Chapter 5
Requirements Engineering Process

Lesson Objectives

- Explain what is requirement engineering
- Describe the 5 activities in requirements engineering process
- Discuss the problems in requirement analysis phase of software engineering
- Explain and evaluate Viewpoint-oriented analysis

Introduction

What is Requirement engineering?

Requirement engineering is a process that involves all of the activities required to create and maintain a system requirements document.

Introduction

This process includes:

1. Feasibility Studies
2. Requirement Elicitation and Analysis
3. Requirement Specification (Discussed in Chapter 4)
4. Requirement Validation
5. Requirement Management

1. Feasibility Studies

1. Feasibility Studies

Technical Feasibility

An estimate is made of whether the identified user needs may be satisfied using current software and hardware technologies.

1. Feasibility Studies

Economical Feasibility

It will decide if the proposed system will be cost-effective and if it can be developed given existing budgetary constraints.

1. Feasibility Studies

Operational Feasibility

Willingness & ability to operate, use & support

Management, employees, customers, suppliers

1. Feasibility Studies

Organizational Feasibility

Supports the strategic objectives?

1. Feasibility Studies

People accepts the system?

Social Feasibility

1. Feasibility Studies

Complete within the planned time

Schedule Feasibility

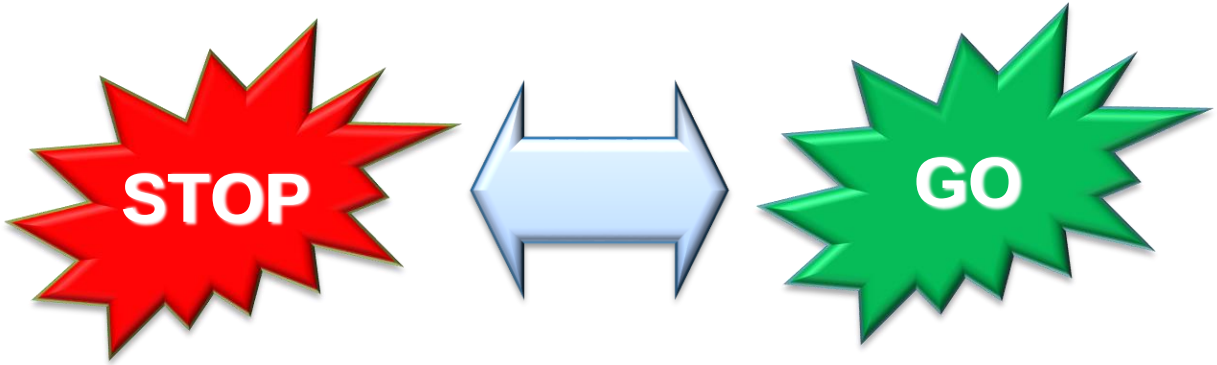
1. Feasibility Studies

Legally accepted

Legal Feasibility

1. Feasibility Studies

- It should be relatively cheap and quickly. The result should inform the decision of whether to go ahead with a more detailed analysis.



2. Requirements Analysis & Elicitation

2. Requirements Analysis & Elicitation

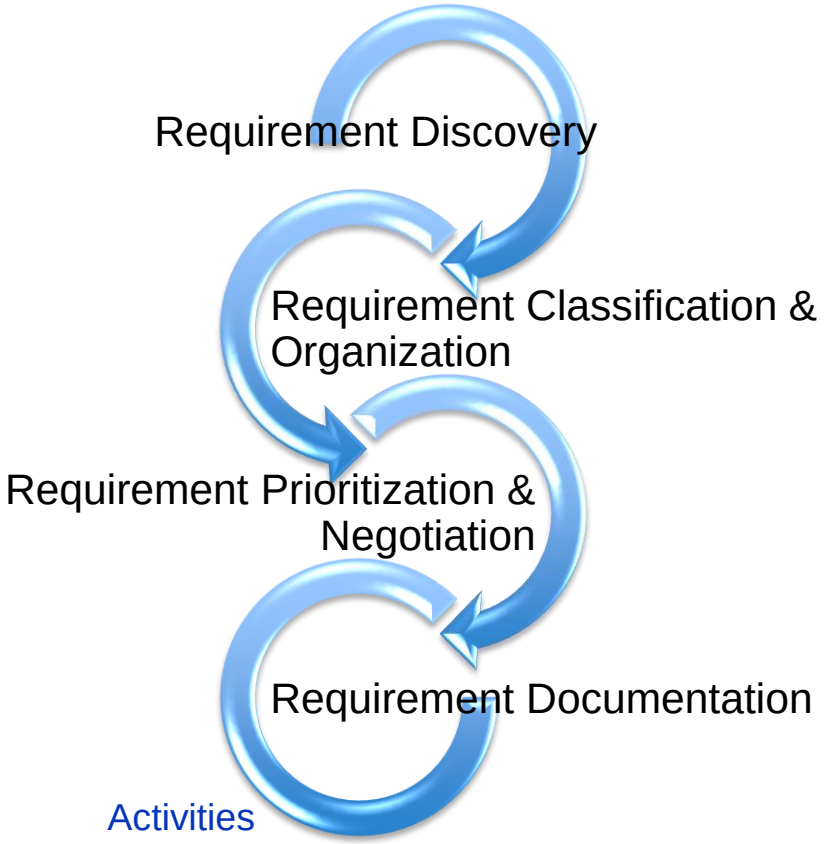
- This is the process of deriving the system requirements.
- Software engineers works with stakeholders to find out about the application domain, what services should provide, the required performance, hardware constraints, and etc.
  - Refer to any person or group who will be affected by the system, directly or indirectly.

