Database Design
(Informatic Engineering Degree)

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Definitions

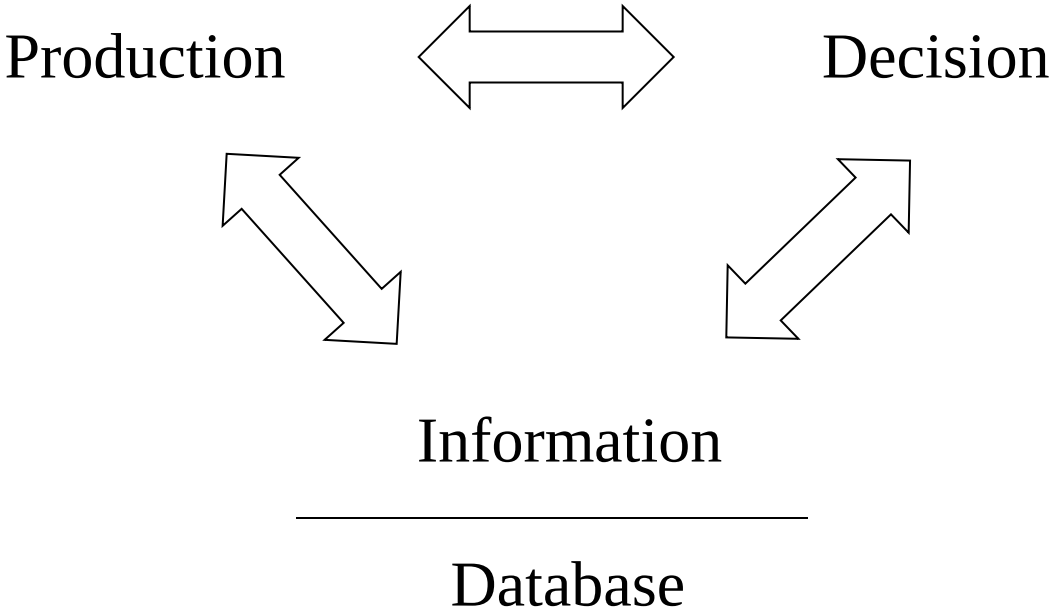
Knowledge objectives

1. Distinguish the three subsystems in every company
2. Recognize the longest stage in the waterfall lifecycle of an Information system
3. Distinguish between a data model and a database model
4. Place in a time axis the different database models
5. Enumerate the design steps of an operational database

