UNIT 2

Requirement Elicitation– SRS Document

Requirements elicitation is the process of gathering and defining the requirements for a software system. The goal of requirements elicitation is to ensure that the software development process is based on a clear and comprehensive understanding of the customer's needs and requirements. Requirements elicitation involves the identification, collection, analysis, and refinement of the requirements for a software system.

Requirements elicitation is perhaps the most difficult, most error-prone, and most communication-intensive software development. It can be successful only through an effective customer-developer partnership. It is needed to know what the users really need.

RequirementselicitationActivities:

Requirements elicitation includes the subsequent activities. Few of them are listed below –

- Knowledge of the overall area where the systems is applied.
- The details of the precise customer problem where the system is going to be applied must be understood.
- Interaction of system with external requirements.
- Detailed investigation of user needs.
- Define the constraints for system development.

Requirements elicitation Methods:

There are a number of requirements elicitation methods. Few of them are listed below –

1. Interviews
2. Brainstorming Sessions
3. Facilitated Application Specification Technique (FAST)
4. Quality Function Deployment (QFD)
5. Use Case Approach

The success of an elicitation technique used depends on the maturity of the analyst, developers, users, and the customer involved.

1. Interviews:

Objective of conducting an interview is to understand the customer's expectations from the software.

It is impossible to interview every stakeholder hence representatives from groups are selected based on their expertise and credibility.

Interviews maybe be open-ended or structured.

1. In open-ended interviews there is no pre-set agenda. Context free questions may be asked to understand the problem.

2. In structured interview, agenda of fairly open questions is prepared. Sometimes a proper questionnaire is designed for the interview.

2. Brainstorming Sessions:

- It is a group technique
- It is intended to generate lots of new ideas hence providing a platform to share views
- A highly trained facilitator is required to handle group bias and group conflicts.
- Every idea is documented so that everyone can see it.
- Finally, a document is prepared which consists of the list of requirements and their priority if possible.

3. Facilitated Application Specification Technique:

Its objective is to bridge the expectation gap – the difference between what the developers think they are supposed to build and what customers think they are going to get. A team-oriented approach is developed for requirements gathering. Each attendee is asked to make a list of objects that are-

1. Part of the environment that surrounds the system
2. Produced by the system
3. Used by the system

Each participant prepares his/her list, different lists are then combined, redundant entries are eliminated, team is divided into smaller sub-teams to develop mini-specifications and finally a draft of specifications is written down using all the inputs from the meeting.

4. Quality Function Deployment:

In this technique customer satisfaction is of prime concern, hence it emphasizes on the requirements which are valuable to the customer.
3 types of requirements are identified –

- **Normalrequirements** – In this the objective and goals of the proposed software are discussed with the customer. Example – normal requirements for a result management system may be entry of marks, calculation of results, etc
- **Expectedrequirements** – These requirements are so obvious that the customer need not explicitly state them. Example – protection from unauthorized access.
- **Excitingrequirements** – It includes features that are beyond customer's expectations and prove to be very satisfying when present. Example – when unauthorized access is detected, it should backup and shutdown all processes.

The major steps involved in this procedure are –

1. Identify all the stakeholders, eg. Users, developers, customers etc
2. List out all requirements from customer.
3. A value indicating degree of importance is assigned to each requirement.
4. In the end the final list of requirements is categorized as –
    - It is possible to achieve
    - It should be deferred and the reason for it
    - It is impossible to achieve and should be dropped off

5.UseCaseApproach:

This technique combines text and pictures to provide a better understanding of the requirements. The use cases describe the 'what', of a system and not 'how'. Hence, they only give a functional viewofthesystem.

The components of the use case design includes three major things – Actor, Use cases, use case diagram.

1. **Actor** –
   It is the external agent that lies outside the system but interacts with it in some way. An actor maybe a person, machine etc. It is represented as a stick figure. Actors can be primary actors or secondary actors.
   - Primary actors – It requires assistance from the system to achieve a goal.
   - Secondary actor – It is an actor from which the system needs assistance.
2. **Use cases** –
   They describe the sequence of interactions between actors and the system. They capture who(actors) do what(interaction) with the system. A complete set of use cases specifies all possible ways to use the system.
3. **Use case diagram** –
   A use case diagram graphically represents what happens when an actor interacts with a system. It captures the functional aspect of the system.
   - A stick figure is used to represent an actor.
   - An oval is used to represent a use case.
   - A line is used to represent a relationship between an actor and a use case.

