System Analysis and Design

Chapter 1

1) What is System? What types of Systems are there?

Ans) A system is a group of parts that work together to achieve a specific goal. A system has three parts:

Input - > Process -> Output

There are many kinds of systems, some of them are:

- **Physical or Abstract Systems:** Physical systems are tangible, like a computer, and can be static or dynamic. Abstract systems are not physical, but are ideas, formulas, or models.

- **Open or Closed Systems:** Most systems are open, which means they can interact with their environment and adapt to changes. Closed systems, which are only theoretical, do not interact with their environment.

- **Man-made Information Systems:** These systems are used to manage data for an organization.

2) What are the needs for Systems Analysis and Design?

Ans) System Analysis and Design is needed because:

- **Understanding what people need**: It helps analysts figure out what users require to work with data effectively within a company.

- **Solving the right problems**: It ensures that analysts identify and address the correct issues, preventing wasted effort on the wrong ones.

- **Preventing user dissatisfaction**: Without proper planning, new systems often fail and are not used, so systems analysis helps avoid this by involving users in the process.

- **Structuring the development process**: It provides a systematic approach for creating information systems, which are expensive projects that could otherwise be done in a chaotic way.

- **Adapting to new technologies**: It helps businesses and analysts work with and redesign new and complex technologies, like Ajax and Ruby on Rails, to create better systems.
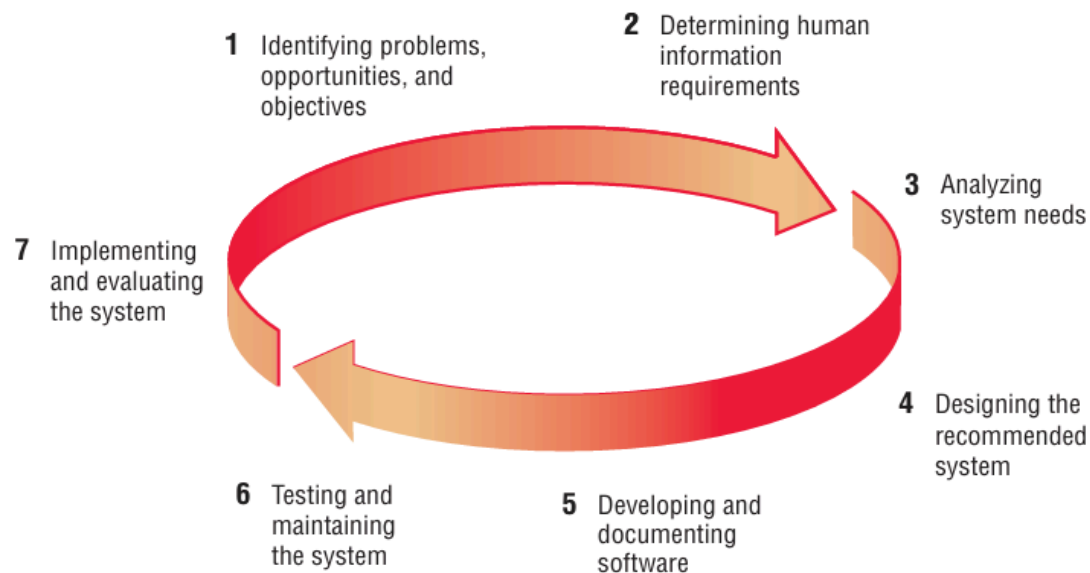
3) What are the roles of a System Analyst ?

Ans) A systems analyst tries to understand how people interact with technology and how businesses function to improve organizational processes through the use of computerized information systems. The primary roles are:

- **As a Consultant:** A systems analyst acts as a consultant by being hired to address information system issues within a business. They bring a fresh perspective, but must rely on users to understand the organization's culture.

- **As a Supporting Expert:** As a supporting expert, a systems analyst draws on their knowledge of computer hardware and software to serve as a resource for small modifications or decisions affecting a single department. They don't manage the project but provide expertise.

- **As an Agent of Change:** The most comprehensive role is that of an agent of change, where a systems analyst serves as a catalyst for change by developing a plan and working with others to facilitate it. They are present for an extended period, interacting with users and advocating for changes involving information systems.

4) SDLC (Systems Development Life Cycle) Methodology.