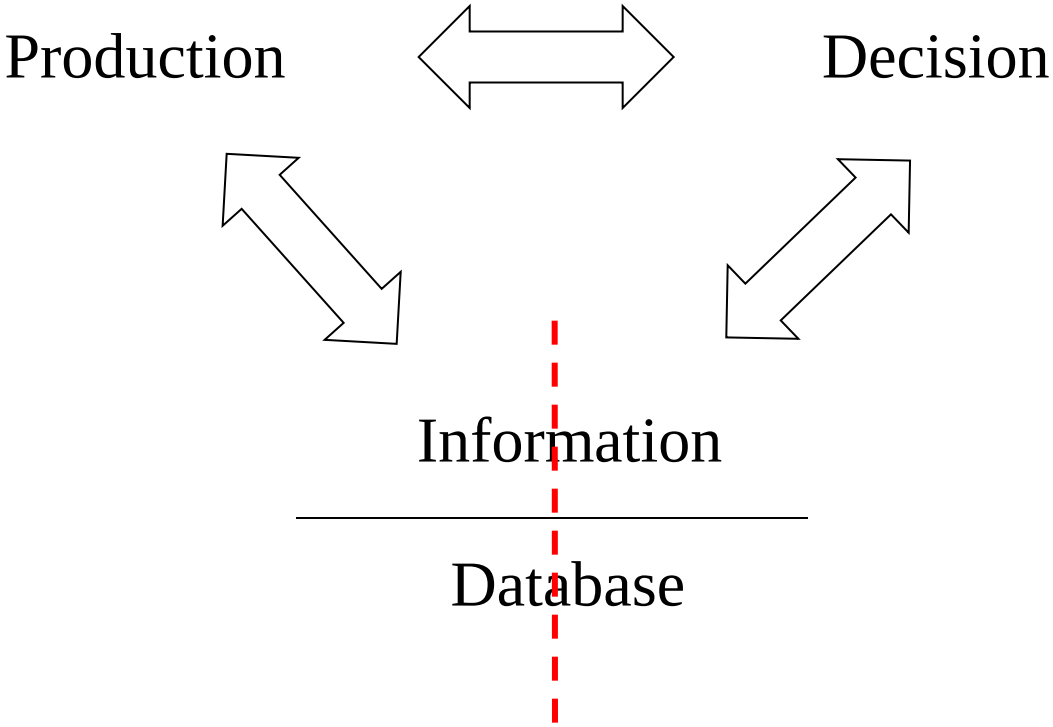
Organization subsystems

- Production: Perform activities constituting the goal of the organization
- Decision: Plan, Coordinate and Control production activities
- Information: Collect (*input*), Store (*save*), Process (*run*) and Distribute (*output*) all information **relevant and needed** by the other subsystems

Enterprise subsystems (II)



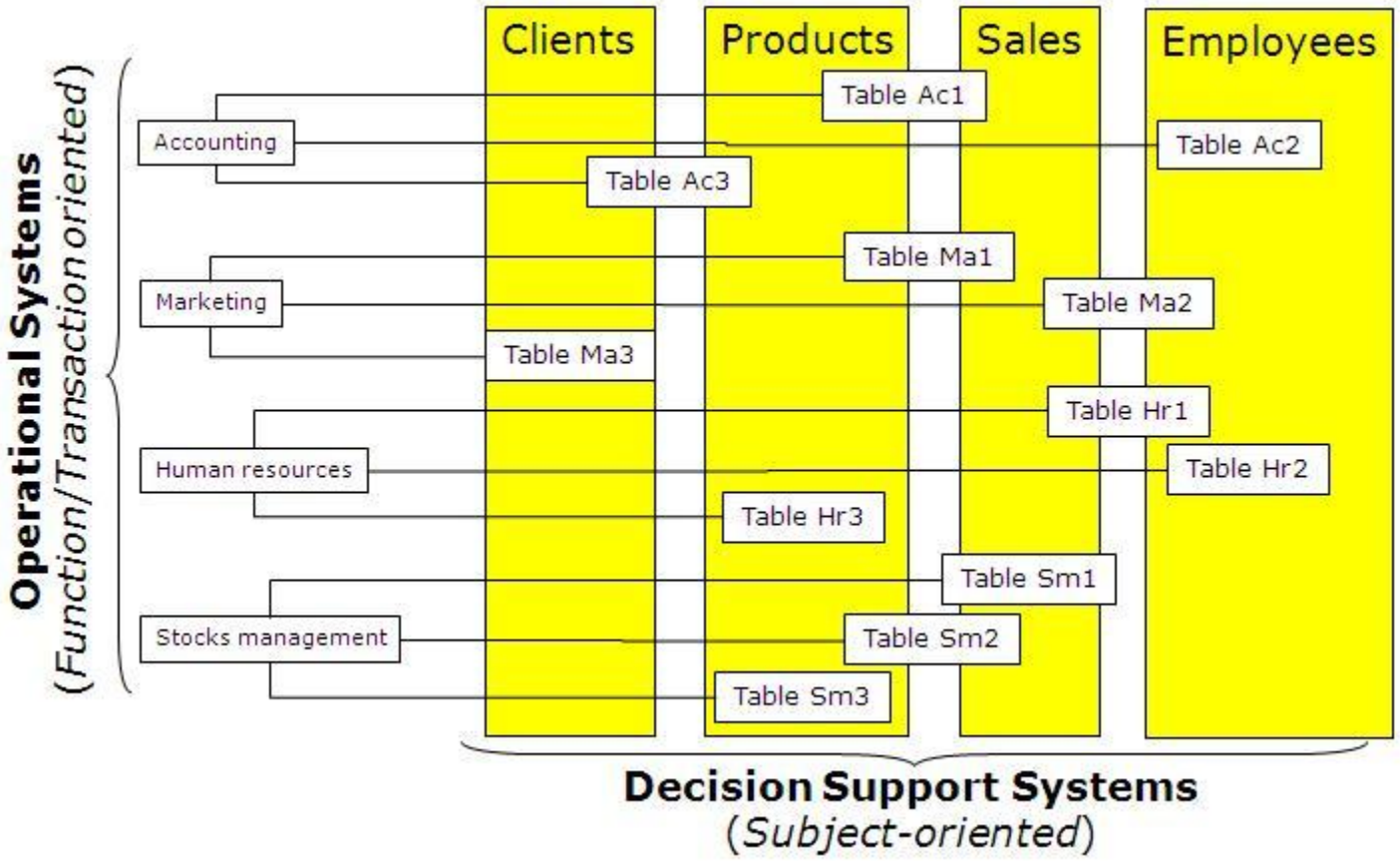
Enterprise subsystems (II)



