Requirement Engineering (Ch-9)

4 Main Steps of RE

1. Requirement Elicitation - understanding the problem
2. Requirement Specification - describing the Problem
3. Requirement Validation & Verification - agreeing upon nature of problem
4. Requirement Negotiation - agreeing upon boundaries of problem

Requirement Elicitation.

Conceptual Modeling -

- Problem in ~~elicitation~~ REngg stage is unclear, not well defined & fuzzy.
- The process to elicit the contours & constituents of the fuzzy problem is Conceptual Modeling.

(UoD) Universe of discourse - The part of reality in which we are interested in (that is modelled during REng phase)

Explicit Conceptual Model - model constructed during REng phase is an Explicit Conceptual Model of UoD

- People involved in UoD have an implicit Conceptual model of that UoD. (contains background knowledge shared by people in the UoD)

Turning Implicit CM to Explicit -

Two problems -

- Analysis problem : it arises due to the fact that
  > Part of Implicit CM is not verbalized
  > Implicit CM evolves over time
  > User & Analyst ~~speak~~ talk a different language.
  > Implicit CM can not be completely codified

- Negotiation problem : arises because
  > people in VoD may counteract the analysis process
  > Implicit CM of people in VoD may differ
  > opposing interests of people involved.

Human As Information Sources -

1. Different Background
2. Short term vs long term memory
3. Human Prejudices
4. Limited capability for rational thinking.

Requirement Engineering Paradigms

- Existing methods are 'Taylorian' in nature.
- These may work in technical environment.
- However, VODs contain people whose models can be irrational, incomplete, inconsistent & contradictory.

- Paradigm - The set of assumptions Analysts have about the nature of subject of study.
- Epistemological Assumptions - the way in which analyst ~~acks~~ acquire knowledge.
- Ontological Assumptions - Analyst view of social & technical world.

2 Dimensions

1. Objectivist ← (wrt knowledge) → Subjectivist

Objectivist	Subjectivist
Annalyst applies models & methods derived from natural sciences to arrive at one & only truth	Understand how the individual creates, modifies & interprets the world

2. Order ← (wrt the world) → Conflict

Order	Conflict
Emphasizes on Order, Stability, integration & consensus	Stresses on Change, conflict & disintegration

4 Paradigm / Approaches of R Eng.

1. Functional (Objective + Order)
   Analyst is the expert who empirically seeks the truth.
2. Social-relativism (Subjective + Order)
   Analysit is a change agent. RE is a ~~guided~~ learning process guided by the analyst.

3. Radical - Structuralism (objective + conflict)
   Struggle b/w classes - analyst chooses for either party.

4. Neohumanism (Subjective + conflict)
   Analyst is social therapist, brings parties together.

Elicitation Techniques

1. Interview - Open ended & Structured
2. Brainstorming
3. Delphi technique - Iterative technique. Information exchanged in written form until consensus reached.

4. Task Analysis - A technique to obtain a hierarchy of tasks and subtasks to be carried out by people working in the domain.
- Task is performed to achieve a goal.

5. Scenario-based Analysis - Provides user oriented view perspective on design & development.
- Analyst study instances of task.
- Uses 'Think Aloud' method.
- Often called 'use-case-analysis'
- Most often use method

Diff b/w

Scenario View	Standard View
• Concrete descriptions	• Abstract Descriptions
• Focus on particular instances	• Focus on generic types
• Work driven	• Technology driven
• Open-ended, fragmentary	• complete, exhaustive

Application (multiple choice)

1. Requirement Analysis
2. User-designer communication
3. design rationale

4. Software architecture and analysis
5. Software design
6. Implementation
7. Verification & validation
8. documentation and training.
9. Evaluation
10. Team Buildin

• Scenarios must be structured & managed.

6. Ethnography - In this method groups of people are studied in their natural settings.
   • Thinking aloud protocols are based on idea that users have well defined goals & subgoals.
   - These goals are traverse in a top-down-manner.

7. Form Analysis - • Contains info about the domain being modeled.
   • Info about data objects of the domain, their properties, their interrelations.

8. Natural Language Description - provides background info to be used with other elicitation technique.
   • Starting point object oriented analysis technique.

9. Derivation from an existing system - Rather than looking at one particular scene, we may also study a number of system in some application domain. This meta requirement analysis process is called domain analysis.

10. Business Process Redesign (BPR) Ordering
1. Identify process for Innovation
2. Identify change levers
3. Develop process visions.
4. Understand the existing process
5. Design and prototype the new process.

11. Prototyping

Structuring a set of Requirements.

1. Hierarchical Structure - higher-level reqs are decomposed into lower reqs.

2. Link requirement to specific stakeholders - management & end user have their own set.

Prioritizing Requirements (MoSCoW)

Must Have - Top priority
Should Have - Highly desirable
Could Have - If time allows
Won't Have - Not Today

Kano model - used for prioritizing requirement
User preference categorised into 5 properties

1. Attractive - more satisfied if +, not less satisfied if -
2. Must-be - dissatisfied when -, at most neutral.
3. One dimensional - satisfaction proportional to number
4. Indifferent - don't care
5. Reverse - opposite ~~to~~ of what ~~ant~~ analyst thought
6. Questionable - preferences not clear

COTS - Commercial Off The Shelf

Customer have to choose from what is available.
COTS selection is an Iterative process (Steps) - Ordering

1. Define Requirement
2. Select component
3. Rank component
4. Select most appropriate component.

Simple ranking : weight * score (WSM → Weighted Scoring Method)

Requirement Document - Specification

The document states that Requirement specification should be

1. Correct
2. unambigious
3. complete
4. consistent
5. stability
6. verifiable
7. modifiable
8. traceable
9. Usable

Category of Detailed Requirement

- Mode
- User class
- Objects
- Response
- Functional

Requirement Management

Requirements Creep - A phenomenon in which requirements will be changed and new requirement will be put forward after the requirement phase has ended.

Requirement Management Involves 3 Activities -

1. Requirement Identification
2. Requirement Change management
3. Requirement Traceability

Requirement Traceability -
- Where is requirement implemented ?
- Do we need this requirement
- Are all requirements linked to soln. element
- What is the impact of this requirement.
- Which requirement does this Test Case covers ?
- do we need the design implement.

* Design Space Analysis - explicitly model all possible combinations of requirements and Solutions. Also known as QOC (Questions, Options & Criteria)

7 Sins of Requirement Specification

1. Noise
2. Silence
3. Over-specification
4. Contradictions
5. Ambiguity
6. Forward references
7. Wishful Thinking.

Functional Requirements

The system services which are expected by the users of the system.

Non Functional (quality) requirements.

Set of constraints that the system must satisfy and the standards which must be met by the delivered system.

- Speed
- Size
- ease of use
- reliability
- robustness
- portability

Requirement Validation

Inspection of the requirement w.r.t
- correctness
- completeness
- consistency
- Accuracy
- Readability
- Testability

Aids -
- Structured ~~Walk~~ Walkthrough
- Prototypes
- develop a test plan
- tool support for formal specification.