An introduction to Project Management

Seminar lead :

Thijs Wijnands, *PhD, MBA, PMP, CSCA*

CERN DG Unit, Internal Audit Service

Thijs.Wijnands@cern.ch, Tel : +41 75 411 05 85

Housekeeping

Please ask questions and share your ideas/experience :

- It will keep the presentations alive
- It will help you to understand the subject

For questions, interrupts please

- Raise hand in zoom
- Just speak up

If you have 'private' questions, we can discuss "one to one"

- during the coffee breaks
- after the course

Welcome !

Please Introduce yourself :

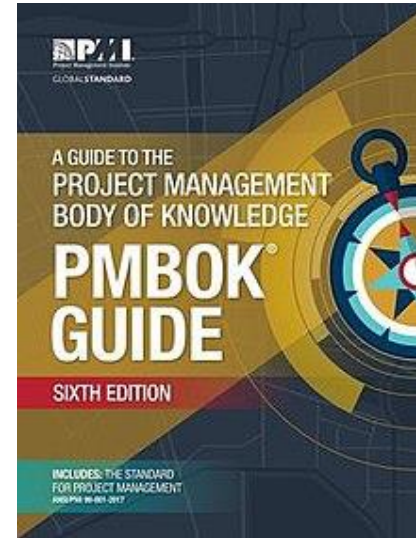Name, nationality, background ?

Experience with projects ?

What are your expectations ?

Learning Objectives of this course

This course is an 'appetizer' to learn :

- Some of the basics aspects of project management

- If, when and how to initialise a project in the field of research and development

- How to use some basic tools that you can use to propose your project next week

www.pmi.org   www.ipma.world

Outline of this course

Agenda Wednesday 2 March 2022

13h30 – 14h00 :   Welcome and introduction
14h00 – 15h30 :   Project, Management, Project Environment
                    Coffee Break
15h45 – 16h45 :   How to start a project ?
16h45 – 17h00 :   Urban Bees Project – exercise 1
                    Lunch

Agenda Thursday 3 March 2021

13h30 – 14h00 :   Recap and Questions & Answers from Day 1
14h00 – 15h30 :   Project scope, schedule and budget
                    Coffee break
15h45 – 16h45 :   Project execution
16h45 – 17h00 :   Urban Bees Project – exercise 2

                    Lunch

Vision, Mission, Strategy

Vision Statement: (Desired End-State) A one-sentence statement describing the clear and inspirational long-term desired change resulting from an organization.

Mission Statement (What You Do): A one-sentence statement describing the reason an organization or program exists and used to help guide decisions about priorities, actions, and responsibilities.

Strategy (How you will do it): A one-sentence determining the basic long-term goals and objectives of an enterprise or organization, the adoption of courses of action and the allocation of resources necessary for carrying out these goals.

Vision

Vision Statement: (Desired End-State) A one-sentence statement describing the clear and inspirational long-term desired change resulting from an organization.
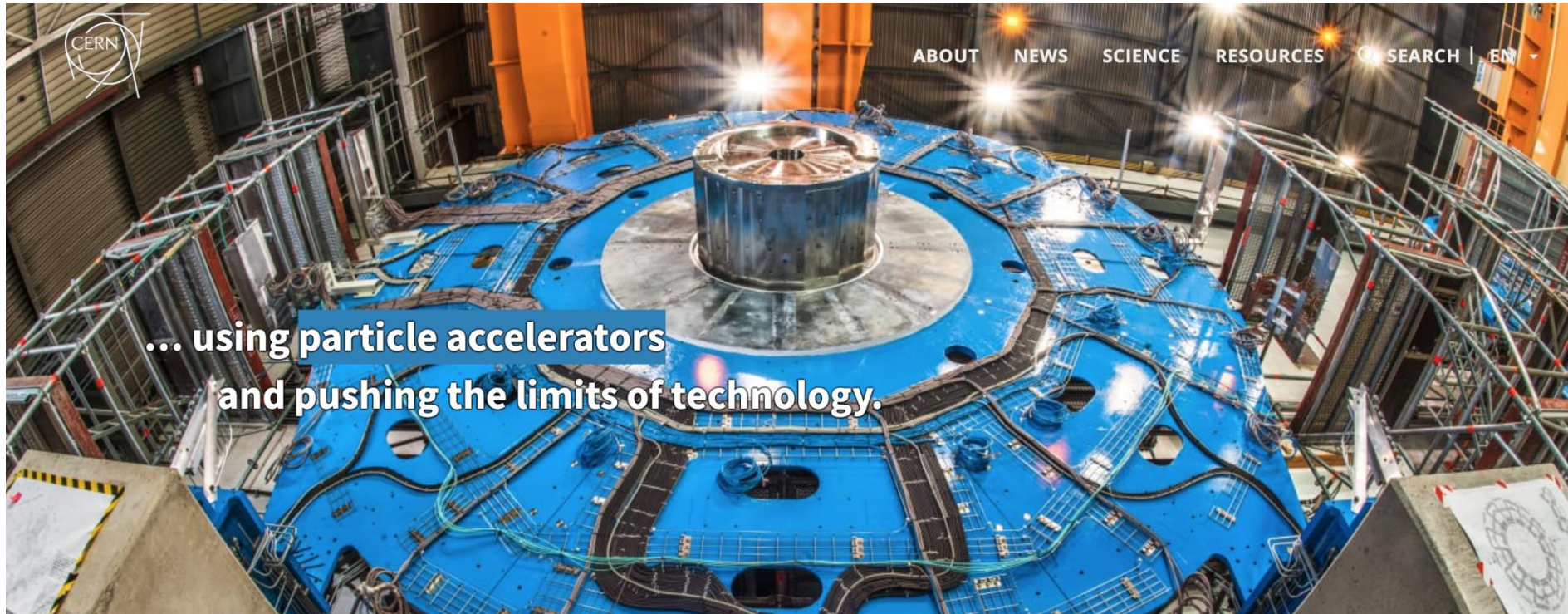
CERN : to uncover what the universe is made of and how it works.

Mission

Mission Statement (What You Do): A one-sentence statement describing the reason an organization or program exists and used to help guide decisions about priorities, actions, and responsibilities.

Strategy

Strategy (How you will do it): A one-sentence determining the basic long-term goals and objectives of an enterprise or organization, the adoption of courses of action and the allocation of resources necessary for carrying out these goals.

CERN unveils its new European strategy - it does not rule out a new particle accelerator

par Sarah Sermondadaz

Geneva

FCC - 100km

LHC - 27km
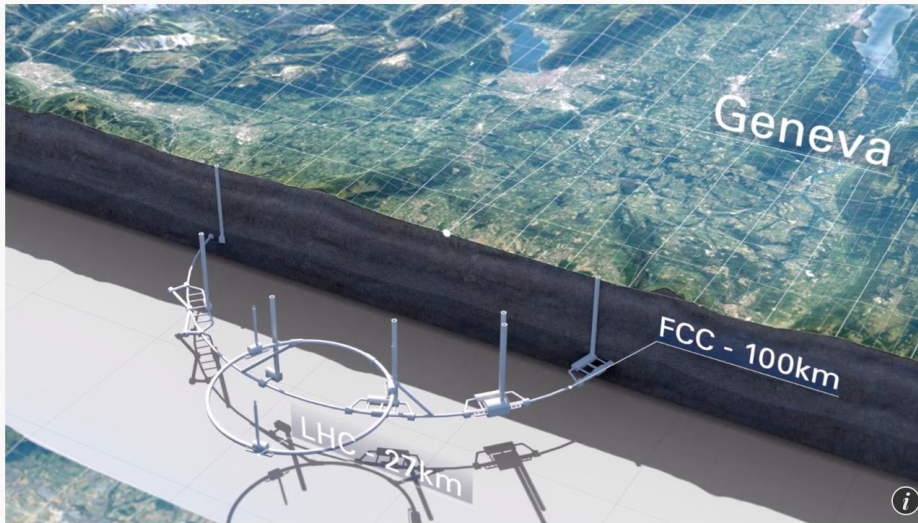
3 !

High-priority future initiatives

A. An electron-positron Higgs factory is the highest-priority next collider. For the longer term, the European particle physics community has the ambition to operate a proton-proton collider at the highest achievable energy. Accomplishing these compelling goals will require innovation and cutting-edge technology:

· the particle physics community should ramp up its R&D effort focused on advanced accelerator technologies, in particular that for high-field superconducting magnets, including high-temperature superconductors;

· Europe, together with its international partners, should investigate the technical and financial feasibility of a future hadron collider at CERN with a centre-of-mass energy of at least 100 TeV and with an electron-positron Higgs and electroweak factory as a possible first stage. Such a feasibility study of the colliders and related infrastructure should be established as a global endeavour and be completed on the timescale of the next Strategy update.

The timely realisation of the electron-positron International Linear Collider (ILC) in Japan would be compatible with this strategy and, in that case, the European particle physics community would wish to collaborate.

B. Innovative accelerator technology underpins the physics reach of high-energy and high-intensity colliders. It is also a powerful driver for many accelerator-based fields of science and industry. The technologies under consideration include high-field magnets, high-temperature superconductors, plasma wakefield acceleration and other high-gradient accelerating structures, bright muon beams, energy recovery linacs. The European particle physics community must intensify accelerator R&D and sustain it with adequate resources. A roadmap should prioritise the technology, taking into account synergies with international partners and other communities

Operations vs Projects

i.e. **studies** and **projects**

Entrepreneurial activities

- Specific mandates, organizations and objectives
- Change-oriented
- Unique product
- Heterogeneous teams
- A start and an end

Operations activities

- Permanent mandates, organizations and objectives
- Status quo-oriented
- Standard product
- Homogeneous teams
- No temporal limitation

Intrusiveness

6 **New projects**

5 **Upgrade projects**/activities

4 **Consolidation projects**/activities

3 **Corrective maintenance activities**

2 **Preventive maintenance activities**

1 **Inspection activities**

What should a project do ?

XYZ company or organization

Value

"new" situation

"old" situation

Time
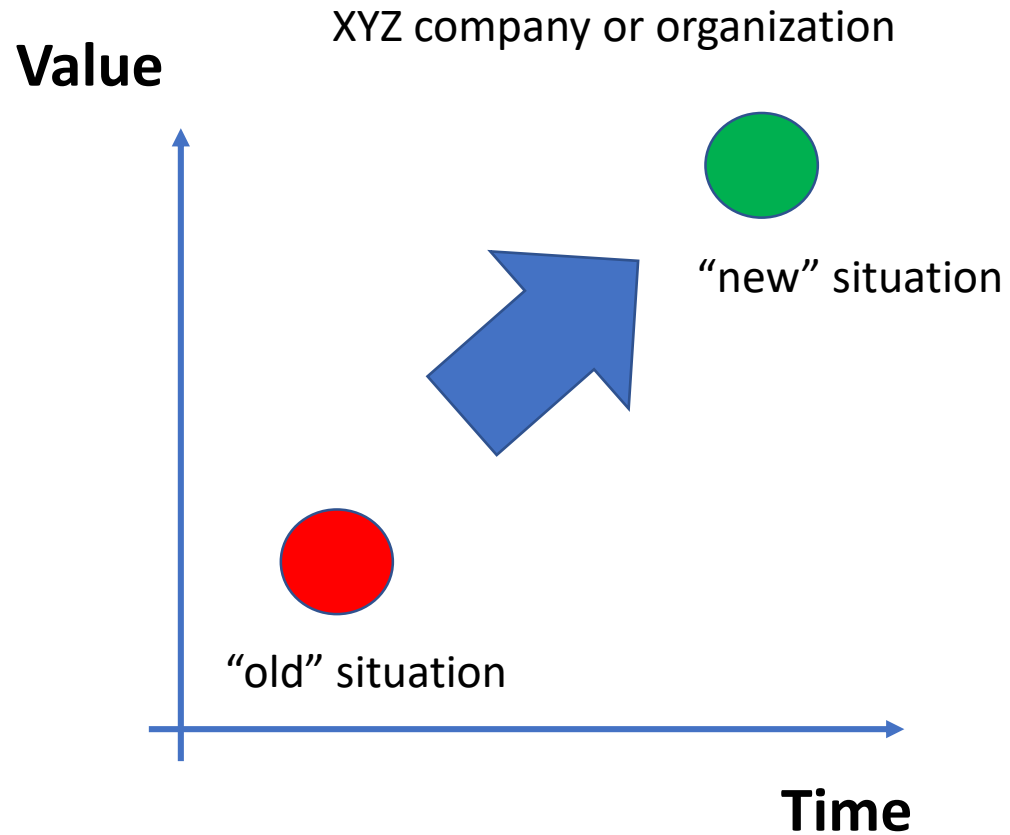
What is Value and how to increase it ?

