UNIT-2 REQUIREMENT ENGINEERING
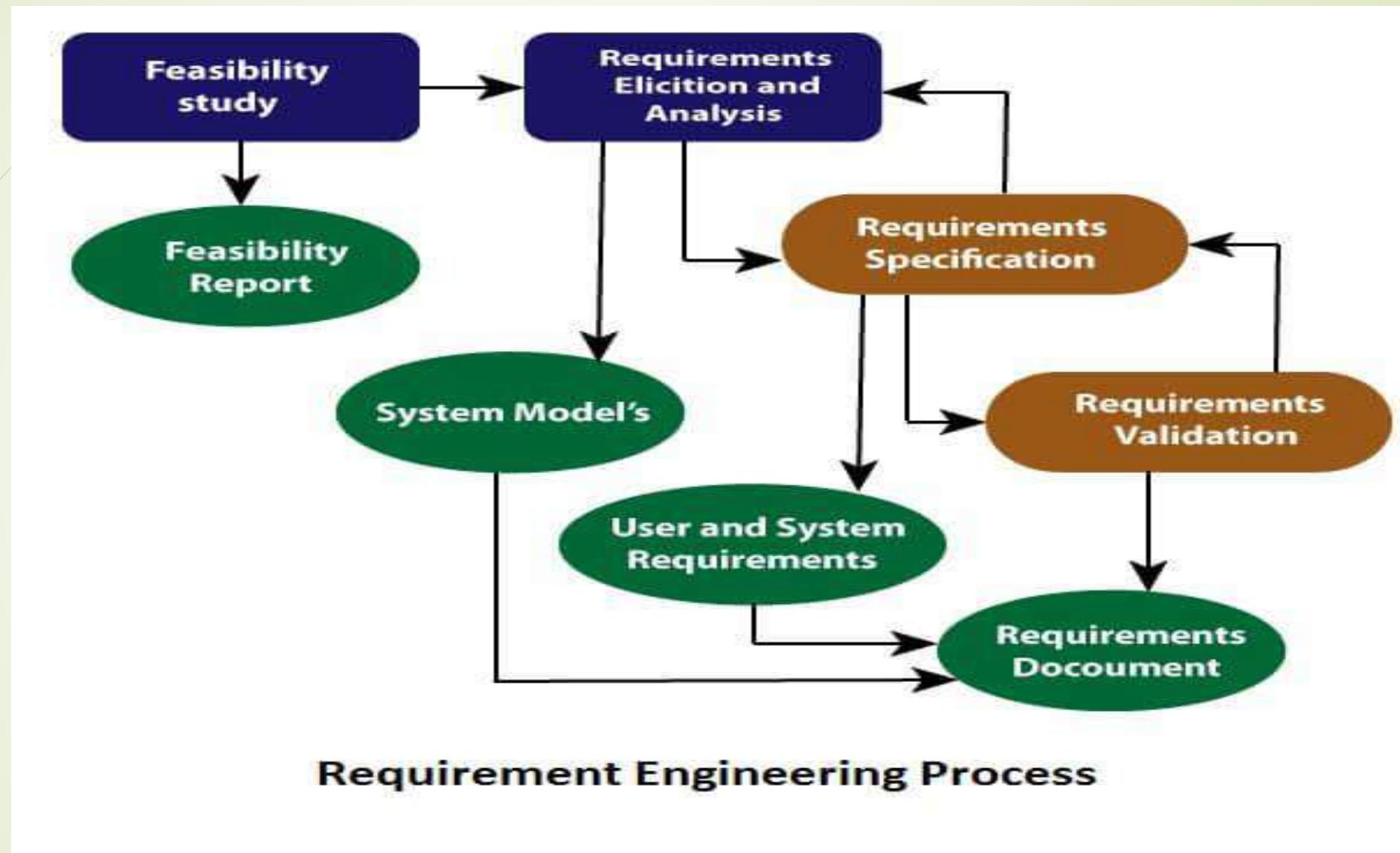
- Requirements engineering (RE) refers to the **process of defining, documenting, and maintaining requirements** in the engineering design process.

