System Design and Analysis

CS-324

SDLC

Lecture # 03, 04
7,8 Sep

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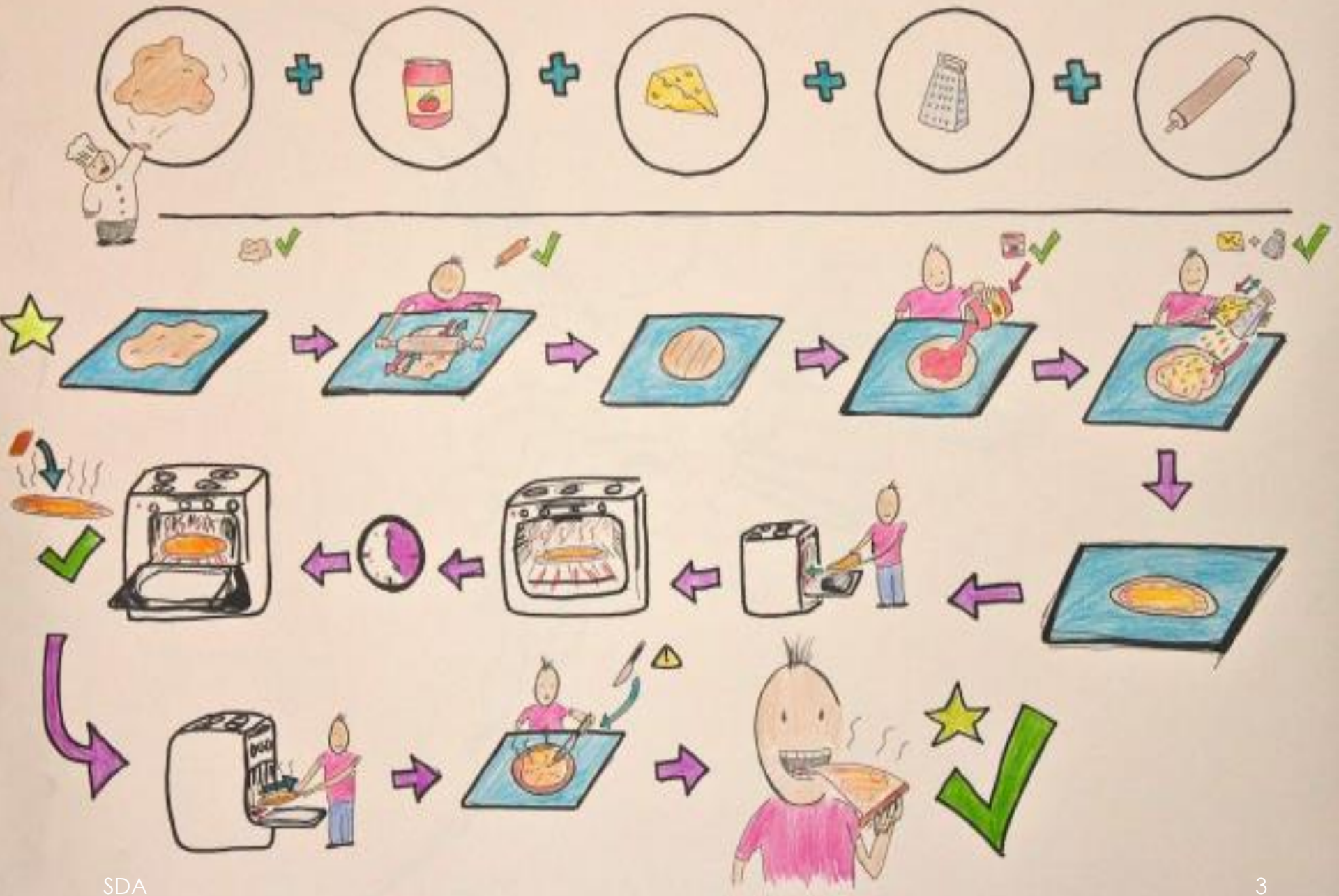
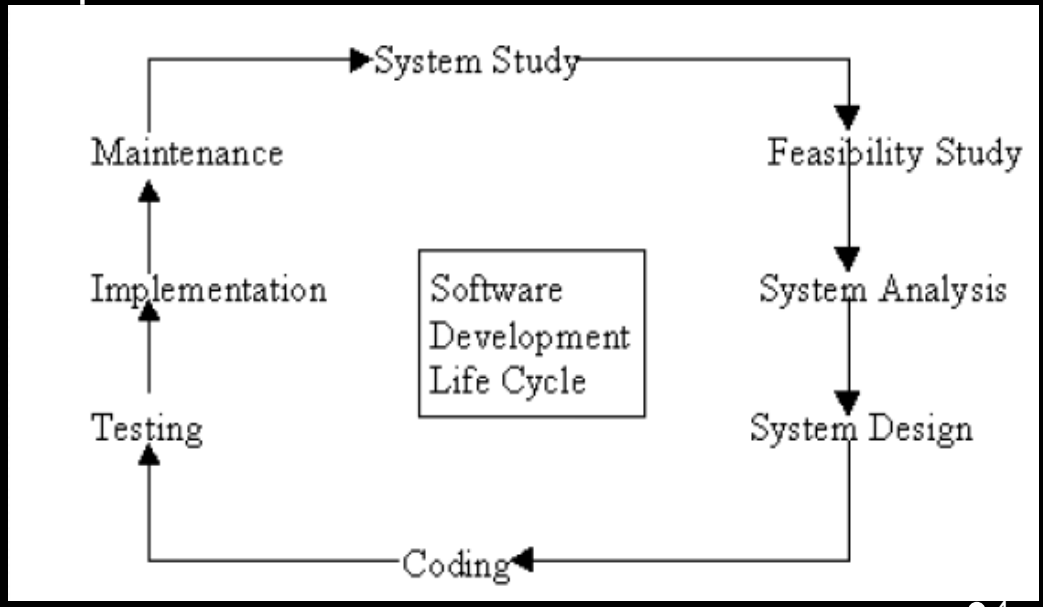
Today's Outline