2. Requirements Analysis & Elicitation

It is a difficult process due to the following reasons:

- Users/stakeholders are not clear on what they want from the computer system
- Users/stakeholders normally express requirements in their own terms
- Different Users/stakeholders have different requirements and they may express them in quite different ways
- Analysis takes place in an organizational context and political factors may influence the requirements of the systems
- The economic and business environment in which the analysis takes place is dynamic. It inevitably changes during the analysis process.

2. Requirements Analysis & Elicitation

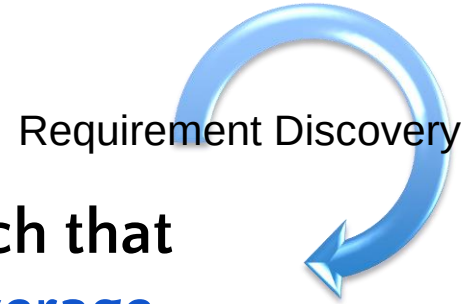


2. Requirements Analysis & Elicitation

Requirements Discovery

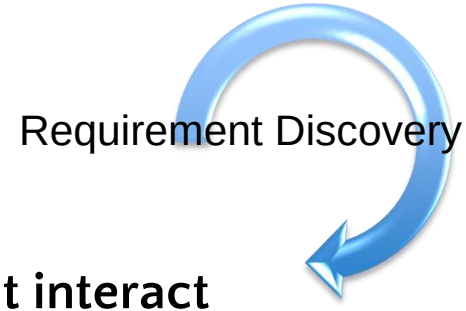
- This is the process of interacting with stakeholders in the system to discover their requirements
- Sources of information include:
  - Documentation
  - Stakeholders
  - Specification of similar systems
  - Etc.

2. Requirements Analysis & Elicitation



- Viewpoint-oriented analysis is an approach that helps to ensure get broad stakeholder coverage when discovering requirements.
- Viewpoints can be used to classifying stakeholders and other sources of requirements.

2. Requirements Analysis & Elicitation



Viewpoint-oriented Analysis

Three generic types of viewpoints:

- Interactor viewpoints – people or other systems that interact directly with the system (provide detailed system requirements like system features & interfaces)
- Indirect viewpoints – stakeholders who do not use the system themselves but who influence the requirements in some way (provide high-level organizational requirements & constraints)
- Domain viewpoints – domain characteristics and constraints that influence the system requirements (provide domain constraints)

Exercise

ATM system

- Viewpoint-oriented Analysis
  - Interactor Viewpoints
  - Indirect Viewpoints
  - Domain Viewpoints

2. Requirements Analysis & Elicitation

Viewpoint-oriented Analysis

More specifics types of viewpoints include:

- Providers and receivers of system services
- Other systems interface directly with the system
- Regulations and standards that apply to the system
- Engineering viewpoints
- Marketing and other viewpoints

