System Analysis and Design

Slide 01

Systems Concepts and the Information Systems Environment

What is System?

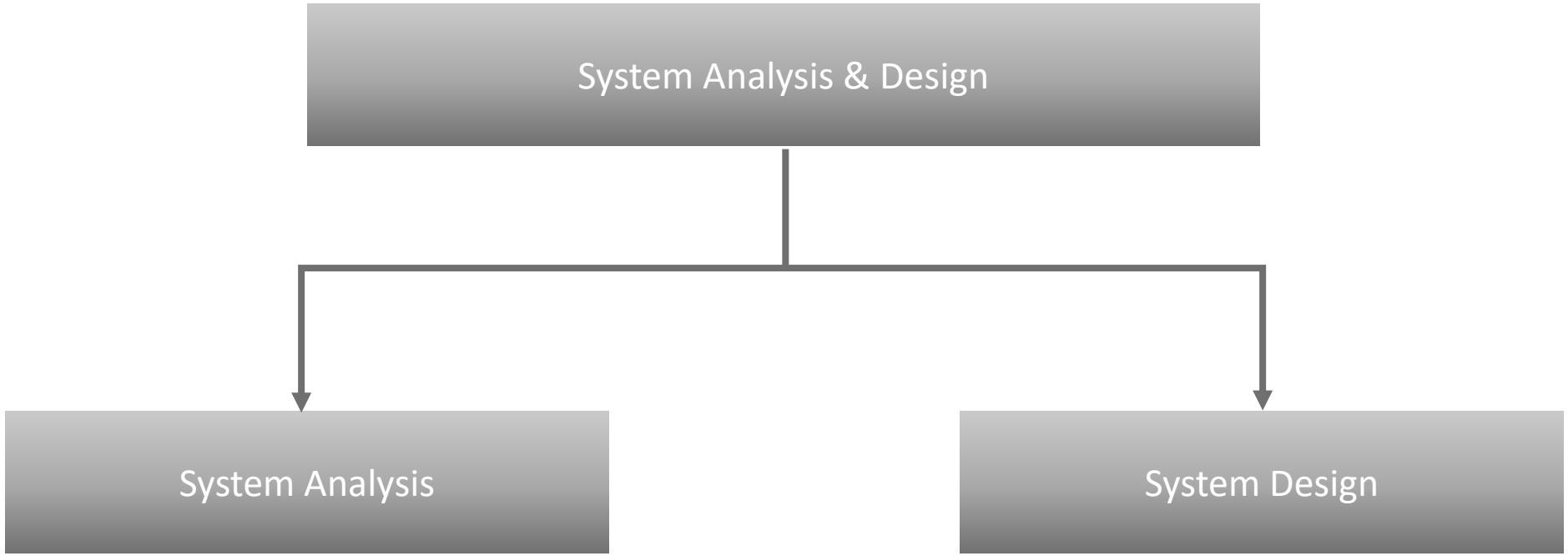
- System is a group of elements or components which work together to accomplish a common task.

What is System Analysis & Design?

- In very simple words, system analysis and design is a study in which we learn how to analyze an existing system and create a better one.

Why we need it?

- For System Development
  - Creating a new one
  - Updating the existing one.


System Analysis & Design
System Analysis
System Design

System Analysis

- System analysis is a process of studying and observing a system to know how it works and to identify its goal and purposes.
- System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives.
- It specifies “What the system should do”.

System Design

- It is a process of planning a new system or replacing an existing system.
- It’s done by defining its components or modules to satisfy the specific requirements.
- It focuses on “how to accomplish the objective of the system”.

Properties/Characteristics of a System

- A system must have following properties/characteristics:
  - Organization
  - Integration
  - Interaction
  - Interdependence
  - Central Objective

Properties/Characteristics of a System

- Organization
  - It implies Structure and Order.
  - Elements should be well arranged in order to achieve predetermined objective.

Properties/Characteristics of a System

- Integration
  - It implies how components of a system are tied together.
  - The parts of the system must work together within the system even though each part performs a unique function.

Properties/Characteristics of a System

- Interaction
  - It implies in which manner the components operate with each other.

