Unit II

Software Requirements Engineering and Analysis

Unit II	Software Requirements Engineering and Analysis	(07 Hours)

Modeling: Requirements Engineering, Establishing the Groundwork, Identifying Stakeholders, Recognizing Multiple Viewpoints, working toward Collaboration, Asking the First Questions, Eliciting Requirements, Collaborative Requirements Gathering, Usage Scenarios, Elicitation Work Products, Developing Use Cases, Building the Requirements Model, Elements of the Requirements Model, Negotiating Requirements, Validating Requirements.

Suggested Free Open Source tools: StarUML, Modelio, SmartDraw.

Software Requirements

- Requirements:-
  - Services that user expects from system
  - Gathering the requirements-done by communication with user
- Types of Requirements:-

1. Functional Requirements
2. Non Functional Requirements

Cont'd….

- Functional Requirements:-
  - Describe the functionality of the system.

    i.e. features provided by system to satisfy customer (List of features)
  - Should be complete and consistent

- Non-Functional Requirements:-
  - Not directly related to the functionality of the system.
  - How features are provided. (Implementation of those features)

Cont'd….

- Not needed for users.
- More important than functional

Types of Non Functional Requirements

1. Product Requirements
2. Organizational Requirements
3. External Requirements

Cont'd….

1. Product Requirements:-

- Specify that delivered product must behave in a particular way.
- Ex: Reliability, Efficiency, Performance etc…

2. Organizational Requirements:-

- Specifies the organizational policies and procedures
- Ex: Process standard and its implementation

Cont'd….

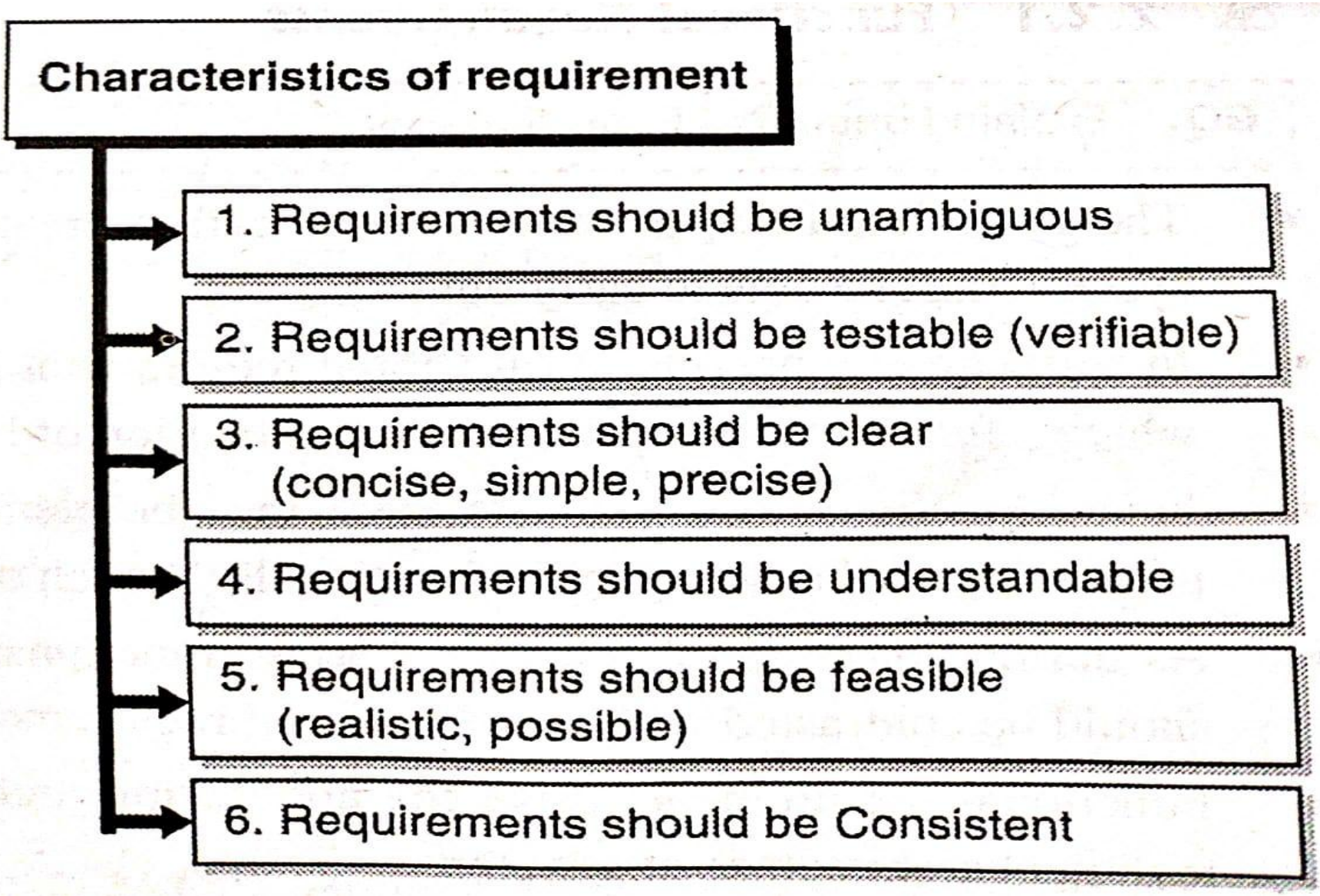
3. External Requirements:-

- Req. that arise from external process of system and development process.
- Ex: Interoperability

