Modern Requirements and Business Analysis

Jean-Michel Bruel -- 2024/04/17

PEGS Overview

https://bit.ly/jmbruel

@SmartModelTeam

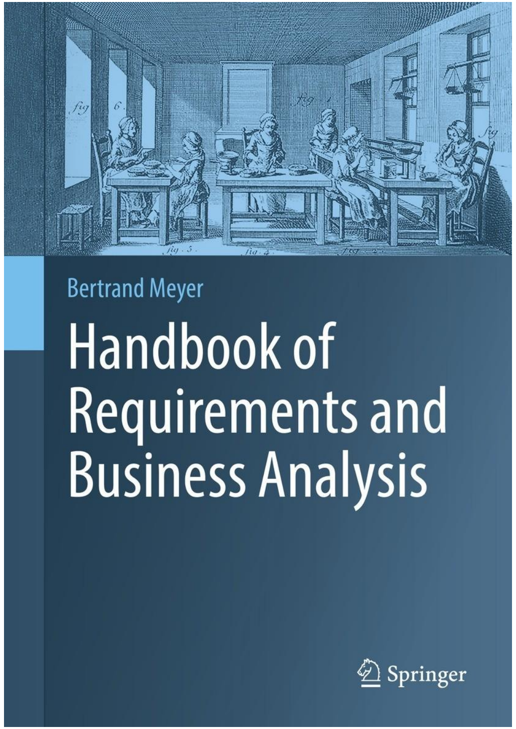
https://github.com/smart-researchteam

Get the 180 slides (pdf)

DON'T
PANIC!

Outline

- Context
- Requirements Anatomy
  - Categories of requirements
  - Categories of inter-requirements relations
- Requirements tooling
  - There is more than Word and Excel
  - Concrete implementation *(of what comes next)*

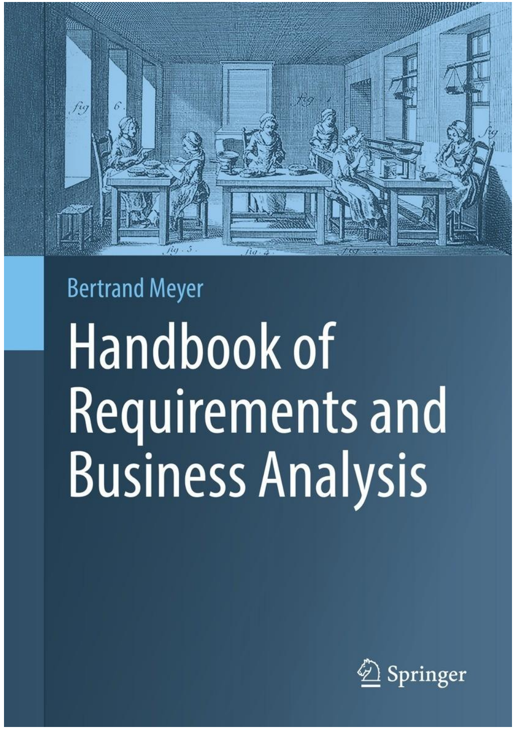


https://se.inf.ethz.ch/requirements/

Why me?

- Professor at Toulouse University
  - Teaching modeling and DevOps
- Member of the CNRS-IRIT Laboratory
  - Model-Based Systems Engineering
- Airbus MBSE Chair of Toulouse
- Leader of the companion book (end of 2023)

https:/bit.ly/jmbruel



Bertrand Meyer

Handbook of Requirements and Business Analysis

Springer

https://se.inf.ethz.ch/requirements/

Outline

- Context
- Requirements anatomy
- Requirements tooling

Context

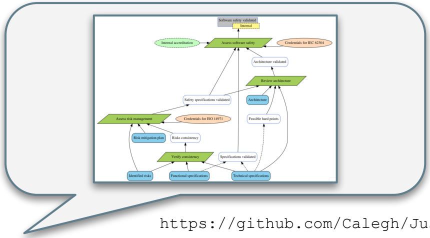
https://www.linkedin.com/posts/daniel-abrahams_reminder-people-dont-buy-products-they-ugcPost-7010015948820680704-CTJD?utm_source=share&utm_medium=member_android

People don’t buy products

They buy solutions to their problem

[...] they buy solutions to their problem

- **Play** with the product
  - Not so easy with an airplane...
- Don’t need details
  - **Early** V&V
- Validation => **Rational**



https://github.com/Calegh/JustificationDiagram

Joint effort...

- Innopolis University
  - Alexandr
  - Bertrand
  - Manuel
- Constructor Institute
  - Bertrand
  - Li
- IRIT/SM@RT team
  - Florian
  - Sophie
  - JMB
  - Maria
- CoCoVaD
  - Imen Sayar
  - Thuy Nguyen

INNOPOLIS UNIVERSITY

CONSTRUCTOR UNIVERSITY

IRIT

SM@RT

AIRBUS

Validation & Verification (V&V)

Does the right **thing**

- Validation
- « Building the right system »

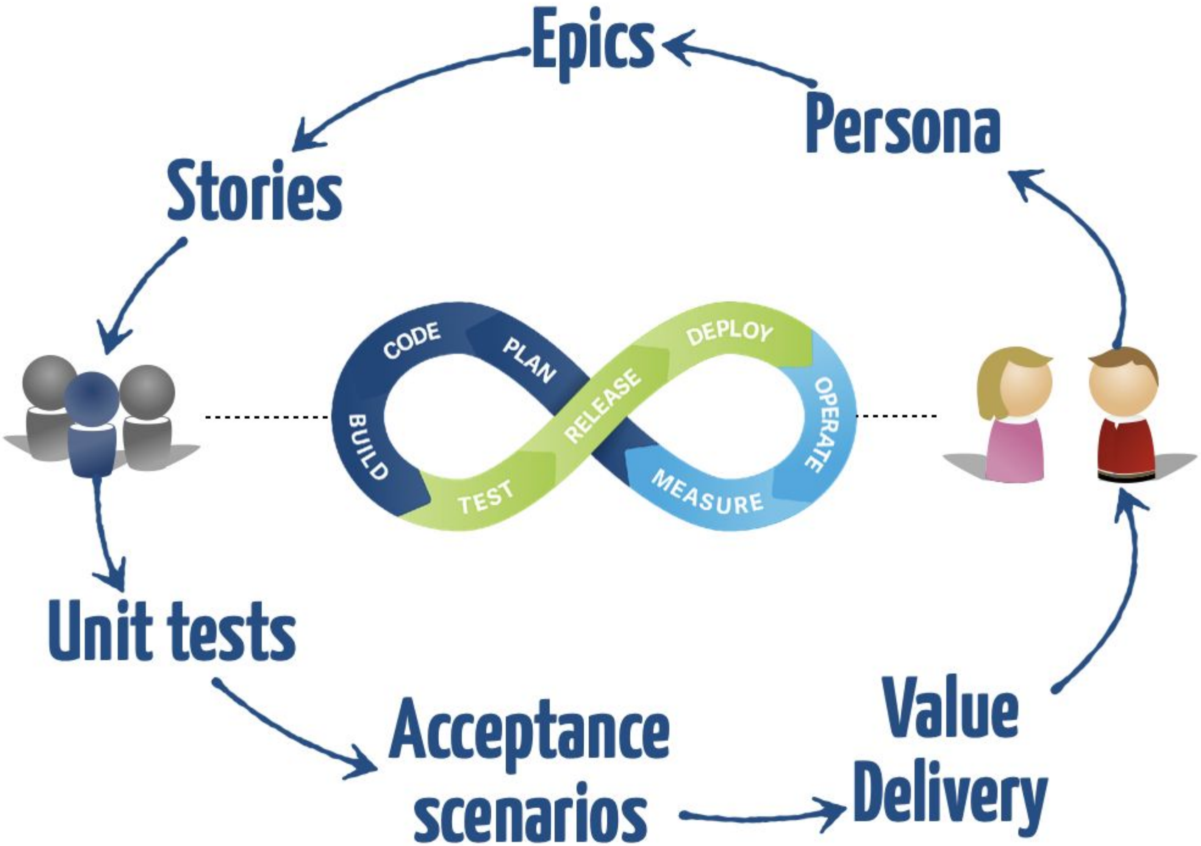
Does them right

- Verification
- « Building the system right »

https://www.canon.co.nz/software-solutions/iw-sam

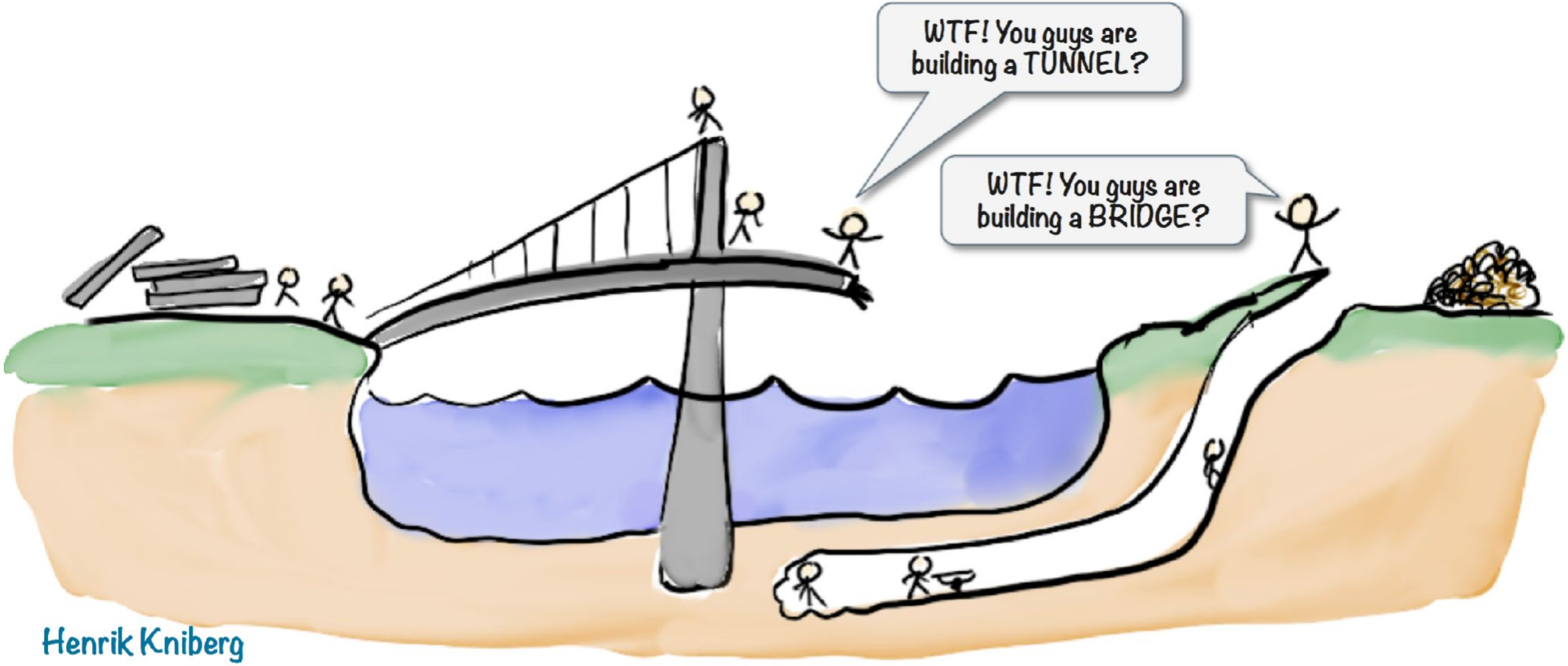
https://www.techopedia.com

Lean development

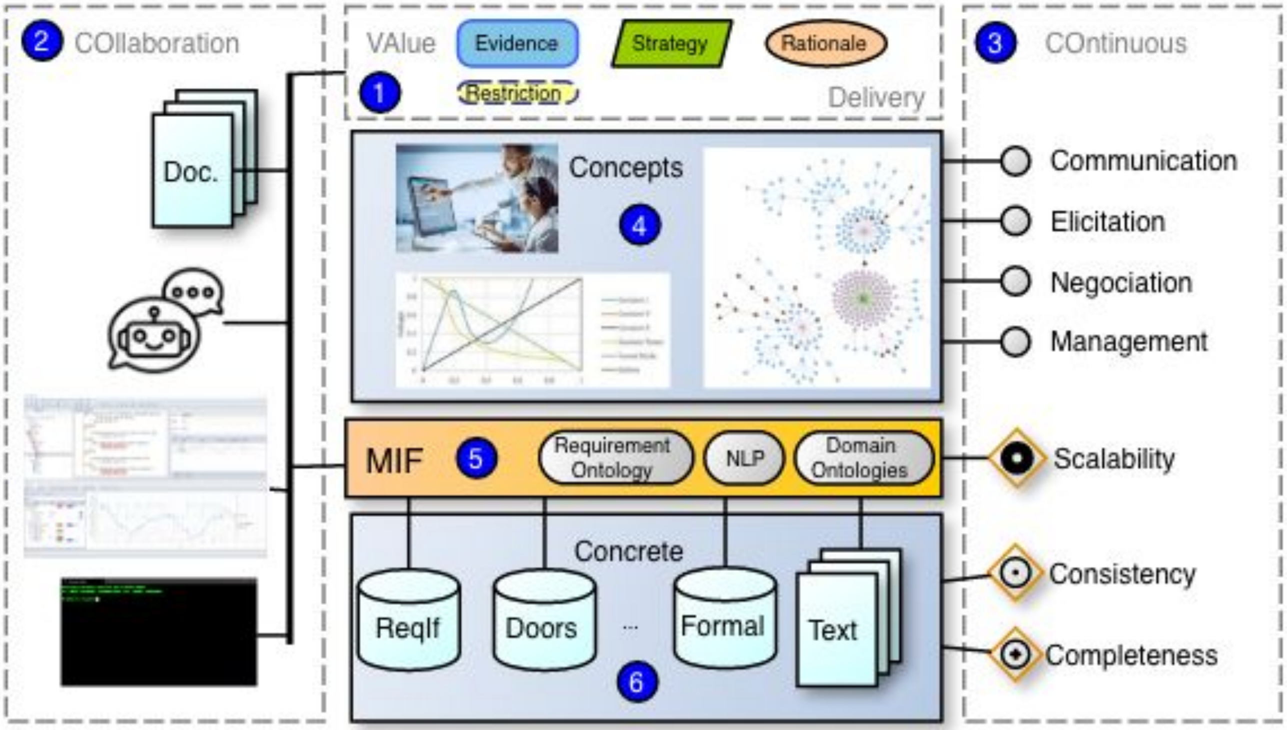


Source: http://meshfields.de/continuous-integration-testing-delivery-ionic2-hybrid-mobile-apps-buddybuild/

Misalignment


WTF! You guys are building a TUNNEL?
WTF! You guys are building a BRIDGE?
Henrik Kniberg

Requirements as first-class citizens



IEEE/SWEBOK/ISO definition of a Requirement

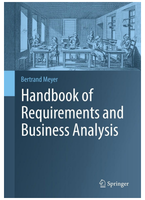
> “A **1.1 Definition of a Software Requirement**
>
> At its most basic, a software requirement is a property that must be exhibited by something in order to solve some problem in the real world. It may aim to automate part of a task for someone to support the business processes of an organization, to correct shortcomings of existing software, or to control a device—to name just a few of the many problems for which software solutions are possible. The ways in which users, business processes, and devices function are typically complex. By extension, therefore, the requirements on particular software are typically a complex combination from various people at different levels of an organization, and who are in one way or another involved or connected with this feature from the environment in which the software will operate.
>
> ”

http://swebokwiki.org/Chapter_1:_Software_Requirements

Outline

- Context
- Requirements anatomy
- Requirements tooling

Requirements Anatomy



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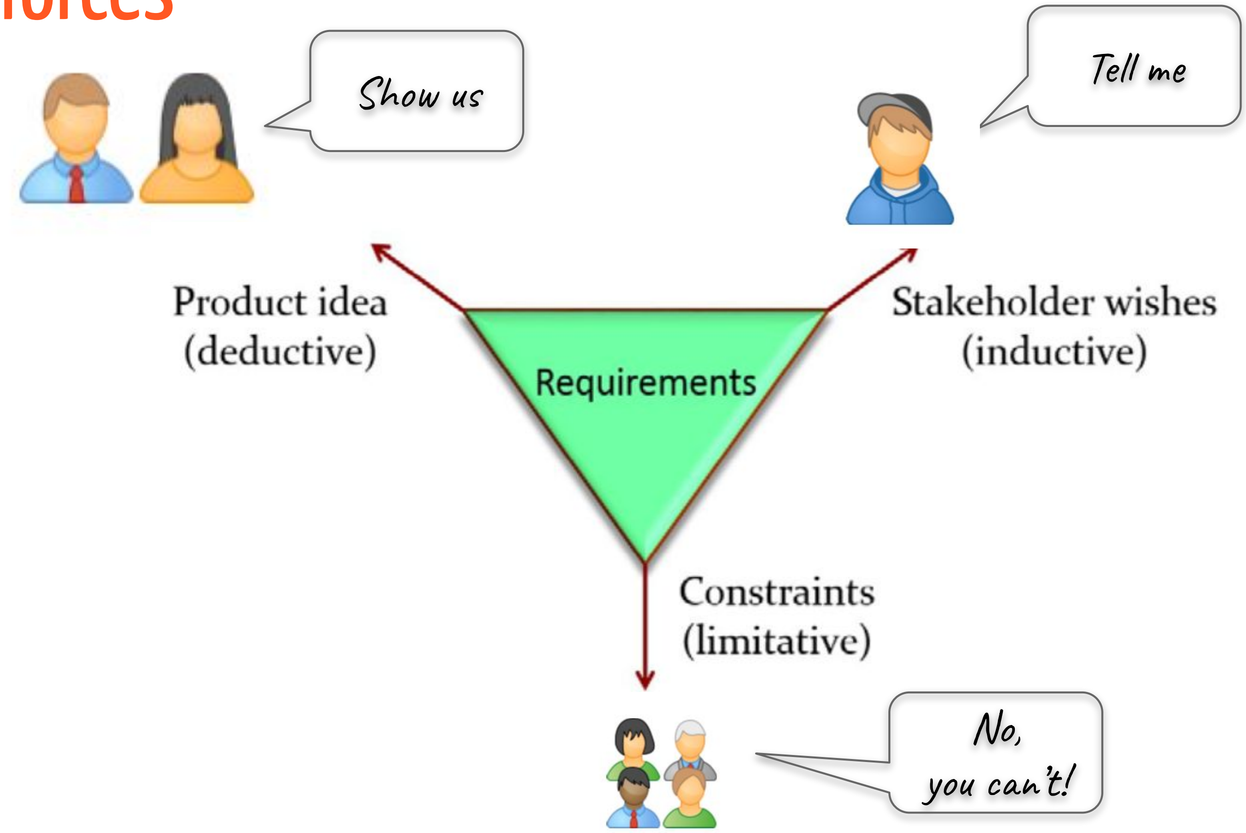
3 pulling forces