The systems development life cycle is a systematic approach to solving business problems. It is divided into seven phases:
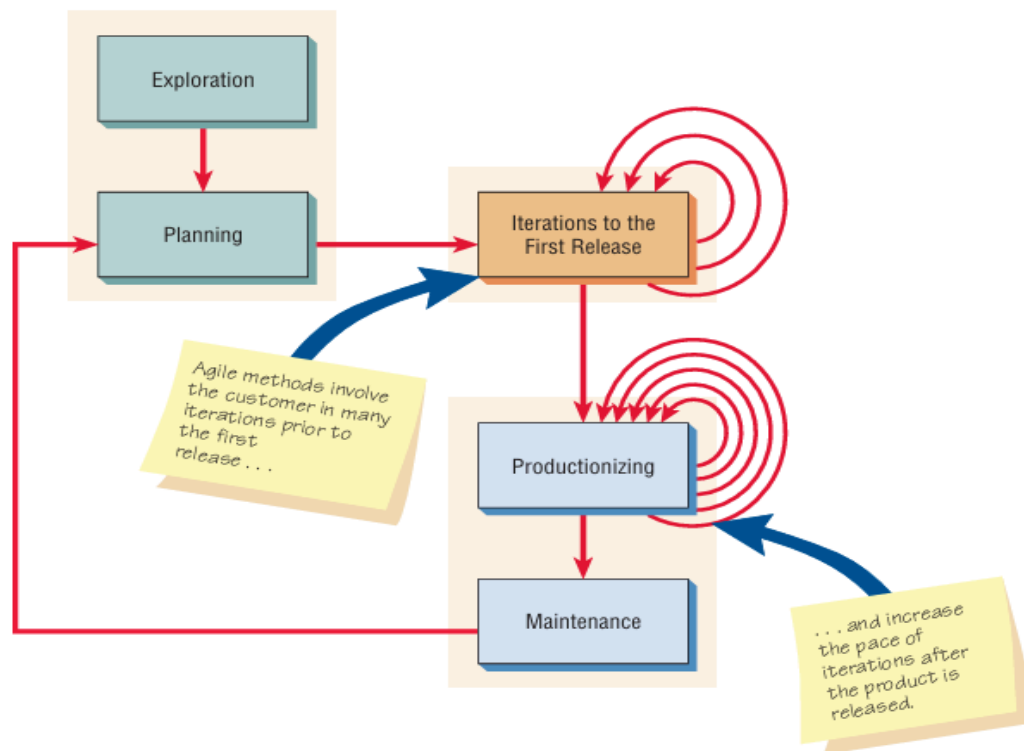

1 Identifying problems, opportunities, and objectives

2 Determining human information requirements

3 Analyzing system needs

4 Designing the recommended system

5 Developing and documenting software

6 Testing and maintaining the system

7 Implementing and evaluating the system

5) The Agile Approach.