- What is system?
- SDLC
- SDLC Phases

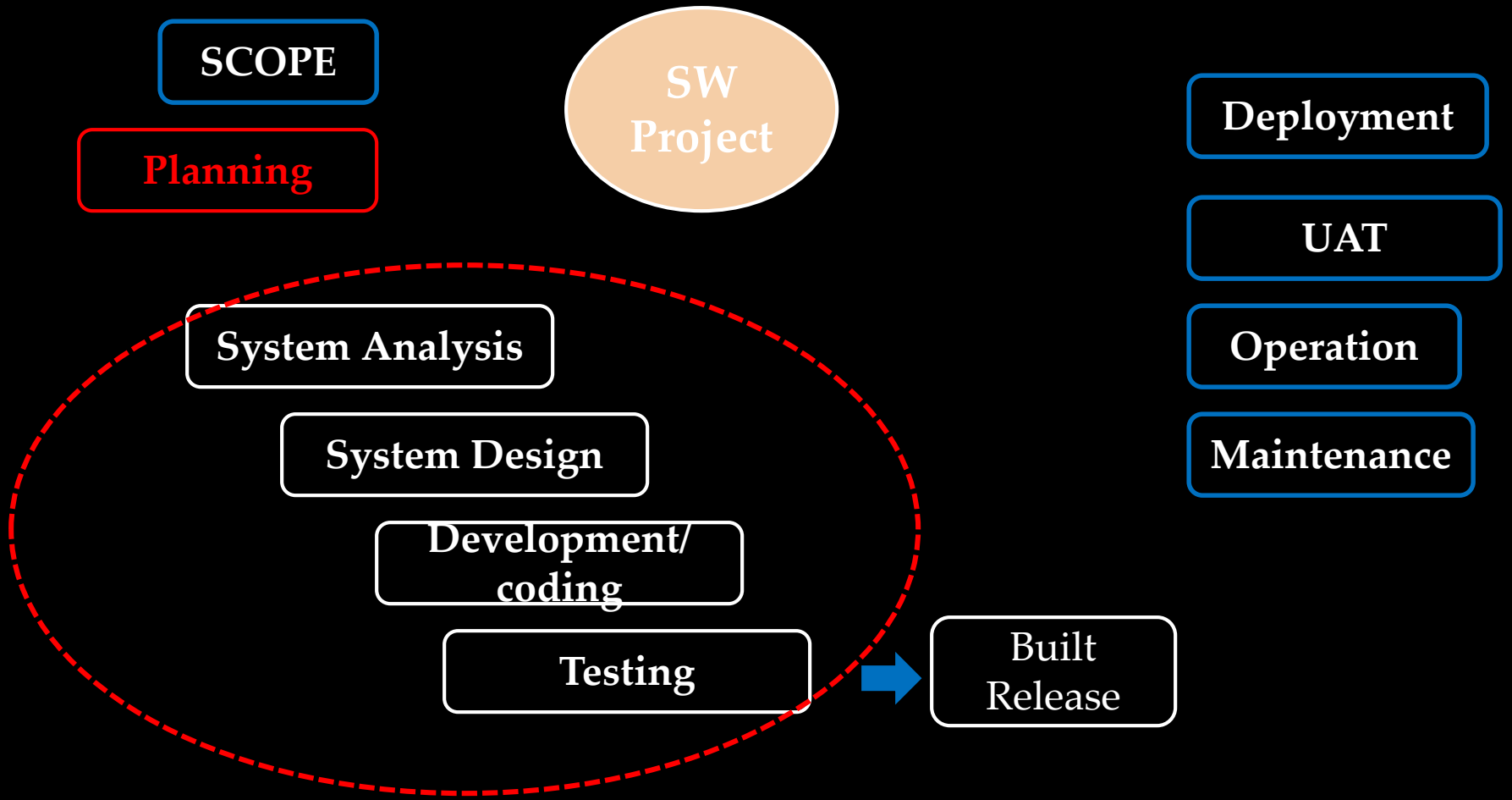


SDLC

- Software Development Life Cycle (SDLC) is a process used by the software industry to design, develop and test high quality software.
- It consists of a detailed plan describing how to develop and maintain software.
- SDLC consists of many activities/ phases.
- Following are the major phases of SDLC.
  - System study
  - Feasibility study
  - System analysis
  - System design
  - Coding
  - Testing
  - Built release
  - Maintenance

