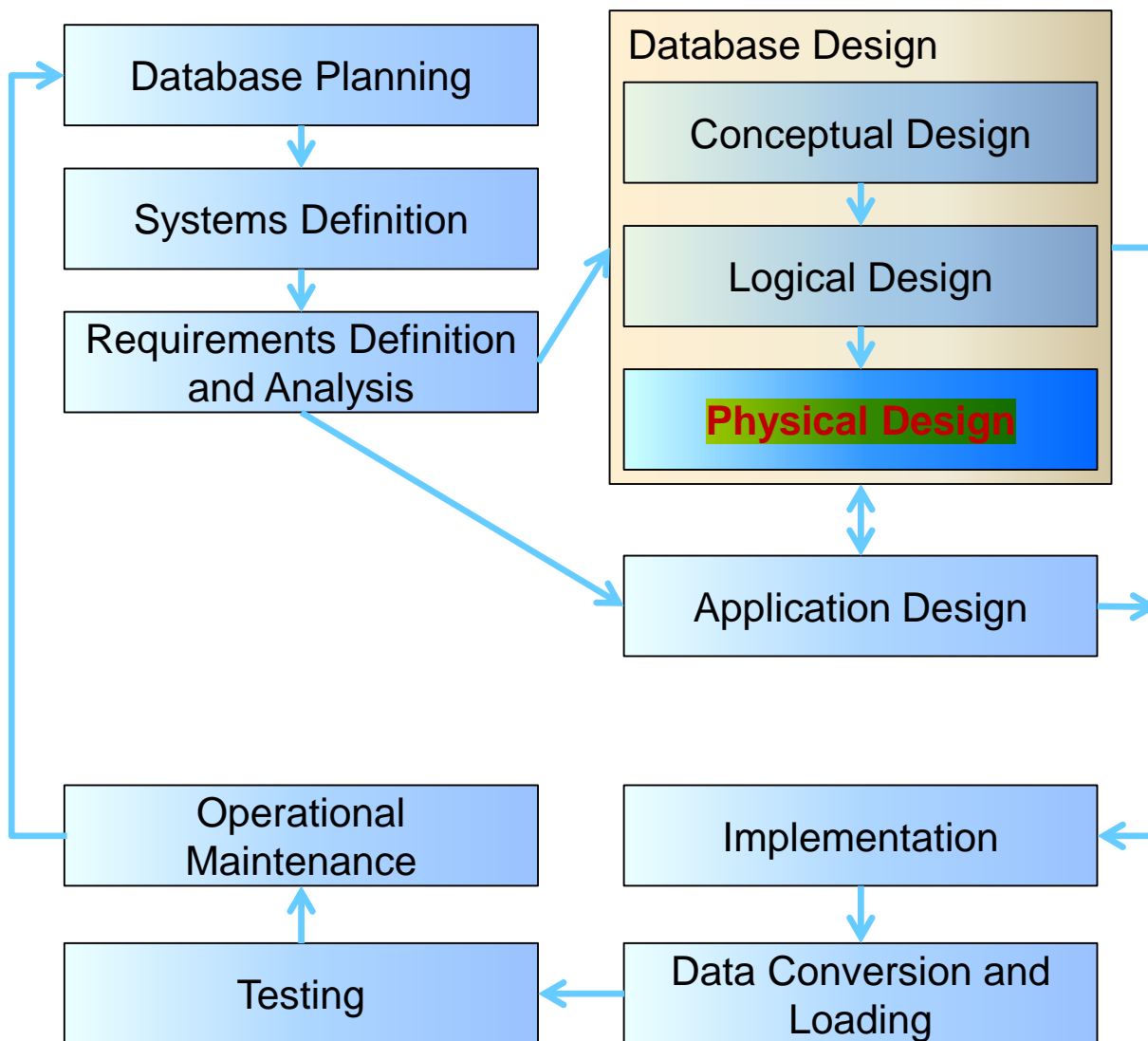


# Database Development Lifecycle





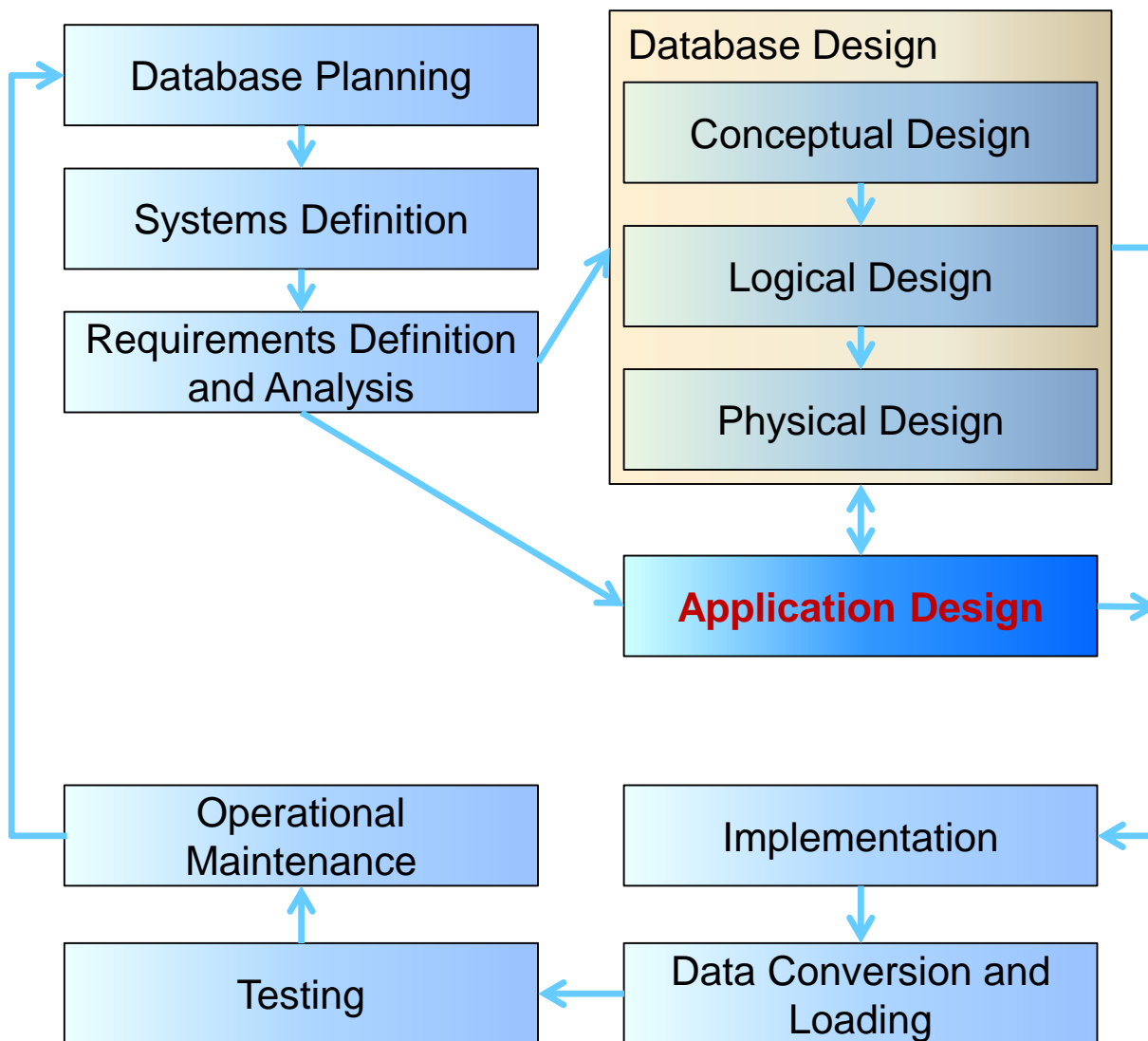
# Database Development Lifecycle



- Implements the logical design for a specific DBMS.
- Describes:
  - Base tables
  - Data types
  - Indexes
  - Integrity constraints
  - File organisation
  - Security measures
- We will cover some aspects of physical design



