# Chapter I

# System Development life cycle



Compiled by Yilkal B.

# Chapter Outline

- *What is system?*
- *System Components*
- *What is System Analysis and Design*
- *System Development Life Cycle (SDLC)*
- *Systems Planning and Selection*

  *o Identifying and selecting Systems Development project*

  *o Initiating and Planning Systems Development project*

  *o Structuring System Process Requirements*

  *o Structuring system Logic Requirements*

  *o Structuring System data Requirements*

# *What is system?*

- The word System is derived from Greek word Systema, which means **an organized relationship between any set of components to achieve some common goal or objective**.
- A system is "an orderly grouping of interdependent components linked together according to a plan to achieve a specific goal."
- It is collection of elements or components that organized for common purpose to accomplish overall tasks or goal or multiple tasks.

  e.g. traffic management system, payroll system, automatic library system, human resources information system.

# *Constraints of a System*

- A system must have **three basic constraints**:

  1. A system must have **some structure and behavior** which is designed to achieve a predefined objective.

  2. Interconnectivity and interdependence must exist among the system components.

  3.The objectives of the organization have a higher priority than the objectives of its subsystems.

# Properties of a System

A system has the following properties

**1. Organization:** It implies structure and order. It is the arrangement of components that helps to achieve **predetermined objectives**.

**2. Interaction:** It is defined by the manner in which the components operate with each other.

✓E.g., in an organization, purchasing department must interact with production department and payroll with personnel department.

**3. Interdependence:** **I** means how the components of a system depend on one another. For proper functioning, the components are coordinated and linked together according to a specified plan. The output of one subsystem is the required by other subsystem as input.

# *Properties of a System*

## 4. Integration

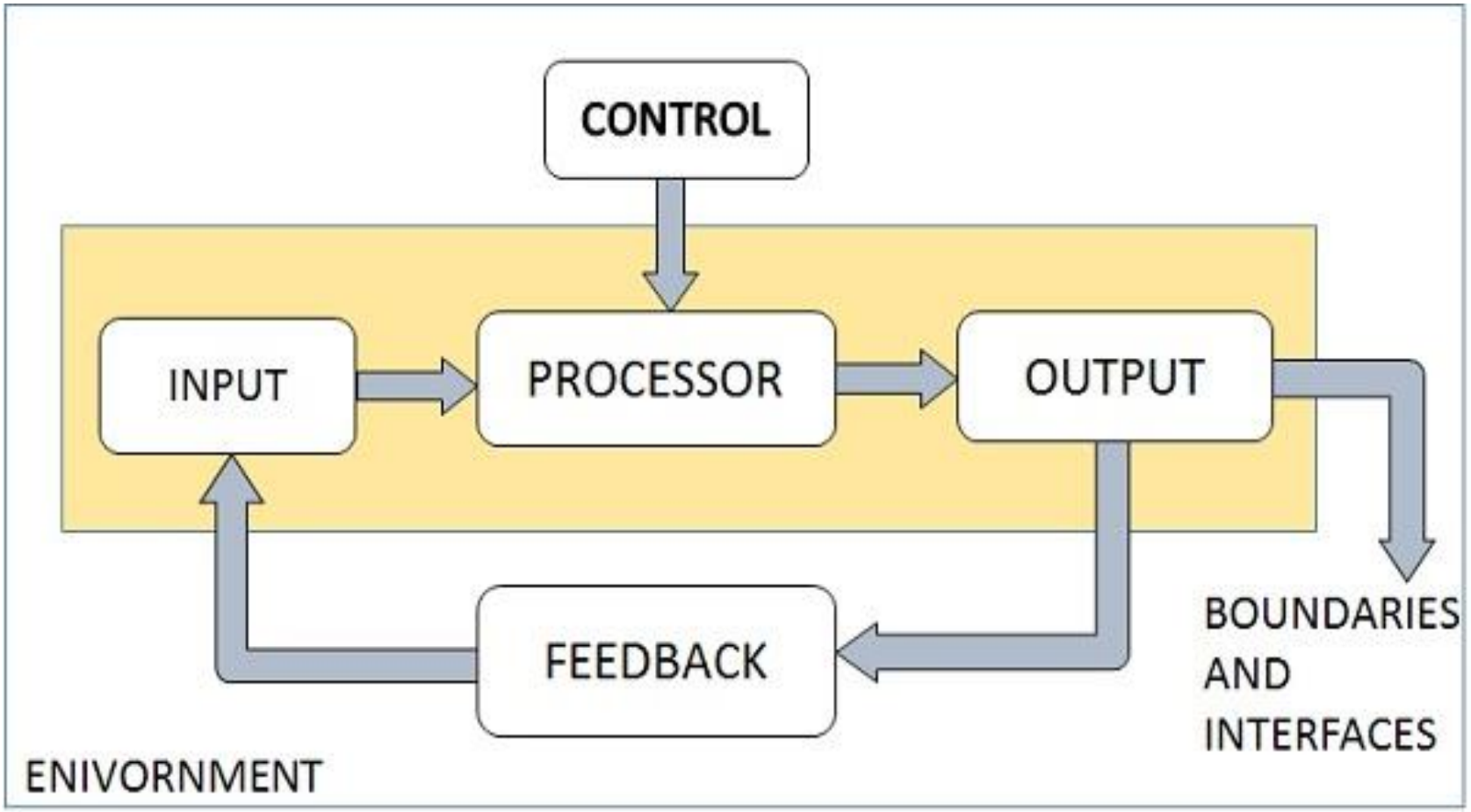
- ✓ It means Integration is concerned with how a system components are connected together.
- ✓ hat the parts of the system work together within the system even if each part performs a unique function.

## 5. Central Objective

- ✓ The objective of system must be **central**.
- ✓ It may be real or stated.
- ✓ The users must know the main objective of a computer application early in the analysis for a successful design and conversion.

# Elements of a System

The following diagram shows the elements of a system



# Cntd…

1. **Outputs and Inputs:** The main aim of a system is to produce an output which is useful for its user.

- ✓ Inputs are the information that enters into the system for processing.
- ✓ Output is the outcome of processing.

**2. Processor(s):** The processor is the element of a system that involves the actual transformation of input into output.

- ✓ It is the operational component of a system.
- ✓ Processors may modify the input either totally or partially, depending on the output specification.
- ✓ As the output specifications change, so does the processing.
- ✓ In some cases, input is also modified to enable the processor for handling the transformation.

# *Cntd…*

**3. Control:** The control element guides the system.

- It is the decision making subsystem that controls the pattern of activities governing input, processing, and output.
- The behavior of a computer System is controlled by the Operating System and software. In order to keep system in balance, what and how much input is needed is determined by Output Specifications.

**4. Feedback:** Feedback provides the control in a dynamic system.

- **Positive feedback** is routine in nature **that encourages** the performance of the system.
- **Negative feedback** is informational in nature that **provides the controller** with information for action.

# *Cntd…*

## 5. Environment:

- it is the "supersystem" within which an organization operates.
- It is the source of external elements that strike on the system.
- **It determines how a system must function.**

## 6. Boundaries and Interface:

- A system should be defined by its boundaries.
- Boundaries are the limits that identify its components, processes, and interrelationship when it interfaces with another system.
- The knowledge of the boundaries of a given system is crucial in determining the nature of its interface with other systems.

# *Types of Systems*

The systems can be divided into the following types

## a. Physical or Abstract Systems

**I. Physical systems:** are tangible entities.

- We can touch and feel them.
- Physical System may be **static** or **dynamic** in nature.

E.g., desks and chairs are the physical parts of computer center which are static.

- A programmed computer is a dynamic system in which programs, data, and applications can change according to the user's needs.

**II. Abstract systems:** are non-physical entities or conceptual that may be formulas, representation or model of a real system.

# Cntd…

## b. Open or Closed Systems

### I. An open system

- It must interact with its environment.
- It receives inputs from and delivers outputs to the outside of the system.
- E.g. an information system which must adapt to the changing environmental conditions.

### II. A closed system

- Doesn't interact with its environment.
- It is isolated from environmental influences.
- A completely closed system is rare in reality.

## C. Adaptive and Non Adaptive System

**I. Adaptive System:** responds to the change in the environment in a way to improve their performance and to survive. E.g. human beings, animals.

