Requirements and Business Analysis

Chapter 3 - Standard Plan for requirements

v.2024.05.15

https://requirements.university

Official reference:

https://requirements.university

How to cite:

"Jean-Michel Bruel, Handbook of Requirements and Business Analysis Teaching Materials. https://requirements.university."

About the slides' author

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  - Teaching modeling, requirements and DevOps
- Member of the CNRS-IRIT Laboratory
  - Model-Based Systems Engineering
- Leader of the companion book

https:/bit.ly/jmbruel

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If you have any content that I did not reference well or that should be removed, please do not hesitate to contact me so that I can correct this presentation.

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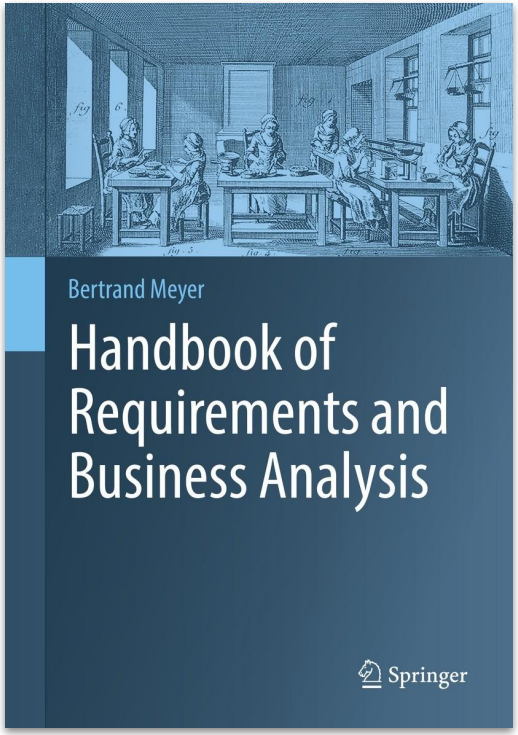


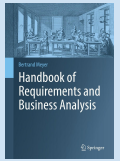
This material is based on this book, by Bertrand Meyer.

But it only reflects the point of view of its author.

It is part of additional materials developed

and available at https://requirements.university

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

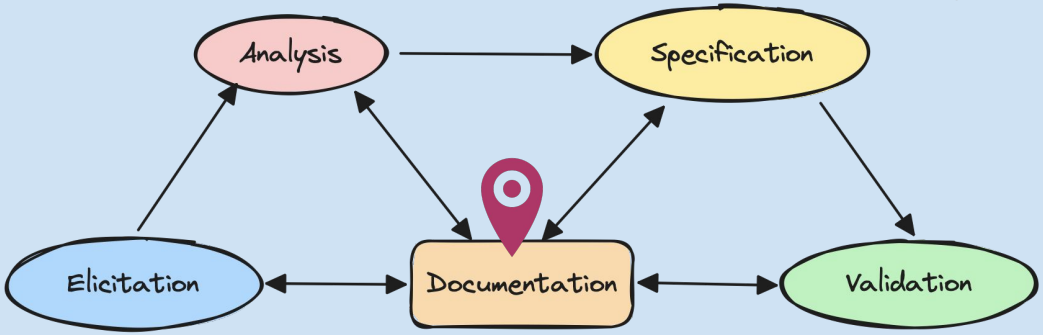


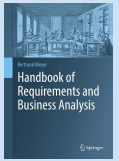
Chapter #3

Outline

1. Overall structure
2. Front and back matter
3. Using the plan
4. The Goals book
5. The Environment book
6. The System book
7. The Project book
8. Minimum requirements

Templates and available material





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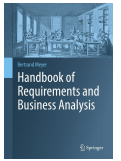


Standard Plan

P E G S

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)

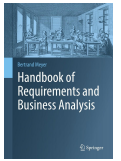
E.1 Glossary
E.2 Components
E.3 Constraints*
E.4 Assumptions
E.5 Effects
E.6 Invariants