Values is created for <u>stakeholders</u>.

Value Creation - examples

When to start projects ?

The 3 reasons to start a project :

- Pain
- Need
- Desire

At the end of a project you can expect :

- One or several outputs
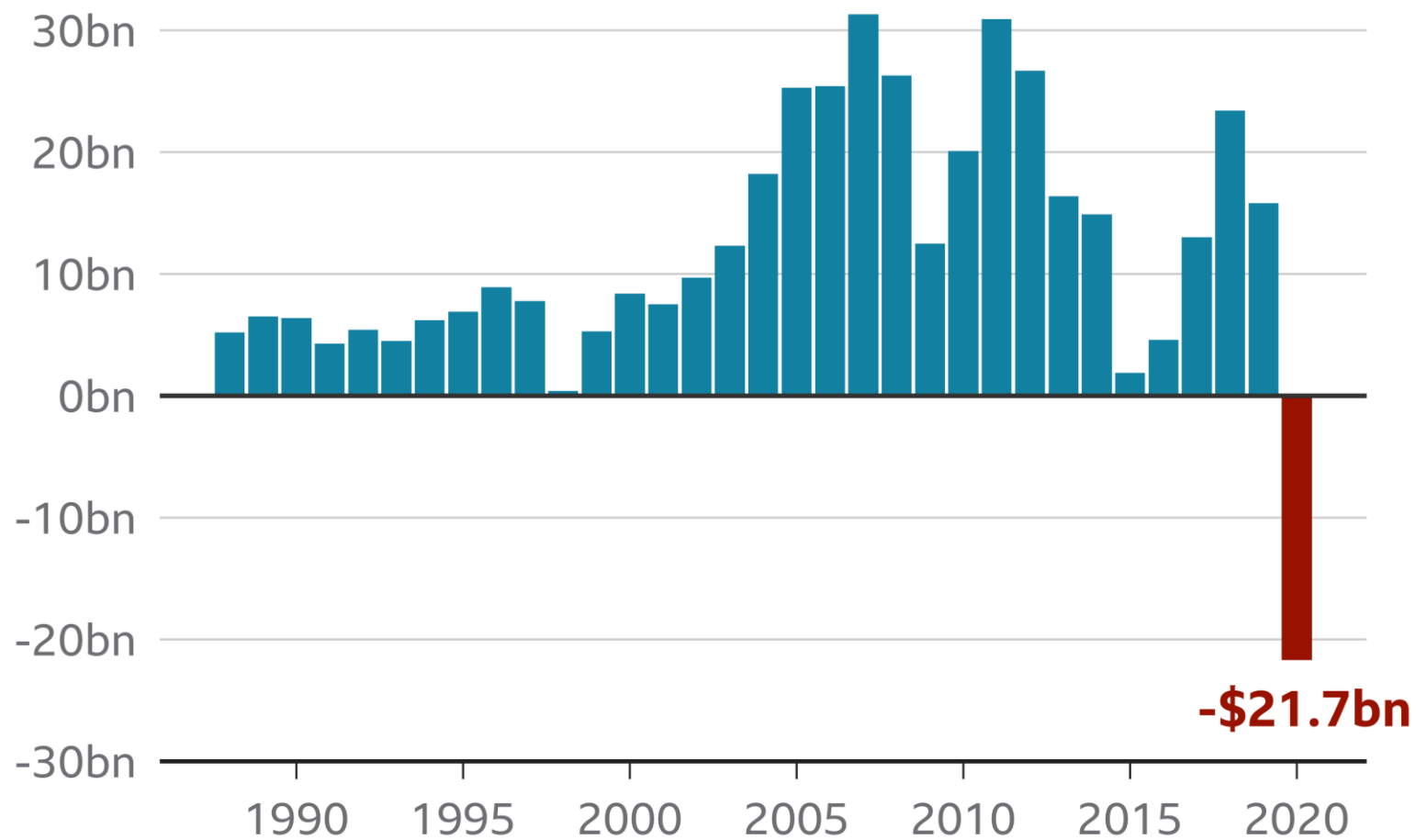- Organizational change
- Value added and transferred

PAIN

NEED

DESIRE

Royal Dutch Shell sinks to record loss

Company's net profit since 1988, US Dollars

-$21.7bn

Source: Royal Dutch Shell

BBC

What is a project ?

A unique set of processes consisting of coordinated and controlled activities with start and end dates, performed to achieve project objectives.
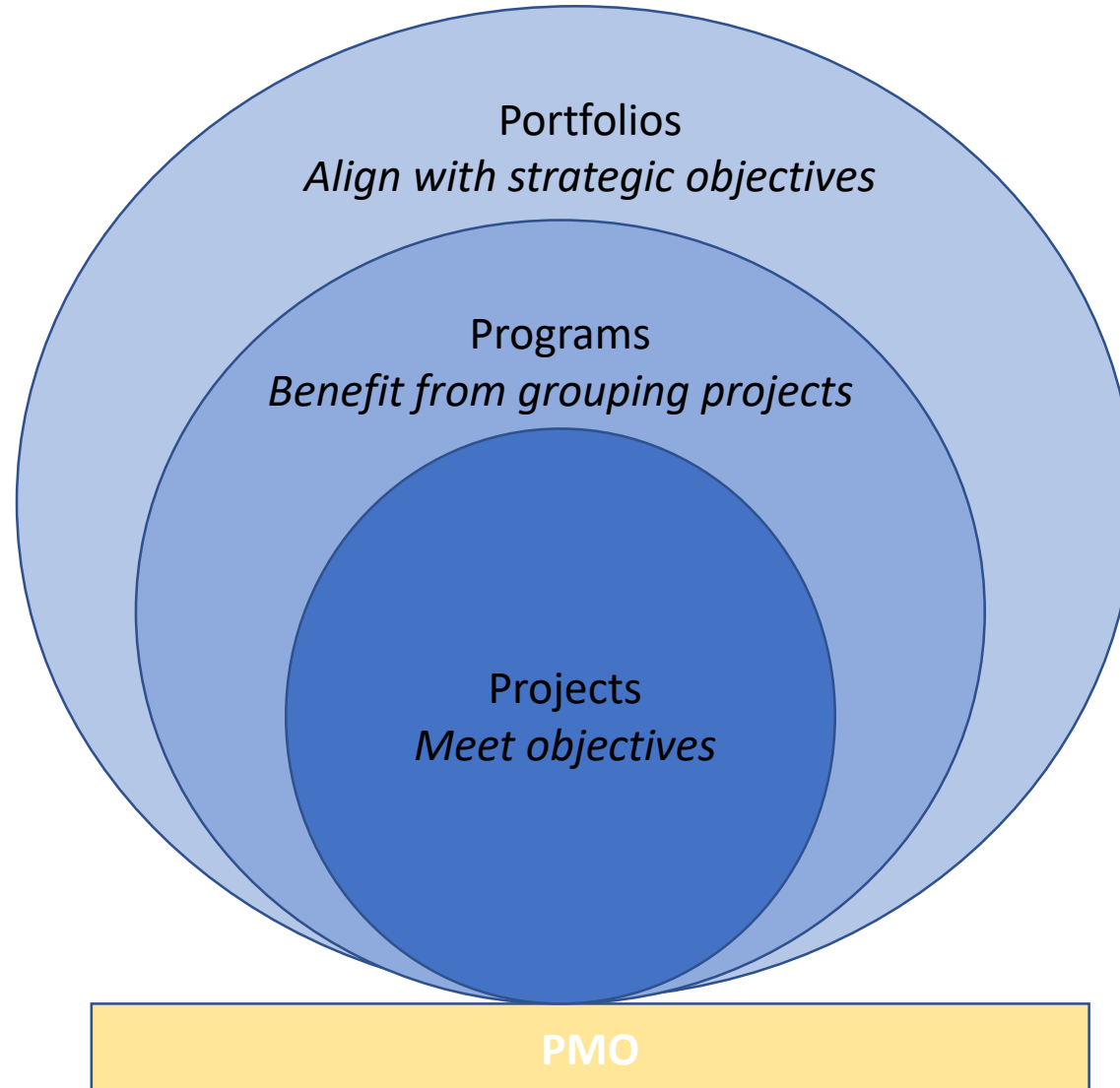
ISO 21500:2012

'A project is a 'temporary endeavour undertaken to create a unique product, service or result'

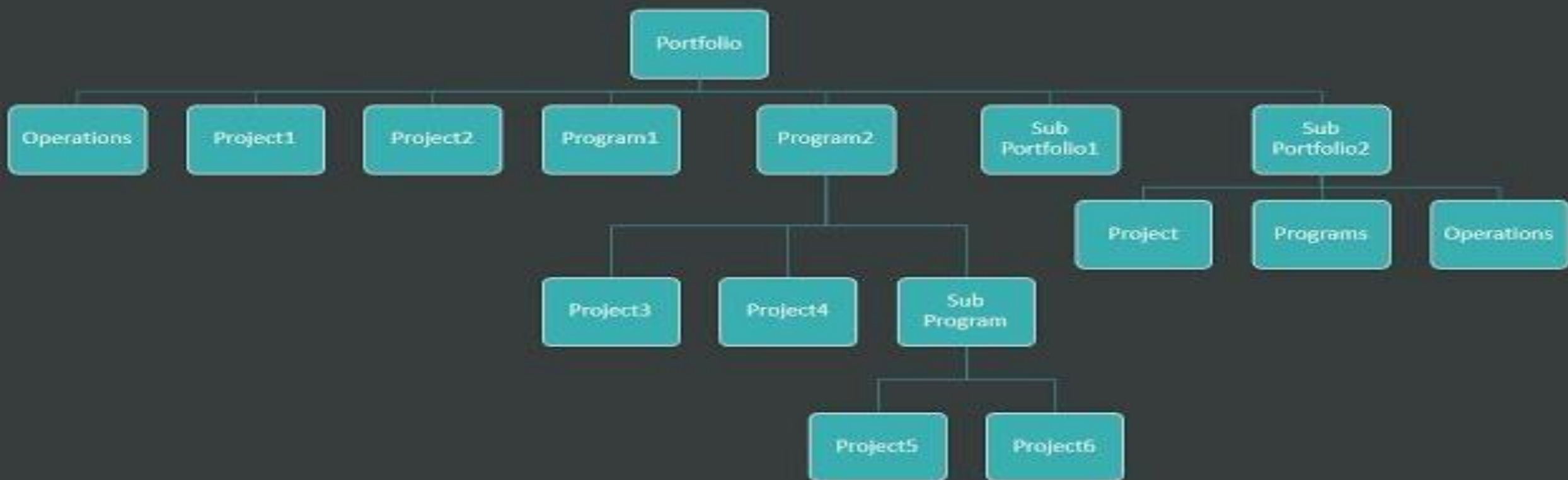*PMBok 6th Edition, Project Management Institute*

3 main features of a project are :

- Temporary - definite beginning and definite end
- Unique result – even if repeated
- Progressive Elaboration – incremental development

Management

Management is about carrying out the directives (from senior management or from the board of directors) to achieve goals and objectives.