**II. Non Adaptive System:** is the system which does not respond to the environment. E.g. machines.

# *Cntd…*

## D. Permanent or Temporary System

**I. Permanent System:** it persists for long time. e.g. business policies.

II. **Temporary System:** it is made for specified time and after that they are demolished.

E.g., A DJ system is set up for a program and it is dissembled after the program.

## E. Natural and Manufactured System

- **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.

# Cntd…

## F. Deterministic or Probabilistic System

- **Deterministic system** operates in a predictable manner and the interaction between system components is known with certainty. For example, two molecules of hydrogen and one molecule of oxygen makes water.
- **Probabilistic System** shows uncertain behavior. The exact output is not known. For example, Weather forecasting, mail delivery.

## G. Social, Human-Machine, Machine System

**I. Social System** is made up of people. E,g., social clubs, societies.

**II. In Human-Machine System**, both human and machines are involved to perform a particular task. E,g., Computer programming.

**III. Machine System** is where human interference is neglected. All the tasks are performed by the machine. E.g., an autonomous robot.

# *Cntd…*

## IV. Man–Made Information Systems

- It is an interconnected set of information resources to manage data for particular organization, under Direct Management Control (DMC).
- This system includes hardware, software, communication, data, and application for producing information according to the need of an organization.

**Man-made information systems are divided into three types:**

1. **Formal Information System:** It is based on the flow of information in the form of memos, instructions, etc., from top level to lower levels of management.
2. **Informal Information System:** This is employee based system which solves the day to day work related problems
3. **Computer Based System:** This system is directly dependent on the computer for managing business applications. E,g., automatic library system.

# *Components of System*

- Components of system are parts of system.

**Components of information systems:**

- An information system is essentially made up of **five components**.

1. Hardware consists of input/output device, processor, operating system etc.
2. Software consists of various programs and procedures.
3. Database consists of data organized in the required structure.
4. Network consists of hubs, communication media and network devices.
5. People consist of device operators, network administrators and system specialist.

- **Information processing consists** of input; data process, data storage, output and control.

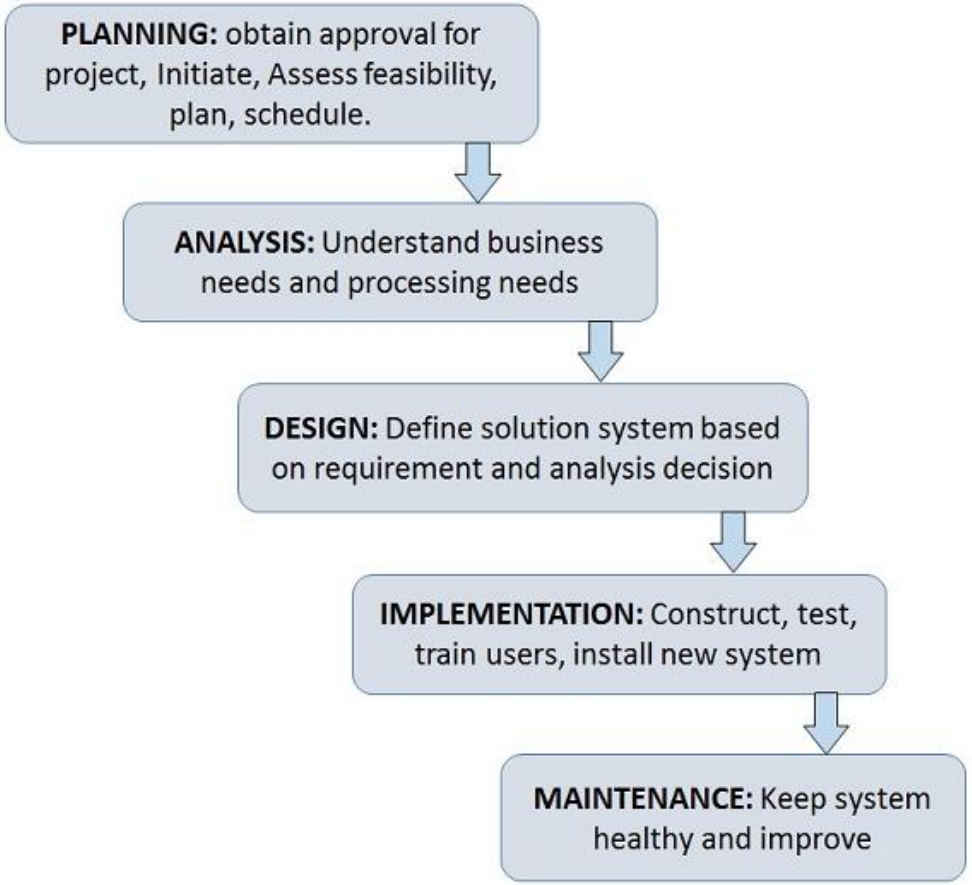
# System Development Life Cycle ( SDLc)

- SDLC is a conceptual model which includes **policies** and **procedures** for developing or altering systems throughout their life cycles.
- SDLC is used by analysts to develop an information system.
- An effective SDLC should result in a **high quality system** that meets customer expectations, reaches completion **within time** and **cost evaluations**, and works effectively and efficiently.
- SDLC includes the following activities:−

- Requirements
- Design
- Implementation
- Testing
- Deployment
- Operations
- Maintenance

# *Phases of SDLC*

- SDLC is a **systematic approach** which explicitly ***breaks down the work*** into phases that are required to implement either **new** or **modified Information System.**



# *Cntd…*

## 1. Planning or Feasibility Study

- **Define the problem** and **scope** of existing system.
- Overview the new system and determine its objectives.
- Confirm project feasibility and produce the **project Schedule**.
- During this phase, threats, constraints, integration and security of system are also considered.
- **A feasibility report** for the entire project is created at the end of this phase.

## 2. Analysis and Specification

- Gather, analyze, and validate the information.
- Define the **requirements** and **prototypes** for new system.
- Evaluate the alternatives and prioritize the requirements.
- Examine the information needs of end-user and enhances the system goal.

# Cntd …

- **A software Requirement Specification (SRS) document**, which specifies the software, hardware, functional, and network requirements of the system is prepared at the **end of this phase**.

## 3. System Design

- Includes the design of application, network, databases, user interfaces, and system interfaces.
- Transform the SRS document into **logical structure**, which contains detailed and complete set of specifications that can be implemented in a programming language.
- **Create a contingency**, training, **maintenance**, and operation plan.
- **Review the proposed design. Ensure that the final design must meet the requirements stated in SRS document**.
- Finally, **prepare a design document** which will be used during next phases

# *Cntd…*

## 4. Implementation

- Implement the design into **source code** through coding.
- Combine all the modules together into **training environment** that detects errors and defects.
- **A test report** which contains errors is prepared through test plan that includes test related tasks such as **test case generation**, testing criteria, and resource allocation for testing.
- **Integrate the information system into its environment and install the new system.**

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## 5. Maintenance / Support

- Include all the activities such as **phone support** or **physical on-site support** for users that is required once the system is installing.
- Implement the changes that software might undergo over a period of time, or implement any new requirements after the software is deployed at the customer location.
- It also includes **handling the residual errors** and resolve any issues that may exist in the system even after the testing phase.
- Maintenance and support may be needed for a **longer time** for large systems and for a short time for smaller systems.

