CS660 – DATABASE SYSTEMS

UNIT 5 - VARIATIONS IN DATABASE SYSTEMS

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Agenda

- Data Requirements
- Centralized vs. Distributed DBMS
- Enterprise Information Systems
- Overview of Database System Lifecycle
- Database Design Methodology
- Fact-Finding Techniques
- Prototyping
- Data Conversion and Loading
- Individual Project

DATA REQUIREMENTS

Introduction to Data Requirements

Understanding Data Requirements

- ◦ **Definition**.

- ◦ **Purpose**.
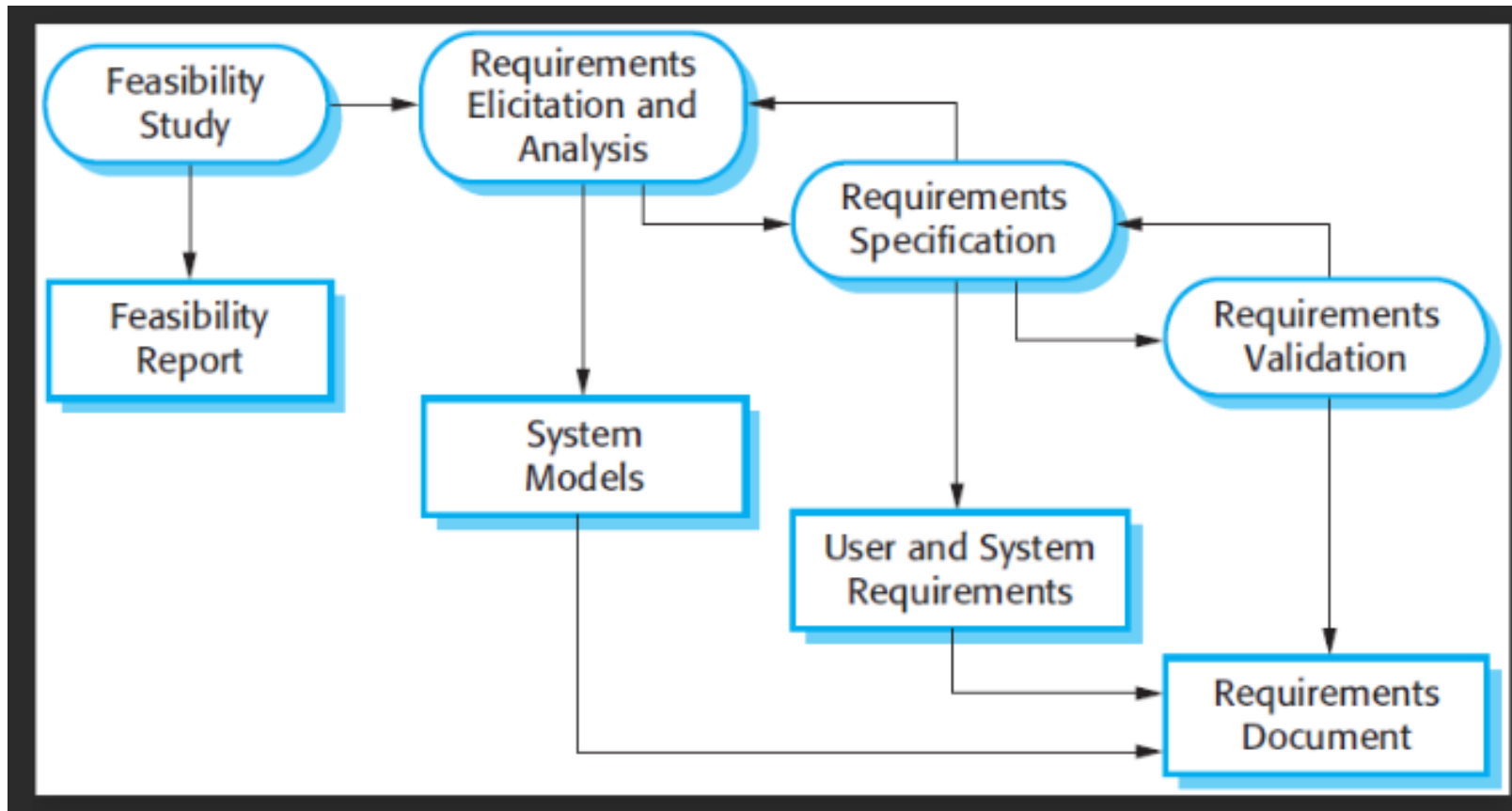
