Chapter 2: The Database Development Process

Modern Database Management

6th Edition

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Information Systems Architecture (ISA)

Overall blueprint for organization's information systems

Consists of:

- Data (Enterprise Data Model – simplified ER Diagram)
- Processes – data flow diagrams, process decomposition, etc.
- Data Network – topology diagram (like fig 1.8)
- People – people management using project management tools (Gantt charts, etc.)
- Events and Points in Time (when processes are performed)
- Reasons for events and rules (e.g. decision tables)

Information Engineering

A data-oriented methodology to create and maintain information systems

Top-down planning approach.

Four steps:

- ***Planning***
  - Results in an **Information Systems Architecture**
- ***Analysis***
  - Results in **functional specifications**…i.e. what we want
- ***Design***
  - Results in **design specifications**…i.e. how we'll do it
- ***Implementation***
  - Results in final **operational system**

Information Systems Planning

Strategy development

- IT Planning to meet Corporate strategy

Three steps:

1. Identify strategic planning factors
2. Identify corporate planning objects
3. Develop enterprise model

Identify Strategic Planning Factors (table 2.1)

- Organization goals – what we hope to accomplish
- Critical success factors – what MUST work in order for us to survive
- Problem areas – weaknesses we now have

Identify Corporate Planning Objects (table 2.3)

- Organizational units
- Organizational locations
- Business functions – these might become the users
- Entity types – the things we are trying to model
- Information (application) systems

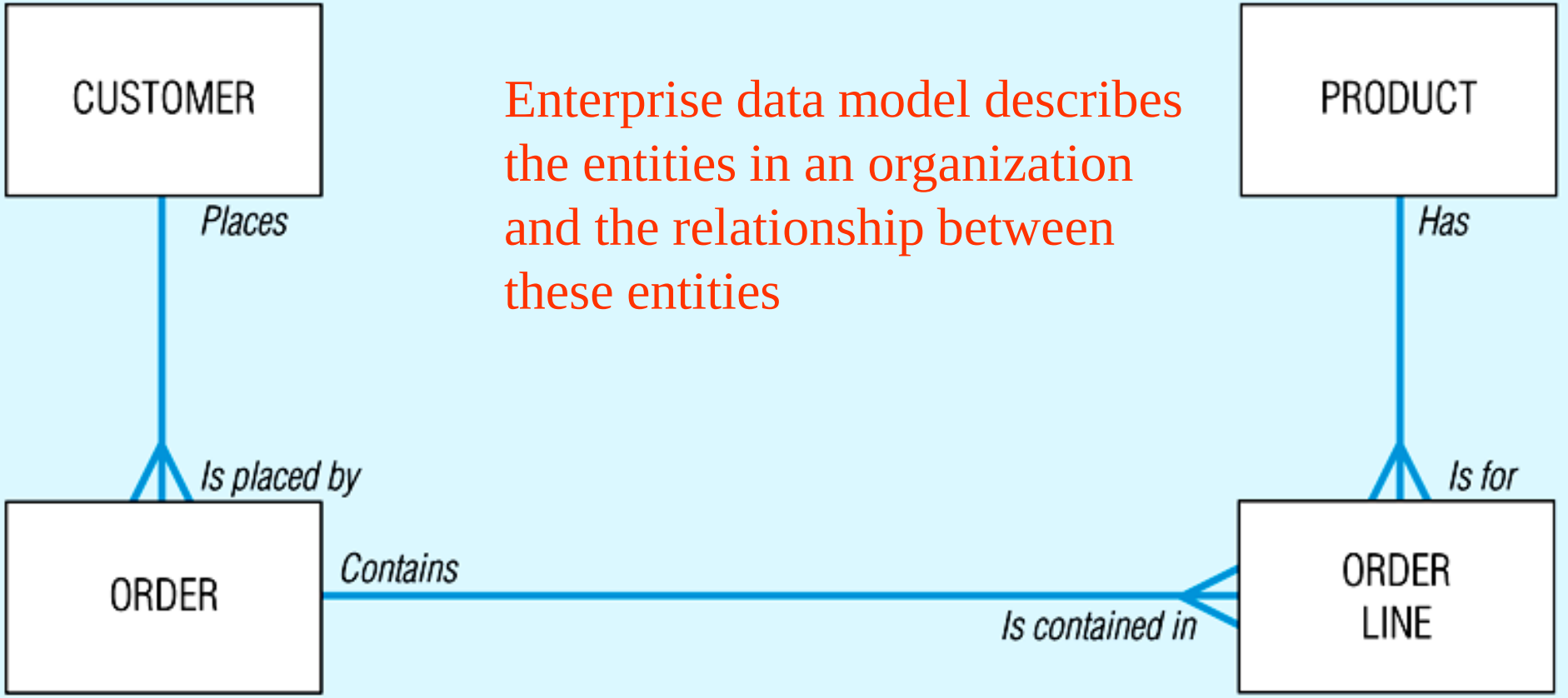
Develop Enterprise Model

- Decomposition of business functions
  - See figure 2.2
- Enterprise data model
  - See figure 2.1
- Planning matrixes
  - See figure 2.3

Enterprise Data Model

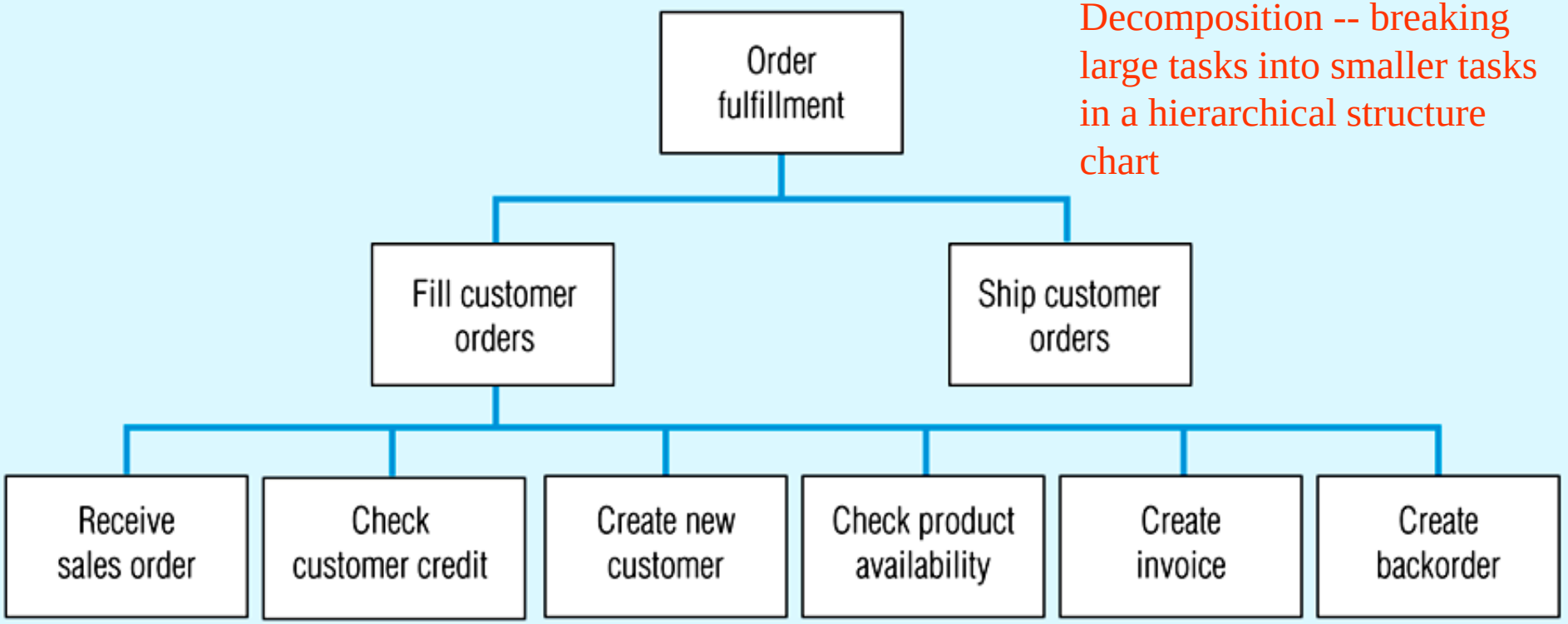
- First step in database development
- Specifies scope and general content
- Overall picture of organizational data, not specific design
- Entity-relationship diagram
- Descriptions of entity types
- Relationships between entities
- Business rules

Figure 2-1 Segment from enterprise data model (Pine Valley Furniture Company) [simplified E-R diagram, repeat of figure 1.3]



Enterprise data model describes the entities in an organization and the relationship between these entities

Figure 2.2 -- Example of process decomposition of an order fulfillment function (Pine Valley Furniture)



Decomposition -- breaking large tasks into smaller tasks in a hierarchical structure chart

Planning Matrixes

- Function-to-data entity
- Location-to-function
- Unit-to-function
- IS-to-data entity
- Supporting function-to-data entity
  - which data are captured, used, updated, deleted within each function
- IS-to-business objective

Example business function-to-data entity matrix (fig. 2.3)

Business Function (users) \ Data Entity Types	Customer	Product	Raw Material	Order	Work Center	Work Order	Invoice	Equipment	Employee
Business Planning	X	X						X	X
Product Development		X	X		X			X	
Materials Management		X	X	X	X	X		X	
Order Fulfillment	X	X	X	X	X	X	X	X	X
Order Shipment	X	X		X	X		X		X
Sales Summarization	X	X		X			X		X
Production Operations		X	X	X	X	X		X	X
Finance and Accounting	X	X	X	X	X		X	X	X