# Cntd…

| Phase | Products, out puts, or Deliverables |
|---|---|
| System Planning & Selection | - priorities for systems and projects<br>- architecture of data, networks, hardware, and IS management<br>- detailed work plan for selected project<br>- specification of system scope<br>- system justification or business case |
| System Analysis | - description of current system<br>- general recommendation on how to fix, enhance or replace current system<br>- explanation of alternative systems, and justification for chosen alternative |
| System Design | - detailed specification of all system elements<br>- acquisition plan for new technology |
| System Implementation & Operation | - code<br>- documentation<br>- training procedures and support capabilities<br>- new versions or releases of software with associated updates to documentation, training and support |

# System Analysis and Design (SAD)- Overview

- Systems development is systematic process which includes phases such as:
  - planning,
  - analysis,
  - design,
  - deployment, and
  - maintenance.
- We will primarily focus on
  - ✓ Systems analysis
  - ✓ Systems design

# *Systems Analysis*

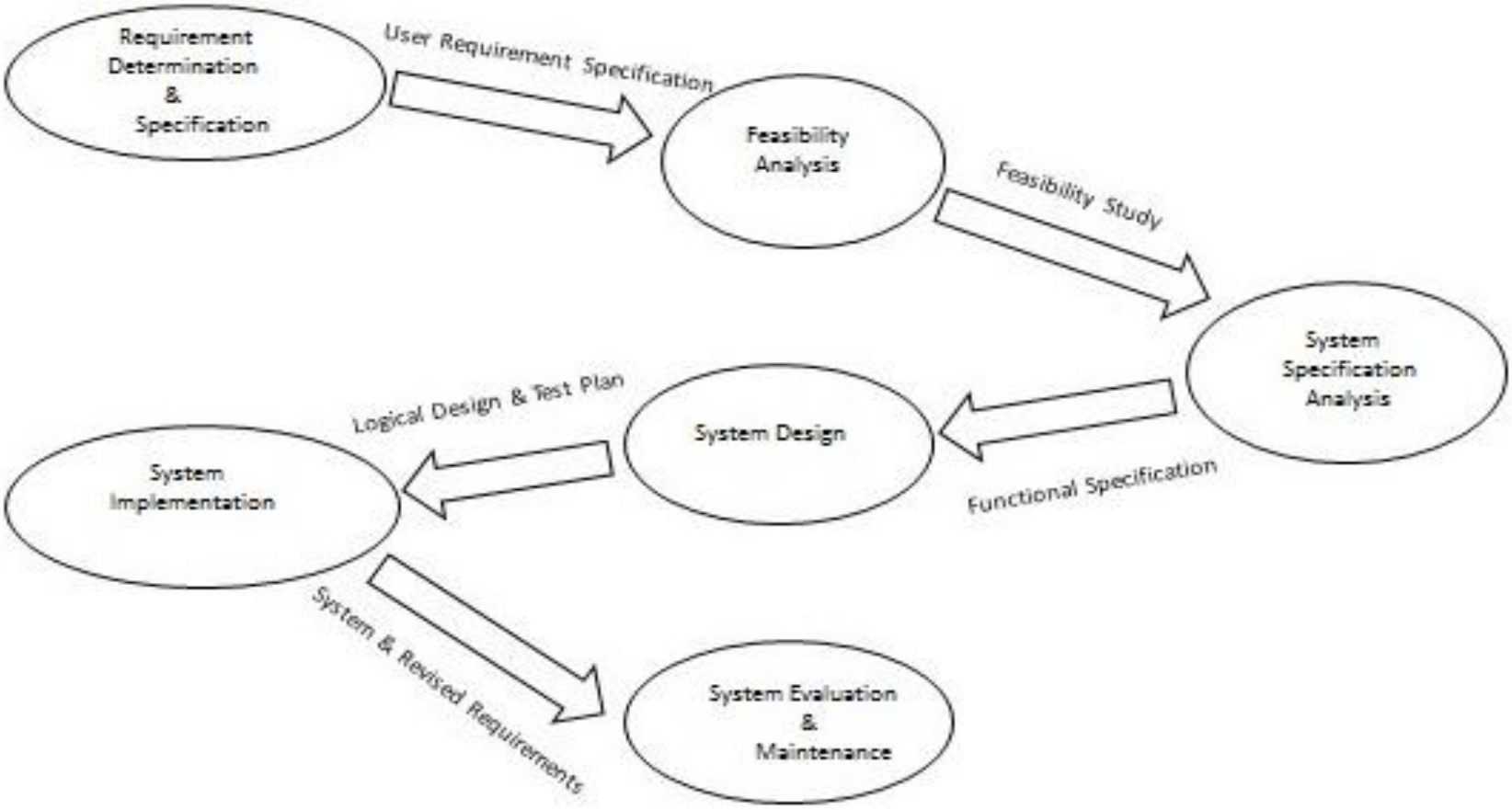
- **Systems analysis** is the part of the SDLC in which you determine how a current information system in an organization functions.
- It is a process of collecting and interpreting facts, identifying the problems, and **decomposition** of a system into its components.
- It is conducted for **the purpose of studying a system** or its parts **in order to identify its objectives**.
- It is a **problem solving technique** that improves the system and ensures that all the components of the system work efficiently.
- Analysis specifies **what the system should do.**
- There are three parts to system analysis: **determining requirements**, **structuring requirements**, and selecting the best alternative design strategy.

# Systems Design

- It is a process of **planning a new business system** or **replacing an existing system** by defining its components or modules to satisfy the specific requirements.
- **Before planning**, you need to understand the old system carefully and determine how computers can best be used in order to operate efficiently.
- System Design focuses on **how to accomplish the objective** of the system.
- System Analysis and Design (SAD) mainly focuses on:
  - Systems
  - Processes
  - Technology

# Life Cycle of System Analysis and Design

- The following diagram shows the complete life cycle of the system during analysis and design phase.



# *What is Information System Analysis & Design?*

- Information SAD is the process of developing and maintaining an information system.
- The main goal of SAD is to **improve the organizational systems** that can help employees accomplish tasks more easily and efficiently.
- The analysis and design of information systems are based on:
  - Your understanding of the organizations objective, structure and process.
  - Your knowledge of how to exploit information technology for advantage.
- In order to understand and follow the software engineering process that leads to the creation of information system, proven **methodologies**, **techniques**, and **tools** are central to software engineering process.

# *Cntd…*

- **Methodologies:** are sequences of step by step approaches that help develop your final project the information system.
- **Techniques:** are processes that you, as a system analyst, will follow to help ensure that your work is well thought out, complete, and comprehensible to others on your project team.
- **Tools:** are computer programs, such as Computer Aided Software Engineering (CASE) tools, that make it easy to use specific techniques.

# *Types of Information System*

- There are actually **several different types** of classes of information systems.
- These classes are distinguished from each other on the basis of **what the system does** or **by the technology used to construct the system**.
- As a system analyst working as part of a team, you will work with at least four classes of information system.

1. Transaction processing system.
2. Management information system (Business support system).
3. Decision support system (for individuals, groups, and executives).
4. Expert systems (Knowledge management System).

# *Types of Information System*

## 1.Transaction Processing System(TPS)

- It automates the handling of data about business activities or transaction.
- For E.g., a banks tps would capture information's about withdrawals from and deposits to customers accounts.
- **The goal of TPS development** is to **improve transaction processing** by speeding it up, using fewer people, improving efficiency and accuracy, integrating it with other organizational information systems, or providing information not previously available.

# *Cntd…*

2. **Management Information System(MIS) (Business Support Systems)**

- It is a computer based information system that takes the raw data available through a TPS and converts them into a meaning full aggregated form.
- These systems can analyze transactional data, generate information needed to manage and control business process, and provide information that leads to better **decision making**.

E.g., whereas a TPS keeps track of sales, a MIS can pinpoint which items are selling slowly and which are selling quickly.

- The MIS system can direct the manufacturing department on what to produce and when.
- An important feature of an MIS is decision support capability to conduct a what ~~if~~ analysis.

# *Cntd…*

**3. Decision Support System(DSS):** It is designed to help decision makers with decisions.

- Whereas, an **MIS produces a report**, a DSS provides an interactive environment in which decision makers can quickly manipulate data and models of business operations.
- **A DSS has three parts:**
  - The first part is composed of a database (may be extracted from TPS or MIS).
  - The second part consists of **mathematical** or **graphical models** of business process.
  - The third part is made up of a **user interface** that provides a way for the decision maker to communicate with the DSS.
- A DSS is characterized by less structured and predictable use.
- DSS software supports certain decision making activities.

# *Cntd…*

4. **Expert System (Knowledge Management System)**

- An expert system (ES) is **different from** any of the other classes of information systems.
- The ES replicates the decision making process rather than manipulating information.
- Typically users communicate with an ES through an interactive dialog.
- The ES asks question (which an expert would ask) and the user supplies the answers.
- The answers are then used to **determine which rules apply**, and the ES provides a recommendation based on the rules.

# *Project management*

- **A project** is a planned undertaking of series of related activities to reach an objective that has a beginning and an end.
- Project management is an important aspect of the development of information systems and a critical skill for a system analyst.
- The focus of project management is to assure that system development projects **meet customer expectations** and are delivered within the time constraints.
- The project manager is a system analyst with a various set of skills- management, leadership, technical and customer relationship.
- project manager is responsible for **initiating**, **planning**, **executing**, and **closing** down the systems development project.

# Project management

- The project management process involves 4 phase

**1. Initiating the project:** During this phase, the project manager performs several activities.

- Evaluate the size, scope, and complexity of the project.
- Establishes procedures to support subsequent activities.

