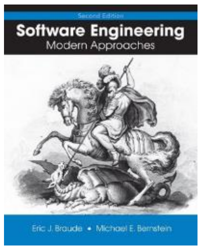
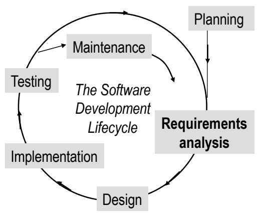
Software Engineering

Modern Approaches



Eric Braude and Michael Bernstein

Chapter 10: Principles of Requirements Analysis



Phase most relevant to this chapter is shown in bold

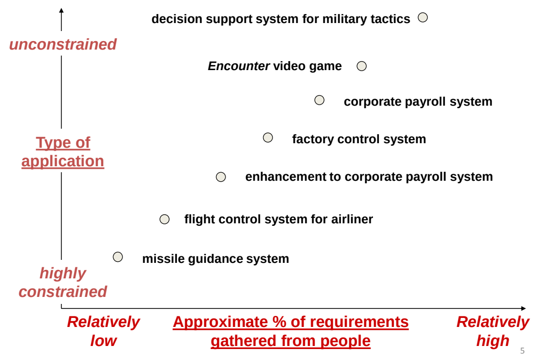
Learning goals of this chapter

- Why the term requirements *analysis*?
- What is the value of writing down requirements?
- Where do requirements come from?
- What is the difference between high-level and detailed requirements?
- What is the difference between functional and non-functional requirements?
- How do you document requirements?
- What does traceability mean?
- How do agile methods handle requirements?
- What are good tips for student project requirements analysis?

The Meaning of *Requirements Analysis*

- The process of understanding what's wanted and needed in an application. For example, you may know that you *want* a colonial house in New England, but you may not know that you will probably *need* a basement for it.
- We express requirements in writing to complete our understanding and to create a contract between developer and customer.

Sources of Requirements: People vs. Other (adapted from Brackett [Br])



High-level *versus* Detailed Requirements

- High-level requirements (market requirements): an overview, which is relatively readable and well suited to customers.
  - Anyone wanting to get an idea of what the application is all about reads the high-level requirements. For instance, considering the video store
  - The Video Store application shall enable clerks to check DVDs in and out.
  - The following shows a sketch of the main user interface: . . .
- Detailed requirements: specially useful for developers, who need to know precisely what they have to build. They also should be understandable to the customer, and should not contain developer jargon where possible.
  - The daily late charge o n a D V D shall b e computed at half the regular two-day rental rate, up to the value of the DVD listed in the "Intergalactic Video Catalog." When the amount owed reaches this value, the total l ate charge is computed as this amount plus $5.
  - When the "comm it" button is pressed on CUI 37, the CUI shall disappear and CUI 15 shall appear with a superimposed green border (RGB = 6, 32, 8) and the name and address fields filled with the data for the customer.

Functional *vesus* Non-Functional Requirements

- Functional requirement: also known as behavioral requirement, specify services that the application must provide. For example:
  - The application allows clerks to check out DVDs
  - The application allows clerks to display the customer's account status
- Non-functional requirement: any requirement that does not specify functionality. It qualifies a service or services. It needs to be specific, quantifiable, and testable.
  - The system shall retrieve user information quickly
    - What does retrieve means? (vague)
    - What does quickly means? (not quantifiable)
  - Once the Ok button is pressed on the "Retrieve account information" screen, the user's account information shall be displayed in less than 3 seconds.

Non-Functional Requirements

- **Quality attributes**
  - **Reliability and Availability** (observed faults, average up time)
  - **Performance** (speed, throughput, storage)
  - **Security** (malicious and non-malicious compromise of data or functionality)
  - **Maintainability** (cost to maintain)
  - **Portability** (move to a different operating enviroment)
- **Constraints** on the application or its development
- **External interfaces** that the application "talks to"
  - **Hardware**
  - **Other software**
  - **Communication with external agents**
- **User interfaces**
- **Error handling**

Examples of Constraints

- **Platform**
  - e.g., the application must execute on any 1GH Linux computer
- **Development Media**
  - e.g., the application must be implemented in Java
  - e.g., Rational Rose must be used for the design

External Interface Requirements

- **Hardware**
  - e.g., "the application must interface with a model 1234 bar code reader"
- **Software**
  - e.g., "the application shall use the company's payroll system to retrieve salary information"
  - e.g., "the application shall use version 1.1 of the Apache server"
- **Communications**
  - e.g., "the application shall communicate with human resources applications via the company intranet"
  - e.g., "the format used to transmit "article expected" messages to cooperating shipping companies shall use XML standard 183.34 published at http://…"