Properties/Characteristics of a System

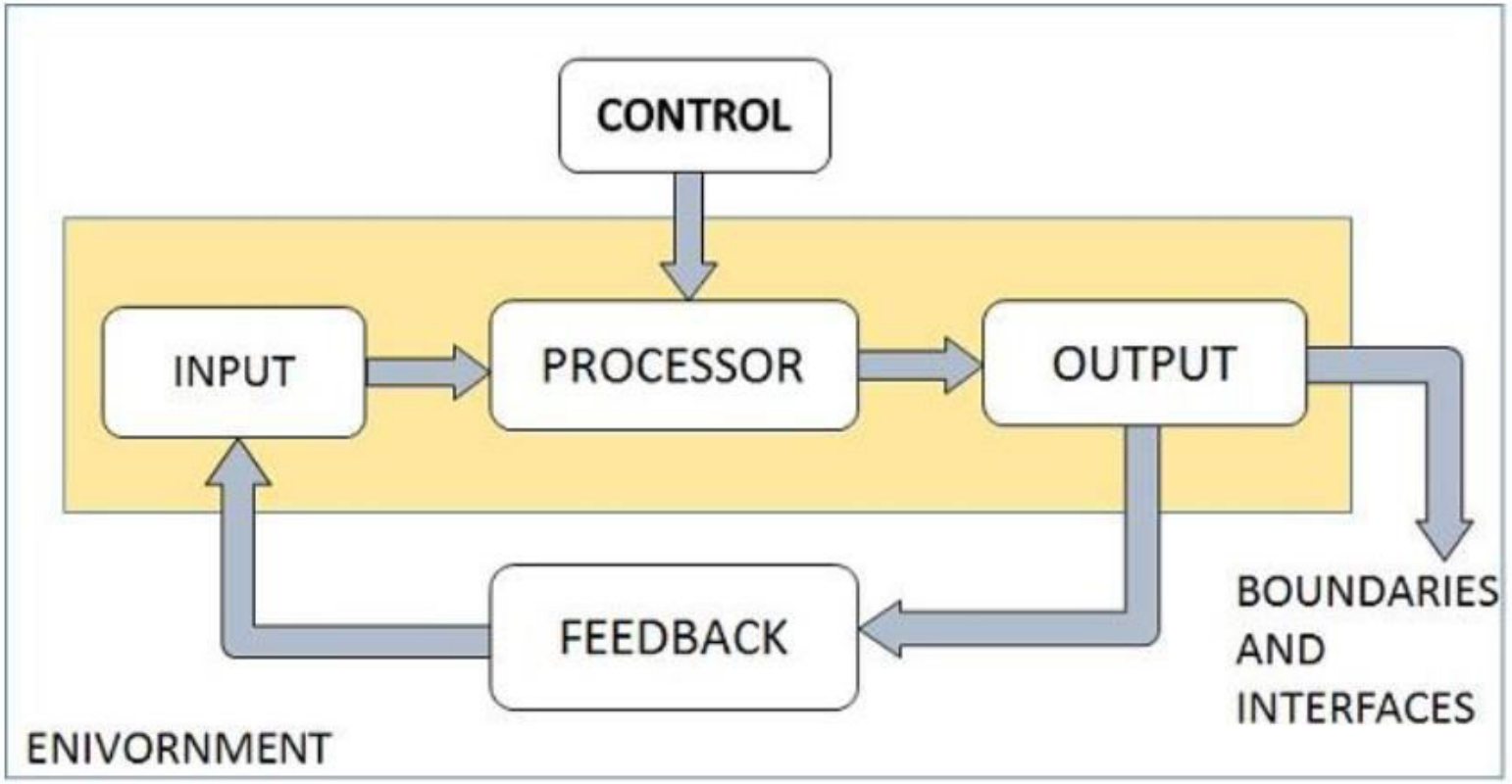
- Interdependence
  - It implies how components of a system depend on each other.
  - The components must be well linked and they must coordinate with each other for proper functioning.
  - Interdependence is important because the output of one subsystem may be required by other subsystem as input.

Properties/Characteristics of a System

- Central Objective
  - The objective of the system must be central.
  - It means, the user must know the main objective of the system in the early phase for successful design and conversion.

Elements of a System

- There are 6 elements in a system:
  - Inputs and Outputs
  - Processor
  - Control
  - Feedback
  - Boundaries & Interface
  - Environment



Elements of a System

- Inputs and Outputs
  - The information that enters in a system is treated as input.
  - Output is the outcome of input after processing.
  - The main aim of a system is to produce an output which is useful for the users.

Elements of a System

- Processor
  - It transforms the input into useful output.
  - It is an operational element.
  - It may modify the input either totally or partially, depending on the output's specification.

Elements of a System

- Control
  - The element guides the system.
  - It is a decision making element that controls the pattern of activities governing input, processing and output.

