

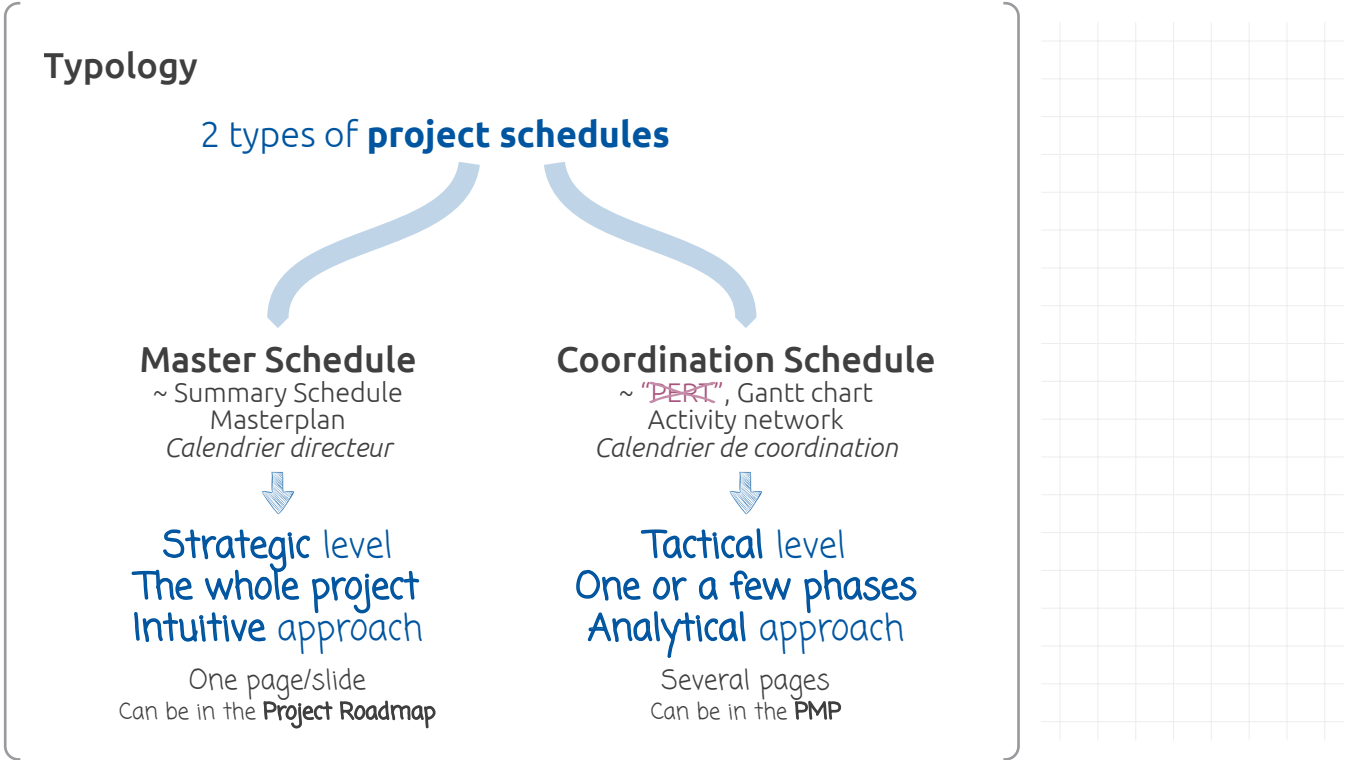
Managing Projects with **openSE**

Part **3**

Table of Content

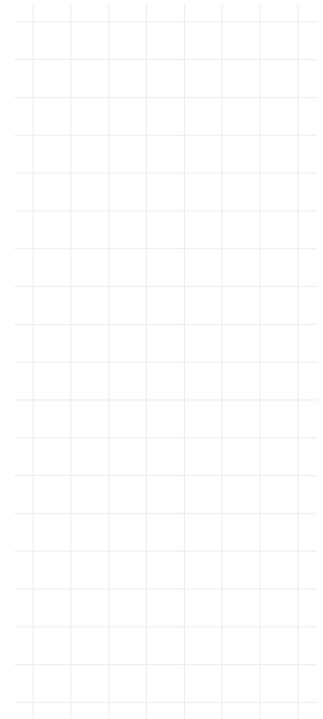
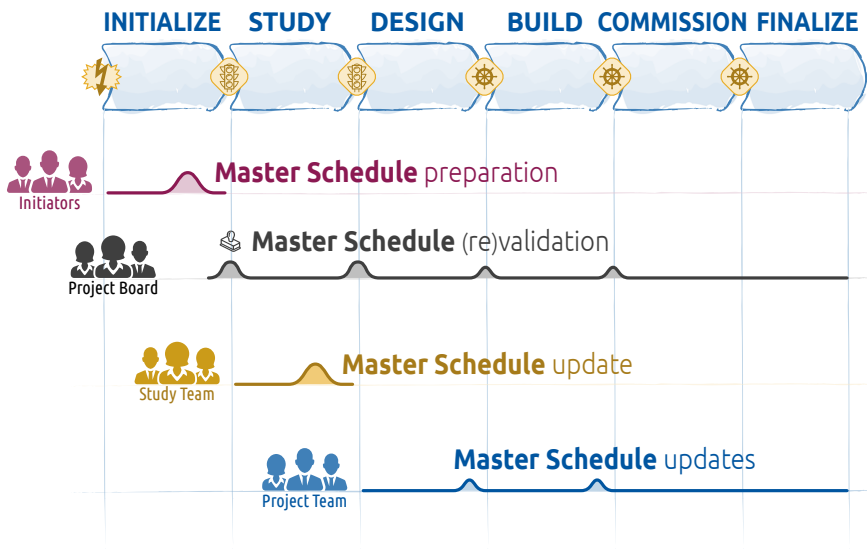
- Project Planning & Scheduling** 1