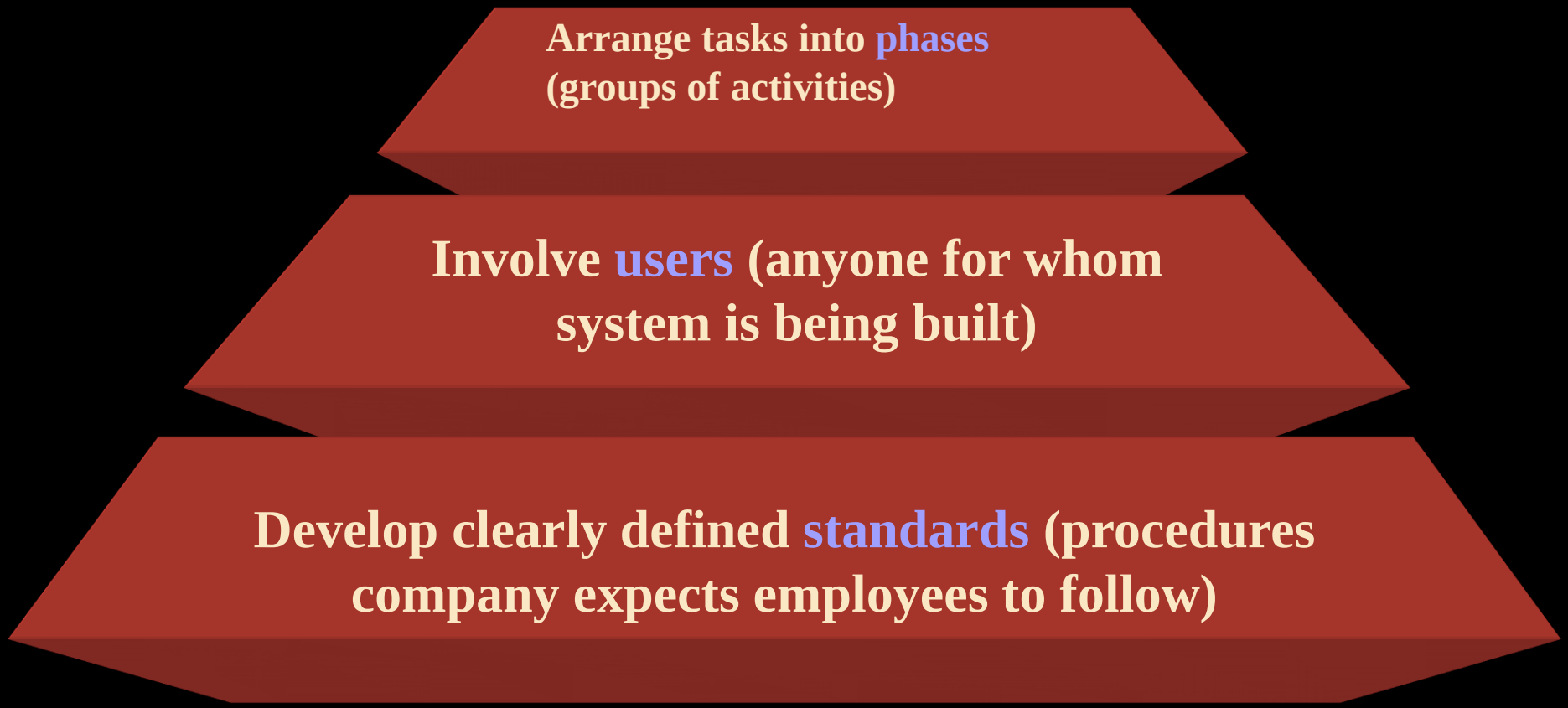


Software Development Life Cycle



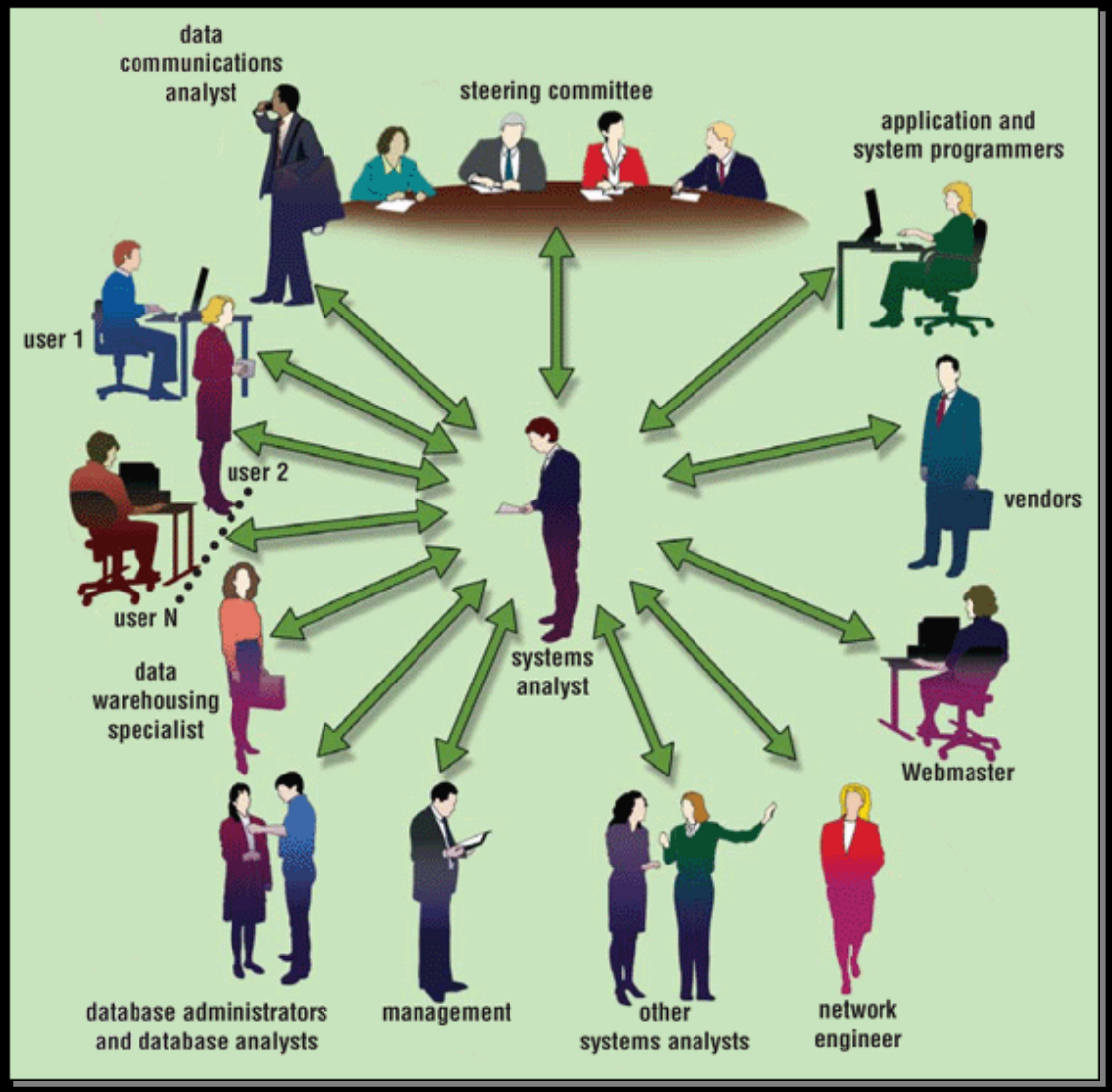
The System Development Life Cycle

What are guidelines for system development?



The System Development Life Cycle

Who participates in the system development life cycle?



The System Development Life Cycle

What is the project team?