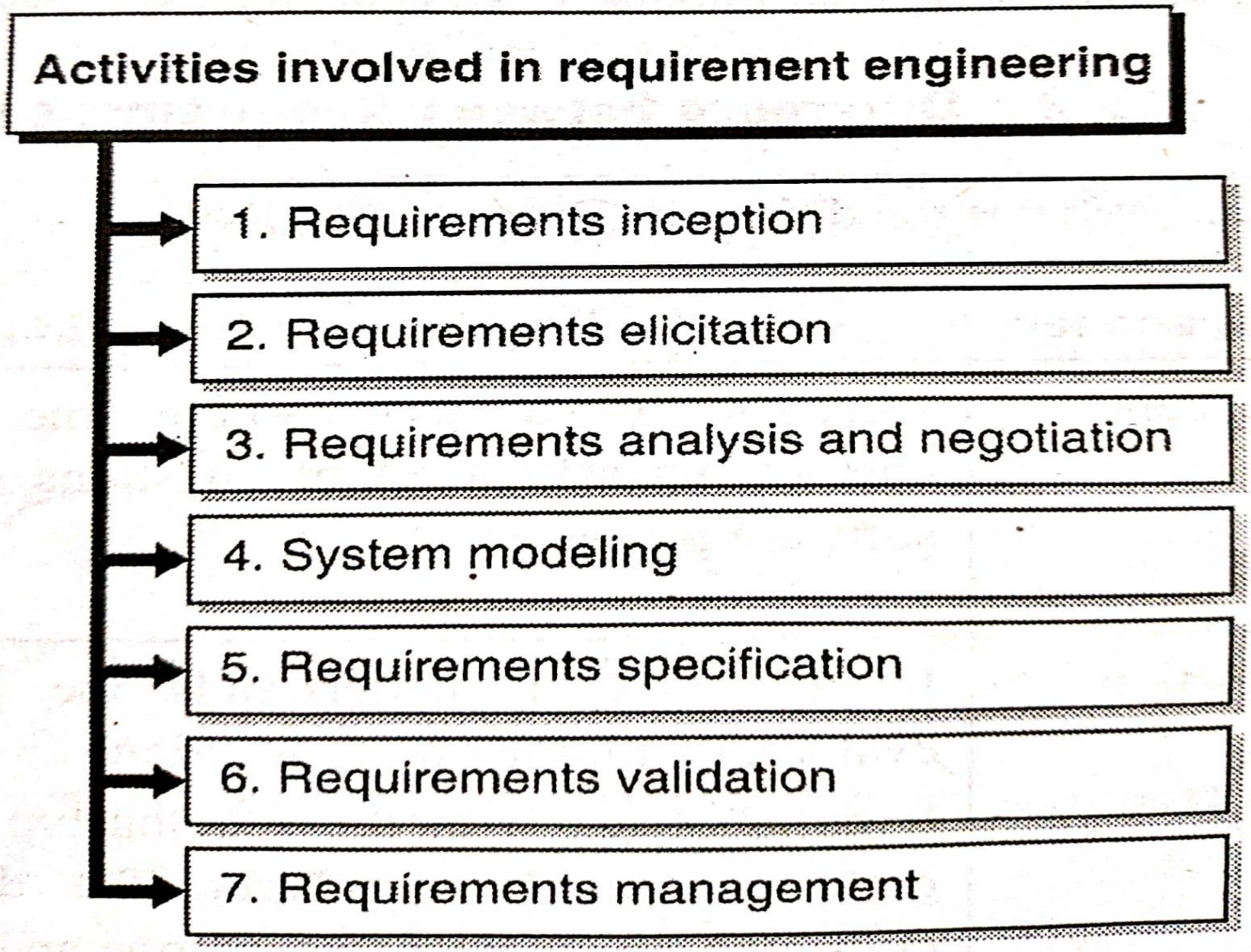
Requirements Engineering

- Requirements engineering (RE) is the **process of defining, documenting, and maintaining requirements in the engineering design process**.
- It is the description of features and functionalities of the target system.
- It is the description of what the system should do.
- It is a common role in systems engineering and software engineering. ... In the waterfall model, requirements engineering is presented as the first phase of the development process.

