

Requirements Document

Chapter 4.2-4.3
Slides #10

CMPT 276

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Based on slides from Software Engineering 9th ed, Sommerville.

Topics

- 1) What is a requirements document (req. doc.)?
- 2) How can we write requirements?

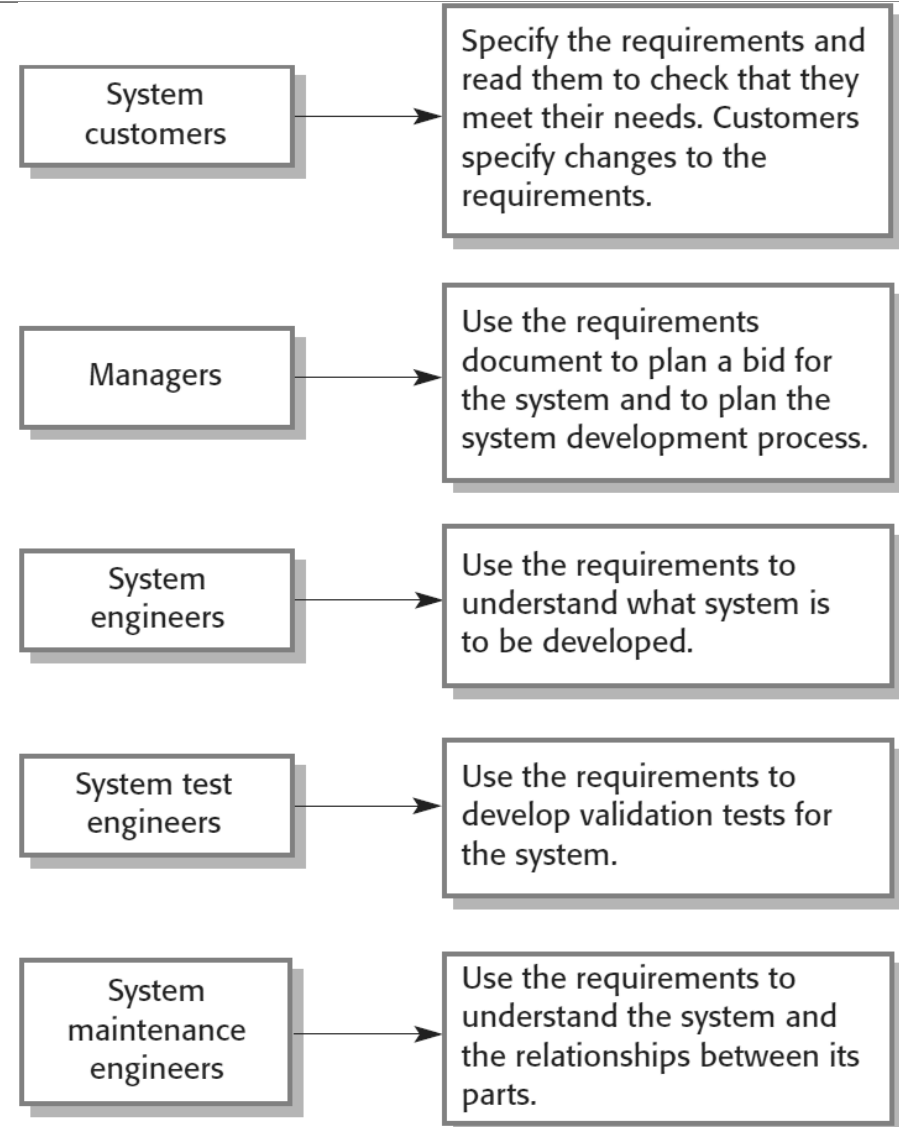
Software requirements document

- Software requirements document:
 - **official statement of what is required of the document.**
official statement of what should be implemented into the system
- Can include both:
 - user requirements and
 - system requirements.



Users of a requirements document

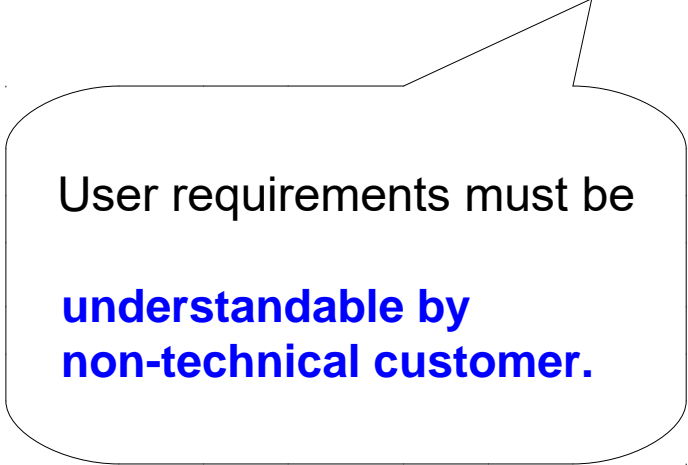
- Req. doc. mainly part of a plan-driven method
 - Agile methods argue requirements change too quickly for a req. doc. to be useful.
 - Large systems and critical systems...
still need a req. doc.
- Many uses for a req. doc.:



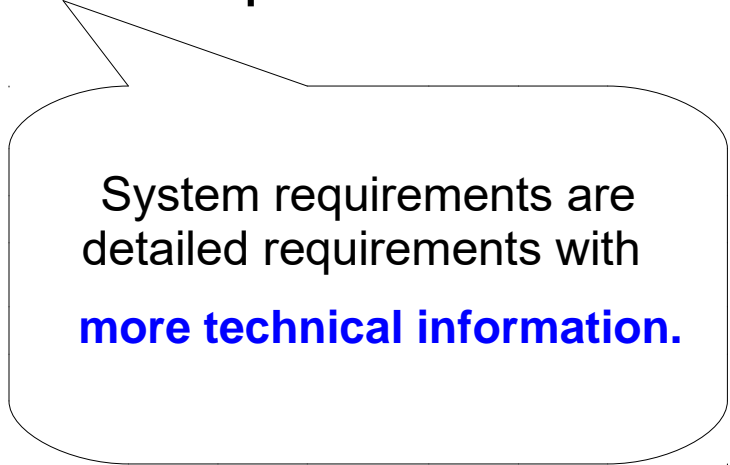
Requirements specification process

Requirements specification

- Requirements specification is
 - process of writing a requirements document.
 - Includes the user and system requirements.



User requirements must be
**understandable by
non-technical customer.**



System requirements are
detailed requirements with
more technical information.

- Important to be as complete as possible:
 - may be the basis for system development contract.

Requirements and design

- In principle:

requirements state **what** the system should do;
design describes **how** it does this.

- In practice...

requirements and design are inseparable

- Interaction with other systems may generate design requirements.
- A non-functional requirement may need a specific architecture design.
- Design constraints may be from regulatory requirements.

Guidelines for writing requirements

- Requirements often written in natural language:..
sentences, diagrams, and tables.
- Natural language used because it is..
expressive, intuitive, and universal
 - Understood by customers and developers.
- Use language in a consistent way.
 - Use shall for... **mandatory requirements**
 - Use should for... **desirable requirements**
- Avoid computer jargon: use domain terminology
- Include an explanation (rationale) of...
why a requirement is necessary

Exercise

- Write a natural language specification for the shifter on an automatic transmission



Problems with natural language

- Lack of clarity..
 - Precision is difficult without making the document difficult to read
- Requirements confusion
 - Functional and non-functional requirements tend to be mixed-up.
- Requirements amalgamation
 - If several different requirements are expressed together.
- See **the** cookie recipe: MIL-C-44072C
 - Ex: Sections 3.2.2, 3.3.11.

Ways of writing a system req. specification

Notation

Natural language sentences

Graphical notations

Mathematical specification

Description

Requirements are... **numbered sentences** in plain English.

Diagrams and text to describe the system.
Ex: UML

Ex:... **Finite state machine**
Unambiguous, but hard for customers to understand.

Structured spec.: an insulin pump

Action

- CompDose is zero if the sugar level is **stable or falling** or if the level is increasing but the **rate of increase is decreasing**.
- If the **level is increasing and the rate of increase is increasing**, then CompDose is computed by dividing the difference between the current sugar level and the previous level by 4 and rounding the result.
- If the **result is rounded to zero** then CompDose is set to the minimum dose that can be delivered.

Requirements

Two previous readings so that the rate of change of sugar level can be computed.

Pre-condition

The insulin reservoir contains at least the maximum allowed single dose of insulin.

Post-condition r0 is replaced by r1 then r1 is replaced by r2.

Side effects None.

Tabular specification: Insulin pump

Condition	Action
Sugar level falling ($r2 < r1$)	CompDose = 0
Sugar level stable ($r2 = r1$)	CompDose = 0
Sugar level increasing and rate of increase decreasing ($(r2 - r1) < (r1 - r0)$)	CompDose = 0
Sugar level increasing and rate of increase stable or increasing ($(r2 - r1) \geq (r1 - r0)$)	CompDose = round $((r2 - r1)/4)$ If rounded result = 0 then CompDose = MinimumDose

Exercise

- Write a tabular specification for the shifter on an automatic transmission



current state	car motion	up state	condition to shift up	down state	condition to shift down
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P	stopped	-			
R	backwards				
N	roll				
D	...				
S	...				

Handwritten notes in blue ink:

- A circle around the 'P' in the 'current state' column.
- A circle around the 'R' in the 'current state' column.
- A horizontal line connecting the two circles.
- The word "down" written above the line.
- The words "Up Press" written below the line.

Summary

- The software requirements document is
 - an agreed statement of the system requirements.
 - organized so that both system customers and software developers can use it.
- Often written in natural language with diagrams
 - Numbered sentences;
 - Conforming to uniform style.