RE for Large Scale Systems

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Outline

- What is Large Scale Systems?
- RE for Large Scale Systems (Challenges)
- Case Studies
- Methodology
Large Scale Systems

“Software development organizations with 50 or more people or at least six teams”.
-- Dikert, 2016

- Significant size
- Independences of the system elements
- Geographic distribution
- Multi-organisational systems
- Multiple stakeholder viewpoints
- Evolutionary development
- Emergent behaviour
- Data intensive
Challenges - Communication Gaps

- Gap between customer and developer
  - Multi-levels between developers and customers
- Gap between developers
  - Distributed teams
  - Developers roles (Requirements teams and design teams)
Challenges - Requirements Development

- Large number of requirements
- Customer's expectations
- Large project can span several years
Challenges - Requirements Management

- Resource fluctuation
- Unclear vision of overall goal
A Large-scale Industrial Project

- More than 4,000 user requirements
- Hundreds of distributed components
- Elided V-model is used in the project
Lessons Learned - Requirement Development

- A well-structure feature list
- Good understanding of customer requirements
- Specification approaches that scale
- Separate requirements and design decisions
Lessons Learned - Requirement Management

- Establish a traceability model
- Provide project status visualizations
- Establish effective documentation standards and review processes
- Create effective hierarchical change control board (CCB) structure
Methodology for Modeling

--- i* framework + Lexicon control

- **i* framework:**
  - For agent-oriented requirements engineering
  - Introduces an intentional and social ontology for RE
  - Strategic dependency model for external relationships
  - Strategic rationale model for internal relationships

- **Example domain: healthcare**
  - Support to assess patients with chronic diseases
  - “Guardian angel” software agents
  - A personal system helps track, manage and interpret the subject’s health history, and offers advice to both patient and healthcare provider.
Overall Methodology

Note:
LEL: Language extended lexicon
UofD: Universe of discourse
Build the Lexicon - Understand the Vocabulary

- Language extended lexicon (LEL): captures the vocabulary used in practice in the domain
- First contact: open-ended interview
  - Have an initial idea of the domain
  - Take Initial lexicon symbols
  - Identify possible documents to further elicit other symbols
  - Ask why you need this system to demarcate the context
  - Try to find main stakeholders
- Domain knowledge construction
- Validating the lexicon with stakeholders
Language Extended Lexicon

Symbols
Symbol
patient

Category
Subject

Notions:
- The one who visits a physician.
- Has a chronic disease.

Behavioral Responses:
- Visit a physician.
- commit to a treatment.
- follow a treatment.
Outline the Social Structure

- Identify the main actors, and how they relate
- Validate the social structure with stakeholders
Build a First-Cut Dependency Model

- Identify the main dependencies:
- Searching for goal or task dependencies
- Search for resource dependencies
- Softgoals
The one who visits a **physician**. Has a **chronic disease**.

- **Patient**
- **Treatment**

- **Follow Treatment**
- **Be Assessed**

**Behavioral Responses**
- Visit a **physician**.
- Commit to a **treatment**.
- Follow a **treatment**.
Build a First-Cut Dependency Model

- Identify the main dependencies
- Searching for goal or task dependencies
- Search for resource dependencies
- Softgoals
Elaborating on Processes and Rationales

Understand the actors’ internal implementation - build SR model

- Examining the lexicon
- Drawing some scenarios
- Asking questions:
  - What is this person responsible for?
  - What are the processes in which this person is involved?
- Managing viewpoints
- Maintain consistency between SD and SR models.
Elaborate on the Intentional Dimension

- Semi-structured and open-ended interviews, document analysis.
- Refine Softgoals.
  - Safety
  - Accuracy
  - Performance?
- Check for possible interdependencies
- Check model completeness at this stage
- Evaluate softgoals:
  - Help/Hurt
  - Some+/Some-
  - Make/Break
Explore Further Alternatives

- Change agent.
- Add new actors to the process
- Compare different viewpoints
Summary

- Large scale systems
- Ultra large-scale systems
- RE challenges for large scale systems
- Extended i* framework for large scale systems
Thank you!
References