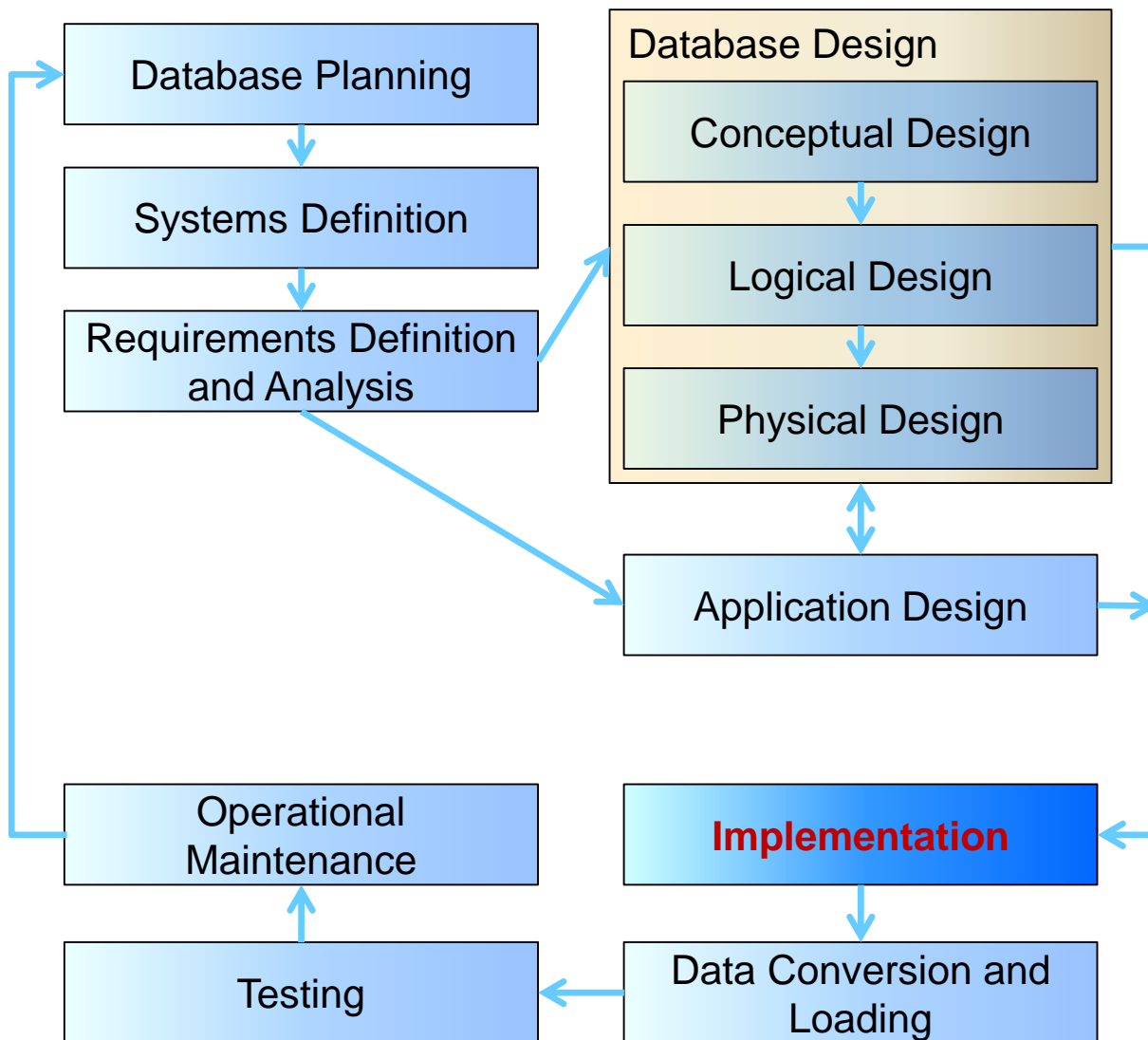
# Database Development Lifecycle



- Done in conjunction with database design
- Design of the interface and application programs that use and process the database
- Mostly outside scope of the course, but discussed in week 7