Formed to work on project from beginning to end

Consists of users, systems analyst, and other IT professionals

Project leader—one member of the team who manages and controls project budget and schedule

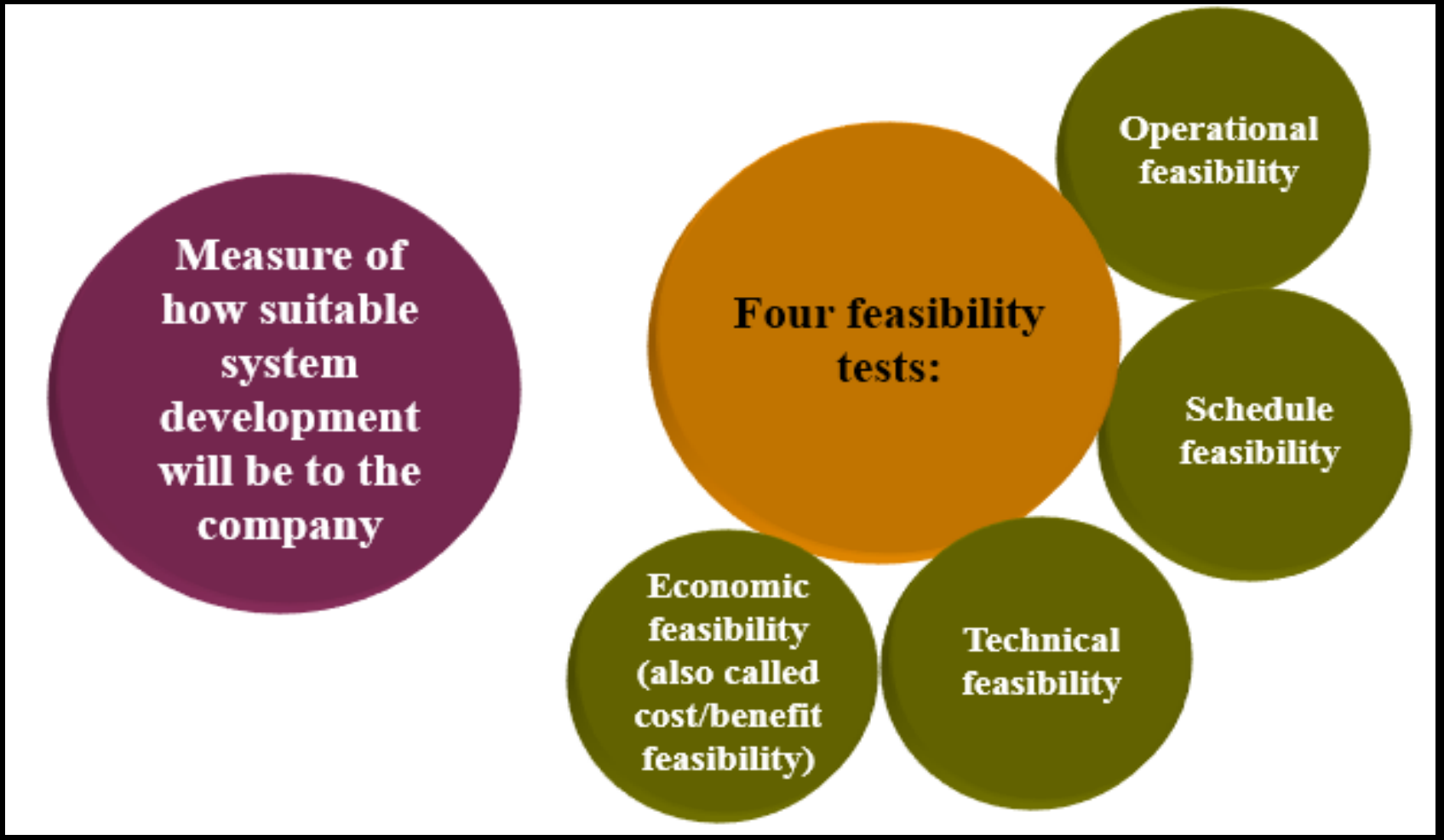
Stage 1: System Study

- Gives clear picture of what actually the physical system is.
- System study phases(I & II):
  - I: initial survey of the system(scope identification)
  - II: depth study of the system (requirement identification, limitation & issues of the current system). It also includes the back ground analysis and inference or findings of the system.
- Output: system proposal or recommendations to overcome the limitations / issues of the current system.

Stage 2: Feasibility Study

- A feasibility study precedes the decision to begin a project. It is an assessment of the practicality of a proposed system.
- Three main types of feasibility study:
  - **Technical feasibility:** This assessment is based on an outline design of system requirements, to determine whether the company has the technical expertise to handle completion of the project.
  - **Operational feasibility:** refers to the measure of solving problems with the help of a new proposed system. It helps in taking advantage of the opportunities and fulfills the requirements as identified during the development of the project. It takes care that the management and the users support the project.
  - Economical feasibility: A project is considered economically feasible when the benefits that will accrue to the broad community are greater than the cost of undertaking the project.
- A feasibility study leads to a decision: go or no-go.
- Output: FSR

What is feasibility?