**2. Planning the project:** This phase involves defining clear, discrete activities and the

- work needed to complete each activity within a single project.

3. **Executing the project:** This phase puts the baseline project plan into action.

- Number of activities must be performed in this phase as well.

**4. Closing the project:** □ Close Project Phase is the process of finalizing all activities for the project, phase, or contract.

- To bring the project to an end.
- Projects can conclude with a natural or unnatural termination.

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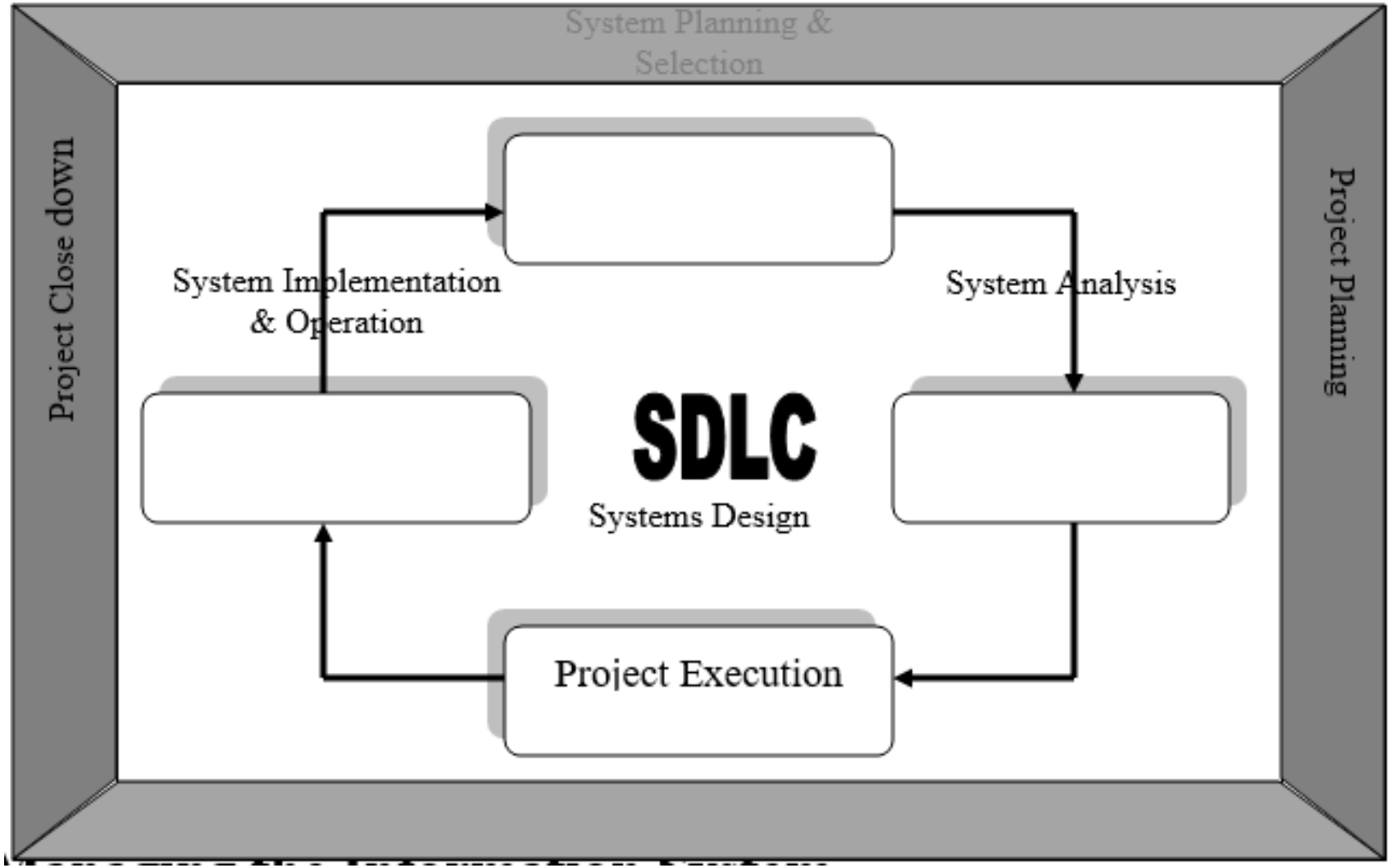

System Planning &
Selection
Project Close down
Project Planning
System Implementation
& Operation
System Analysis
SDLC
Systems Design
Project Execution

# *Cntd…*

**Requests for information system development can come from three key sources.**

a. **Managers and business units** who want to replace or extend an existing system in order gain needed information or to provide a new service to customers.

b. **Managers** who want to make a system more efficient, less costly to operate, or want to move a system to a new operating environment.

c. **Formal planning groups** that want to improve an existing system in order to help the organization meet its corporate objectives, such as providing better customer service.

# *Cntd…*

## Role of System Analyst

- The system analyst is **a person** who is thoroughly aware of the system and guides the system development project by giving proper directions.
- He is an expert having **technical** and **interpersonal skills** to carry out development tasks required at each phase.
- He pursues to match the **objectives of information** system with the organization goal.

# Cntd…

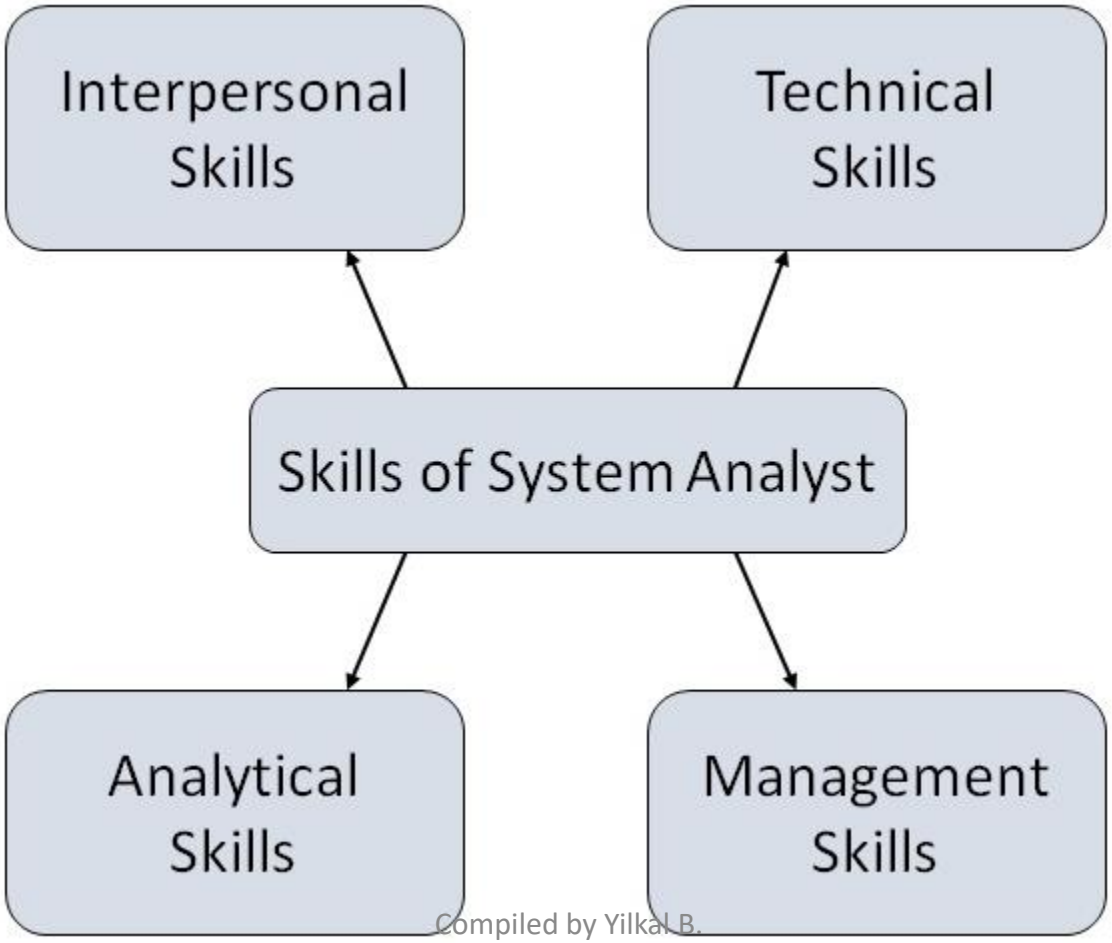
**Main Roles:** Defining and understanding the requirement of user through various Fact finding techniques.