Requirements

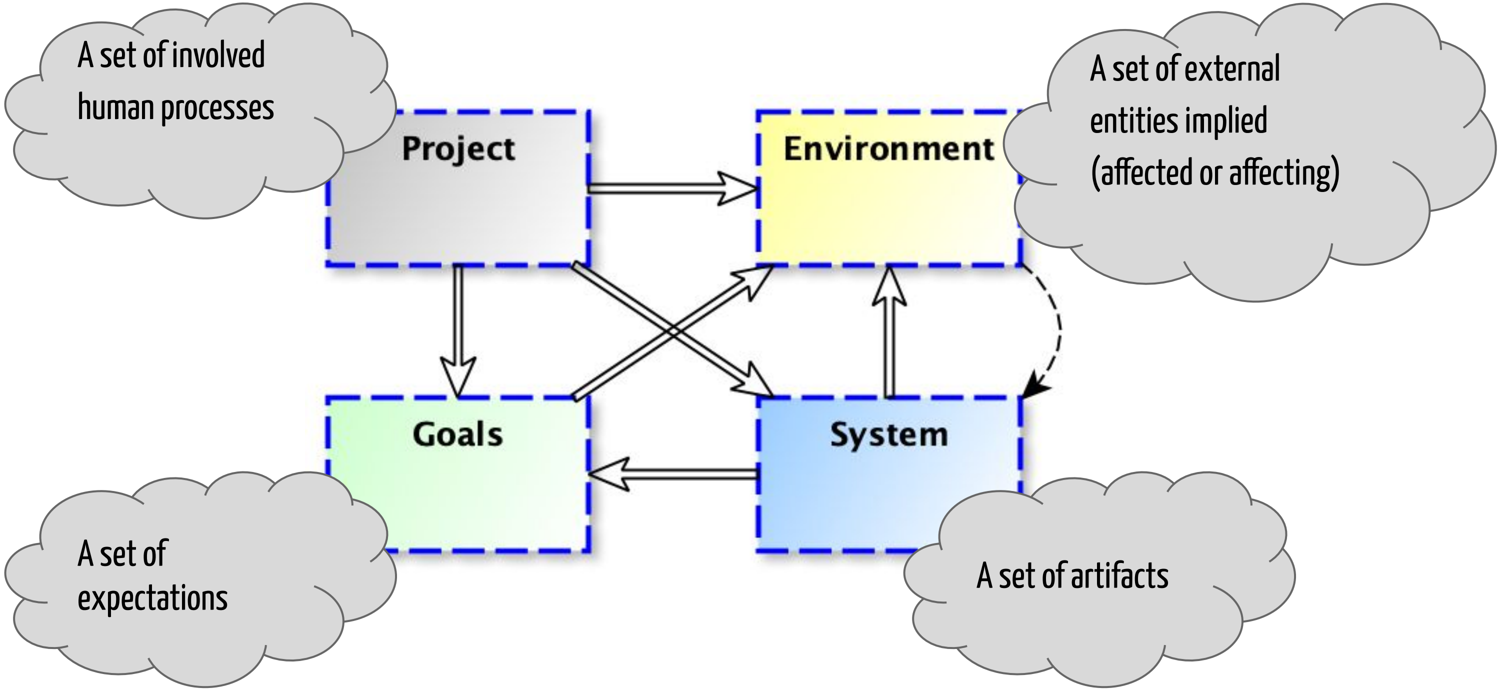
Product idea (deductive)

Stakeholder wishes (inductive)

Constraints (limitative)

Context (universe of discourse)

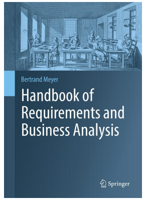
"a **project** to develop a **system**, in a certain **environment**, to satisfy a set of **goals**"



A set of involved human processes
Project
Environment
A set of external entities implied (affected or affecting)
Goals
System
A set of expectations
A set of artifacts

General definition of a Requirement

"A requirement is a (relevant) **statement** about a **property**"



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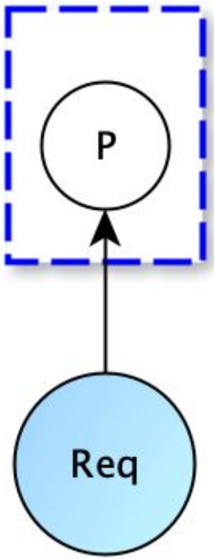

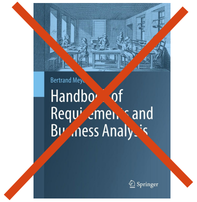
Bertrand Meyer
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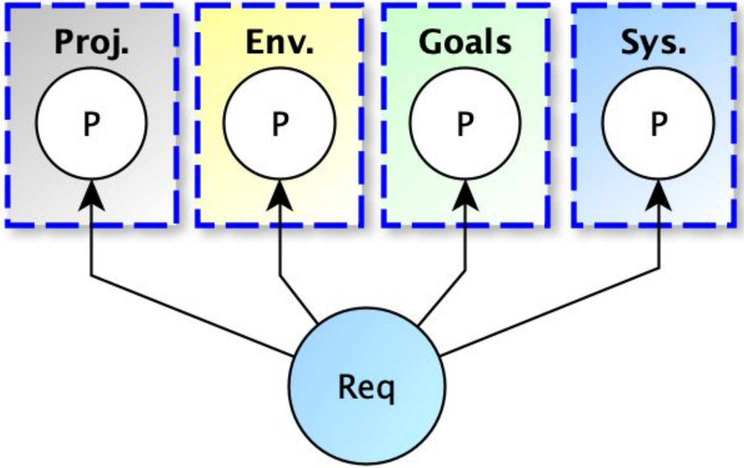
General definition of a Requirement

“A requirement is a (relevant) **statement** about a **p**roject, **e**nvironment, **g**oals or **s**ystem **property**”



Some basic concepts

Property: boolean predicate (on a project, system or environment)

Statement: human-readable expression of a property

Relevant: ...

Relevance

Goals: always (by definition)

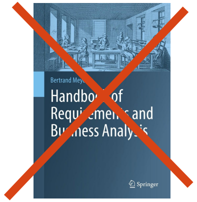
Environment: if it can affect or be affected

System: if it can affect or be affected by a stakeholder

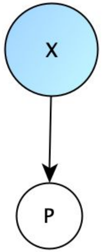
Project: if it can affect or be affected by a stakeholder

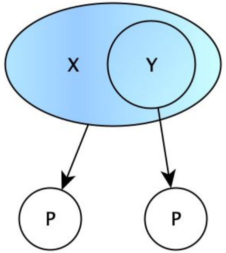
A statement of a property is relevant if the property is relevant

Elements of graphical representation

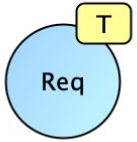


A requirement can be **Atomic** or **Composite**

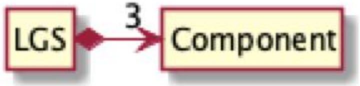


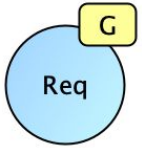


The **notation** of a requirement is the concrete syntax in which it is expressed (Text, Tabular, Graphical, formal)



"The LGS has three components."





Additional concepts

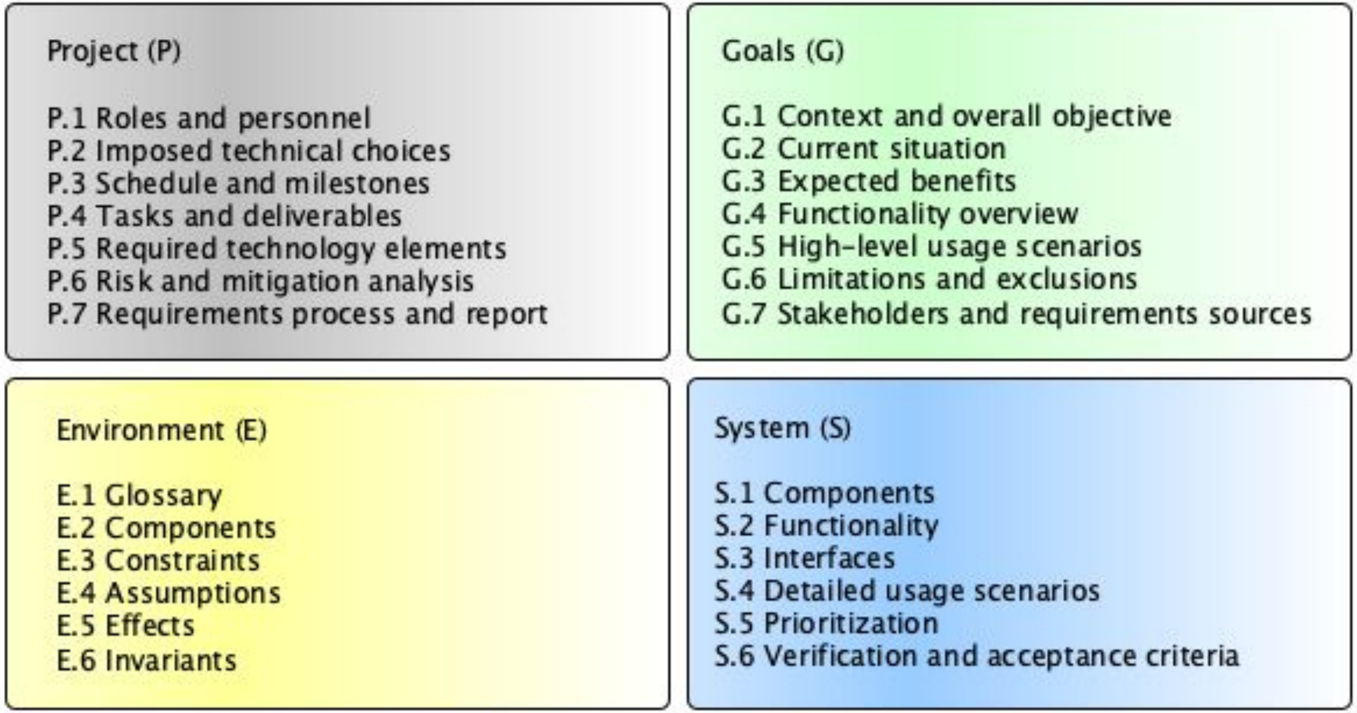
We distinguish the different stages of a System:

- The system itself (mainly to talk about its components)
- The running system (mainly to talk about its behavior)
- The system in development (mainly to talk about phases and artifacts)

Sys.
Run. Sys.
Sys. Dev.

The four PEGS

Standard Plan



Project (P)

P.1 Roles and personnel
P.2 Imposed technical choices
P.3 Schedule and milestones
P.4 Tasks and deliverables
P.5 Required technology elements
P.6 Risk and mitigation analysis
P.7 Requirements process and report

Goals (G)

G.1 Context and overall objective
G.2 Current situation
G.3 Expected benefits
G.4 Functionality overview
G.5 High-level usage scenarios
G.6 Limitations and exclusions
G.7 Stakeholders and requirements sources

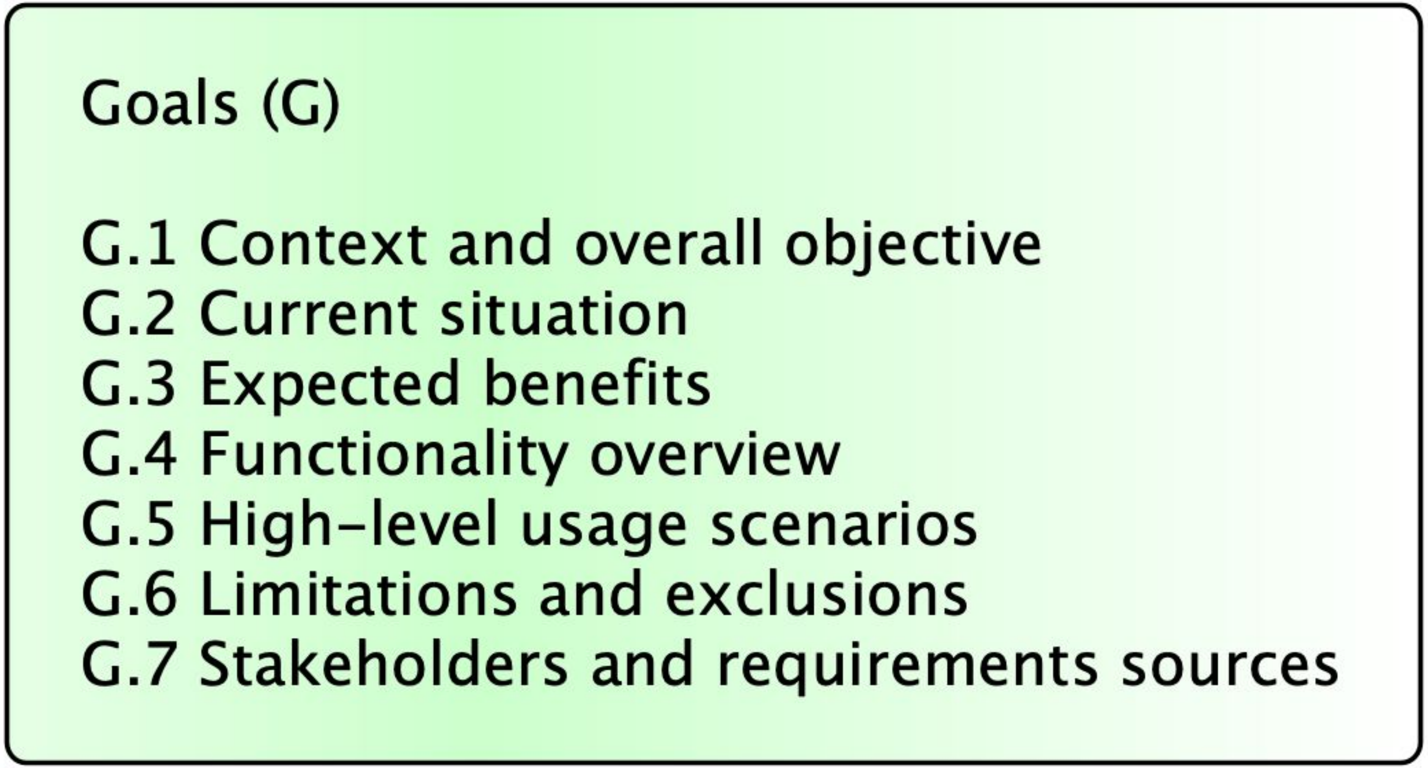
Environment (E)

E.1 Glossary
E.2 Components
E.3 Constraints
E.4 Assumptions
E.5 Effects
E.6 Invariants

System (S)

S.1 Components
S.2 Functionality
S.3 Interfaces
S.4 Detailed usage scenarios
S.5 Prioritization
S.6 Verification and acceptance criteria

