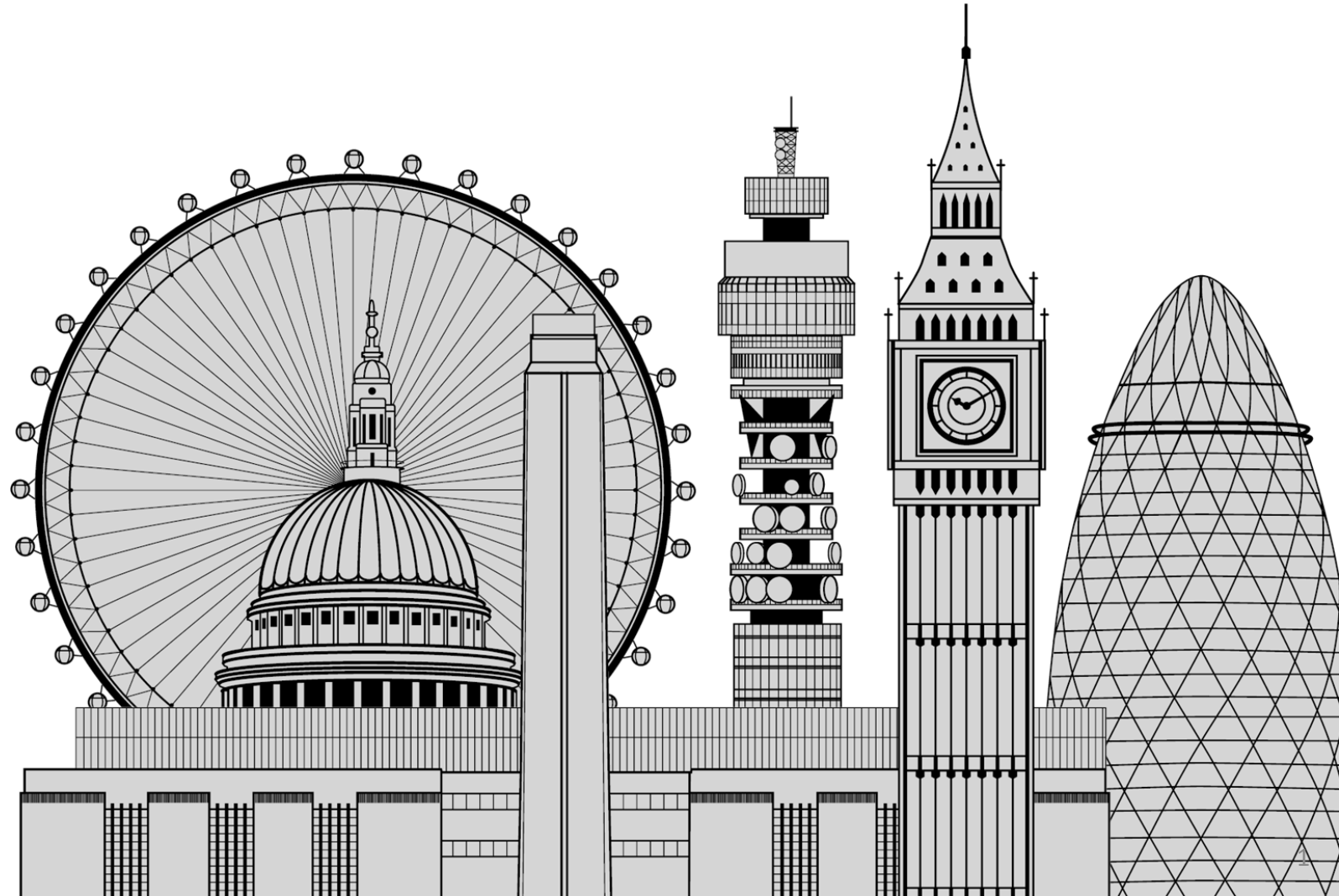


# 5COSC020W DATABASE SYSTEMS – LECTURE 04

## Logical Database Design – Complex Mapping to a Logical ERD

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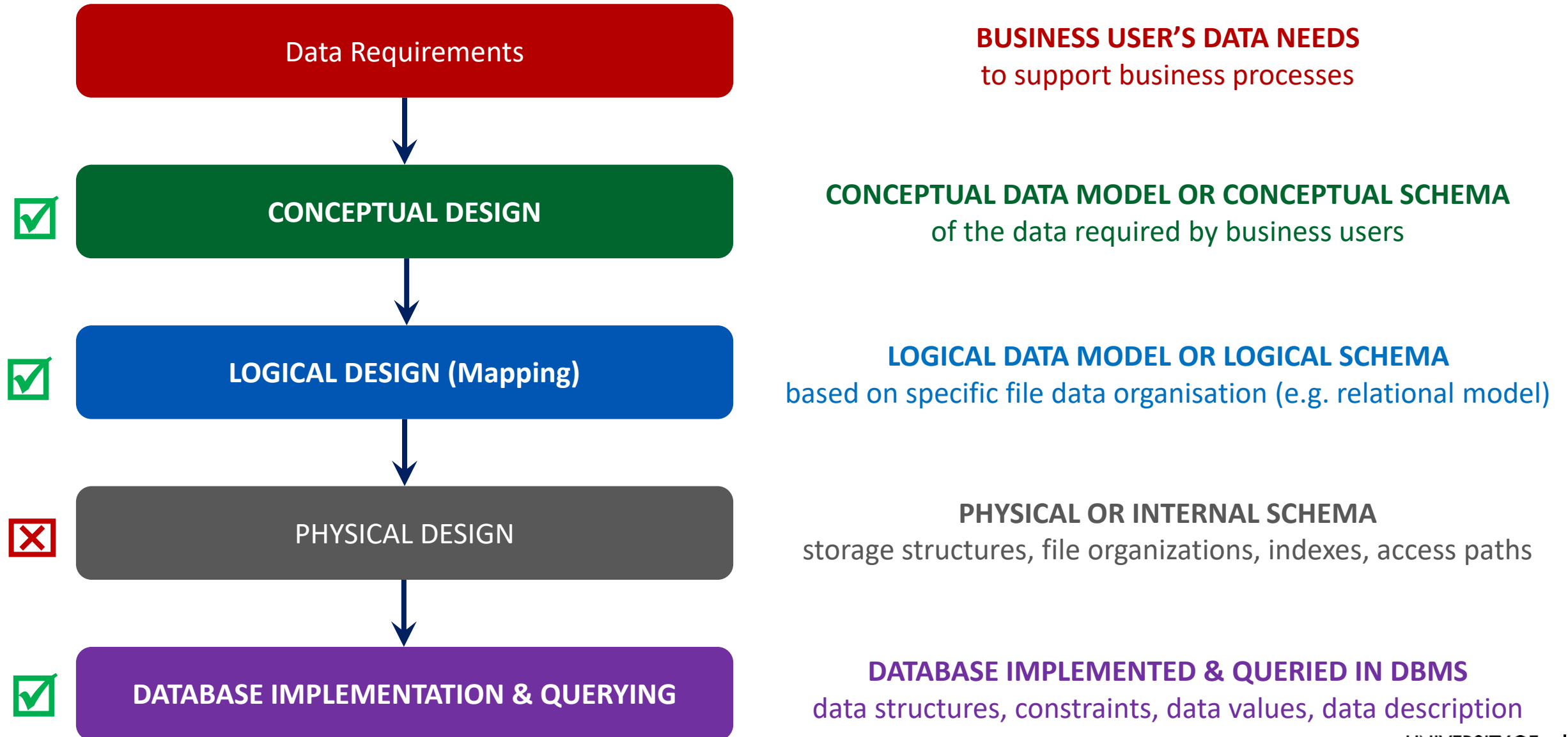


# Lecture 04 – Outline

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- **10 Logical Mapping Rules (recap)**
  - From conceptual to logical
- **Logical Mapping Strategy (recap)**
  - Step-by-step Approach
- **Example of a complex mapping from a conceptual to a logical ER**
  - Mapping Exercise

# Phases and outputs of Database Design (recap)



# 10 Logical Mapping Rules (Rule 1 to 6)

## 1) One-to-many relationship.

Create 2 tables parent & child. Create a FK in child to reference PK in parent.