Alternative Approaches to Database and IS Development

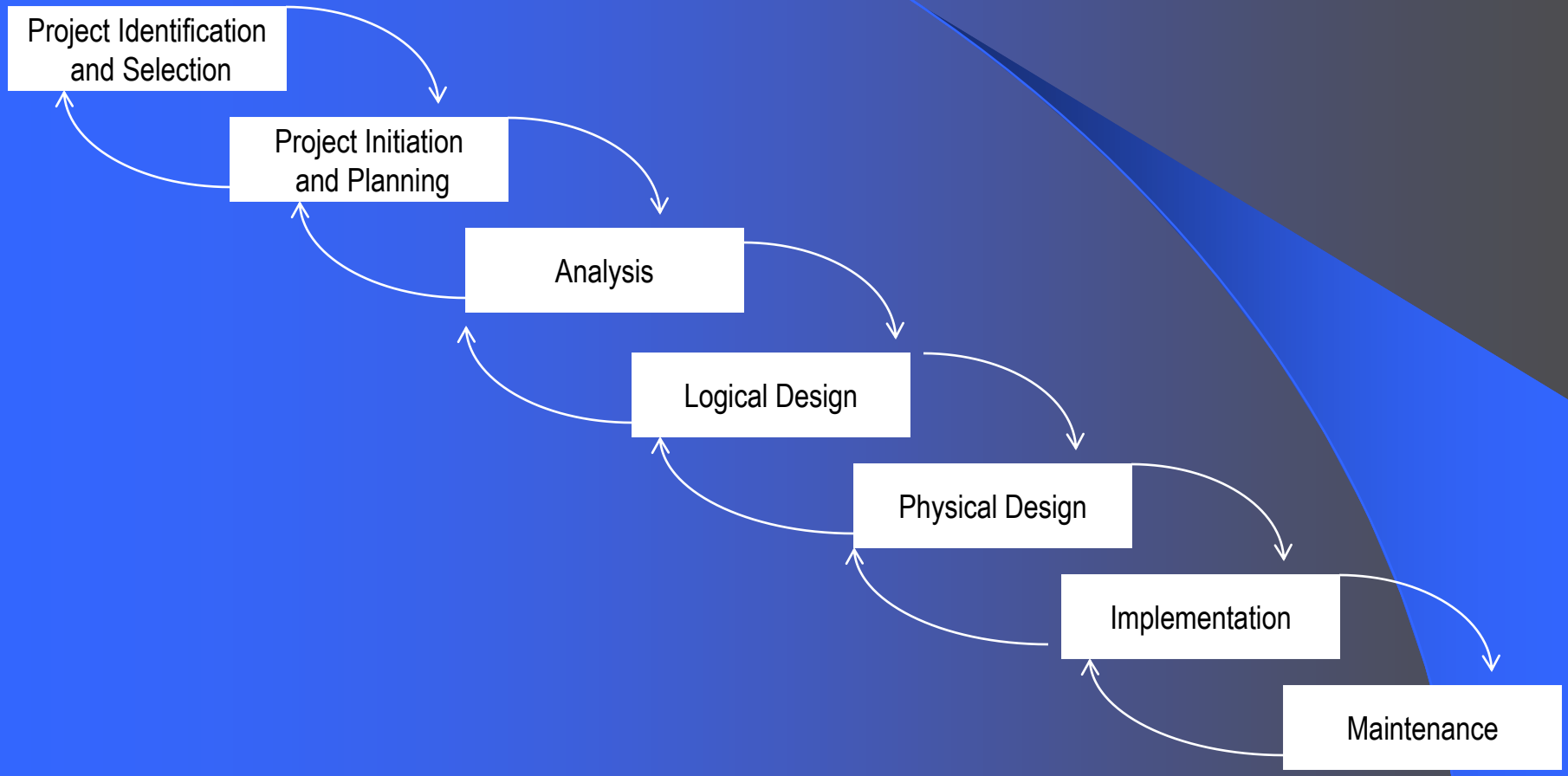
SDLC

- System Development Life cycle
- Detailed, well-planned development process
- Time-consuming, but comprehensive
- Long development cycle

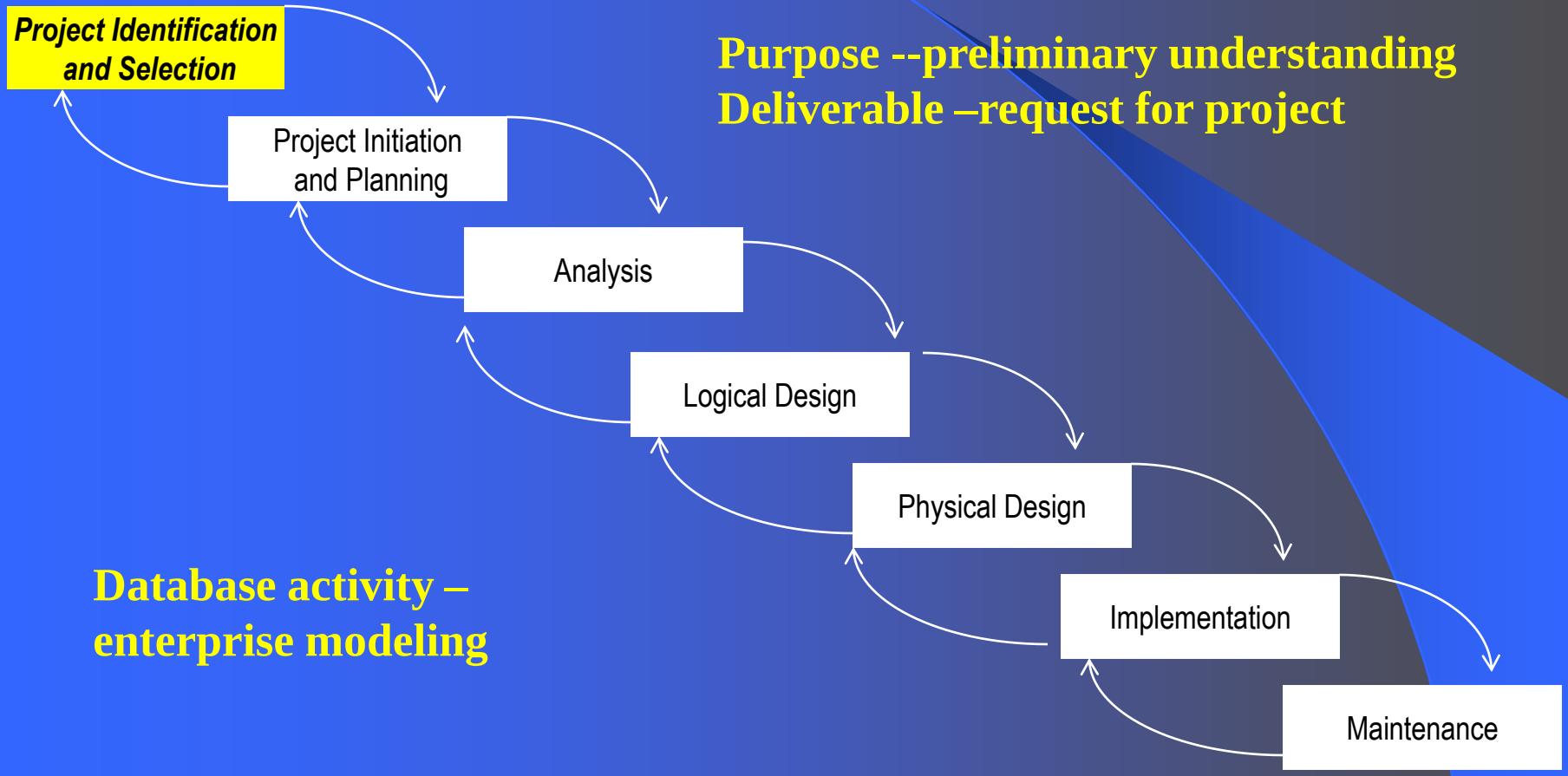
Prototyping

- Rapid application development (RAD)
- Cursory attempt at conceptual data modeling.
- Define database during development of initial prototype.
- Repeat implementation and maintenance activities with new prototype versions.

Systems Development Life Cycle (figures 2.4, 2.5)



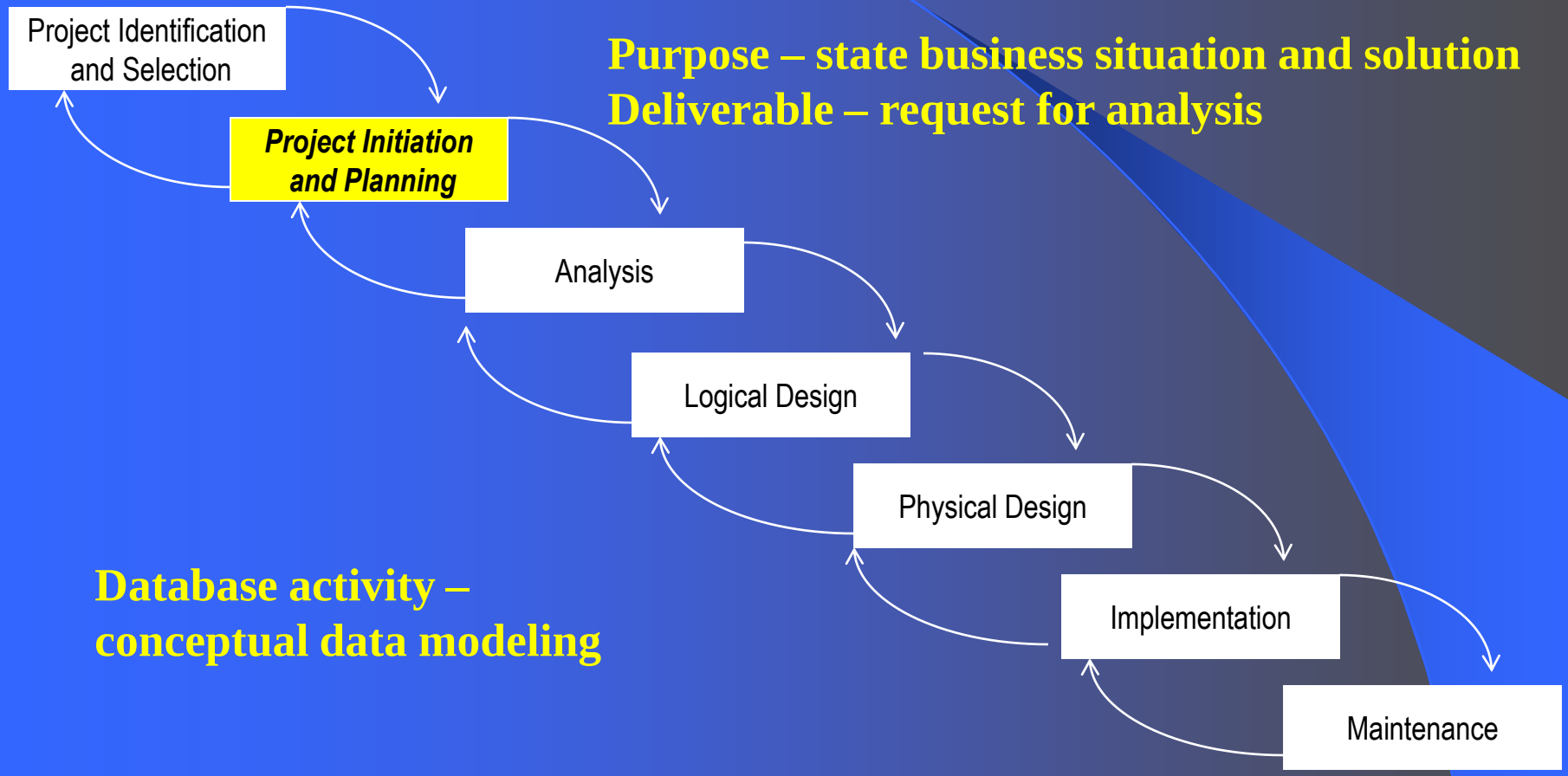
Systems Development Life Cycle (figures 2.4, 2.5)