Characteristics of Requirements



Activities/Tasks involved in requirement Engineering



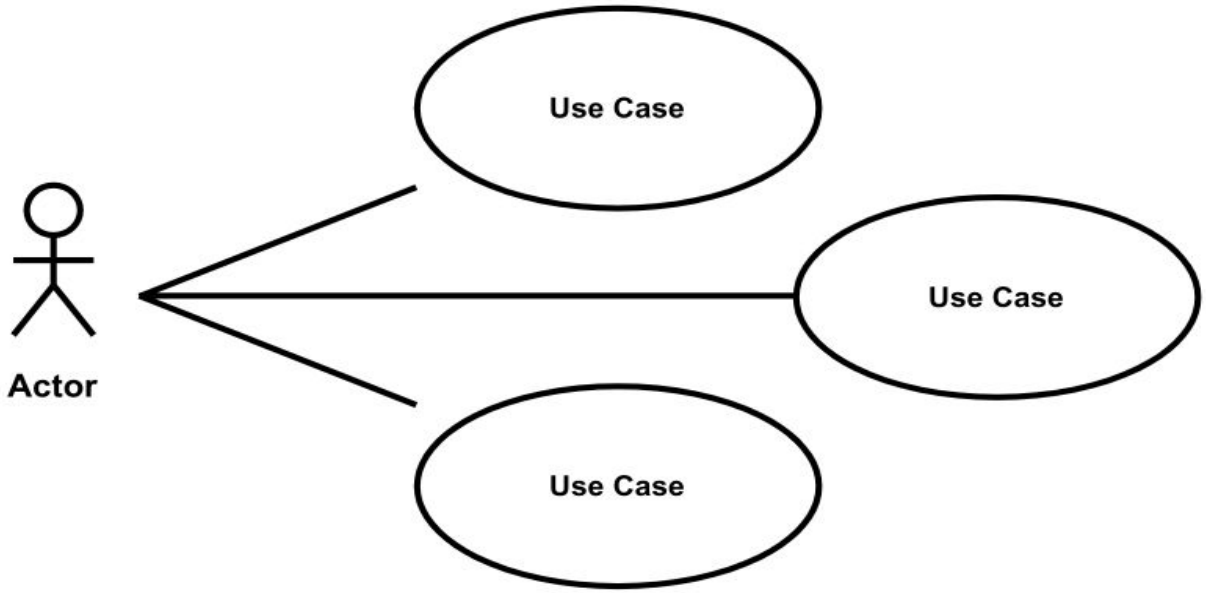
Tool support for Requirements Engineering

- Use cases
- Observation reports (User observation)
- Questionnaires (Interviews and Surveys)
- Prototyping
- Role Playing

Use case

- Use case is nothing but the system behavior and how the system behaves as per the end user.
- It describes the system functionality as per the end user.
- Use case diagram represents various business activities performed in a system.
- Business analysts or Business users will create the use cases.
- Purpose:- Perform the task & achieve the main goal.

Use Case Diagram



Cont'd….

- A use case diagram graphically represents what happens when an actor interacts with a system. It captures the functional aspect of the system.