- Prioritizing the requirements by obtaining user consensus.
- Gathering the facts or information and acquires the opinions of users.
- Maintains analysis and evaluation to arrive at appropriate system which is more user friendly.
- Suggests many **flexible alternative solutions**, pick the best solution, and quantify cost and benefits.
- Draw certain specifications which are easily understood by users and programmer in precise and detailed form.
- **Implemented the logical design of system which must be modular.**
- Plan the periodicity for evaluation after it has been used for some time, and modify the system as needed.

# Cntd …

## Attributes of a Systems Analyst

- The following figure shows the attributes a systems analyst should possess



# Cntd…

## Interpersonal Skills

- Interface with users and programmer.
- Facilitate groups and lead smaller teams.
- Managing expectations.
- Good understanding, communication, selling and teaching abilities.
- Motivator having the confidence to solve queries.

## Analytical Skills

- System study and organizational knowledge
- Problem identification, problem analysis, and problem solving
- Sound commonsense
- Ability to access trade-off
- Curiosity to learn about new organization

# *Cntd …*

## Management Skills

- Understand users jargon and practices.
- Resource & project management.
- Change & risk management.
- Understand the management functions thoroughly.

## Technical Skills

- Knowledge of computers and software.
- Keep abreast of modern development.
- Know of system design tools.
- Breadth knowledge about new technologies.

# *Information Gathering Techniques*

- The main aim of fact finding techniques is to determine the information requirements of an organization used by analysts to prepare a precise SRS understood by user.
- Ideal SRS document should:−
  - be complete, Unambiguous, and Jargon-free.
  - specify operational, tactical, and strategic information requirements.
  - solve possible disputes between users and analyst.
  - use graphical aids which simplify understanding and design.
- There are various information gathering techniques −

- Interviewing
- Questionnaires
- Review of Records, Procedures, and Forms
- Joint Application Development (JAD)
- Secondary Research or Background Reading
- Observation

# *Cntd…*

**A. Interviewing:** It can be done in two ways:−

**I. Unstructured Interview: t**he system analyst conducts question-answer session to acquire basic information of the system.

**II. Structured Interview:** It **has standard** questions which user need to respond in either close (objective) or open (descriptive) format.

## Advantages of Interviewing

- This method is the best source of gathering **qualitative information**.
- It is useful for them, who do not communicate effectively in writing.
- Information can easily be validated and cross checked immediately.
- It can handle the complex subjects.
- It is easy to discover key problem by seeking opinions.
- It bridges the **gaps in the areas of misunderstandings** and minimizes future problems.

# Cntd…

**B. Questionnaires:** used by analyst to gather information about various issues of system from large number of persons.

There are two types of questionnaires −

**I. Open-ended Questionnaires:** It consists of questions that can be easily and correctly interpreted.

**II. Closed-ended Questionnaires:** It consists of questions that system analyst effectively **lists all possible responses**, which are mutually exclusive.

**Advantages of questionnaires**

- **It is very effective in surveying interests, attitudes, feelings, and beliefs of users**
- It is useful to know what proportion of a given group approves/ disapproves
- It is useful to determine the overall opinion to the system project.
- **It is more reliable and provides high confidentiality of honest responses**.
- It is appropriate for electing for **statistical data collection**

# Cntd…

**C. Review of Records, Procedures, and Forms:** Review of existing records, procedures, and forms helps to seek insight into a system which describes the current system capabilities, its operations, or activities.

**Advantages**

- It helps user to **gain some knowledge** about the organization.
- It helps in documenting current operations within short span of time .
- It can provide a clear understanding about the transactions that are handled in the organization, identifying input for processing, and evaluating performance.
- It can help an analyst to understand the system in terms of the operations that must be supported.
- It describes the problem, its affected parts, and the proposed solution.

# *Cntd…*

**D. Observation:** This is a method of gathering information by noticing and observing the people, events, and objects.

- The analyst visits the organization to observe the working of current system and understands the requirements of the system.
- **Advantages**
  - It is a direct method for gaining information.
  - It is useful in situation where **authenticity of data** collected is in question
  - It produces more accurate and reliable data.
  - It produces all the aspect of documentation that are incomplete and outdated.

# *Cntd…*

**E. Joint Application Development (JAD):** It is a new technique developed by **IBM** which brings **owners**, **users**, **analysts**, **designers,** and builders to define and design the system using organized and intensive workshops.

- JAD trained analyst act as facilitator for workshop who has some specialized skills.
- **Advantages of JAD**
  - It **saves time** and cost by replacing months of traditional interviews
  - It is useful in organizational culture which supports joint problem solving.
  - Raises formal relationships **among multiple levels of employees**.
  - It can lead to development of **design creatively**.
  - It **Allows rapid development** and improves ownership of information system.

# Cntd…

## F. Secondary Research or Background Reading

➢ This method is widely used for information gathering by accessing the gleaned information.

➢ It includes **any previously gathered information** used by the marketer from any internal or external source.

**Advantages**

- ❖ It is more openly accessed with the **availability of internet**.
- ❖ It provides valuable information with **low cost and time**.
- ❖ It act as forerunner to primary research and aligns the focus of primary research.
- ❖ It is used by the researcher to **conclude if the research is worth** it as it is available with procedures used and issues in collecting them.

# A. Systems Planning and Selection

- The Process of Identifying and Selecting Information Systems Development Project.
- Project identification and selection consists **of three primary activities**:

I. identifying potential development projects,

II. classifying and ranking projects, and

III. selecting projects for development.

**1. Identifying potential development projects:** this process can be performed by

- A key member of top management
- A steering committee (mangers with an interest in systems.
- User departments.
- The development group or a senior manager.

**Note**: Projects identified by **top management committee** are referred to as coming **from a top down source** and if it is from mangers, business units, or the development group are referred to as coming from a **bottom - up source**.

# *Cntd…*

## 2. Classifying and ranking projects:

- Assessing **the merit** of potential project is the **second major activity** in the project identification and selection phase.
- As with project identification, classifying and ranking projects can be performed by top mangers, **a steering committee**, business units, or the IS development group.
- **The following are the criteria commonly used to evaluate projects**.

  a) value chain analysis

  b) strategic alignment

  c) potential benefits

  d) resource availability

  e) project size/duration

  f) technical difficulty/risks

# Cntd…

## 3. Selecting projects for development

- The selection of projects is the **final activity** in the project identification and selection phase.
- The primary **deliverable, or end product**, from the project identification and selection phase is a **schedule of specific IS development project**.
- These projects come from both **top-down** and **bottom-up sources**, and once selected they move into the second activity, **project initiation and planning**.

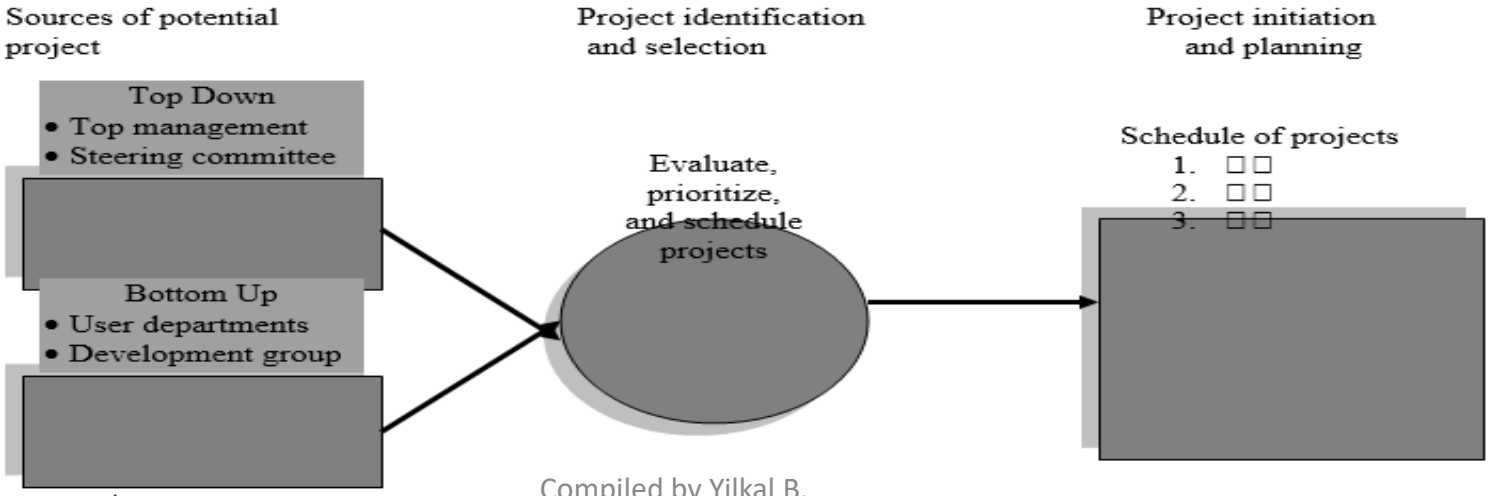



Figure 1 information system development projects come from both top-down and bottom-up initiative.