Goals



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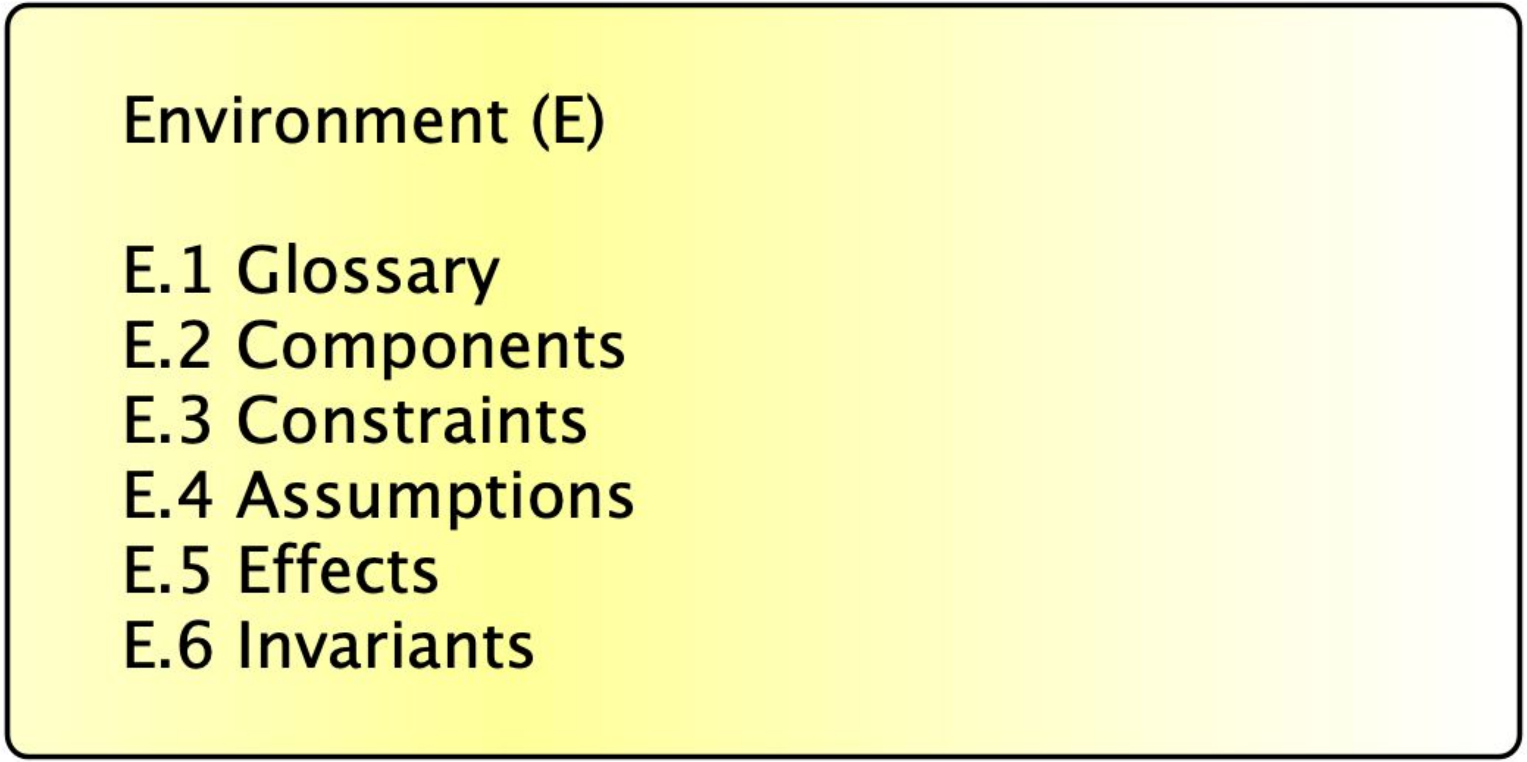
Environment



Environment (E)

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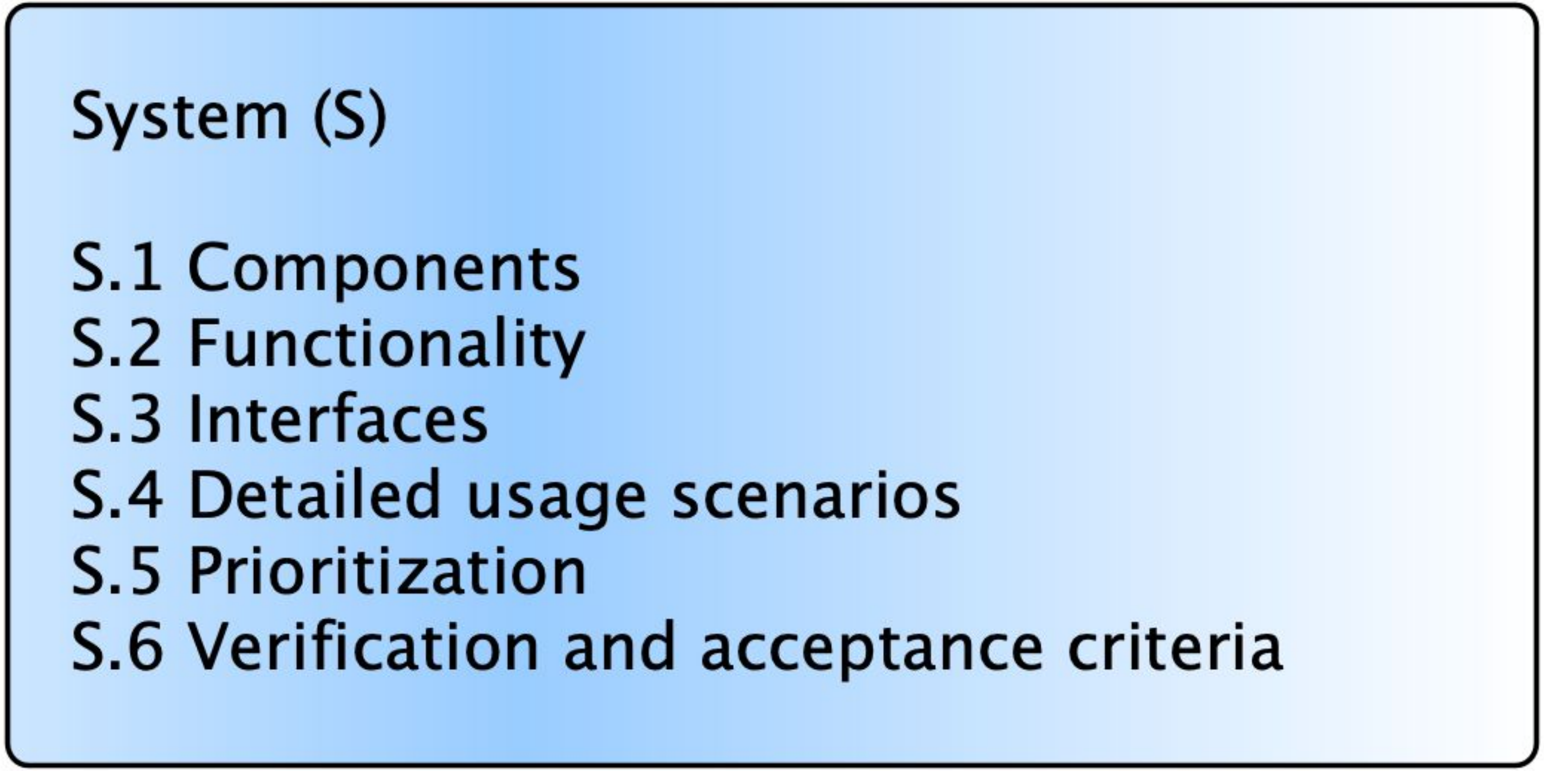
System



System (S)

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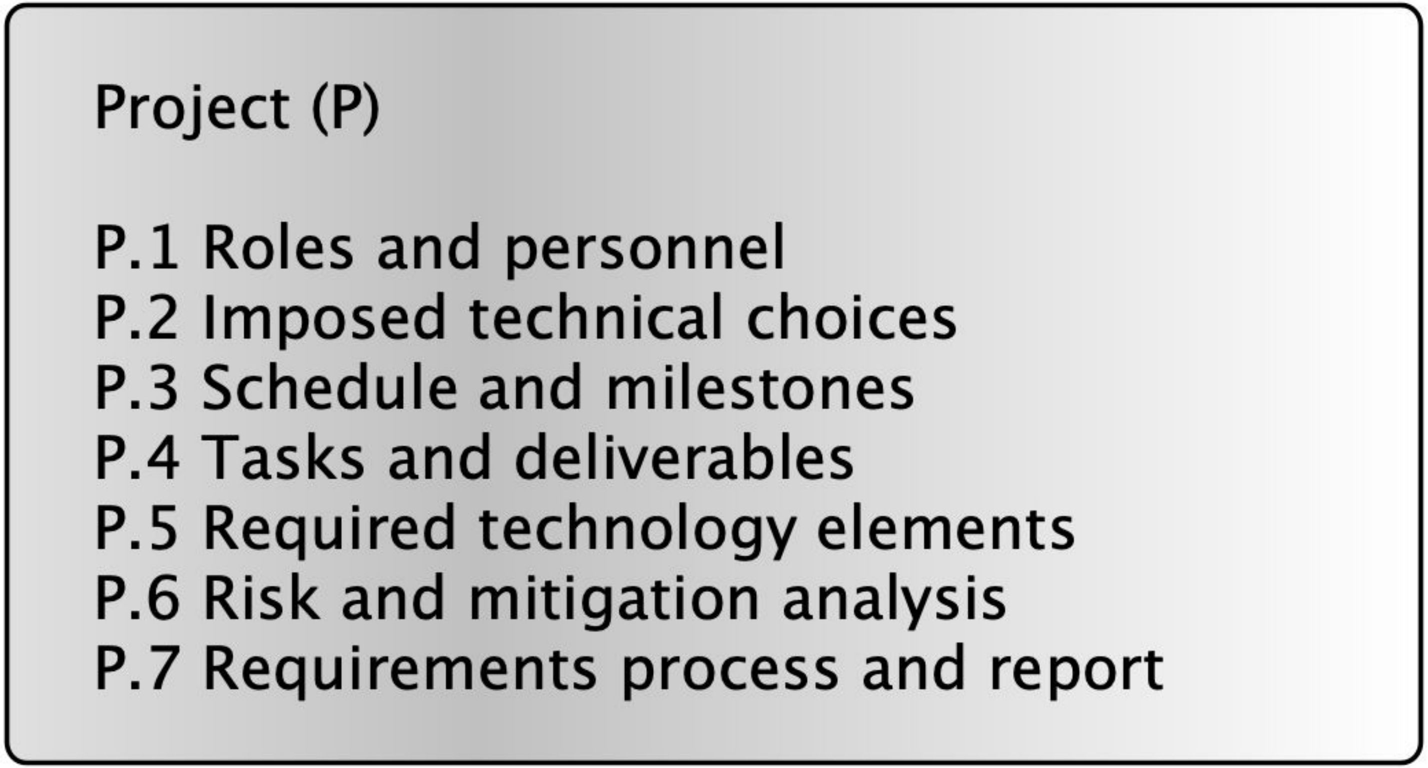
Project



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Outline

- Context
- Categories of requirements
- Categories of inter-requirements relations

Kind of requirements (overview)

Kind of requirements (common to all PEGS)

- Component
- Responsability
    - *Role*
- Limit

Kind of requirements (Goals)

- Goal
  - *Obstacle*

Kind of requirements (Projects)

- Task
- Product

Kind of requirements (System)

- Behavior
    - *Functional*
    - *Non-functional*
    - *Example*

Kind of requirements (Environment)

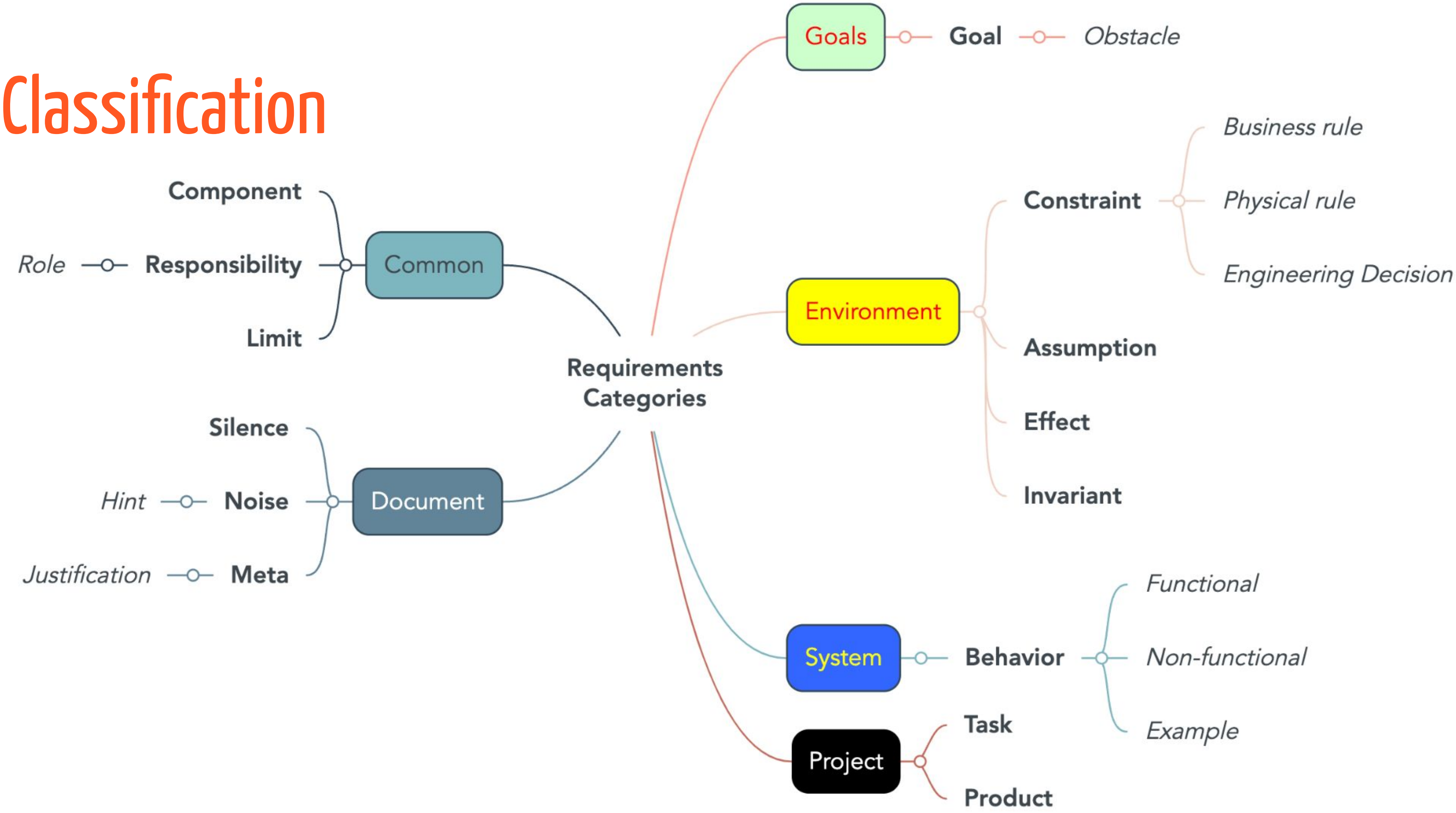
- Constraint
  - *Business rule*
  - *Physical rule*
  - *Engineering decision*
- Assumption
- Effect
- Invariant

Kind of requirements (Document description)

- Silence
- Noise
  - *Hint*
- Meta-requirement
  - *Justification*

Kind of requirements (details)

Classification

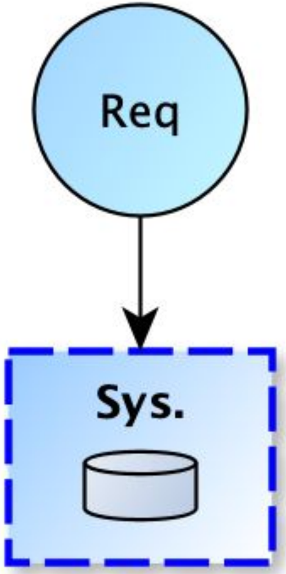


Common to all PEGS

- Component
- Responsability
  - *Role*
- Limit

Component

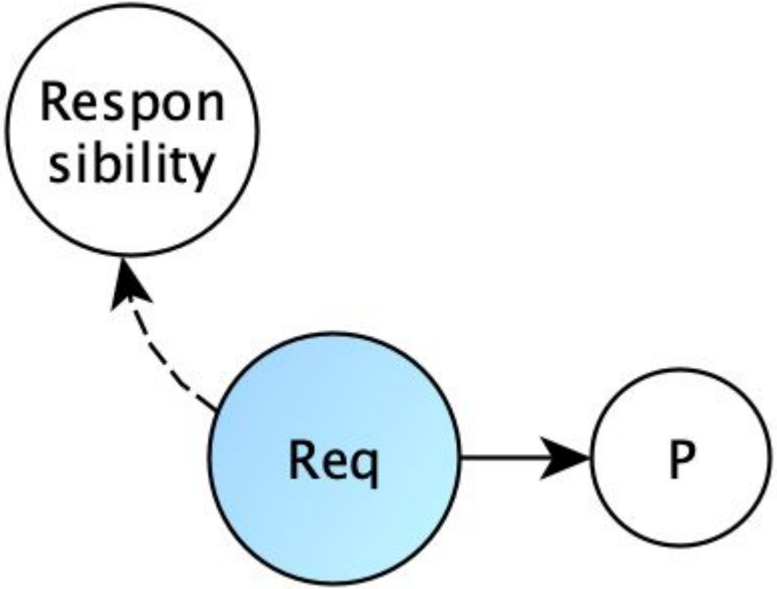
(Identification of a part of a whole)



"The Landing Gear System is composed of three parts."

Responsibility

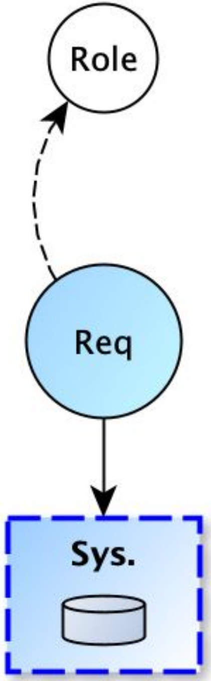
(Assignment of behavior or task to component)



"The control system is in charge of the opening/closing of the door."

Role (kind of responsibility)

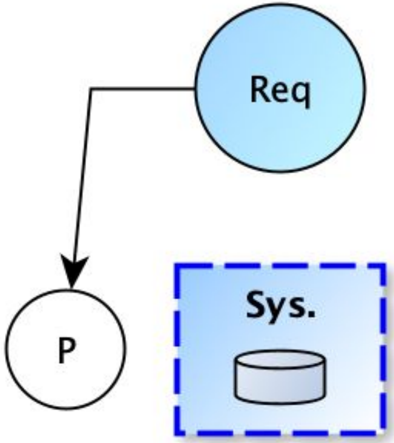
(A human or organizational responsibility)



"Authorizations are provided by the head of the audit department."