 - Work Breakdown Structure 6
 - RACI Matrix 11
 - Scheduling 13
- Project Costing** 13
 - Cost Estimating 14
 - Budgeting 20

Project Planning & Scheduling



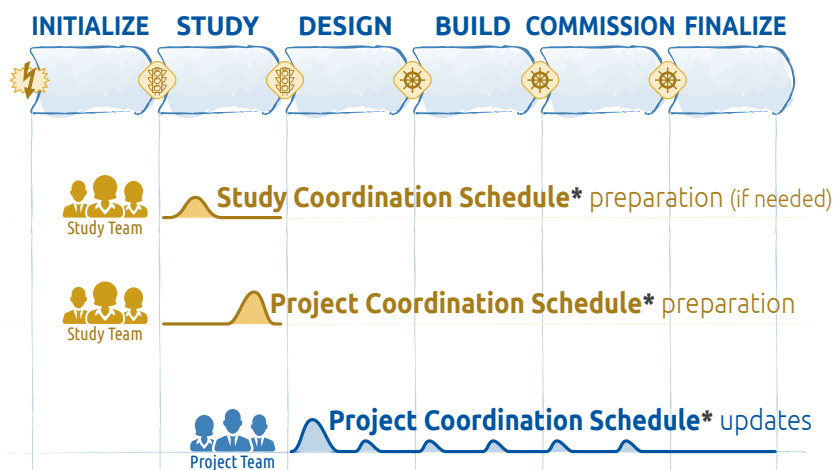
Master Schedule

When and which effort?