Purpose --preliminary understanding
Deliverable –request for project

Database activity – enterprise modeling

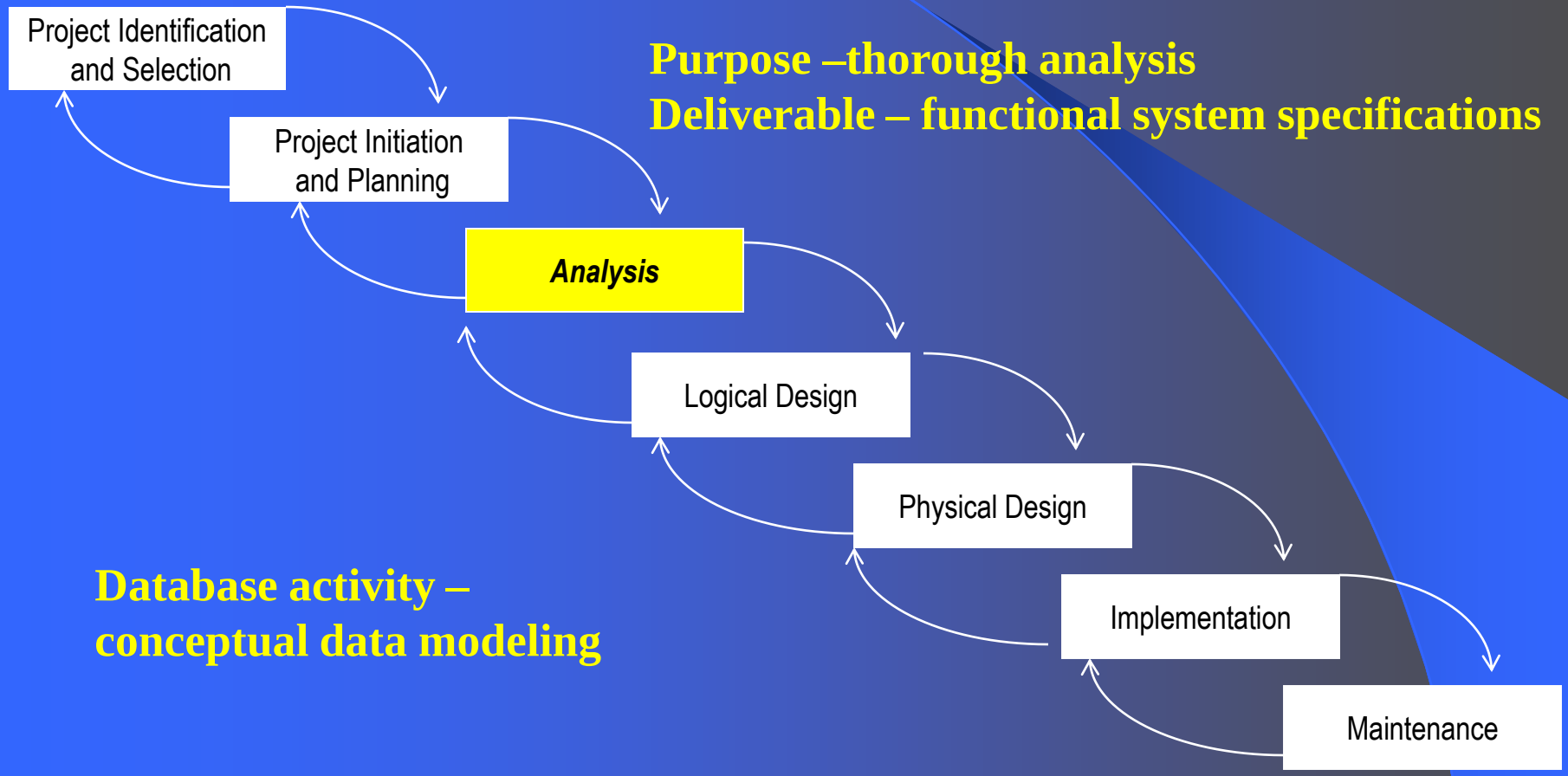
Systems Development Life Cycle (figures 2.4, 2.5)



Purpose – state business situation and solution
Deliverable – request for analysis

Database activity – conceptual data modeling

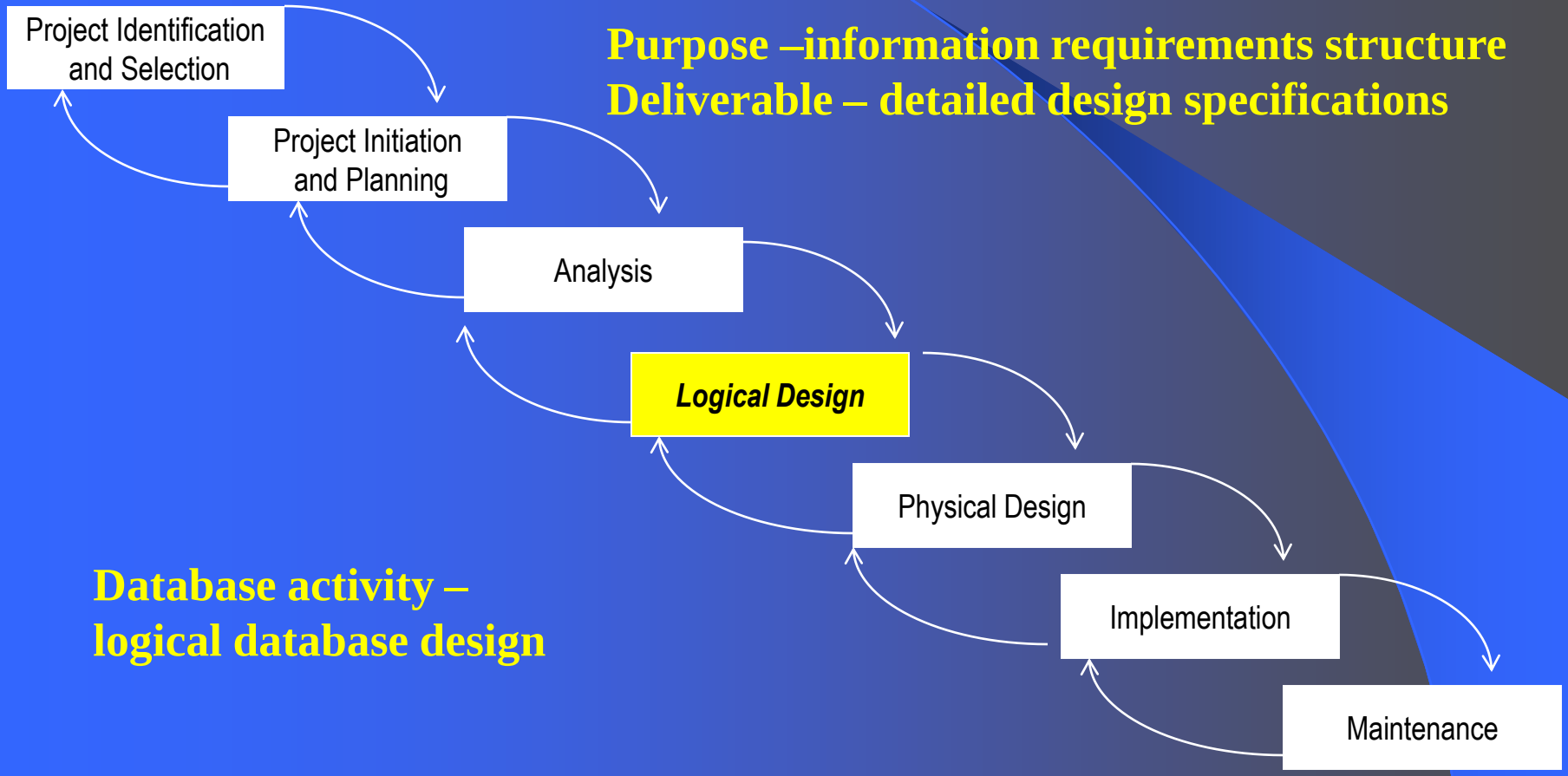
Systems Development Life Cycle (figures 2.4, 2.5)



