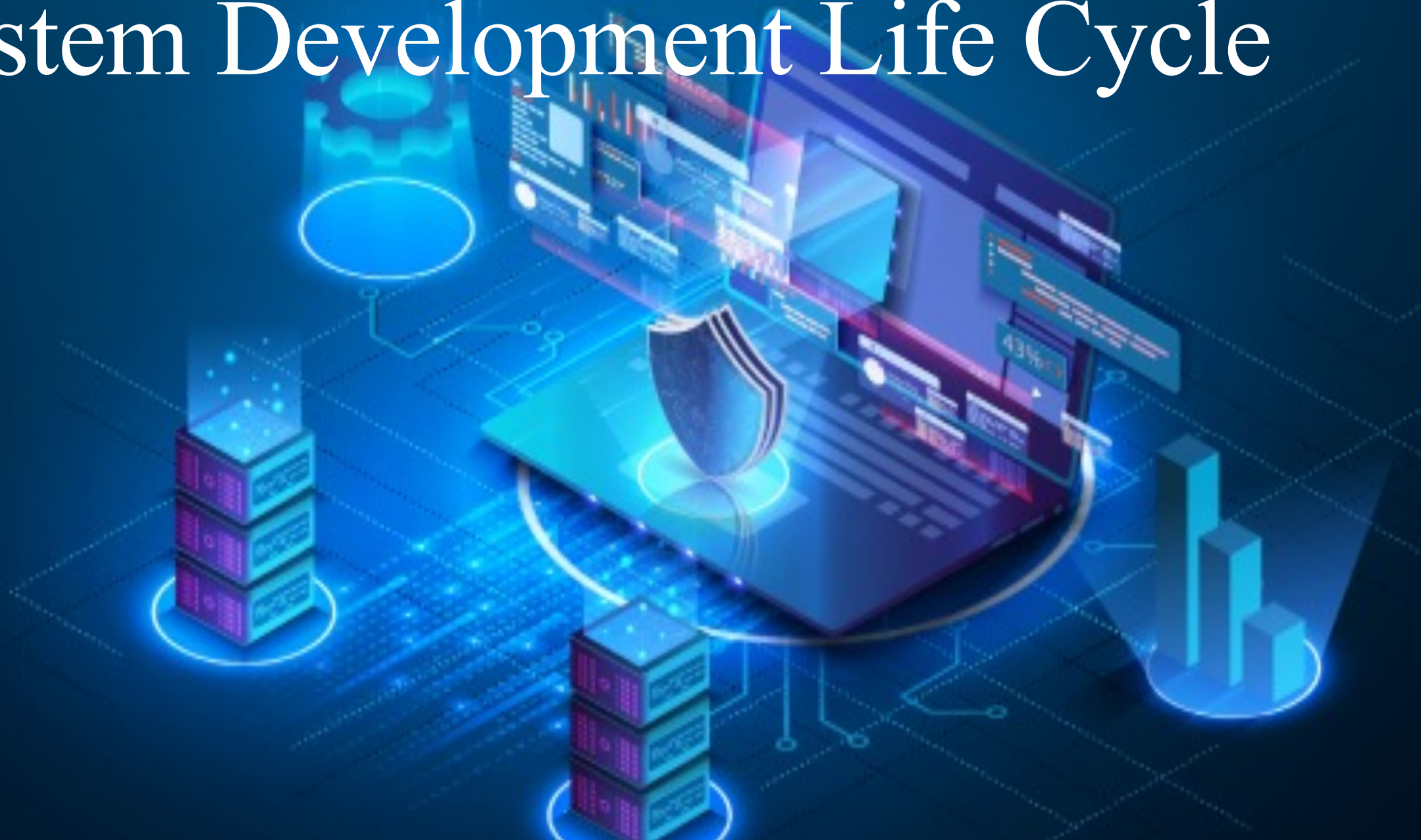# Chapter 2
System Development Life Cycle

Outline

- Project Identification and Selection
- Feasibility Study
- Analysis
- Design
- Implementation

What is System Development Life Cycle (SDLC)?

- A process for developing software or a structured way to create and develop high-quality software.

- It is essentially a project management model. It defines different stages that are necessary to bring a project from its initial idea or conception all the way to deployment and later maintenance.

- SDLC is not a linear project management framework. Instead, it becomes a cycle where feedback is made, problems are solved through repetitions, or new features are acquired.