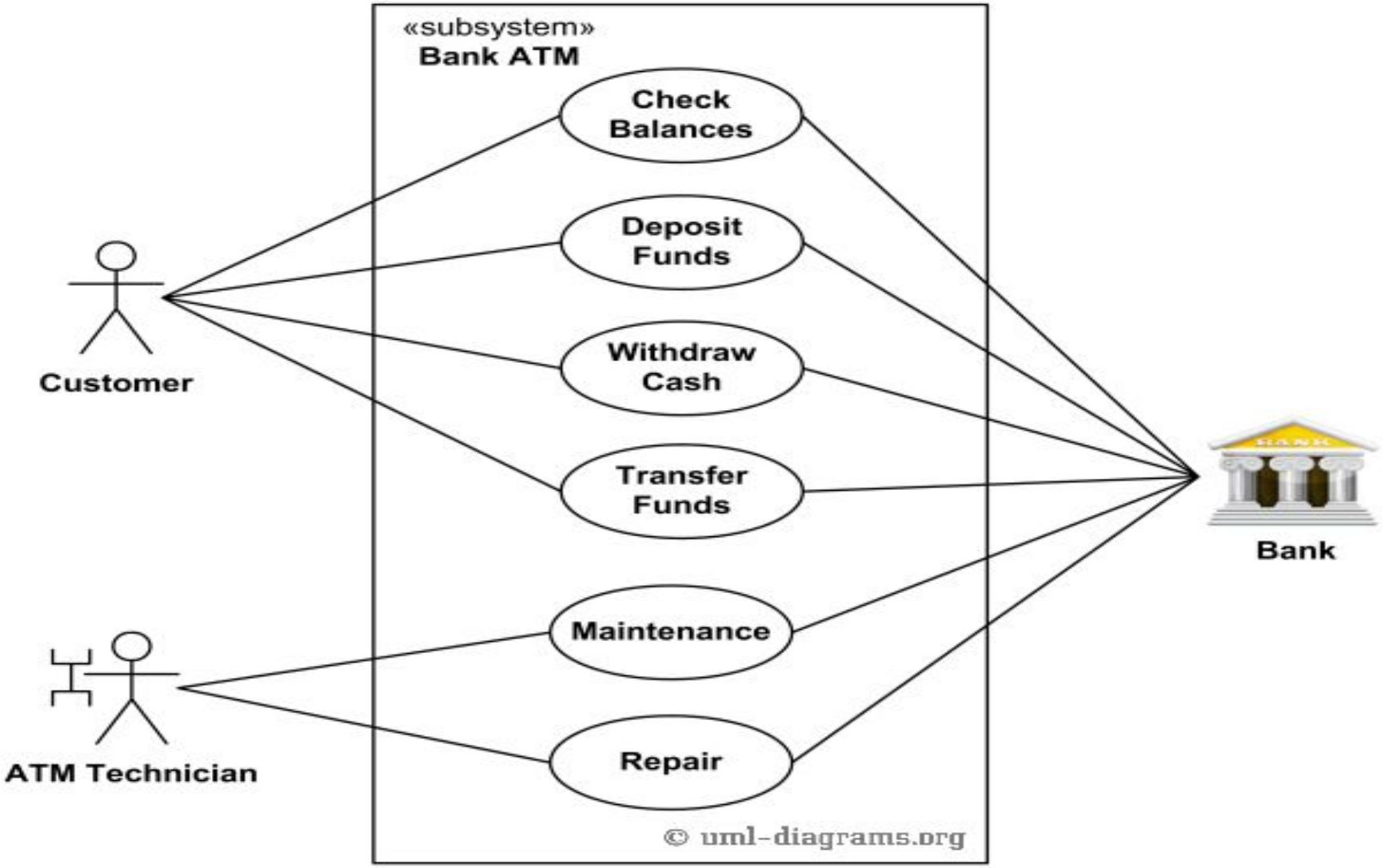
- **Components of Use Case diagram**

1. Actor:- It may be a person, machine, or group of person or system. A stick figure is used to represent an actor.

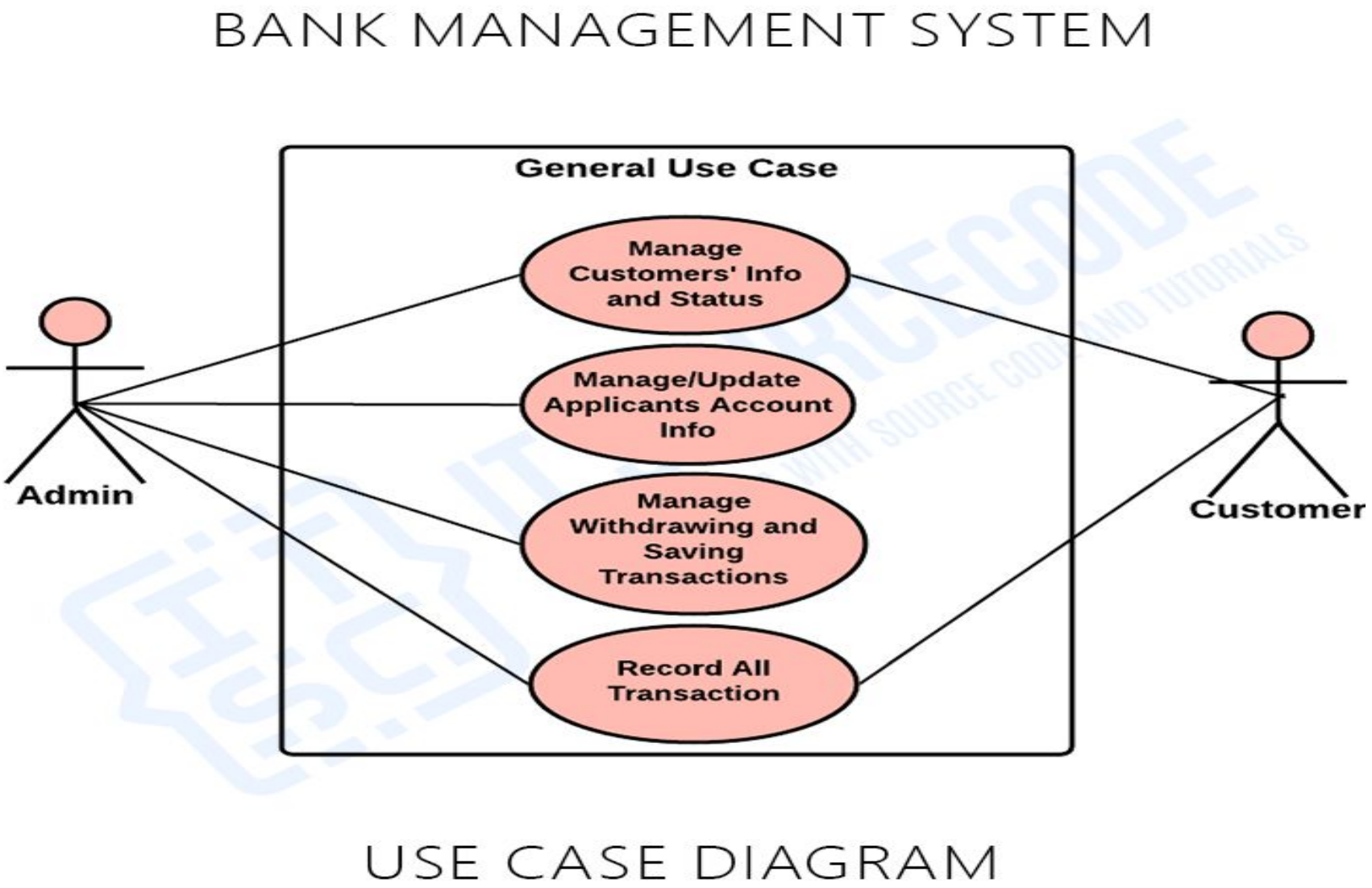
2. Use case:- The actions that a person is going to perform that actions can be represented in a use case. An oval is used to represent a use case.

