Course: Software Requirements Engineering

Week 11: Requirements Validation

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Contents

- Introduction
- Overview of requirement validation
- Validation vs verification
- Validation techniques and methods
- Common issues in requirements
- Best practices and case examples

Figure 1. *The software requirements*
Note. Image generated using Sora by OpenAI (2026).

Learning Outcomes

After completing this lesson, you will be able to:

- Define the concept of requirement validation
- Explain the importance of validation in software projects
- Identify common validation techniques
- Analyze and detect requirement issues
- Apply validation practices in real scenarios

Introduction

From Requirements Analysis to Validation

- Requirements engineering lifecycle (Beatty, 2013)
  - **Steps: Elicitation ➔ Analysis ➔ Specify ➔** Validation ➔ Mgmt.
  - Requirements may contain errors and gaps Need to confirm accuracy and completeness
  - Transition from defining to evaluating requirements
    - Leads to requirement validation phase

What is Requirement Validation?

Ensures requirements reflect **user needs**

Focus on **correctness** and **completeness**

Answers: **"Are we building the right system?"**

Importance of Requirement Validation

- Ensures alignment with stakeholder needs and enhances satisfaction
- Reduces costly errors, rework, and scope creep
- Improves system quality through clearer, more complete requirements
- Identifies ambiguities and inconsistencies early
- Supports accurate planning, testing, and validation

Validation Vs Verification

VALIDATION

Right system

Focus: Meeting user needs and solving the right problem

VERIFICATION

Built correctly

Focus: Conformance to requirements and specifications

COMPLEMENTARY PROCESSES

Validation ensures we build the right system;
Verification ensures we build the system right.

Objectives of Validation

CORRECTNESS

Ensures requirements accurately reflect stakeholder needs.

COMPLETENESS

Ensures all necessary requirements are included.

CONSISTENCY

Ensures requirements are uniform, non-conflicting, and coherent.

FEASIBILITY

Ensures requirements are realistic, achievable, and within constraints.

Characteristics of Valid Requirements

CLEAR

Requirements are easy to understand and have a single, well-defined meaning.

TESTABLE

Requirements can be verified through testing or other objective means.

TRACEABLE

Requirements can be traced to their sources and related requirements throughout the lifecycle.

UNAMBIGUOUS

Requirements are specified in a way that allows only one possible interpretation.

Validation Process

GOAL

Ensure requirements reflect stakeholder needs and are correct, complete, consistent, feasible, and testable.

Stakeholder Involvement

Identify all relevant stakeholders

Engage users, clients, and sponsors

Encourage active participation

Capture diverse perspectives

Resolve expectation gaps

Ensure continuous communication

Validation Techniques

Figure 2. *Requirements Validation Techniques*

Note. Image generated using ChatGPT by OpenAI (2026).

Requirement Review

Figure 3. *Requirements Review Validation Technique*
Note. Image generated using ChatGPT by OpenAI (2026).

