

SWE62-232

Requirements Engineering

Fundamentals

Session #1.1



Dr. Jidtima Sunkhamani
Software Engineering, WU

Outline



- ✦ Why requirements are important?
- ✦ Definitions and classifications of requirements

Learning objectives



- ✦ Upon successful completion students will be able to:
 - ✦ Discuss the importance of requirements to the development of software systems;
 - ✦ Give the meaning of “requirements”
 - ✦ Describe and give examples of different kinds of requirements



Why requirements are important?



The infamous software design/development process tree-swing comic

[2005 Paragon Innovations, Inc.]



How the customer explained it



How the Project Leader understood it



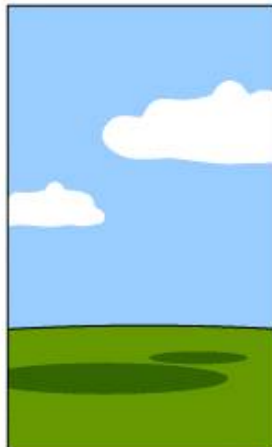
How the Analyst designed it



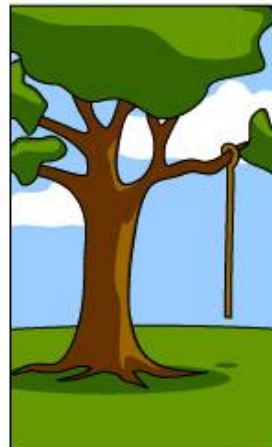
How the Programmer wrote it



How the Business Consultant described it



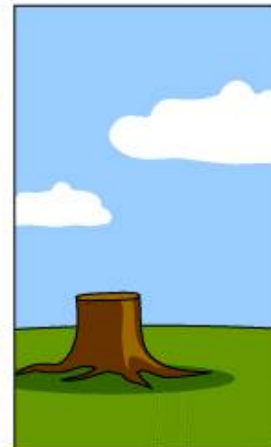
How the project was documented



What operations installed



How the customer was billed



How it was supported



What the customer really needed

Software development projects failures



- ✧ Numerous industry studies indicate that requirements issues are a pervasive cause of project distress.
- ✧ The often-quoted CHAOS Reports from the Standish Group indicate that three of the biggest factors that lead to failed or challenged (*late delivered, over budget, features reduced*) projects are:
 - ✧ Lack of user input.
 - ✧ Incomplete requirements and specifications.
 - ✧ Changing requirements and specifications.

[Wiegers, 2006]

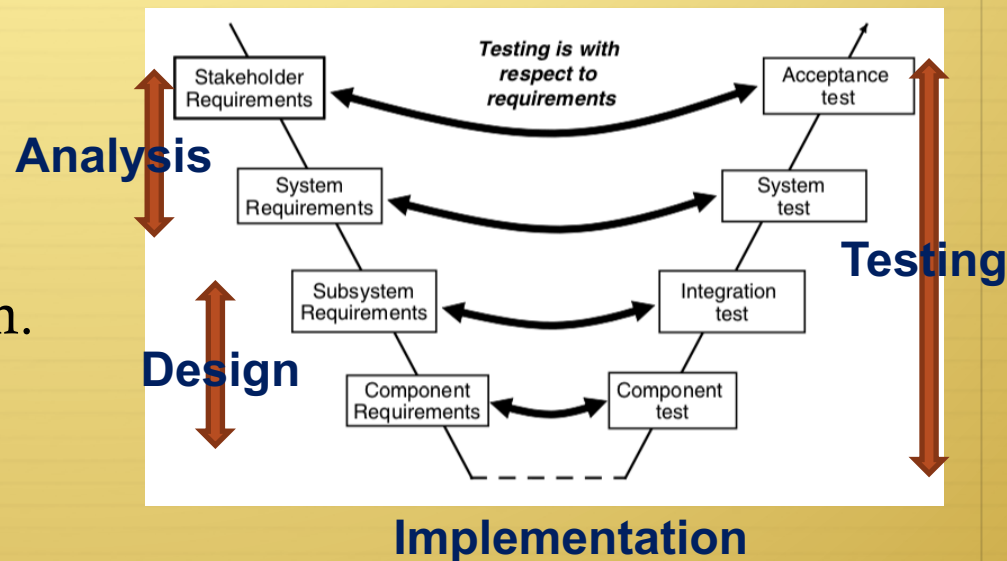
Software Development Life Cycle (SDLC)



Role of requirements

- Contract –baseline agreed between system developers, customers, and end-users regarding what to build.
- The basis for software design.
- Support for verification and validation.
- Support for system evolution.

Requirements in the V-Model



V-Model is a software development model
(we will study more of the V-Model in the
Software Process course)

How costly are requirements errors?

- ✦ Relative cost to correct a requirement defect. [Wiegers, 2006]

Stage Error was Discovered	Relative Cost to Correct
Requirements Development	1X
Design	2-3X
Construction	5-10X
System or acceptance test	8-20X
Operation	68-110X

- ✦ $\text{COST}(\text{correcting design/implementation errors})$
= 100 x $\text{COST}(\text{correcting requirements errors})$
[Boehm87]

Error propagation in lifecycle

Simplified Lifecycle

Cumulative Effects of Error

Requirements Specification

Design

Implementation

Testing

Maintenance

the real problem

correct
spec.

erroneous
spec.

correct
design

erroneous
design

design based on
erroneous spec

correct
program

erroneous
program

prog based on
erroneous design

prog based on
erroneous spec

correct
functions

correctable
errors

uncorrectable
errors

hidden
errors

Imperfect program products

Defining the problem is the Problem!