- Requirement engineering **provides the appropriate mechanism to understand**

- what the customer desires,

- analyzing the need,

- and assessing feasibility,

- negotiating a reasonable solution,

- specifying the solution clearly,

- validating the specifications and managing the requirements as they are transformed into a working system.

Requirement Engineering Process

It is a **four-step process**, which includes -

- Feasibility Study
- Requirement Elicitation and Analysis
- Software Requirement Specification
- Software Requirement Validation

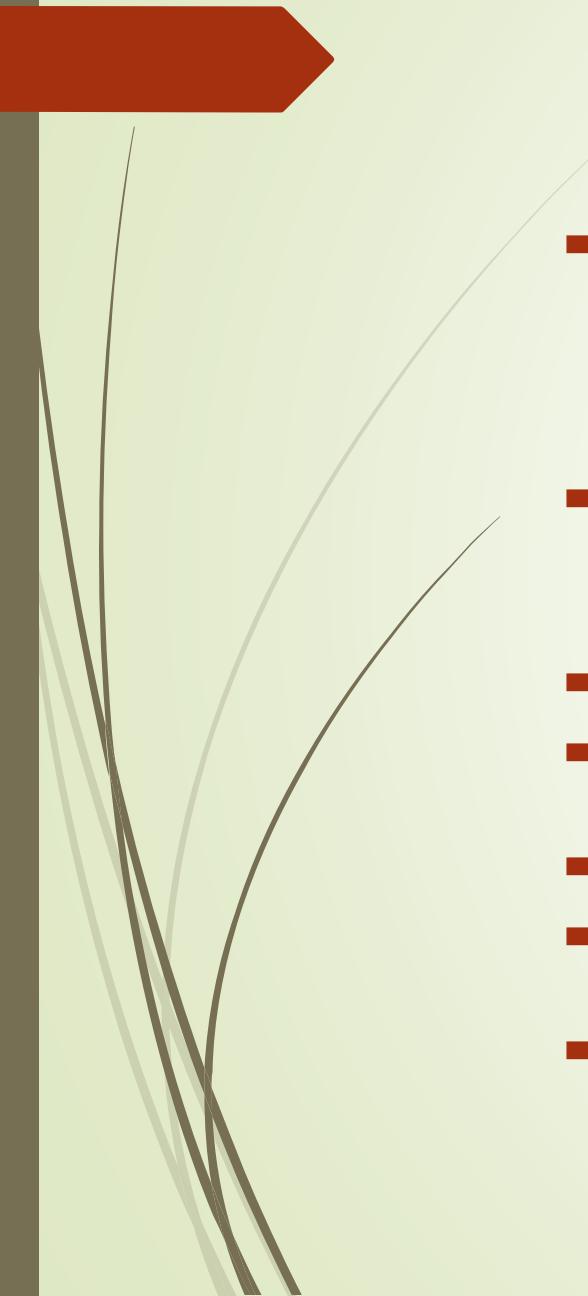**Requirement Engineering Process**

1. Feasibility Study:

- **it is a measure of the software product in terms of how much beneficial** product development will be for the organization in a **practical point of view**.

- to **analyze whether software product will be right** in terms of **development**, **implementation**, **contribution** of project to the organization.

TYPES OF FEASIBILITY STUDY

- **Technical Feasibility**: **gives report whether there exists correct required resources and technologies** which will be used for project development.

  It **analyzes technical skills and capabilities of technical team, existing technology** can be used or not,

- **Operational Feasibility: how much easy product will be to operate and maintenance** after deployment.

- **Economic Feasibility: cost and profit** of the project is analyzed.

- **Legal Feasibility:** It checks if proposed project follow **legal and ethical requirements** --Like **data protection laws**, **copyright laws**, **industry standards**, or contractual obligations.

- **Schedule Feasibility: timelines/deadlines** is analyzed for proposed project which includes **how much time team will take to complete final project** which has a **great impact** on the organization.

- **Cultural and Political Feasibility:** This section assesses **how the software project will affect the political environment and organizational** culture.

- **Example**: Launching a Social Media App with Facial Recognition in a New Country

- A tech company wants to launch its AI-powered social media app in a foreign country. The app uses facial recognition to auto-tag users in photos and suggest friends.

- **Cultural Feasibility** - In countries like Japan or South Korea, advanced tech features like facial recognition may be culturally embraced due to high digital literacy and comfort with innovation.