- ◦ **Key Aspects**

Types of Data Requirements

Types of Data Requirements

- Functional Requirements

- Non-Functional Requirements:

- Technical Requirements

Gathering Data Requirements

Gathering Data Requirements

◦ **Stakeholder Interviews**

◦ **Document Analysis**

◦ **Use Cases and Scenarios**

◦ **Workshops and Brainstorming**

◦ **Surveys and Questionnaires**

Requirements Gathering

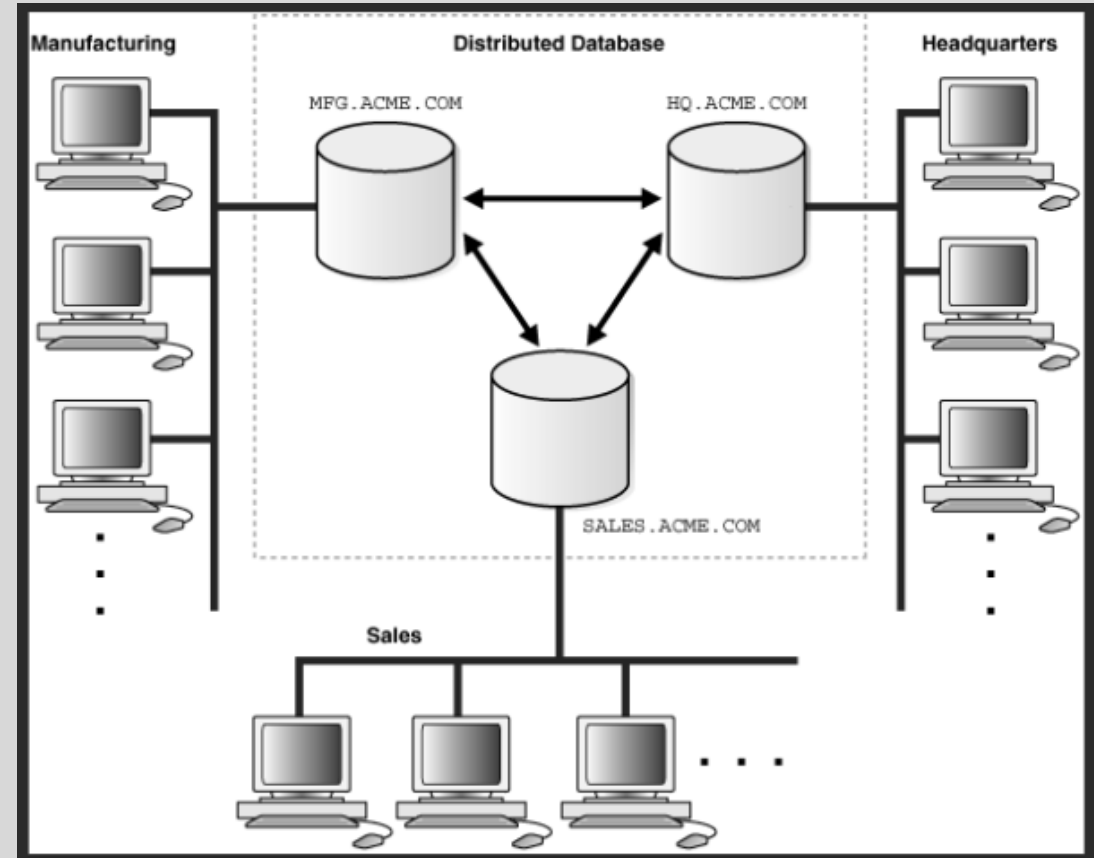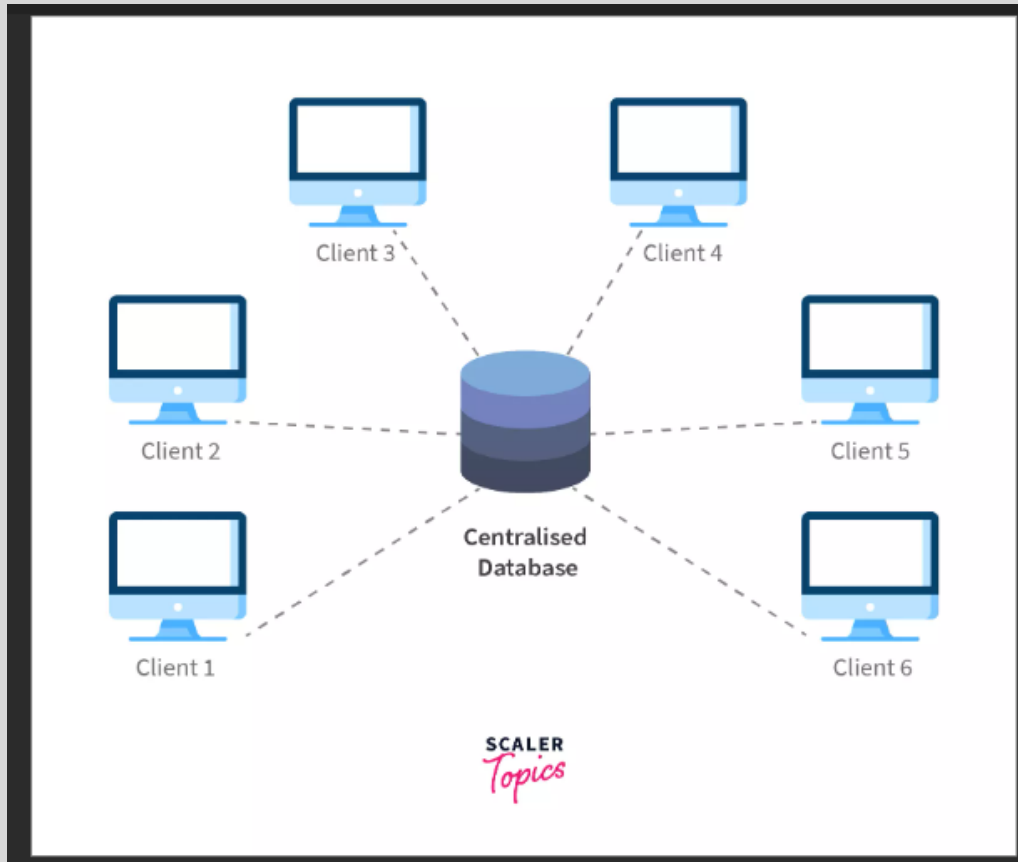This diagram shows the requirements-gathering process visually.

