RE Process

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RE Process:
What is a Process?

- Given input, transforms it into output
- Consist of a set of activities
- Process descriptions are also “process specifications”!
  - Often produced by Requirements Engineers
  - Should be as complete, consistent, clear, agile, …
RE Process:
Why?

Quality of product ← Quality of Process

- Garbage in garbage out, so get the right requirements

*** Recall: Error Propagation Cycle

Product
RE Process: Why?

It is more important to understand the **problem** than the solution. [Albert Einstein]

If software is simply for automation, what would a washing machine be like?
RE Process: The Basic RE Evolutionary Process

Old Reality -> Old Model
  | Reverse Engineering |
  | Legacy Integration |

Change in Reality

Change Definition

New Reality -> New Model
  | Change Incorporation |

Old Implementation -> New Implementation
Evolution is inevitable – *traceability* is more than a virtue

- Forward traceability
- Backward traceability
RE Process:
A Basic Framework [Loucopoulos]

Many variations and extensions

- 3 fundamental activities:
  - **understand**, (formally) **describe**, attain an **agreement** on, the **problem**

- **Elicitation**: determine what’s really needed, why needed, whom to talk to
- **Specification**: produce a (formal) RS model: translate "vague" into "concrete", etc. make various decisions on what & how
- **Validation**: assure that the RS model satisfies the users’ needs

(domain experts, laws, standards, policies, documents, etc.)
RE Process: Spiral Model [KotonyaSummerville98]

Decision point: Accept document or re-enter spiral

- Requirements elicitation: Requirements discovered through consultation with stakeholders
- Requirements analysis and negotiation: Requirements are analysed and conflicts resolved through negotiation
- Requirements documentation: A requirements document is produced
- Requirements validation: The requirements document is checked for consistency and completeness
RE Processes: RAD (Role Actor Diagram)

An RE Process is dominated by human, social and organisational factors

Would you use this process for your project?

Stakeholders/Actors/Agents

ROLES

ACTIONS

Understand problem
Establish outline requirements
Select prototyping system
Develop prototype
Evaluate prototype

Req. engineer
Domain expert
End-user

Req. engineer
End-user

Software
engineer
Project manager

Req. engineer
Software engineer

End-user
Domain expert
Req. engineer
Software engineer

for prototyping [Kotonya&Sommerville98]
RE Process: A RE Process Maturity Model
Based on CMM

5 levels

Level 1 - Initial
Ad-hoc requirements engineering; requirements problems are common

Level 2 - Repeatable
Standardised requirements engineering; fewer requirements problems

Level 3 - Defined
Defined process based on best practice; process improvement in place
# IEEE Standard for SRS

## 1 Introduction
- **Purpose**
- **Scope**
- **Definitions, acronyms, abbreviations**
- **Reference documents**
- **Overview**

## 2 Overall Description
- **Product perspective**
- **Product functions**
- **User characteristics**
- **Constraints**
- **Assumptions and Dependencies**

## 3 Specific Requirements

### Appendices
- **IEEE-STD-830-1998**

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**Identifies the product, & application domain**

**Describes contents and structure of the remainder of the SRS**

**Describes all external interfaces: system, user, hardware, software; also operations and site adaptation, and hardware constraints**

**Summary of major functions**

**Anything that will limit the developer’s options (e.g. regulations, reliability, criticality, hardware limitations, parallelism, etc)**

**All the requirements go in here (i.e. this is the body of the document). IEEE STD provides 8 different templates for this section.**

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3.1 External Interface Requirements
   3.1.1 User Interfaces
   3.1.2 Hardware Interfaces
   3.1.3 Software Interfaces
   3.1.4 Communication Interfaces

3.2 Functional Requirements
   *this section organized by mode, user class, feature, etc.*
   *For example:*
   
   3.2.1 Mode 1
       3.2.1.1 Functional Requirement 1.1
       ...
   
   3.2.2 Mode 2
       3.2.1.1 Functional Requirement 1.1
       ...
   
   3.2.n Mode n
       ...

3.3 Performance Requirements
   *Remember to state this in measurable terms!*

3.4 Design Constraints
   3.4.1 Standards compliance
   3.4.2 Hardware limitations
   etc.

3.5 Software System Attributes
   3.5.1 Reliability
   3.5.2 Availability
   3.5.3 Security
   3.5.4 Maintainability
   3.5.5 Portability

3.6 Other Requirements
RE in Agile Methods

Basic Philosophy

- Reduce communication barriers
  Programmer interacts with customer
- Reduce document-heavy approach
  Documentation is expensive and of limited use
- Have faith in the people
  Don’t need fancy process models to tell them what to do!
- Respond to the customer
  Rather than focussing on the contract

Weaknesses

- Relies on programmer’s memory
  Code can be hard to maintain
- Relies on oral communication
  Mis-interpretation possible
- Assumes single customer representative
  Multiple viewpoints not possible
- Only short term planning
  No longer term vision

E.g. Extreme Programming

- Instead of a requirements spec, use:
  - User story cards
  - On-site customer representative

- Pair Programming

- Small releases
  - E.g. every three weeks

- Planning game
  - Select and estimate user story cards at the beginning of each release

- Write test cases before code

- The program code is the design doc
  - Can also use CRC cards (Class-Responsibility-Collaboration)

- Continuous Integration
  - Integrate and test several times a day

Would you always use an agile process?
Appendix
RE Processes:
Volere Requirements Process

How many cycles? When to analyze and negotiate?
RE in V Model

- System requirements
- Software requirements
- Preliminary design
- Detailed design
- Code & debug
- Component test
- Unit test
- Software integration
- Acceptance test
- System integration

Level of abstraction

Time

Test and integrate

Analyze and design
RE Processes:
RE Process Variability

Many Variety …and Evolution is inevitable

- RE processes vary radically from one organisation to another
- Factors contributing to this variability include
  - Technical maturity
  - Disciplinary involvement
  - Organisational culture
  - Application domain
  - ...

- There is therefore no ‘ideal’ requirements engineering process [KotonyaSummerville98]
NFRs & RE Process: A Requirements Management System
Many variations and extensions