  In Germany or France, where people value privacy deeply (due to historical reasons like surveillance under past regimes), the public might strongly resist facial recognition tech.

- Political Feasibility - In China, the government may support facial recognition as it aligns with surveillance policies.

  In the EU, GDPR laws heavily regulate biometric data use. Without strict compliance and user consent, the app could be banned or fined.

- **Market Feasibility:** This refers to **evaluating the market's willingness and ability to accept the suggested software system.**

  Analyzing the **target market**, understanding **consumer wants**

  Assessing possible **competitors** are all part of this study.

- **Example: Launching a New Project Management Tool**

  A startup wants to release a **project management software** targeting **small businesses.**

- **Market Feasibility Check**

- **1. Market Demand-**-Is there a genuine need for another project management tool?

- Are users unhappy with existing options?

- If market research **shows growing demand for simpler or cheaper alternatives** → feasible

- If the market is already saturated and loyal to big players → not feasible

2. Competition --Trello, Asana, ClickUp, Jira, Notion – already dominate this space.

- To be feasible, the new product needs a unique value proposition (e.g., offline support, language localization, industry-specific features).

- **3. Target Audience Behavior**

- Do small businesses have the budget and tech capability to adopt a new tool?

- Are they open to switching from Excel/manual processes?

- **4. Go-to-Market Strategy**

- Does the company have a realistic plan to attract users (pricing, marketing, freemium model)?

- Without visibility or brand trust, even good software may fail.

- **Resource Feasibility:** This method evaluates **resources needed** to complete the software project successfully.

- It guarantees that sufficient **hardware**, **software**, Skilled Labor and **funding** are available to complete the project successfully.

Aim of Feasibility Study

- To check if the **new system supports and contributes** to the overall goals of the organization.

- ☐ To see if the system can be built using the **available** or **current technology**.

- ☐ To find out if the system **can work well with the other systems** that already exist in the organization.

Feasibility Study Process

- The below steps are carried out during entire feasibility analysis.

- **Information assessment**: It assesses the original project concept and **establishes the main aims and objectives.**

- **Information collection**: It **collects the necessary information** and **data** required to evaluate the project's many components.

- **Report writing**: It produces an **in-depth feasibility report** that details the analysis and results.

- **General information**: It gives a **summary** of the main points discussed in the report on the feasibility study.
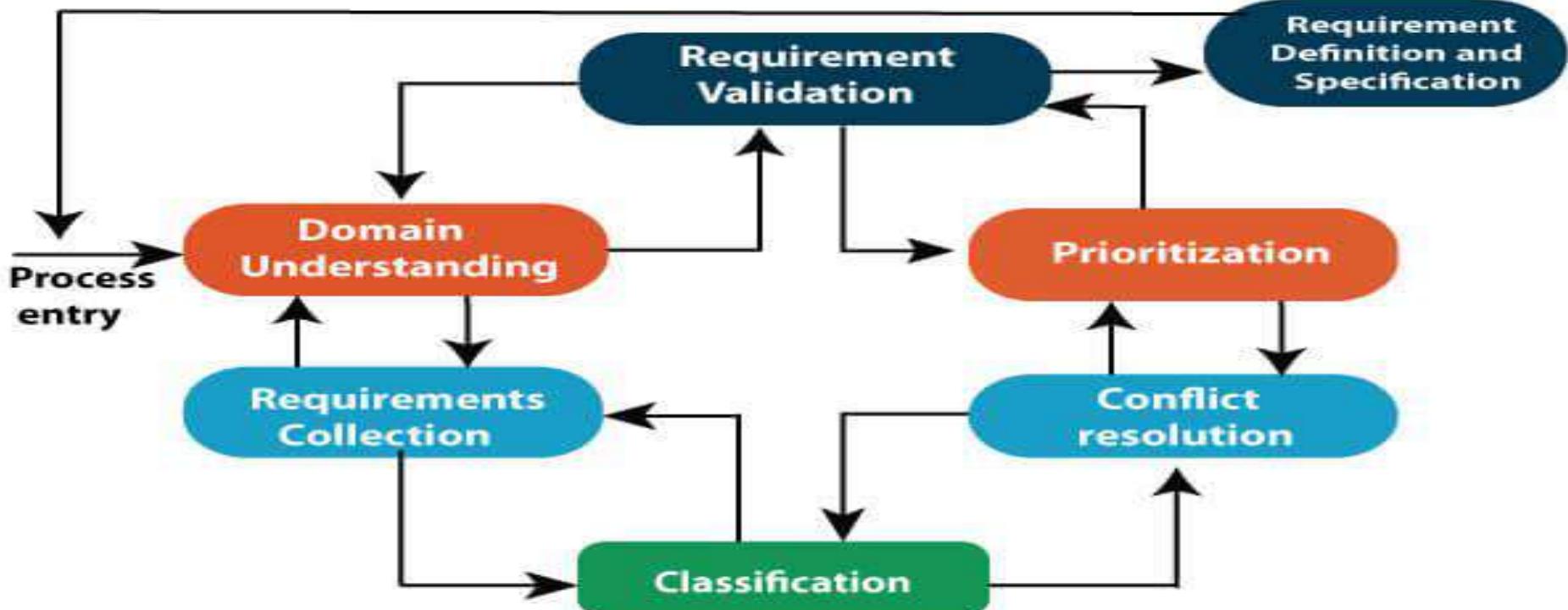
2. Requirement Elicitation and Analysis