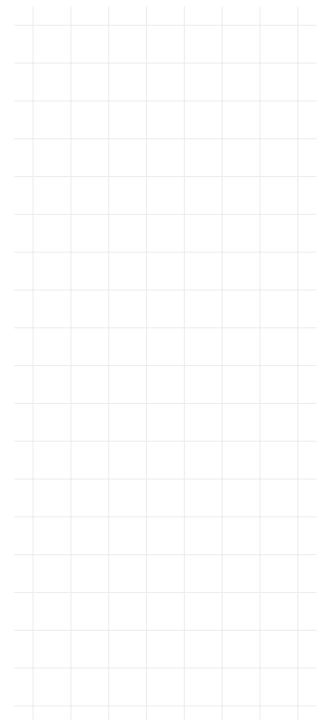


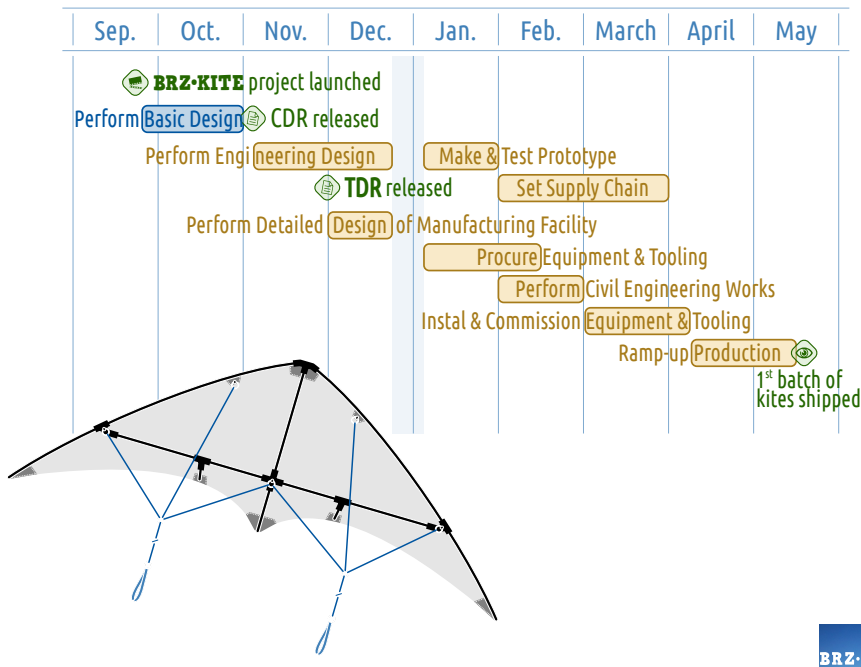
Coordination Schedule

When and which effort?



* incl. PBS, WBS, LoA (list of activities), RBS, RACI matrix





Coordination Planning & Scheduling

A three-step process

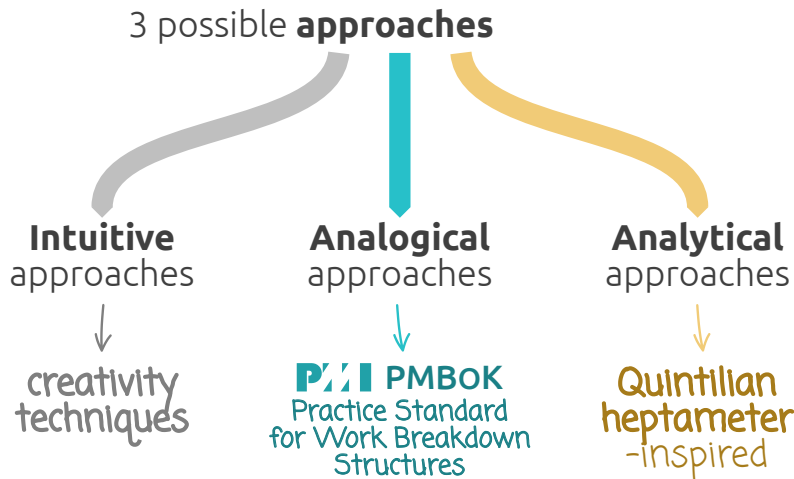
- 1 Identifying the project **activities**
 - ⇒ The **Work Breakdown Structure (WBS)**
- 2 Identifying the **resources** available, estimating the **resources** required
 - ⇒ The **RACI Matrix**
- 3 Scheduling the **activities**
 - ⇒ The **Coordination Schedule**