Elements of a System

- Feedback
  - The output is checked with the desired output set and then necessary steps are taken for achieving the output as per the standards.
  - Positive feedback encourages the performance of the system.
  - Negative feedback is informational in nature.

Elements of a System

- Boundaries and Interface
  - The boundaries are the limits under which the components of a system interact with each other.
  - Each system has boundaries that determine its sphere of influence and control.
  - The interconnection and the interaction between the sub-system is known as the interface.

Elements of a System

- Environment
  - The things outside the boundary of the system are known as environment.
  - It is the source of external elements that strike on the system.
  - Change in the environment affects the working of the system.

Types of System

- A system can be divided into following types:
  - Physical or Abstract System
  - Open or Closed System
  - Adaptive or Non-Adaptive System
  - Permanent or Temporary System
  - Natural or Manufactured System.

Types of System

Physical	Abstract
▪ Physical systems are tangible entities ▪ It may be static or dynamic in nature ▪ The physical parts of the computer center are desks, and chair that facilitate operation of the computer are static. A computer is a dynamic system in which programs, data and applications can change according to the user's needs.	▪ Abstract systems are non-physical entities or conceptual that maybe formulas, representations or model of a real system.

Types of System

Open	Closed
• An open system must interact with its environment. • It receives inputs and delivers outputs to the outside of the system. • It must adopt to the changing demands of the users.	• A closed system is isolated from environment influences. • A completely closed system is rare.

Types of System

Adaptive	Non-Adaptive
▪ Adaptive System responds to the change in the environment in a way to improve their performance and to survive. ▪ For example: human beings, animals.	• Non Adaptive System is the system which does not respond to the environment. • For example: machines.

Types of System

Temporary	Permanent
▪ Temporary System is made for specified time and after that they are demolished. ▪ For example: A DJ system is set up for a program and it is dissembled after the program.	▪ Permanent System persists for long time. ▪ For example: Business policies.

Types of System

Natural	Manufactured
▪ Natural systems are created by the nature. ▪ For example: Solar system, seasonal system.	▪ Manufactured system is the man-made system. ▪ For example: Rockets, dams, trains.

Information Systems

- An information system may be defined as a set of devices, procedures, and operating systems designed around user-based criteria to produce information and communicate it to the user for planning, control, and performance.

- The major information systems are:
  - Formal
  - Informal
  - Computer based.