Limit

(the property that the project, system or environment does *not* include a requirement of any of the preceding kinds)



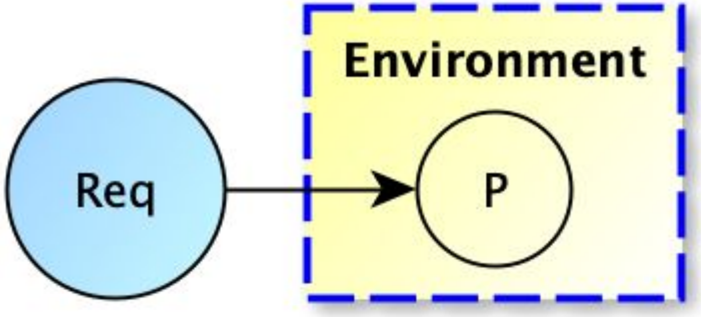
"Integration testing will be performed in a follow-up project."

Goals Requirements

- Goal
    - *Obstacle*

Goal

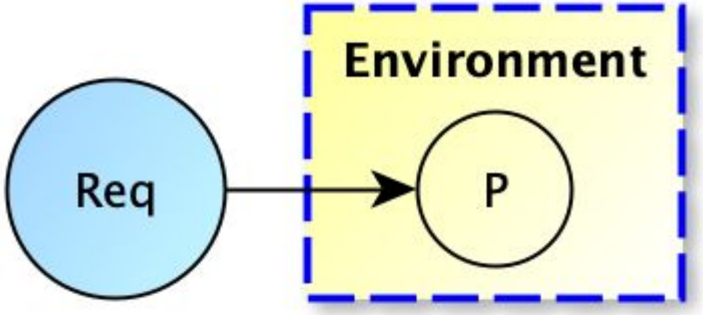
(Desired result for the target organization)



"The goal of the system is to allow any user to book a flight."

Obstacle (kind of goal)

(Goal describing a property to be overcome)



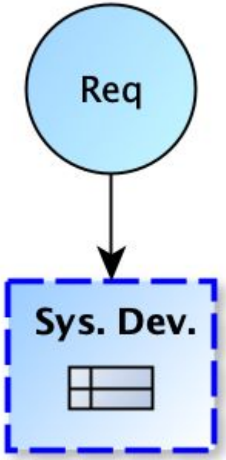
"The current manual operation makes it impossible to meet the expected growth of traffic over the next 10 years."

Projects requirements

- Task
- Product

Task

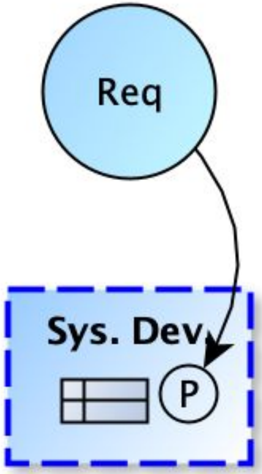
(The property that the project includes a certain activity)



“The team should meet in a daily basis, called daily meeting.”

Product

(Artifact produced or needed by a task)



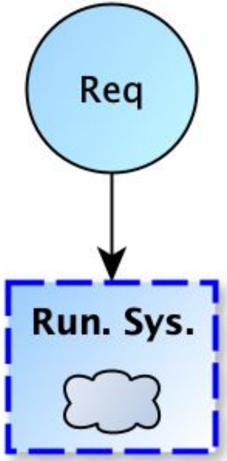
"The following test plan is provided:..."

System requirements

- Behavior
    - *Functional*
    - *Non-functional*
    - *Example*

Behavior

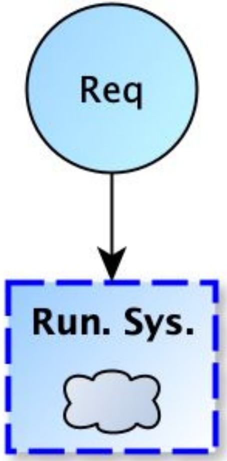
(A property of the effects of the operation of the system or some of its components)



“The system should allow to open and close the door safely.”

Functional requirement (kind of behavior)

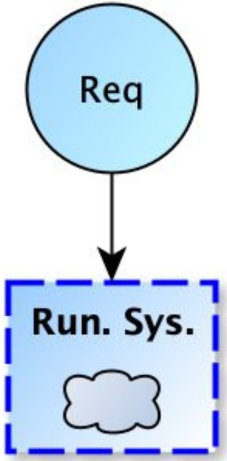
(**What** the system must do)



"The system should allow to open and close the door safely."

Non-functional requirement (kind of behavior)

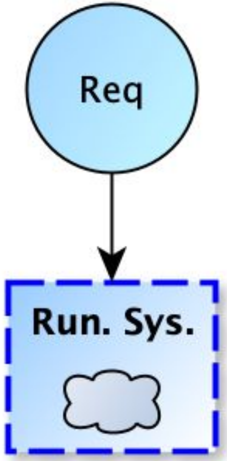
(**How** the system must perform)



"The identification process should be secure."

Example (kind of behavior)

(Illustrative/representative scenario)



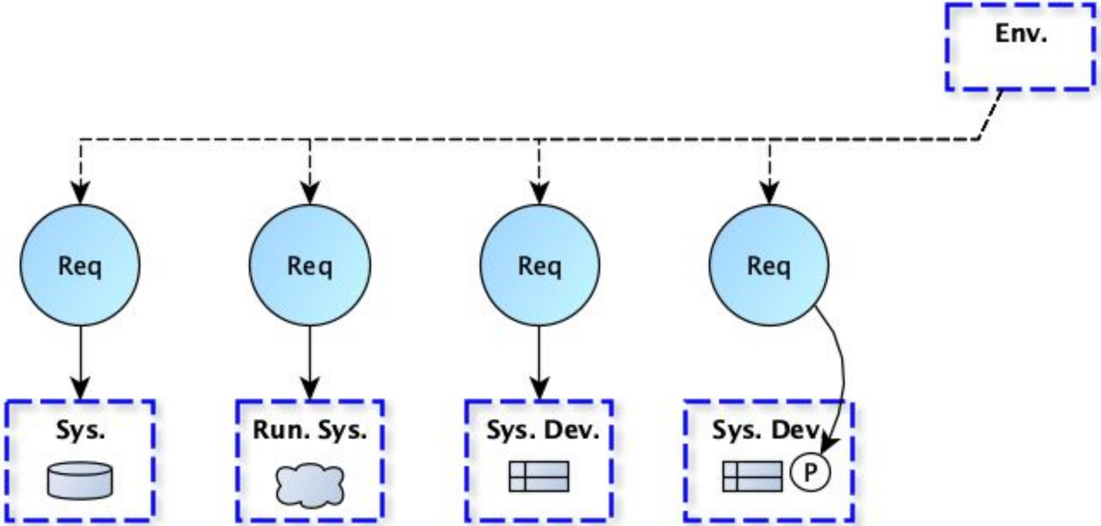
"Here is the description of the use case *cancel a previous order...*"

Environment requirements

- Constraint
  - *Business rule*
  - *Physical rule*
  - *Engineering decision*
- Assumption
- Effect
- Invariant

Constraint

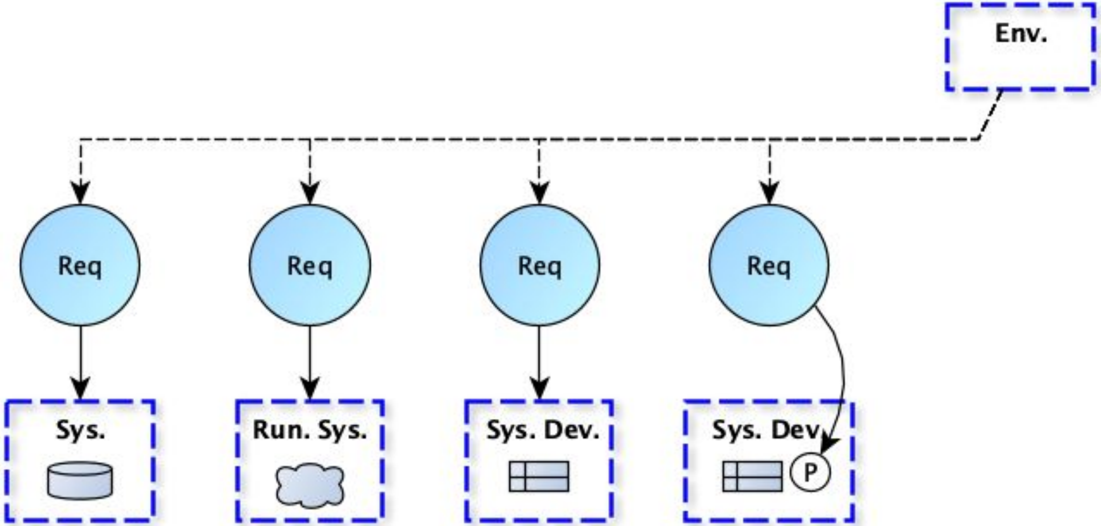
(A property imposed by the environment)



"Every transfer over 10.000€ requires an authorization."

Business rules (kind of Constraint)

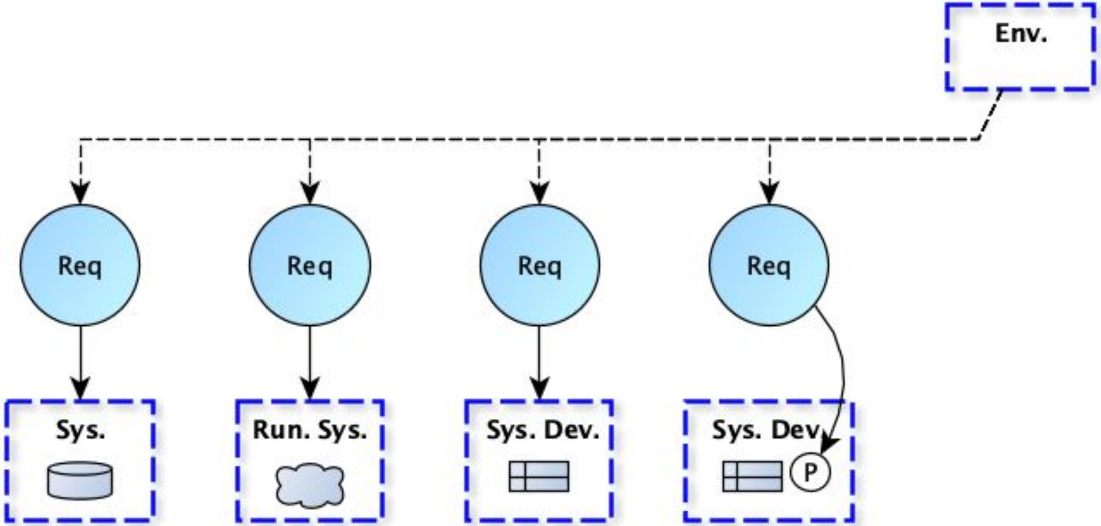
(A constraint imposed by an **organization or standard**)



“According to the regulation rule X.45F53, the amount of the engine CO2 emission must be less than...”

Physical rules (kind of Constraint)

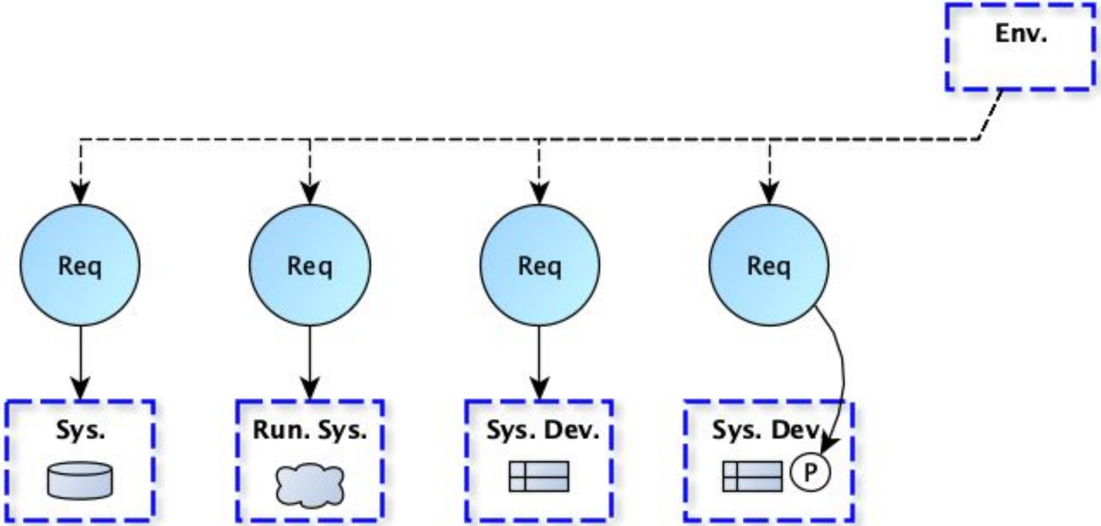
(A constraint imposed by **nature**)



“The volume of the tank needs to be twice the amount of …”

Engineering decisions (kind of Constraint)

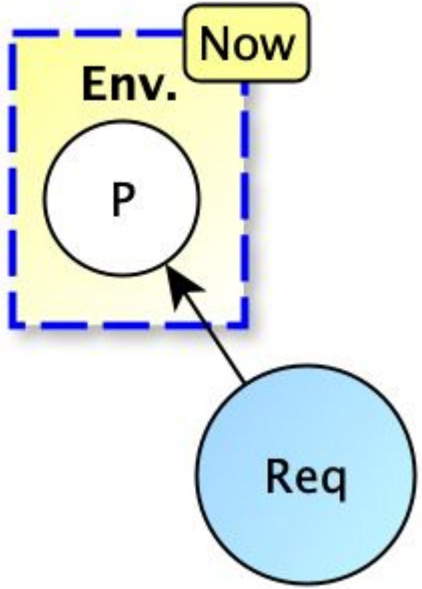
(A constraint imposed by **design**)



"According to the regulation rule X.45F53, the amount of the engine CO2 emission must be less than..."

Assumption

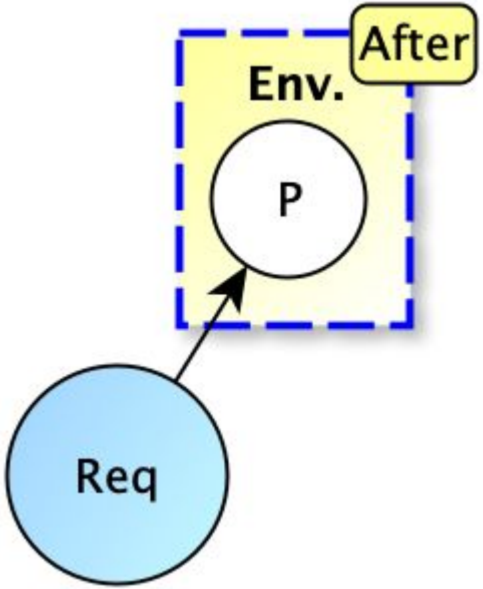
(Expected property of the environment)



"The available bandwidth will be 1 Mbit/s or more."

Effect

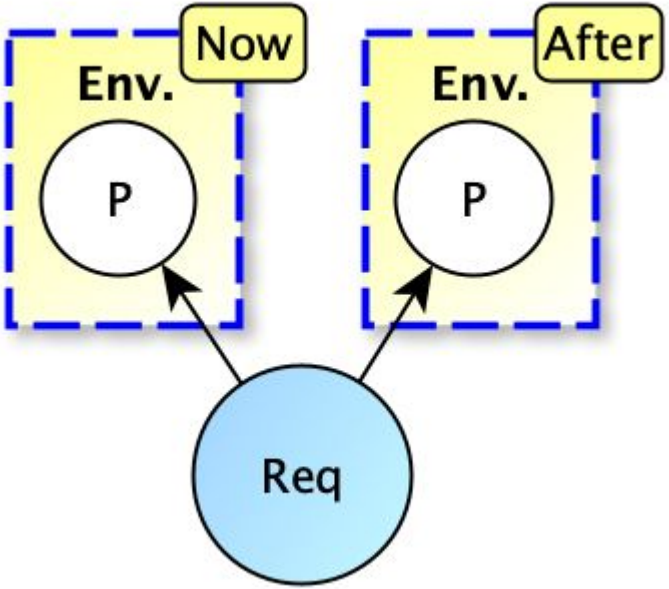
(Property of the environment affected by the system)



"When the system is put into operation, employees will be paid on the last working day of the month."

Invariant

(Environment property that must be maintained)



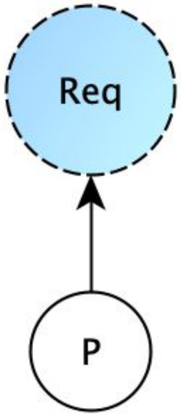
"The system expects a temperature between 18 to 25 degrees Celsius (precondition) and maintains it in that range."

Document description

- Silence
- Noise
  - *Hint*
- Meta-requirement
  - *Justification*

Silence

(a property that should have a requirement, but does not)



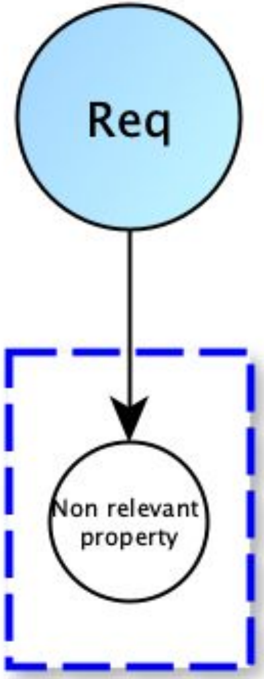
How do we blacklist a customer ?

When do we send the bill, and how ?

> “The system should send the bill to the non blacklisted customers.”

Noise

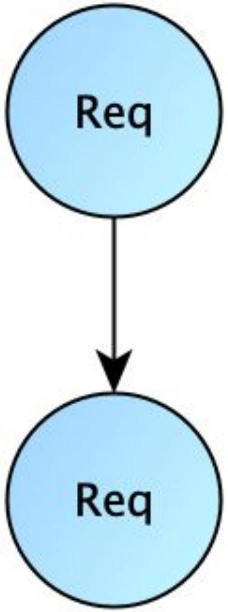
(something that should not be in the requirement document but is there)



"The director is not consistent in his decision making."