↳ a **Gantt chart**

 - ↳ ProjectWizard® Merlin® Gantt chart
 - ↳ Microsoft® Project® Gantt chart

Coordination Planning & Scheduling

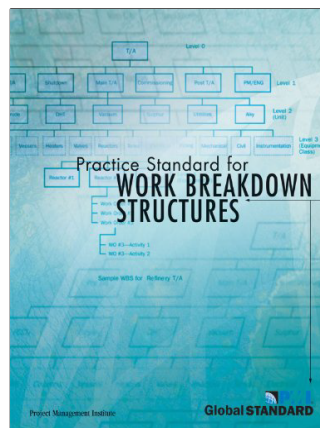
1 Identifying the project activities



Coordination Planning & Scheduling

1 Identifying the project activities → analogical approaches

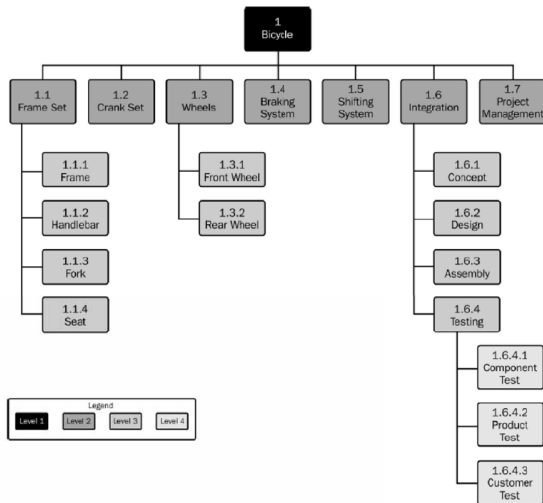
- ➔ Approach sold as *systematic*, but not that much!
- ➔ Global lessons learned collected by the Project Management Institute



- PMBOK Project Management Institute's Practice Standard to Work Breakdown Structures
- NASA's Work Breakdown Structure Handbook (NASA/SP-2010-3404)

Coordination Planning & Scheduling

1 Identifying the project activities → analogical approaches



Level	WBS Code	Element Name
1	1	Bicycle WBS
2	1.1	Frame Set
3	1.1.1	Frame
3	1.1.2	Handlebar
3	1.1.3	Fork
3	1.1.4	Seat
2	1.2	Crank Set
2	1.3	Wheels
3	1.3.1	Front Wheel
3	1.3.2	Rear Wheel
2	1.4	Braking System
2	1.5	Shifting System
2	1.6	Integration
3	1.6.1	Concept
3	1.6.2	Design
3	1.6.3	Assembly
3	1.6.4	Testing
4	1.6.4.1	Component Test
4	1.6.4.2	Product Test
4	1.6.4.3	Customer Test
2	1.7	Project Management

Figure 2-1. WBS Bicycle Example

Project Management Institute's Practice Standard to Work Breakdown Structures

Coordination Planning & Scheduling

1 Identifying the project activities → analytical approach

→ Inspired from the Quintilian heptameter

quis quid ubi quibus auxiliis
 who what where which means
 cur quomodo quando
 why how when



Marcus Fabius Quintilianus (c. 35 – c. 100 CE) was a Roman rhetorician from Hispania, widely referred to in medieval schools of rhetoric and in Renaissance writing

- 1.1 Describing the final **deliverable(s)**
 → The **Product Breakdown Structure (PBS)**
- 1.2 Deriving the **Work Breakdown Structure (WBS)** from the PBS
 → The **WBS top nodes**, then the **WBS-matrix**
- 1.3 Generating the list of **activities** from the **WBS-matrix**
 → The **activity portfolio**

Coordination Planning & Scheduling

1 Identifying the project **activities** → analytical approach

? What is an **activity**?

▶ ≠ deliverable! a.k.a. work unit

To avoid confusion, clever professional practices (e.g. MIL-HDBK-245B + appendix A) and several textbooks suggest to label activities as follow:

▶ **action verb (infinitive tense) + noun**

An **activity**:

- ▶ consumes **time**
- ▶ consumes **resources**
- ▶ has **start** and **end** dates
- ▶ creates (a) **deliverable(s)**
- ▶ is **measurable** ← and only one!
- ▶ is **assignable** to one project participant

Some examples:

Manage the project
 Prepare PM documents
 Perform detail design of wing surface
 Supply rope & straps
 CFT for moulded ABS parts

Coordination Planning & Scheduling

1 Identifying the project **activities** → analytical approach

? What is an **activity**?

An **activity**:

▶ consumes **time** ⚠ Yes, but within certain limits!

What is the maximum duration?

- ▶ No definitive answer!
- ▶ No more than **5% to 10%** of the project duration
- ▶ No more than **13 weeks** (long lead projects)
- ▶ One or up to 1% of **level-of-effort** activities

And how many activities on a coordination schedule?

- ▶ No definitive answer! ← activities vs. planned activities **ANSI** #748
- ▶ But not more than **400 activities**, otherwise difficult to manage

Coordination Planning & Scheduling

1 Identifying the project **activities** → analytical approach

? What is a **deliverable**?

▶ ≠ activity! ← a.k.a. result

▶ ≠ product! → e.g. the brz-kite

▶ **noun + verb at past participle tense**

▶ ≠ milestone!