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

* These chapters should not be empty
(following the Minimum Requirements Outcome Principle)

practice

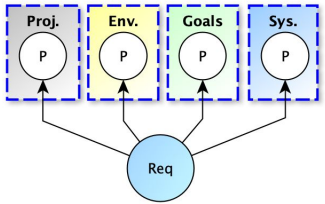


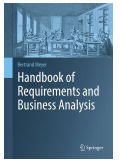
Chapter #3

Practice 2: Find the corresponding Book

EXERCICE

1. Some of the general constraints were defined in the preliminary meeting of 15 June 2022, available at [URL].
2. The login record shall be implemented using MongoDB.
3. Here is the basic scheme of interaction for ordering a product: [followed by the description of that scheme].
4. The project shall only use external software products available through an approved open-source license (GPL or Creative Commons).
5. The product shall be available on mobile platforms as well as through an API.
6. Any use of cookies shall conform to the GDPR.
7. As a result of the introduction of the new payroll system, pay periods shall be standardized to monthly for all employees.
8. As the system depends on Windows 11 facilities, meeting the schedule depends on Microsoft fully releasing Windows 11 by end of October, 2021.
9. This function is considered critical to the deployment of the project.
10. Upon exiting a session, the system shall memorize the last explored directory as the restart point for the next session.



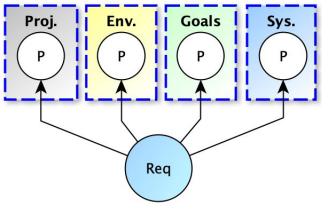


Chapter #3

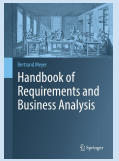
Find the corresponding Book in the Standard Plan

SOLUTION

Req #	Book	Explanations
1	Goal	Origin/Source of the requirements
2	Project	A technical constraint
3	System	A scenario
4	Project	Constraint on the project
5	System	Technical details
6	Environment	Constraint from the environment
7	Goal	High-level objective
8	Project	Describes a risk
9	System	Describes a priority between system's functions
10	System	A behaviour



Outline



Chapter #3

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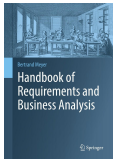
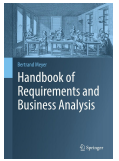


Front matter (for each PEGS book)

- **Title** of the book
- General **reminder** about the project, a mention that the current book is one of four covering that project, and references to the other three.
- **Date** of publication of first version and of current version; revision history.
- **Table of contents** and any other appropriate tables, such as a table of illustrations.
- Copyright notice, intellectual property, distribution information, restrictions on distribution.
- Approval information.

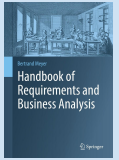


Back matter (for each PEGS book)

- Same as Front (but in the back instead)
- An index

Front and Back matters are META-requirements

Outline



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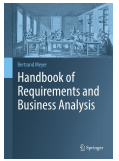
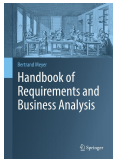


Forms of requirements

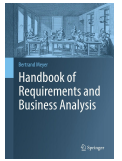
- Every requirement element should be marked as belonging to (exactly) **one of the chapters** of the Standard Plan.
- It should be possible to obtain, for each book, a **linear form** (tool generated if needed).



