Chapter Four

Systems Analysis and Design & MIS

System Analysis

- **Systems Analysis** is the process of investigation of a system's operation with a view to **changing** it to new requirements or improving its current working.
- Systems Analysis is plays a **vital role** in the development of MIS.
- MIS is a **conglomerate** of various systems
- Each system within the MIS plays a role which contributes to the **accomplishment** of the MIS **objective**
- The success of MIS **lies** in meeting the information needs of the various users in organization across all levels of the management.

NEED FOR SYSTEMS ANALYSIS

- Business systems are usually complex
- Making changes to a system without reference to its **effects** on other subsystems or current working practices could result in a **worsening** rather than improvement.

Systems analysis will identify

- User requirements
- Outputs and processing needed.
- Data required providing this processing and output.
- Role of people in the process.
- Security aspects to ensure the efficient continuation of the business.
- Costs of providing the system.

Structured System Analysis and Design Method

- SSADM was designed to formalize the stages of the Systems Life Cycle from planning through to implementation and maintenance as follows (Cashman, 2001)
  - Planning
  - Analysis
  - Design
  - Implementation
  - Support

CONT.

- **Planning**
  - Review project requests ,
  - Prioritize project requests,
  - Allocate resources and
  - Identify project development team)
- **Analysis**
  - Conduct preliminary investigation,
- perform detailed analysis activities
  - information needs assessment
  - requirements analysis
  - and requirements specification

CONT.

- **Design**
  - focused on the data requirements
  - synthesis of alternatives, cost-effectiveness analysis of alternatives,
  - specification of **criteria** for selecting a preferred alternative, selection of a preferred alternative
- Implementation
- Support

- **SSADM** provides sets of standard analysis and design techniques.
- It separates the logical and physical components of a system.
- The stages of the systems life cycle are effectively broken down into a series of modules (called stages) with standard method of approaching and dealing with them.

STANDARD METHOD OF APPROACHING TO SSADM

- Feasibility study
- Investigation of current requirements
- Business systems options.
- Requirements Specification.
- Technical Systems Specification.
- Logical Design.
- Physical Design

Feasibility is a measure of how suitable the development of a system will be to the organization.

Feasibility study

- clearly define the scope and objectives of the systems project
- identify alternative solutions to the problem defined earlier.

- System analysts use **four criteria** to test feasibility of the proposed system (Cashman, 2001)
  - **Operational feasibility**
  - **Organizational Feasibility**
  - **Technical Feasibility**
  - **Economical Feasibility**

- The methodology system design life cycle **(SDLC)**
  - is closely linked to what has come to be known as structured systems analysis & design.

Problem definition

- **Systems analysis phase**: The present system is investigated and its specifications documented.
- contain our understanding of HOW the present system works and WHAT it does.
- The information the analyst will require will include
  - Precise definition of each process
  - Who performs what
  - What it involves
  - What data is collected
  - How it is collected
  - What data is stored
  - What documentation/forms are used
  - Where the data then is moved

Fact finding tools

- **Possible ways to obtain information could be:**
  - **Questionnaires**
  - **Interview**
  - **Document analysis**
  - **Systems Observation**
- **Deliverable : Specifications of the present system.**

Systems design phase:

- The specifications of the present system are studied to determine what changes will be needed to incorporate the user needs not met by the system currently.
- The output will consist of the specifications, which must describe both WHAT the proposed system will do and HOW it will work.
- Deliverables: **Specifications of the proposed system.**

Systems construction: Programming the system

- development of user documentation for the system as well as the programs.
- Deliverables:
  - Programs,
  - their documentation,
  - and user manuals.

- **Implementation** also includes converting from the old system to the new system, this may involve operating both new and old systems in

  a. **parallel** for a trial period,

  b. operating a **pilot system** on a trial basis at one location,

  c. **phasing** in the new system one application or location at a time, or

  d. an immediate **cutover** to the new system.

CONT.

- **System testing & evaluation:**
  - Testing, verification and validation of the system just built.
  - Deliverables:
    - Test and evaluation results and
    - the system ready to be delivered to the user/client

System Development Process Models

- While nearly all system development efforts engage in some combination of the above tasks,
  - They can be differentiated by the ***feedback*** and ***control methods*** employed during development and the timing of activities.