- The software development process is normally long and tedious.

……What is System Development Life Cycle?

- SDLC framework includes the following steps and each phase has different processes and activities.
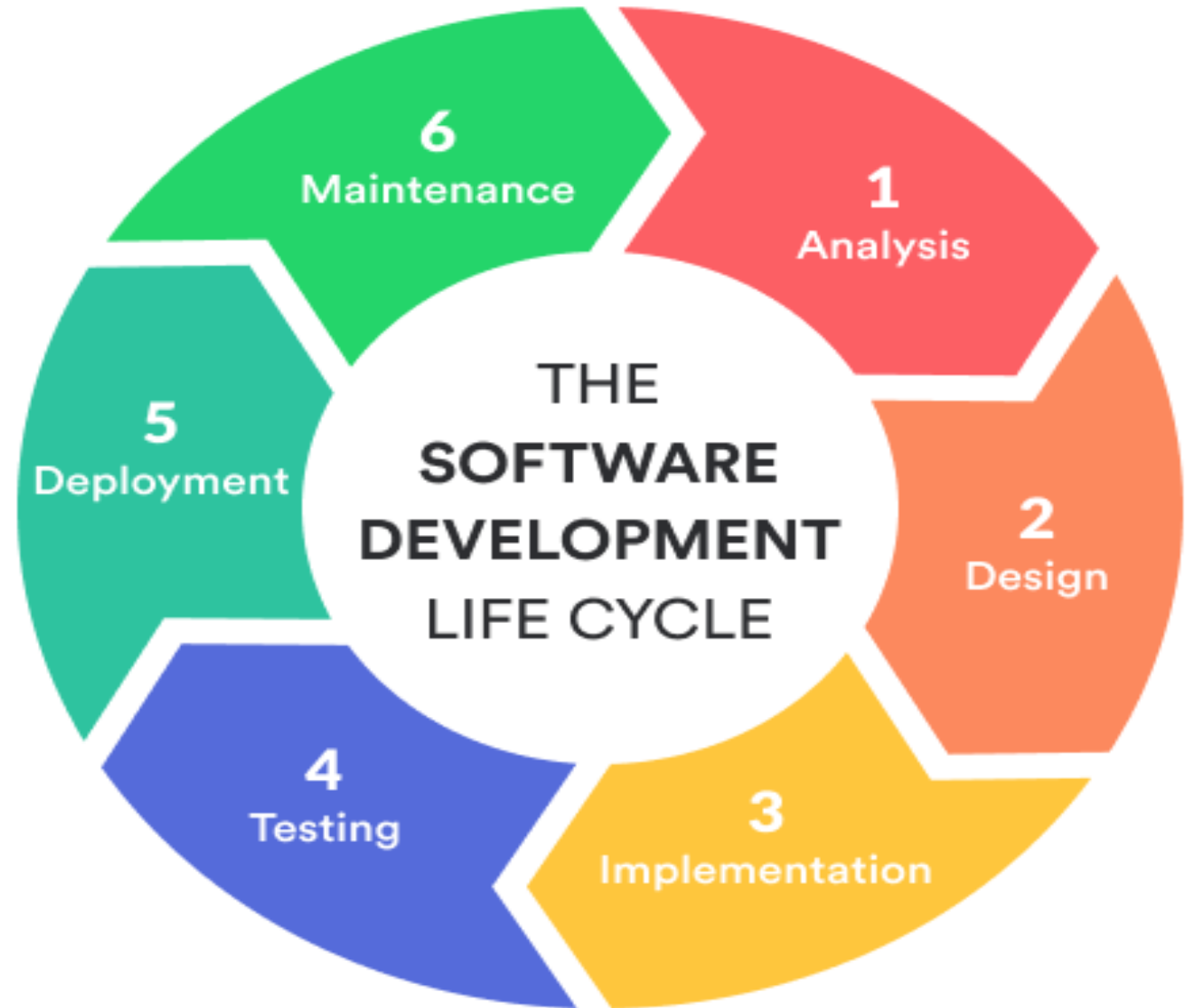
Need of SDLS

- The software is actually a product, and that there is a life process in that product. Thus SDLC is used to produce software with high quality **that meets customer needs.**

- It reduces the **hassle** of developing a new product.

- helps to transform a product from a design state into a complete product. This production process consists of phases that follow each other.