CENTRALIZED VS. DISTRIBUTED DBMS

Introduction to DBMS Architectures

Centralized vs. Distributed DBMS

- **Centralized DBMS**
- **Distributed DBMS**
- **Visual**

Centralized vs. Distributed DB

Centralized DBMS

Centralized DBMS

- ◦ **Characteristics**
- ◦ **Advantages**
- ◦ **Disadvantages**
- ◦ **Visual**

Distributed DBMS

Distributed DBMS

- Characteristics
- Advantages
- Disadvantages
- Visual

INTRODUCTION TO ENTERPRISE INFORMATION SYSTEMS

Introduction to Enterprise Information Systems

Enterprise Information Systems (EIS)

- Definition
- Purpose
- Components

Types of Enterprise Information Systems

Types of Enterprise Information Systems

- ◦ **ERP (Enterprise Resource Planning**

- ◦ **CRM (Customer Relationship Management)**

- ◦ **SCM (Supply Chain Management)**

Benefits and Challenges of EIS

Benefits and Challenges of EIS

- **Benefits**:
  - Improved Efficiency.
  - Enhanced Decision-Making.
  - Better Customer Service.
  - Scalability.
- **Challenges**:
  - High Implementation Costs.
  - Complexity.
  - Integration Issues.
  - Data Security.

