

Requirements Analysis

Overview

- What is requirement?
- Classification of requirements
- Iterative and evolutionary requirements analysis
- Use cases

Requirements

- Definition [LAR]
 - Capabilities and conditions to which the system—and more broadly, the project—must conform
- Focusing on the **WHAT** not the **HOW**

Requirements Analysis Is Hard

- Major causes of project failures
 - Incomplete requirements
 - Changing requirements
 - Poor user input
- Essential solutions
 - Classification of requirements
 - Iterative and evolutionary requirements analysis
 - Use Cases

Classification of Requirements

- **Functional:** features, capabilities, security
 - “The system reads employee records and prints paychecks”
 - All other reqs are **non-functional**
- **Usability:** human factors, help, documentation
 - “Text on the display must be visible from 1 meter.”

Classification of Requirements

- **Reliability**: frequency of failure, recoverability, predictability
 - “When doing search, the radar should have 28 hours MTBF(mean time between failures)”
- **Performance**: response times, throughput, accuracy, availability, resource usage
 - “The server response time is <1 sec for 90% of the accesses”

Classification of Requirements

- **Supportability:** adaptability, maintainability, internationalization, configurability
 - “The system should allow frequent and easy changes in the network configuration”
- **Implementation:** resource limitations, languages, tools, hardware
 - “Must use Linux and Java”

Iterative and Evolutionary Requirements Analysis

- Motivation
 - 20-50% of the original reqs change because of miscommunication or changing business needs
- Strategies
 - 10-20% of the most architecturally significant, risky, and high-business-value requirements are specified before the initial implementation
 - The short duration of iterations allows quick adaptation and increments of reqs.

Requirements Elicitation

- Brainstorming
 - Gather stakeholders, collect ideas and prune
- Interviewing
 - Formal or informal interviews with stakeholders
- Ethnography
 - A social scientist observes and analyzes how people actually work
- Strawman/Prototype
 - GUI, flow charts of UIs

Requirements Analysis in the UP

- Major artifacts: *Use Cases* and *Supplementary Specification*
 - Use Cases: functional requirements
 - Supplementary specification: non-functional requirements

How to do iterative requirement analysis?

- **Inception**, 2 days
 - Identify names of use cases and features, and key non-functional requirements
 - 10% are analyzed in detail due to high-risk, high-business-value, and architecture significance
- Iteration planning meeting
 - Choose a subset of the 10% for implementation, break them down to detailed iteration tasks

Possible Timeline

- **Elaboration**, iteration #1, 4 weeks
 - Design, implement, and test selected features
 - Demo it to collect feedback
 - Pick another 10-15% to analyze in detail (2 days)
- Iteration planning meeting
- **Elaboration**, iteration #2, 4 weeks
 - Repeat iteration #1
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- **Elaboration**, iteration #4, 4 weeks

At the end of Elaboration, ...

- 80-90% of use cases are analyzed and written in detail
- 10% implementation done
- Other phases do very little work on use cases

Definitions—Stakeholders

- People who support, benefit from, or are affected by a software project
 - Managers
 - Communicators
 - Software engineers
 - Maintainers
 - System administrators
 - Users
 - Customers

Definitions

- Use case is a story of using the system to fulfill stakeholder goals
 - It is a text document, not a diagram
 - Its name usually contains a verb
- Use-Case Model: the set of all written use cases
- Use-Case Modeling: primarily an act of writing text, not drawing diagrams

Use Cases

The Role of Use Cases

- The use-case modeling is the most widely used approach for capturing requirements
- Input to many subsequent activities and artifacts

Running example: point-of-sale (POS) system [LAR]



- **Process Sale use case**

A customer arrives at a checkout with items to purchase. The cashier uses the POS system to record each purchased item. The system presents a running total and line-item details. The customer enters payment information, which the system validates and records. The system updates inventory. The customer receives a receipt from the system.

Who Are The Stakeholders?

- Customer
- Cashier
- Store
- Government tax agencies
- Credit card company

Terms Relevant to Use Cases

- Actor: Something with behavior
 - Person, computer system, organization
- Scenario (use case instance)
 - a specific sequence of actions and interactions between actors and the system
- Use case: a collection of related success and failure scenarios that describe an actor using the system to support a goal

Three Kinds of Actors

- Primary actor: uses the system to fulfill goals
 - E.g., cashier
 - Why? To find user goals and drive use cases
- Supporting actor: provides a service to the system
 - E.g., Tax agencies, credit card company, store
 - Why? To clarify external interfaces and protocols
- Offstage actor: has an interest in the behavior
 - E.g., Customer
 - Why? To ensure that all necessary interests are identified and satisfied

Handle Returns use case

- Main Success Scenario: A customer arrives with items to return. The cashier uses POS to record each returned item and reimburse...
- Alternative Scenarios:
 - If they paid by credit, and the reimbursement transaction to their credit account is rejected, pay by cash
 - If the system detects failure to communicate with the external accounting system, ...
 - (Any other alternatives?)