Stage 3: System Analysis

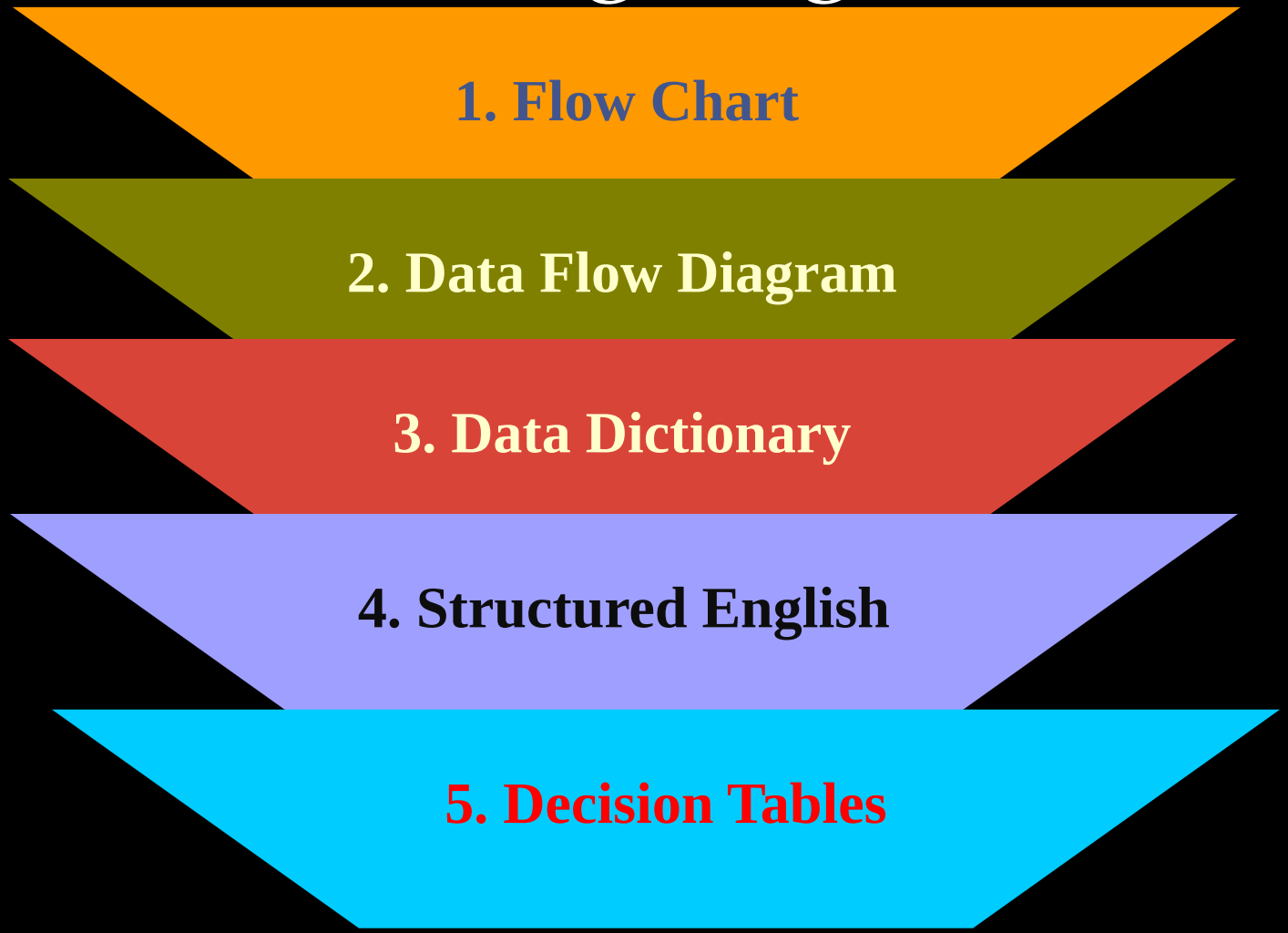
- Forms the basis of agreement between user and developer. System analysis establish the system's services, constraints and goals by consultation with users.
- It is the study of specifications, operations and relationships with in the system and outside the system.
- Specifies what not how. (Hard task)
- Define the boundary of the new system keeping in view the problems and the new requirement.
- Output: is the Software Requirements Specification (SRS) document.

Stage 4: System Design

- A major step in moving from *problem* to *solution*.
- Based on system analysis, the new system must be designed.
- *Two main tasks*
  - *General design:* (preliminary design) components and connectors that should be there in the system
  - *Detailed design: (Detailed Design)* logic of modules

Output: SDS(system Design Specification)

Tools and Techniques for Designing



Decision Tables

1) List all actions that can be associated with a specific procedure (or module)
2) List all conditions (or decisions made) during execution of the procedure

List of Conditions	Combination Of Conditions
List of Actions	**The Corresponding Set of Actions**

	Rules					
Conditions	**1**	**2**	**3**	**4**	**5**	**6**
Regular customer	T	T				
Silver customer			T	T		
Gold customer					T	T
Special discount	F	T	F	T	F	T
Actions						
No discount	✓					
Apply 8 percent discount			✓	✓		
Apply 15 percent discount					✓	✓
Apply additional *x* percent discount		✓		✓		✓

Decision Tables

Activity Task:

For the SafeHome problem, assume that the system is connected to the network. Write a decision table based on the following facts;-

The homeowner is supposed to get an E-Mail if and only if noise level goes beyond a level. If the temperature goes beyond a level not only homeowner will be getting an E-Mail, but also alarm has to be switched on along with a telephone call to a local police station. Same thing goes by for the fact when pressure goes beyond certain level.

Stage 5: Coding

- Converts design into ***code*** in specific language
- ***Goal:*** Implement the design with simple and easy to understand code
- programs must be modular in nature. This helps in fast development, maintenance and future changes, if required.
- Coding phase affects both ***testing*** and ***maintenance***.
  - Well written code reduces testing and maintenance effort.
- ***Output:*** is source-code.

Stage 6: Testing

- ***Defects*** are introduced in each phase
  - Must be found and removed to achieve high quality
- Software testing is a process of analyzing software for the purpose of finding bugs.
- Using test data, following test runs are carried out
  - Unit test: performed by the respective developers on the individual units of source code to ensure that the individual parts are correct in terms of requirements and functionality.
  - System test: done after unit test. System testing tests the system as a whole. Actual output of the system is matched with the expected outputs. Errors are identified and fixed.
  - *User acceptance testing (UAT)* – determines if the system satisfies the business requirements

- ***Outputs:*** are
  - Test plans/results
  - Final tested (reliable) code

Stage 7: Built Release

- After UAT, deployment phase begins.
- Final phase of SDLC, puts the product into production
- All programs of system are loaded onto the user's computer.
- Then training of user starts including
  - how to execute the package
  - how to enter the data
  - how to process data

Built Release Strategies

- Parallel run: computerized & manual systems are executed in parallel.
- Advantages of Parallel run:
  - Manual results comparison with the computerized one.
  - Failure of the computerized system at the early stage, does not affect the working of the organization.
- Pilot run: New system is installed in parts. Some part of the new system is installed first and executed successfully for considerable time period.
- Advantages:
  - When results are found satisfactory then only other parts are implemented.
  - This strategy builds the confidence and the errors are traced easily.

Stage 8: Maintenance

- Maintenance phase focuses on changes that associated with
  - Error Correction
  - Platform Adaptations required
  - Enhancement due to change
  - Re-engineering
- Maintenance is required to:
  - eliminate errors in the system during its working life
  - tune the system to any variations in its working environment.
- System Review: is necessary from time to time for:
  - knowing the full capabilities of the system
  - knowing the required changes or the additional requirements
  - studying the performance
- Major change during the review:
  - If a major change to a system is needed, a new project may have to be set up to carry out the change.
  - New project will then proceed through all above life cycle phases.