Inspection

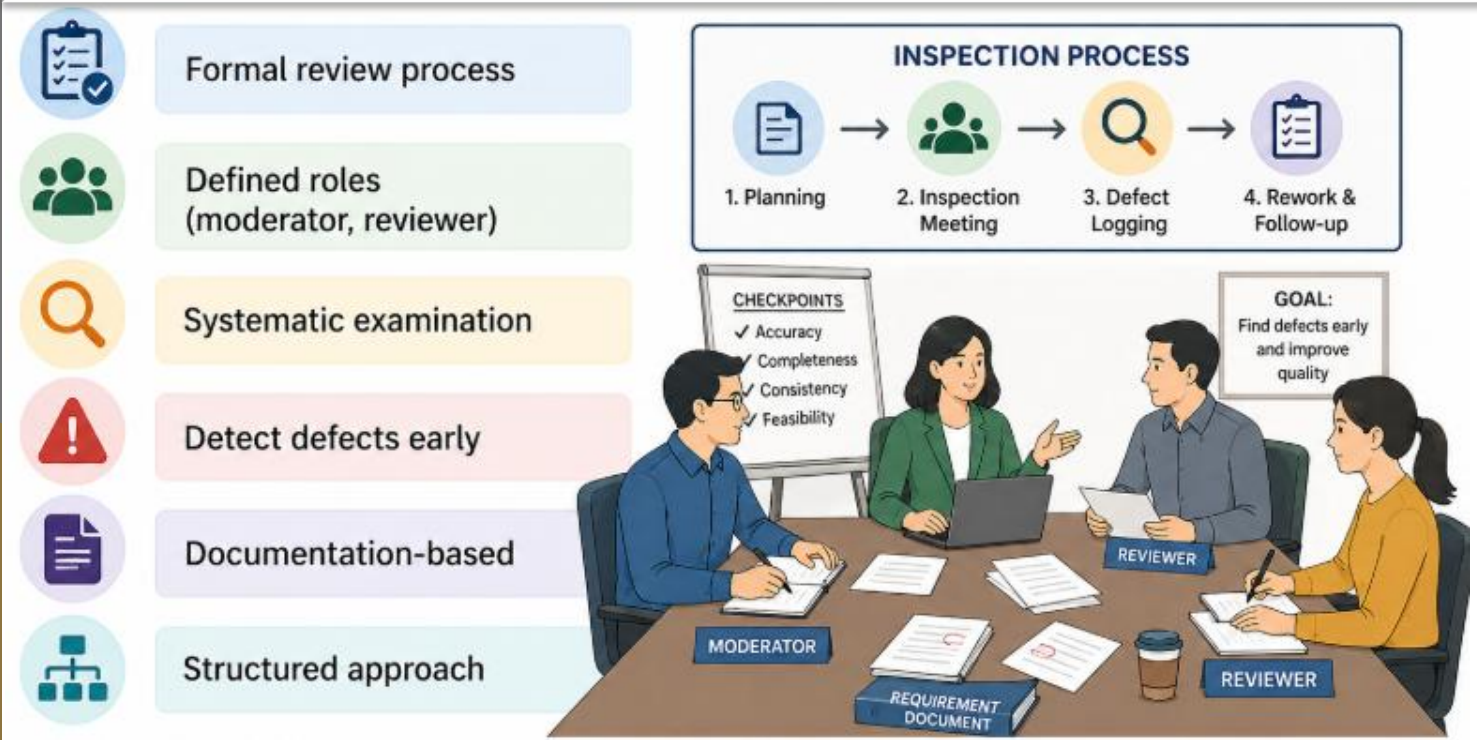


Figure 4. *Inspection Technique*

Note. Image generated using ChatGPT by OpenAI (2026).

Walkthrough

Figure 5. *Walkthrough Validation Technique*
Note. Image generated using ChatGPT by OpenAI (2026).

Prototyping

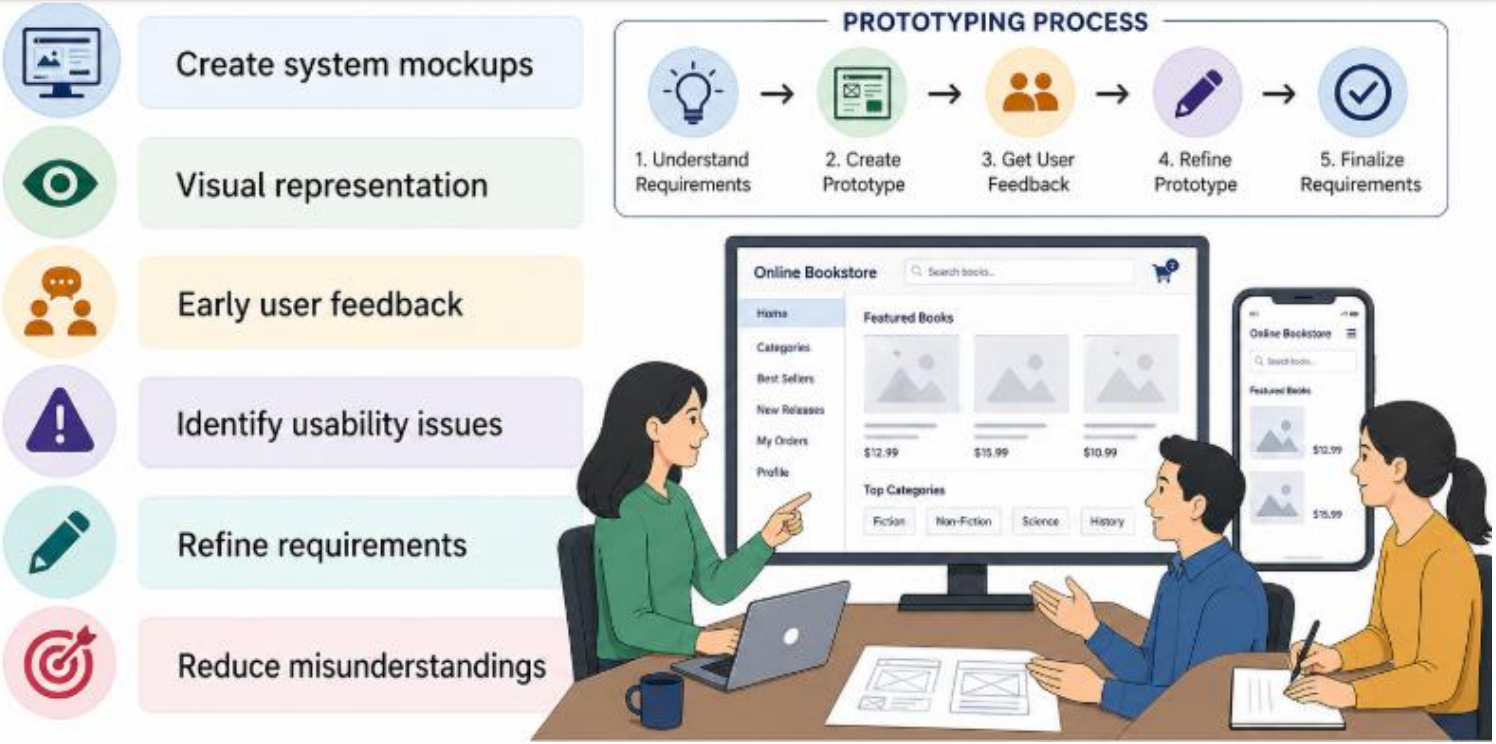
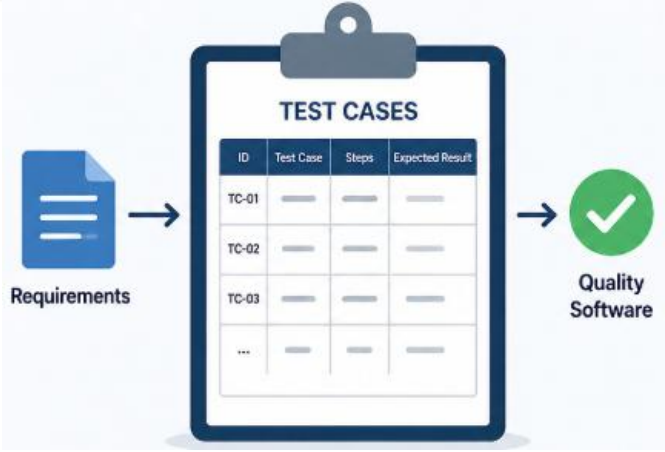