Purpose –thorough analysis
Deliverable – functional system specifications

Database activity – conceptual data modeling

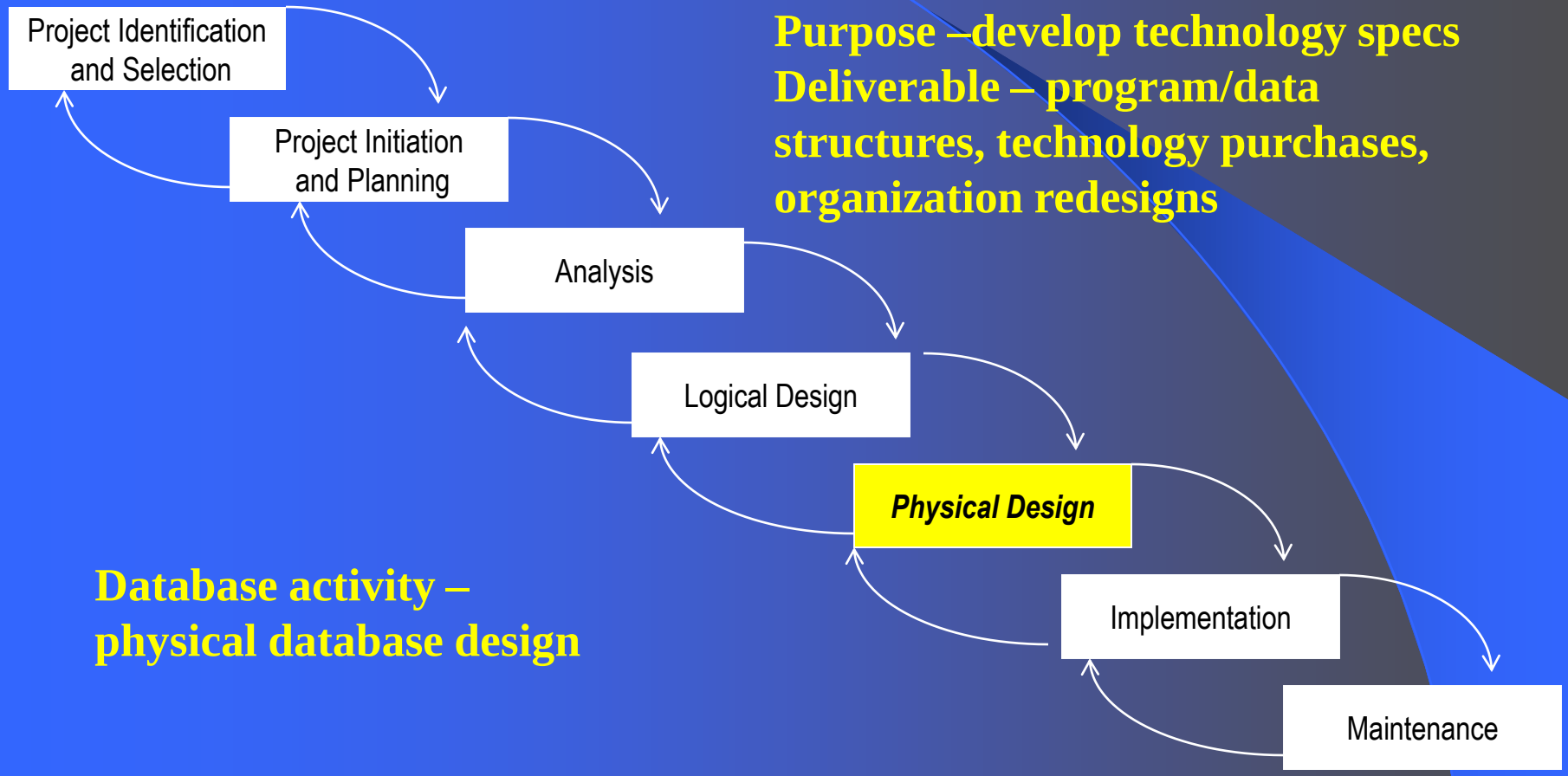
Systems Development Life Cycle (figures 2.4, 2.5)



Purpose –information requirements structure
Deliverable – detailed design specifications

Database activity – logical database design

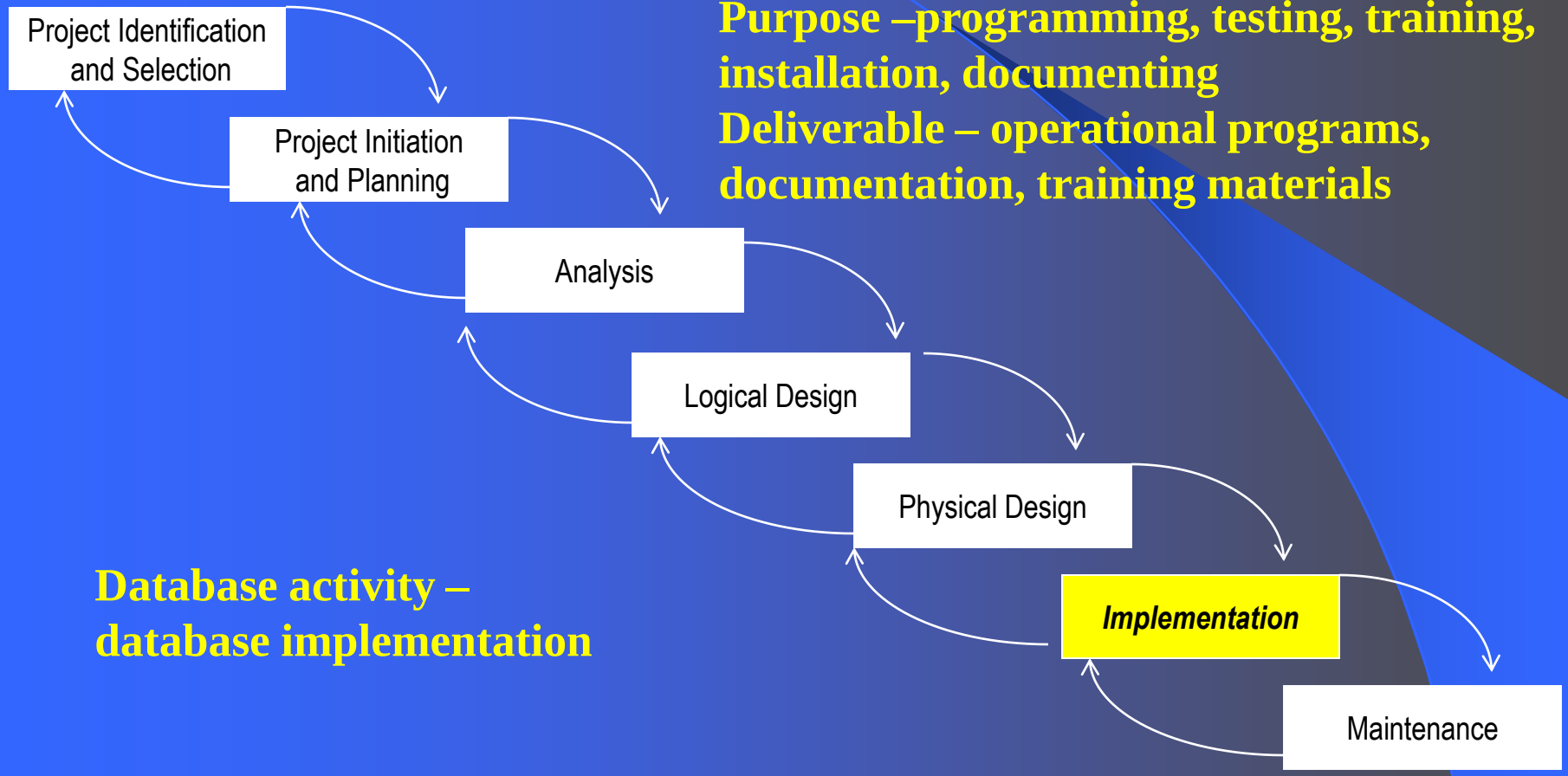
Systems Development Life Cycle (figures 2.4, 2.5)



Purpose –develop technology specs
Deliverable – program/data structures, technology purchases, organization redesigns

Database activity – physical database design

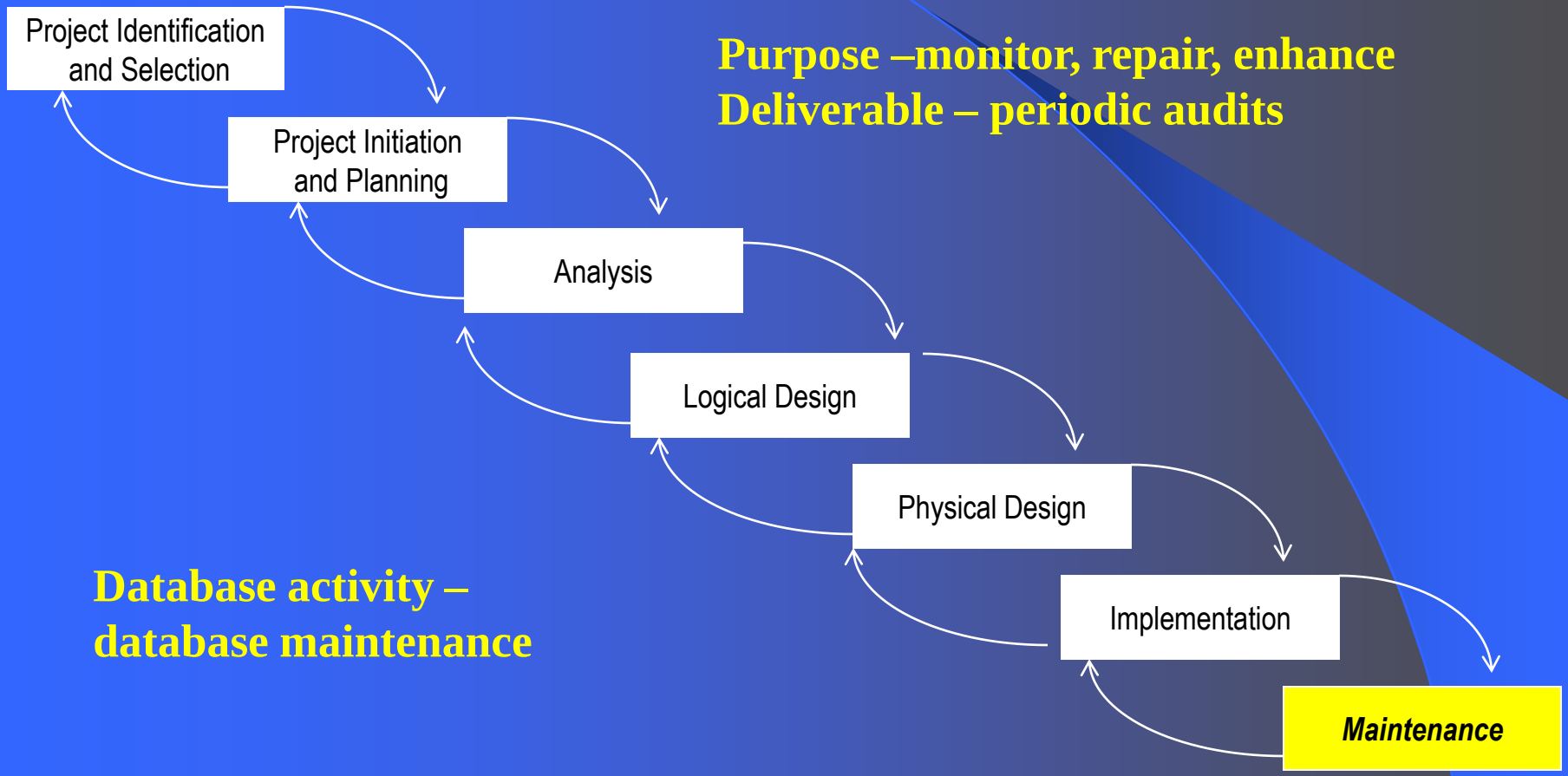
Systems Development Life Cycle (figures 2.4, 2.5)



Purpose –programming, testing, training, installation, documenting
Deliverable – operational programs, documentation, training materials