Exercise

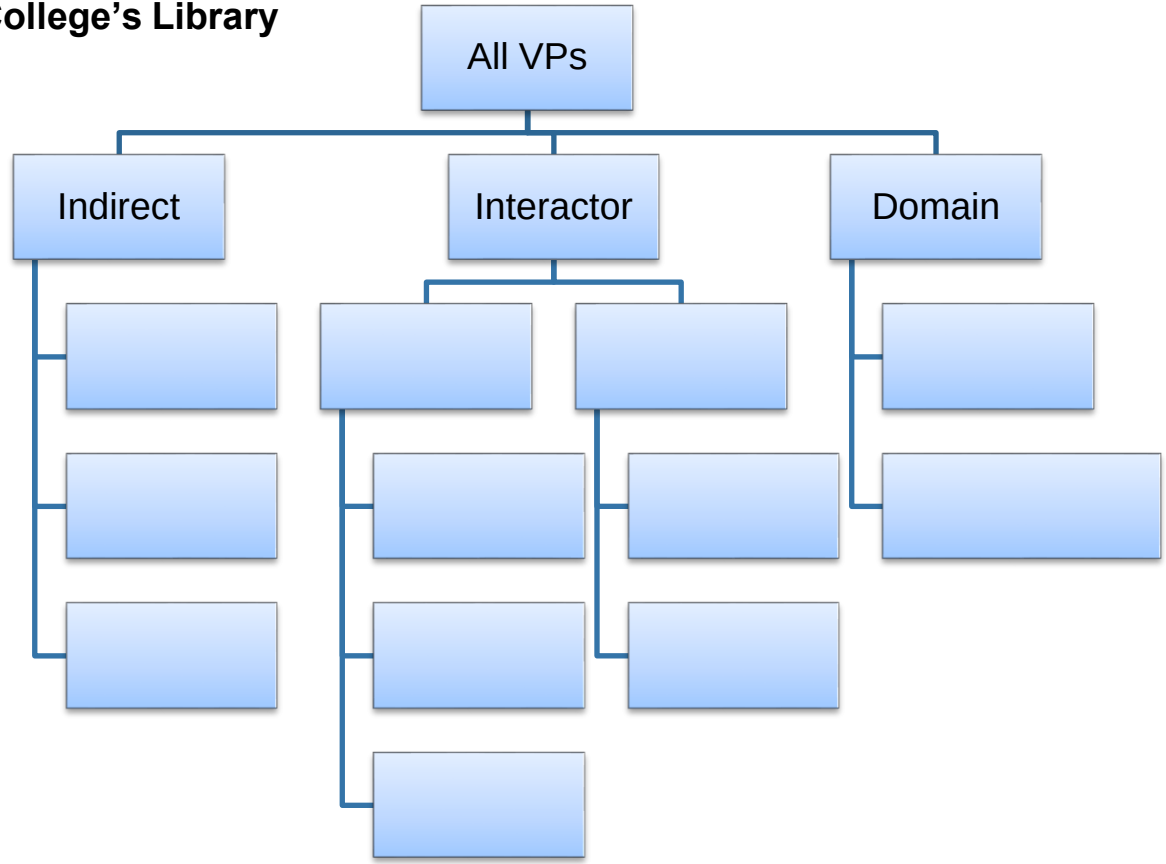
List the possible viewpoints for a college's library system.

Answer:

- ✓ ***Interactor VPs***
- ✓ ***Indirect VPs***
- ✓ ***Domain VPs***

Exercise

Viewpoint Hierarchy for College's Library System

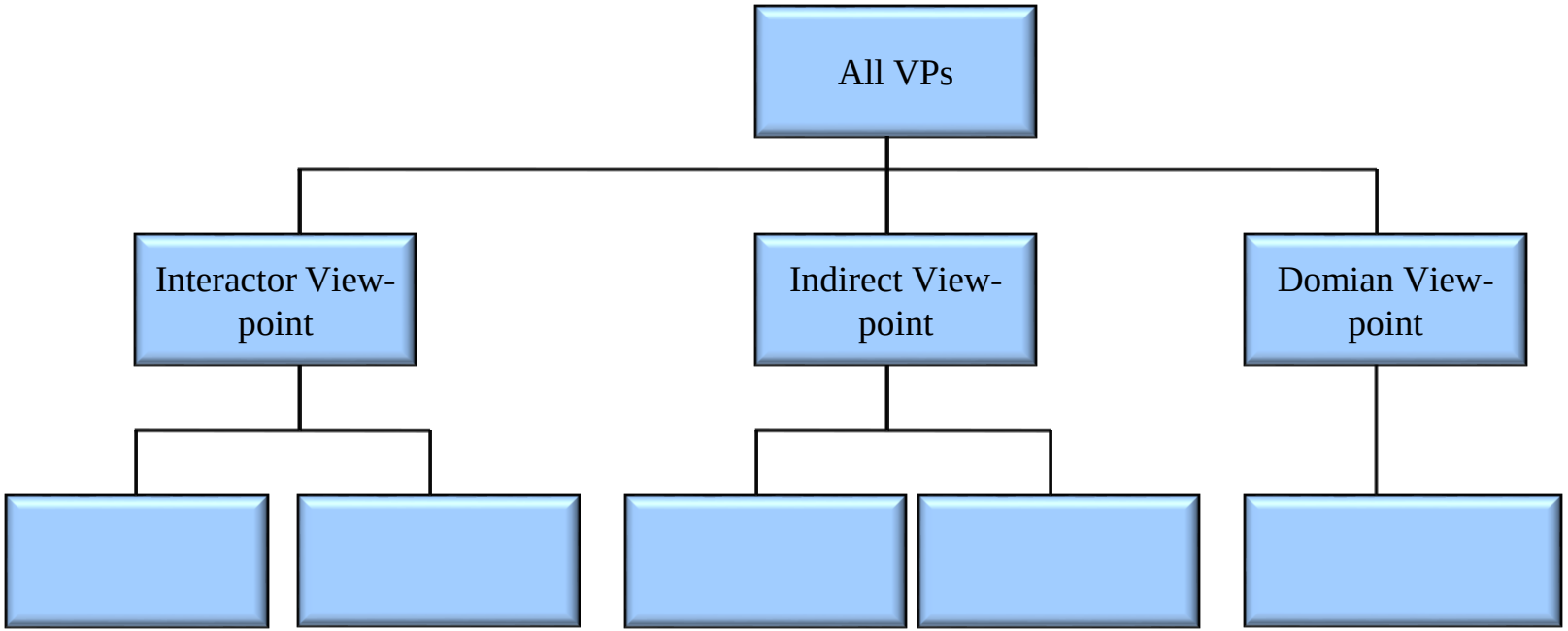


Exercise

Identify 5 viewpoints of an Online Hotel Room Reservation System and prepare a Viewpoint Hierarchy.

Exercise

Online Hotel Room Reservation System



Exercise

It is important to organize and structure the viewpoints into a hierarchy. WHY?

Exercise

It is important to organize and structure the viewpoints into a hierarchy. WHY?

Answer:

a) For large system, there are a huge number of viewpoints. It is practically impossible to elicit requirement from all of them. Hence, the hierarchy helps to identify viewpoints in the same branch are likely to share common requirements, and SE may not need to elicit requirement from each of them.

Exercise

It is important to organize and structure the viewpoints into a hierarchy. WHY?

Answer:

b) To help ensuring all VPs are covered in the analysis and elicitation stage.

c) Help to decide whether a VP is a valid VP or not.

2. Requirements Analysis & Elicitation

Techniques of req. discovery include:

i) Interviewing
open and closed questions may miss essential information

ii) Prototyping
(Discuss in chapter 6a)

2. Requirements Analysis & Elicitation

Techniques of req. discovery include:

iii) Scenario

- Stakeholders usually find it easier to relate to real-life examples than abstract descriptions.
- Most general scenario are:
  - System and users expectation when the scenario starts
  - The normal flow of events
  - What can go wrong and how to handle
  - Info about other activities might go at the same time
  - System state when the scenario ends
- Scenarios may written in text plus diagrams. For e.g. Event scenario and Use-cases scenario

2. Requirements Analysis & Elicitation

Techniques of req. discovery include:

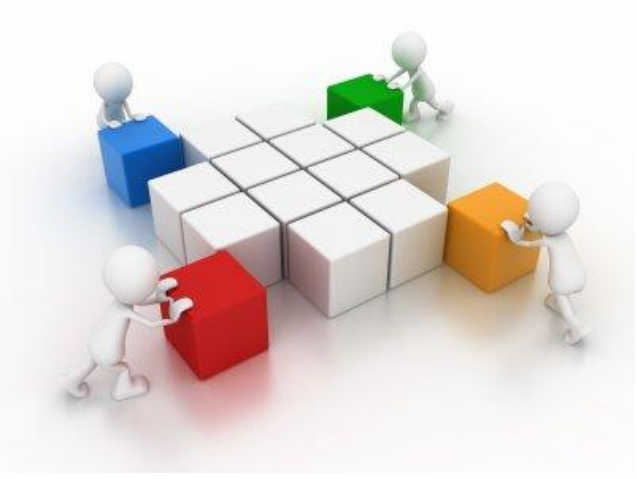
iv) Ethnography (Observation)