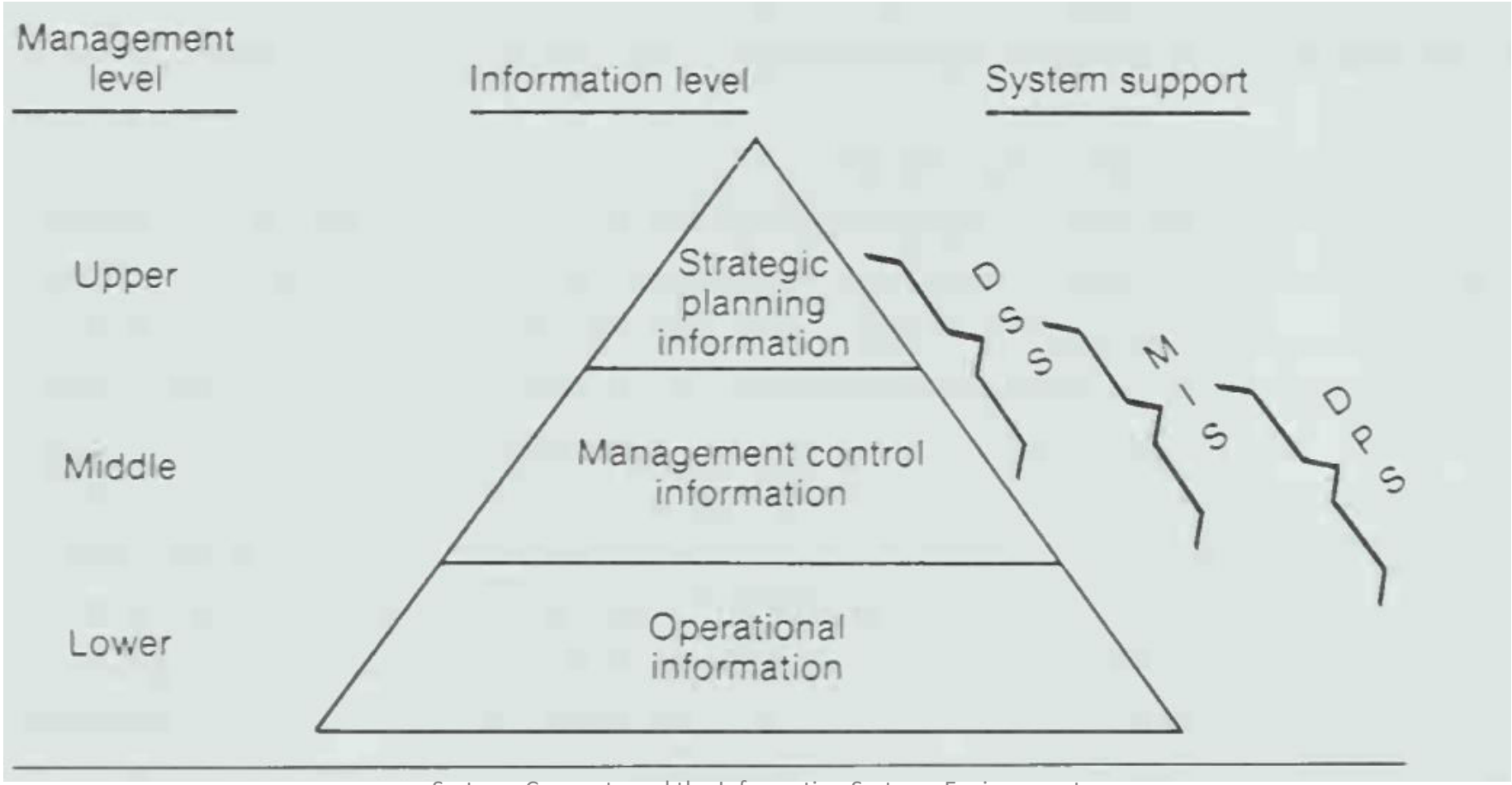
Formal Information Systems

- A Formal Information System is based on the organization represented by the organization chart. The chart is map of their positions and relationships, the pattern of authority, communications and workflow.

Formal Information Systems

- Categories of Information:
  - **Strategic information:** relates to long-range planning policies that are of direct interest to upper management. Example: decision support systems (DSS)
  - **Managerial information:** It is of direct use to middle management and department heads for implementation and control. Example: management information systems (MIS)
  - **Operational information:** daily information used to operate departments and enforce the day-to-day rules and regulations of the business. Example: data processing systems (DPS)

Management and Information Levels in a Typical Organization



EXAMPLE OF INFORMATION NEEDED BY A SHOPKEEPER

- Daily sales account
- List of low stock items to be re-ordered
- List of overstock items
- Long overdue payments
- Profit and loss account

- **Used to streamline day to day operations called Operational information**

EXAMPLE OF INFORMATION NEEDED BY A SHOPKEEPER

- Slow or fast moving items
- Reliable supplier of items
- Sales trends

- **Used to improve profitability of shop called Tactical information or managerial information**

EXAMPLE OF INFORMATION NEEDED BY A SHOPKEEPER

- Whether to stock different varieties of items
- Whether to diversify
- Whether to start a new branch in a different locality
- Whether to start an e-shop

- **Information to expand business and explore new opportunities known as Strategic Information**

Informal Information Systems

- The formal information system is a power structure designed to achieve company goals. An organization's emphasis on control to ensure performance tends to restrict the communication flow among employees, however.

- As a result, an informal information system develops. It is an employee based system designed to meet personnel and vocational needs and to help solve work-related problems

Computer based Information Systems

- **Transaction Processing Systems or Data Processing Systems(Operational information):**
  - TPS processes business transaction of the organization.
  - For example, take a railway reservation system. booking, canceling etc. are all transactions.
  - Transaction processing systems provide speed and accuracy, and can be programmed to follow routines functions of the organization.

Computer based Information Systems

- **Management Information Systems(MIS)**
  - These systems assist lower management in problem solving and making decisions.
  - They use the results of transaction processing and some other information also.
  - An important element of MIS system is database.
  - And the information is accessed through DBMS.

- But there are two drawbacks of database i.e. requirement of a specialized personnel and need to secure data from unauthorized access.

Computer based Information Systems

- **Decision Support Systems (strategic information):**
  - These systems assist higher management to make long term decisions.
  - These type of systems handle unstructured or semi structured decisions.
  - A decision is considered unstructured if there are no clear procedures for making the decision

System Analysis and Design

Slide 02

System Development Life Cycle

System Development Life Cycle

- Systems analysis and design are keyed to the system life cycle.
- The analyst must progress from one stage to another methodically, answering key questions and achieving results in each stage
- An effective System Development Life Cycle (SDLC) should result in a high quality system. System Development Life Cycle (SDLC) is a conceptual model.