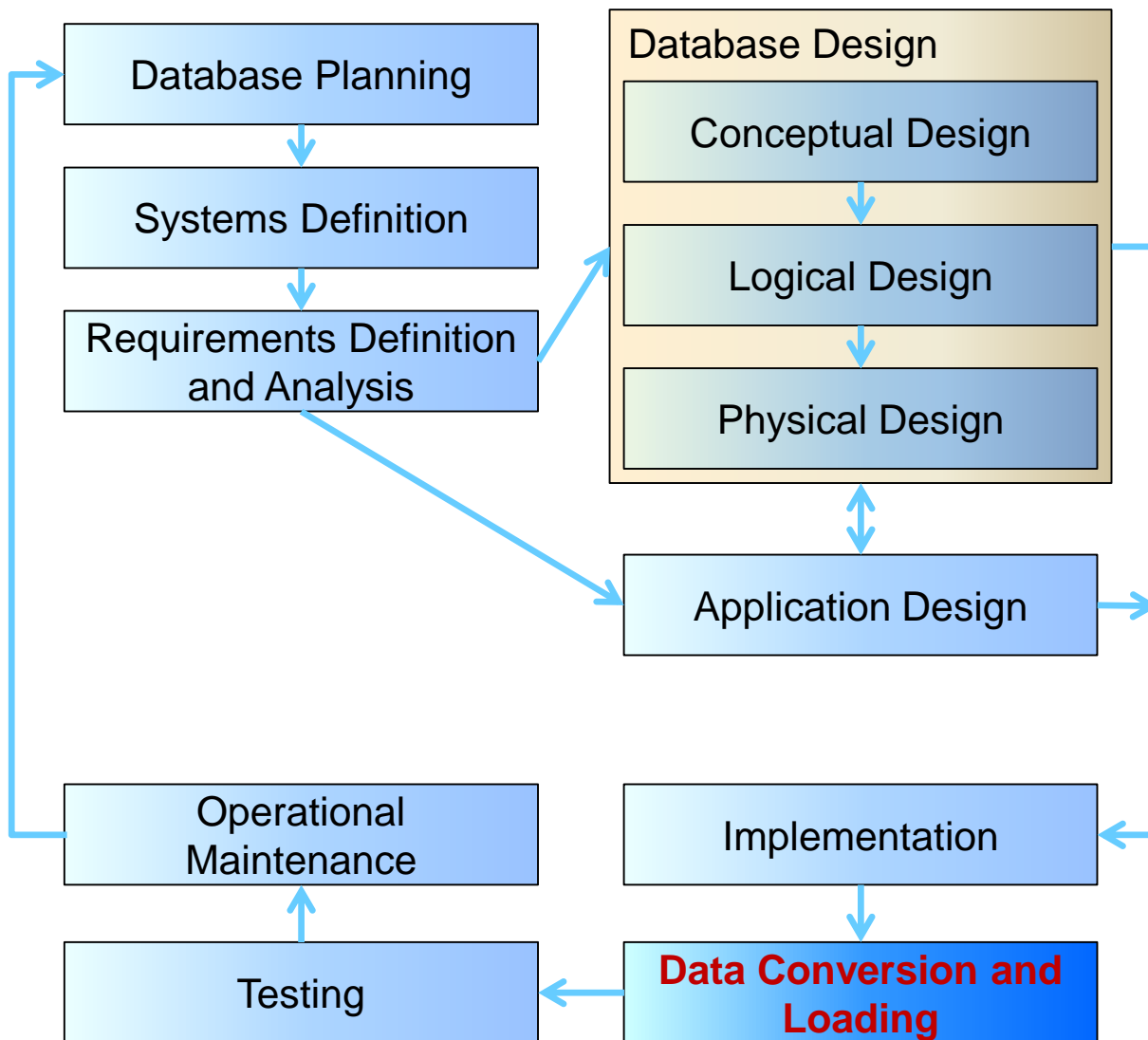
# Database Development Lifecycle



- Implementation of the design as a working database



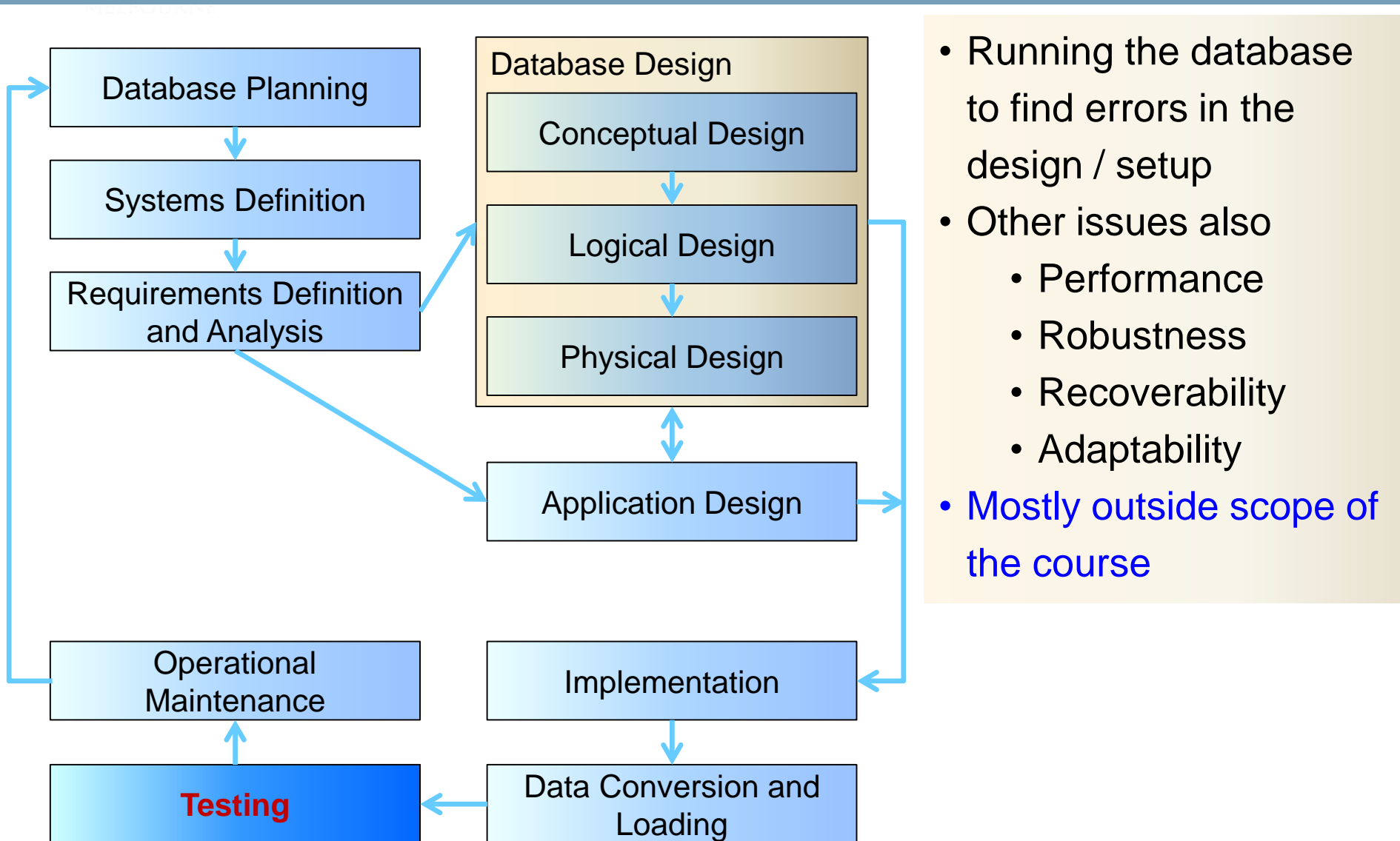