Features of requirements elicitation:

1. **Stakeholder engagement:** Requirements elicitation involves engaging with stakeholders such as customers, end-users, project sponsors, and subject matter experts to understand their needs and requirements.
2. **Gathering information:** Requirements elicitation involves gathering information about the system to be developed, the business processes it will support, and the end-users who will be using it.
3. **Requirement prioritization:** Requirements elicitation involves prioritizing requirements based on their importance to the project's success.
4. **Requirements documentation:** Requirements elicitation involves documenting the requirements in a clear and concise manner so that they can be easily understood and communicated to the development team.
5. **Validation and verification:** Requirements elicitation involves validating and verifying the requirements with the stakeholders to ensure that they accurately represent their needs and requirements.
6. **Iterative process:** Requirements elicitation is an iterative process that involves continuously refining and updating the requirements based on feedback from stakeholders.
7. C**ommunication and collaboration:** Requirements elicitation involves effective communication and collaboration with stakeholders, project team members, and other relevant parties to ensure that the requirements are clearly understood and implemented.

8. **Flexibility:** Requirements elicitation requires flexibility to adapt to changing requirements, stakeholder needs, and project constraints.

Advantages of Requirements Elicitation:

- Helps to clarify and refine customer requirements.
- Improves communication and collaboration between stakeholders.
- Increases the chances of developing a software system that meets customer needs.
- Avoids misunderstandings and helps to manage expectations.
- Supports the identification of potential risks and problems early in the development cycle.
- Facilitates the development of a comprehensive and accurate project plan.
- Increases user and stakeholder confidence in the software development process.
- Supports the identification of new business opportunities and revenue streams.

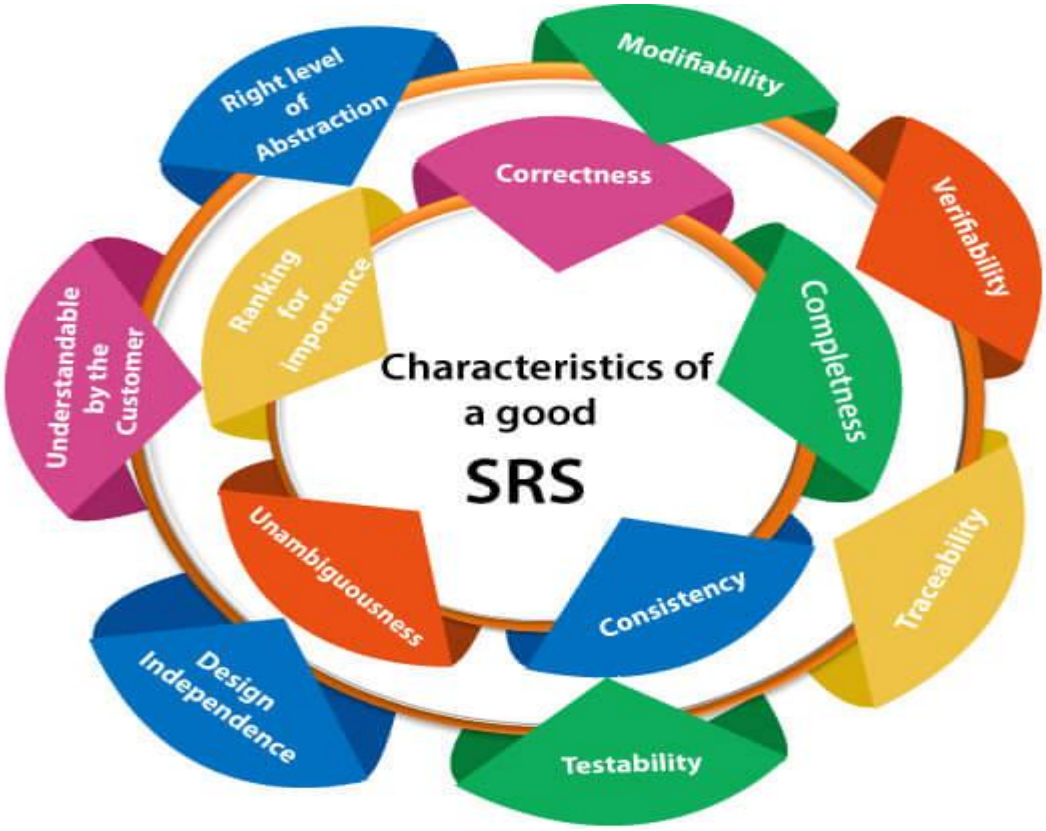
Disadvantages of Requirements Elicitation:

- Can be time-consuming and expensive.
- Requires specialized skills and expertise.
- May be impacted by changing business needs and requirements.
- Can be impacted by political and organizational factors.
- Can result in a lack of buy-in and commitment from stakeholders.
- Can be impacted by conflicting priorities and competing interests.
- May result in incomplete or inaccurate requirements if not properly managed.
- Can lead to increased development costs and decreased efficiency if requirements are not well-defined.

Software Requirement Specifications

The production of the requirements stage of the software development process is **Software Requirements Specifications (SRS)** (also called a **requirements document**). This report lays a foundation for software engineering activities and is constructing when entire requirements are elicited and analyzed. **SRS** is a formal report, which acts as a representation of software that enables the customers to review whether it (SRS) is according to their requirements. Also, it comprises user requirements for a system as well as detailed specifications of the system requirements.