Steps for Constructing User Interfaces[1]

Step 1: Know your user	(H[2])
Step 2: Understand the business function in question	(H)
Step 3: Apply principles of good screen design	(H, D[3])
Step 4: Select the appropriate kind of windows	(H, D)
Step 5: Develop system menus	(H, D)
Step 6: Select the appropriate device-based controls	(H)
Step 7: Choose the appropriate screen-based controls	(H)
Step 8: Organize and lay out windows	(H, D)
Step 9: Choose appropriate colors	(D)
Step 10: Create meaningful icons	(H, D)
Step 11: Provide effective message, feedback, & guidance	(D)

[1] adapted from Galitz [2]a high-level requirement process [3]a detailed requirement process

Examples of Error Handling Options

- Ignore
- Warn user
- Allow unlimited retries
- Log and proceed anyway
- Substitute default values
- Shut down

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-- see Figure 9
Appendixes

Replaced by ISO/IEC/IEEE 29148:2011

IEEE 830-1998 Detailed Requirements

3.1 External interfaces
3.2 Functional requirements
-- organized by feature, object, user class, etc.
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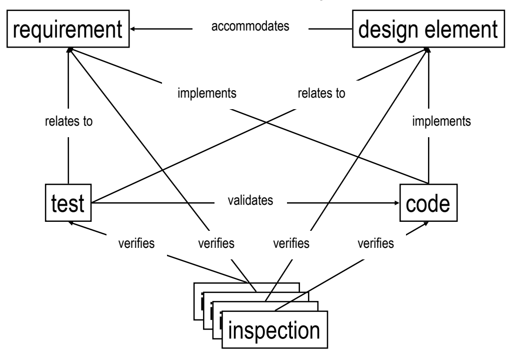
3.7.4 Feature -- or
3.7.5 Stimulus -- or
3.7.6 Response -- or
3.7.7 Functional hierarchy -- or
3.8 Additional comments

Traceability



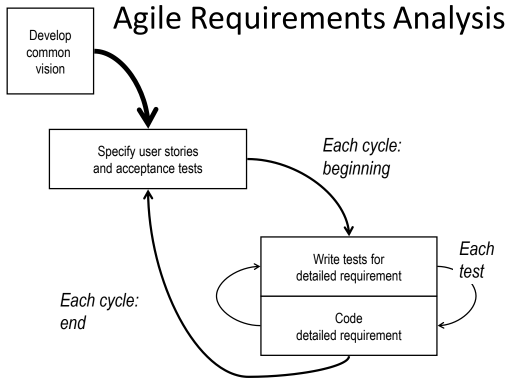
A Change In a Requirement Causes Changes In Other Artifacts

Artifact	Original version	Revised version
Requirement	The title of a DVD shall consist of between 1 and 15 English characters.	The title of a DVD shall consist of between 1 and 15 characters, available in English, French and Russian.
Design element		

Code	class DVD
	{ String title ….
	}
		class DVD
		{ Title title ….
		}
		class Title…

Inspection report	Inspection # 672: 4 defects; Follow-up inspection #684.	Inspection # 935: 1 defect; no follow-up inspection required.
Test report	Test # 8920 …	Test # 15084 …

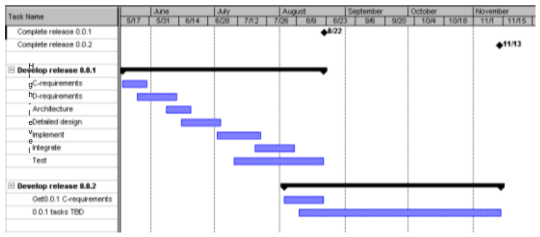
Agile Requirements Analysis


Develop common vision
Specify user stories and acceptance tests
Each cycle: beginning
Write tests for detailed requirement
Each test
Code detailed requirement
Each cycle: end

Updating Project Plan After Obtaining High-Level Requirements

	Status after initial draft	*Status after obtaining high-level requirements*
Milestones	Initial	**More milestones; more specific**
Risks	Identify initial risks	**Retire risks identified previously; identify more risks now that more is known about the project**
Schedule	Very rough	**Preliminary project schedule**
Personnel	Designate high-level requirements engineers	**Designated engineers for detailed requirements analysis**
Cost Estimation	Very rough	**First estimates based on job content**

Typical Schedule Following High-Level Requirements Analysis



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