The agile approach is a software development approach based on values, principles, and core practices. The four values are:
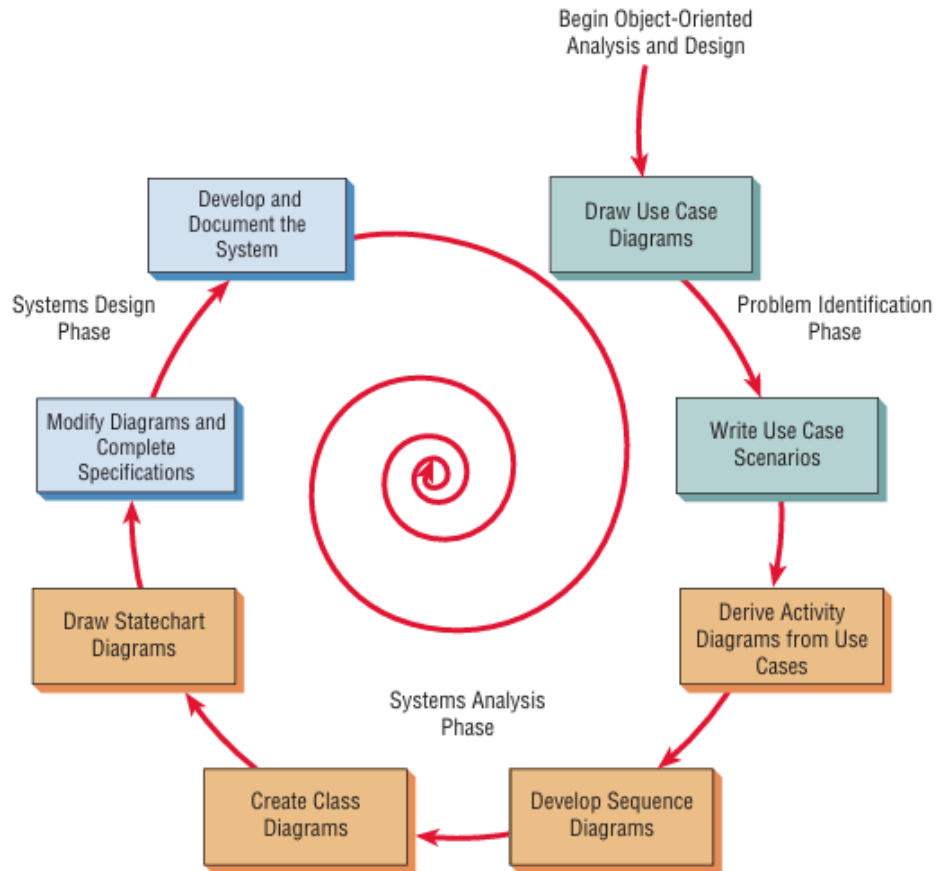
- Communication
- Simplicity
- Feedback
- Courage
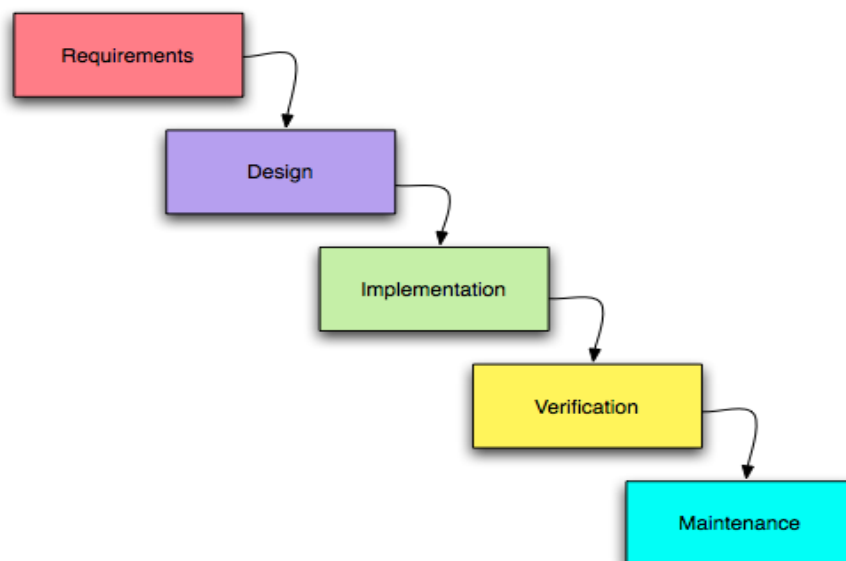
The five stages of Agile Development are:

6) Object Oriented System Analysis and Design.

Object-oriented (O-O) analysis and design is an approach that is intended to facilitate the development of systems that must change rapidly in response to dynamic business environments.

Begin Object-Oriented Analysis and Design

Develop and Document the System

Draw Use Case Diagrams

Systems Design Phase

Problem Identification Phase

Modify Diagrams and Complete Specifications

Write Use Case Scenarios

Draw Statechart Diagrams

Derive Activity Diagrams from Use Cases

Systems Analysis Phase

Create Class Diagrams

Develop Sequence Diagrams

7) Waterfall Methodology.

The waterfall methodology is a linear, sequential project development approach where each phase must be completed before the next can begin, like water flowing over a waterfall.

Requirements

Design

Implementation

Verification

Maintenance

8) When to Choose which Methodology?

Choose	When
The Systems Development Life Cycle (SDLC) Approach	• systems have been developed and documented using SDLC • it is important to document each step of the way • upper-level management feels more comfortable or safe using SDLC • there are adequate resources and time to complete the full SDLC • communication of how new systems work is important
Agile Methodologies	• there is a project champion of agile methods in the organization • applications need to be developed quickly in response to a dynamic environment • a rescue takes place (the system failed and there is no time to figure out what went wrong) • the customer is satisfied with incremental improvements • executives and analysts agree with the principles of agile methodologies
Object-Oriented Methodologies	• the problems modeled lend themselves to classes • an organization supports the UML learning • systems can be added gradually, one subsystem at a time • reuse of previously written software is a possibility • it is acceptable to tackle the difficult problems first
Waterfall Methodology	• the requirements are well-understood, clear, and fixed • the project is relatively small and can be completed in a short timeframe • the required technology is well-known and not likely to change • quality is the top priority, and the project can afford a longer development cycle • there is low risk of unexpected changes to the project's scope