Meta-requirement

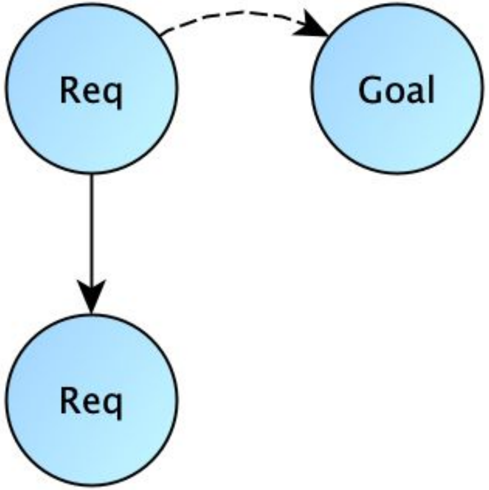
(a property of requirements themselves)



“The details are provided in Fig7.”

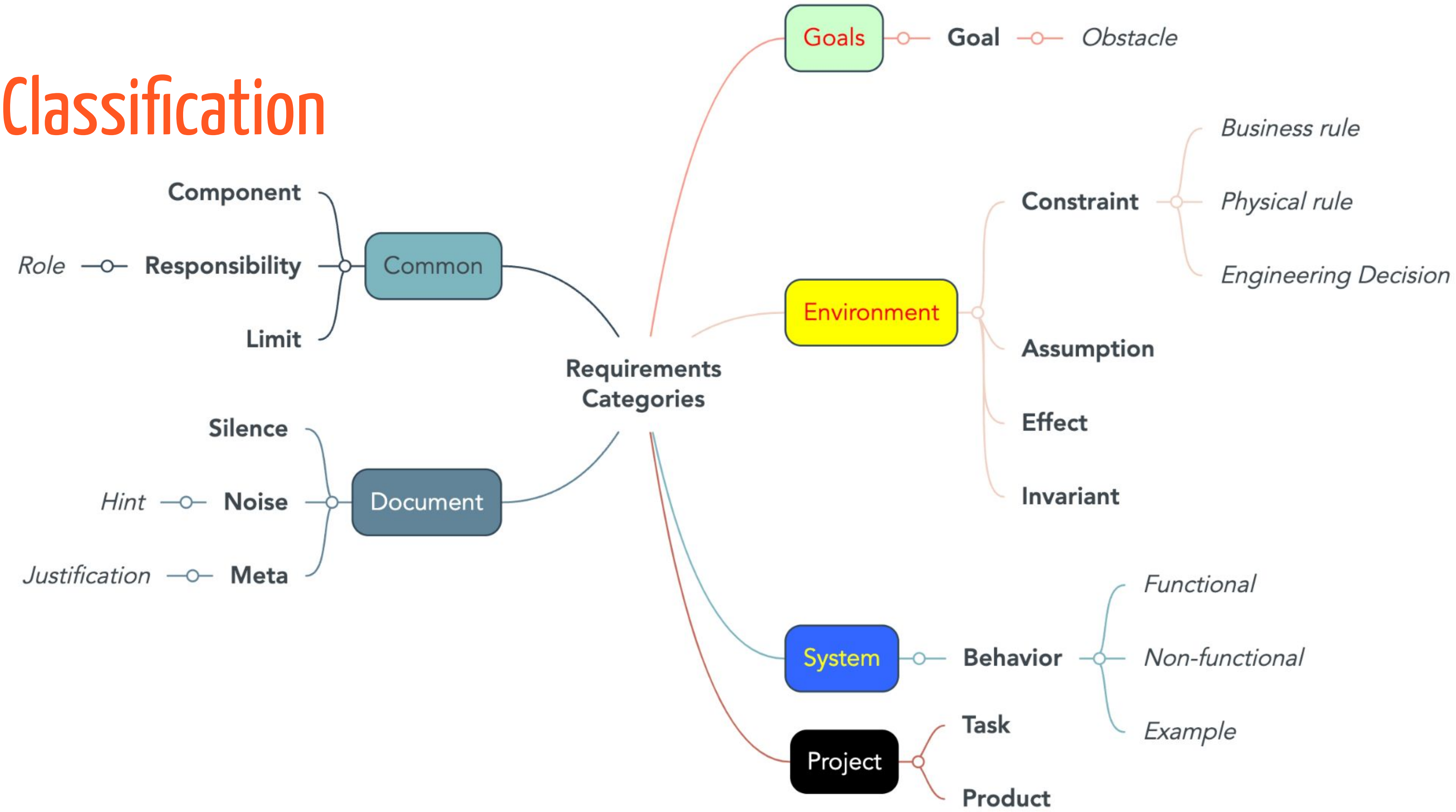
Justification (kind of Meta-requirement)

(Explanation of a project or system property, in reference to a goal or environment property)



> " The presence of two signature fields follows from the rule on purchases higher than € 5000 (section E.3.X)."

Classification



Categories of requirements (derived)

- Justification (from Meta)
- Role (from Responsibility)
- Business rule (from Constraint)
- Physical rule (from Constraint)
- Engineering decision (from Constraint)
- Hint (from Noise)
- Obstacle (from Goal)
- Functional (from Behavior)
- Non-Functional (from Behavior)
- Example (from Behavior)

Guideline for category identification

1. Which PEGS (this shortens the possibilities)
2. Check if specific (not component/resp/limit or document)
3. Pick the best among the remaining ones

Outline

- Context
- Requirements anatomy
- Requirements tooling

Categories of inter-requirements relations

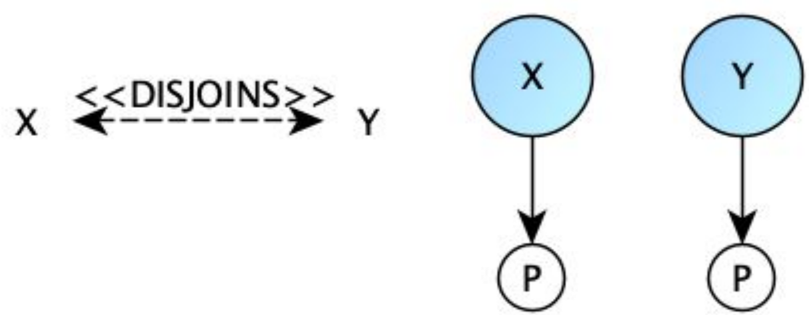
Relations between requirements

- Disjoins (X || Y)
- Belongs (X ⊆ Y)
- Repeats (X ⇔ Y)
- Contradicts (X ⊕ Y)

- Extends (X > Y)
- Excepts (X \\ Y)
- Constrains (X ▸ Y)
- Characterizes (X → Y)

X || Y

X and Y are unrelated

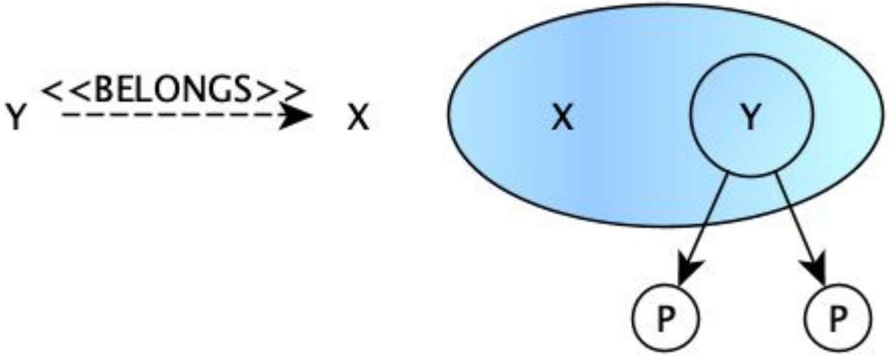


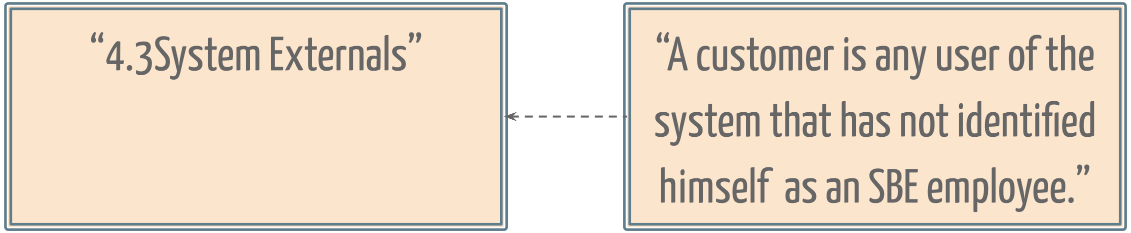
"The system is composed of three components."

"The car should be as economic in fuel consumption as possible."

Y is a sub-requirement of X

$Y \subseteq X$



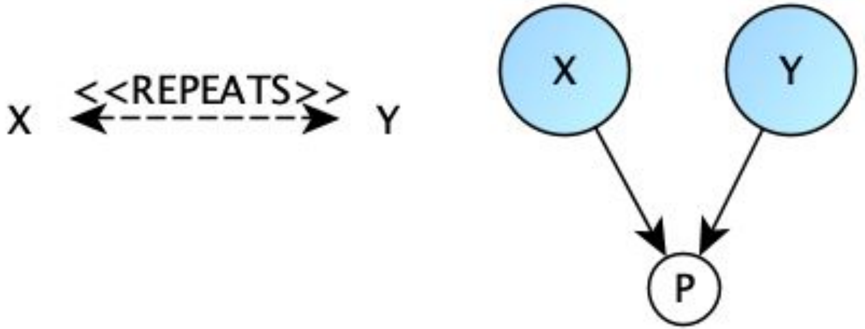


“4.3System Externals”

“A customer is any user of the system that has not identified himself as an SBE employee.”

X ⇔ Y

X specifies the same property as Y

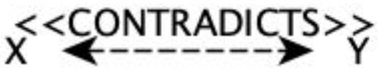


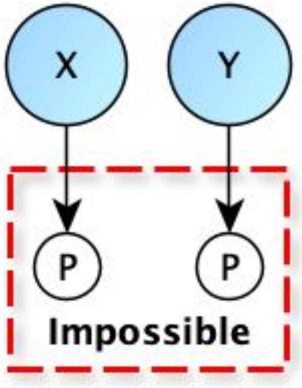
“The system is composed of three components.”

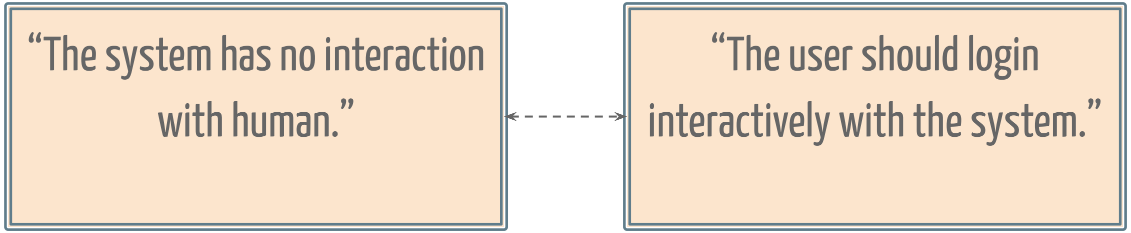
“Here are the descriptions of the three parts of the system:”

X ⊕ Y

X specifies a property in a way not compatible with Y



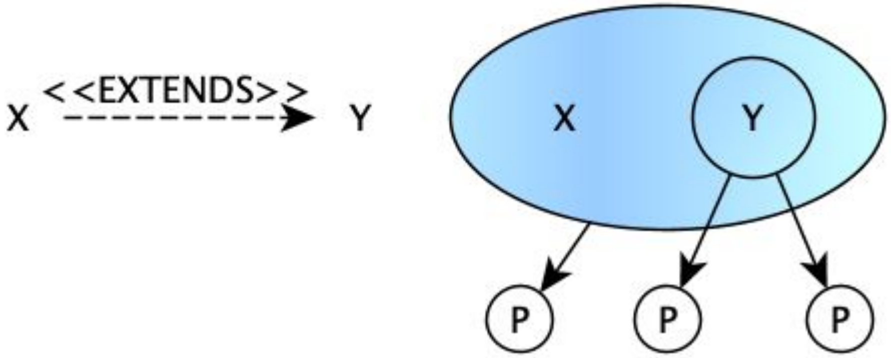



"The system has no interaction with human."

"The user should login interactively with the system."

X > Y

X assumes Y and specifies a property not specified by Y

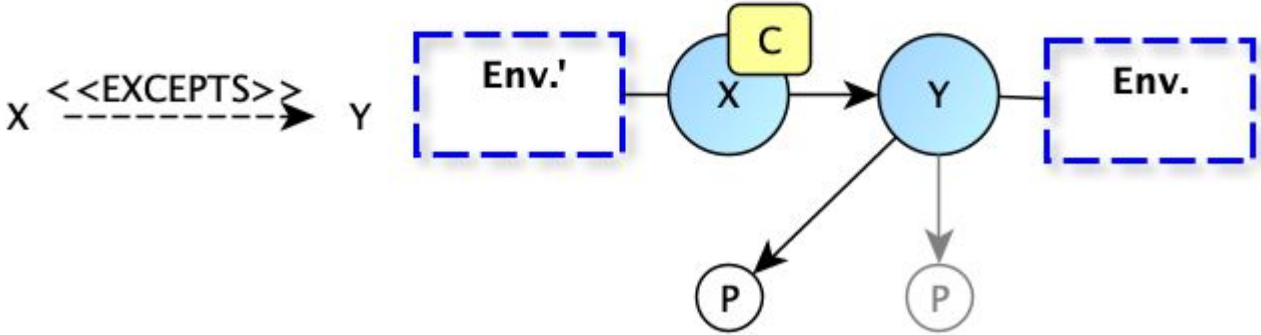


"The online product ordering should allow direct access to the confirmation page."

"The system shall allow for online product ordering by either the customer or the sales agent."

X \\ Y

X changes or removes, for a specified case, a property specified by Y

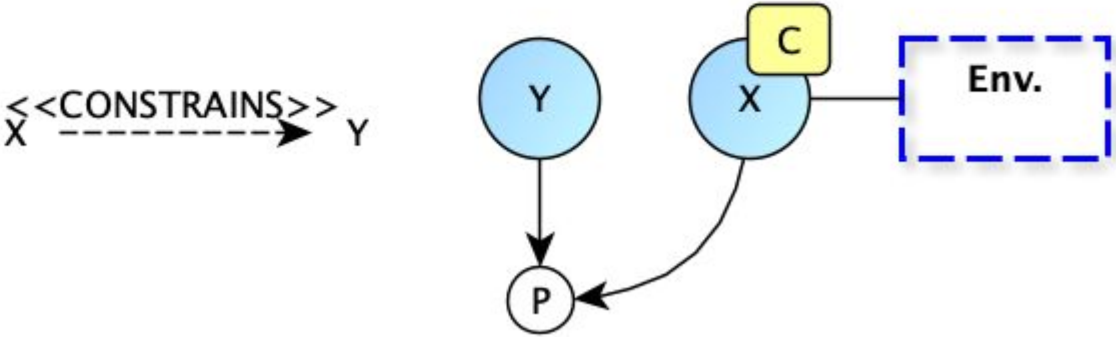


"In case of emergency braking, the system should prevent the wheels from frozing."

"The wheel can be frozen by braking."

X ▶ Y

X specifies a constraint on a property specified by X

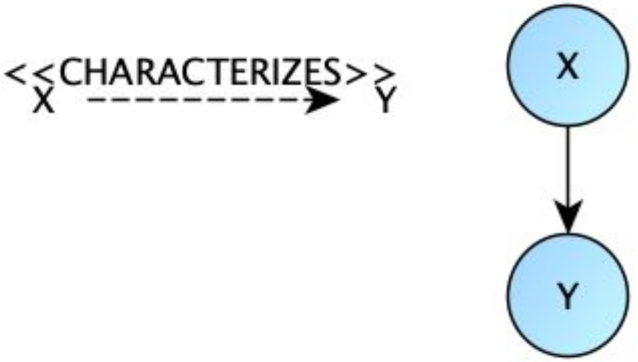


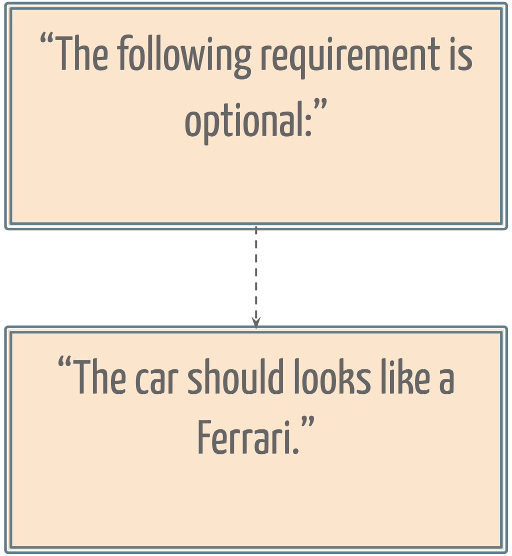
"The user is registered."

"In order to get personalized or restricted information, place orders or do other specialized transactions a user must login so that that the system can determine his access level."