Figure 6. *Prototyping Technique*

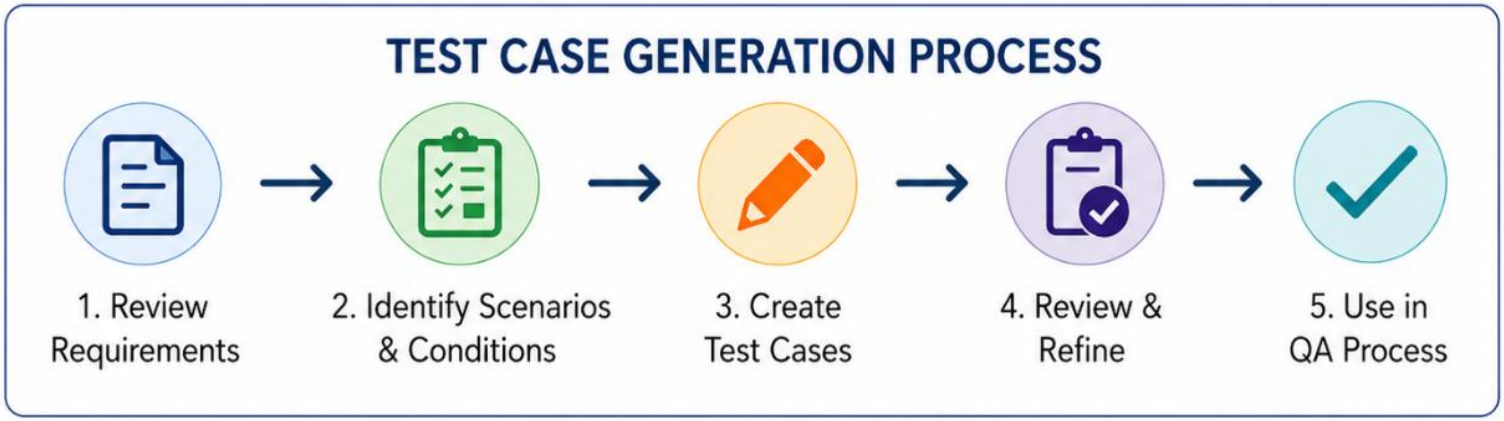
Note. Image generated using ChatGPT by OpenAI (2026).

Test Case Generation

- Derive test cases from requirements
- Ensure testability
- Identify missing requirements
- Validate expected outcomes
- Improve requirement clarity
- Support QA process



Test Case Generation – The Process



Test Case Generation – Example

EXAMPLE: REQUIREMENT TO TEST CASES

REQUIREMENT

User shall be able to reset password using registered email.