Chapter 2

1) Levels of Management

Strategic Management:

- Look outward from the organization to the future
- Make decisions that will guide middle and operations managers
- Work in highly uncertain decision-making environment
- Define the organization as a whole

Management Planning and Control:

- Different organization structure
- Leadership style
- Technological considerations
- Organization culture
- Human interaction
- All carry implications for the analysis and design of information systems

Operational Control:

- Make decisions using predetermined rules that have predictable outcomes
- Oversee the operating details of the organization

2) Draw DFD Diagram from the given scenario. (ONLY LEVEL 0)
https://www.youtube.com/watch?v=N0nx1omNX8k You can watch any video or learning from slides/book.

3) Draw Usecase Diagram from the given scenario.
https://www.youtube.com/watch?v=IyiCfWqor_I

4) Draw E-R (Entity Relationship) Diagram from the given scenario.
https://www.youtube.com/watch?v=ZIZsLt52NgE

Chapter 3

1) Draw Pert Chart and Gantt Chart. (Watch any youtube tutorial)
Pert Chart : https://www.youtube.com/watch?v=4oDLMs11Exs
Gantt Chart: https://www.youtube.com/watch?v=R5IUNGnM2Fo

2) Selection of Process:
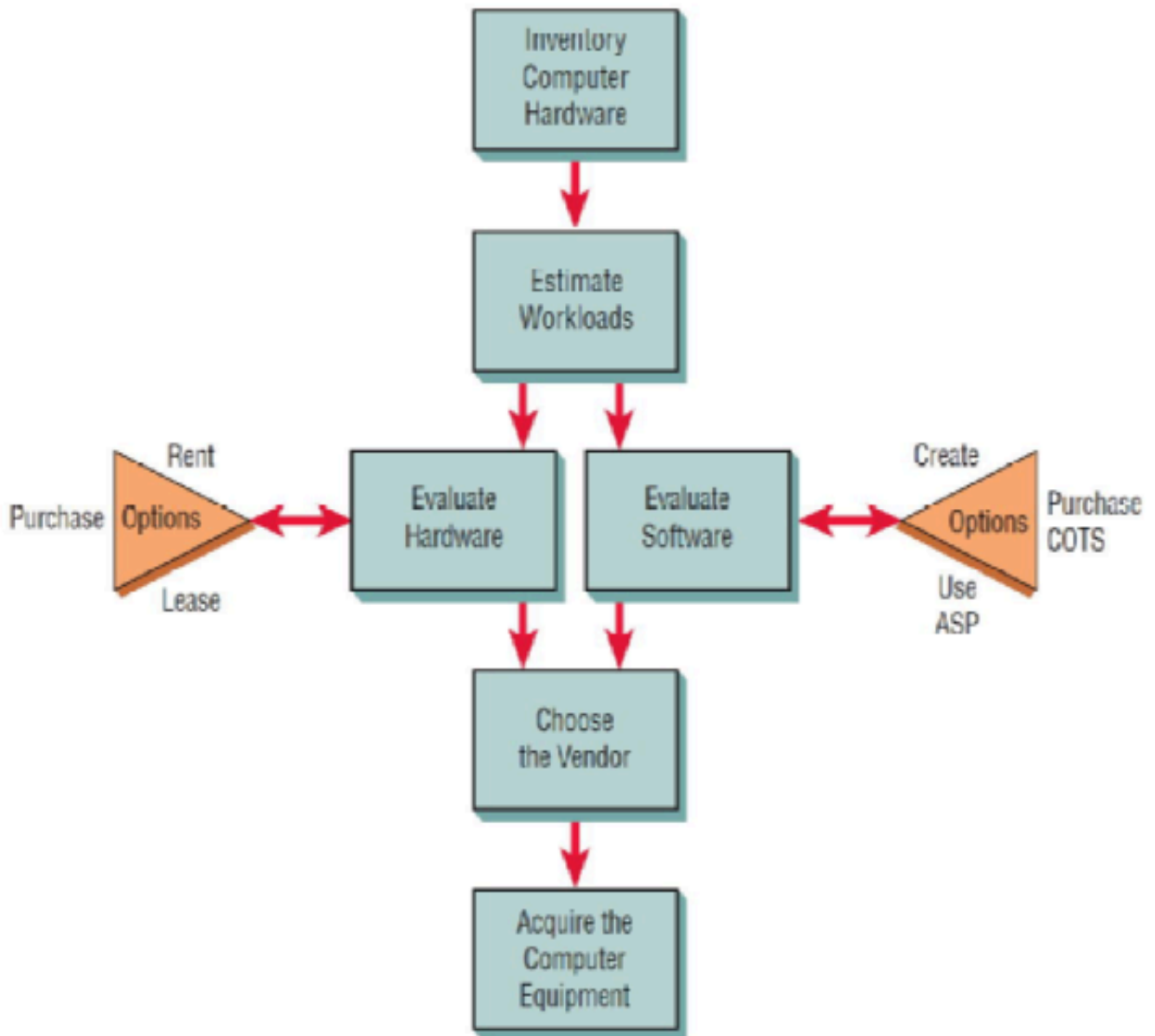The necessary steps are:

- Backing from management
- Appropriate timing of project commitment
- Possibility of improving attainment of organizational goals
- Practical in terms of resources for the system analyst and organization
- Worthwhile project compared with other ways the organization could invest resources

3) Determining Feasibility:

The Three Key Elements of Feasibility

Technical Feasibility
    Add on to present system
    Technology available to meet users' needs

Economic Feasibility
    Systems analysts' time
    Cost of systems study
    Cost of employees' time for study
    Estimated cost of hardware
    Cost of packaged software or software development

Operational Feasibility
    Whether the system will operate when put in service
    Whether the system will be used

3) Steps to determine Software and Hardware Needs:

- Inventory computer hardware currently available
- Estimate current and future system workloads
- Evaluate available hardware and software
- Choose the vendor
- Acquire the computer equipment

4) Software Alternatives

	Advantages	Disadvantages
Creating Custom Software	• Specific response to specialized business needs • Innovation may give firm a competitive advantage • In-house staff available to maintain software • Pride of ownership	• May be significantly higher initial cost compared to COTS software or ASP • Necessity of hiring or working with a development team • Ongoing maintenance
Purchasing COTS Packages	• Refined in the commercial world • Increased reliability • Increased functionality • Often lower initial cost • Already in use by other firms • Help and training comes with software	• Programming focused; not business focused • Must live with the existing features • Limited customization • Uncertain financial future of vendor • Less ownership and commitment
Using SaaS	• Organizations that do not specialize in information systems can focus on what they do best (their strategic mission) • There is no need to hire, train, or retain a large IT staff • There is no expenditure of employee time on nonessential IT tasks	• Loss of control of data, systems, IT employees, and schedules • Concern over the financial viability and long-run stability of the SaaS provider • Security, confidentiality, and privacy concerns • Loss of potential strategic corporate advantage regarding innovativeness of applications

5) Guideline for evaluating Software:

Software Requirements	Specific Software Features
Performance Effectiveness	Able to perform all required tasks Able to perform all tasks desired Well-designed display screens Adequate capacity
Performance Efficiency	Fast response time Efficient input Efficient output Efficient storage of data Efficient backup
Ease of use	Satisfactory user interface Help menus available "Read Me" files for last-minute changes Flexible interface Adequate feedback Good error recovery
Flexibility	Options for input Options for output Usable with other software
Quality of Documentation	Good organization Adequate online tutorial Website with FAQ
Manufacturer Support	Technical support hotline Newsletter/email Website with downloadable product updates

6) Identifying Benefits and cost:

- Tangible benefits are advantages measurable in dollars through the use of the information system
- Intangible benefits are difficult to measure
- Tangible costs are accurately projected by the systems analyst and accounting personnel
- Intangible costs are difficult to estimate and may not be know

7) Tangible/ Intangible Benefits/ Cost:

Tangible Benefit: Advantages measurable in dollars that accrue to the organization through the use of the information system. Example: Increase in the speed of processing, access to otherwise inaccessible information etc.

Tangible Cost: Those that can be accurately projected by systems analysts and the business' accounting personnel. Cost of equipment, cost of resources etc.

Intangible Benefit: Benefits from use of the information system that are difficult to measure. Example: Maintaining good business image, increasing job satisfaction.

Intangible Cost: Those that are difficult to estimate and may not be known. Example: Losing reputation, ineffective decision making.

8) Comparing Cost and Benefits:

- Break-even analysis: Analysis that determines the point at which a business's total revenue equals its total costs. No profit or loss.