Standard phases involved :

- Initialising
- Planning and organizing (making a detailed plan)
- Allocating resources (time, cost)
- Executing (monitoring, steering)
- Closing (goals and objectives achieved)

Project Management

The application of **methods**, **tools**, **techniques** and **competencies** to a project

ISO 21500:2012

PMI PMBoK

ISO 10006:2003

IPMA» **ICB**

Hermes

ANSI #748

CCPM

NASA Systems Engineering Handbook NASA/SP-2007-6105 Rev1

INCOSE **G2SEBoK**

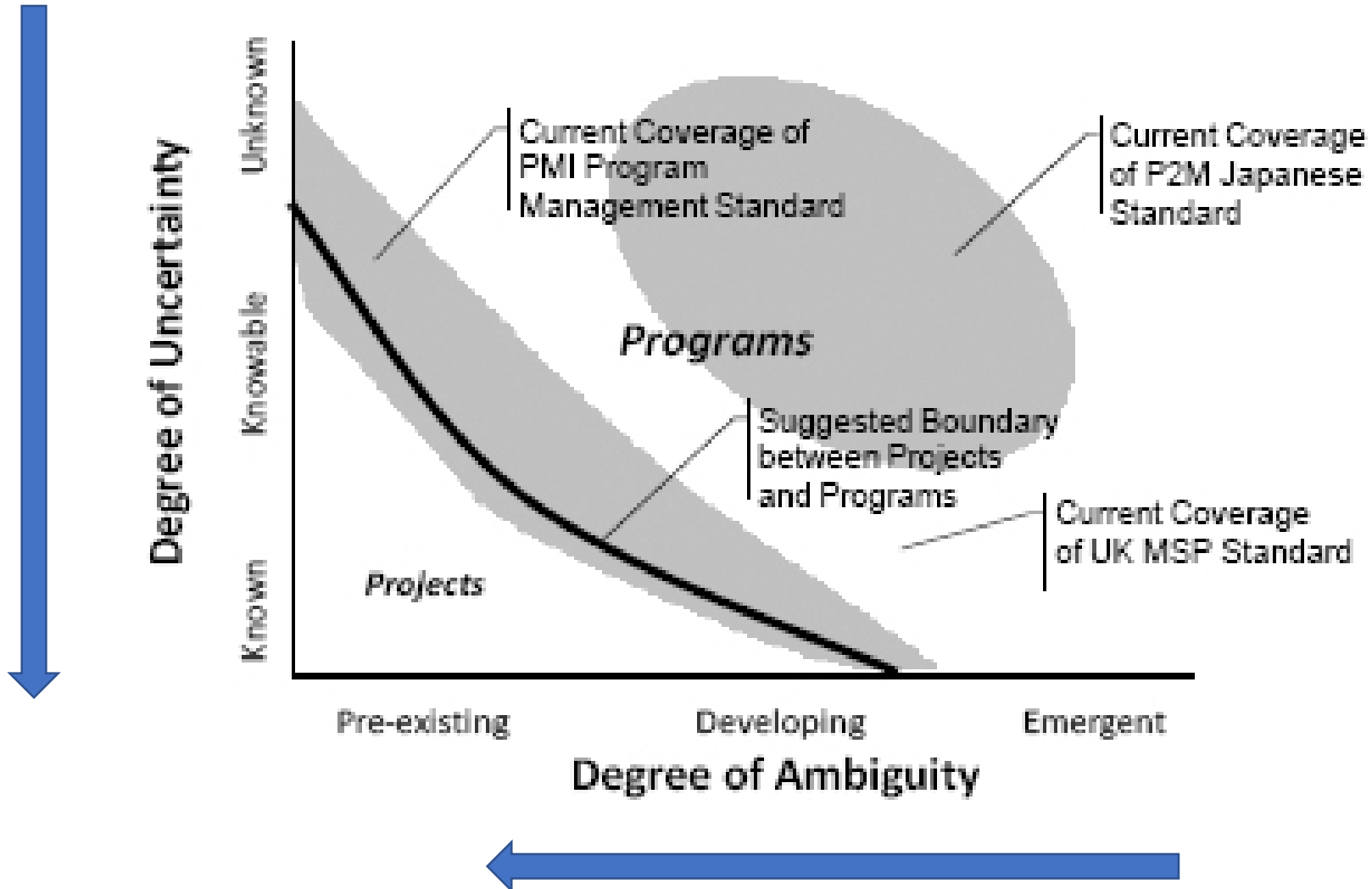**ECSS** EUROPEAN COORDINATION FOR SPACE STANDARDISATION

RUP RATIONAL UNIFIED PROCESS

PRINCE2

GDPM

SCRUM +KANBAN

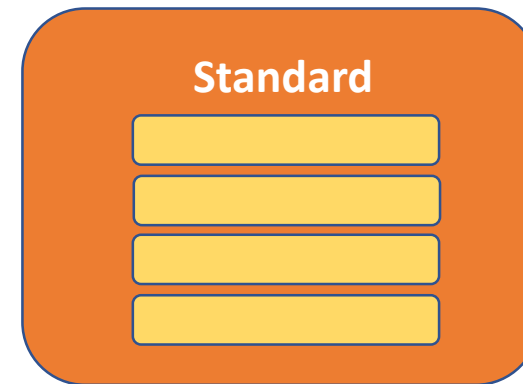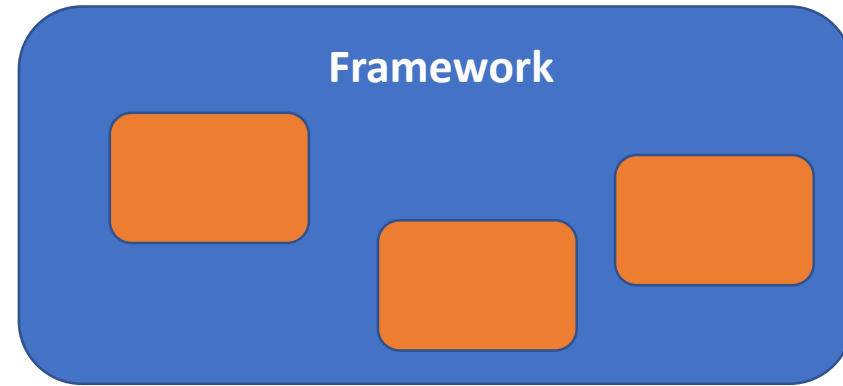XP EXTREME PROGRAMMING

ISO 21500:2012

Why Project Management ?

From : Michel Thiry, 'Program Management'
1st Edition Gower 2010

Body of knowledge, Framework, Standard

Body of Knowledge

Framework

Standard
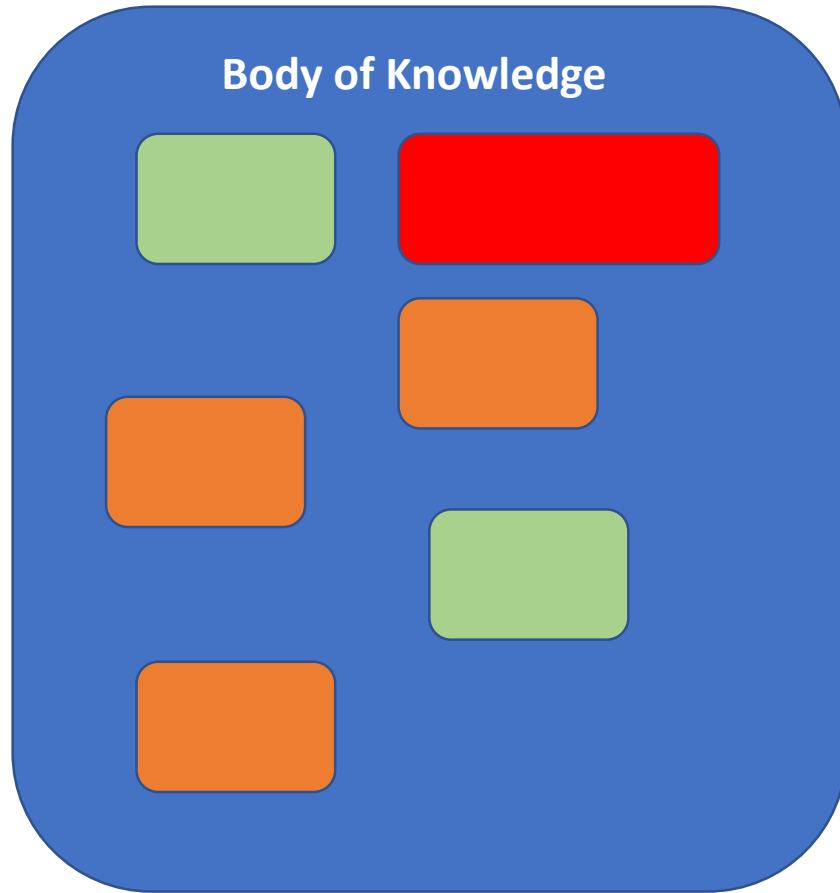
Process map of the PMBok version 6

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	**Planning Process Group**	**Executing Process Group**	**Monitoring and Controlling Process Group**	**Closing Process Group**
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

This course

In a project

PMBok Version 6
Page 25

- 10 Knowledge areas

- 49 processes

- 5 process groups

PMBok – PMP exam knowledge areas

Knowledge Area	Percentage
Introduction to Project Management	6%
Project Environnent (6%)	6%
Role of the Project Manager	7%
Project Integration Management	9%
Project Scope Management	9%
Project Schedule Management	9%
Project Cost Management	8%
Project Risk Management	8%
Project Procurement Management	4%
Project Stakeholder Management	9%
Project Quality Management	7%
Project Resource Management	8%
Project Communication Management	10%

https://opense.web.cern.ch

Project Lifecycle

DEFINITION

IMPLEMENTATION

CLOSE OUT

Write a Concept Design Report

Make a prototype

Write a tendering document

some iterations

some iterations

t

Product Lifecycle

INITIALIZE STUDY DESIGN BUILD COMMISSION OPERATE & MAINTAIN DECOMMISSION

FINALIZE

Project "front end" Project Operation Project ?