Database activity – database implementation

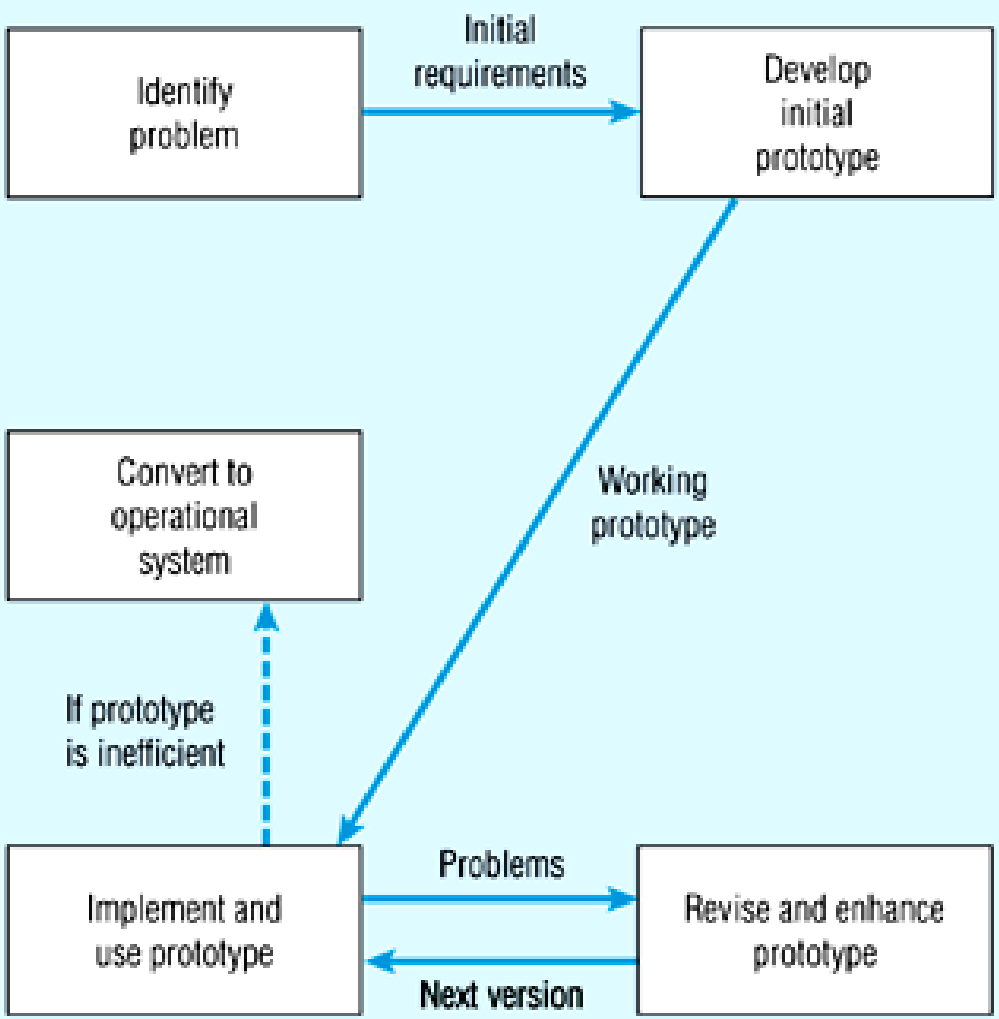
Systems Development Life Cycle (figures 2.4, 2.5)



Purpose –monitor, repair, enhance
Deliverable – periodic audits

Database activity – database maintenance

Figure 2-6 The *prototyping methodology* and database development process



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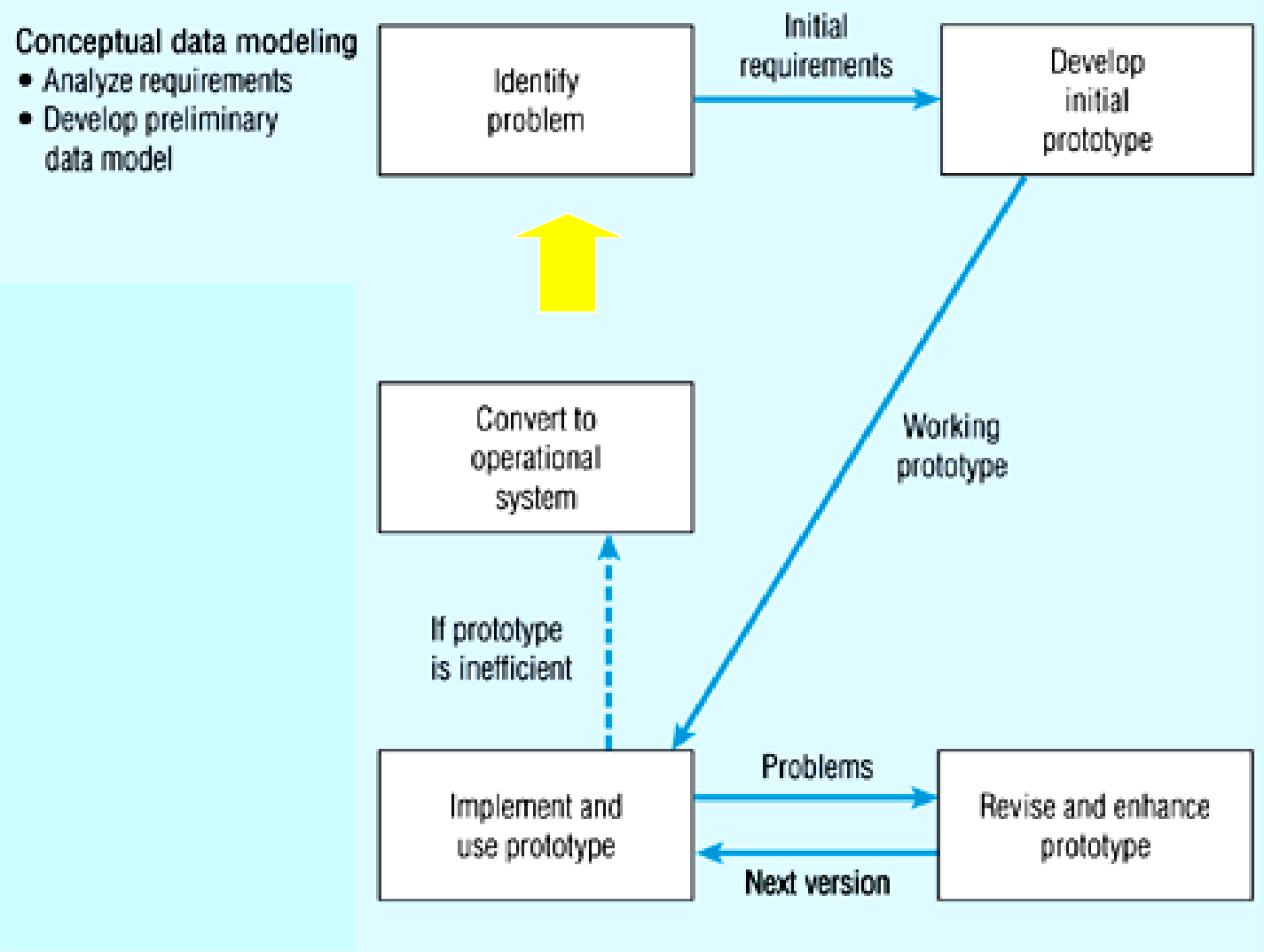

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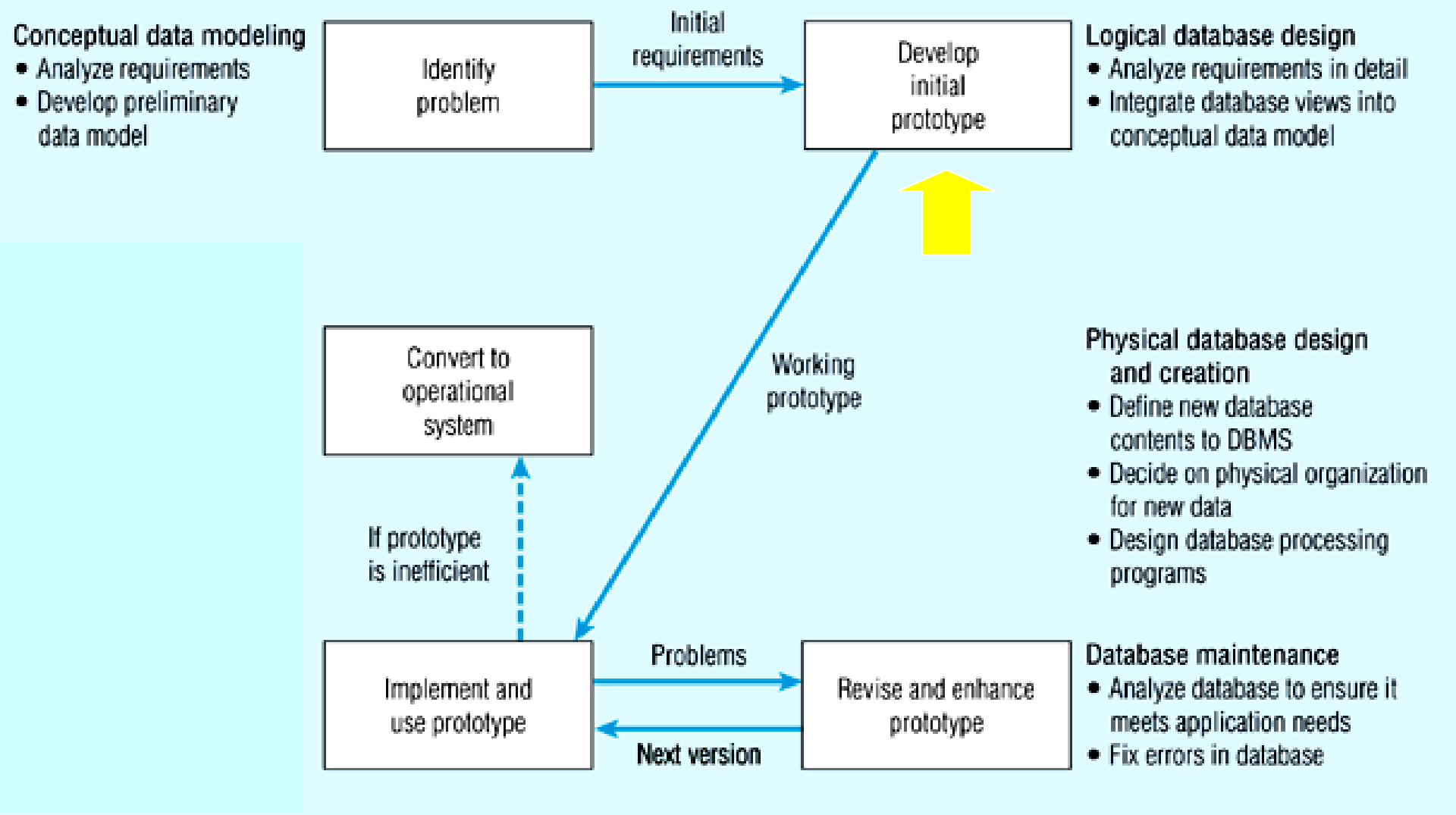