Characteristics of good SRS



Following are the features of a good SRS document:

1. Correctness: User review is used to provide the accuracy of requirements stated in the SRS. SRS is said to be perfect if it covers all the needs that are truly expected from the system.

Completeness: The SRS is complete if, and only if, it includes the following elements:

(1). All essential requirements, whether relating to functionality, performance, design, constraints, attributes, or external interfaces.

(2). Definition of their responses of the software to all realizable classes of input data in all available categories of situations.

(3). Full labels and references to all figures, tables, and diagrams in the SRS and definitions of all terms and units of measure.

3. Consistency: The SRS is consistent if, and only if, no subset of individual requirements described in its conflict. There are three types of possible conflict in the SRS:

(1). The specified characteristics of real-world objects may conflicts. For example,

(a) The format of an output report may be described in one requirement as tabular but in another as textual.

(b) One condition may state that all lights shall be green while another states that all lights shall be blue.

(2). There may be a reasonable or temporal conflict between the two specified actions. For example,

(a) One requirement may determine that the program will add two inputs, and another may determine that the program will multiply them.

(b) One condition may state that "A" must always follow "B," while other requires that "A and B" co-occurs.

(3). Two or more requirements may define the same real-world object but use different terms for that object. For example, a program's request for user input may be called a "prompt" in one requirement's and a "cue" in another. The use of standard terminology and descriptions promotes consistency.

4. Unambiguousness: SRS is unambiguous when every fixed requirement has only one interpretation. This suggests that each element is uniquely interpreted. In case there is a method used with multiple definitions, the requirements report should determine the implications in the SRS so that it is clear and simple to understand.

5. Ranking for importance and stability: The SRS is ranked for importance and stability if each requirement in it has an identifier to indicate either the significance or stability of that particular requirement.

Typically, all requirements are not equally important. Some prerequisites may be essential, especially

for life-critical applications, while others may be desirable. Each element should be identified to make these differences clear and explicit. Another way to rank requirements is to distinguish classes of items as essential, conditional, and optional.

6. Modifiability: SRS should be made as modifiable as likely and should be capable of quickly obtain changes to the system to some extent. Modifications should be perfectly indexed and cross-referenced.

7. Verifiability: SRS is correct when the specified requirements can be verified with a cost-effective system to check whether the final software meets those requirements. The requirements are verified with the help of reviews.

8. Traceability: The SRS is traceable if the origin of each of the requirements is clear and if it facilitates the referencing of each condition in future development or enhancement documentation.

There are two types of Traceability:

1. Backward Traceability: This depends upon each requirement explicitly referencing its source in earlier documents.

2. Forward Traceability: This depends upon each element in the SRS having a unique name or reference number.

The forward traceability of the SRS is especially crucial when the software product enters the operation and maintenance phase. As code and design document is modified, it is necessary to be able to ascertain the complete set of requirements that may be concerned by those modifications.

9. Design Independence: There should be an option to select from multiple design alternatives for the final system. More specifically, the SRS should not contain any implementation details.

10. Testability: An SRS should be written in such a method that it is simple to generate test cases and test plans from the report.

11. Understandable by the customer: An end user may be an expert in his/her explicit domain but might not be trained in computer science. Hence, the purpose of formal notations and symbols should be avoided too as much extent as possible. The language should be kept simple and clear.

12. The right level of abstraction: If the SRS is written for the requirements stage, the details should be explained explicitly. Whereas,for a feasibility study, fewer analysis can be used. Hence, the level of abstraction modifies according to the objective of the SRS.

Properties of a good SRS document

The essential properties of a good SRS document are the following:

Concise: The SRS report should be concise and at the same time, unambiguous, consistent, and

complete. Verbose and irrelevant descriptions decrease readability and also increase error possibilities.

Structured: It should be well-structured. A well-structured document is simple to understand and modify. In practice, the SRS document undergoes several revisions to cope up with the user requirements. Often, user requirements evolve over a period of time. Therefore, to make the modifications to the SRS document easy, it is vital to make the report well-structured.

Black-box view: It should only define what the system should do and refrain from stating how to do these. This means that the SRS document should define the external behavior of the system and not discuss the implementation issues. The SRS report should view the system to be developed as a black box and should define the externally visible behavior of the system. For this reason, the SRS report is also known as the black-box specification of a system.

Conceptual integrity: It should show conceptual integrity so that the reader can merely understand it. Response to undesired events: It should characterize acceptable responses to unwanted events. These are called system response to exceptional conditions.

Verifiable: All requirements of the system, as documented in the SRS document, should be correct. This means that it should be possible to decide whether or not requirements have been met in an implementation.