3. A line is used to represent a relationship between an actor and a use case.

Bank ATM

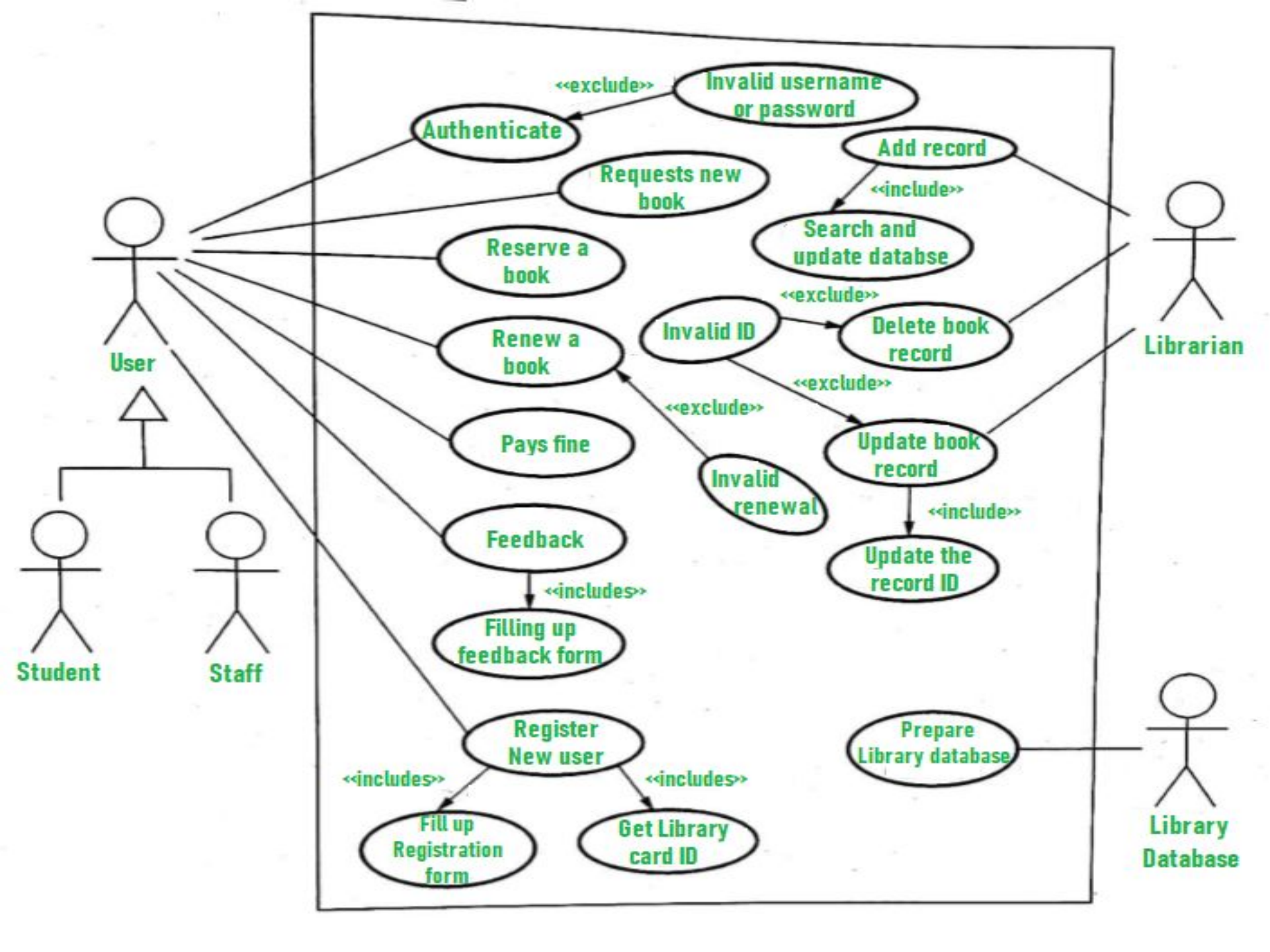

«subsystem»
Bank ATM
Check Balances
Deposit Funds
Withdraw Cash
Transfer Funds
Maintenance
Repair
Customer
ATM Technician
Bank
© uml-diagrams.org

Bank Management System



Library Management System

- There are 4 actors in this system.
- Multiple use cases, and they are interacting with system.
- Actors interact with system with help of use cases.


User
Student
Staff
Librarian
Library Database
Authenticate
<<exclude>>
Invalid username or password
Requests new book
Reserve a book
Renew a book
Pays fine
Feedback
<<includes>>
Filling up feedback form
Register New user
<<includes>>
Fill up Registration form
<<includes>>
Get Library card ID
Add record
<<include>>
Search and update databse
<<exclude>>
Invalid ID
Delete book record
<<exclude>>
<<exclude>>
Invalid renewal
Update book record
<<include>>
Update the record ID
Prepare Library database

Software Engineering Process

- Requirements engineering (RE) is the **process of defining, documenting, and maintaining requirements in the engineering design process**.

- It is a common role in systems engineering and software engineering. In the waterfall model, requirements engineering is presented as the first phase of the development process.

Cont'd….

- It is a four step process, which includes –

1. Feasibility Study
2. Requirement Gathering
3. Software Requirement Specification
4. Software Requirement Validation

Software Requirement Specification (SRS)

- SRS stands for “Software Requirement Specification”.
- It is a detail description of software system to be developed with its functional & non functional requirement.
- It is a document prepared by business analyst or system analyst.
- It describes what will be the features of software and what will be its behaviour.