- This is also known as the **gathering of requirements**.

- Here, **requirements are identified** with the help of **customers** and **existing systems** processes, if available.

- **Analysis of requirements starts with requirement elicitation.**

- The requirements are **analyzed to identify inconsistencies**, **defects**, **omission**, etc. We describe requirements in terms of **relationships** and also resolve conflicts if any.

- **Problems of Elicitation and Analysis**

- Getting all, and only, the right people involved.

- Stakeholders often don't know what they want

- Stakeholders express requirements in their terms.

- Stakeholders may have conflicting requirements.

- Requirement change during the analysis process.

- Organizational and political factors may influence system requirements.
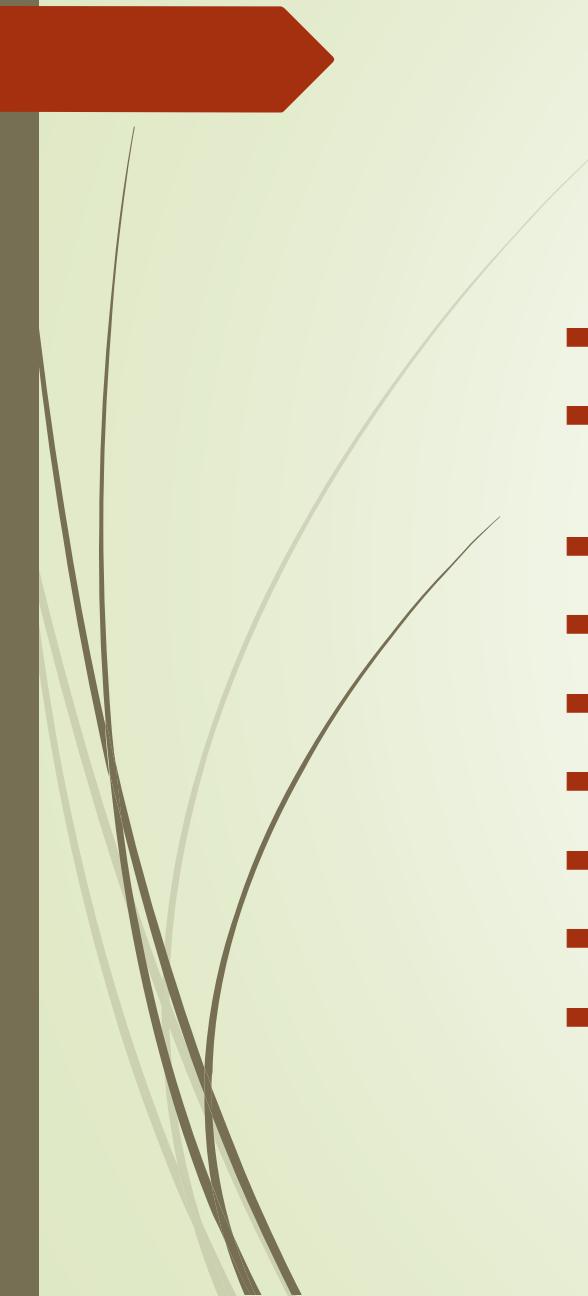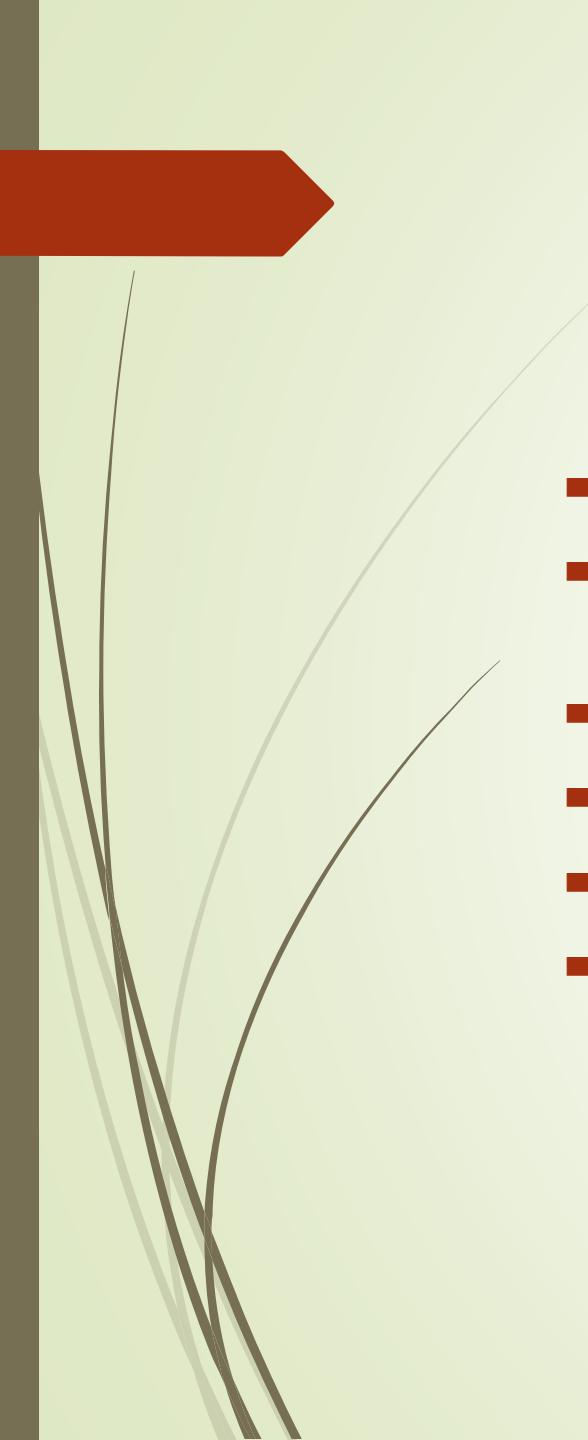
Elicitation and Analysis Process

REQUIREMENT GATHERING

- It is the **process of identifying your project's exact requirements.**

- **This process occurs during the project initiation phase** but you'll **continue to manage your project requirements** throughout the entire project timeline.

- **Step 1: Assign roles - identify** your project stakeholders.

- A stakeholder is anyone invested in the project, they can be internal or external partners.

- For **example**, a customer is an external stakeholder, while a department manager or board member is an internal stakeholder.

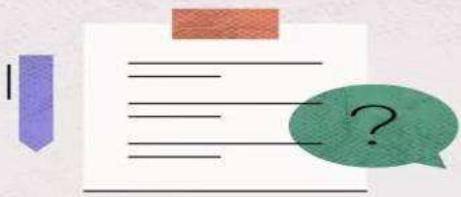- **Other roles** include the project manager, project administrator, designers, product testers, and developers.

- **Step 2: Meet with stakeholders**
- Some questions you can ask include:
- What is your goal for this project?
- What do you think would make this project successful?
- What are your concerns about this project?
- What do you wish this product or service would do that it doesn't already?
- What changes would you recommend about this project?