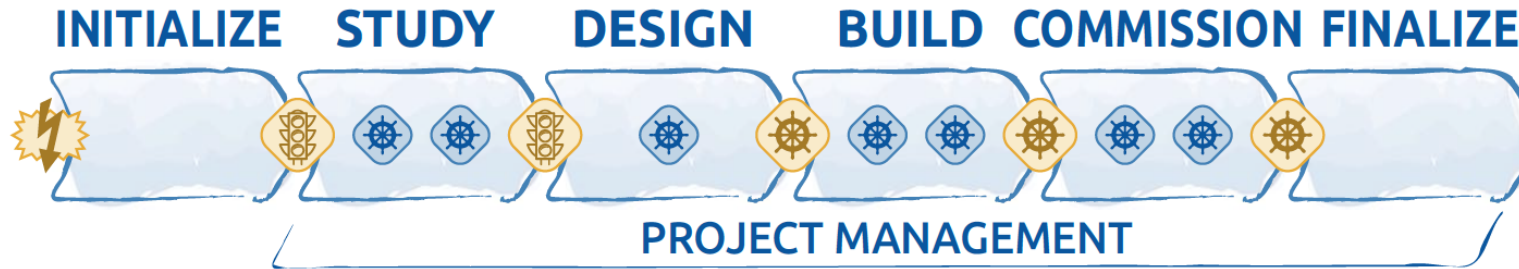$ $ $ $
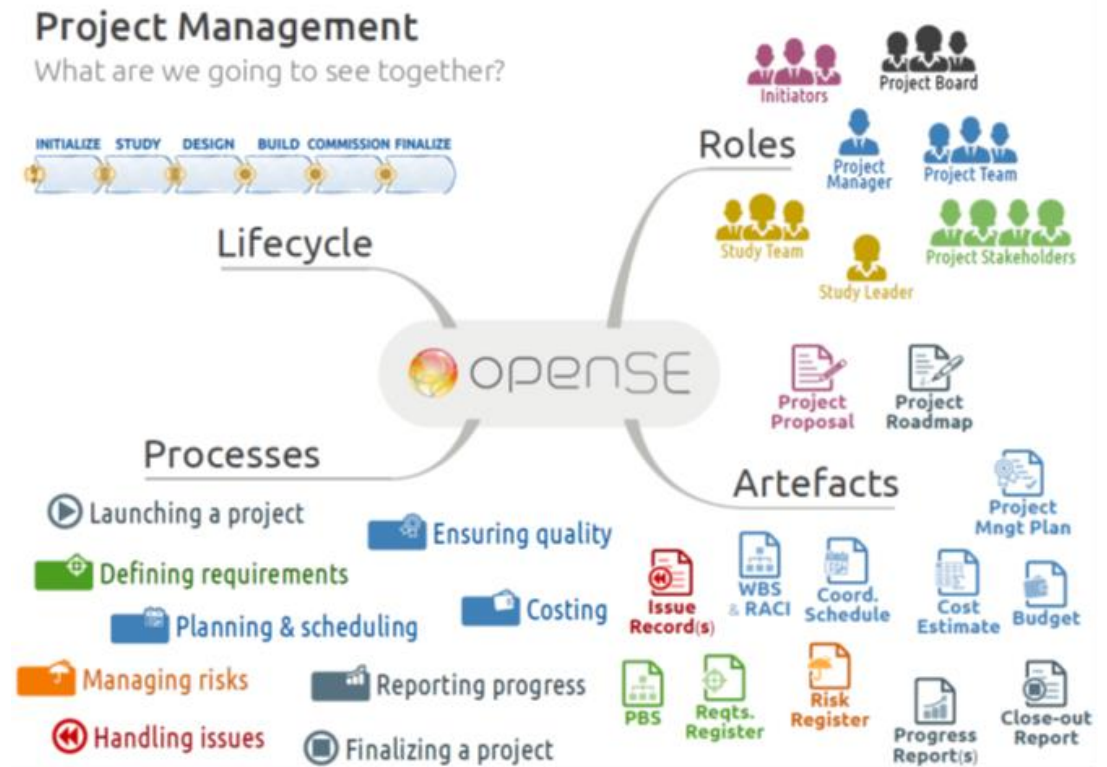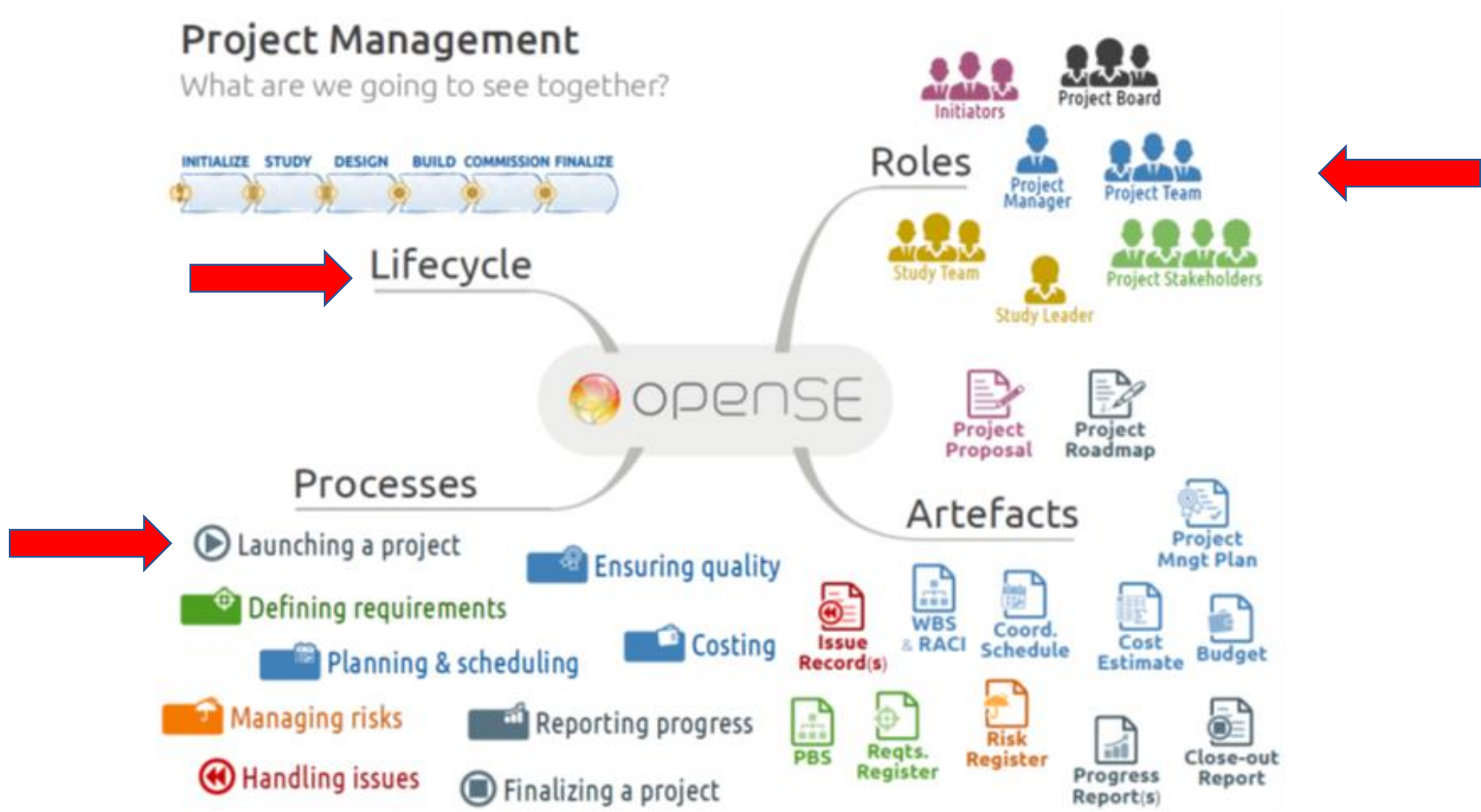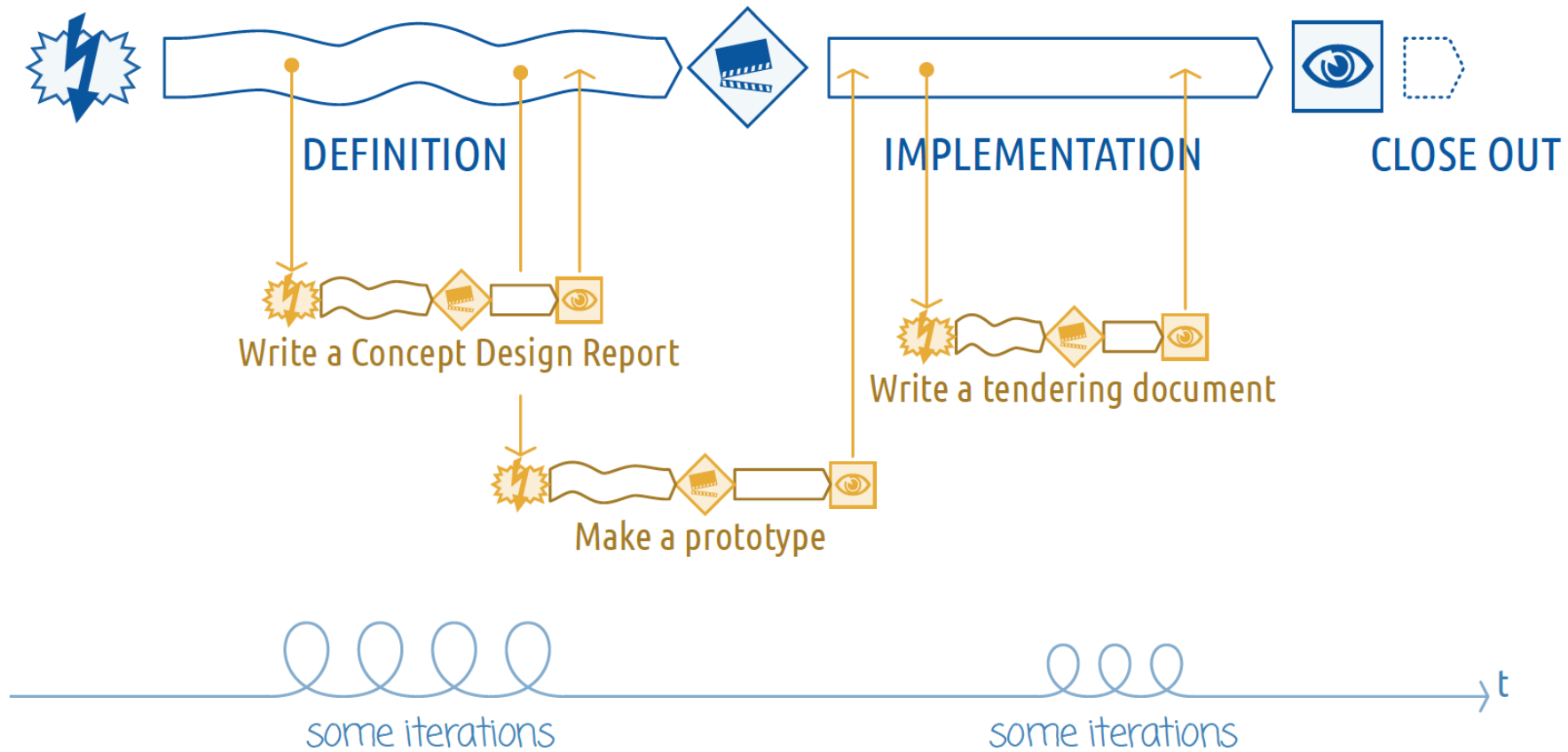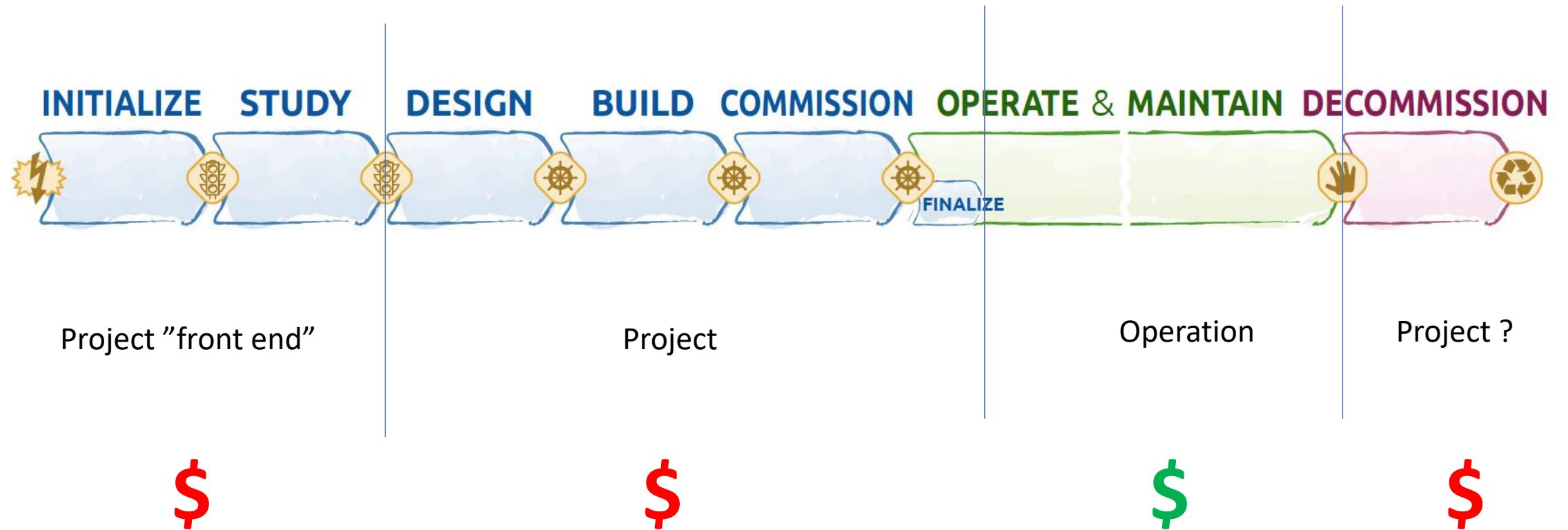
- The A380 came on the market in 2007 the development costs were about $25 billion.

- AIRbus recently made the descision to stop the production of the A380 as from 2021. There are no more clients for this type of aircraft !

-

- The A380 has been in production since approximately 10 years but the sales were disappointing from the beginning

- The first aircraft was delivered to Singapour Airlines in 2007 but is now headed for the scrapyard