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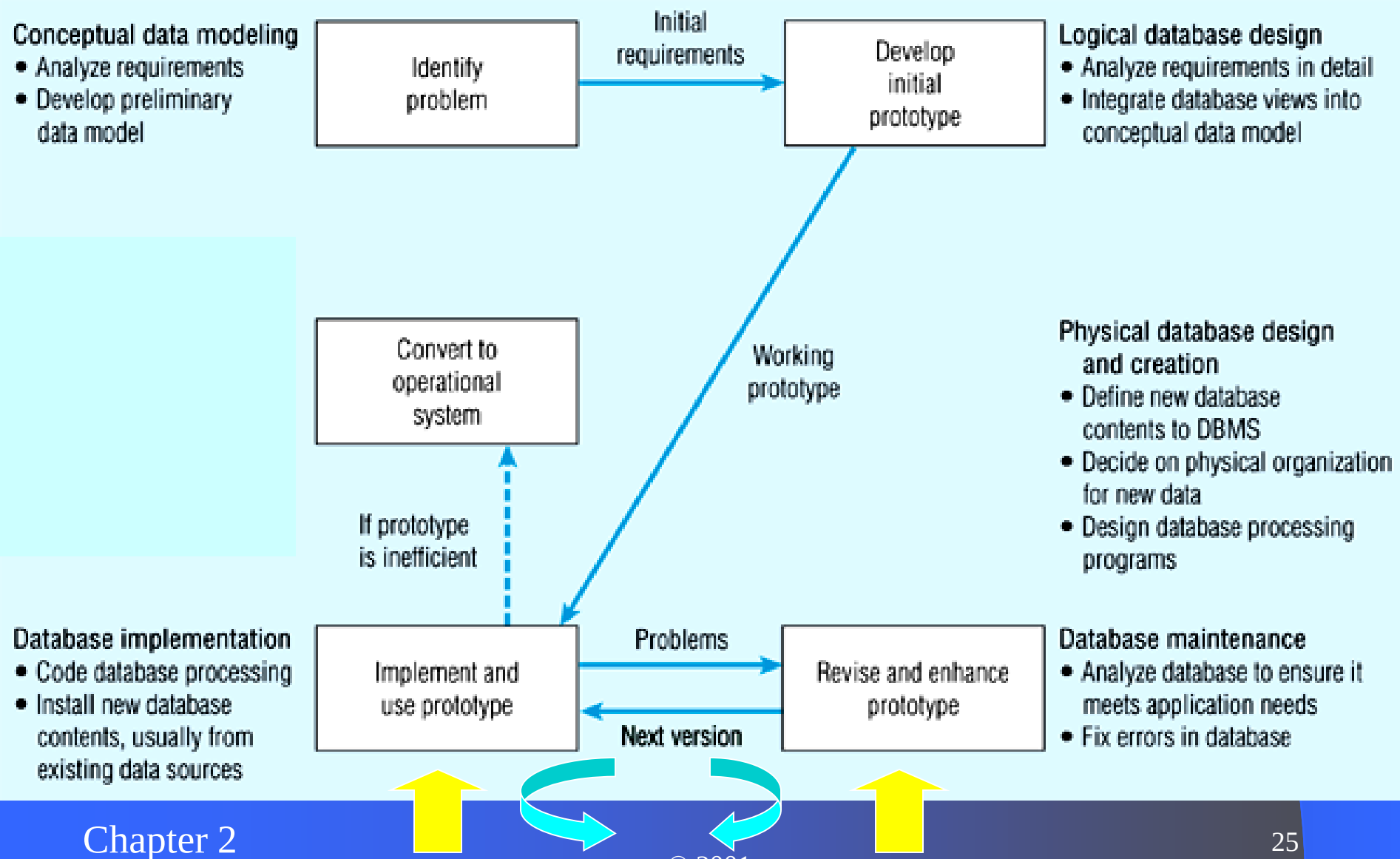

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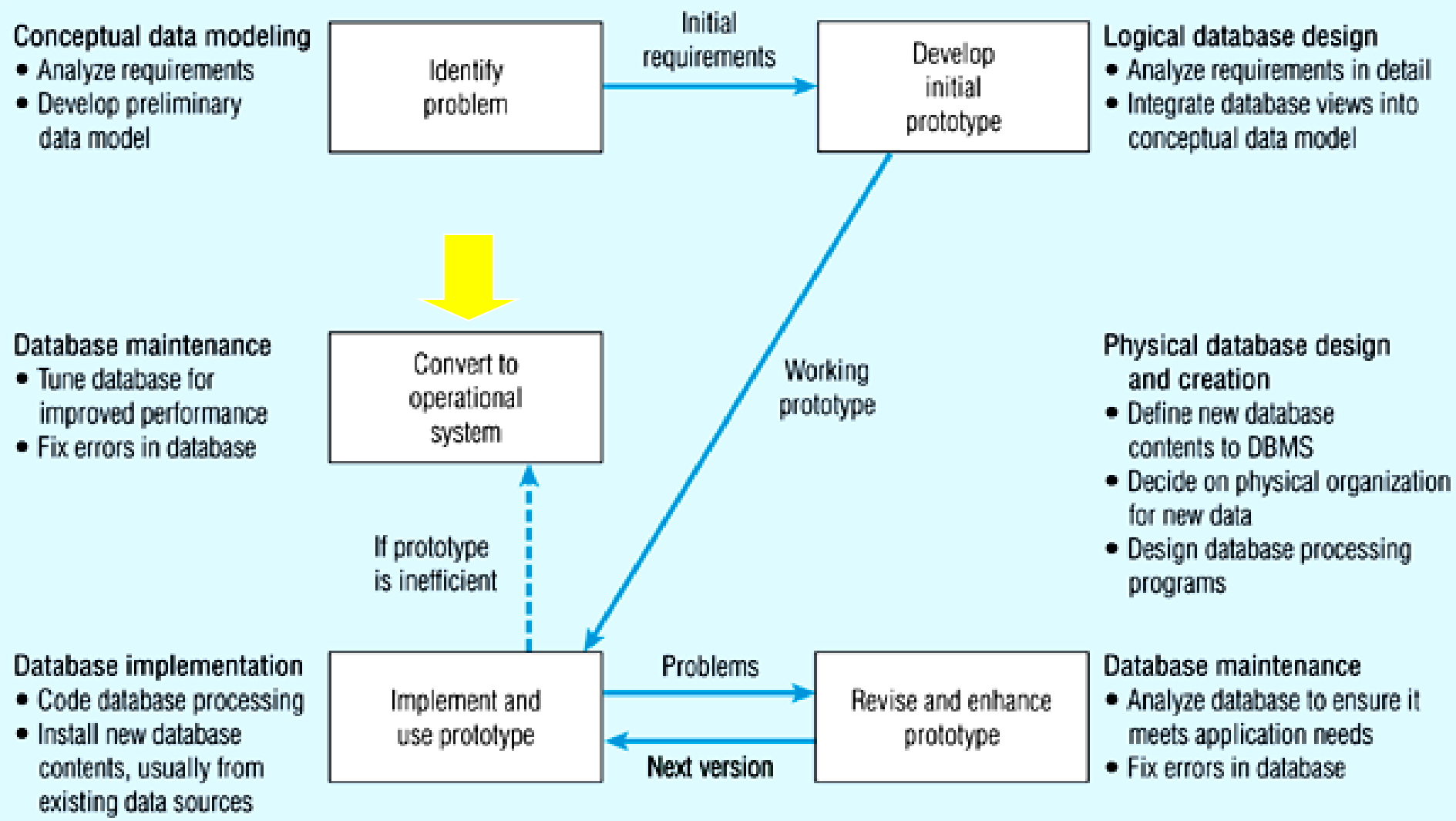


Managing Projects: People Involved

- Systems analysts
- Database analysts
- Users
- Programmers
- Database/data administrators
- Systems programmers, network administrators, testers, technical writers