- Structured System Analysis and Design models
  - Each of which has its own strength and weakness
  - Share some common features
  - They are basis for today's system development

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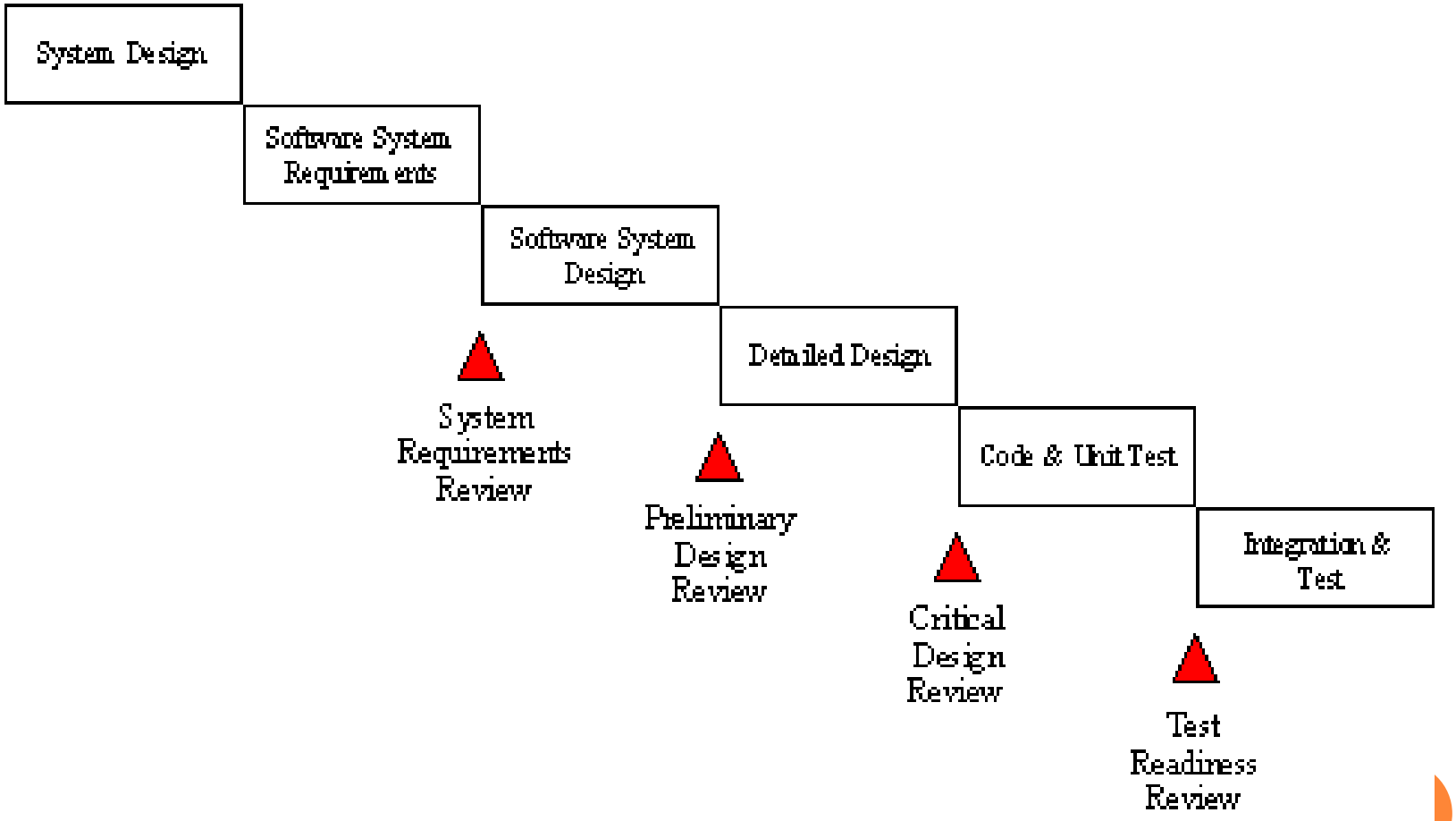
1. The **Waterfall Model**
   - the earliest method
   - still widely used
   - It is attributed with providing the theoretical basis for other *Process Models*
   - closely resembles a "**generic**" model for software development.