- The catalogue price is 445 Moi USD per plane

Phases and decision points

Stepping stones

INITIALIZE · STUDY · DESIGN · BUILD · COMMISSION · FINALIZE

Project boundary **defined**

Preferred solution **identified**

Reference solution **designed**

Reference solution **developed**

Reference solution **in-use**

Lessons learned **capitalized**

Inspired from Hermes

INITIALIZE STUDY DESIGN BUILD COMMISSION FINALIZE
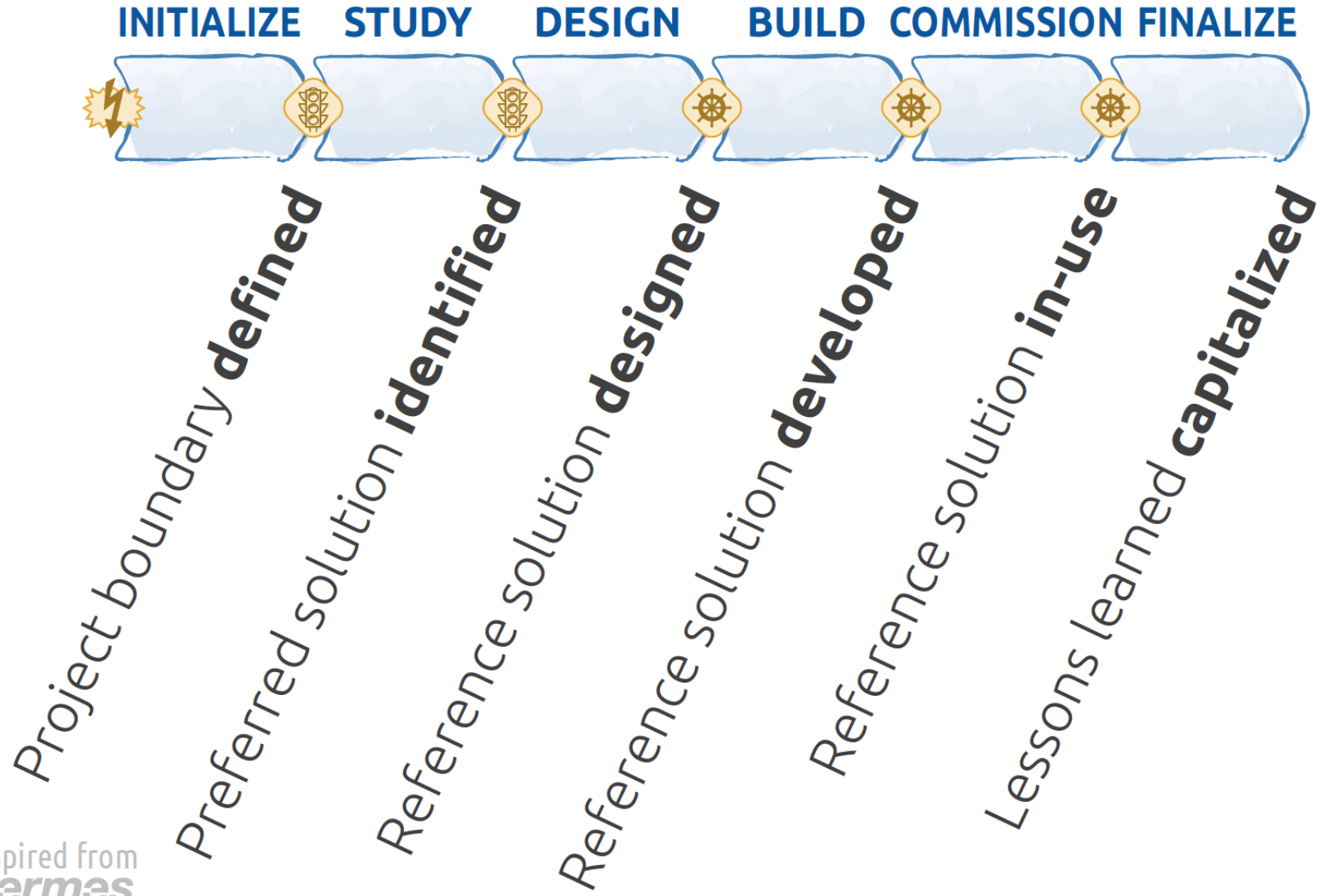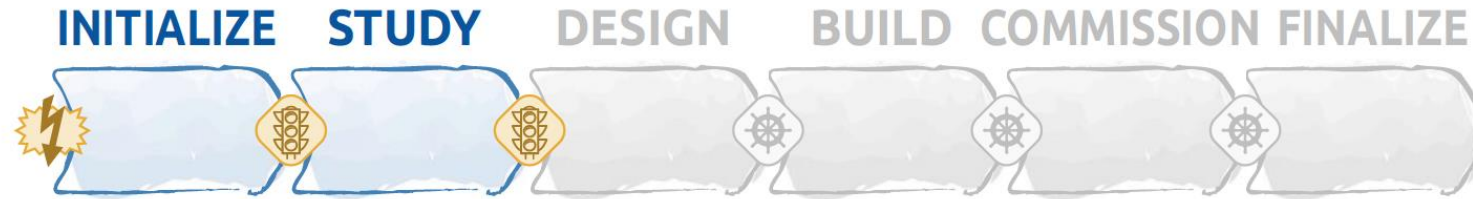
CDR
Conceptual
Design Report

Development phase

INITIALIZE   STUDY   DESIGN   BUILD   COMMISSION   FINALIZE
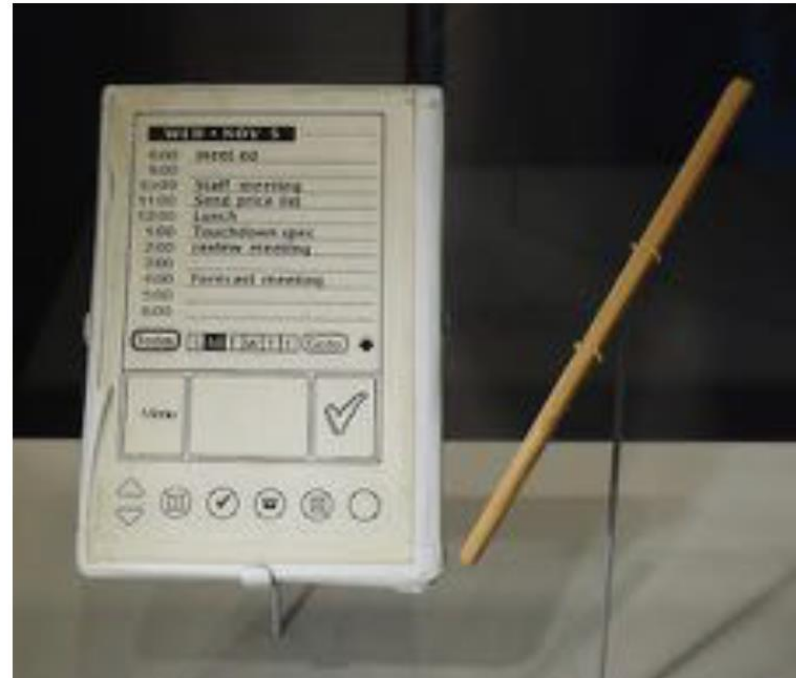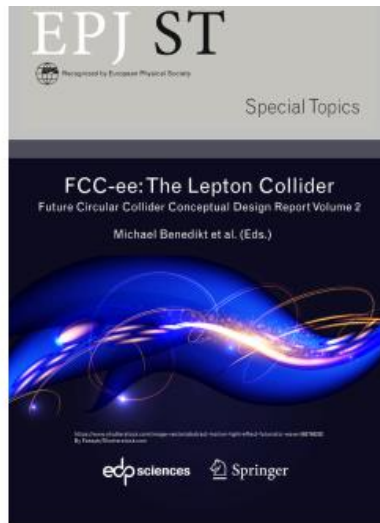
CDR
Conceptual
Design Report

TDR
Technical
Design Report

**Project / Product
Documentation**

Exercise : Project Lifecycle

The project Lifecycle is a series of phases that a project goes through from start to end.

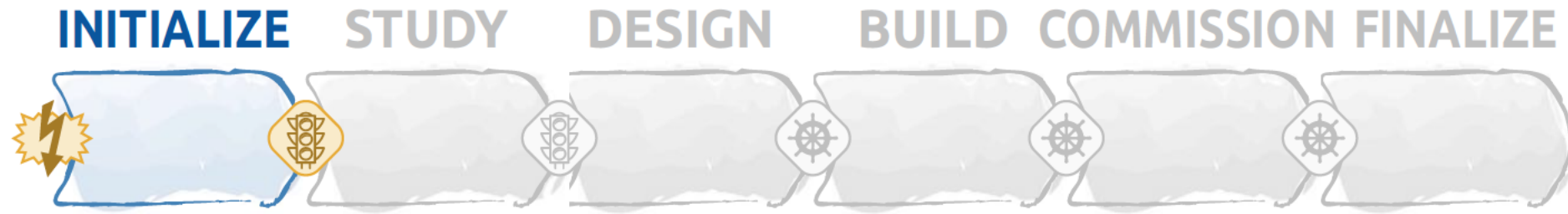**Present Situation :**

Dad has found a new job in New Zealand. The family (Mum, Dad, 2 kids (7 and 16 years old)) decide to emigrate and Mum, who is working in retail, has to find a new job too in New Zealand. Their dog is of course coming along. The kids have to change schools and learn the language. The family has to find a new place to live and has to decide what to do with the present house they live in (they are house owners). They will all need residence permits for NZ and they have to check if their vaccinations are still in order and sufficient. They will also have to arrange all administrative matters and ensure they have a bank account and social security number before Dad is starting with his new job.
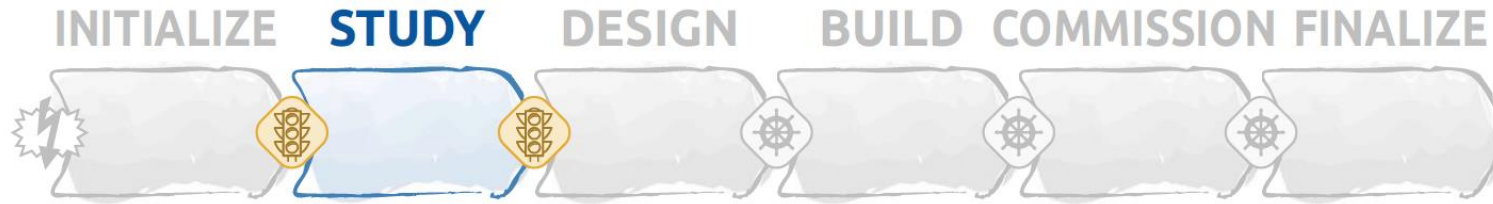
Exercise : Break the work the family has ahead of them down in logical phases and label them

Initialise phase

→ Analyse the **current situation**; define the **problem**

→ Propose some **possible solutions**

Study phase

INITIALIZE **STUDY** DESIGN BUILD COMMISSION FINALIZE

- Define more precisely the **scientific/user requirements**
- Convert the gathered UR's into **product/systems requirements**
- Identify straightforwardly all possible solutions
- Propose one solution and demonstrate its **feasibility**
- If required, develop **prototypes**, mock-ups…

Design phase

INITIALIZE   STUDY   **DESIGN**   BUILD COMMISSION FINALIZE
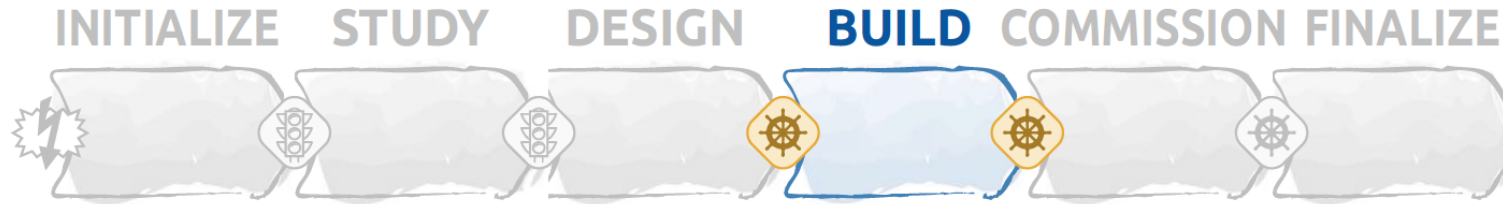
- Finalise the definition of the **scientific/user requirements**
- Finalise the **product/systems requirements** accordingly
- Design the solution (design and engineering tasks)
- Plan the **BUILD** and **COMMISSION** phases
- If required, develop further prototypes, mock-ups…

Build phase

INITIALIZE   STUDY   DESIGN   **BUILD**   COMMISSION   FINALIZE

- Perform the **detailed design**
- **Materialize**, i.e. procure, manufacture, assemble...
- **Verify** and **validate** at components and subsystems levels

Commissioning phase
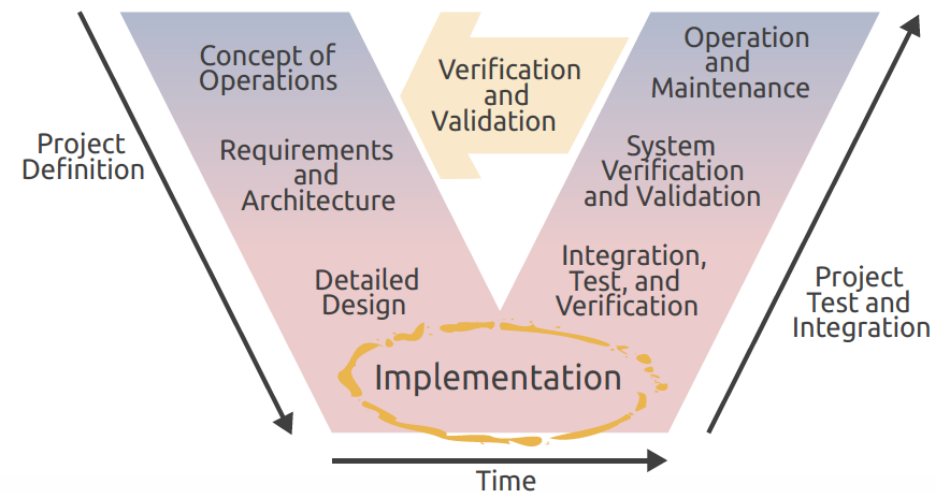
INITIALIZE   STUDY   DESIGN   BUILD   **COMMISSION** FINALIZE
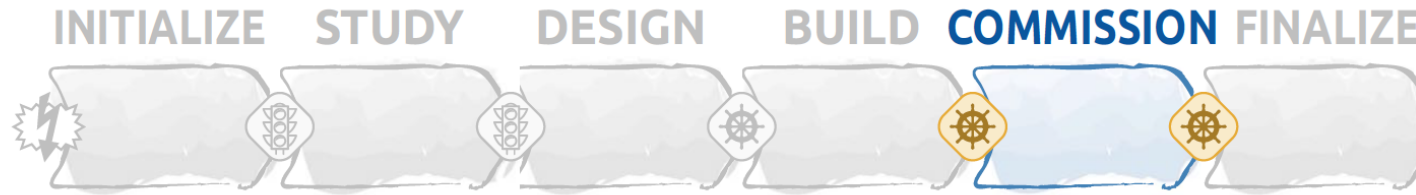
- Further **validate** (i.e. commission) at systems level
- Refine and ramp-up
- **Train** of the users
- Adapt to the evolving context