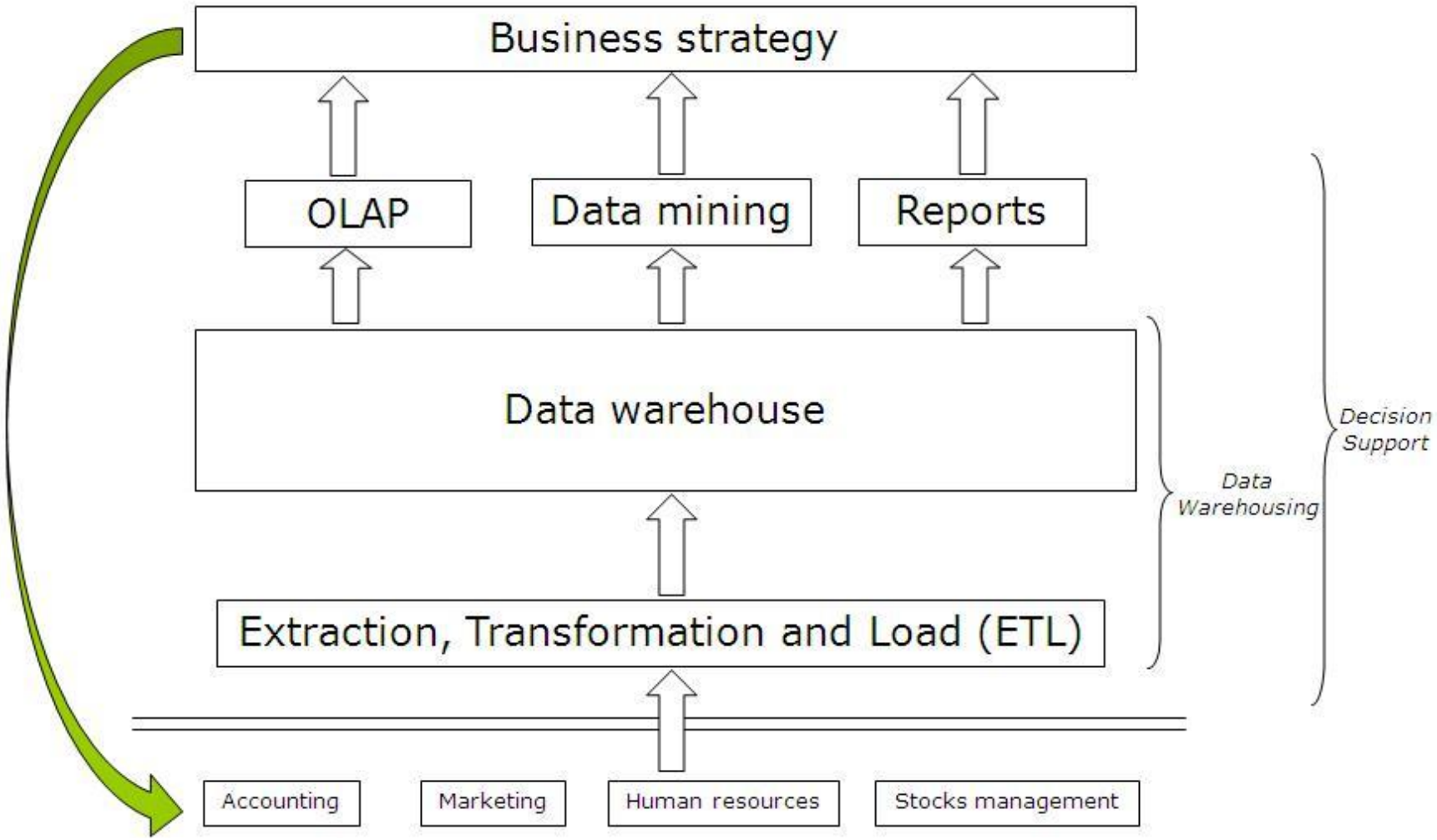
Comparison

	Operational	Decisional
Objective	Business operation	Business analysis
Main functions	Daily oper. (OLTP)	Decision Support System (OLAP)
Usage	Repetitive (predefined)	Innovative (unexpected)
Design orientation	Functionality	Subject
Kind of users	Clerks	Executives
Number of users	Thousands	Hundreds
Accessed tuples	Hundreds	Thousands
Data sources	Isolated	Integrated
Granularity	Atomic	Summarized
Time coverage	Current	Historical
Access	Read/Write	Read-only
Work units	Simple transactions	Complex queries
Requirements	Performance & consistency	Performance & precision
Size	Mega/Gigabytes	Giga/Tera/Petabytes

Subject vs Functionality



B.I. Cycle


Business strategy
OLAP