Test Case ID	Test Scenario	Test Data	Expected Result
TC-001	Reset password with valid email	user@example.com	Password reset link sent to email
TC-002	Reset password with invalid email	invalid@abc.com	Error message: Email not found
TC-003	Reset password with empty email	(empty)	Validation message: Email is required
TC-004	Reset password link expiry	Expired link	Error message: Link has expired

Simulation and Modeling

Represents system behavior using models

Simulates real-world scenarios before development

Helps visualize complex requirements

Detects logical and functional errors early

Useful for performance and interaction analysis

Supports stakeholder understanding and feedback

Automated Validation Tools

Requirement management tools (e.g., JIRA, DOORS)

Automated consistency checking

Traceability matrix generation

Version control and change tracking

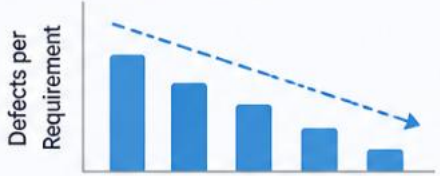
Error and duplication detection

Improve validation efficiency

Validation Metrics

Defect density in requirements

Number of defects found per requirement.

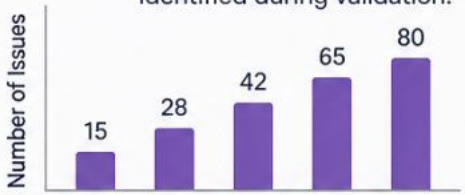


Requirement coverage percentage

Percentage of requirements that are validated.

Number of issues identified

Total number of issues identified during validation.



Validation completion rate

Percentage of validation activities completed.

Validation Metrics … cont'd

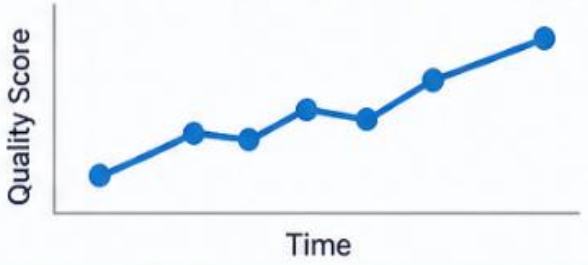
Review effectiveness rate

Percentage of reviews that identified issues.

78%

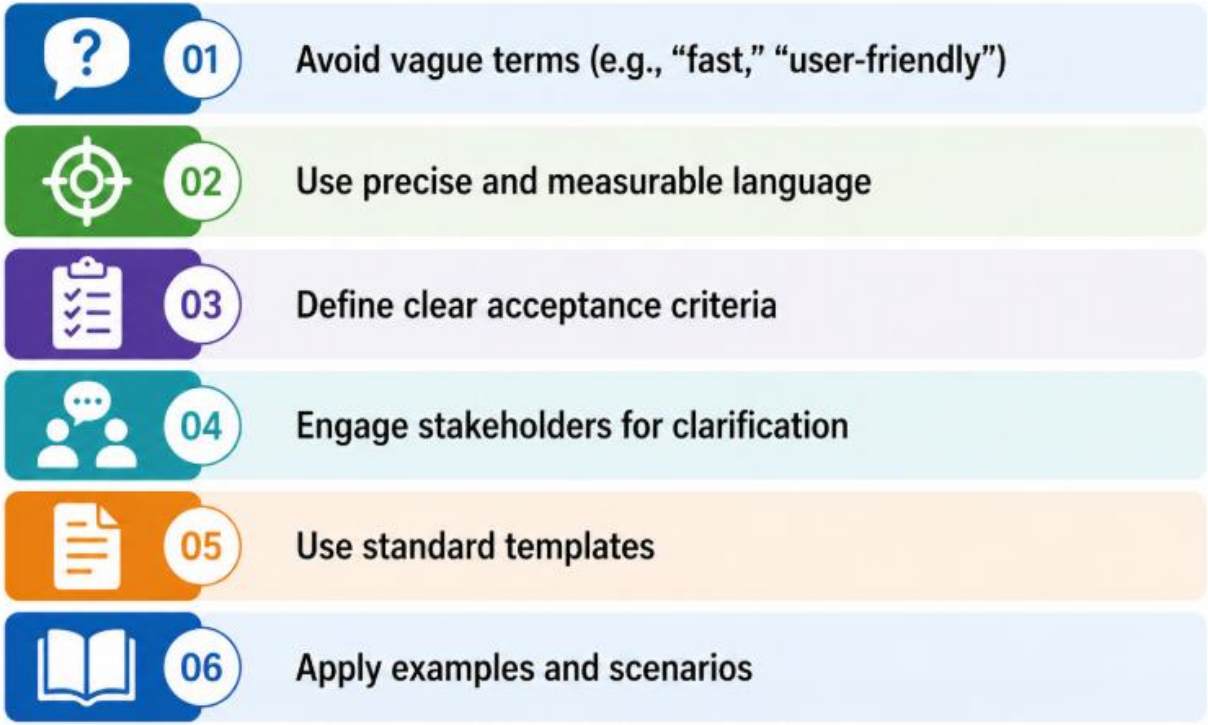
Quality improvement indicators

Measure improvement in requirement quality over time.