X is a meta-requirement involving Y

$X \longrightarrow Y$





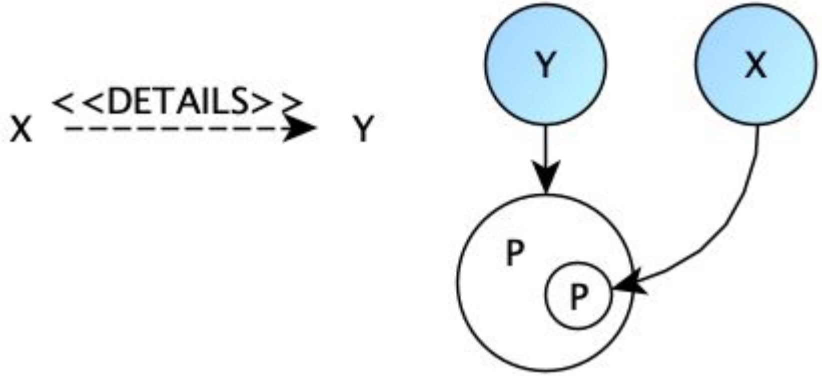
“The following requirement is optional:”

“The car should looks like a Ferrari.”

Derived (but useful) relations

X » Y

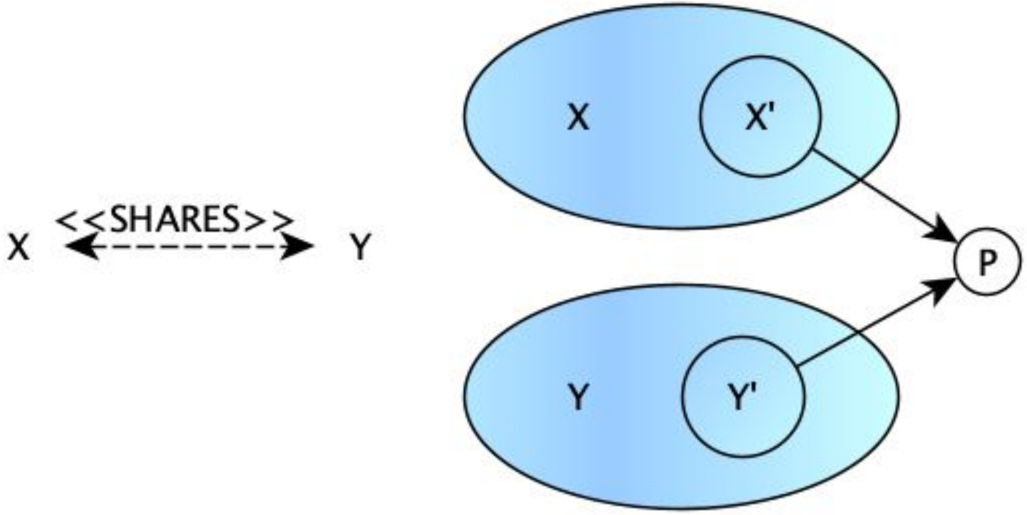
X adds detail to a property specified by X



“The hot water should be between 27°C and 37°C.”

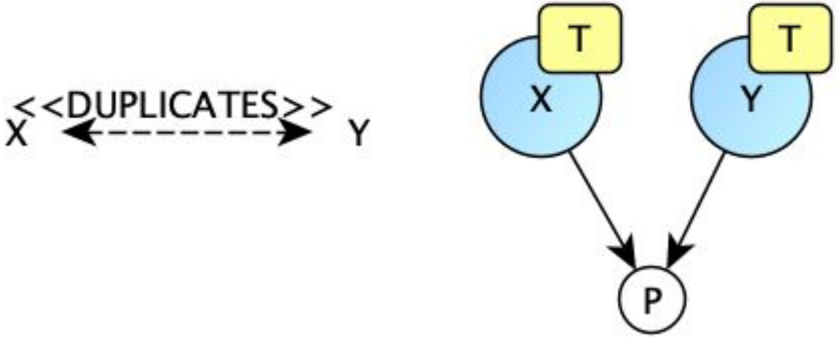
“The shower should deliver hot water.”

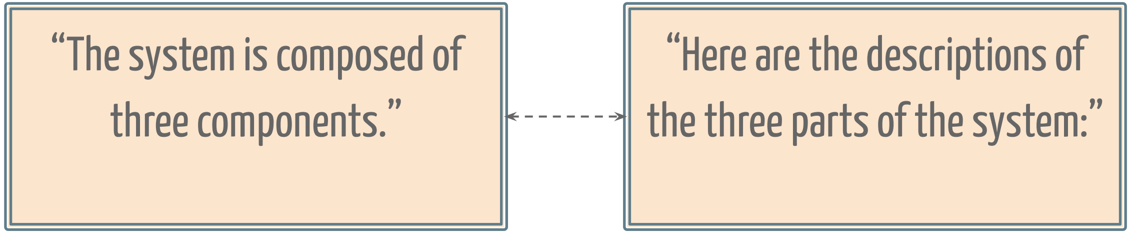
X’ ⇔ Y’ for some sub-requirements X’ and Y’ of X and Y



X ≡ Y

X ⇔ Y, and X has the same type as Y



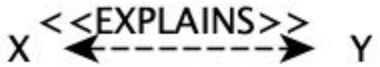


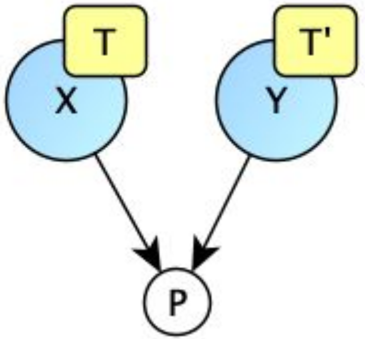
“The system is composed of three components.”

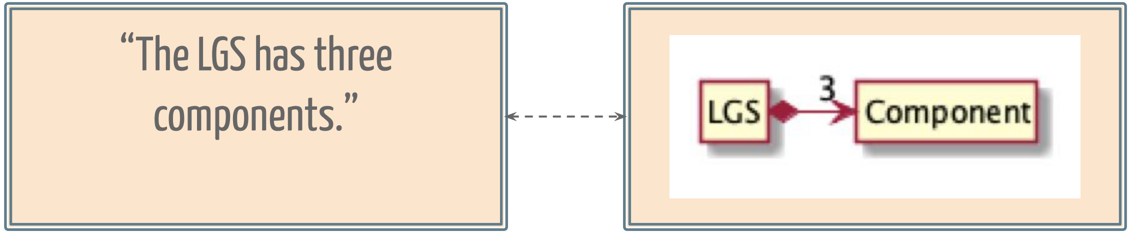
“Here are the descriptions of the three parts of the system:”

X ≅ Y

X ⇔ Y, and X has a different type from Y

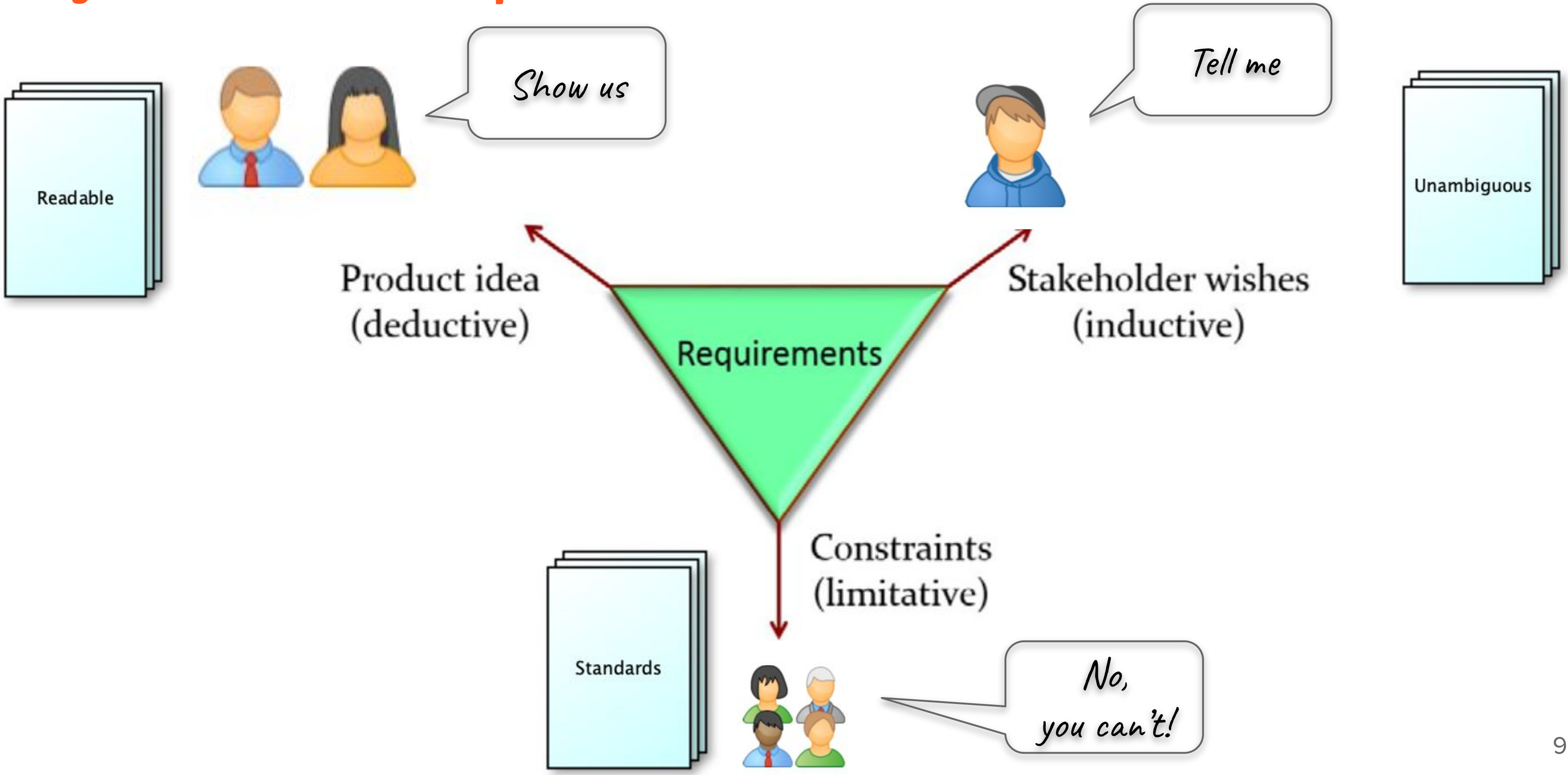




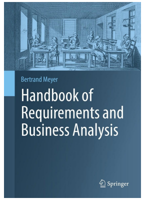

“The LGS has three components.”

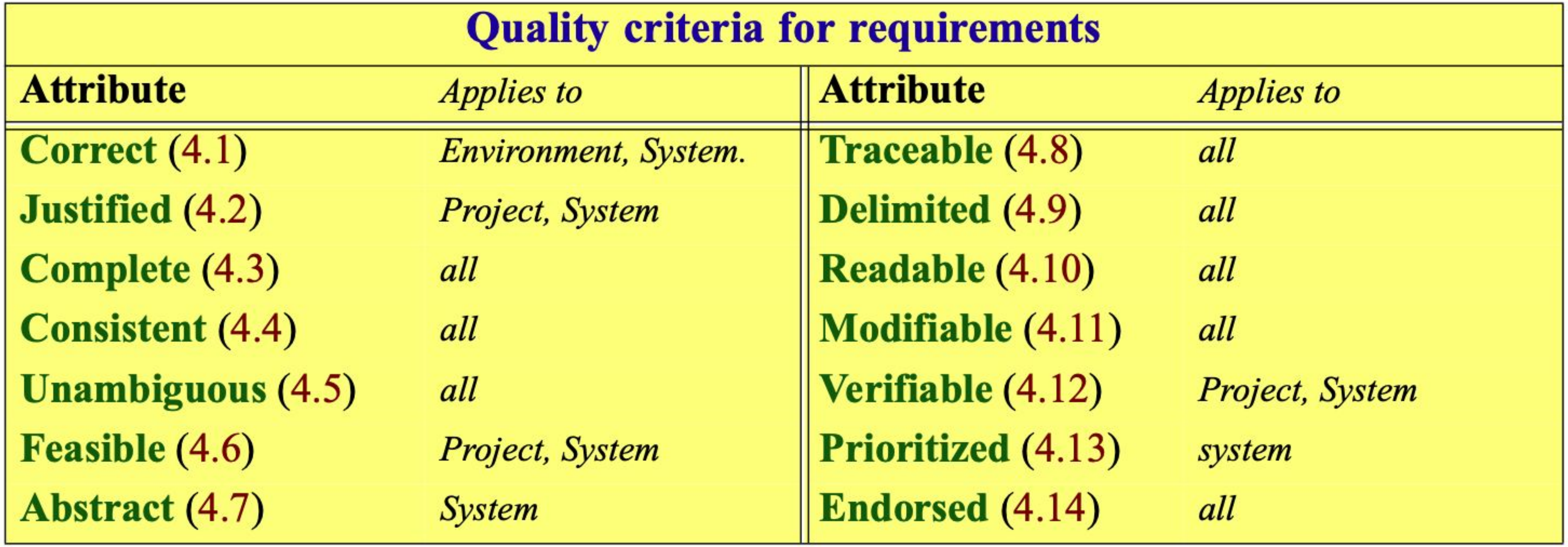
Quality Assessment

Quality criteria for requirements



Quality criteria for requirements





Quality criteria for requirements

Attribute	*Applies to*	**Attribute**	*Applies to*
Correct (4.1)	*Environment, System.*	**Traceable** (4.8)	*all*
Justified (4.2)	*Project, System*	**Delimited** (4.9)	*all*
Complete (4.3)	*all*	**Readable** (4.10)	*all*
Consistent (4.4)	*all*	**Modifiable** (4.11)	*all*
Unambiguous (4.5)	*all*	**Verifiable** (4.12)	*Project, System*
Feasible (4.6)	*Project, System*	**Prioritized** (4.13)	*system*
Abstract (4.7)	*System*	**Endorsed** (4.14)	*all*

Applies to:
Env & Sys

Correctness

An Environment or System requirement is correct if it is **compatible with actual** project **parameters**, properties of the **environment**, organizational **goals**, and stakeholder **expectations.**

APPLIES TO:
PROJ & SYS

Justifiability

A Project or System requirement is justified if it **helps reach a goal** or **satisfy a constraint.**

Applies to:
All

Completeness

A **set** of requirements is complete, or not, along six criteria: document, goal, scenario, environment, interface and command-query completeness.

Consistency

Applies to:
All

A **set** of requirements is consistent if it contains no contradiction.

Applies to:
All

Non-ambiguity

A **set** of requirements is unambiguous if none of its elements is so expressed as to lend itself to **two significantly different understandings.**

Applies to:
Syst & Proj

Feasibility

A System (resp. Project) requirement is feasible if it is **possible**, within the constraints of the Environment and Goals, **to produce an implementation** (resp. schedule) that satisfies it.

APPLIES TO:
SYST

Abstractness

A System requirement is abstract if it specifies a desired system property **without prescribing** or favoring specific design or implementation **choices.**

Applies to:
All

Traceability

A Goals, System, Project or Environment requirement is traceable if it is possible to **follow its consequences**, both ways, in other project artifacts including design, implementation and verification elements.

Applies to:
Goal & Syst

Delimitedness

A set of Goals or System requirements is delimited if it specifies the **scope** of the future system, making it possible to determine what functionality lies beyond that scope.

Applies to:
All

Readability

A requirement is readable if it can be **readily understood** by its intended audience.

Applies to:
All

Modifiability

A set of requirements is modifiable if it can be **adapted** in case of **changes** to Project, Environment, Goals or System properties, through an effort commensurate with the extent of the changes.

Applies to:
Proj & Sys

Verifiability

A System (resp. Project) requirement is verifiable if it is expressed in such a way as to allow **determining whether** a proposed **implementation** (resp. the sequence of events in the actual project) **satisfies** it.

Applies to:
System

Prioritization

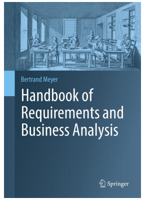
A set of System requirements is prioritized if it includes for each of them a **specification of its importance** relative to the others, making it possible to make informed decisions if events in the course of the project make it necessary to renounce some functionality.

Applies to:
All

Endorsement

A requirement is endorsed if it has been **approved** by all the relevant decision-makers.

What are the benefits ?

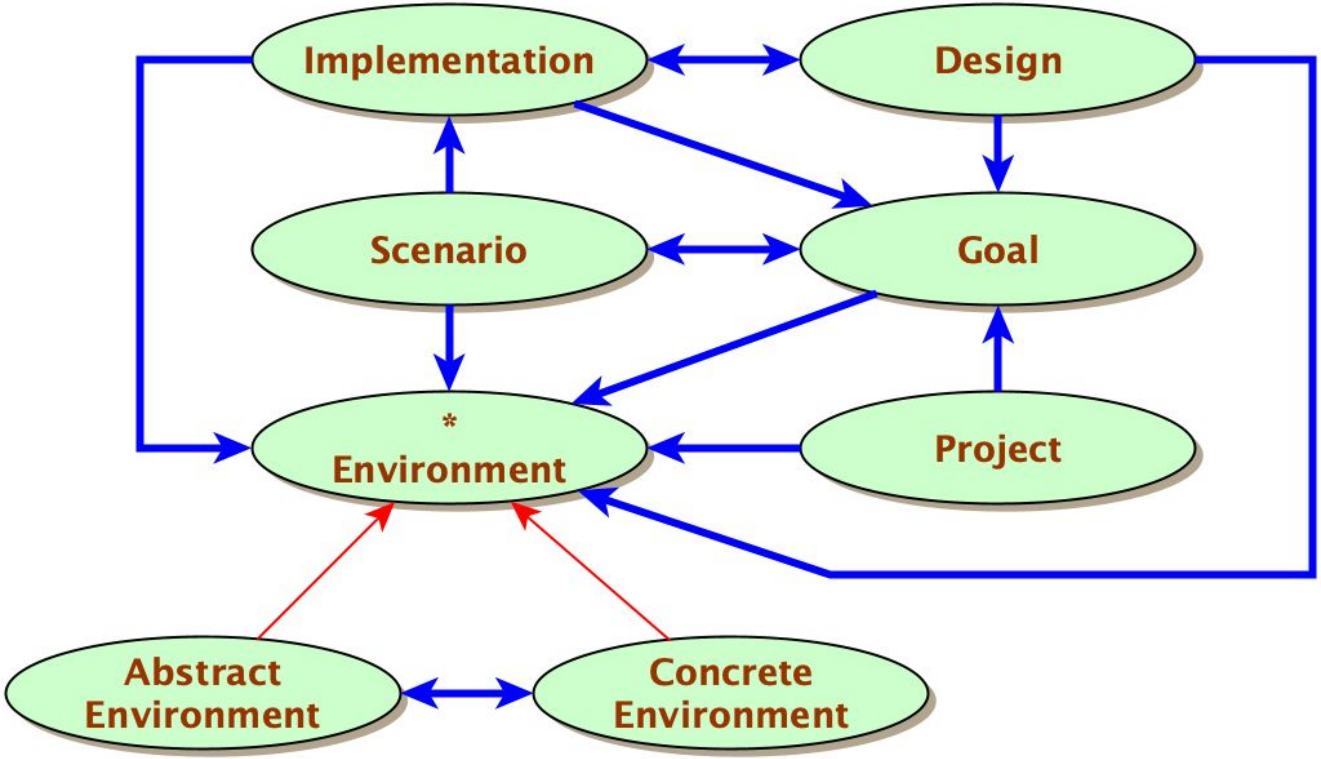


Bertrand Meyer

Handbook of Requirements and Business Analysis

Springer

Seven kinds of classes



Examples of possible prescriptions

No **Duplicates**

Few **Excepts**

Discussions and choices made **explicit**

...