- At any stage in the cycle, it is possible to go back and forward again which helps the development team to produce high-quality software.

- helps to describes entry and exit criteria for each phase.

- Easy for software project managers to monitor the progress of the project.

…..Need of SDLS

- Helps to development of a software product in a systematic and disciplined manner.

- When a team is developing a software product, there must be a clear understanding among team representative about when and what to do. Otherwise, it would point to chaos and project failure.

  - This problem can be defined by using an example. Suppose a software development issue is divided into various parts and the parts are assigned to the team members.

Project Selection

Planning (feasibility stage)

- Before we even begin with the planning stage, it is important to take time and acquire proper [understanding of app. development life cycle.](#)

- This is the first phase in the systems development process in which developers will plan for the upcoming project.

- It identifies whether or not there is the need for a new system to achieve a business's strategic objectives.

- This is a preliminary plan (or a feasibility study) for a company's business initiative to acquire the resources to build on an infrastructure to modify or improve a service.

- The company might be trying to meet or exceed expectations for their employees, customers and stakeholders too. The purpose of this step is to find out the scope of the problem and determine solutions.

- Resources, costs, time, benefits and other items should be considered at this stage.

Project Selection

- Types of committees to identify and assess all possible systems development projects that an organization unit could undertake:

1. Senior manager.

2. Business group.

3. IS manager.

- Next, those projects deemed most likely to yield significant organizational benefits, given available resources, are selected.

……Project Selection

- Organizations vary in their approach to identifying and selecting projects. In some organizations, project identification and selection is a **formal process** in which projects are outcomes of a larger overall planning process.

- E.g. a large organization may follow a formal project identification process that involves **rigorously comparing all competing projects**.

- Alternatively, a small organization may use **informal project selection processes** that allow the highest-ranking manager to select projects independently or allow individual business units to decide on projects after agreeing on funding.

……Project Selection

- Requests for information systems development can come from three **key sources**, as depicted in the following figure:
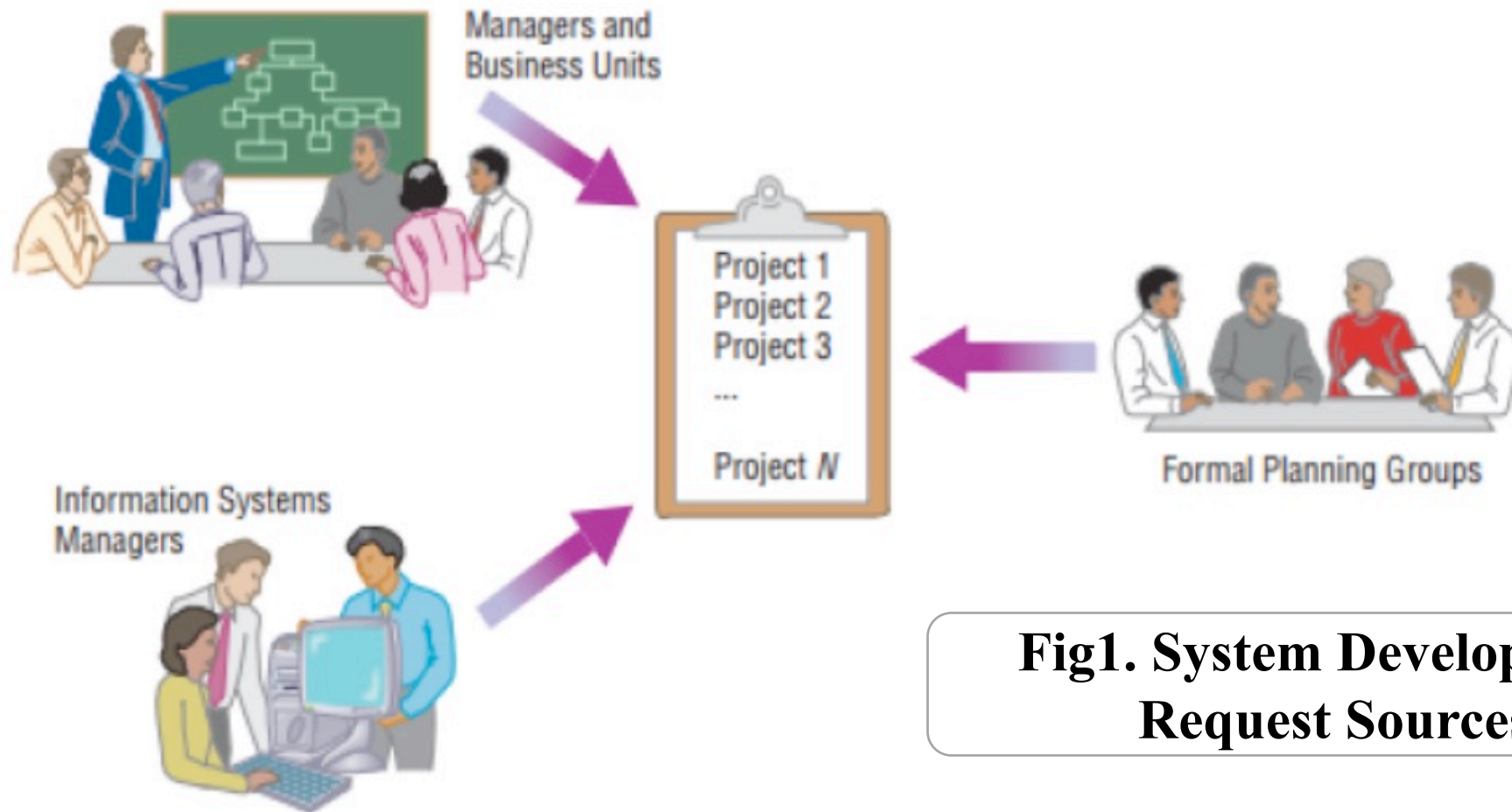