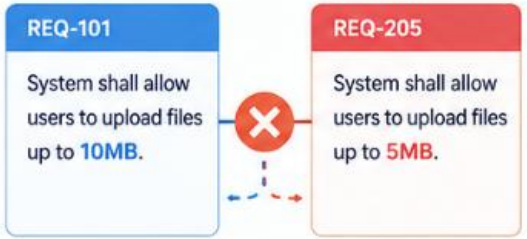
These metrics help track validation effectiveness, identify areas for improvement, and ensure high-quality requirements.

Handling Ambiguity



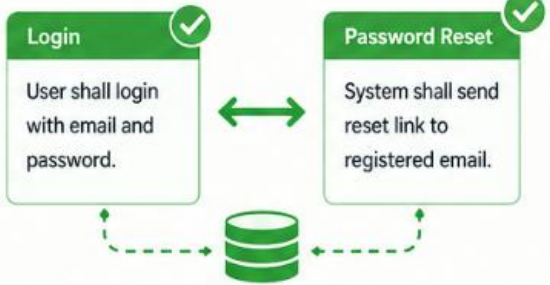
Detecting Inconsistencies

01 Identify conflicting requirements



Spot contradictions and conflicts in requirements.

02 Cross-check related requirements



Ensure related requirements are consistent and aligned.

03 Use validation checklists

Apply standard checklists to catch inconsistencies early.

Detecting Inconsistencies … cont'd

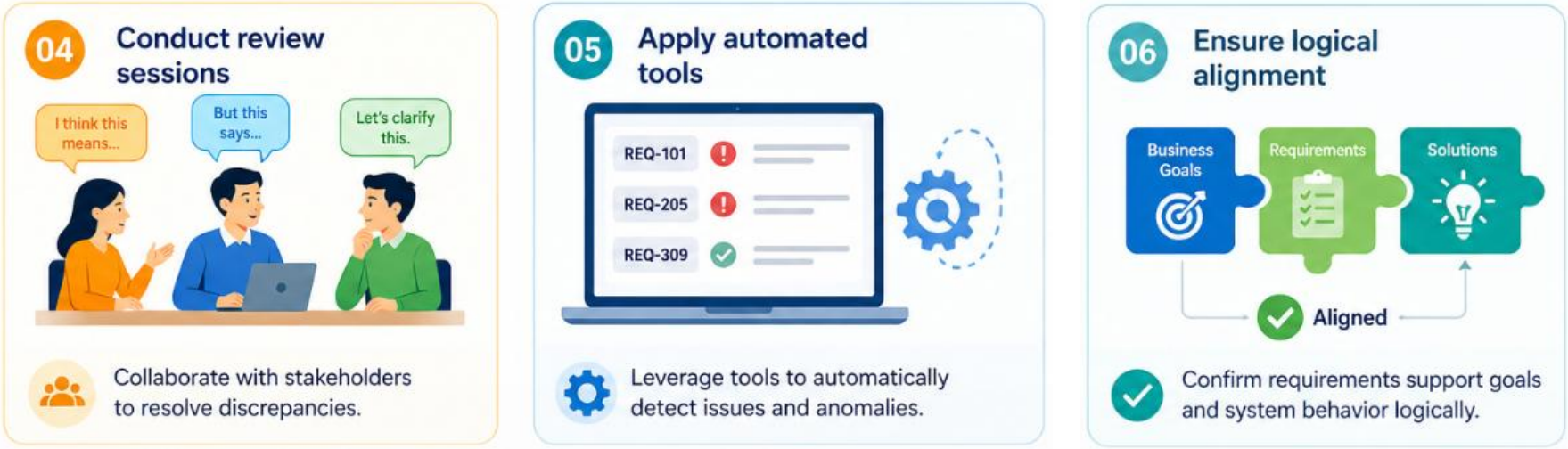
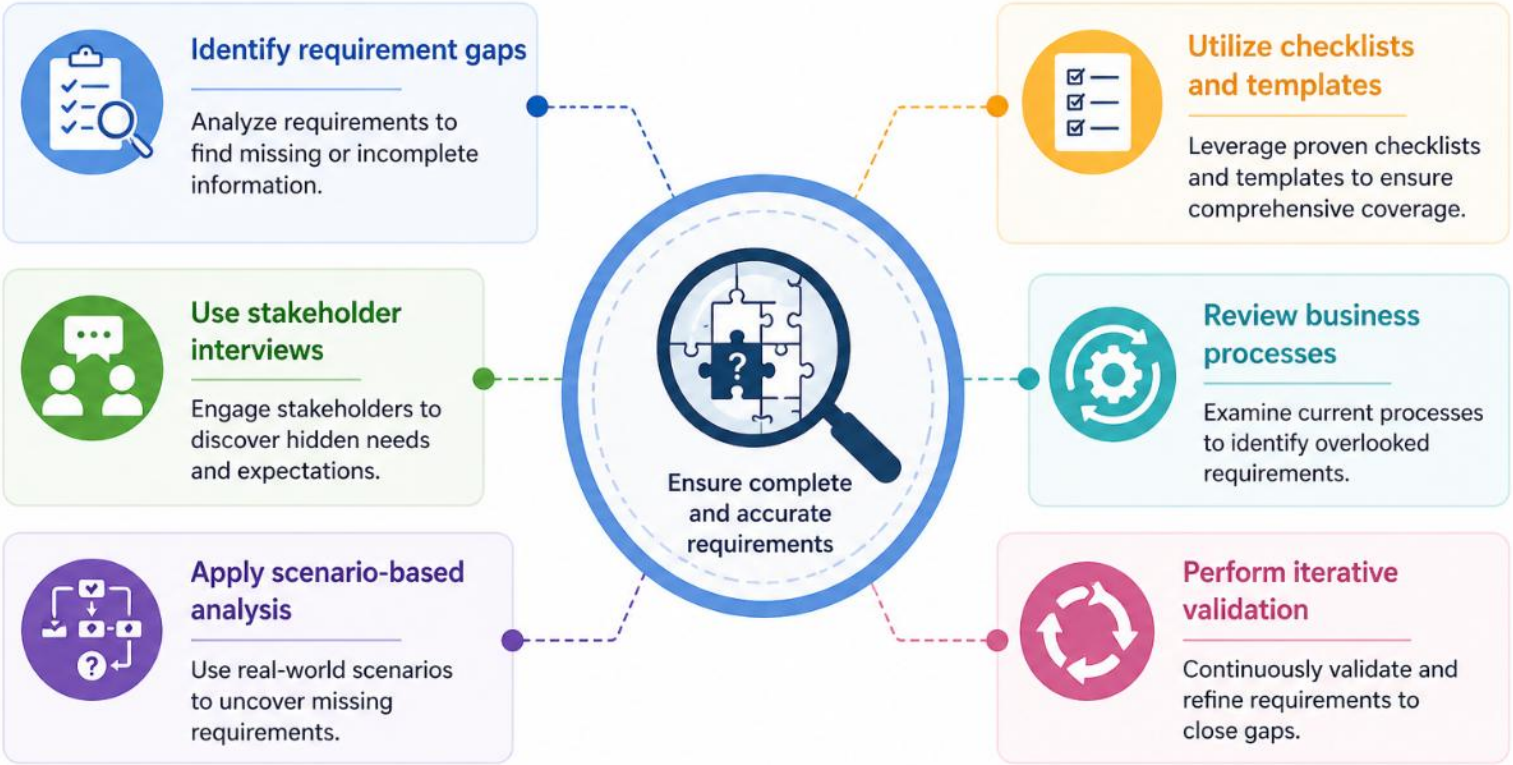