Contributions

Clarification of reqs concepts

Basic for reqs **methodology**

Basics for critical analysis of **reqs docs**

Basis for **NLP**

...

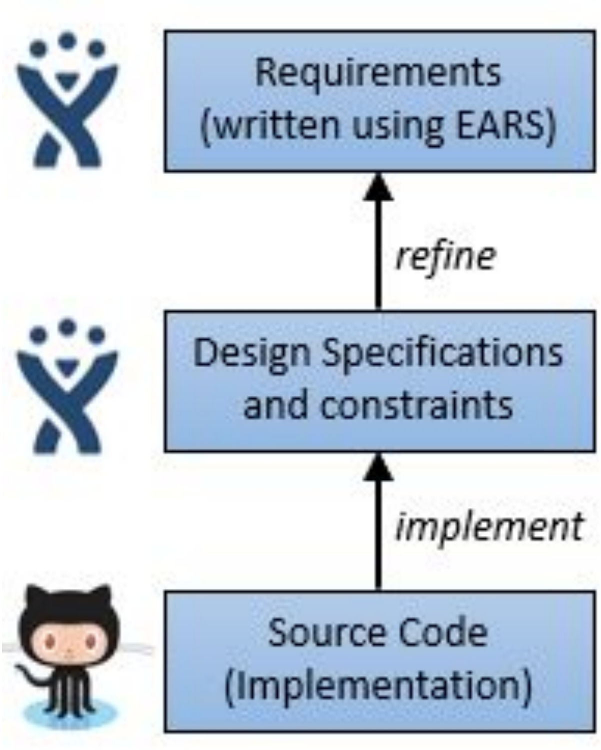
Enough concepts,
let’s get practical

Modern versions

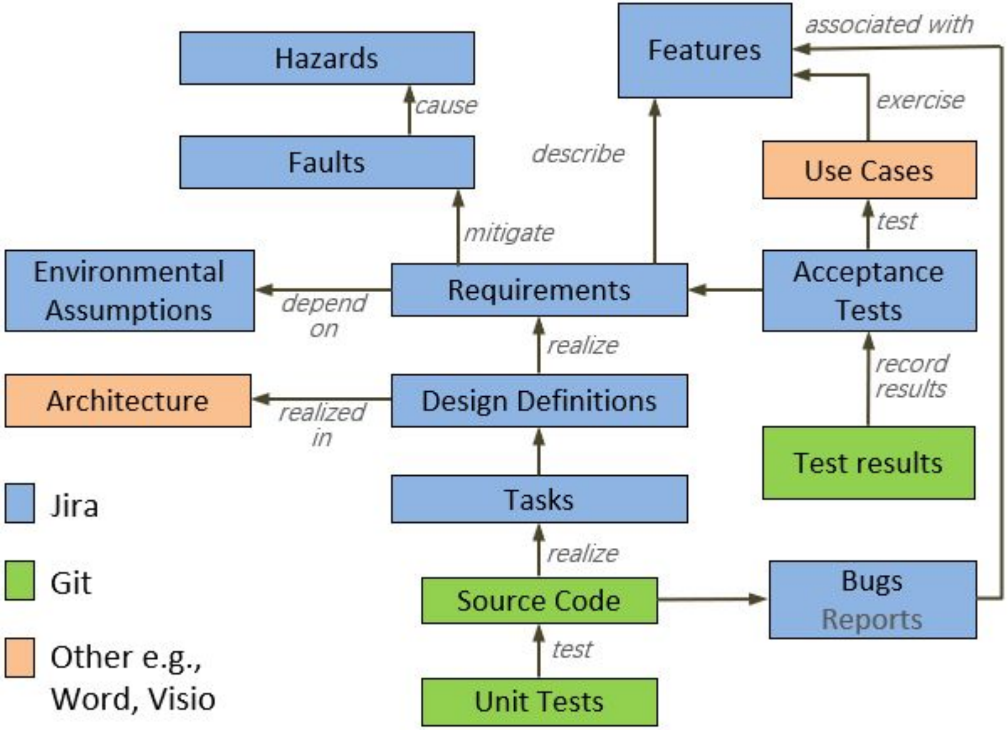
- Dronology: a traceability masterpiece (https://dronology.info/)
- Companion material for an upcoming book... (https://requirements.university)

Dronology

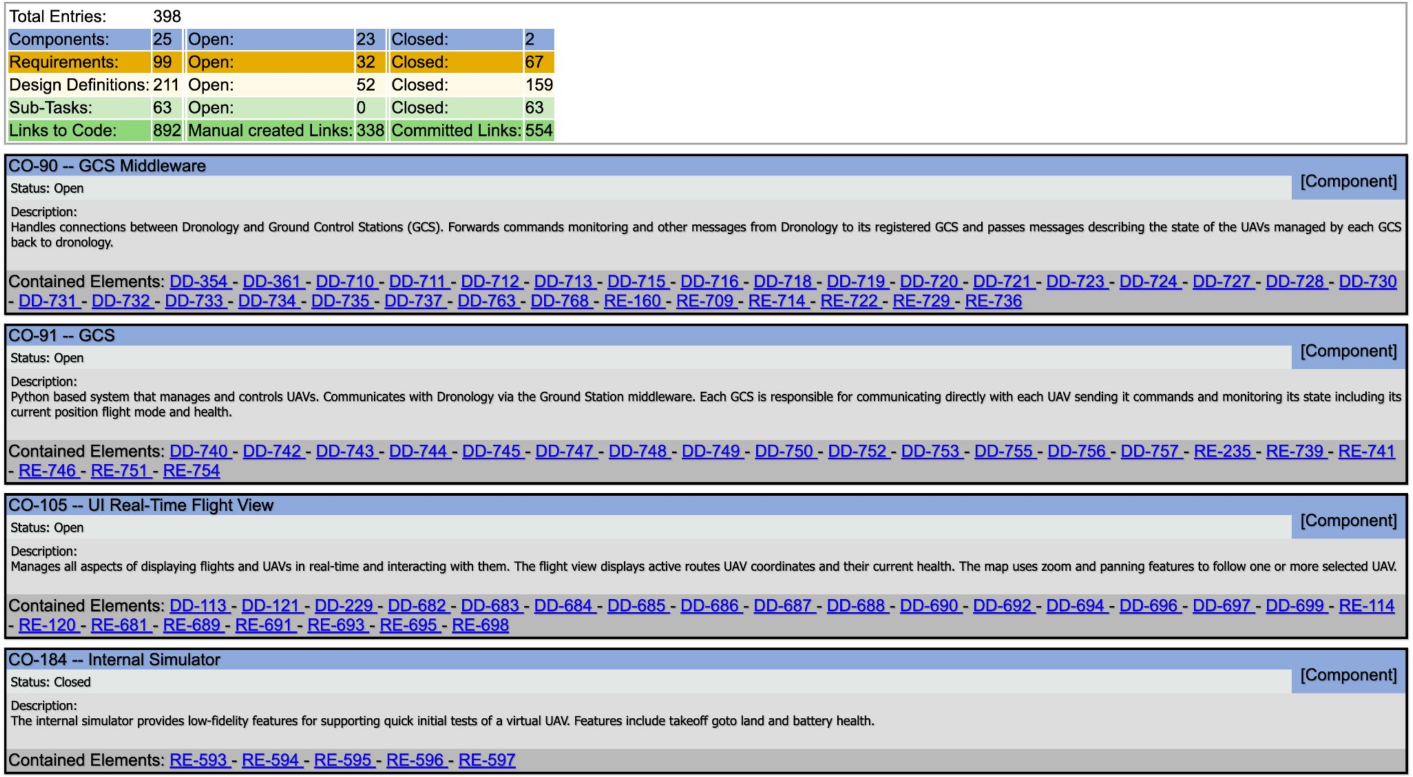
Focus on traceability



Traceability



Useful requirements document



Total Entries:	398				
Components:	25	Open:	23	Closed:	2
Requirements:	99	Open:	32	Closed:	67
Design Definitions:	211	Open:	52	Closed:	159
Sub-Tasks:	63	Open:	0	Closed:	63
Links to Code:	892	Manual created Links:	338	Committed Links:	554

CO-90 -- GCS Middleware

[Component]

Status: Open

Description:
Handles connections between Dronology and Ground Control Stations (GCS). Forwards commands monitoring and other messages from Dronology to its registered GCS and passes messages describing the state of the UAVs managed by each GCS back to dronology.

Contained Elements: DD-354 - DD-361 - DD-710 - DD-711 - DD-712 - DD-713 - DD-715 - DD-716 - DD-718 - DD-719 - DD-720 - DD-721 - DD-723 - DD-724 - DD-727 - DD-728 - DD-730 - DD-731 - DD-732 - DD-733 - DD-734 - DD-735 - DD-737 - DD-763 - DD-768 - RE-160 - RE-709 - RE-714 - RE-722 - RE-729 - RE-736

CO-91 -- GCS

[Component]

Status: Open

Description:
Python based system that manages and controls UAVs. Communicates with Dronology via the Ground Station middleware. Each GCS is responsible for communicating directly with each UAV sending it commands and monitoring its state including its current position flight mode and health.

Contained Elements: DD-740 - DD-742 - DD-743 - DD-744 - DD-745 - DD-747 - DD-748 - DD-749 - DD-750 - DD-752 - DD-753 - DD-755 - DD-756 - DD-757 - RE-235 - RE-739 - RE-741 - RE-746 - RE-751 - RE-754

CO-105 -- UI Real-Time Flight View

[Component]

Status: Open

Description:
Manages all aspects of displaying flights and UAVs in real-time and interacting with them. The flight view displays active routes UAV coordinates and their current health. The map uses zoom and panning features to follow one or more selected UAV.

Contained Elements: DD-113 - DD-121 - DD-229 - DD-682 - DD-683 - DD-684 - DD-685 - DD-686 - DD-687 - DD-688 - DD-690 - DD-692 - DD-694 - DD-696 - DD-697 - DD-699 - RE-114 - RE-120 - RE-681 - RE-689 - RE-691 - RE-693 - RE-695 - RE-698

CO-184 -- Internal Simulator

[Component]

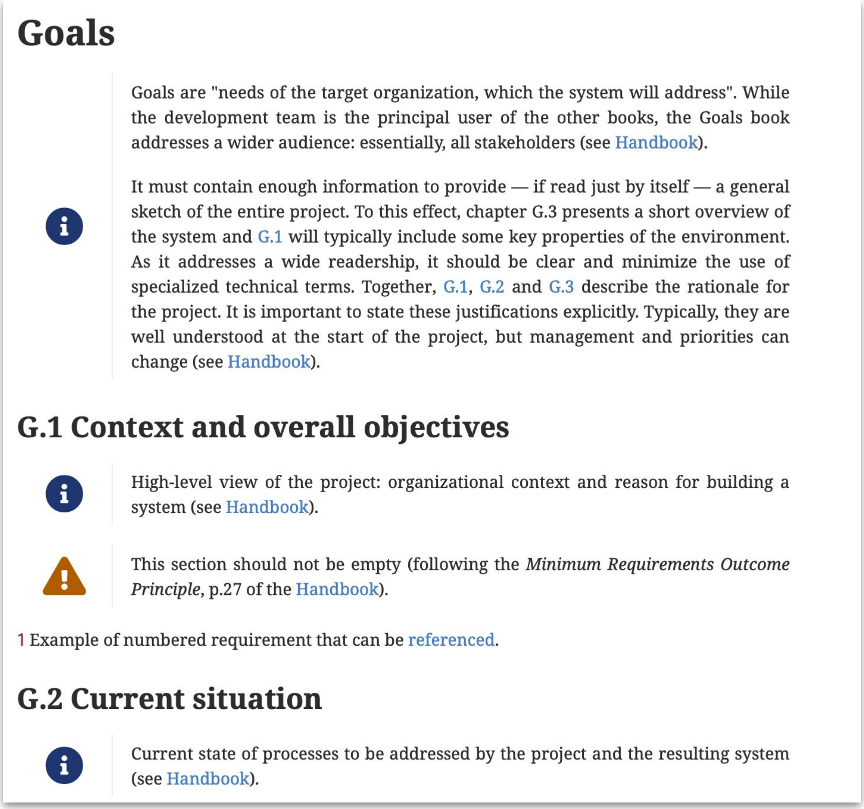
Status: Closed

Description:
The internal simulator provides low-fidelity features for supporting quick initial tests of a virtual UAV. Features include takeoff goto land and battery health.

Contained Elements: RE-593 - RE-594 - RE-595 - RE-596 - RE-597

Companion material

Templates (docx, LaTeX, Google Doc, ...)



Goals

Goals are "needs of the target organization, which the system will address". While the development team is the principal user of the other books, the Goals book addresses a wider audience: essentially, all stakeholders (see Handbook).

It must contain enough information to provide — if read just by itself — a general sketch of the entire project. To this effect, chapter G.3 presents a short overview of the system and G.1 will typically include some key properties of the environment. As it addresses a wide readership, it should be clear and minimize the use of specialized technical terms. Together, G.1, G.2 and G.3 describe the rationale for the project. It is important to state these justifications explicitly. Typically, they are well understood at the start of the project, but management and priorities can change (see Handbook).

G.1 Context and overall objectives

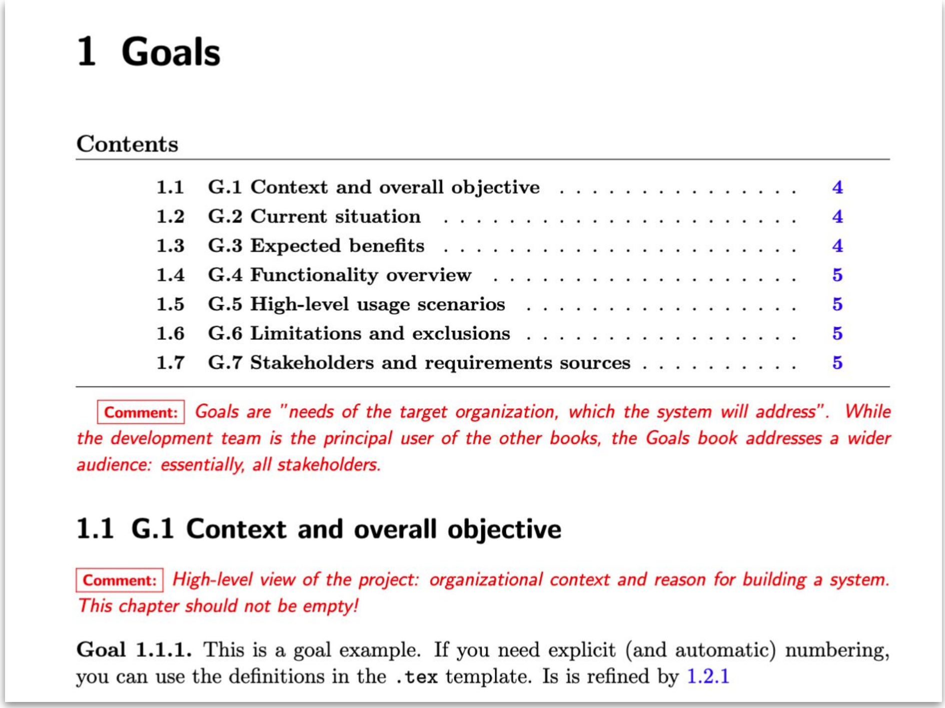
High-level view of the project: organizational context and reason for building a system (see Handbook).

This section should not be empty (following the *Minimum Requirements Outcome Principle*, p.27 of the Handbook).

1 Example of numbered requirement that can be referenced.

G.2 Current situation

Current state of processes to be addressed by the project and the resulting system (see Handbook).