Data mining
Reports
Data warehouse
Extraction, Transformation and Load (ETL)
Accounting
Marketing
Human resources
Stocks management
Data Warehousing
Decision Support

Lifecycle of an IS

1. Definition: What I want to do
   1. Study of opportunities
   2. Requirements analysis — DATA MODEL
   3. Specification
2. Design: How I will do it
   1. Logic (independent of tools) — DATABASE MODEL
   2. Physical (dependent on tools) — DBMS
3. Construction: Coding
4. Execution:
   1. Test
   2. Open it to users
5. Maintaining
   1. Repair the code
   2. Appearance of new functionalities

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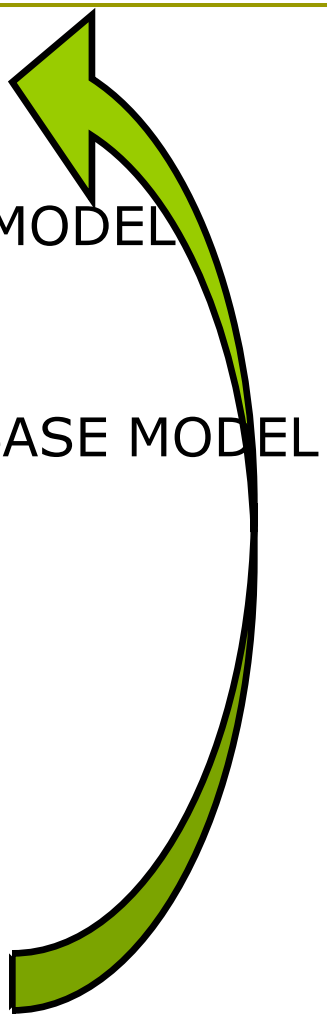
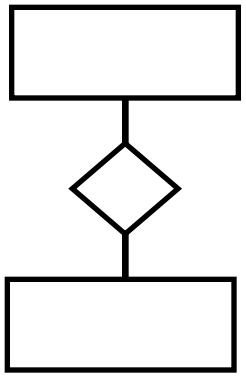
DATA MODEL