System Environments

- Development
- Test
- Staging
- Pre-Production
- Production
- Mirror
- Roles involved:
- D, PM, TM, BA.

Today's Outline(08/09)

- Software Development methodologies
  - SAD
  - OOAD
- SAD vs. OOAD
- Case Study
- Software development Categories

Structured Analysis and Design

What is the SAD?

Divide and Conquer

Traditional systems development technique that is time tested and easy to understand

Uses set of process models to describe a system graphically

Divide large, complex problem into smaller, more easily handled ones.

Top Down Approach

Functional view of the problem

- SDA

Structured Analysis and Design

What is the SAD?

Establish complete requirement documentation

Establish concrete requirement specification

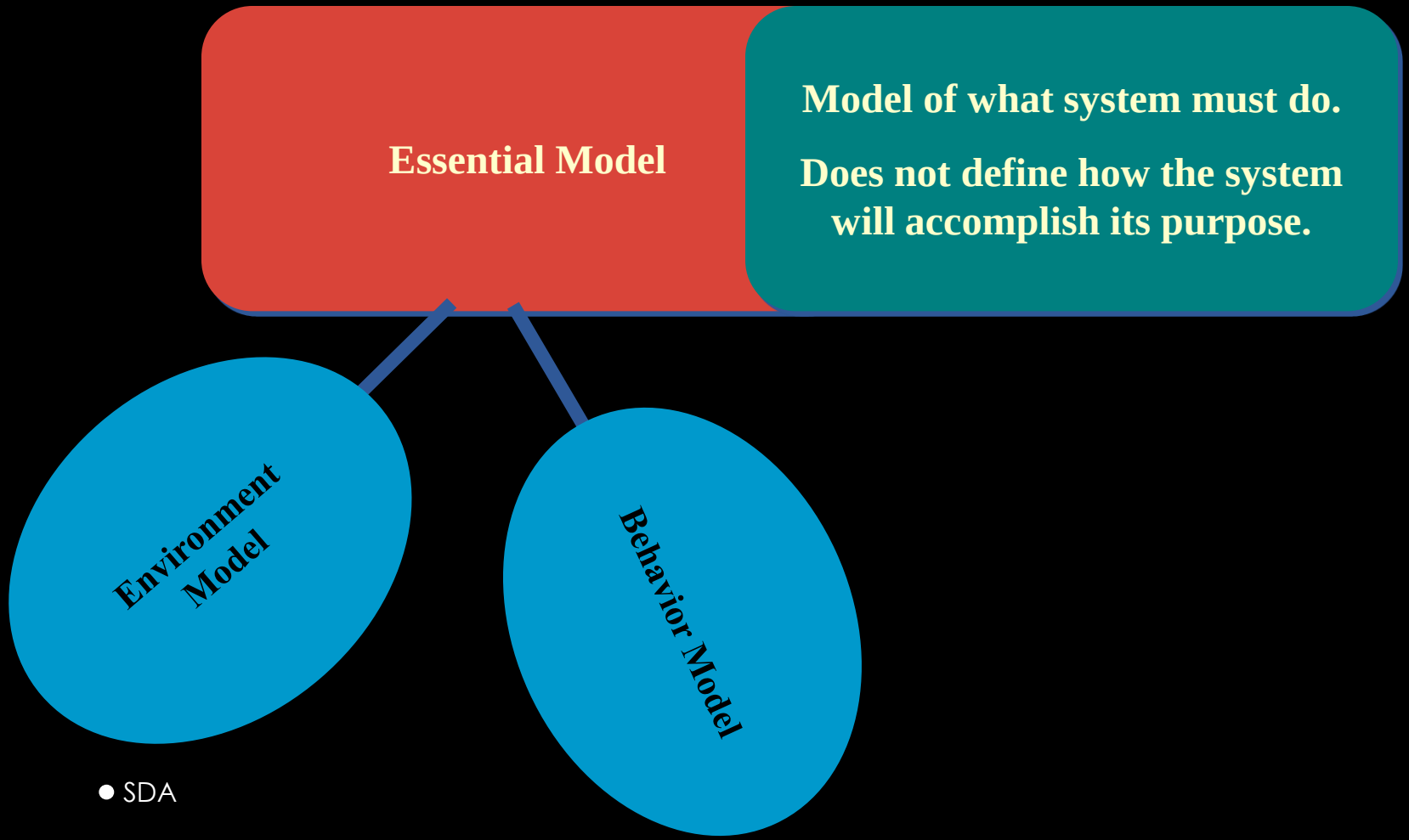
Structured analysis is a set of techniques and graphical tools that allow the analyst to develop a new kind of system specification that are easily understandable to the user. Analysts work primarily with their wits, pencil and paper."