## 2) One-to-one relationship mandatory on both sides.

Merge both into 1 table with all attributes. Choose PK, other one is AK.

## 3) One-to-one relationship optional on one side.

Create 2 tables parent & child. Create a FK in child to reference PK in parent.

## 4) One-to-one relationship optional on both sides.

Create 2 tables parent & child. Create a FK in child to reference PK in parent.

## 5) Many-to-Many relationship.

Create 3 tables. Link table is a child of the other 2 tables and carries FKs and link table has a PK that is compound or composite.

## 6) Ternary relationship.

Create 3 tables. Link table is a child of the other 2 tables and carries FKs and link table has a PK that is compound or composite.

# 10 Logical Mapping Rules (Rule 7 to 10)

## — 7) Specialisation with {Mandatory, And} constraint.

- Merge all three into 1 table with all attributes.
- Add relevant flags.

## 8) Specialisation with {Optional, And} constraint.

- Create 2 tables (1 for general, 1 for both specialised) with a one-to-one relationship optional on specialised side.
- Create FK that also happens to be a PK, with the right attributes.
- Add relevant flags.

## 9) Specialisation with {Mandatory, Or} constraint.

- Create 2 completely separate tables.
- Separate all the attributes and all the relationships.

## 10) Specialisation with {Optional, Or} constraint.

- Create 3 tables (1 for general, 2 for specialised) with 2 one-to-one relationships optional on specialised side.
- Create FKs that also happens to be a PKs, with the right attributes.

# Mapping Strategy: Step-by-step Logical Mapping (Recap)

## **I. Map specialisations**

**(rules 7, 8, 9 or 10)**

- Consider constraint and apply appropriate rule.

## **II. Map one-to-one relationships mandatory on both sides (rule 2)**

- Merge 2 entities into one table, select PK and AK.

## **III. Map complex & many-to-many relationships (rules 5 or 6)**

- Reproduce original entities and make them parent tables.
- Introduce link table as a child, define new multiplicities and define FKs and PK.

## **IV. Map one-to-many relationships and one-to-one relationships that are optional on one side or on both sides (rules 1, 3 or 4)**

- Reproduce original entities, make one the parent table, make the other the child.
- Introduce FK in the child table to reference PK of the parent table.

# Mapping Exercise (1): the Futuro project brief

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- Futuro is the careers and professional development service offered by the University of Westminster.
- Futuro employs several career consultants to provide guidance and advice to the students who use the service to find employment.
- Companies propose multiple offers of employment that can be of interest to students.
- Students can apply to these employment offers e.g. job offers, graduate scheme offers, and placement offers.
- To assist the students with their applications, career consultants at Futuro organise support sessions to help them with their application forms, CVs and cover letters.
- Futuro career consultants also organise a number of events to showcase jobs and graduate schemes.

## Mapping Exercise (2): instructions

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- From Blackboard, download the Conceptual EERD file called “Lecture 04 - Futuro brief & conceptual EERD”.
- Study it very carefully and consider and categorise all the relationships (hint: for binary relationships, consider the cardinalities).
- Open draw.io and create a new diagram called “Lecture 04 - Futuro Logical ERD”.
- Use the **Mapping Strategy** (slide 6) and the **Mapping Rules** (slides 4 & 5 and Lecture 03) to map the conceptual EERD to the logical ERD by resolving all the relationships, one by one, on your diagram.
- Produce a high quality logical ERD with all the right FKs.



# References and Essential Readings

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- Module Reading List: <https://rl.talis.com/3/westminster/lists/2CAA7D6B-DCAD-AB71-C97B-7FEFCB499C28.html>
- Connolly, T. & Begg, C. E. (2015). Database systems: a practical approach to design, implementation and management. 6th Edition (Global Edition). Pearson Education. Ch. 1, 12, 13, 16.
- Elmasri, R. & Navathe, S. (2017). Fundamentals of Database Systems. 7th Edition (Global Edition). Pearson Education. Ch 9.