Fig1. System Development Request Sources
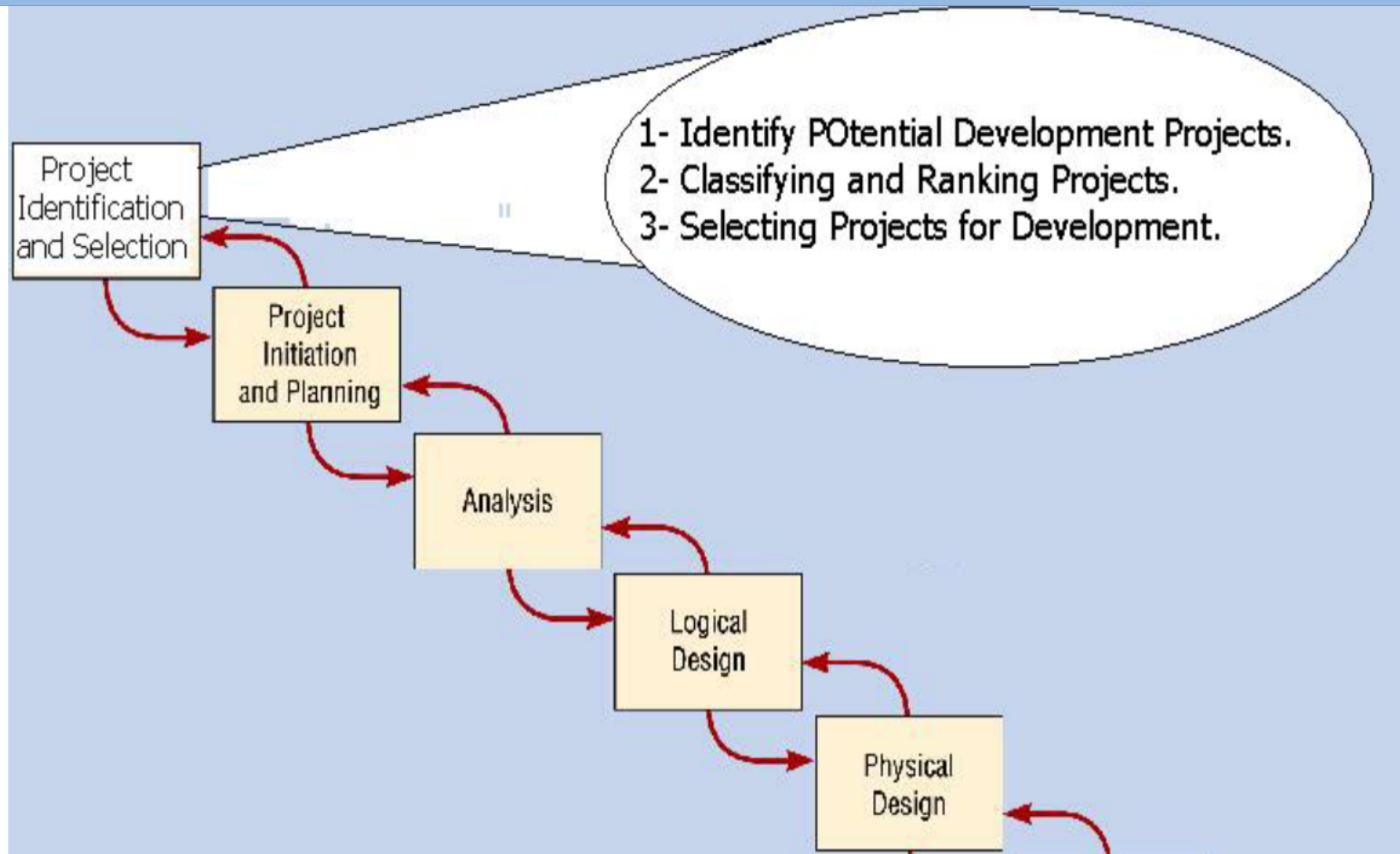
……Project Selection