Improve Quality and reduce risk

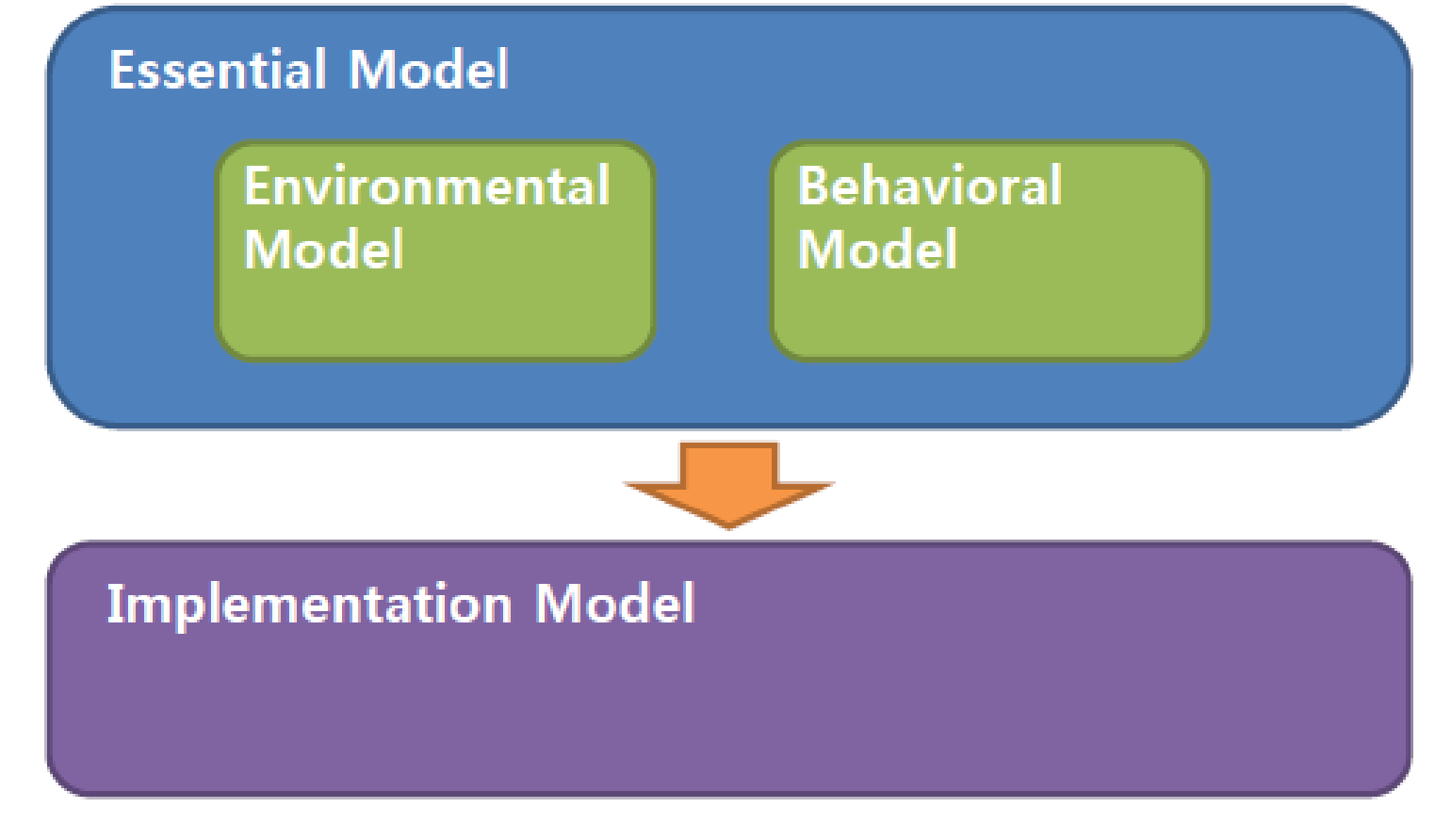
Focus on reliability, flexibility & maintainability

Structured Analysis and Design

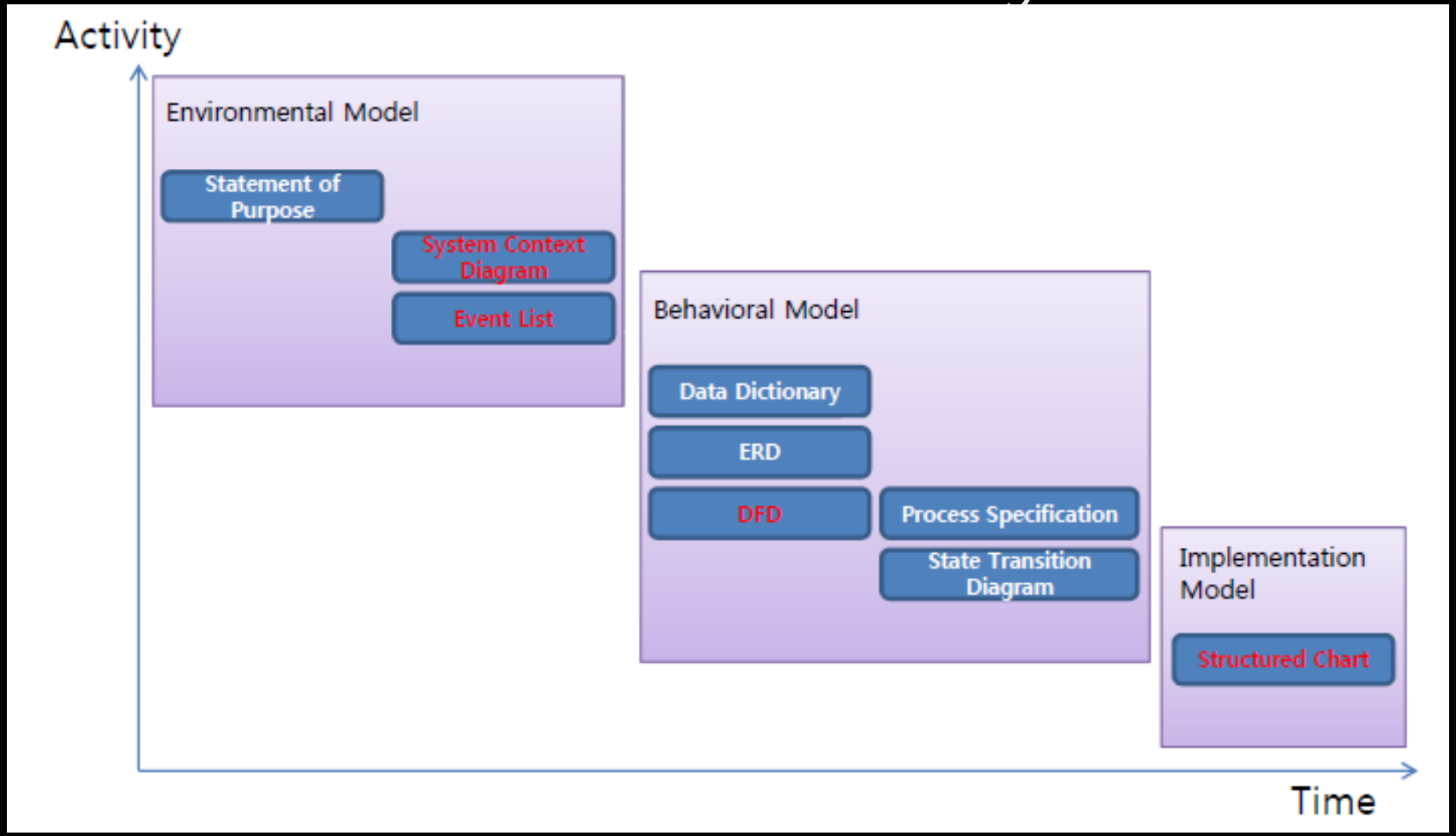
Elements of Structured Analysis and Design?