# *Initiating & Planning Systems Development Project*

- The objective of project initiation and planning is to transform a **vague system** request document into a **tangible project description**.
- There are two major activities that occur during project initiation and project planning that **project initiation** and **project planning.**

**A. Project initiation**:

- focuses on activities that will help organize a team to conduct project planning.
- There are five basic activities performed during project initiation.

1. Establishing the project initiation team.
2. Establishing a relationship with the customer.
3. Establishing the project initiation plan.
4. Establishing management procedure
5. Establishing the project management environment and **project workbook**.

# *Cntd…*

**B. Project planning:** the second activity which focuses on **defining clear**, *discrete tasks* and the work needed to complete each task.

- The objective of the project planning process is to **produce two documents:** a Baseline Project Plan (BPP) and the Statement of Work (SOW).
- The following are the activities performed during project planning.

1. Describing the **project scope**, alternatives and ***feasibility***.
2. **Dividing the project into manageable tasks.**
3. Estimating resources and creating a resource plan.
4. Developing a **preliminary schedule**.
5. Developing a communication plans
6. Determining project standards and procedures
7. Identifying and assessing **risks**.
8. Creating a preliminary budget.
9. Developing a **statement of work**.
10. Setting a **base line project plan**.

# *Cntd…*

- The major outcomes and deliverables from project initiation and planning are the Baseline Project Plan and the Statement of Work.
- **The Baseline Project Plan (BPP):** contains all information collected and analyzed during the ***project initiation and planning activity***.
- The plan reflects the best estimate of the projects scope, benefits, **costs**, **risks**, and **resource requirements** given the current understanding of the project.
- **The Statement of Work (SOW):** is a short document prepared for the customer that describes what the project will deliver and **outlines all work** required complete the project.
- The SOW is a useful communication tool that assures that both you and your customer have a common understanding of the project.

## Building the Baseline Project Plan

- All the information's collected during project initiation and planning are collected and organized into a document called the Baseline Project Plan.
- An outline of a baseline project plan contains **four major** sections.
  1. Introduction
  2. System description
  3. Feasibility assessment
  4. Management issue
- The purpose of the introduction is to provide a **brief overview** of the entire document and outline a recommended course of action for the project.
- The introduction is often limited to **only a few pages.**

# *Cntd…*

## ❑ Assessing Project Feasibility:

- the specifics of a given project will dictate which factors are most important.
- Most feasibility factors fall into the following six categories:
  - ✓ Economic
  - ✓ Operational
  - ✓ Technical
  - ✓ Schedule
  - ✓ Legal and Contractual
  - ✓ Political
- The analysis of these six factors forms the business case that justifies the spending of resources on the project.

# Cntd…

I. **Assessing Economic Feasibility:** A process of identifying the **financial benefits** and **costs** associated with a development project.

- **Economic feasibility** is often **referred** to as **cost-benefit analysis.**
- **Determining Project Benefits**: an information system can provide many benefits to an organization. These benefits are both tangible and intangible.

A. **Tangible Benefits:** is an item that can be **measured in dollars** and with **certainty**. E.g., of tangible benefits include reduced personnel expense, lower transaction costs, or higher profit margins. It include costs of hardware costs, labor costs, and operational costs from employee training and building innovations.

- Most tangible benefits fit in one or more of the following categories.

- Cost reduction and avoidance
- Error reduction
- Increased flexibility
- Increased speed of activity
- Improvement of management planning and control
- Opening new markets and increasing sales opportunities

# *Cntd…*

**B. Intangible Benefits:** refer to items that can't be easily measured dollars or with certainty.

- Intangible benefits may have direct organizational benefits, such as **improvement of employee morale**, customer goodwill, or operational efficiency. or they may have broader societal implications, such as the reduction of waste creation or resource consumption.
- Intangible benefits include:
  - Competitive necessity
  - Increased organizational flexibility
  - Increased employee morale
  - Promotion of organizational learning and understanding
  - More timely information

# Cntd…

- Beside tangible and intangible costs, you can distinguish system related **development costs as either one time or recurring.**

- **A One time cost** refers to a cost associated with project initiation, development, and the start up of the system.

These costs encompass the following activities:

- System development
- New hardware and software purchase
- User training
- Site preparation
- Data or system conversion

- **A recurring cost** refers to a cost resulting from the **ongoing evolution** and use of the system.

E.g., of these costs typically include:

- Application software maintenance
- Incremental data storage expense
- Incremental communications
- New software and hardware rent
- Consumable supplies and other expenses.

(e.g., paper, forms, data center personnel)

# Cntd…

## ❑ Assessing Other Feasibility Concerns

**I. Operational Feasibility:** the process of assessing the degree to which a proposed system solves business problems or takes advantage of business opportunities.

**II. Technical Feasibility:** the process of assessing the development organizations ability to construct the proposed system.

**III. Schedule Feasibility:** the process of assessing the degree to which the potential time frame and completion dates for all major activities within a project meet organizational deadlines and constraints for affecting change.

**IV. Legal and Contractual Feasibility:** the process of assessing potential legal and contractual consequences due to the construction of a system.

**V. Political Feasibility:** the process of evaluating how key stakeholders within the organization view the proposed system. Etc.

# *Cntd…*

- **There are three parts to system analysis**:
  - **A. determining requirements**,
  - **B. structuring requirements**, and
  - **C. selecting the best alternative design strategy.**

## A. The process of determining requirements

- During requirement determination, you and other analysts gather information on **what the system should do** from as many sources as possible.

  Such sources include users of the current system, reports, forms, and procedures.
- **Deliverables and Outcomes:** The **primary deliverables** from requirement determination are the **types of information gathered** during the determination process.

# Cntd…

| Traditional Method | Activities Involved |
|---|---|
| Interviews with individuals | Interview individuals informed about the operation and issue of the current system and needs for the systems in future organizational activities. |
| Questionnaire | Survey people via questionnaire to discover issues and requirements. |
| On job observation | Observe workers at selected times to see how data are handled and what information people need to do their jobs. |
| Business documents | Study business documents to discover reported issues, policies, rules, and directions as well as concrete examples of the use of data and information in the organization. |

Modern methods for determining system requirement joint Application design(JAD)

# *Cntd…*

## B. Structuring System Requirement

- During requirement structuring you study the requirements and structure them according to their interrelationships, eliminating the redundancies.
- **There are three primary activities** performed during requirement structuring.
  - I. Process Modeling
  - II. Logic Modeling
  - III. Conceptual Data Modeling

## I. Process Modeling

- It involves **graphically representing the process**, or actions, that capture, manipulate, store, and distribute data between a system and its environment among components with in a system.
- A common form of a process model is a **Data Flow Diagram (DFD).**

# *Cntd…*

- A DFD is a graphic that illustrates the movement of data between external entities and the process and data stores with in a system.
- The analysis team begins the process of structuring requirements with an abundance of information gathered during requirements determination.
- In structured analysis, the **primary deliverables** from process modeling are a set of coherent, interrelated data flow diagrams.
- **Deliverables of the process modeling are**:
  - Context DFD
  - DFDs of current physical system
  - DFDs of new logical system
  - Through description of each DFD component

# *Cntd…*

- **First**, a context DFD shows the scope of the system, indicating which elements are inside and outside the system.
- **Second,** DFD of the current system specify which people and technologies are used in which process to move and transform data, accepting inputs, and producing outputs.
- **Third** technology independent or new logical DFD shows the data flow structure and functional requirements of the new system.
- **Finally**, entries for all of the objects included in all diagrams are included in the project dictionary or CASE repository.
- DFDs are versatile diagramming tools with only **four symbols**.
- It can represent both **physical** and **logical** information systems.
- The four symbols in the DFD represent **data flows**, **data stores**, **processes**, and **sources/sinks (external entities).**

# *Cntd…*

**II. Logic Modeling:** It involves **representing the internal structure and functionality** of the processes represented on DFD.