Some examples:
 bzh-kite designed
 bzh-kite specified
 bzh-kite prototype tested
 bzh-kite manuf. facility commissioned

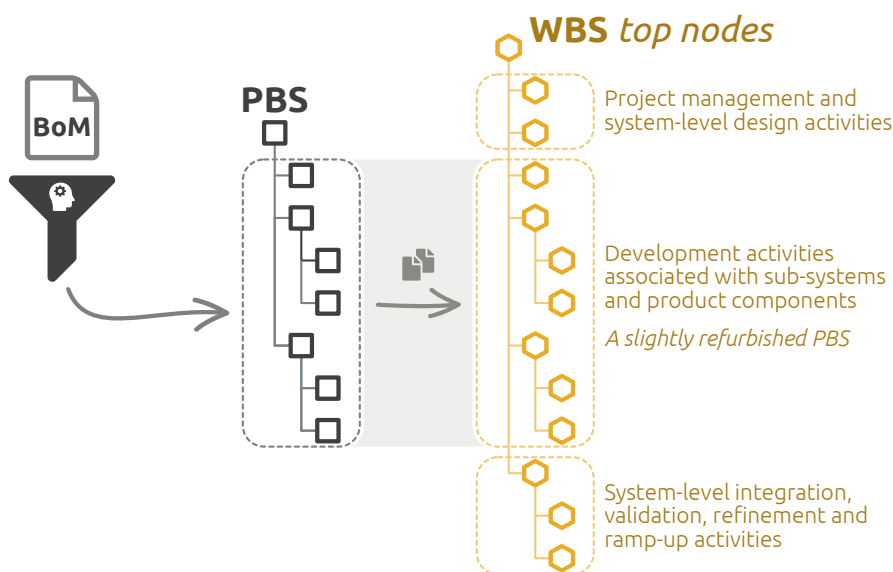
Deliverable is a term used [...] to describe a tangible or intangible object produced as a result of the project that is intended to be delivered to a customer (either internal or external). A deliverable could be a **report**, a **document** [...] or any other **building block** of an overall project.

en.Wikipedia.org

Coordination Planning & Scheduling

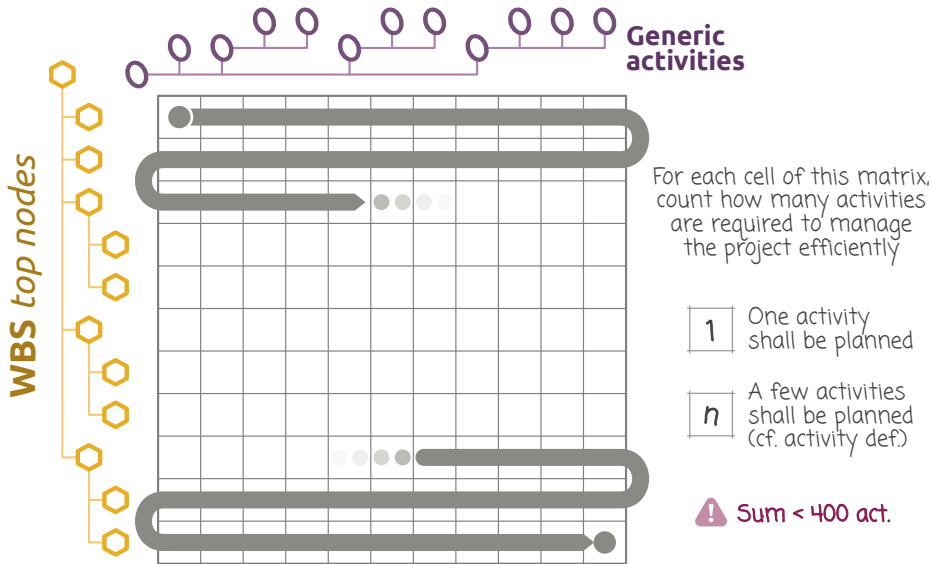
1 Identifying the project **activities** → analytical approach

12 Deriving the **Work Breakdown Structure (WBS)** from the PBS



Coordination Planning & Scheduling

- 1 Identifying the project **activities** → analytical approach
- 1.3 Generating the list of **activities** from the **WBS-matrix**