Figure 2-7a Gantt Chart

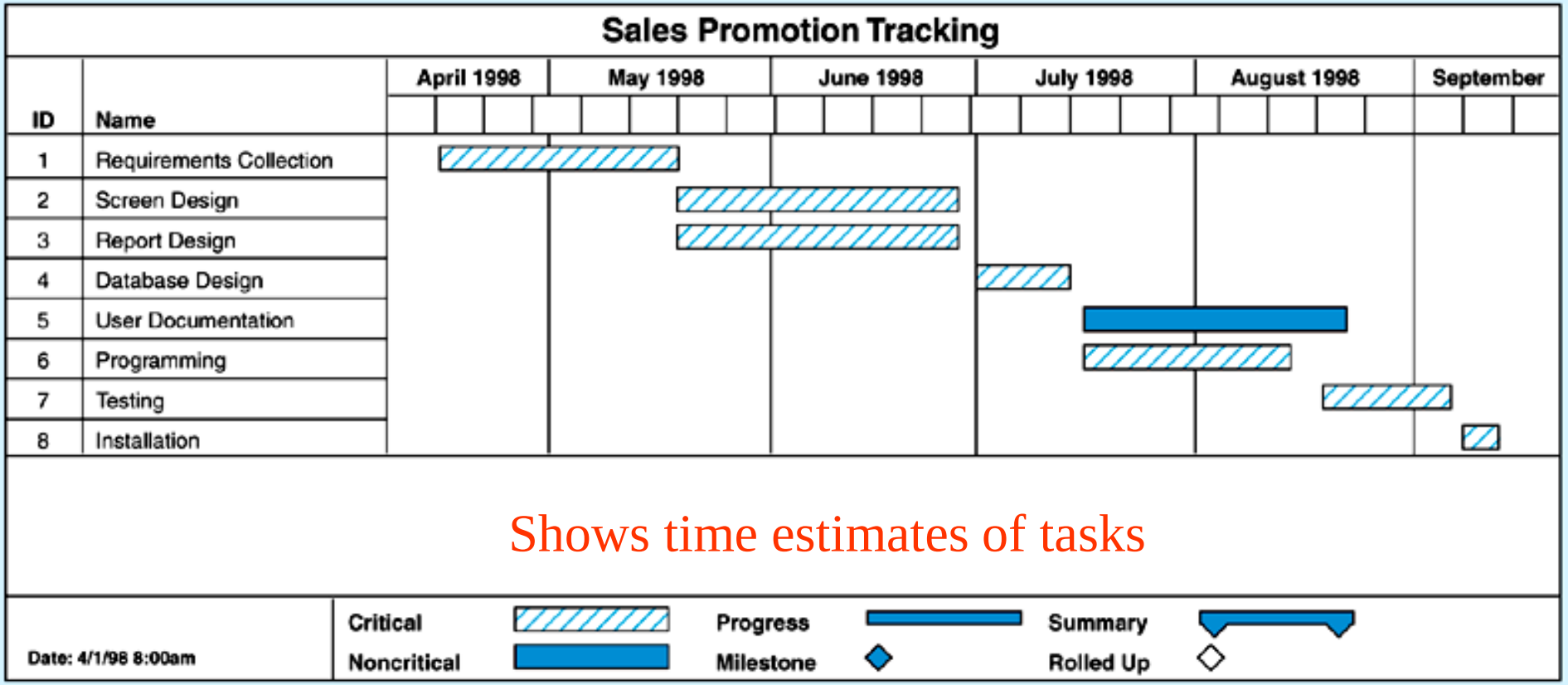
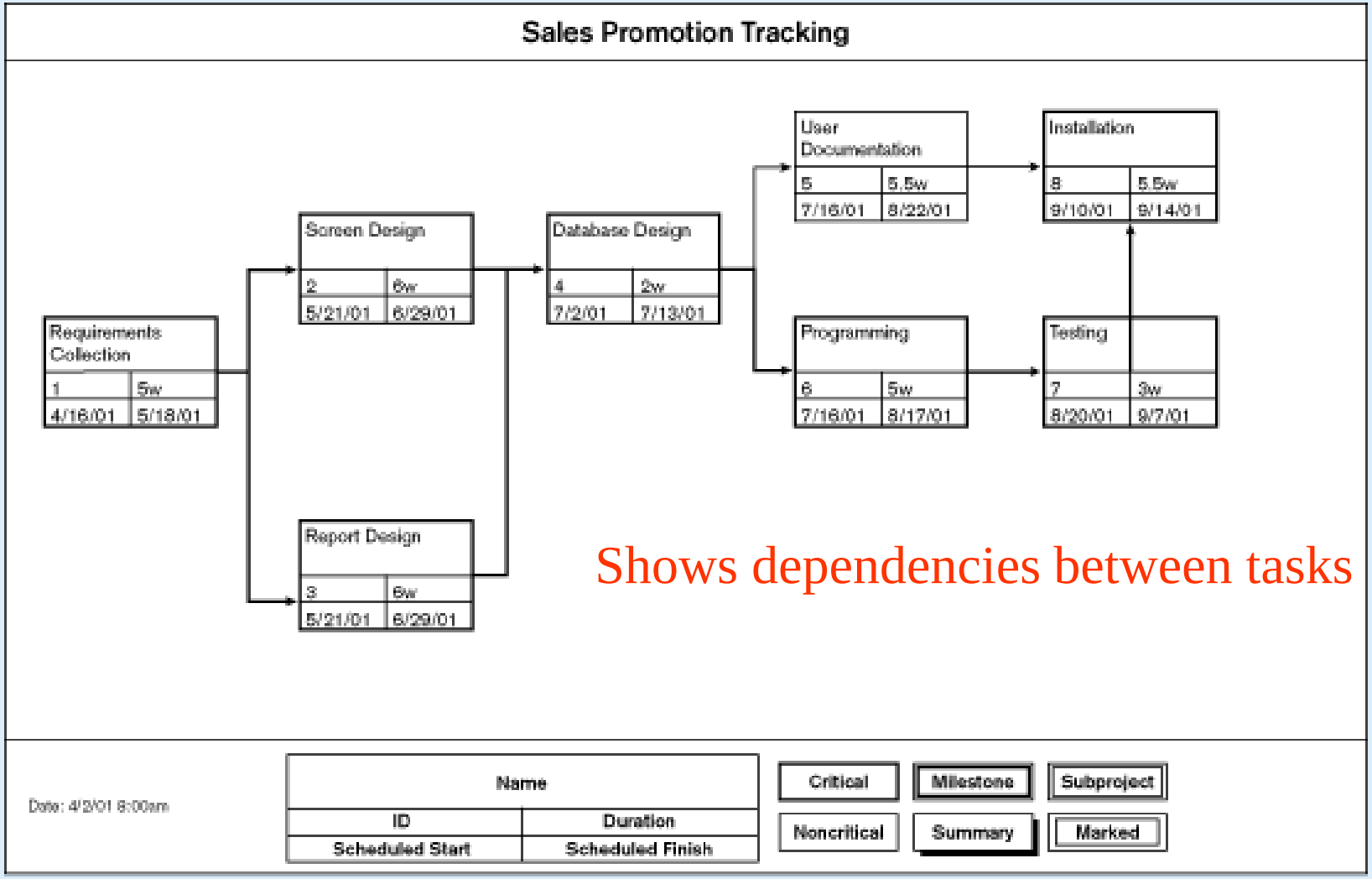


Figure 2-7b PERT chart



Database Schema

Physical Schema

- Physical structures – covered in chapters 5 and 6

Conceptual Schema

- ER models – covered in chapters 3 and 4

External Schema

- User Views
- Subsets of Conceptual Schema
- Can be determined from business-function/data entity matrices
- DBA determines schema for different users
- **This is part of people-management in databases**