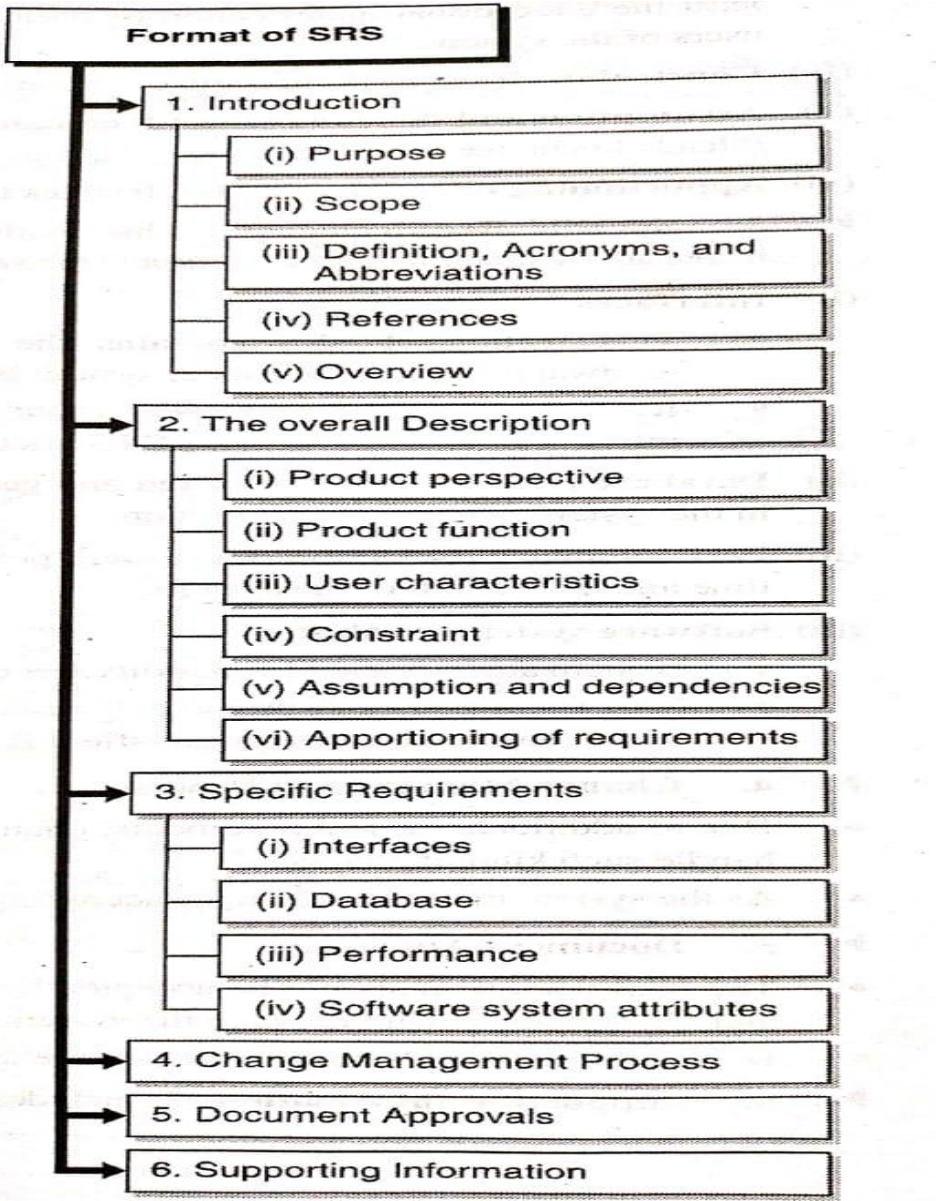
Cont'd….

- The SRS consists of all necessary requirements required for the project development.
- In order to get all the details of software from customer and to write the SRS document, system analyst is required.
- SRS document is actually an agreements between the client and developer.