- Although DFD are very good for identifying process, they do not show the logic inside the process.
- There are two methods used most commonly modeling system process.
  1. Structured English
  2. Decision Tables

**1) Modeling Logic with Structured English**

- Starting with the processes depicted in the various sets of DFD you and others on the analysis team have produced, you must now begin to study and document the logic of each process.
- **Structured English:** is a modified form of English that is used to specify the contents of process boxes in DFD.

# *Cntd…*

- It uses a subset of **English vocabulary** to express information system process procedures.
- Structured English uses **strong verbs** such as read, write, print, sort, move, merge, add, subtract, multiply, and divide.
- Unlike regular English, structured English does not use adjectives or adverbs.
- It is possible to use structured English to represent all three processes typical to structured programming: sequence, conditional statements, and repetitive.

E.g. Conditional statements can be represented with a structure like the following.

```
BEGIN IF
    IF Quantity-in-stock is less than Minimum-order-quantity
    THEN GENERATE new order
     ELSE DO nothing
END IF
```

# Cntd…

## 2) Modeling Logic with Decision Tables

- If **several different conditions are involved**, and combinations of these conditions dictated, then structured **English may not be adequate** for representing the logic behind such a **complicated choice**.
- A Decision Table is a diagram of process logic where the logic is reasonably complicated. All of the possible choices and the conditions of the choices depend on are represented in tabular form.

**Example**

| | Conditions/Courses of Action | Rules | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Condition Stubs | Employee Type | S | H | S | H | S | H |
| | Hours Worked | <40 | <40 | 40 | 40 | >40 | >40 |
| | | | | | | | |
| Action Stubs | Pay Base Salary | X | | X | | X | |
| | Calculate Hourly Wage | | X | | X | | X |
| | Calculate Overtime | | | | | | X |
| | Produce Absence Report | | X | | | | |

In constructing a decision tables, you may actually follow a set of basic procedures,

## III. Conceptual Data Modeling and the Entity-Relationship (E-R) Diagram

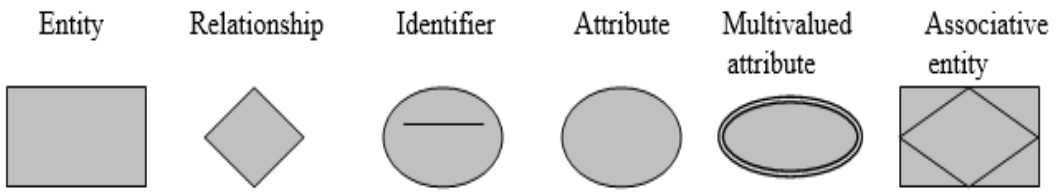
- The goal of conceptual data model is to capture as much of the meaning of data as possible.
- The more details (or what some systems analysts call **business rule**) about data that we can model, the better the system we can design and build.
- **The purpose of a conceptual data model** is to show as many rules about the meaning and interrelationships among data as possible.
- E-R data models are commonly used diagrams that show how data are organized in an information system.
- **The main goal** of conceptual data modeling is to **create accurate E-R diagrams**

# Cntd…

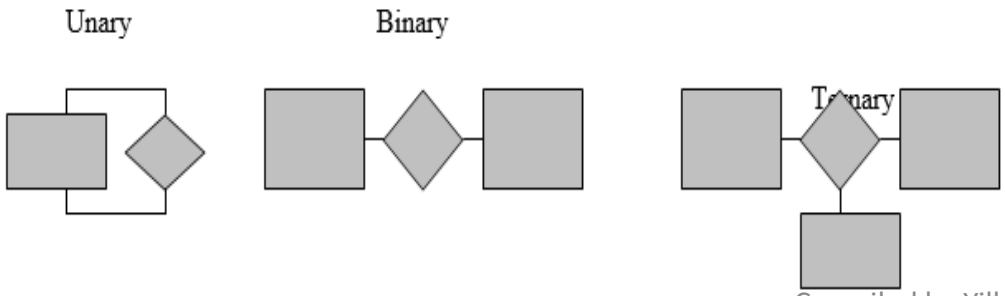
## Introduction to Entity-Relationship (E-R) Modeling

- E-R diagram is a detailed logical and graphical representation of the **entities**, **associations**, and **data elements** for an organization or business area.
- The basic entity-relationship modeling notation uses **three main constructs**: data entities, relationships, and their associated attributes.

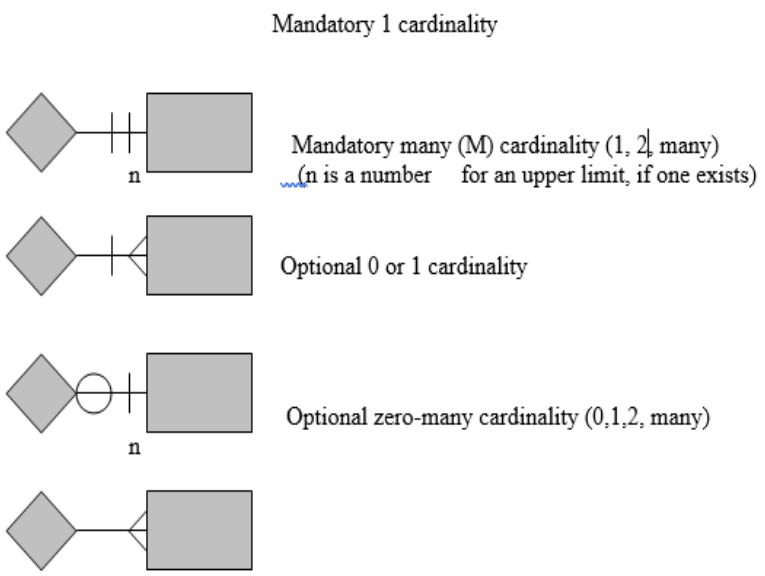
**Basic Symbols**




**Relationship degree**




**Relationship Cardinality**



# Cntd…

**Entities:** **An entity is a person**, place, object, event or concept.

Some examples of entity are:

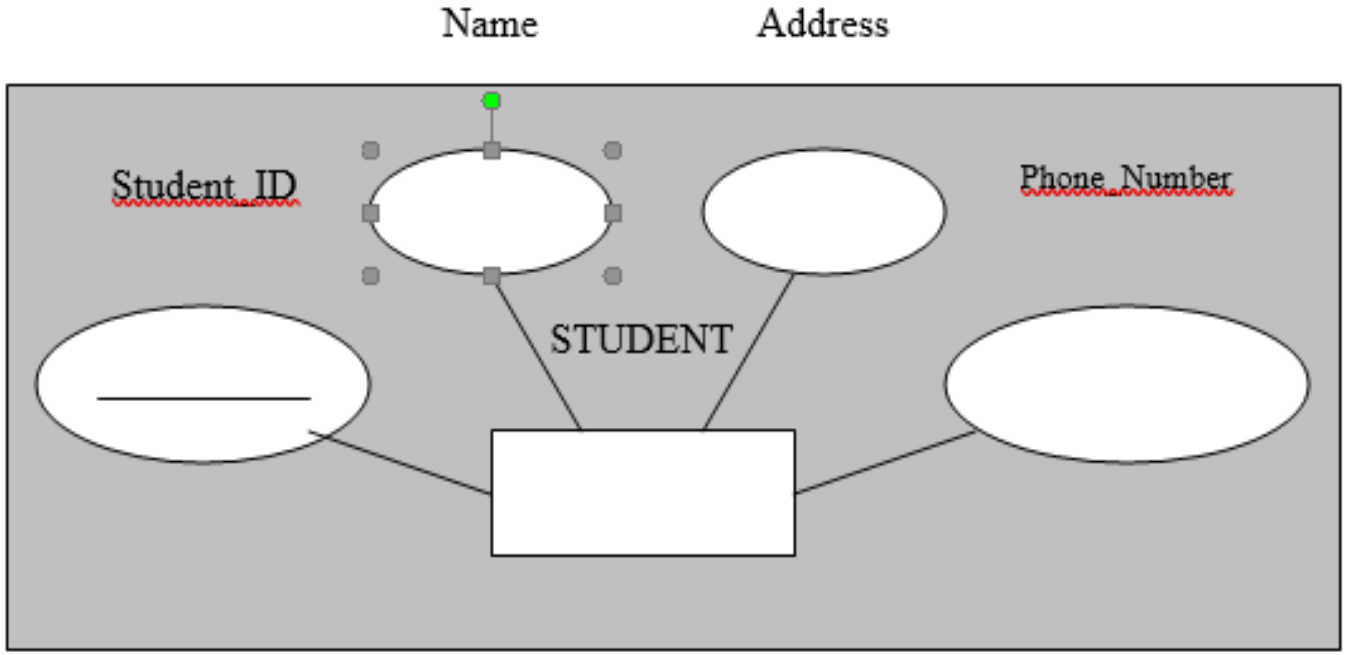
- Person: EMPLOYEE, STUDENT, PATIENT
- Place: STATE, REGION COUNTRY, BRANCH
- Object: MACHINE, BUILDING, AUTOMOBILE, PRODUCT
- Event: SALE, REGISTRATION, RENEWAL
- Concept: ACCOUNT, COURSE, WORK CENTER