The hardest single part of building a software system is deciding precisely what to build. *[Brooks, 1987]*

Communication & coordination

Inadequate **knowledge** of application domain

Changing & conflicting **requirements**

“Requirements”

Definition and Classification

A Definition.. (1)



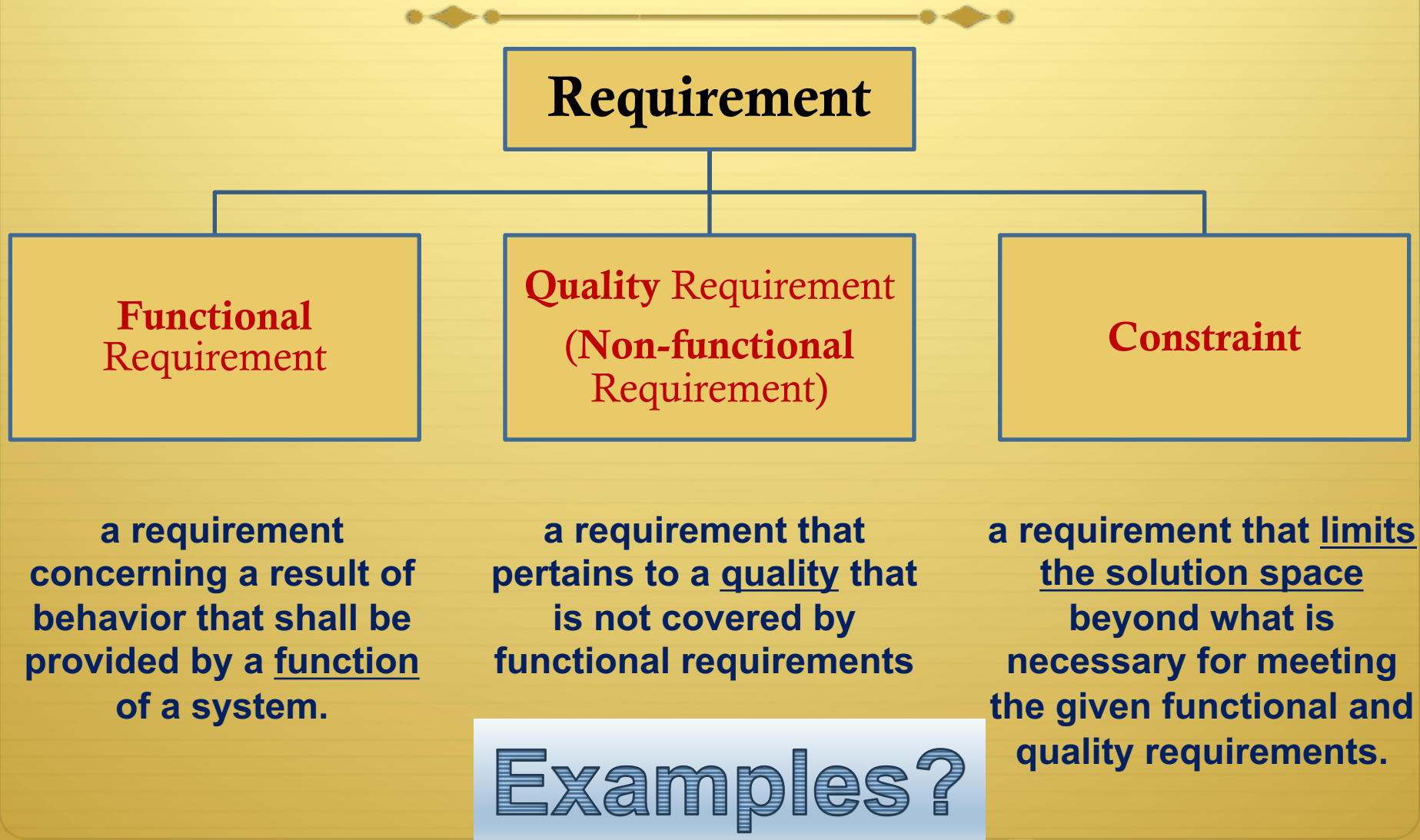
- ✧ Requirements are.. a specification of what should be implemented or as a constraint of some kind on the system. [*Sommerville, I*]
- ✧ They may be :
 - ✧ A user-level facility description,
 - ✧ A detailed specification of expected system behavior,
 - ✧ A general system property,
 - ✧ A specific constraint on the system,
 - ✧ Information on how to carry out some computation,
 - ✧ A constraint on the development of the system.

A Definition (2)



- ✧ “A requirement is
 - ✧ (A) A condition or capability needed by a user to solve a problem or achieve an objective.
 - ✧ (B) A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document.
 - ✧ (C) A documented representation of a condition or capability as in definition (A) or (B)”

Requirements Classification



Session summary



- ✦ Why requirements are important?
- ✦ Definitions and classifications of requirements