- Cash flow analysis: Analysis that looks at a company's incoming and outgoing cash over time. Amount of money business receives and pays out.

- Present value analysis: Analysis that calculates how much a future sum of money is worth today. Money today is worth more than money in the future.

9) Guidelines for Analysis:

- Use break-even analysis if the project needs to be justified in terms of cost, not benefits
- Use payback when the improved tangible benefits form a convincing argument for the proposed system
- Use cash-flow analysis when the project is expensive, relative to the size of the company
- Use present value when the payback period is long or when the cost of borrowing money is high

10) Work Breakdown Structure (WBS).

Often a project needs to be broken down into smaller tasks or activities. These tasks together make up a work breakdown structure (WBS)
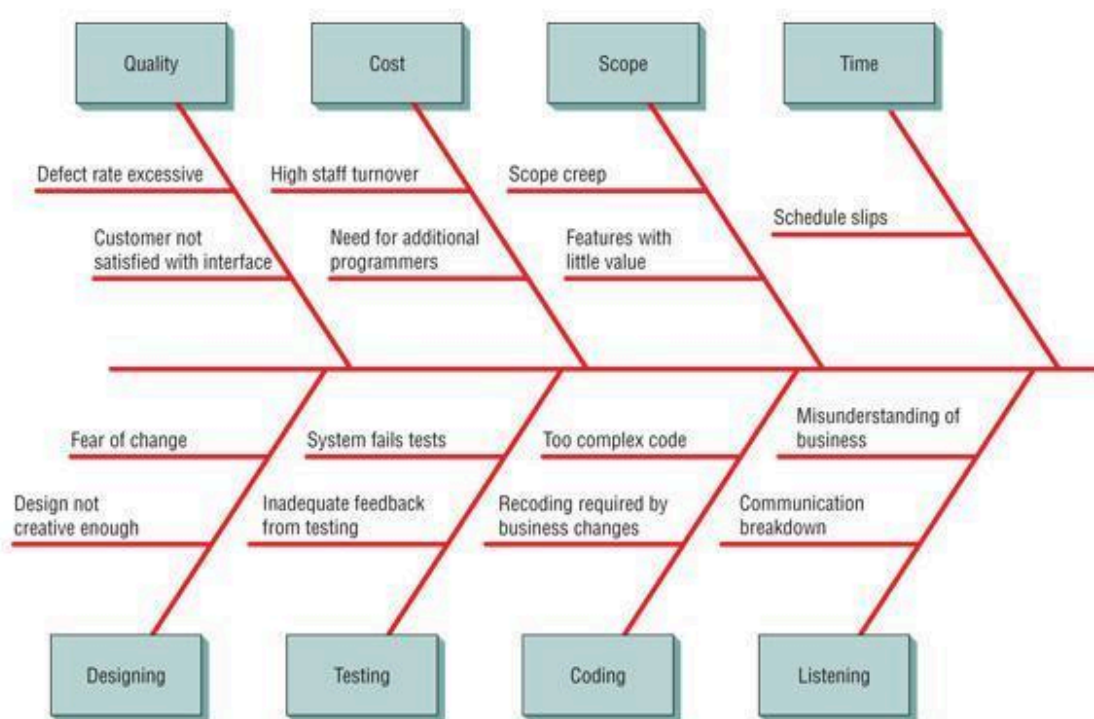
- Each task or activity contains one deliverable, or tangible outcome, from the activity
- Each task can be assigned to a single individual or a single group
- Each task has a responsible person monitoring and controlling performance

Developing a WBS:

- Decomposition, starting with large ideas, then breaking them down into manageable activities
- Product oriented, building a website can be broken down into many parts
- Process-oriented, emphasizes the importance of each phase

11) Project Risk (Fish Bone Diagram)

Fishbone diagram systematically lists all of the possible problems that can occur.

12) Earned Value Management (EVM):

A technique used to help determine progress (or setbacks) on a project. It involves:

- Project cost
- Project schedule
- Performance of the project team

13) Team management:

Team management is very important. The four steps of team management are:

- Assembling a Team: Picking the right people with the necessary skills.

- Team Communication Strategies: Establishing clear methods and tools for everyone to share information and feedback efficiently.

- Project Productivity Goals: These are specific, measurable targets that a team aims to achieve to ensure a project is completed on time and successfully.

- Team Member Motivation: This is the process of inspiring and encouraging individuals to perform at their best and stay engaged with their work.