EIS Benefits and Challenges

Benefits	Challenges
Improved Decision Making: Provides comprehensive data analysis and reporting for better decision-making.	**High Implementation Cost:** Significant initial investment required for software, hardware, and training.
Enhanced Collaboration: Facilitates communication and information sharing across departments.	**Complex Integration:** Challenges in integrating with existing systems and processes.
Increased Efficiency: Automates business processes, reducing manual work and improving productivity.	**User Resistance:** Employees may resist changes due to new system adoption and processes.
Data Consistency: Centralized data storage ensures data accuracy and consistency.	**Security Risks:** Potential vulnerabilities in centralized systems require robust security measures.

This table presents a clear contrast between the benefits and challenges of Enterprise Information Systems

OVERVIEW OF DATABASE SYSTEM LIFECYCLE

Introduction to Database System Lifecycle

Database System Lifecycle

- ◦ **Definition**

- ◦ **Purpose**

- ◦ **Stages Overview**

Key Stages of Database System Lifecycle

Key Stages of Database System Lifecycle

1. **Requirements Analysis**
2. **Design**
3. **Implementation**

Continuation and Maintenance of Database System Lifecycle

4. **Testing**.
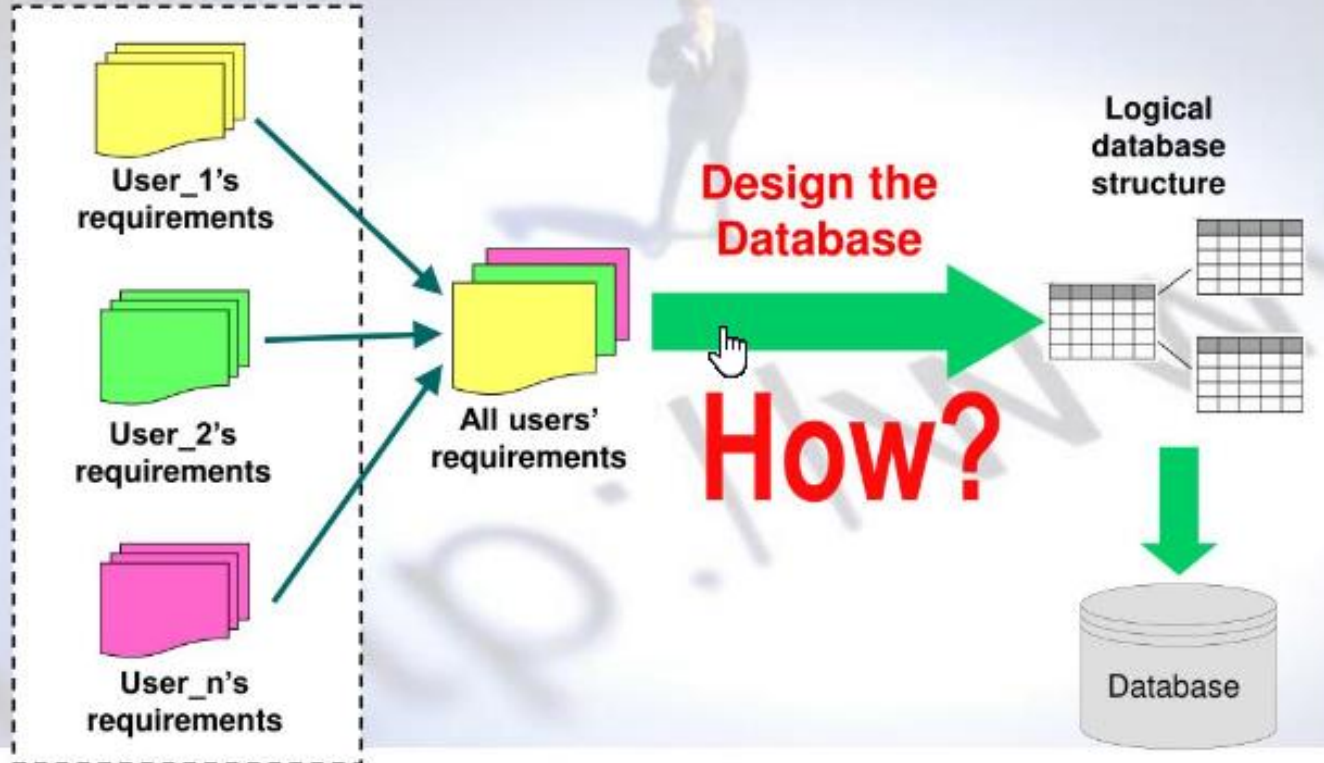
5. **Deployment.**

6. **Maintenance**.

DATABASE DESIGN METHODOLOGY

Introduction to Database Design Methodology

Database Design Methodology

- **Definition.**
- **Importance**

Database Design

Diagram illustrating the stages of the database design process.

Stages of Database Design Methodology

Stages of Database Design

1. **Requirements Analysis**
2. **Conceptual Design**
3. **Logical Design**

Stages of Database Design Methodology

Stages of Database Design (continued)

4. **Physical Design**

5. **Implementation.**

6. **Testing and Evaluation.**

7. **Maintenance and Evolution.**

FACT FINDING TECHNIQUES

Introduction to Fact-Finding Techniques

◦ Fact-finding techniques are crucial in the database design process to gather essential information about an organization's requirements, processes, and data.

◦ These techniques help designers understand the organization's operations, identify user needs, and define the scope of the database project.

Common Fact-Finding Techniques

1. **Interview**

2. **Questionnaires/Surveys**