DATABASE MODEL
DBMS



Data models and Database models

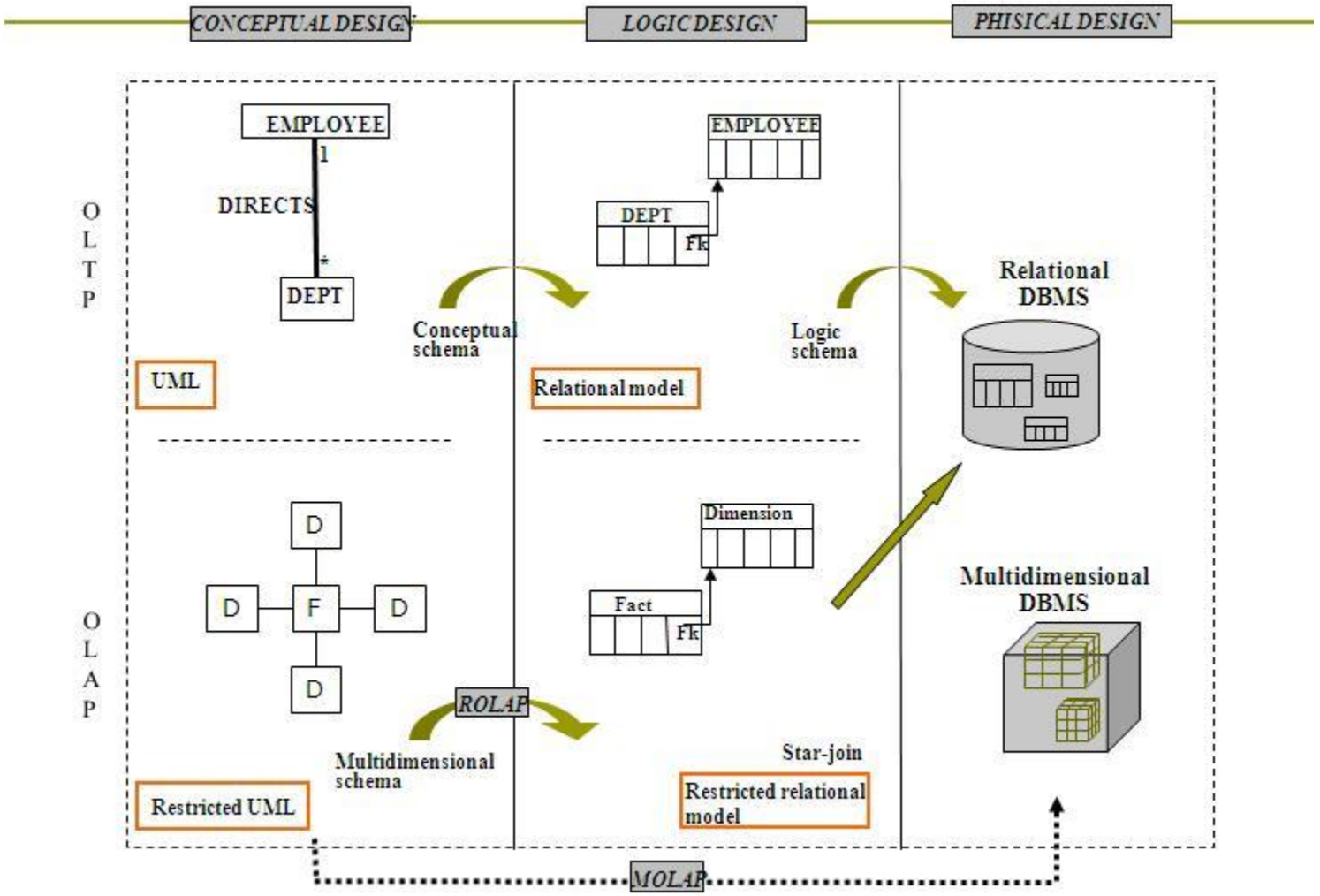
- [Semantic] data models
  - Abrial (1974)
  - Entity-Relationship (P. Chen, 1976)
  - Extended ER (Smith&Smith, 1977)
  - RM/T (E.F. Codd, 1979)
  - Unified Modeling Language (1.0, 1997)
- Database models (kinds of DBMS)
  - Pre-relational (hierarchical and network)
  - Relational (E.F. Codd, 1969-1970)
    - SQL'86/89
    - SQL'92
  - Post-relational
    - Pure-objects (ODMG v3)
    - Object-Relational
      - SQL'99
      - SQL'03
    - NOSQL
- Physic models (concrete DBMS)



Database design of an IS

- Static facet:
  - Conceptual schema
    - Intra-objects
      - Classes
      - Attributes
    - Inter-objects
      - Relationships
  - Integrity constraints
- Dynamic facet (aspects that change through time):
  - Use cases
  - Behavior model
  - State diagrams

Transactional vs Decisional



Summary

- Subsystems of an enterprise
- Decisional and Operational Databases
- Lifecycle of an IS
- Data model vs database model
- Relational operational DB design steps

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