Waterfall process Model



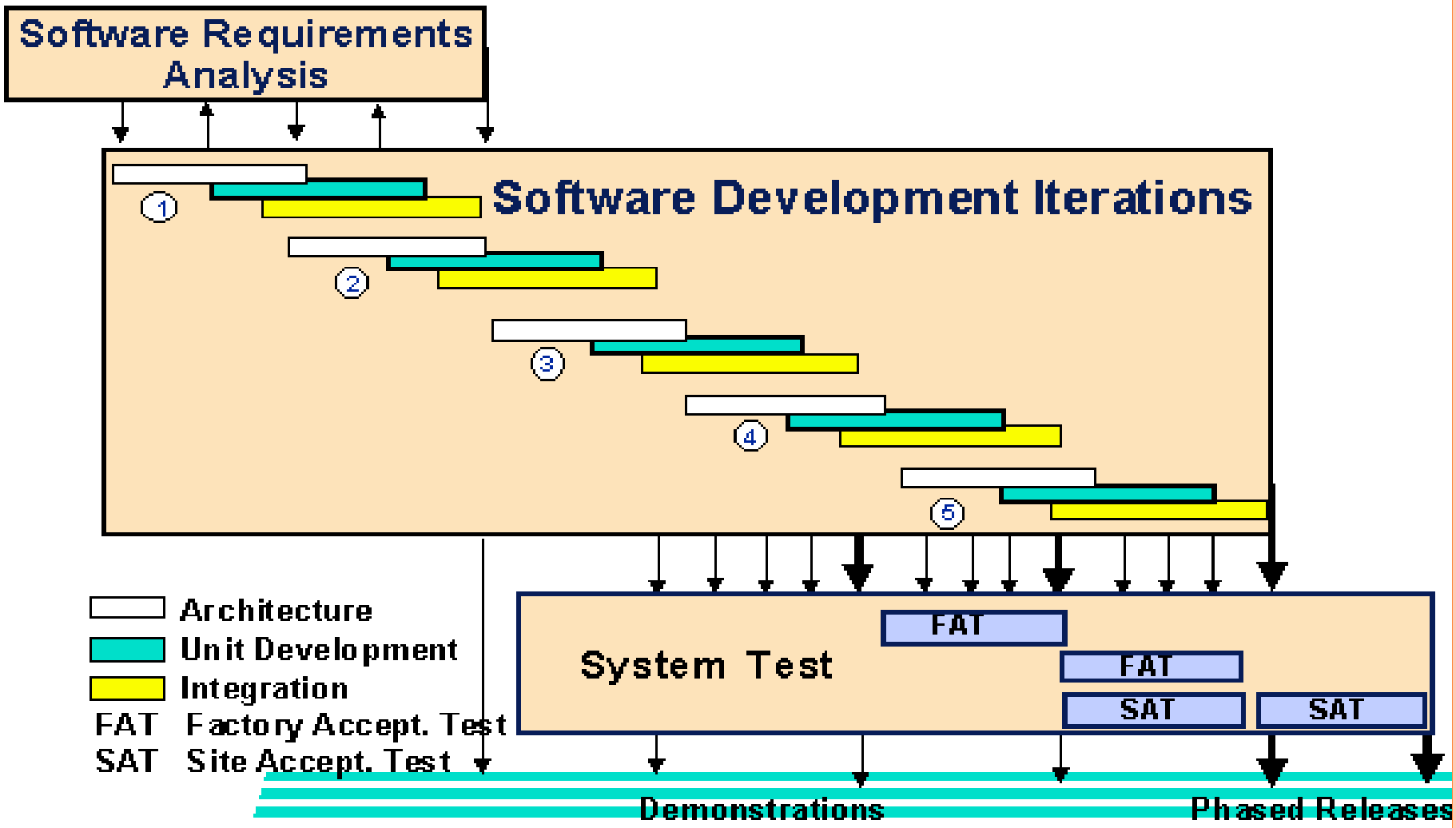
Problem with Waterfall model

- Real projects **rarely** follow the sequential flow that the model proposes.
- At the beginning of most projects there is often a great deal of uncertainty about requirements and goals
- Difficult for customers to identify these criteria on a detailed level.
- The model does not accommodate this natural uncertainty very well.
- Developing a system using the *Waterfall Model* can be a long, painstaking process that does not yield a working version of the system until late in the process

2. Iterative Development

- could provide faster results,
- require less up-front information
- offer **greater** flexibility.
- the project is divided into small parts.
- allows the development team to demonstrate results earlier on in the process and obtain valuable feedback from system users.
- each iteration is actually a mini-*Waterfall* process with the feedback from one phase providing vital information for the design of the next phase.
- In a **variation** of this model,
  - the software products which are produced at the end of each step (or series of steps) can go into production immediately as incremental releases.