Structured Analysis and Design



SAD Activity



Structured Analysis and Design

Environmental Model
- Defines the scope of the proposed system.
- Defines the boundary and interaction between the system and the outside world.
- Composed of: Statement of Purpose, Context Diagram, and Event List.

Behavior Model
- **Model of the internal behavior and data entities of the system.**
- **Models the functional requirements.**
- **Composed of Data Dictionary, Data Flow Diagram, Entity Relationship Diagram, Process Specification, and State Transition Diagram.**

Implementation Model
- **Maps the functional requirements to the hardware and software.**
- **Determines which functions should be manual and which should be automated.**
- **Defines the Human-Computer Interface.**
- **Defines non-functional requirements.**
- **Tool: Structure Charts**

Structured Analysis and Design

Advantages

- **Visual, so it is easier for users/programmers to understand**
- **Makes good use of graphical tools**
- **A mature technique**
- **Process-oriented approach is a natural way of thinking**
- **Flexible**
- **Simple and easy to understand and implement**

Disadvantages

- **Not enough user-analyst interaction**
- **It depends on dividing system to sub systems but it is to decide when to stop decomposing.**

Object Oriented Analysis and Design

Object-Oriented analysis and design thoroughly represent complex relationships, as well as represent data and data processing with a consistent notation

Object Oriented Analysis and Design

Analysis Phase

- Model of the real-world application is developed showing its important properties.
- Model specifies the functional behavior of the system independent of implementation details

Design Phase

- Analysis model is refined and adapted to the environment.
- System design: Concerned with overall system architecture
- Object design: Implementation details are added to system design

Implementation Phase

- Design is implemented using a programming language or database management system

Object Oriented Analysis and Design

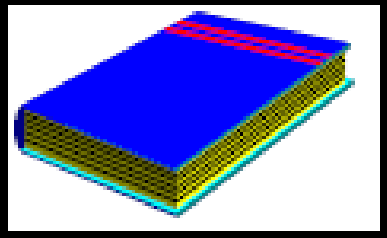
From Analysis to Implementation

Analysis
Investigation of the problem

Design
Logical Solution

Construction
Code

Domain Concept
Ex: Book (Concept)



Logical Software Objects

Book
Attribute: Title
Method:
Display()

Representation in an OO Programming Language

```
Public Class Book {
  Private String Title;
  Public void
  Display();
}
```

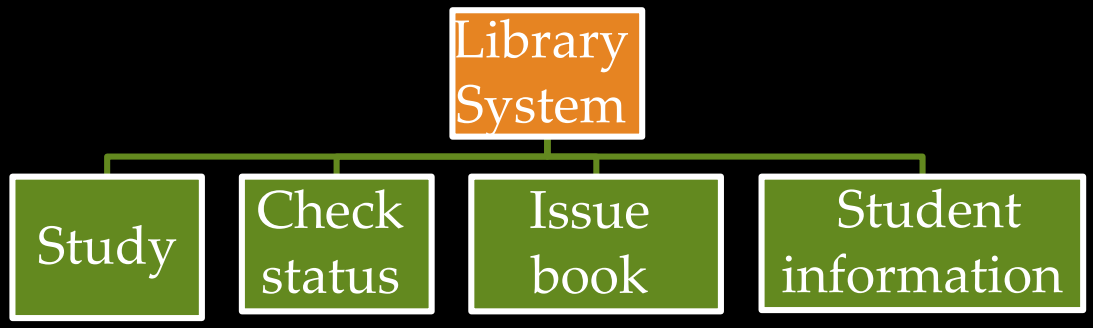
Similarities and difference between SAD and OOAD

- Both SAD and OOAD had started off from programming techniques.
- Both techniques use graphical design and graphical tools to analyze and model the requirements.
- Both techniques provide a systematic step-by-step process for developers
- Both techniques focus on documentation of the requirements

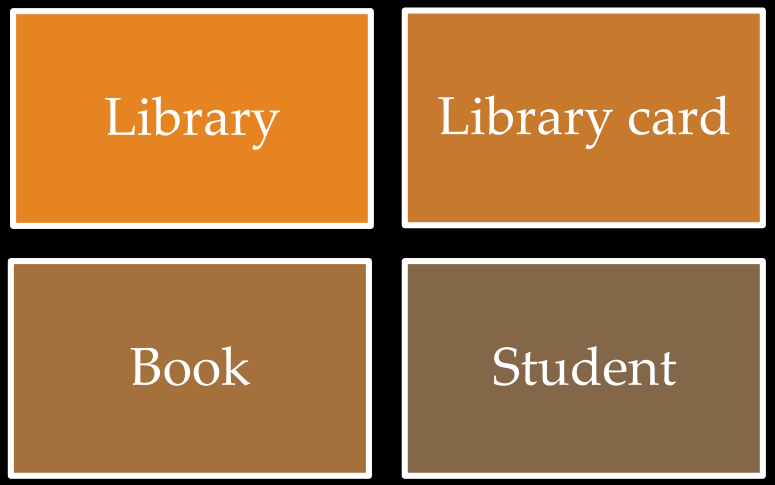
- SAD is Process-Oriented
- OOAD combines data and the processes

Similarities and difference between SAD and OOAD

SAD



OOAD



Similarities and difference between SAD and OOAD

Key Differences Between Structured and Object-Oriented Analysis and Design

	Structured	Object-Oriented
Methodology	SDLC	Iterative/Incremental
Focus	Processs	Objects
Risk	High	Low
Reuse	Low	High
Maturity	Mature and widespread	Emerging (1997)
Suitable for	Well-defined projects with stable user requirements	Risky large projects with changing user requirements

5

That is all