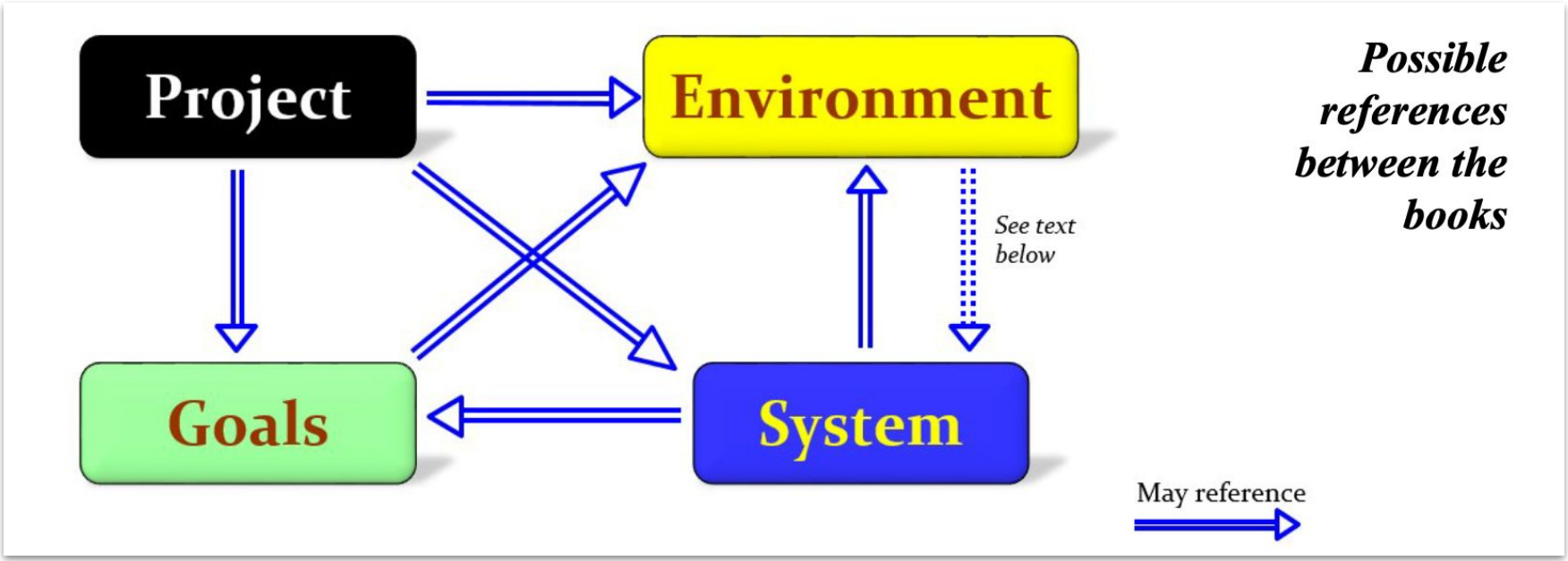
Customizing the plan

The first two levels, consisting of books (P, E, G, S) and chapters (P.1, P.2, E.1 etc.) are universally applicable.

Starting with third-level sections (e.g., P.1.1), every organization can **refine the structure** to fit its specific requirements and software engineering practices.



Mutual references



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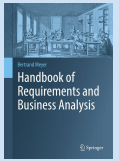

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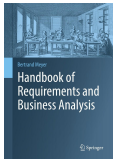


Goals

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

Goals Book

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

Describes the **needs** of the target organization, which the system to be developed **will address**

G.1 Context and overall objectives

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

High-level view of the project: organizational **context** and **reason** for building a system

G.2 Current situation

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

Current state of processes to be addressed by the project and the resulting system

G.3 Expected benefits

Not empty!

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

New processes, or **improvement** to existing processes, made possible by the project's results

G4. Functionality overview

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

Overview of the **functions** (behavior) of the system

Principal **properties** only (*details are in the System book*)

G.5 High-level usage scenarios

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

Fundamental **usage paths** through the system

G.6 Limitations and exclusions

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

Aspects that the system need **not address**

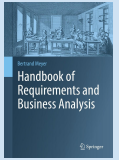
G.7 Stakeholders and requirements sources

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

Groups of **people** who can affect the project or be affected by it, and other places to consider for **information about** the project and system

Outline



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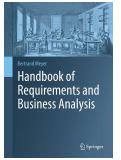


Environment

Environment (E)

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

Environment Book

Environment (E)

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

Describes the application **domain** and **external** context, physical or virtual (or a mix), in which the system will operate

E.1 Glossary

Environment (E)

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

Clear and precise **definitions** of all the **vocabulary specific** to the application domain, including technical terms, words from ordinary language used in a special meaning, and acronyms

E.2 Components

Environment (E)

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

List of elements of the environment that **may affect or be affected by the system** and project

Includes other systems to which the system must be interfaced

E.3 Constraints

Environment (E)

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

Obligations and **limits** imposed on the project and system by the environment

E.4 Assumptions

Environment (E)

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

Properties of the environment that may be **assumed**, with the goal of facilitating the project and simplifying the system

E.5 Effects

Environment (E)

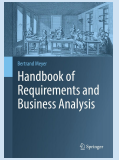
E.1 Glossary
E.2 Components
E.3 Constraints
E.4 Assumptions
E.5 Effects
E.6 Invariants

Elements and properties of the environment that the **system will affect**

E.6 Invariants

Properties of the environment that the system's operation **must preserve**

Outline



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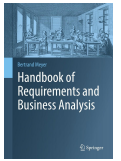


System

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

System Book

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

Refines the Goal one by focusing on more detailed requirements about the system under development, mainly its **constituents**, **behaviors** and **properties**

S.1 Components

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

Overall **structure** expressed by the list of major software and, if applicable, hardware **parts**

S.2 Functionality

PEGS

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

One section, S.2.n, for each of the components identified in S.1, describing the corresponding **behaviors** (functional and non-functional properties)

S.3 Interfaces

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

How the system makes the functionality of S.2 **available** to the rest of the world, particularly user interfaces and program interfaces (**APIs**)

S.4 Detailed usage scenarios

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

Examples of interaction between the environment (or human users) and the system: use cases and/or user stories

S.5 Prioritization

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

Classification of the behaviors, interfaces and scenarios (S.2, S.3 and S.4) by their degree of **criticality**