- an observational technique to understand social and organizational requirements
- Helps to discover implicit system requirements that reflect the actual rather than formal processes
- Focuses on end-users requirements only

2. Requirements Analysis & Elicitation

Requirement Classification & Organization

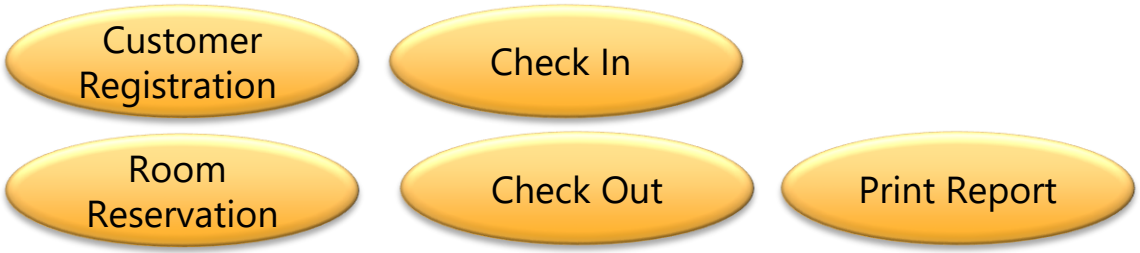
- This activity takes the unstructured collection of requirements and organizes them into coherent clusters



2. Requirements Analysis & Elicitation

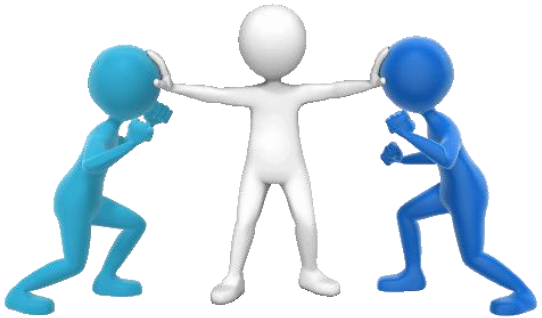
Requirement Classification & Organization

- **Example: Hotel Management System**



2. Requirements Analysis & Elicitation

- Inevitable, where multiple stakeholders are involved, requirements will conflict. This activity is concerned with prioritising requirements, and finding and resolving these conflicts through negotiation



2. Requirements Analysis & Elicitation

Requirement Documentation

- The identified requirements are documented and checked to discover if they are complete, consistent and in accordance with what stakeholders really want from the system
- Formal and informal requirements documents may be produced

3. Requirements Specification

(Discussed in Chapter 4)

Revision

Requirement Engineering:

1. Feasibility Studies
2. Requirement Elicitation and Analysis
3. Requirement Specification (Discussed in Chapter 4)
4. Requirement Validation
5. Requirement Management

4. Requirements Validation

4. Requirements Validation

- It is concerned with showing that the requirement actually define the system that the customer wants.

4. Requirements Validation

Several aspects of requirements that must be checked

- Validity – functions user wanted is correct and confirmed needed
- Consistency – no conflicting functions
- Completeness – include ALL functions needed
- Realism check – could be implemented (with existing technology, budget, schedule)
- Verifiability – requirements are measurable? to reduce potential dispute (demo that the delivered system meets each requirements)

4. Requirements Validation

Example (Adapted): Electronic Library

Context:

"The purpose of this project is to create an attractive user-friendly prototype for a virtual archive (i.e. a virtual framework for virtual items or collection groups within a larger collection) of research materials".

Requirement A: Item Retrieval

"This option allows the user to retrieve items in any format".

Requirement B: No File Conversion

"File conversion should not be supported".

Requirements Partitioning:

Requirement A tagged as a *usability* requirement

Requirement B tagged as a *cost / schedule* requirement

Conflict Identification:

QARCC's expert knowledge system flags the possibility of a conflict due to the fact that *usability* and *cost / schedule* requirements typically stand a good chance of conflicting with each other. The conflict is then verified by the development team with the following issue: "*What is meant by any formats? It may not be possible to retrieve in any format since file conversion will not be supported".*

Exercise

What are the methods can be used to validate user requirements?

Answer:

- ✓ Prototyping
- ✓ Structured walkthrough
- ✓ Formal technical reviews

5. Requirements Management

5. Requirements Management

This process includes :

- Management planning – where policies and procedures for requirements management are designed and specified

- Change management – where proposed requirements changes are analyzed and their impacts are assessed.