A Word of caution regarding life cycle activities: We isolate and sequence these activities for learning purposes, but in real life they overlap and are highly interrelated.

System Development Life Cycle

- SDLC is used by analysts to develop an information system. SDLC includes the following activities −
  1. Preliminary Investigation
  2. Feasibility Study
  3. System Analysis
  4. System Design
  5. System Coding and Testing
  6. System Implementation
  7. System Maintenance

Preliminary Investigation

- Tasks:
  - Recognition of need
  - What is the problem
  - Determine if a new system is needed

- Results:
  - Need for improving existing new system identified
  - Statement of scope

Feasibility Study

- Tasks: evaluate alternatives system based on:
  - Economic Feasibility: do benefits justify the costs?
  - Technical Feasibility: is the reliable technology and training available?
  - Operational Feasibility: can user operate easily?

- Results:
  - feasibility report for the complete project is created
  - threats, constraints, integration and security of system are identified.
  - Flexibility for the future
  - cost v/s benefits

System Analysis

- Tasks:
  - detailed evaluation of the present system
  - Define boundaries of the candidate system
  - Data collection
- Tools:
  - Data flow diagram
  - Interview
  - Onsite observation
  - Questionnaires
  - Data dictionaries

- Result:
  - SRS (Software Requirement Specification) is finalized
    - which specifies the software, hardware and network necessities of the system is ready on the stop of this phase.
  - Logical model of the system (DFD, Data dictionary)

System Design

- Tasks:
  - most creative and challenging task
  - Translate the requirements into design specifications
  - how must the problem solved
  - input data and master files are designed
  - Output format are designed
- Result:
  - Detailed system document
  - Procedural flowcharts
  - Work plan/time schedule for implementing each component

System Coding and Testing

- Tasks:
  - Build the system to design specification
  - System testing
  - User acceptance testing

System Implementation

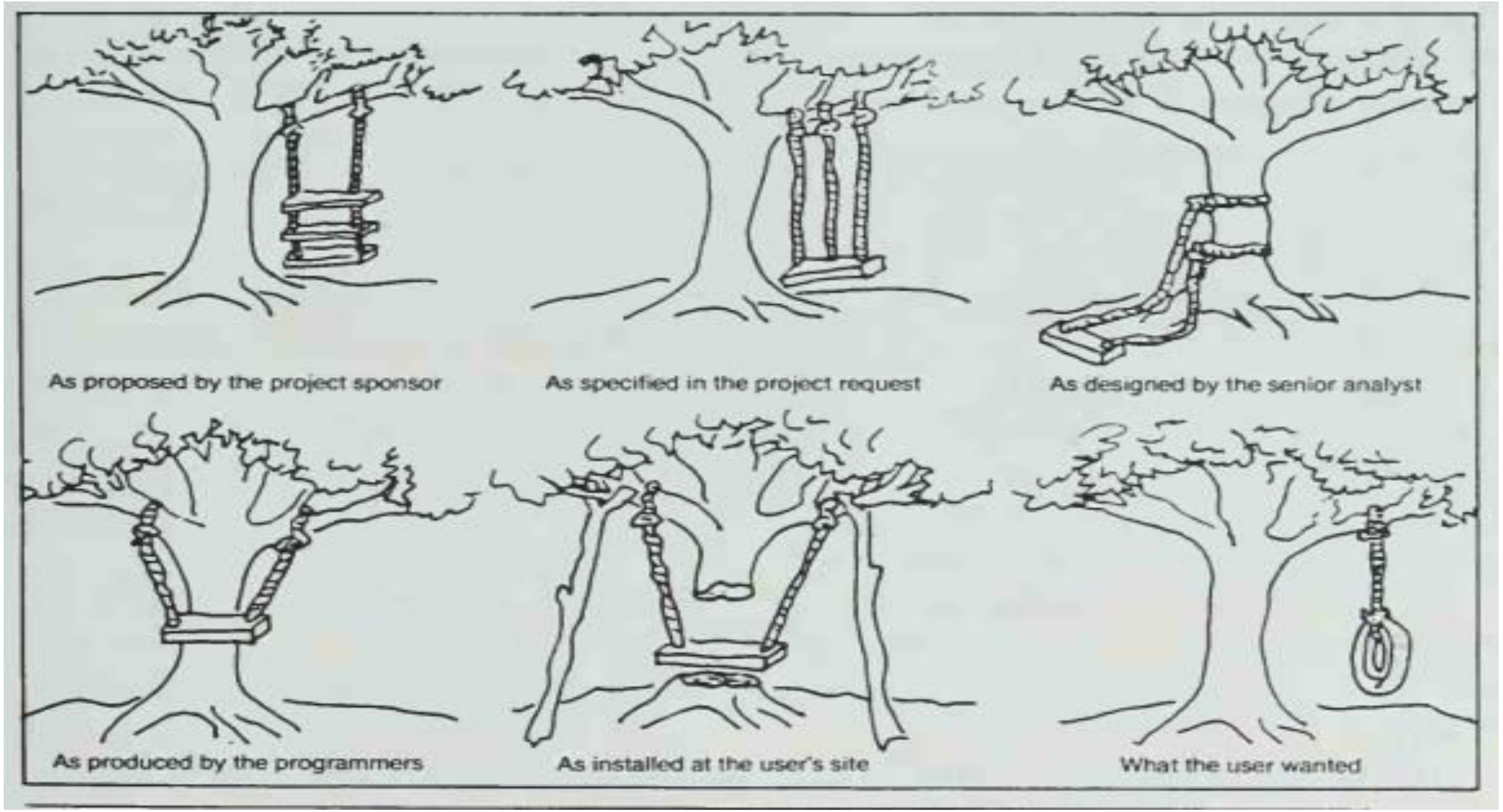
- Tasks:
  - New system completely replaces the old system
  - Parallel approach or pilot approach
  - User training
  - User friendly documentation/ ready the manual