# Database Development Lifecycle

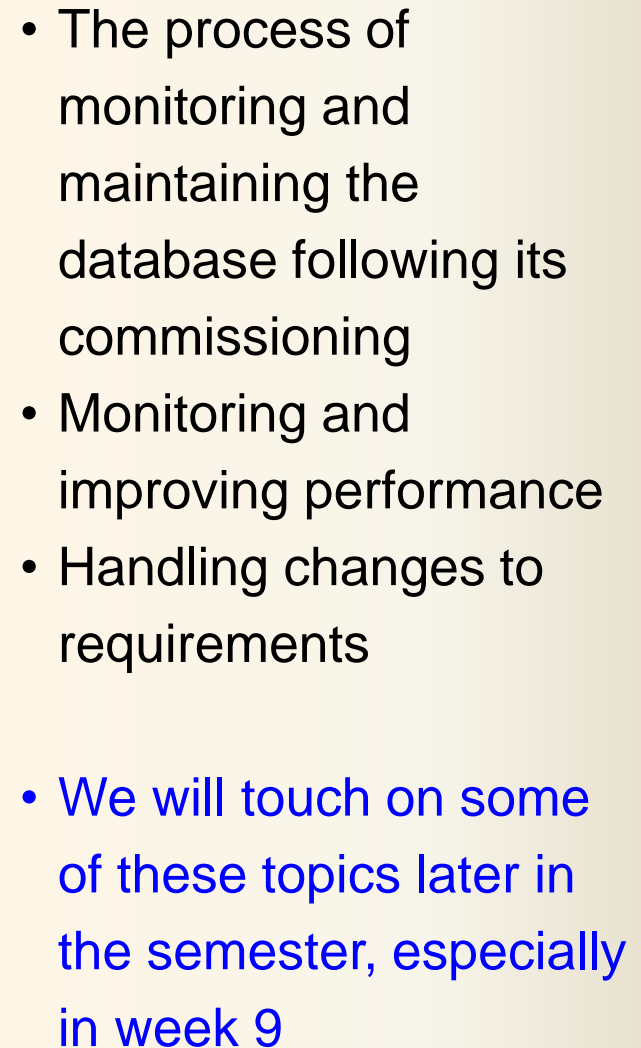


- Transfer existing data into the database
- Conversion from old systems
- Non trivial task