**Attributes:** A named property or characteristics of an entity that is of interest to the organization.

Following are some typical entity types and associated attributes:

- STUDENT: Student_ID, Student_Name, Address, Phone_Number

**Identifiers:** A candidate key that has been selected as the unique, identifying characteristics for an entity type. E,g., from Student.




**Multivalued Attribute**

- An attribute that may take on more than one value for each entity instance. Suppose that Dep_Name (dependant name) is one of the attributes of EMPLOYEE.
- If each employee can have more that one dependent, Dep_Name is a multivalued attribute.

# Cntd…

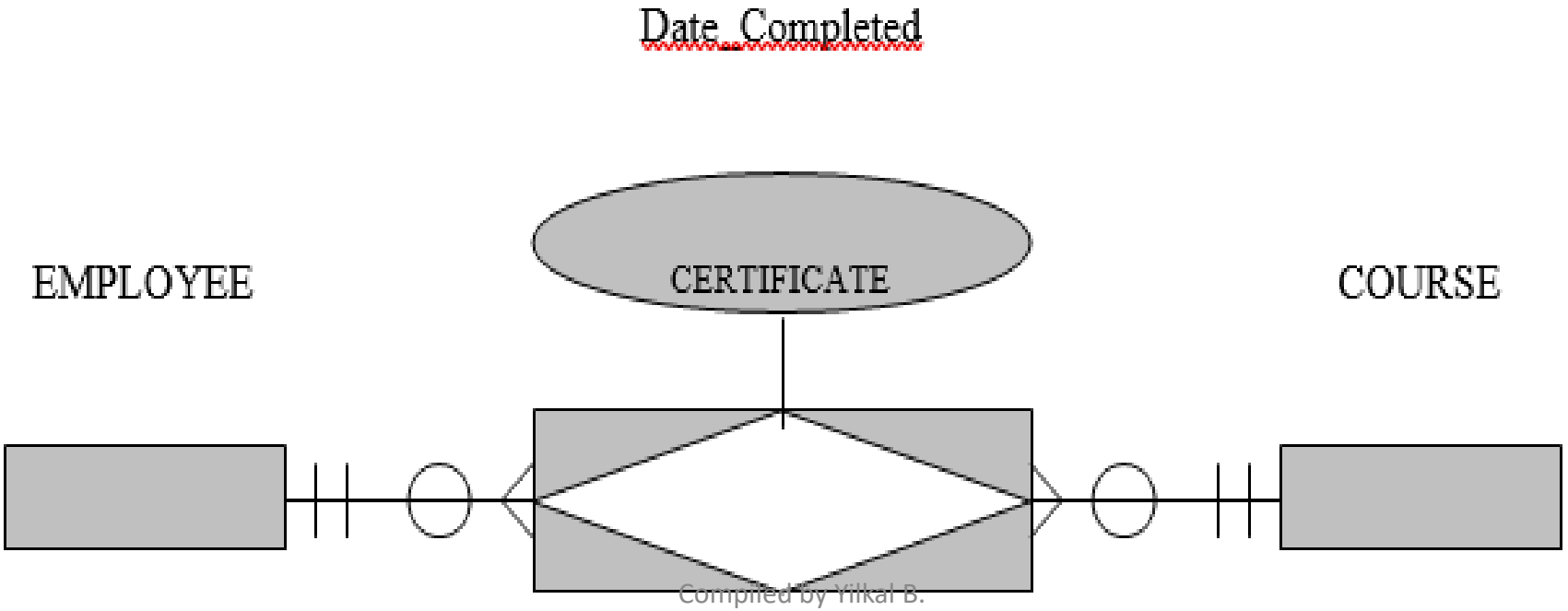
**Degree of a Relationship:** The degree of a relationship is the number of entity types that participate in that relationship.

- relationships are labeled with verb phrase
- The three most common relationships in E-R diagrams are unary (degree one), binary (degree two), and ternary (degree three).
- Unary Relationship Also called a recursive relationship; a unary relationship is a relationship between the instances of one entity type.
- Binary Relationship A binary relationship is a relationship between instances of two entity types and is the most common type of relationship encountered in data modeling.
- Ternary Relationship: A ternary relationship is a simultaneous relationship among instances of three entity types.

# Cntd…

## Associative Entities

- An entity type that associates the instances of one or more entity types and contains attributes that are peculiar to the relationship between those entity instances.
- The following figure illustrates an example of an Associative entity.



# *Cntd…*

## C. Selecting the Best Alternative Design Strategy

- Selecting the best alternative system involves at **least two basic steps:**

(1) generating a comprehensive set of **alternative design strategies** and

(2) selecting the one that is most likely to result in the desired information system, given all of the organizational, economic, and technical constraints that limit what can be done.

- A system design strategy represents a particular approach to developing the system.
- It includes statements on the system's **functionality**, **hardware** and **system software platform, and method for acquisition.**

# *Cntd…*

- **The primary deliverables from generating alternative design strategies and selecting** the best one are:

1) At *least three substantively different system* design strategies for building the replacement information system.

2) A design strategy judged most likely to lead to the most desirable information system.

3) **A Baseline Project Plan** for turning the most likely design strategy into a working information system.

**Note**

- The requirements and constraints of the replacement system raise many issues that analysts must consider when they develop alternative design strategies.
- Issues of functionality help determine software and hard ware selection, implementation, organizational limitations such as available funding levels.

# Overview of Structural Paradigm

## Development Methodologies

- A popular traditional method is called structured analysis,
- but a newer strategy called object-oriented analysis and design is also used widely. Each method offers many variations.
- Some organizations also develop their own approaches.

## Structured Analysis

- A traditional system development technique is time tested and easy to understand. Because it describes the process that transforms data into useful information, structured analysis is called a process – centered technique.
- In addition to modeling the process, structured analysis includes data organization and structure, relational database design, and user interface issues.
- It uses a series of phases, called SDLC to plan analyze design\, implement and support an information system.

# Overview of Structural Paradigm

## Object – Oriented Analysis

- Whereas structured analysis regards process and data as separate components, object oriented (O-O) analysis combines data and the process that act on the data into things called Objects.
- System analysis uses O-O methods to model real world business process and operations.
- The result is a set of software objects that represent actual people, things, transactions, and events.

## Other Development Strategies

- In addition to structured analysis and O-O methodologies, there may other system development techniques created by individual companies.
- E.g., Microsoft has developed an approach called Microsoft Solutions Frame \work (MSF).

# Structural vs Object oriented

| Structured | Object Oriented |
| --- | --- |
| ➢ Data Flow methodology | ➢ Object modeling |
| ➢ Compliments Structured Programming | ➢ Compliments object-oriented programming |
| ➢ Can be repeatable, measurable, & automated (CASE brought significant assistance) | ➢ Can be repeatable, measurable |
| ➢ Functional perspective of problem domain | ➢ Object perspective of the problem domain |
| ➢ Describes the real world as data flowing through the information system, being transformed from inputs to outputs | ➢ Describes the real world by its objects, attributes, services, and relationships |
| ➢ Separates data from functionality | ➢ Data & functions are encapsulated together |

**Reading Assignment:** **Approaches to Development**

*End of chapter one*

*Any Question?*