Figure 7. *Detecting inconsistency during requirements validation*
Note. Image generated using ChatGPT by OpenAI (2026).

Missing Requirements



Conflict Resolution

Figure 8. *Conflict resolution during requirements validation*
Note. Image generated using ChatGPT by OpenAI (2026).

Conflict Resolution … cont'd

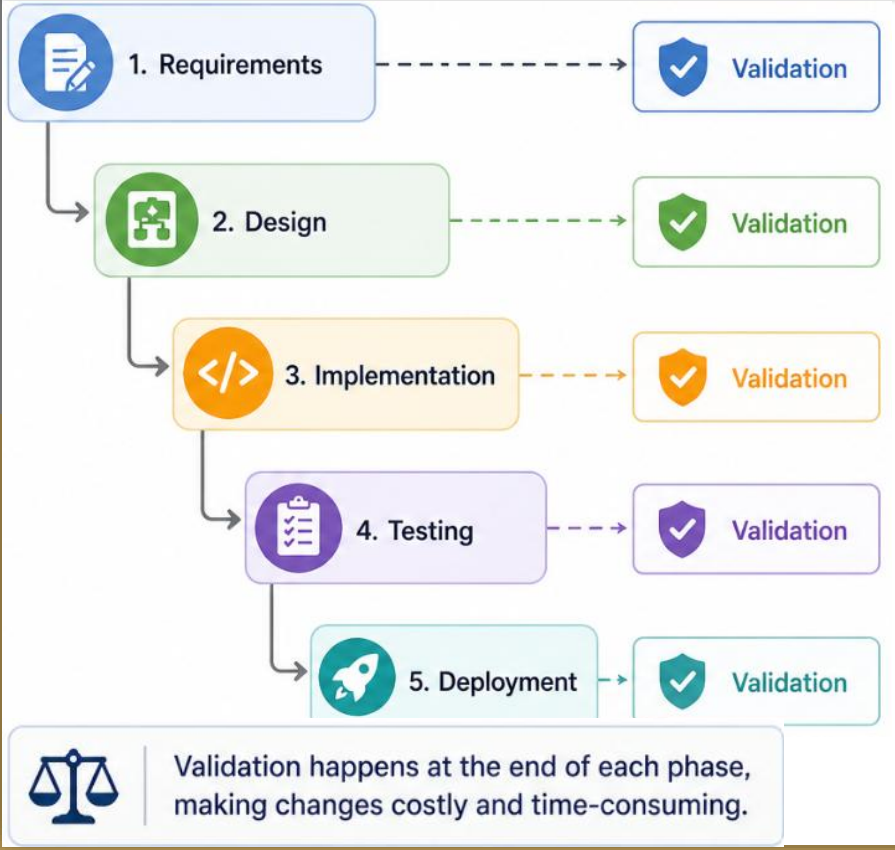
Figure 9. *Conflict resolution during requirements validation*
Note. Image generated using ChatGPT by OpenAI (2026).