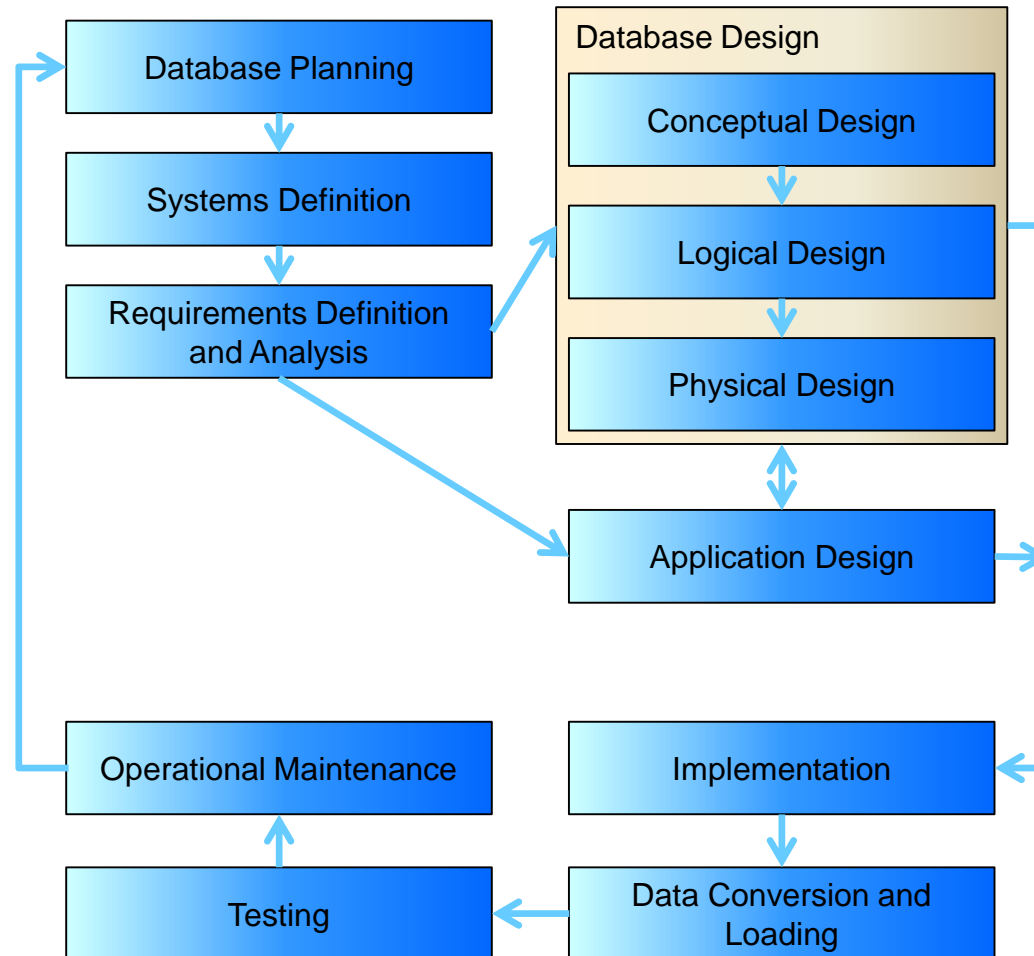


# Database Development Lifecycle





# Summary of database lifecycle



Now we'll work through one example ...





# Case Study: design the db

## Data Modelling

# Case for this lecture: Orders system

- Our company sells many products. About each product we record its id, name, and price.
- We have many customers. About each customer we record their customer id, name, and address.
- Customers place orders for products. Each order is placed by one customer on a particular date. Over time a customer may place several orders, though some may register but not place any orders.
- Each order must contain at least one order-item, but may contain several. Each order-item records a quantity ordered of one product.