1 Goals

Contents

Comment: *Goals are "needs of the target organization, which the system will address". While the development team is the principal user of the other books, the Goals book addresses a wider audience: essentially, all stakeholders.*

1.1 G.1 Context and overall objective

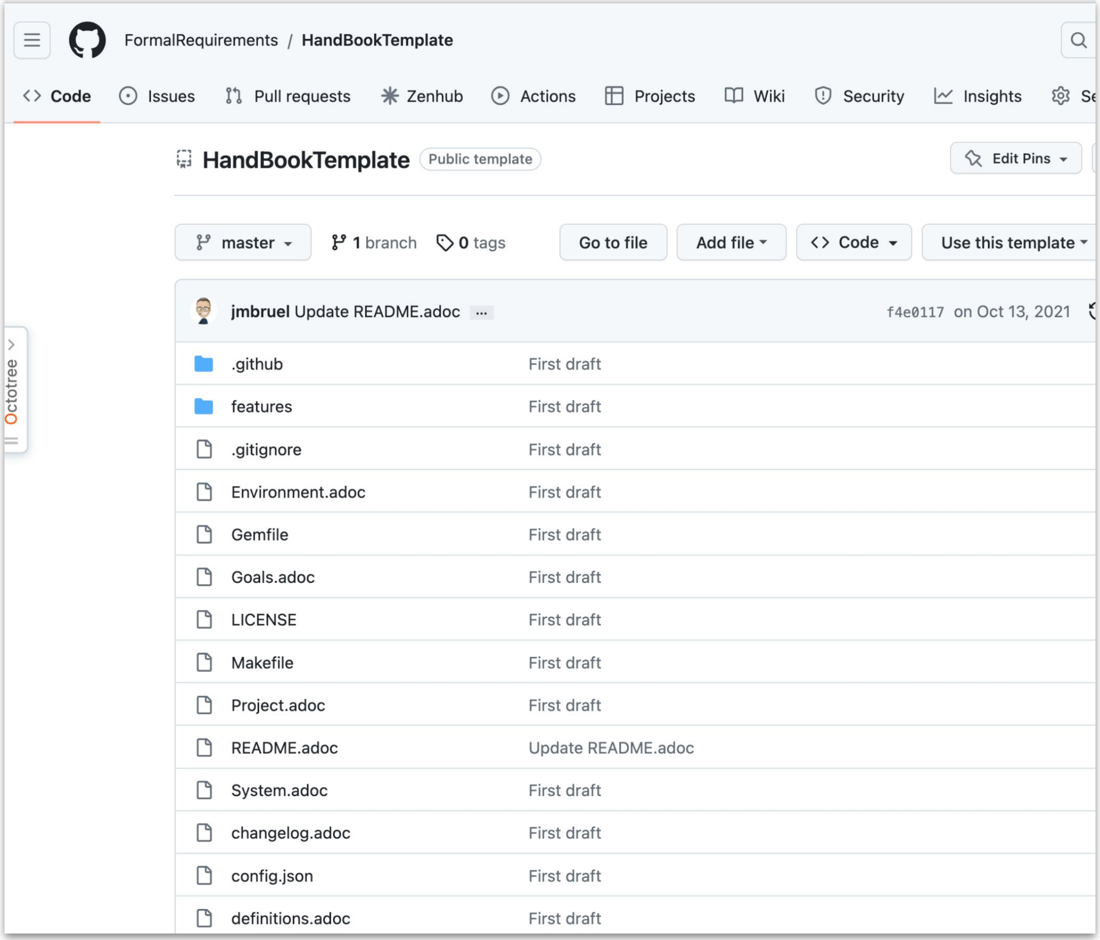
Comment: *High-level view of the project: organizational context and reason for building a system. This chapter should not be empty!*

Goal 1.1.1. This is a goal example. If you need explicit (and automatic) numbering, you can use the definitions in the `.tex` template. Is is refined by 1.2.1

More than Word!

- Markdown-like format
- GitHub itself
- Quality metrics & rules **implemented**

Github repo template



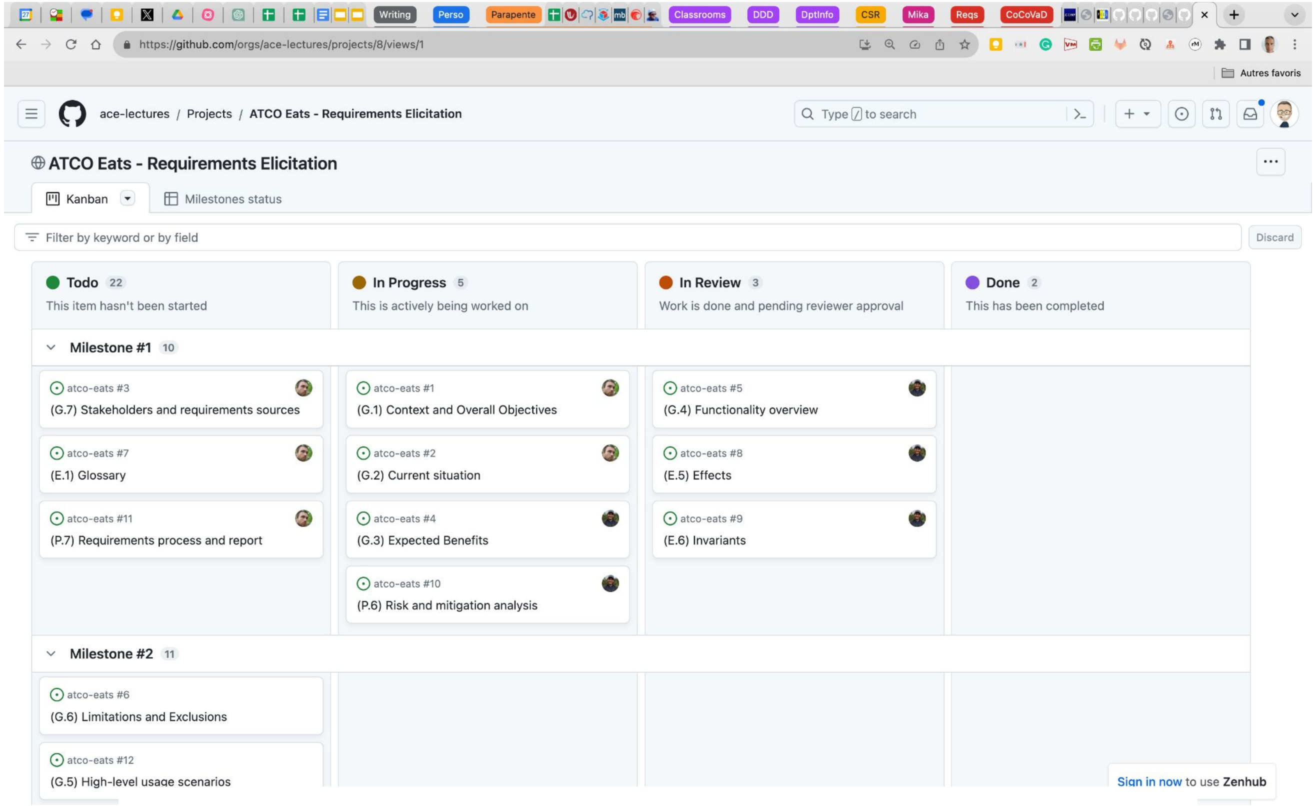
FormalRequirements / HandBookTemplate

HandBookTemplate Public template

jmbruel Update README.adoc ... f4e0117 on Oct 13, 2021

.github	First draft
features	First draft
.gitignore	First draft
Environment.adoc	First draft
Gemfile	First draft
Goals.adoc	First draft
LICENSE	First draft
Makefile	First draft
Project.adoc	First draft
README.adoc	Update README.adoc
System.adoc	First draft
changelog.adoc	First draft
config.json	First draft
definitions.adoc	First draft

PEGS chapters to organize requirements writing



https://github.com/orgs/ace-lectures/projects/8/views/1

ace-lectures / Projects / ATCO Eats - Requirements Elicitation

Type / to search

ATCO Eats - Requirements Elicitation

Kanban | Milestones status

Filter by keyword or by field | Discard

Todo 22 — This item hasn't been started

In Progress 5 — This is actively being worked on

In Review 3 — Work is done and pending reviewer approval

Done 2 — This has been completed

Milestone #1 10

Todo:
- atco-eats #3 — (G.7) Stakeholders and requirements sources
- atco-eats #7 — (E.1) Glossary
- atco-eats #11 — (P.7) Requirements process and report

In Progress:
- atco-eats #1 — (G.1) Context and Overall Objectives
- atco-eats #2 — (G.2) Current situation
- atco-eats #4 — (G.3) Expected Benefits
- atco-eats #10 — (P.6) Risk and mitigation analysis

In Review:
- atco-eats #5 — (G.4) Functionality overview
- atco-eats #8 — (E.5) Effects
- atco-eats #9 — (E.6) Invariants

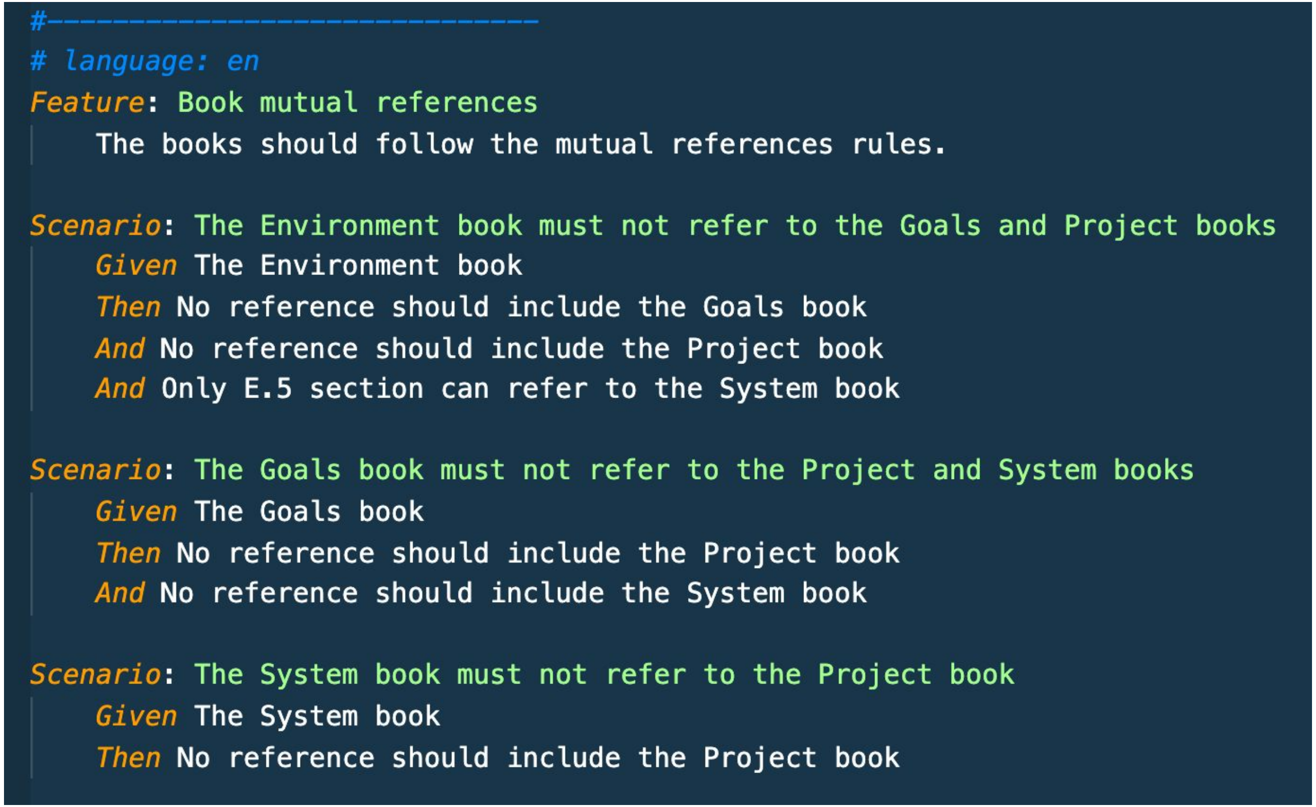
Milestone #2 11

Todo:
- atco-eats #6 — (G.6) Limitations and Exclusions
- atco-eats #12 — (G.5) High-level usage scenarios

Sign in now to use Zenhub

Thanks to Sébastien Mosser for sharing. More at https://github.com/ace-lectures/atco-eats/

Requirements documents can be tested!



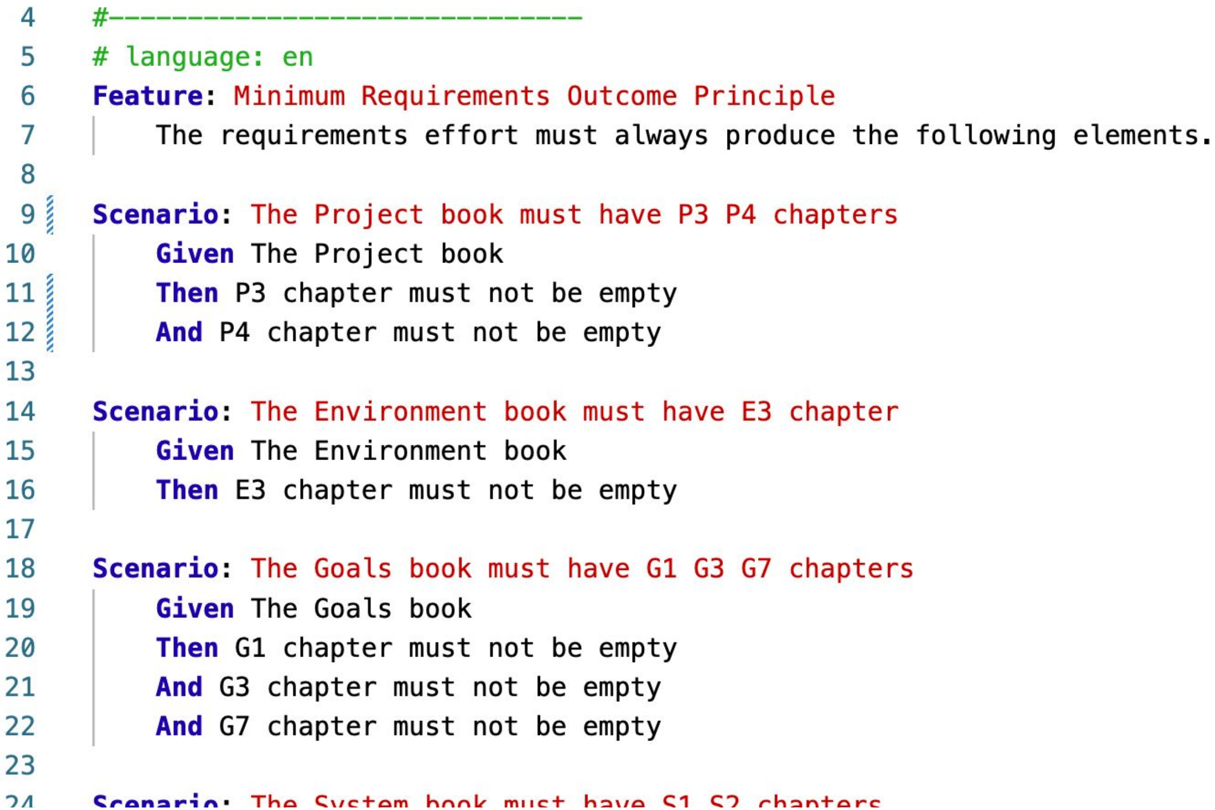
```
#-----------------------------
# language: en
Feature: Book mutual references
    The books should follow the mutual references rules.

Scenario: The Environment book must not refer to the Goals and Project books
    Given The Environment book
    Then No reference should include the Goals book
    And No reference should include the Project book
    And Only E.5 section can refer to the System book

Scenario: The Goals book must not refer to the Project and System books
    Given The Goals book
    Then No reference should include the Project book
    And No reference should include the System book

Scenario: The System book must not refer to the Project book
    Given The System book
    Then No reference should include the Project book
```

Requirements documents can be tested!



```
#-----------------------------
# language: en
Feature: Minimum Requirements Outcome Principle
    The requirements effort must always produce the following elements.

Scenario: The Project book must have P3 P4 chapters
    Given The Project book
    Then P3 chapter must not be empty
    And P4 chapter must not be empty

Scenario: The Environment book must have E3 chapter
    Given The Environment book
    Then E3 chapter must not be empty

Scenario: The Goals book must have G1 G3 G7 chapters
    Given The Goals book
    Then G1 chapter must not be empty
    And G3 chapter must not be empty
    And G7 chapter must not be empty

Scenario: The System book must have S1 S2 chapters
```

Doggy bag

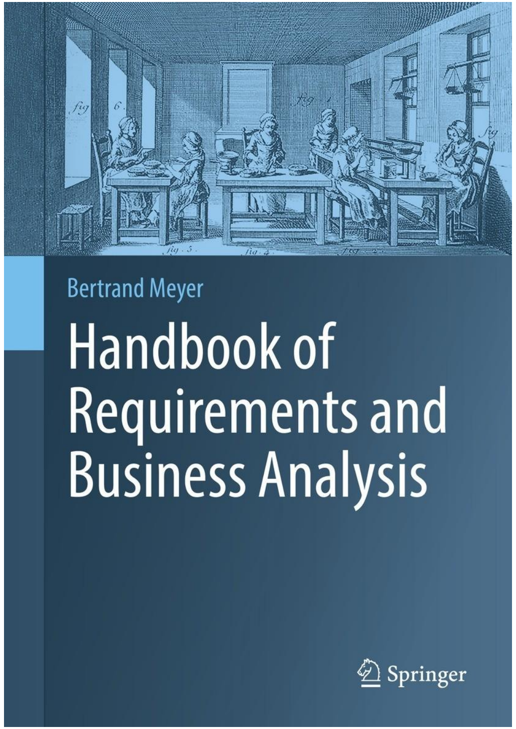
What to remember from all of this?

- Requirements are way more **complex** than simply
  “The system shall work.”
- Organizing and classifying requirements helps **Q&A**
- Quality metrics & rules can be **implemented** and hence useful

What’s next?

- Feedback (more than) welcome!
- Stay tuned (companion is coming)
- Contribute

https://requirements.university



Bertrand Meyer

Handbook of Requirements and Business Analysis

Springer

https://se.inf.ethz.ch/requirements/