Finalising phase

INITIALIZE   STUDY   DESIGN   BUILD   COMMISSION   **FINALIZE**
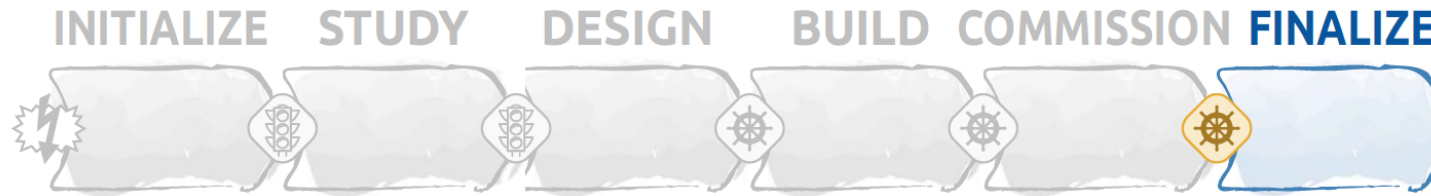
→ **Capitalize** of the lessons learned
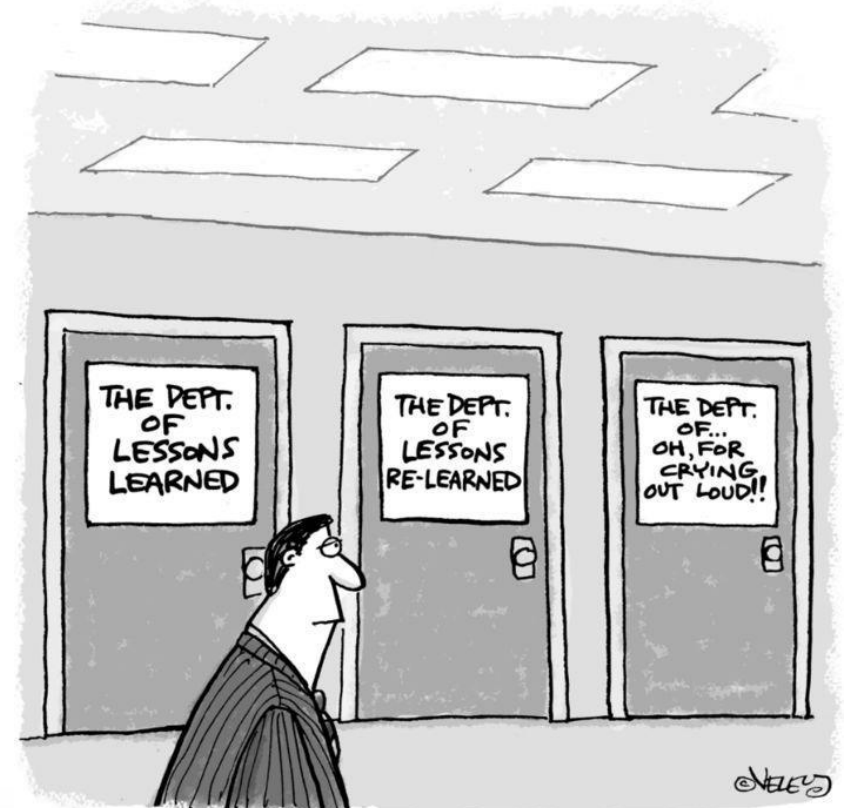
Project Lifecycle – example for software

DEVELOPMENT

DELIVERING PRODUCT
TO THE CUSTOMER

DEFINING THE
PROJECT SCOPE

STABILIZATION

MAINTENANCE
AND SUPPORT

Source : https://www.scnsoft.com/blog/software-development-life-cycle-examples

Project Management Processes

INITIALIZE   STUDY   DESIGN   BUILD   COMMISSION   FINALIZE

PROJECT MANAGEMENT
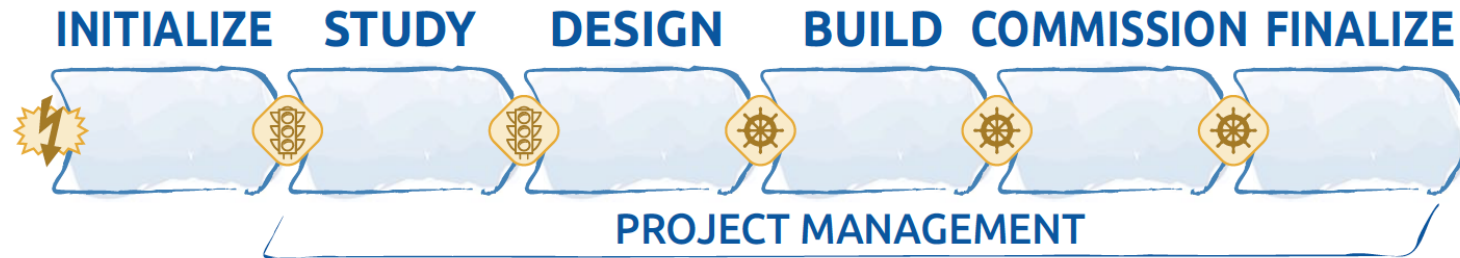
→ Project **Integration** Management