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

- **Information systems managers**: those who want to make a system more efficient, less costly to operate, or want to move a system to a new operating environment.

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

……Project Selection

Process of Identifying and Selecting Systems Development Projects

- Project identification and selection consists of three primary activities:

1) Identifying potential projects,

2) Classifying and ranking projects,

3) Selecting projects for development.

……Project Selection

……Project Selection

- Identifying potential development projects **(have a strategic organizational focus) – can be performed by** :
  - A key member of top management.
  - A steering committee, composed of a cross section of managers with an interest in systems.
  - User departments.
  - The development group or a senior IS manage

1) Identifying potential projects

Each identification method has strengths and weaknesses.

- **Example,** projects identified by top management have a strategic organizational focus.

- Projects identified by steering committees reflect the diversity of the committee and therefore have a cross-functional focus.

- Projects identified by individual departments or business units have a narrow, tactical focus.

- The development group identifies projects based on the ease with which existing hardware and systems will integrate with the proposed project.

- Other factors, such as **project cost**, **duration**, **complexity,** and **risk,** also influence the people who identify a project.

- Redundant in functionality to some existing system, will not be considered.

……Project Selection

- Of all the possible project sources, those identified by top management and steering committees most often reflect the broader needs of the organization.
    - These groups have a better understanding of overall business objectives and constraints.
    - Projects identified by top management or by a diverse steering committee are referred to as coming from a **top-down source**.
- Projects identified by a functional manager, a business unit, or the information systems development group are often designed for a particular business need within a given business unit and *may not reflect the overall objectives of the organization.*
    - Project initiatives stemming from managers, business units, or the development group are referred to as coming from a **bottom-up source**.
- In sum, **projects are identified by both top-down and bottom-up initiatives**.

......Project Selection

Characteristics of alternative Methods for Making IS Identification and Selection Decisions	
Selection Method	**Characteristics**
Top Management	Greater Strategic Focus, Largest project Size, Longest Project Duration
Steering Committee	Cross-Function Focus, Greater Organizational Change, Formal Cost-Benefit Analysis, Larger & Riskier Project
User Department	Narrow, non-strategic Focus, Faster Development, Fewer users, Management Layers, and Business Functions
Development Group	Integration with existing systems focus, Fewer Development Delays, Less Concern on Cost-Benefit Analysis

2) **Classifying and ranking systems development projects**:

- Assessing the **importance** of potential projects is the second major activity in the project identification and selection phase.

- classifying and ranking projects can be performed by top managers, a steering committee, business units, or the IS development group.

- The criteria used to assign the merit of a given project can vary based on the size of the organization.

Possible Evaluation Criteria When Classifying & Ranking Projects	
Evaluation Criteria	**Description**
Value Chain Analysis	Extent to which activities add value and costs when developing products and/or services
Strategic Alignment	Extent to which the project is viewed as helping the organization activities and long-term goals
Potential Benifits	Extent to which the project is viewed as improving profits, customer service, … etc., and the duration of these benefits
Resource Availability	Amount and type of resources the project requires and their availability
Project Size/Duration	Number of individuals and the length of time needed to complete the project
Technical Difficulty/Risks	Level of technical difficulty to successfully complete the project within given time and resource constraints

3) **Selecting projects for development.:**

- The selection of projects is the **final activity** in the project identification and selection phase. The short- and long-term projects most likely to achieve business objectives are considered.