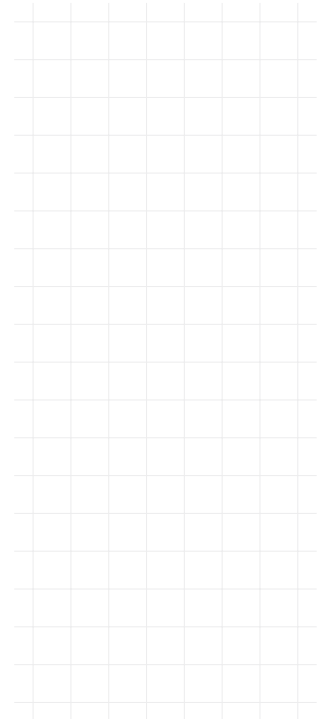
Coordination Planning & Scheduling

- 1 Identifying the project **activities** → analytical approach
- 1.3 Generating the list of **activities** from the **WBS-matrix**
 - i Generic activities suited to a **construction project**



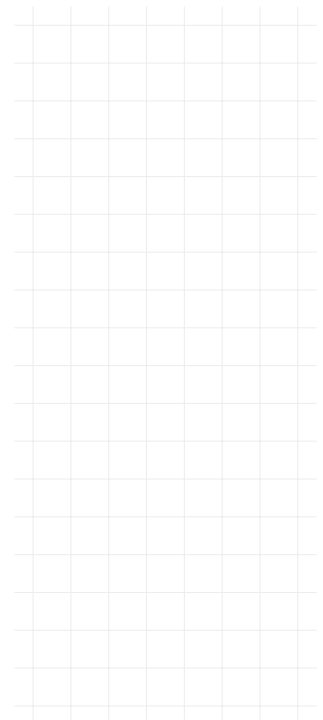
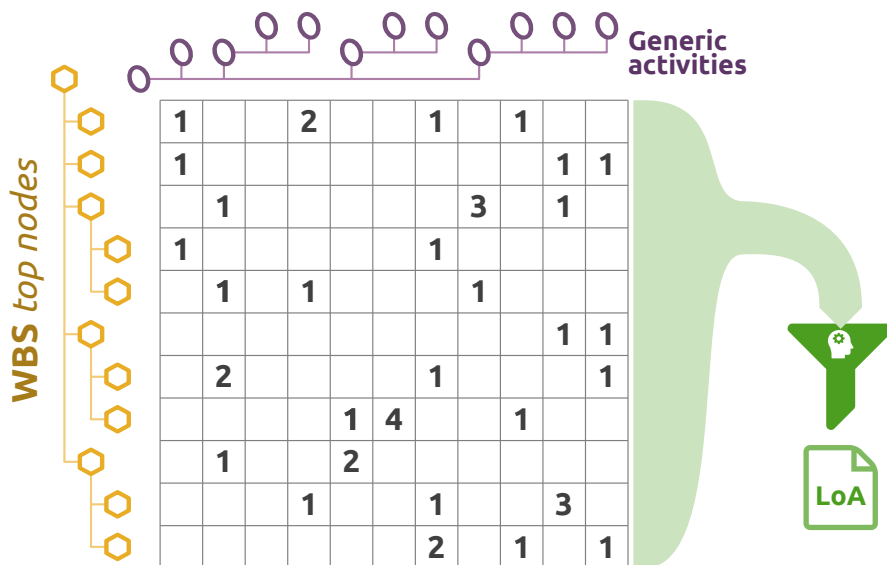
Coordination Planning & Scheduling

- 1 Identifying the project **activities** → analytical approach
- 13 Generating the list of **activities** from the **WBS-matrix**
 - i Generic activities suited to a **NPD project**



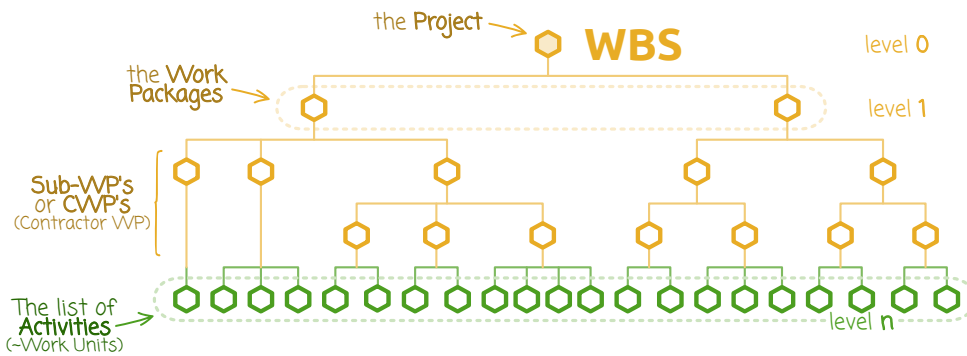
Coordination Planning & Scheduling

- 1 Identifying the project **activities** → analytical approach
- 13 Generating the list of **activities** from the **WBS-matrix**