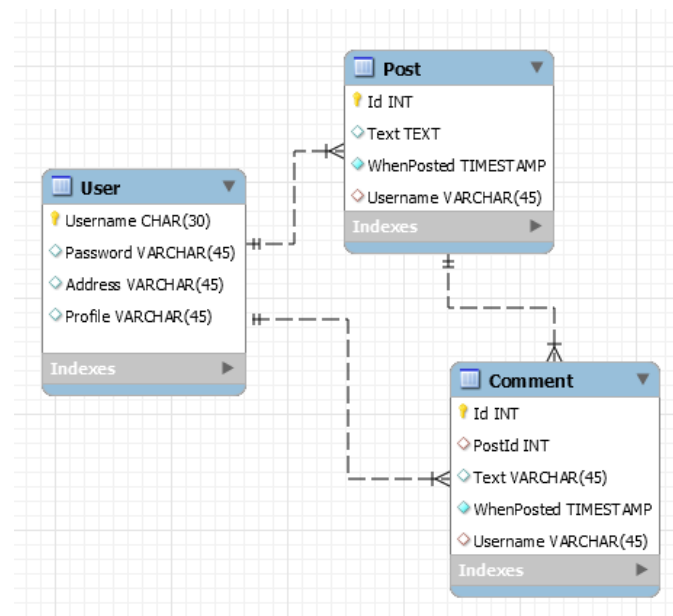
**Order Form** 3-Oct

Ship to:  
June Summers  
123 Main St  
Toronto, ON M5M 5M5

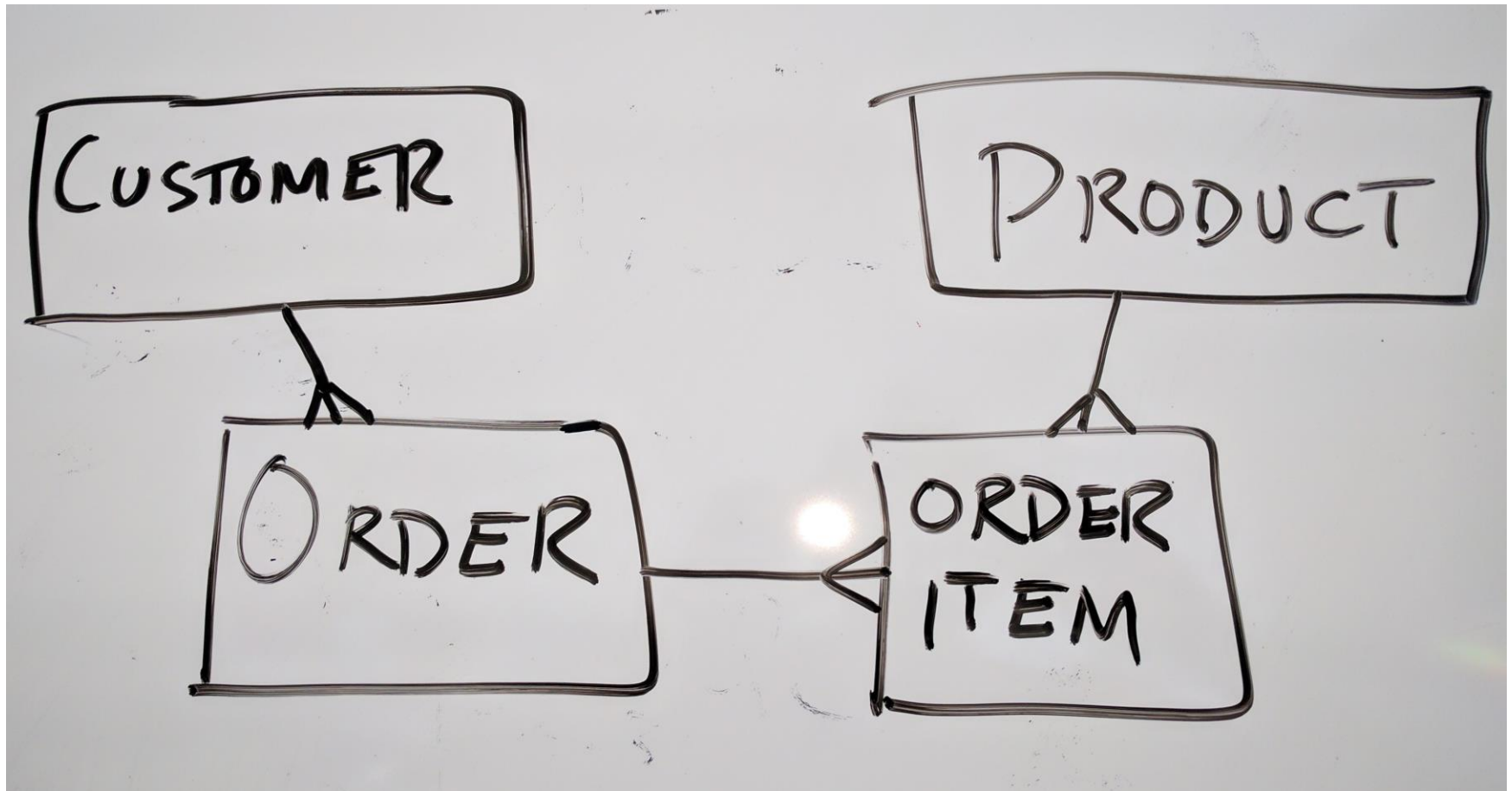
Product	Price	Qty	Total
Sweater	\$ 15.00	5	\$ 75.00
<div><div></div><div>Jacket</div><div>Sweater</div><div>Shirt</div><div>Pants</div><div>Dress</div></div>			
Total			\$ 75.00