- As business conditions change over time, the relative importance of any single project may substantially change.

- Those projects deemed most likely to yield significant organizational benefits, given available resources, are selected for subsequent development activities.

......Project Selection

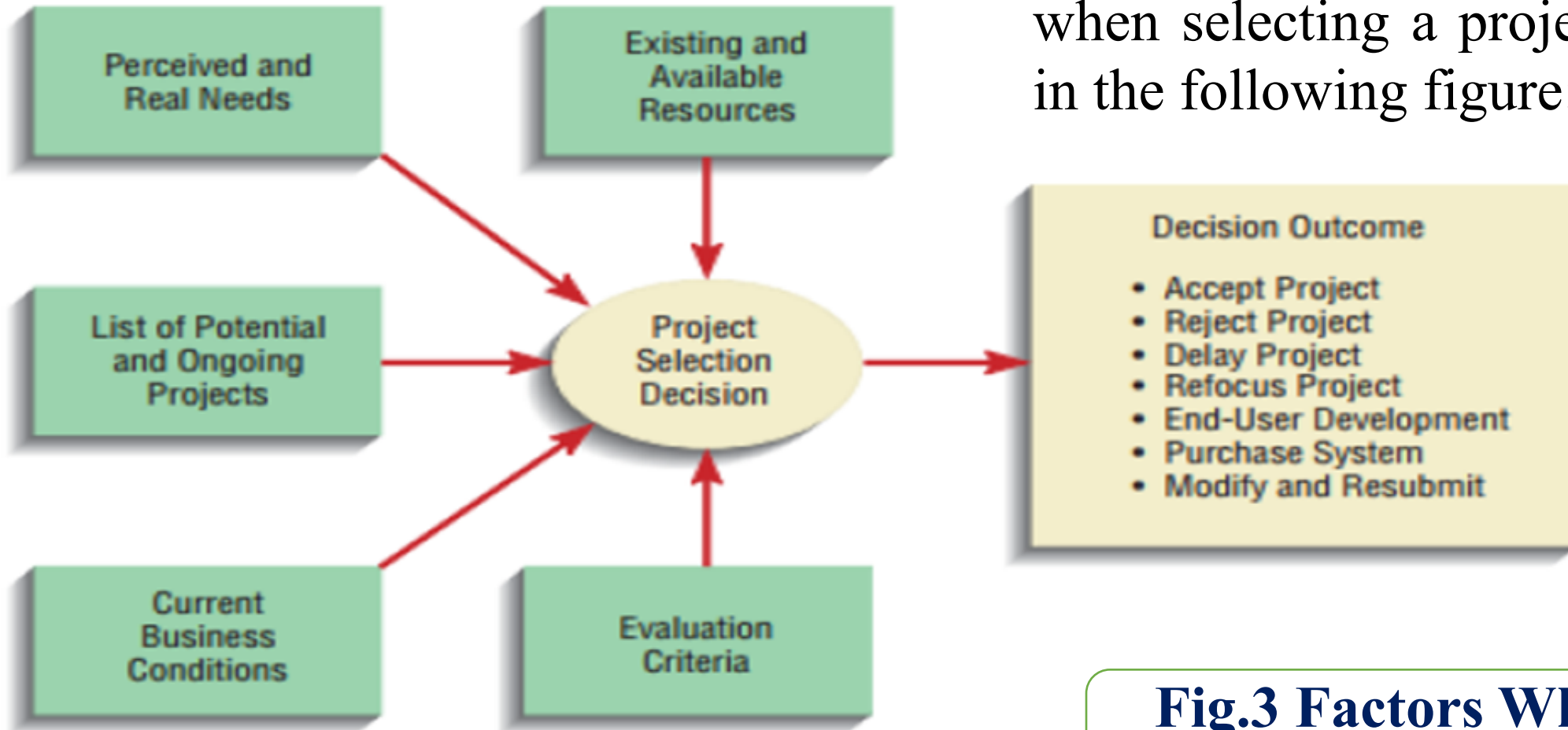• Numerous factors must be considered when selecting a project, as illustrated in the following figure:

Fig.3 Factors While Project Selection

Feasibility study

- Feasibility or Requirements of Analysis Stage is defined as the practical extent to which a project can be performed successfully.