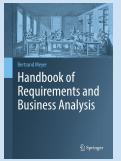
S.6 Verification and acceptance criteria

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

Specification of the **conditions** under which an implementation will be deemed **satisfactory**

Outline



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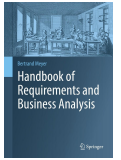

Project

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

Project Book

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

Describes all the constraints and expectations **not about the system** itself, but about **how to develop** and produce it

P.1 Roles and personnel

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

Main **responsibilities** in the project; required project staff and their needed qualifications

P.2 Imposed technical choices

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

Any **a priori** choices **binding** the project to specific tools, hardware, languages or other technical parameters

P.3 Schedule and milestones

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

List of **tasks** to be carried out and their **scheduling**

P.4 Tasks and deliverables

Details of individual tasks listed under P.3 and their expected **outcomes**

P.5 Required technology elements

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

External systems, hardware and software, expected to be **necessary** for building the system

P.6 Risk and mitigation analysis

Project (P)

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

Potential **obstacles** to meeting the schedule of P.4, and measures for **adapting the plan** if they do arise

P.7 Requirements process and report

Project (P)

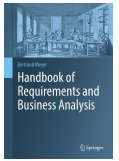
P.1 Roles and personnel
P.2 Imposed technical choices
P.3 Schedule and milestones
P.4 Tasks and deliverables
P.5 Required technology elements
P.6 Risk and mitigation analysis
P.7 Requirements process and report

Initially, description of what the requirements **process** will be; later, **report** on its steps

practice

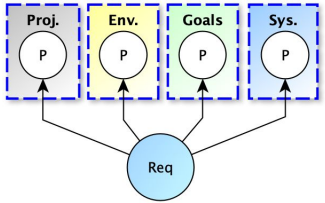
Practice 4: Find the corresponding chapter

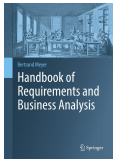
EXERCICE



Chapter #3

1. (G.) Some of the general constraints were defined in the preliminary meeting of 15 June 2022, available at [URL].
2. (P.) The login record shall be implemented using MongoDB.
3. (S.) Here is the basic scheme of interaction for ordering a product: [followed by the description of that scheme].
4. (P.) The project shall only use external software products available through an approved open-source license (GPL or Creative Commons).
5. (S.) The product shall be available on mobile platforms as well as through an API.
6. (E.) Any use of cookies shall conform to the GDPR.
7. (G.) As a result of the introduction of the new payroll system, pay periods shall be standardized to monthly for all employees.
8. (P.) As the system depends on Windows 11 facilities, meeting the schedule depends on Microsoft fully releasing Windows 11 by end of October, 2021.
9. (S.) This function is considered critical to the deployment of the project.
10. (S.) Upon exiting a session, the system shall memorize the last explored directory as the restart point for the next session.





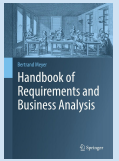
Chapter #3

Find the corresponding chapter in the Standard Plan

SOLUTION

Req #	Chapter	Explanations
1	G.7	Reference source about the origin of the constraints
2	P.2	An imposed technical choice
3	S.4	Use case and scenario (could be G.5 if considered high-level)
4	P.2	Imposed technical choices on the project
5	S.3	Technical details about interfacing
6	E.3	Constraint from the environment
7	G.3	Describes an expected benefit (can be an considered as an effect in E.5)
8	P.6	Describes a risk
9	S.5	Describes a priority between system's functions
10	S.2	A behaviour

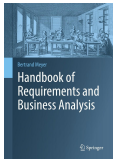
Outline



Chapter #3

1. Overall structure
2. Front and back matter
3. Using the plan
4. The Goals book
5. The Environment book
6. The System book
7. The Project book
8. Minimum requirements

Templates and available material



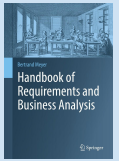
Minimum requirements

The four-book structure **serves as a checklist** for all the elements that may be needed.

Not all requirements efforts will fill in the entire structure at the same **level of detail**.

The "Minimum Requirements Outcome Principle" states the **minimum** that any project should have to show for its requirements efforts.

Not all requirements are "upfront" (we should to **continue working** on the requirements as the project proceeds and accumulates new information about both the problem and the solution).



Outline

1. Overall structure
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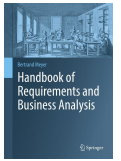

Chapter #3

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

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

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

Discussions time

Get the slides

https://requirements.university

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