System Maintenance

- Tasks:
  - Corrections of new bugs
  - System adjustments to environmental changes/user changing needs
  - Enhancing the performances

- **There are many reasons a new system does not meet user requirements:**
  - User requirements were not clearly defined or understood. (Ref: figure of the next slide)
  - The user was not directly involved in the crucial phases of system development.
  - The analyst, programmer, or both were inexperienced.
  - The systems analyst (or the project team) had to do the work under strict time constraints. Consequently, not enough thought went into the feasibility study and system design.
  - User training was poor.
  - Existing hardware proved deficient to handle the new application.
  - The new system was not user-friendly.
  - Users changed their requirements.

The Systems Design Procedure



Considerations For Candidate Systems

- The basic problem is to match the demands for services with the available resources. How much one project is favored over another depends on technical, behavioral, and economic factors.
- **The technical factor** involves the system department's ability to handle a project. Much depends on the availability of qualified analysts, designers, and software specialists to do the work.
- **The behavioral factor** involves (1) the user's past experience with an existing system, (2) the success record of the analyst, and (3) the influence the user can exert on upper management to finance a candidate system.
- Perhaps the most important criterion in selecting a project is the economic factor. It focuses on the system's potential return on investment.

Planning and Control for System Success

- First, a plan must be devised, detailing the procedure, some methodology, activities, resources, costs, and timetable for completing the system.
- Second, in larger projects, a project team must be formed of analysts, programmers, a system consultant, and user representatives.
- Finally, the project should be divided into manageable modules to reflect the phases of system development—analysis, design, and implementation.

Planning and Control for System Success

- In planning a project, the following steps should be taken:
  1. Identify the activities in each phase and the tasks within each activity.
  2. Calculate the budget for each phase and obtain agreement to proceed.
  3. Review, record, and summarize progress on activities periodically.
  4. Prepare a project progress report at the end of a reporting month.

Prototyping

- As can be deduced from the discussion on system development, there are two major problems with building information systems:
  (1) the system development life cycle takes too long
  (2) the light system is rarely developed the first time.
- Lengthy development frustrates the user expect users to define their information requirements. It usually turns out that what users ask for is not what they want, and what they want is not what they need.
- An alternative to this "paralysis by analysis" is an advanced technique called prototyping. Prototyping recognizes problems of cognitive style and uses advanced computer technology. It advocates building a simple system through trial and error and refining it through an iterative process.

Prototyping

- The basic steps are:
  1. Identify' the users information and operating requirements.
  2. Develop a working prototype that focuses on only the most important functions, using a basic data base.
  3. Allow the user to use the prototype, discuss requested changes, and implement the most important changes.
  4. Repeat the next version of the prototype with further changes incorporated until the system fully meets user requirement

System Development Life Cycle with Prototyping