3. **Observation.**

4. **Document Review**

5. **Prototyping**

Best Practices for Fact-Finding

- **Engage Stakeholders**
- **Combine Techniques**
- **Ask Open-Ended Questions**
- **Validate Information**
- **Iterate and Refine**

Fact-Finding

Benefits of Fact-Finding	Challenges of Fact-Finding
1. **Requirement Clarity**: Fact-finding helps clarify project requirements by gathering accurate and detailed information directly from stakeholders.	1. **Time-Consuming**: Fact-finding processes can be time-consuming, especially when dealing with large organizations or complex systems.
2. **Stakeholder Engagement**: Involving stakeholders in fact-finding fosters engagement and ownership of the project, leading to better buy-in and support.	2. **Resource Intensive**: Conducting fact-finding activities may require significant resources, including personnel, time, and budget.
3. **Risk Reduction**: Identifies potential risks and challenges early in the project lifecycle, allowing for proactive mitigation strategies to be implemented.	3. **Bias and Subjectivity**: There is a risk of bias or subjectivity in the information gathered, particularly if stakeholders have conflicting interests or agendas.
4. **Improved Decision Making**: Fact-based insights enable informed decision-making throughout the project, leading to better outcomes and alignment with organizational goals.	4. **Resistance to Change**: Some stakeholders may resist providing information or participating in fact-finding activities due to fear of change or uncertainty about the project's implications.
5. **Tailored Solutions**: Helps tailor solutions to meet the specific needs and preferences of stakeholders, leading to higher user satisfaction and acceptance.	5. **Limited Access to Information**: Accessing certain data or information may be restricted due to privacy concerns or organizational policies, hindering the fact-finding process.
6. **Enhanced Communication**: Facilitates communication and collaboration among project stakeholders, fostering a shared understanding of project objectives and requirements.	6. **Overwhelm with Data**: The abundance of information collected during fact-finding can sometimes overwhelm project teams, making it challenging to extract relevant insights.

This table provides an overview of the benefits and challenges associated with fact-finding techniques in the context of project planning and execution.