- To evaluate feasibility, a feasibility study is performed, which determines whether the solution considered to accomplish the requirements is practical and workable in the software.

- [Information](#) such as resource availability, cost estimation for software development, benefits of the software to the organization after it is developed and cost to be incurred on its maintenance are considered during the feasibility study.

Feasibility study

- Various other **objectives of feasibility study** are listed below.
  - To analyze whether the software will meet organizational requirements.
  - To determine whether the software can be implemented using the current technology and within the specified budget and schedule.
  - To determine whether the software can be integrated with other existing software.

Feasibility study

- Proper and insightful project initiation and planning, including determining project scope and identifying project activities, can reduce the time needed to complete later project phases, including systems analysis.

- For example, a careful feasibility analysis conducted during initiation and planning could lead to rejecting a project and saving a considerable expenditure of resources.

- Information systems projects have budgets and deadlines. Assessing project feasibility is a required task that can be a large undertaking because it requires a systems analyst, to evaluate a wide range of factors.

- Although the specifics of a given project will dictate which factors are most important, most feasibility factors fall into the following six categories:

Types of Feasibility

- **Economic Feasibility:** The purpose for assessing economic feasibility is to identify the financial benefits and costs associated with the development project.
  - Often referred to as cost-benefit analysis.
  - Determines if the necessary software has the ability to provide financial rewards for a company.
  - This sort of research includes the cost of the software development team, the cost of the study involved in completing a feasibility study, and the expected cost of software and hardware.

….Types of Feasibility

- **Operational Feasibility** : The behavioral feasibility is analyzed to determine whether or not the people or workers in the firm will utilize it.

  - It is based on human resources and determines whether or not the program will work after it has been properly created.
  - It determines whether the program is user-friendly or not. Its interface should be simple enough that everyone can utilize it.

….Types of Feasibility

- **Technical Feasibility:** aids in gaining access to existing resources as well as technology essential for completing the user's needs in the software within the budget and schedule constraints.

- The analyst must determine if the new system can be developed given the available technological resources. If not, can the system be updated or expanded in such a way that it meets the request under consideration?

….Types of Feasibility

Schedule feasibility

- considers the likelihood that all potential time frames and completion date schedules can be met and that meeting these dates will be sufficient for dealing with the needs of the organization.

  - **Example,** a system may have to be operational by a government-imposed deadline by a particular point in the business cycle (such as the beginning of the season when new products are introduced).

….Types of Feasibility

Legal feasibility :

- In Legal Feasibility study project is analyzed in legality point of view. This includes analyzing barriers of legal implementation of project, data protection acts or social media laws, project certificate, license, copyright etc.

- Overall it can be said that **Legal Feasibility Study** is study to know if proposed project conform legal and ethical requirements.

Feasibility study

Political Feasibility

- Involves understanding how key stakeholders within the organization view the proposed system.

- Because an information system may affect the distribution of information within the organization, and thus the distribution of power, the construction of a system can have political consequences.

- Those stakeholders not supporting the project may take steps to block, disrupt, or change the project's intended focus.

Feasibility study

Steps Involved in Feasibility Study

When doing a feasibility study, the following steps are followed:

- Create a project team and choose a project leader.

- Create system flowcharts.

- Determine the shortcomings of the present system and define targets.

- List the alternative solutions or probable candidate systems for meeting objectives.

- Determine the feasibility of each choice, including technical feasibility, operational feasibility, and so on.

- Each proposed system's performance and cost-effectiveness should be weighed.

- Rank the other options and choose the best candidate system.

- Prepare a system proposal for the final project direction and submit it to management for approval.

Feasibility study

Advantages of conducting a feasibility study

- Improves project team concentration
- Aids in discovering new prospects
- Provides essential information for decision making
- Narrows business choices
- Increases the possibility of success by analyzing a variety of parameters.

System Analyst

Roles of System Analyst

- The system analyst is the person (or persons) who guides through the development of an information system.

- In performing these tasks, the analyst must always match the information system objectives with the goals of the of the organization.

- Role of System analyst differs from organization or organization. Most common responsibilities of System Analyst are the following.

1) System analysis

- It includes system`s study in order to get facts about business activity.

- It is about getting information and determining requirements. Here the responsibility includes only requirement determination, not the design of the system.

2) System design:

• Here apart from the analysis work, Analyst is also responsible for the designing of the new system/application.