→ Project **Scope** (i.e. various Breakdown Structures) Management

→ Project **Time** (i.e. Project Master and Coordination Schedules) Management

→ Project **Resource** and **Cost** (incl. Budgets and Follow-up) Management

→ Project **Human Resource** (i.e. Project Staffing and Leadership) Management

→ Project **Quality** (incl. Configuration Management) Management

→ Project **Communication** (incl. Project Marketing) Management

→ Project **Risk** (incl. Safety, Security, Environmental Impact) Management

→ Project **Procurement** (incl. Supply Chain, In-kind Contributions) Management

OpenSE - framework
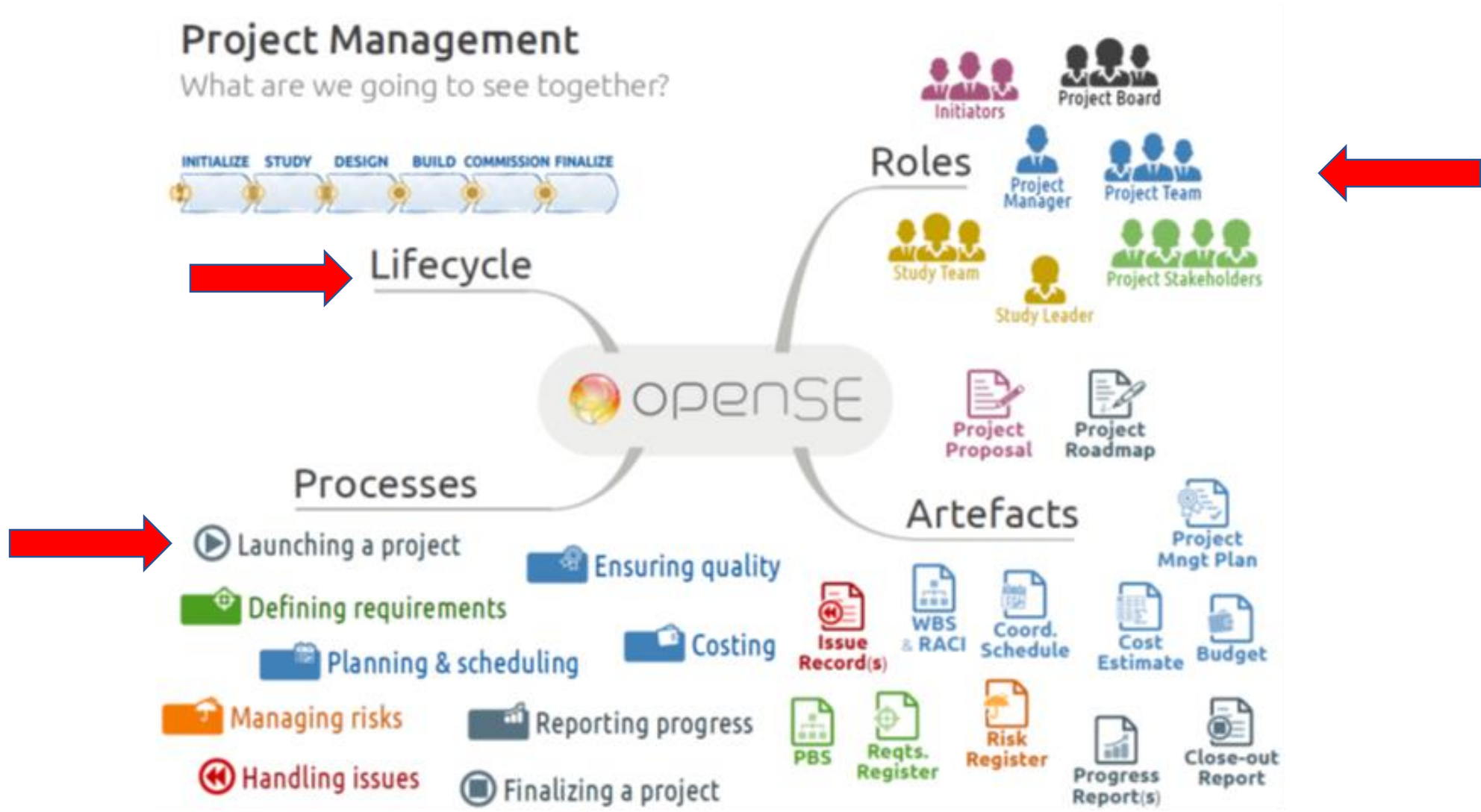
OpenSE - roles
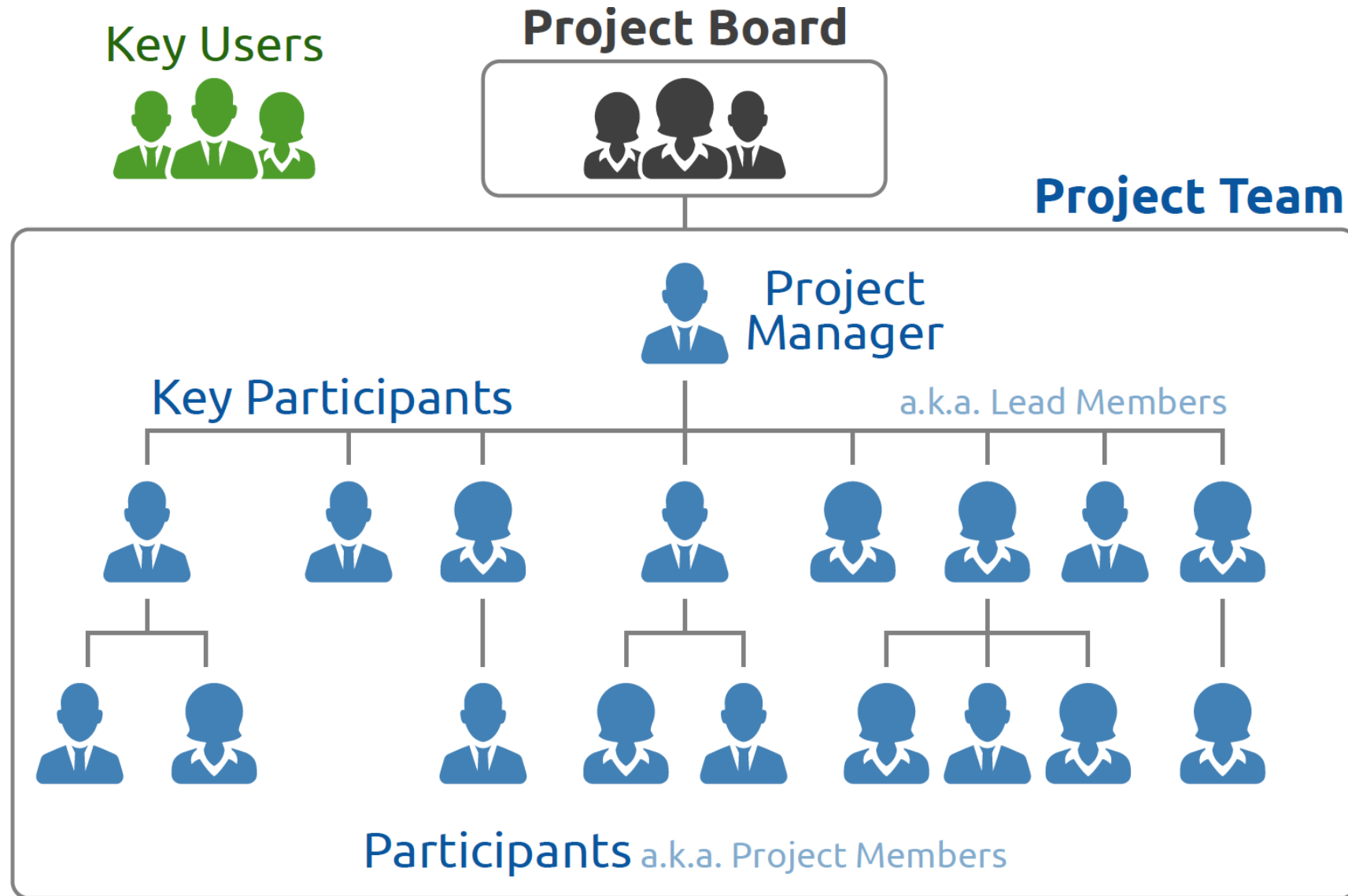
OpenSE – strategic decisions
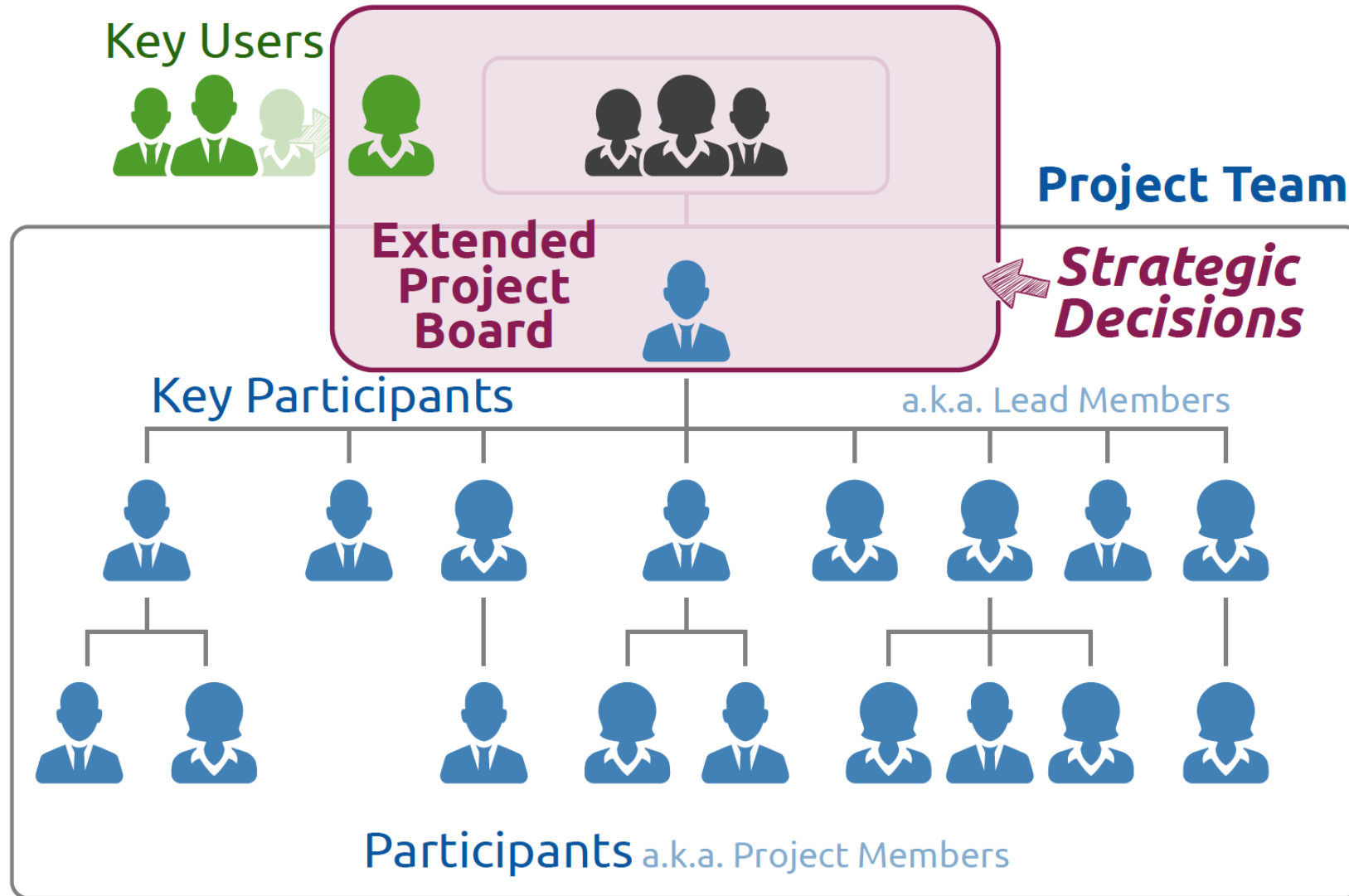
OpenSE – operational decisions
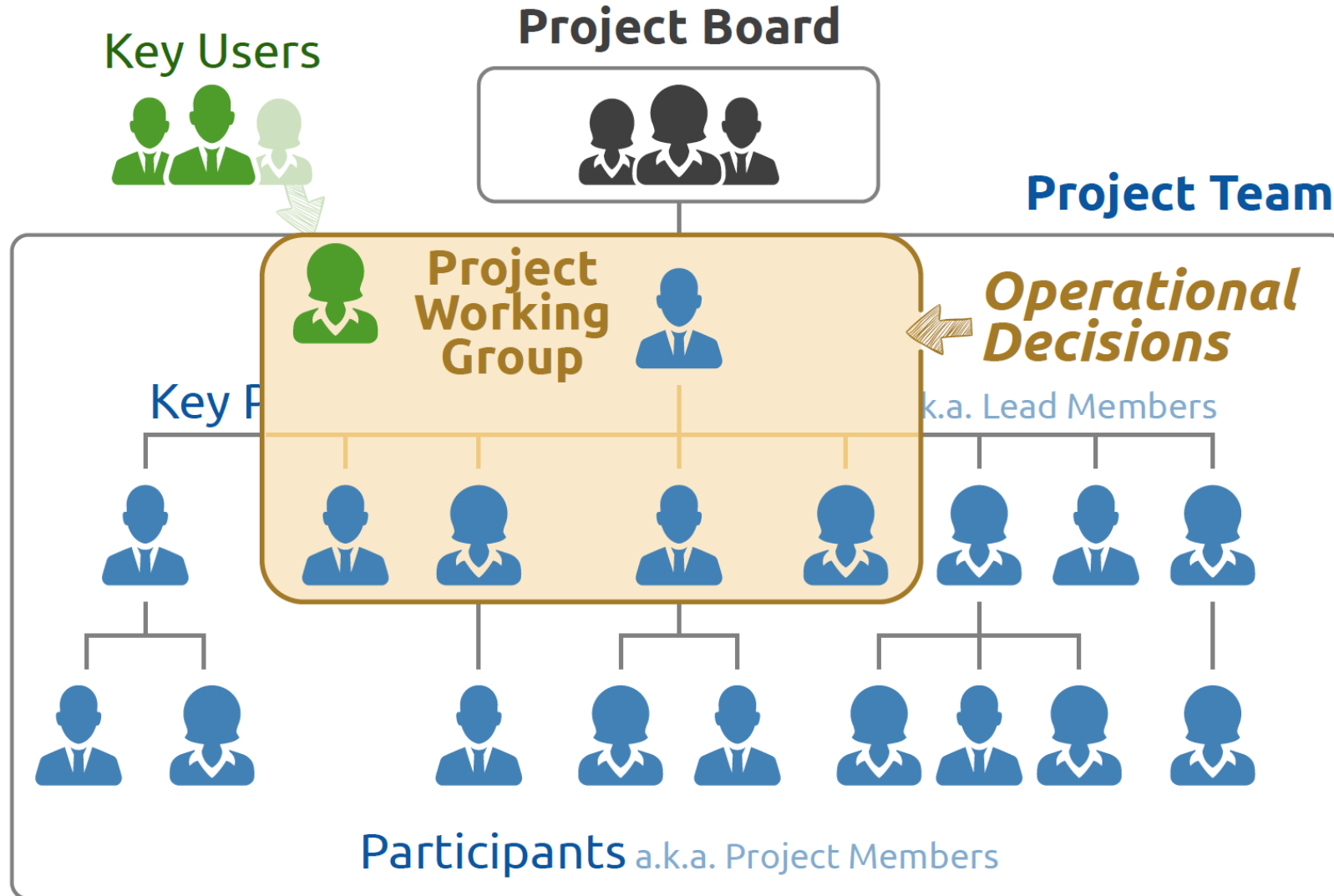
Project Board (PB)

Strategic/Steering Board/Committee,
Project Owner, Product/Systems Owner,
Comité de projet (CoP),
Comité de pilotage (COPIL),
Donneur d'ordre,
Maître d'ouvrage (MOU),
Projektausschuss,
Comitato di progetto...

→ Ensure the **strategic management** of the project

→ Is ultimately responsible w.r.t. successfull completion of the project

→ Guarantee the acquisition and availability of resources

→ Validate transitions between phases (and intra phases also)

→ In case if conflict or disagreement within the project team, arbitrate

Responsibilities

Project Manager (PM)

Project Leader (PL), Project Coordinator, Coordinator,
Chef de projet (CP), Maître d'œuvre (MŒU),
Projektleiter (PL), capoprogetto (CP)...

➡ Ensure the **operational management** of the project

➡ Is responsible for the **organisation** of the project and for its coordination