1. What are the entities that need to be tracked?
2. What information will be recorded about each entity?
3. What are the relationships between entities?
4. What are the cardinalities of relationships?



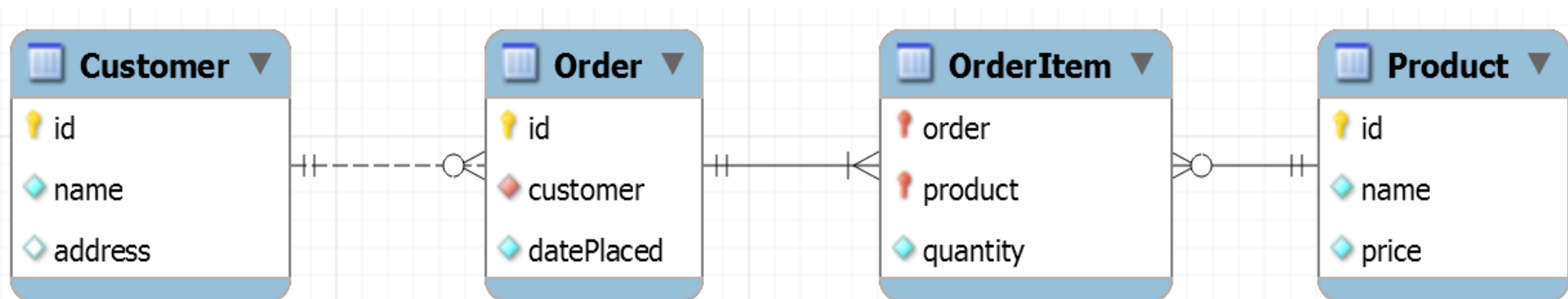
(we will create this together during the lecture)



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New question:

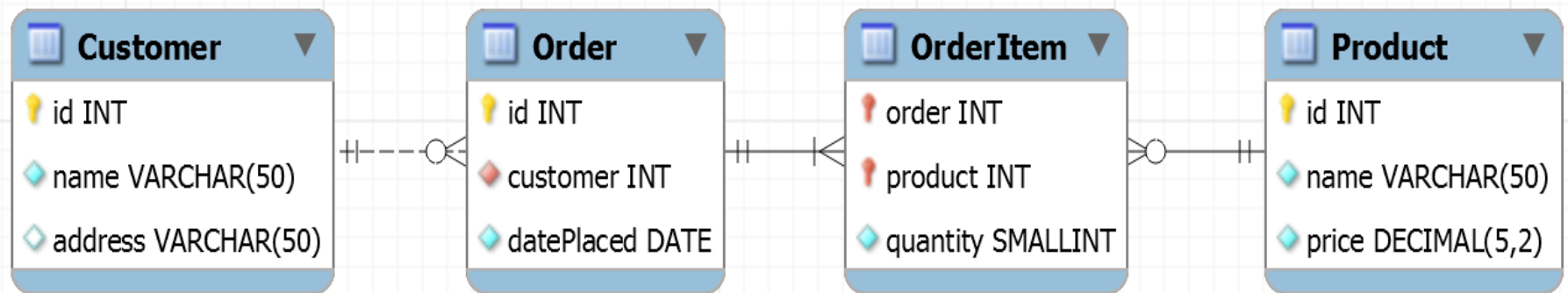
What is the *primary key* of each table?



(we will create this together during the lecture)

New question:

What is the *data type* of each column?





- More detailed understanding of database design
  - Conceptual design
  - Logical design
  - Physical design
- More detailed understanding of SQL
  - Operations on a single table
  - Joining multiple tables