- **Step 3: Gather documents**
- The goal is to document everything you can, so have all of the answers you need to start your project.
- Use a **project management tool** to **collect** and **document** this information.
- Some **examples** of what you might document include:
- Stakeholder answers to interview questions
- Stakeholder questions
- Stakeholder requests
- Stakeholder comments
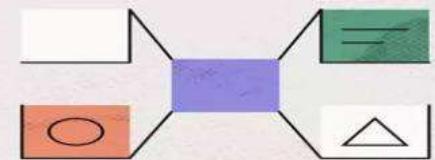- Questions and comments that arise during interviews

- **Step 4: List assumptions and requirements**

- Now that you've completed the **intake process**, create your requirements management plan based on the information you've gathered.

- **create your requirements goals**, including

- **Length of project schedule-- Gantt chart**

- **People involved in the project**

- **Project risks**

- **Step 5: Get approval**
- approval from stakeholders to ensure you're meeting user needs.
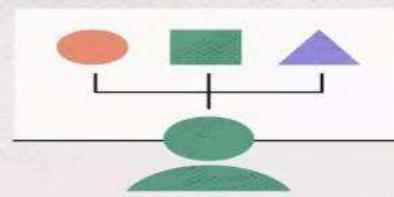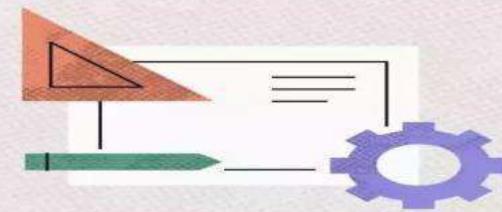- **Step 6: Monitor progress**

Techniques for requirements gathering

Questionnaires
Ask specific questions across the entire team.

Use case scenarios
Describe how you think a project will pan out.

Mind mapping
Visualize brainstorming to identify requirements.

Prototyping
Show stakeholders what the potential deliverable could look like.

Requirements analysis process

- Requirements analysis is a **multistage process** that involves the following steps.

- **Categorize requirements**

- Categorization of requirements can help with prioritization, impact analysis, feasibility analysis and conflict resolution.

- Four common requirements categories are the following:

- Functional requirements.

- Technical requirements.

- Transitional requirements.

- Operational requirements.

3. Software Requirement Specification

- Software requirement specification is a **kind of document** which is created by a **software analyst** after the requirements collected from the various sources - the requirement received by the customer written in ordinary language.

- It is the job of the **analyst to write the requirement in technical language** so that they can be understood and beneficial by the development team.

- The models used at this stage ---

- **Data Flow Diagrams:** Data Flow Diagrams (DFDs) are used widely for modeling the requirements. DFD shows the flow of data through a system. The system may be a company, an organization, a set of procedures, a computer hardware system, a software system, or any combination of the preceding. The DFD is also known as a data flow graph or bubble chart.

- **Data Dictionaries:** Data Dictionaries are simply repositories to store information about all data items defined in DFDs. At the requirements stage, the data dictionary should at least define customer data items, to **ensure that the customer and developers use the same definition and terminologies.**

- **Entity-Relationship Diagrams:** Another tool for requirement specification is the entity-relationship diagram, often called an "*E-R diagram*." It is a detailed logical representation of the data for the organization and uses three main constructs i.e. data entities, relationships, and their associated attributes.

4. Software Requirement Validation

- **After requirement specifications developed**, the requirements discussed in this **document are validated**.

- The user might demand illegal, impossible solution or experts may misinterpret the needs.

- Requirements are checked against the following conditions -

- If they can practically implement

- If they are correct and as per the functionality and specially of software

- If there are any ambiguities

- If they are complete

- If they can describe

Requirements Validation Techniques

- **Requirements reviews/inspections:** systematic manual analysis of the requirements.

- **Prototyping:** Using an executable model of the system to check requirements.

- **Test-case generation:** Developing tests for requirements to check testability.

- **Automated consistency analysis:** checking for the consistency of structured requirements descriptions.

Assignment -2
Case Study

- Requirement Engineering for an AI Customer Support Chatbot.

- **Project Goal:**

- To develop an **AI chatbot** that automates customer support for an e-commerce website, handling common user queries such as order tracking, refunds, and FAQs.