Experiment – 17: Define the design activities along with necessary artifacts using Design Document.

A. Classification of Design Activities:

We can broadly classify into two important stages.

- Preliminary (or high-level) design, and
- Detailed design.

Preliminary (or high-level) design:

- A problem is decomposed into a set of modules. The control relationships among the modules are identified, and also the interfaces among various modules are identified.
- The outcome of high-level design is called the **program structure** or the **software architecture**

Detailed design:

- Once the high-level design is complete, detailed design is undertaken.

During detailed design each module is examined carefully to design its **data structures** and the algorithms

A good design follows:

(a). Modularity design principle (b). Layered design principle

(a). Modularity:

1) A modular design is an effective decomposition of a problem.

2) It is a basic characteristic of any good design solution.

3) A modular design, in simple words, implies that the problem has been decomposed into a set of modules that have only limited interactions with each other.

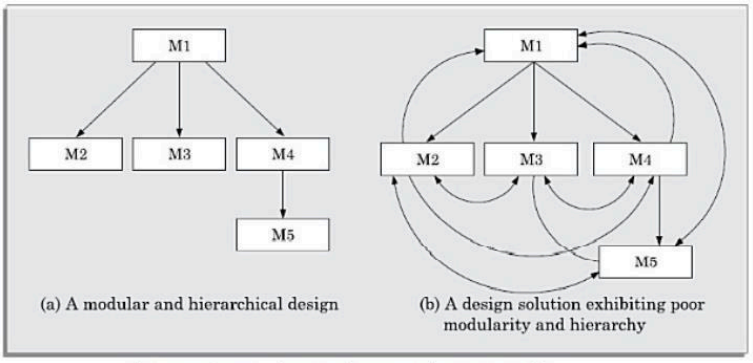
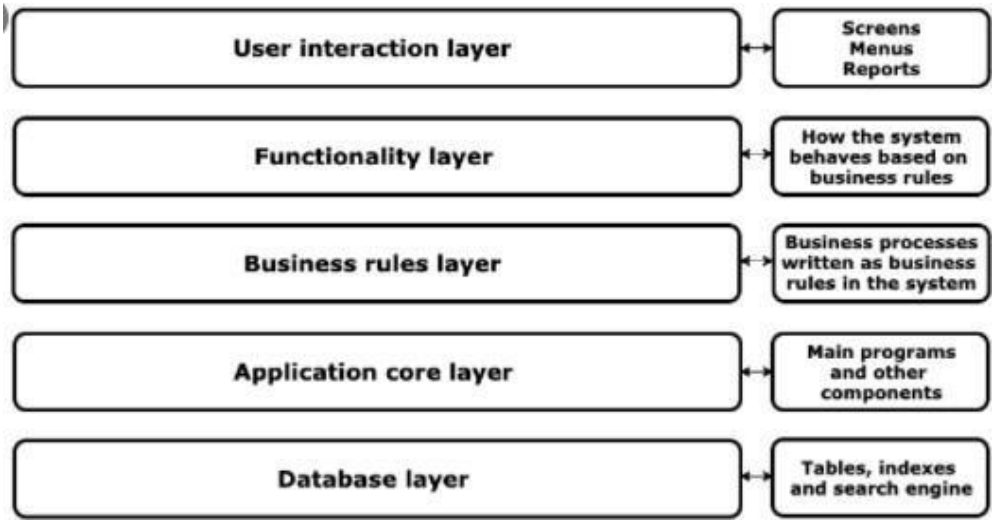


Figure 5.2: Two design solutions to the same problem.

(b). Layered design:

A layered design is one in which when the call **relations** among different modules are represented **graphically**, it would result in a tree-like diagram with clear layering. In a layered design solution, the modules are arranged in a hierarchy of layers. A module can only invoke functions of the modules in the layer immediately below it.



Design activities involve various steps and artifacts to ensure a structured and well-documented approach to the design process. Here are some common design activities and the necessary artifacts associated with them, typically found in a Design Document:

1. Requirement Analysis:

    - Artifact: Functional Requirements Document (FRD)
    - Description: Identify and document the functional requirements of the system or product to be designed. This includes understanding the user needs, goals, and expectations.

2. System Architecture Design:

    - Artifact: System Architecture Diagram
    - Description: Define the high-level structure and components of the system. This includes identifying subsystems, interfaces, and their interactions.

3. Component Design:

    - Artifact: Component Diagrams
    - Description: Break down the system into smaller components and design each component individually. Specify the responsibilities, interfaces, and relationships of each component.

4. Database Design:

    - Artifact: Entity-Relationship (ER) Diagram
    - Description: Design the database schema, including entities, attributes, relationships, and constraints. Define the data model for the system.

5. User Interface (UI) Design:

    - Artifact: UI Wireframes or Mockups

- Description: Design the visual and interactive elements of the user interface. Create wireframes or mockups to showcase the layout, navigation, and overall look and feel of the system.

6. Algorithm Design:

   - Artifact: Algorithm Description or Pseudocode
   - Description: Specify the algorithms and data structures used in the system. Provide a detailed description or pseudocode to explain the logic and steps involved.

7. Security Design:

   - Artifact: Security Requirements and Design Specifications
   - Description: Identify and address potential security risks and vulnerabilities. Define security requirements and design measures to protect the system and its data.

8. Testing and Validation Strategy:

   - Artifact: Test Plan
   - Description: Define the strategy for testing and validating the design. Specify the test cases, test scenarios, and acceptance criteria to ensure the design meets the requirements.

9. Performance and Scalability Design:

   - Artifact: Performance and Scalability Analysis Report
   - Description: Analyze and design the system to meet performance and scalability requirements. Document performance metrics, bottlenecks, and recommendations for optimization.

10. Deployment and Maintenance Plan:

    - Artifact: Deployment and Maintenance Documentation
    - Description: Outline the plan for deploying the system and maintaining it in the production environment. Include installation instructions, configuration details, and ongoing maintenance processes.

These are some common design activities and associated artifacts found in a Design Document. However, the specific activities and artifacts may vary depending on the project, industry, and organizational standards.