PROTOTYPING

Introduction to Prototyping in Database Design

Prototyping in Database Design

◦ **Definition**

◦ **Purpose**

Stages of Prototyping in Database Design

Stages of Prototyping

1. **Initial Requirements Gathering**

2. **Prototype Development**

3. **User Feedback**

Benefits and Challenges of Prototyping

Benefits and Challenges of Prototyping

- **Benefits**:
  - Early Validation.
  - User Involvement.
  - Flexibility.
- **Challenges**:
  - Time-Consuming.
  - Scope Creep.
  - Resource Intensive.

Benefits and Challenges of Prototyping

Benefits	Challenges
Early Validation: Identify design flaws and gaps early.	**Time-Consuming:** Iterative cycles can be lengthy.
User Involvement: Engage users in the design process, ensuring the final product meets their needs.	**Scope Creep:** Frequent changes and additions may expand the project scope.
Flexibility: Allows for iterative improvements based on feedback.	**Resource Intensive:** Requires dedicated resources for development and testing.

This table clearly outlines the benefits and challenges of prototyping in database design.

DATA CONVERSION AND LOADING

Introduction to Data Conversion and Loading

Data Conversion and Loading

- **Definition**
- **Importance**

Steps in Data Conversion

Steps in Data Conversion

1. **Data Assessment**.

2. **Data Mapping**.

3. **Data Transformation**.

4. **Data Validation**.

Data Loading Techniques and Best Practices

Data Loading Techniques and Best Practices

- **Data Loading Techniques**:
  - Bulk Loading.
  - Incremental Loading.
  - Real-time Loading.
- **Best Practices**:
  - Data Backup.
  - Error Handling.
  - Performance Optimization.
  - Documentation.

Data Loading Methods

Loading Method	Description	Examples	Benefits
Bulk Loading	Efficiently loads large volumes of data in batch mode. Suitable for initial data loads and large data migrations.	- Initial data population of a data warehouse. - Loading historical data during system setup.	- Fast loading of large datasets. - Reduced overhead compared to loading data row-by-row.
Incremental Loading	Loads only new or changed data since the last load. Ideal for regular updates where only a subset of data changes.	- Daily updates to a data warehouse with only the new sales transactions. - Syncing updated customer information nightly.	- Minimizes the amount of data processed each time. - Reduces load times and system resource usage.
Real-time Loading	Continuously loads data as it is generated, ensuring that the target system is always up-to-date.	- Streaming data from IoT devices into a real-time analytics platform. - Updating stock levels in an e-commerce system in real-time.	- Provides up-to-date information for decision-making. - Supports real-time analytics and immediate data availability.

This table provides a concise comparison of the three data loading methods, highlighting their descriptions, examples, and benefits.

INDIVIDUAL PROJECT

Individual Project

Part 1 - Future Database System Implementation Plan (4–5 pages)

- What fundamental differences exist between object-oriented and object-relational database systems and Web-based database systems?
  - Would these differences impact your retail store?
- Include details of what changes would need to be introduced to the database if it was used to build a data mart or a data warehouse.
- Include details of what considerations would need to be made if the database were to become a distributed database.
- What specific types of business intelligence could be gathered from the database?
  - How would this information assist in the decision-making process for your retail store?
- How would your retail store benefit from data warehousing in the following areas?
  - Return on investment on business intelligence initiatives (Provide a 3-year estimate.)
  - Competitive advantage (based on local or target area)
  - Increased productivity of decision-makers (related to business process decision-making)

Individual Project

◦ How would you address the following data warehousing problems if they occurred in your retail store?
  ◦ Required data were never captured.
  ◦ There is a high demand for disk space and other resources.
  ◦ There are hidden problems with source systems.

◦ Provide your analysis as to how this part of the project fulfills the mission and 1 or more goals of the case study organization.

◦ All sources should be cited both in-text and in References using APA format.

****NOTE: You can <u>skip</u> part 2 of this project.**

Please submit your assignment.

For assistance with your assignment, please use your textbook, all course resources, and any external research and resources you have gathered.

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