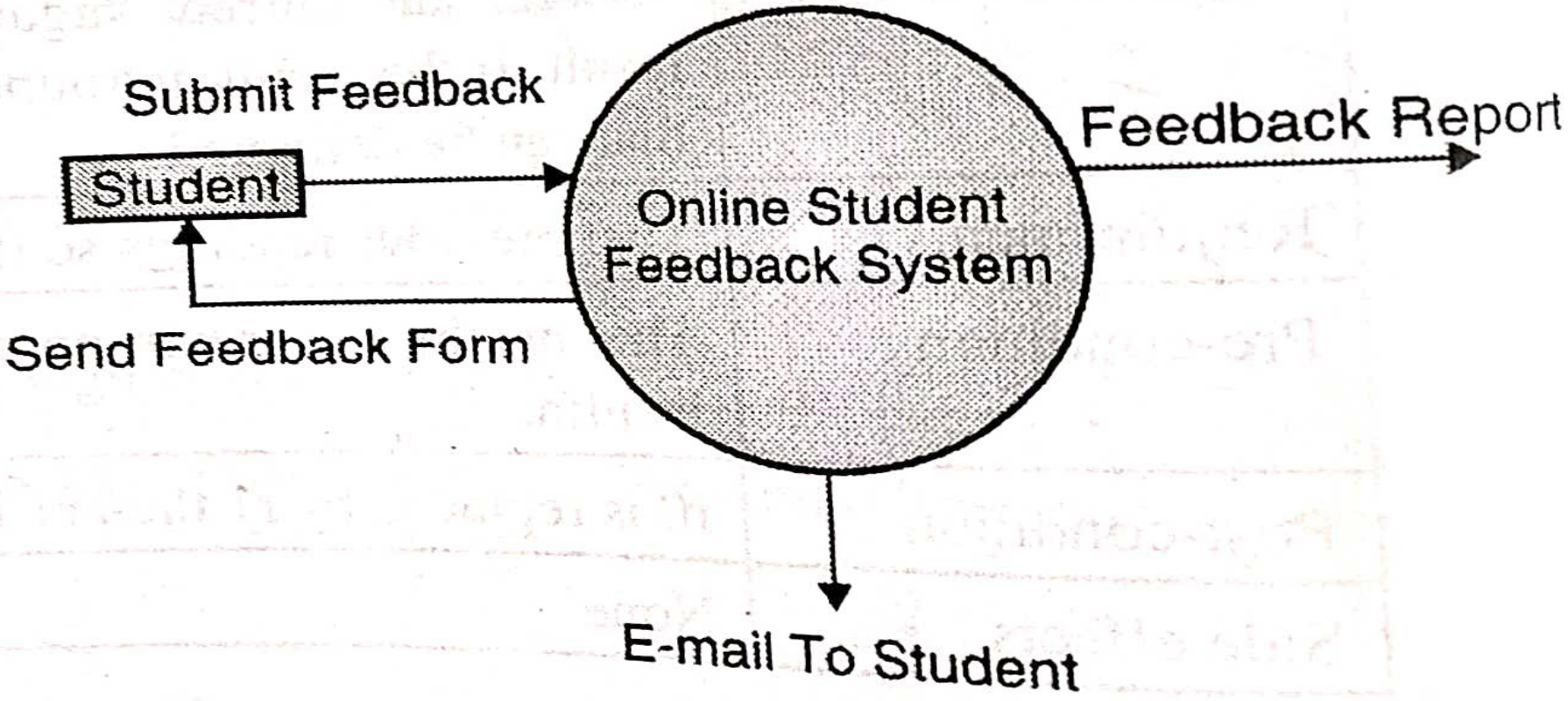
Characteristics of SRS document

1. Complete
2. Feasible
3. Modifiable
4. Testable
5. Correct
6. Verifiable
7. Unambiguous

Structure of SRS



SRS document for Online Student Feedback System



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1. Introduction

1.1 Purpose

- This document gives detailed functional and non- functional requirements for online student feedback system. The purpose of this document is that the requirements mentioned in it should be utilized by software developers to implement the system.

1.2 Scope

- This system allows the students to provide quick feedback which is provided by collage staff.

- The feedback report is generated which is checked by HOD's. He can view grade obtained to the lecturers.

1.3 Overview

- This system provides an easy solution to collage staff and students for maintaining feedback related to collage staff and infrastructure facility.

Cont'd….

2. General Description

- This online student feedback system replaces the traditional, manual feedback system by which lots of paper work will be reduced.

- The teachers are able to provide feedback regarding facility and students are able to provide feedback easily.

- This is primary feature of this system. Another feature is that feedback form can be provided to student and staff by emailing for filling it.

2.1 User Manual

The system should provide Help option in which how to operate system should be explained. Also hard copy of this document should be given to user in booklet form.

Cont'd….

3. Functional Requirement

3.1 Description

For identity of staff, system should display staff photograph along with their names for that corresponding subject and skills.

Statistical report accordingly subject or skill should display individual's report whenever required.

Cont'd….

4. Interface Requirement

Student

Student can give the feedback about the lecturers on the scale of ten. Student can give feedback about the lecturers based on interaction of lecturer in the class rooms with students and facility provided by collage like infrastructure etc.

Staff

The feedback given by students can be viewed by the staff and improve their performance in teaching and other aspects

Cont'd….

Head of Department

The feedback report can be checked by HOD. He can view overall grades and view the grades obtained by the lecturers and give report to principal and he can give counseling to the collage staff.

4.2 Hardware Interface

The system should be embedded in all desktops.

Cont'd….

4.3 Software Interface

(i) Online Student Feedback System

(ii) The feedback database transmitted to database server.

(iii) Report generator

5. Performance Requirements

- The system should work concurrently on multiple processors between the collage hours.
- The report should be generated immediately within one hour

Cont'd….

6. Design Constraints

The system should be designed within 6 months.

7. Other non-functional attributes

Security: The student and staff should be provided password to log on to the system.

Reliability: Reliability should be guaranteed due to wired connectivity. Availability: The system should be available during college hours.

Cont'd….

Maintainability: There should be facility to add and delete feedback form for different purpose. Reusability: The same system will be used in each semester.

8. Operational Scenarios : There should be student database and teacher database. The student database should contain name and feedback information.
The teacher database should contain name, subject, skills, and other details.

9. Preliminary Schedule :
The system should be designed within 6 months.

Feasibility Study

- To find out the current user needs and budget.
- This feasibility study is focused towards goal of the organization.
- This study analyzes whether the software product can be practically materialized in terms of implementation, contribution of project to organization, cost constraints and as per values and objectives of the organization.
- It explores technical aspects of the project and product such as usability, maintainability, productivity and integration ability.

Requirement Gathering / Elicitation

- Requirements Elicitation is the process to find out the requirements for an intended software system by communicating with client, end users, system users and others who have a stake in the software system development.

- There are various ways to discover requirements

1. **Interviews**
2. **Surveys**
3. **Questionnaires**
4. **Domain Analysis**
5. **Brainstorming**
6. **Observation**

Interviews

- Interviews are important way for gathering requirements. Organization may take various kinds of interviews such as:
- Oral interviews.
- Written interviews.
- Structured or closed interviews in which information to be collected from customer in decided in advance.
- Non-structured or open interviews in which details needs to be collected from customer are decided in advance.