Figure 2-8 Three-schema database architecture

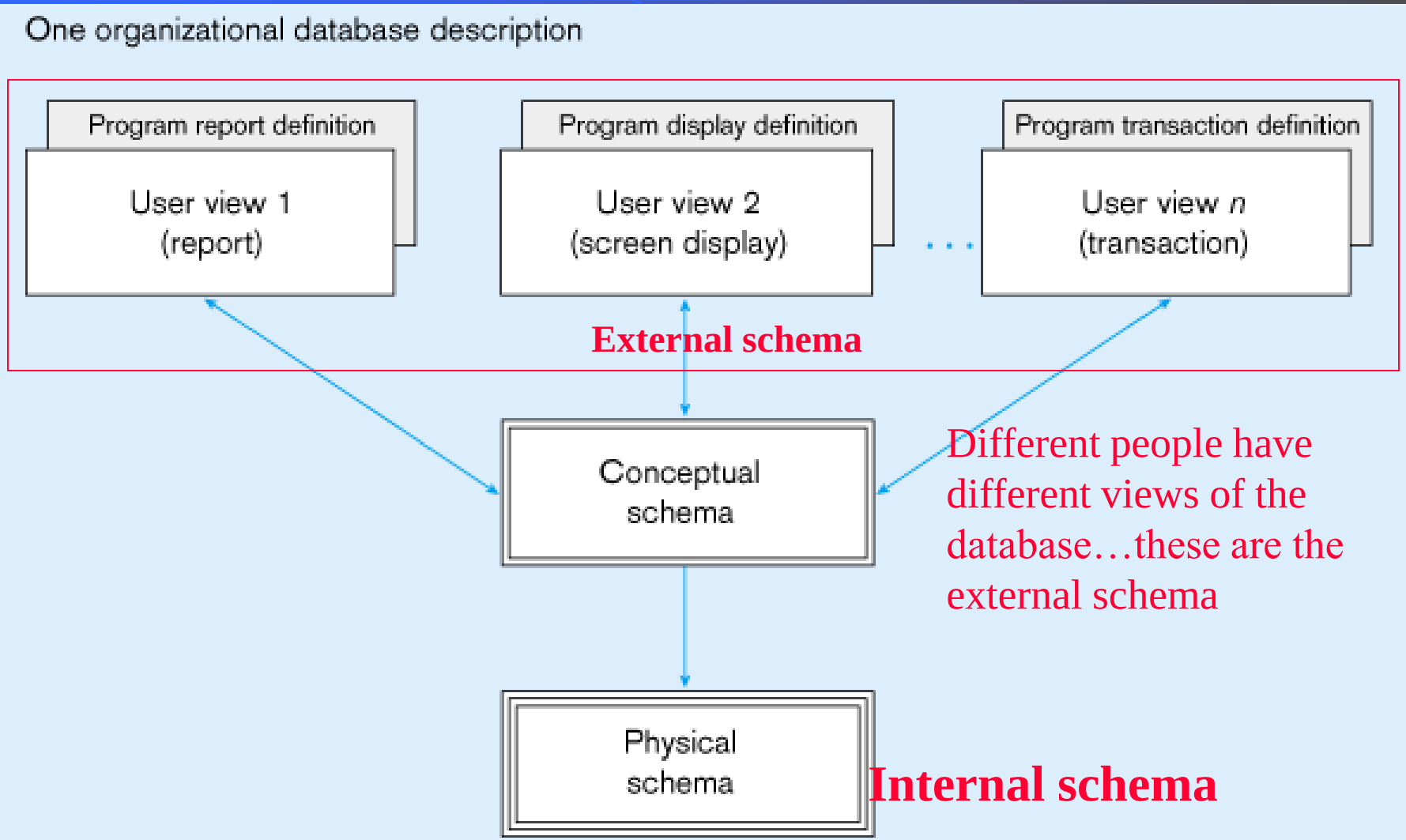
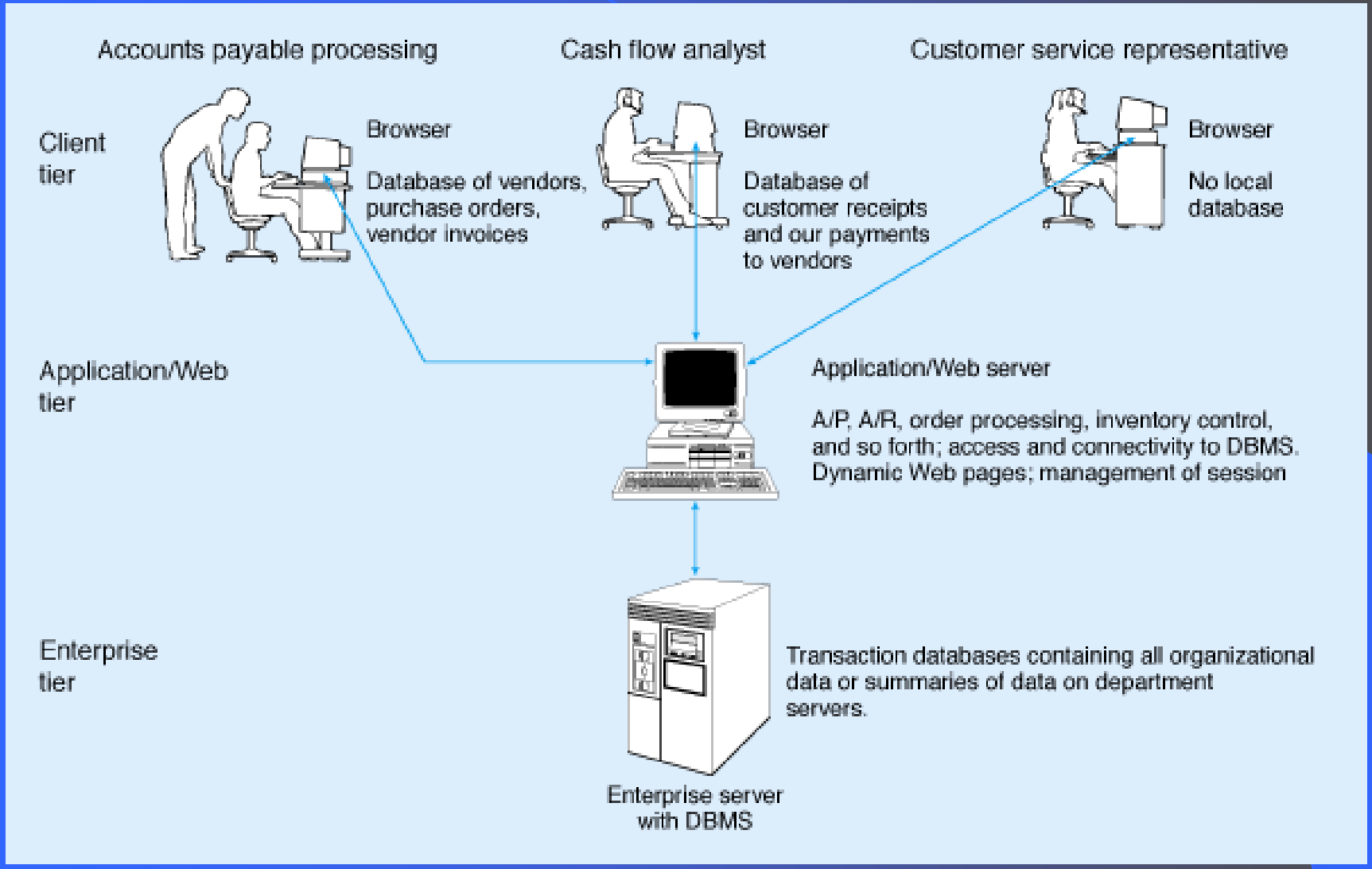
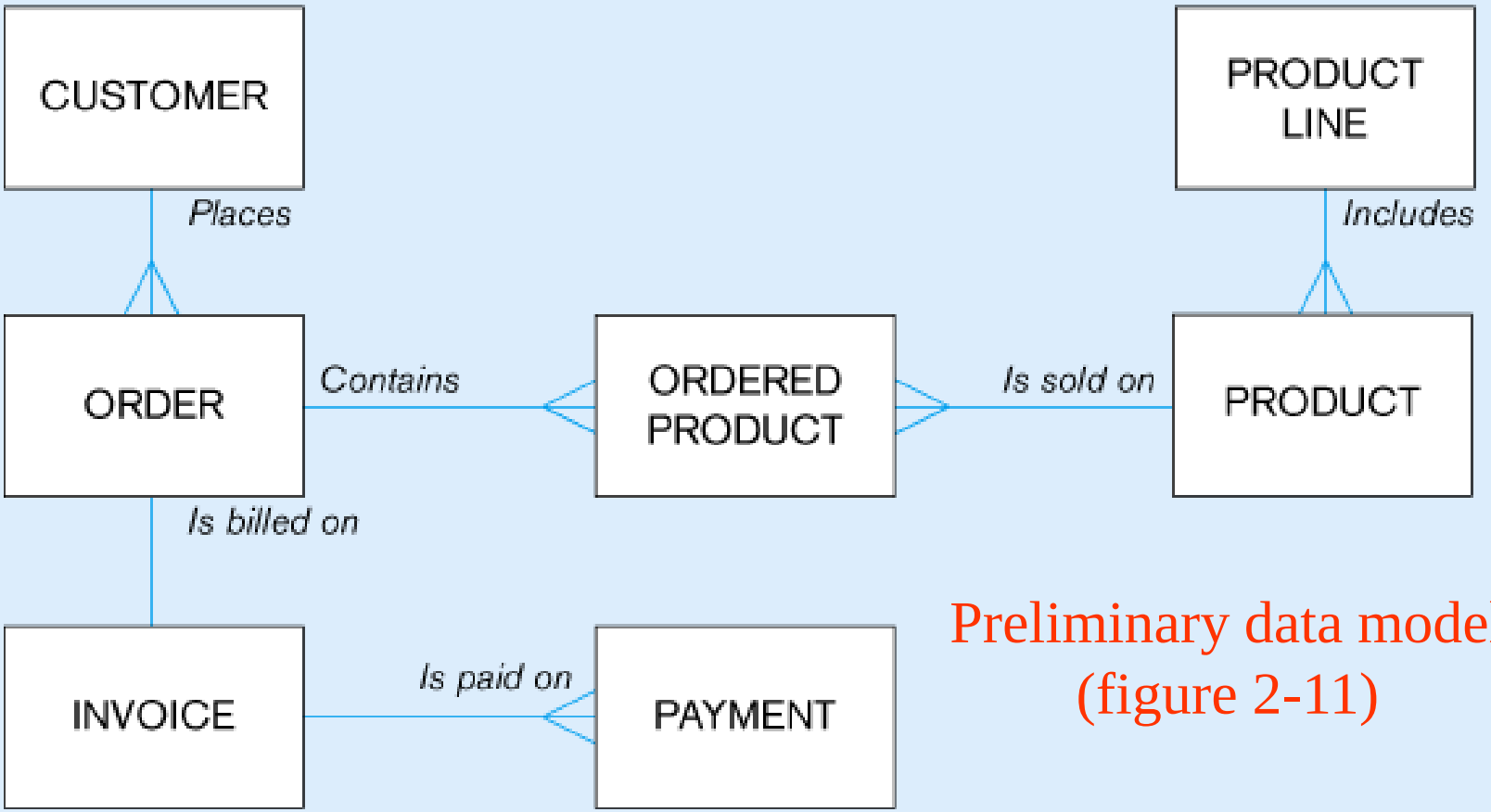


Figure 2-10 Three-tiered client/server database architecture

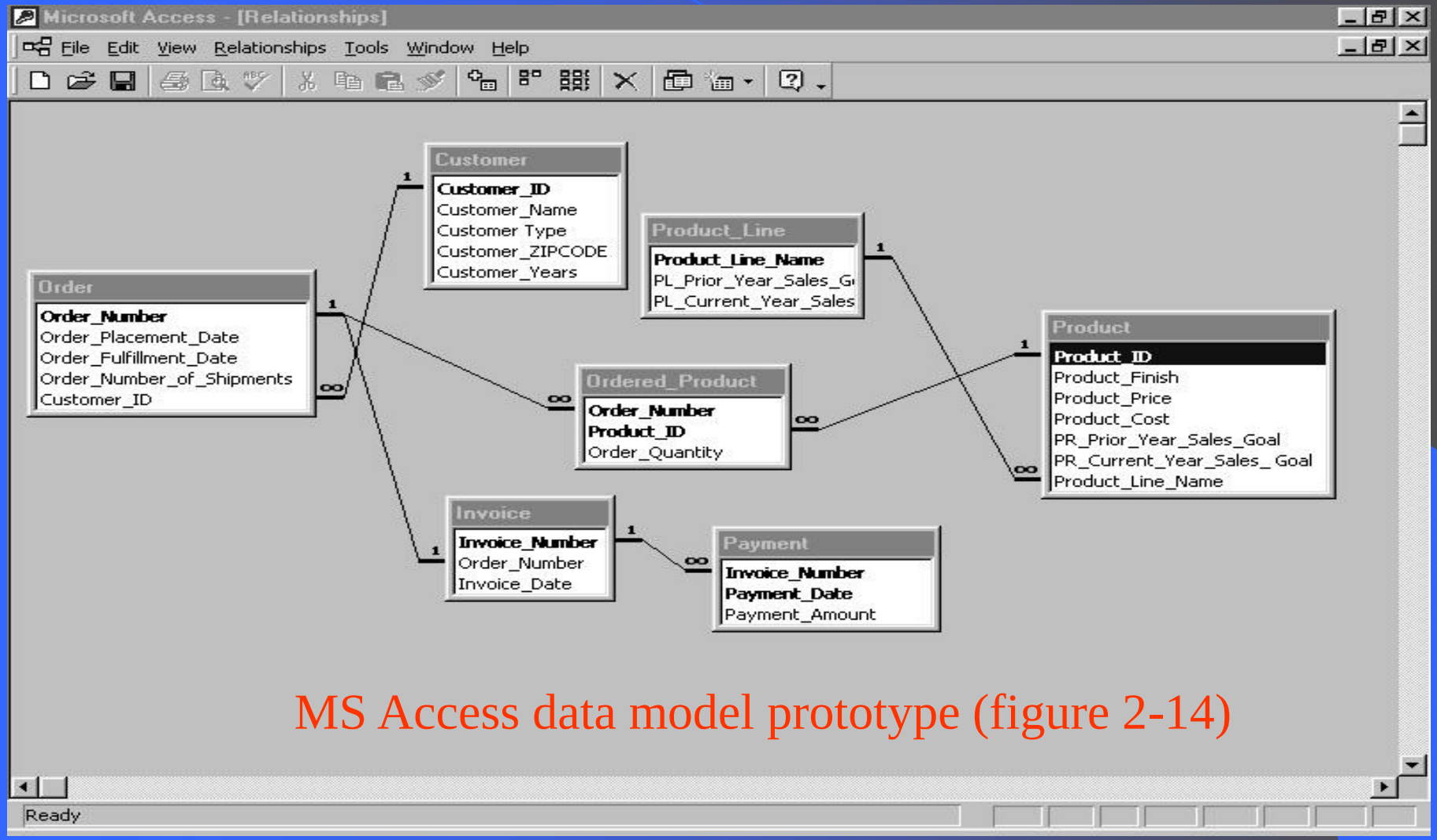


Pine Valley Furniture



Preliminary data model (figure 2-11)

Pine Valley Furniture



MS Access data model prototype (figure 2-14)