Iterative Development process



Problems associated with the Iterative Model

- The user community needs to be actively involved throughout the project.
- While this involvement is a positive for the project, it is demanding on the time of the staff and can add project delay.
- Communication and coordination skills take center stage in project development.
- Informal requests for improvement after each phase may lead to confusion a controlled mechanism for handling substantive requests needs to be developed.
- Can lead to **"scope creep,"** since user feedback following each phase may lead to increased customer demands.

3. Prototyping

- The *Prototyping Model* was developed on the assumption that:
  - It is often **difficult** to know all of your requirements at the beginning of a project.
- the developer builds a simplified version of the proposed system and presents it to the customer
- The customer in turn provides feedback to the developer
- Refine the system requirements to incorporate the additional information
- the prototype code is thrown away and entirely new programs are developed once requirements are identified.

Steps to develop prototyping model

- Requirements Definition/Collection
- Design
- Prototype Creation/Modification
- Assessment
- Prototype Refinement

Problems associated with the Prototyping Model

- Prototyping can lead to false expectations
- Prototyping can lead to poorly designed systems

MIS IMPLEMENTATION

- **MIS implementation** process involves a number of sequential steps
  - First establish management information needs and formulate broad systems objectives so as to delineate important decision areas
  - Develop a general description of a possible MIS as a course design
    A. Once the information units needed have been determined and a systems design developed,
    B. Decide how information will be collected.
    C. Positions will be allocated responsibility for generating and packaging the information.
    D. Develop a network showing information flows.

Cont.

E. Test the system until it meets the operational requirements

F. **Re-check** that all the critical data pertaining to various sub-systems and for the organization as a whole are fully captured.

G. Monitor actual implementation of the MIS and its functioning from time to time

Criteria for MIS

1. **Relevance** Information should be relevant to the individual decision-makers at their level of management.
2. **Management by exception** Managers should get precise information pertaining to factors critical to their decision making.
3. **Accuracy** The database from which information is extracted should be up-to-date, contextually relevant and validated.
4. **Timeliness** The information should be provided at the time required.
5. **Adaptability** The information system should have an in-built capability for re-design so that it can suitably adapt to environmental changes and changing information requirements

Strategies for determining MIS design

- ***Organization-chart approach***:
  - the MIS is designed based on the traditional functional areas(the boundaries of the organization structure)
- ***Integrate-later approach***:
  - largely a ***laissez faire*** approach
  - it does not conform to any specified formats as part of an overall design.
  - There is no notion of how the MIS will evolve in the organization.
  - becomes difficult to integrate In today's environment

- ***Data-collection approach:*** This approach
  - collection of all data which might be relevant to MIS design.
  - data are then classified.
  - classification influences the way the data can be exploited usefully at a later stage.
  - The classification therefore needs to be done extremely carefully.
- ***Database approach:***
  - **A** large and detailed database is amassed, stored and maintained.
  - The database approach is more and more accepted for two main reasons:
    - First, because of data independence it allows for easier system development, even without attempting a complete MIS;
    - Second, it provides management with immediate access to information required.

- ***Top-down approach:***
  - defining the information needs for successive layers of management.
  - The **usefulness** of this approach **depends** on the **nature** of the organization.
  - suitable for those organizations where there is a difference in the type of information required at the various levels.
- ***Total-system approach:***
  - the interrelationships of the basic information are defined **prior** to implementation.
  - Data collection, storage and processing are designed and done within the framework of the total system.
  - This approach can be successfully implemented in organizations which are developing.

Solving Business Problems with Information Systems

Overview

- **Systems Approach** to Problem Solving,
  - Describes and gives examples of the steps involved in using a systems approach to solve business problems.
- **Developing Information Systems Solutions**,
  - Describes the activities involved and products produced in each of the stages of the information systems development cycle,
    - including computer-aided and
    - prototyping approaches to systems development.