3) Systems programming:

• Here Analyst is also required to perform as programmer, where he actually writes the code to implement the design of the proposed application.

• It specifies **what** a system should do

...System analyst

- In addition to the technical knowlegde of the information system development a system analyst should also have the following knowledge.

- **Business Knowledge:** As the analyst might have to develop any kind of a business, he should be familiar with the general functioning of all kind of businesses.

- **Interpersonal skills**: Such skills are required at various stages of development process for interacting with the users and extracting the requirements out of them.

- **Problem solving skills:** A system analyst should have enough problem occurring at the various stages of the development process

System Analysis

- During the analysis phase, the systems analyst gathers documents, interviews users of the current system (if one exists), observes the system in action, and gathers and analyses data to understand the current system and identify new requirements – features or capabilities that must be included in the system to meet the needs of the users.

The system analyst identifies the requirements related to each subsystem of the following in a proposed system:

(i) Input/output requirements: The characteristics of the user interface, including the content, format, and timing requirements for data-entry screens and managerial reports

(ii) Storage requirements: the content of records and databases and the procedures for data retrieval

(iii) **Control requirements:** the desired accuracy, validity, and security of the system; for example, tom prevent data entry errors and guarantee an easy-to-use, user-friendly system

- The systems analyst documents the work done in the analysis phase in a written functional requirements report.

The following are the main issues that the functional requirements report (SRS) should outline;

➢ Explains the current business procedures

➢ How the current system works

➢ Identifies problems with the current procedures and system

➢ Describes the requirements for the new or modified system

System Design

- It is the second step of the SDLC process. The outputs of the design phase will be used as the inputs in this step.

- The main output of the requirement phase **SRS document** will be used as a base document in the design phase.

- This stage the highest priority stage because this is the stage where the system is transformed from logical design to physical design.

- This design also reveals the tools with which the software will be developed. Example,
  - Which programming language will be used, such as Python, Java, .NET, or PHP?
  - Which database to be worked, such as Oracle, MySQL, Postgres, relational or non-relational database?

….System Design

- The design phase focuses on how.

- In the design phase, the system analyst develops the system specifications that describe how exactly the system requirements, identified in the analysis phase, will be met.

- The three main categories of the how-to questions that the systems analyst considers in design phase are;

➢**User interface design:** How will the various outputs of the system be designed? Where will input data come from, and how will it be entered into system? How will the various windows, menus and other user-computer dialogue characteristics be designed?

➢**Database design:** how will the data elements and structure of the files that oppose the database be designed?

…..System Design

- System design is the process that assists in the planning of a new business system or the replacement of an existing system by describing its modules or components to meet specified needs.

- The system design also focuses on techniques for achieving the system's goal.

- The primary focus of System Analysis and Design is on Technology, Systems, and Processes.

- There are primarily two sorts of system designs: logical design and physical design.

….System Design

1. Logical Design

- The logical design of the system is the process of designing the system's many components. And it is platform- independent.

- What are the system's inputs and outputs, and how will data flow through the system? What processes will be performed?

- All of these concerns are outlined in the design of a logical system.

- It is a virtual design that serves as the foundation for the actual design of the system.

- In the logical design of the system, structured designing techniques like Data Flow Diagrams (DFD), Entity Relationship Diagrams (ER diagrams), Decision Trees, and so on are used.

2. Physical System Design –

- In physical system design, the actual procedures for forming the system are implemented depending on the choice of platform.

- The primary focus is on how inputs will enter the system, how that will be checked, and how the output will be sent to its address.

- All procedures and processes are designed as part of the system's logical design.

E.g. User interface design

Implementation

- During the implementation phase, the hardware, DBMS software, and application programs are installed, and the database design is implemented.

- During the initial stages of the implementation phase, the system enters into a cycle of coding, testing, and debugging until it is ready to be delivered.

- The actual database is created, and the system is customized by the creation of tables and views, user authorizations, and so on.

......Implementation

- This stage includes efforts required to implement, resolve system problems identified during the implementation process, and plan for sustainment.
  - **Coding** – the physical design specifications are turned into working computer code.
  - **Integration and Testing**– a testing environment is created where all components are brought together.
  - **Installation** – here the new system is rolled out.
- Additionally, this phase is the longest phase of the SDLC process, and it requires a focused approach for the developers.

Reading Assignment

- Testing and Maintenance

End of CH-2