Validation in Agile

Validating early and often to deliver value with confidence

- ✓ Continuous validation
- ✓ User stories and acceptance criteria
- ✓ Sprint reviews
- ✓ Frequent stakeholder feedback
- ✓ Iterative refinement
- ✓ Rapid adaptation

Validation in Waterfall



- ✓ Sequential validation phase
- ✓ Formal requirement reviews
- ✓ Detailed documentation
- ✓ Limited stakeholder feedback later
- ✓ Structured validation approach
- ✓ Risk of late error detection

Role of Analysis

Figure 10. *Challenges of requirements validation*
Note. Image generated using ChatGPT by OpenAI (2026).

Role of Stakeholders

Figure 11. *Role of stakeholders during requirements validation*
Note. Image generated using ChatGPT by OpenAI (2026).

Common Challenges

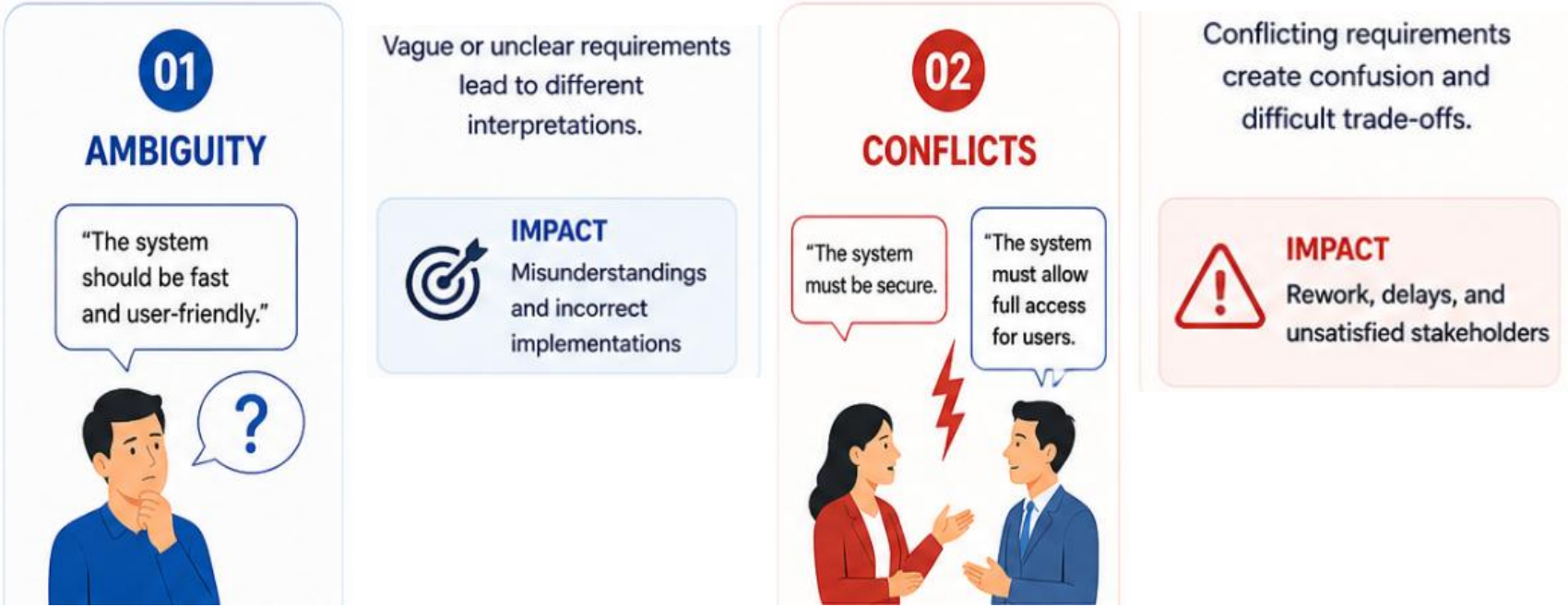


Figure 12. *Challenges of requirements validation*
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Common Challenges … cont'd