The Scientific Method

- Based on the established problem-solving methodology known as the scientific method.
- The scientific method consists of five steps:

1. Recognize phenomena in the real world.
2. Formulate a hypothesis about the causes or effects of the phenomena.
3. Test the hypothesis through experimentation.
4. Evaluate the results of the experiments.
5. Draw conclusions about the hypothesis.

The Scientific Method vs. The Systems Approach

The Systems Approach

- is a modification of the scientific method
- It stresses a systematic process of problem solving
- Problems and opportunities are viewed in a systems context.
- Steps of the systems approach may **overlap** each other
- The completion of activities in one step may extend into the performance of another.

Steps in The Systems Approach

1. Define a problem or opportunity in a systems context.
2. Gather data describing the problem or opportunity
3. Identify alternative solutions.
4. Evaluate each alternative solution.
5. Select the best solution.
6. Implement the selected solution.
7. Evaluate the success of the implemented solution

Understanding a Problem or Opportunity

- Implies viewing the problem/opportunity in a systematic fashion within a systems context.

1. Defining Problems and Opportunities

- Symptoms must be separated from problems. Symptoms are merely signals of **underlying** problems.
  - A **problem** is a basic condition that causes undesirable results
  - An **opportunity** is a condition that presents the potential for desirable results

2. Gathering Data and Information.

- Data and information need to be captured to gain sufficient background into the problem or opportunity situation
- Interviews, Questionnaires, Personal observation, Examination of documents, Inspecting accounting and management reports, performance results etc..

- Once you understand a problem or opportunity, you can develop an appropriate solution.

3. Designing Alternative Solutions

- Jumping immediately from problem definition to a single solution limits your options and **robs** you of the chance to consider the advantages and disadvantages of several alternatives.
- **Of course,** having too many alternatives can obscure the best solution.
- Alternative solutions may come from past experience, advice of others, simulation of business operations models, and your own **intuition** and **ingenuity**.
- The "**doing nothing**" option is also a valid alternative.

4. Evaluating Alternative Solutions

- The goal of evaluation is to determine how well each alternative solution helps the firm and its selected subsystems meet their objectives.
- To understand a problem and solve it, you should try to determine if basic system functions are being properly performed
- This should be done within a systems context by looking at inputs, processing, outputs, feedback, and control structures
- The systems approach must determine firm objectives, identify standards, and recognize constraints
- **Objectives:-** are accomplishments a system is supposed to achieve (a good performance for this year)
- **Standards:-** (Quantitative Measures)used to measure the progress a firm makes as it tries to achieve objectives of the system.
- **Constraints:-** are restrictions on the form and content of a solution

Cont…**Evaluating Alternative Solutions**

Cost Benefit Analysis

- This process identifies the benefits and costs associated with each alternative solution.
- Every legitimate solution will have some advantages or benefits, and some disadvantages or costs.

I. Tangible costs - quantified costs.
   - Hardware, Software, Salaries

II. Intangible Costs - difficult to quantify
   - Customer goodwill, Employee morale caused by system errors, Installation/conversion problems

III. Tangible Benefits - favourable results that the firm has attained
   - Decrease in payroll, Decrease in inventory carry

IV. Intangible Benefits - hard to estimate
   - Customer service, Better delivery of customer request(s)

5. Selecting the Best Solution

- Once all alternative solutions have been evaluated, they can be compared to each other, and the "best" (most desirable) solution can be selected.
- Since the solutions are compared based on multiple criteria (some of which may be intangible), this selection is not always a simple process.

6. Implement the selected solution

- An implementation plan may have to be developed.
- A project management effort may be required to supervise the implementation of large projects.

Cont… Implement the selected solution

- Typically, an implementation plan specifies the activities, resources, and timing needed for proper implementation.
- This may include:
  a) Types and sources of hardware and software
  b) Construction of physical facilities.
  c) Hiring and training of personnel
  d) Start-up and operating procedures
  e) Conversion procedures and timetables

7. Post implementation Review (Evaluate the success of the implemented solution)

- Focus to determine if the implemented solution has indeed helped the firm and selected subsystems meet their system objectives.
- If not,
  - The systems approach assumes
  - you will cycle back to a previous step and make another attempt to find a workable solution.

Quiz

1. SSADM stands for?
2. Write the seven steps of problem solving approach?
3. Define MIS
4. List the structured system analysis and design models?
5. List the four criteria's used for feasibility study?


Thank
You
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