Cont'd….

- Face-to-face interviews which are held among two people across the table.

- Groups of persons are participating in group interviews. They support to cover any missing requirement as number of people participates in this process -conduct

Surveys

- Organization may perform surveys of different stakeholders by questioning them about their requirements and expectation from the proposed software system.

- The advantage of this technique is that, collecting requirements is economically beneficial because it collects requirements from a large number of persons at same time

Questionnaires

- Questionnaires are a document which contains set of objectives that is based on questions and their options. This document is given to all stakeholders to give answers of those questions which are gathered and compiled.

- The advantage of this technique is that, collecting requirements is economically beneficial because it collects requirements from persons at the same time.

Cont'd….

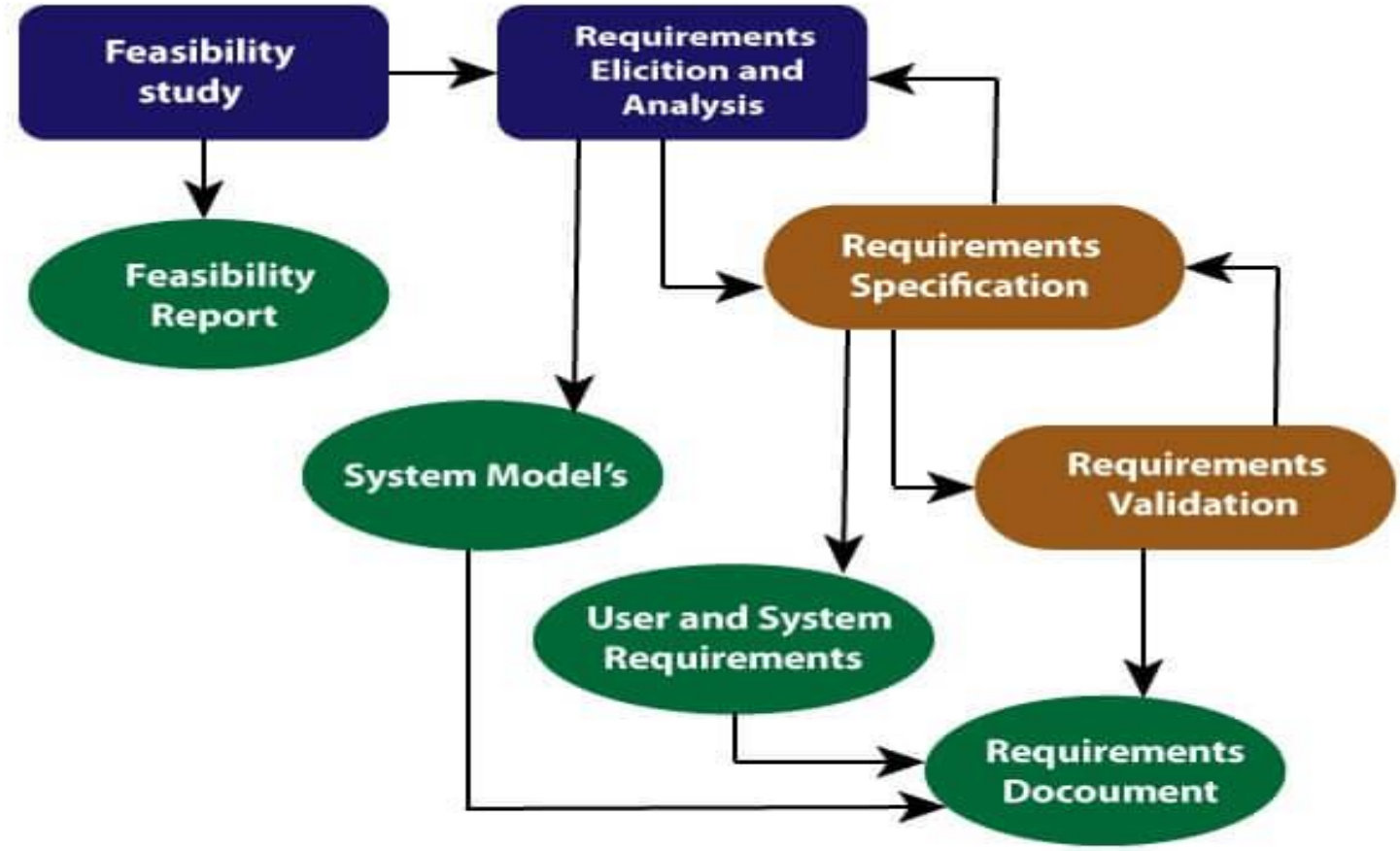
Domain Analysis:

- Each software is put into some domain category
- The experienced persons in that domain can be a great support to study general and specific requirements.

Brainstorming:

- Brainstorming is an informal debate held between different stakeholders and all their suggestions are documented for further requirement analysis.

Requirement Engineering Process



Requirement Engineering Process

Requirement Validation

- Requirements validation is the process of checking that requirements defined for development, define the system that the customer really wants.

- To check issues related to requirements, we perform requirements validation.

- We usually use requirements validation to check error at the initial phase of development as the error may increase excessive rework when detected later in the development process.

Cont'd….

In the requirements validation process, we perform a different type of test to check the requirements mentioned in the SRS these checks include:

1. Completeness checks
2. Consistency checks
3. Validity checks
4. Realism checks
5. Ambiguity checks
6. Verifiability