Most of **project management**
is about setting this organisation

Project Management Artefacts

Project Management Plan
PM Procedures/Processes
Work Package Descriptions
Master/Coordination Schedules
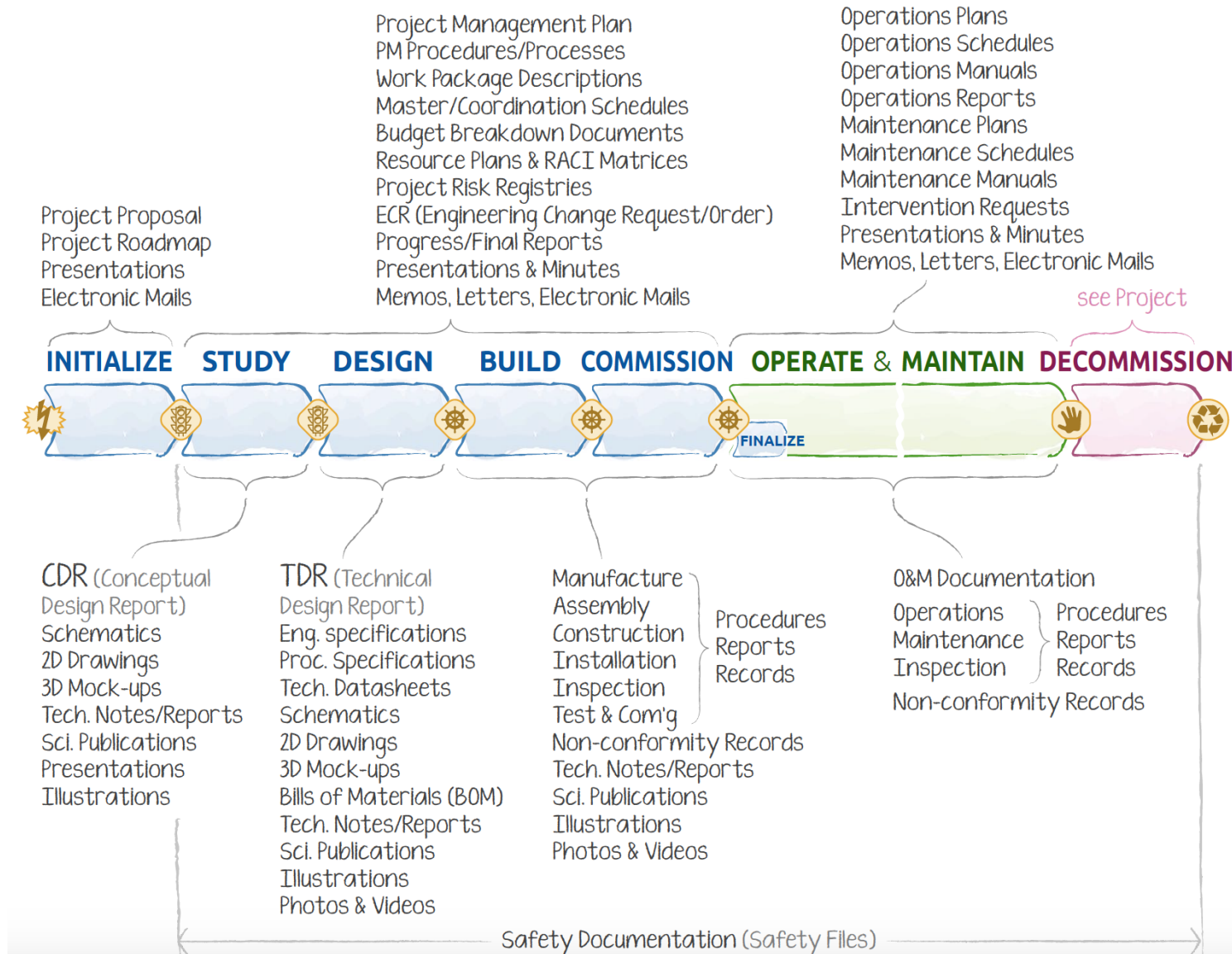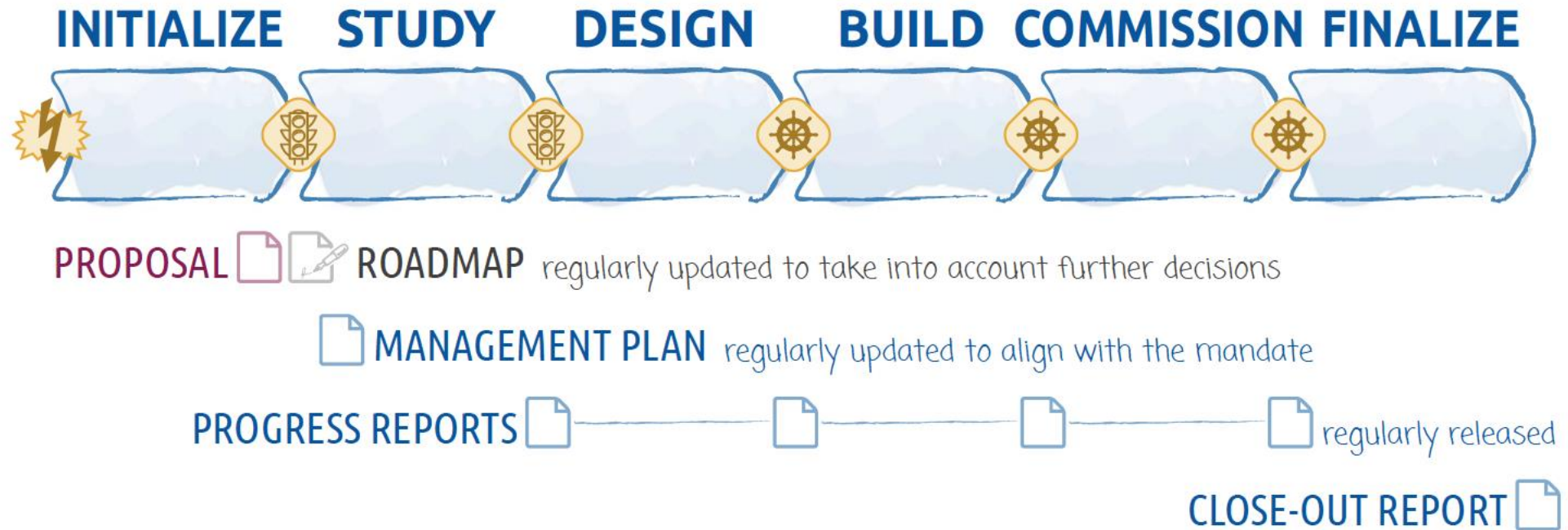Budget Breakdown Documents
Resource Plans & RACI Matrices
Project Risk Registries
ECR (Engineering Change Request/Order)
Progress/Final Reports
Presentations & Minutes
Memos, Letters, Electronic Mails

Operations Plans
Operations Schedules
Operations Manuals
Operations Reports
Maintenance Plans
Maintenance Schedules
Maintenance Manuals
Intervention Requests
Presentations & Minutes
Memos, Letters, Electronic Mails

Project Proposal
Project Roadmap
Presentations
Electronic Mails

see Project

INITIALIZE STUDY DESIGN BUILD COMMISSION OPERATE & MAINTAIN DECOMMISSION

FINALIZE

CDR (Conceptual Design Report)
Schematics
2D Drawings
3D Mock-ups
Tech. Notes/Reports
Sci. Publications
Presentations
Illustrations

TDR (Technical Design Report)
Eng. specifications
Proc. Specifications
Tech. Datasheets
Schematics
2D Drawings
3D Mock-ups
Bills of Materials (BOM)
Tech. Notes/Reports
Sci. Publications
Illustrations
Photos & Videos

Manufacture
Assembly
Construction
Installation
Inspection
Test & Com'g

Procedures
Reports
Records

Non-conformity Records
Tech. Notes/Reports
Sci. Publications
Illustrations
Photos & Videos

O&M Documentation
Operations
Maintenance
Inspection

Procedures
Reports
Records

Non-conformity Records

Safety Documentation (Safety Files)

OpenSE – technical project documentation

Nam-pyo Suh (1990) Principles of Design. Oxford University Press
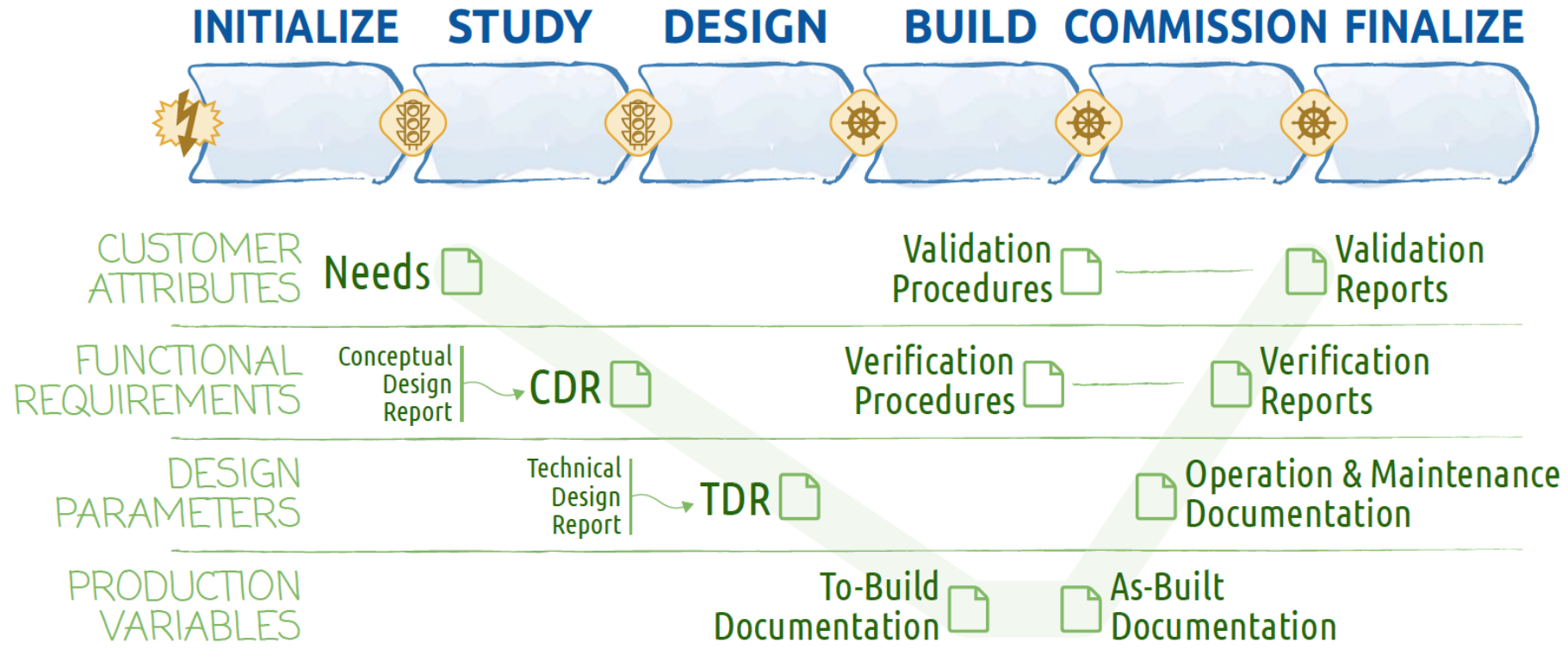
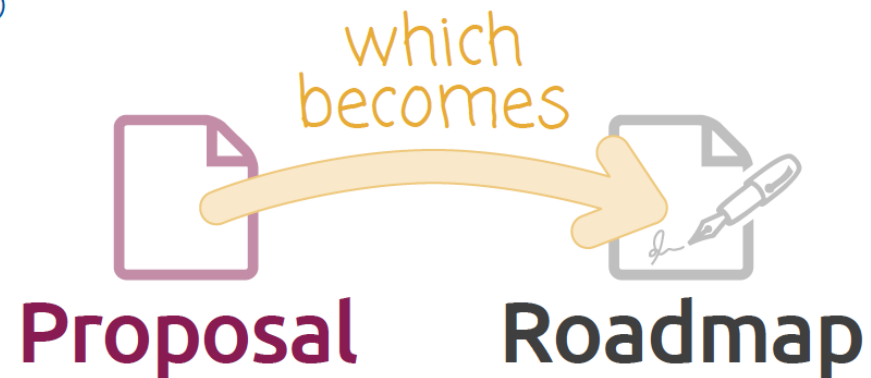It is a document that summarizes the direction to be followed by the project team (for the **STUDY**, **DESIGN**, **BUILD** and **COMMISSIONING** phases)

Other names for this document:

→ (Project) Charter

→ (Project) Mandate ← (e.g. **GDPM**)

→ (Project) Mission Statement

→ (Project) Brief

which becomes

Proposal → **Roadmap**

OpenSE – project charter contents

0 **Executive Summary** To the attention of the Project Board

1 **Initial Situation** Problem statement, rationale, current situation

2 **Project Objectives**

3 **Possible Solutions**

4 *A priori* **Preferred Solution**

    4.1 Description of the preferred solution

    4.2 Stakeholders and "approched Project Board" membership

    4.3 Phasing, project organization, masterplan

    4.4 Required resources

    4.5 Outcomes and benefits of the project

5 **Preliminary Risk Register**

OpenSE – editorial process for charter

➜ **Authoring:** Project Initiators

➜ **Verification:** Some experts in the field
The foreseen Project Manager
A few possible Key Project Participants

➜ **Validation:** Ø

OpenSE – project roadmap

0 Executive Summary

1 Initial Situation

2 Project Objectives

3 Possible Solutions

4 *A priori* Preferred Solution

5 Preliminary Risk Register

6 **Decisions**

   6.1 Decisions w.r.t. the **STUDY** phase

      6.1.1 Validation of the PB membership and project organization

      6.1.2 Decision w.r.t. the preferred solution

      6.1.3 Decision w.r.t. budgets and masterplan

   6.2 Decisions w.r.t. the **DESIGN** phase

   ⋮

OpenSE – editorial process project roadmap

➡ **Authoring:** Project Initiators

➡ **Verification:** Some experts in the field
The foreseen Project Manager
A few possible Key Project Participants

➡ **Validation:** **Project Board**

you

University laboratory in urban ecology

Bee collapse syndrome of urban bees

200 beehives located on urban roofs

To date: limited to chemical analyses of honey

Need for a remote monitoring of the hives:

➡ Monitoring of the external environment, temperature, NOx, etc.

➡ Monitoring of the internal environment, temperature, moisture, "activity" (number of bees moving in and out), etc.

Your task: drafting the **Project Proposal**

University of **BROBDINGNAG**