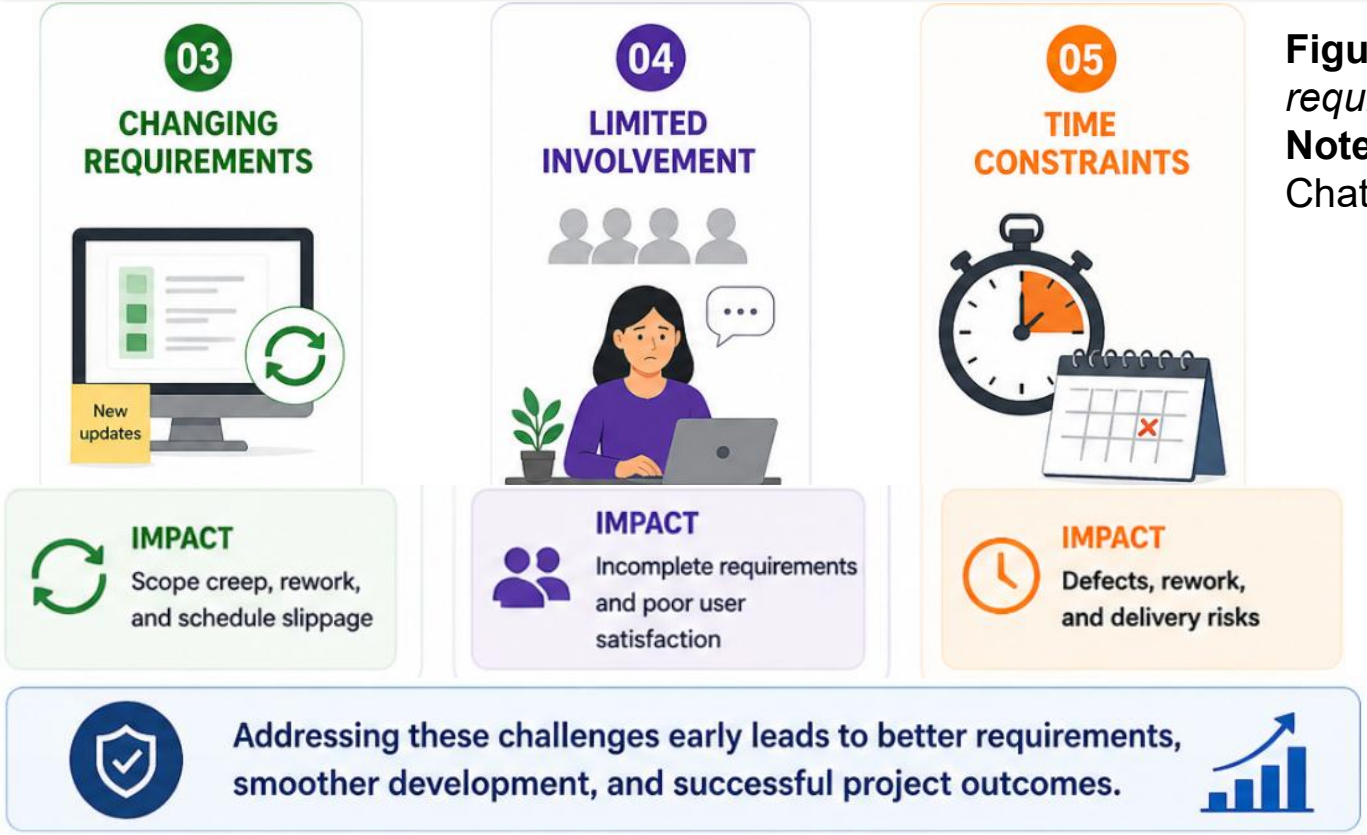

Figure 13. *Challenges of requirements validation*
Note. Image generated using ChatGPT by OpenAI (2026).

Best Practices

Figure 14. *Best Practices during requirements validation*
Note. Image generated using ChatGPT by OpenAI (2026).

Example – Online Learning System

1 Sample Requirement

"Students should easily access course materials"

2 Validation Issues Identified

- **Ambiguity** ("easily" unclear)
- **Missing requirement** (mobile access not specified)
- **Inconsistency** (conflicts with security login steps)

- ✓ Students
- ✓ Instructors
- ✓ Admin

3 Validation Techniques Applied

- Review & walkthrough with stakeholders
- Prototype of student dashboard
- Test case creation (access within 2 clicks)

4 Refined Requirement

"Students can access enrolled course materials **within 2 clicks** via web and mobile platforms after secure login"

5 Outcome

Clear | Testable | Consistent | Validated Requirement

Summary


Critical for success
Prevents costly failures
Continuous activity
Requires collaboration
Improves system quality
Leads to better outcomes

References

1. Beatty, K. W. (2013). Software Requirements (3rd ed.). Washington: Microsoft Press.

Thank You!