Coordination Planning & Scheduling

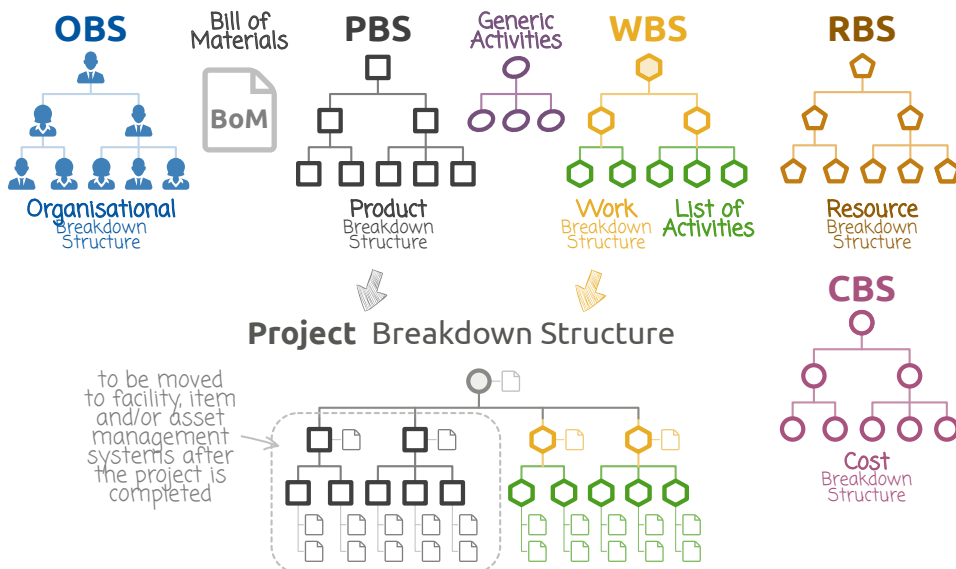
1 Identifying the project **activities** → analytical approach



- ➔ **Work packages** = level 1 of the Work Breakdown Structure
- ➔ **Activities** = the *leaves* (🌿) of the WBS (from level 2 to level 6 max.)
- ➔ There is no requirement to have all activities at a same level!

Coordination Planning & Scheduling

1 Identifying the project **activities** → analytical approach



Coordination Planning & Scheduling

2 Identifying the **resources** available, estimating the **resources** required

2 types of **resources**

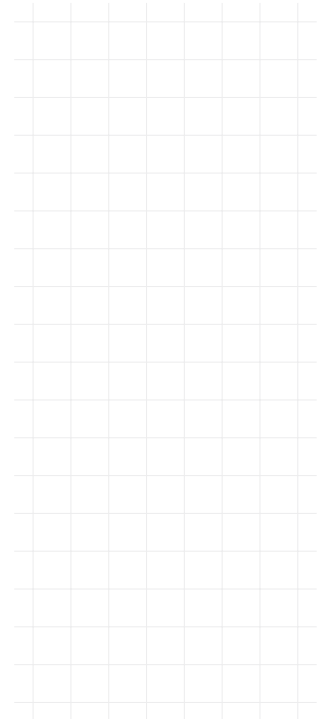


Renewable
resources

Non-renewable
resources



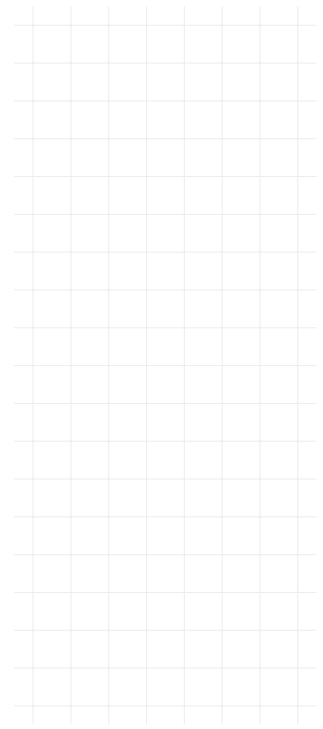
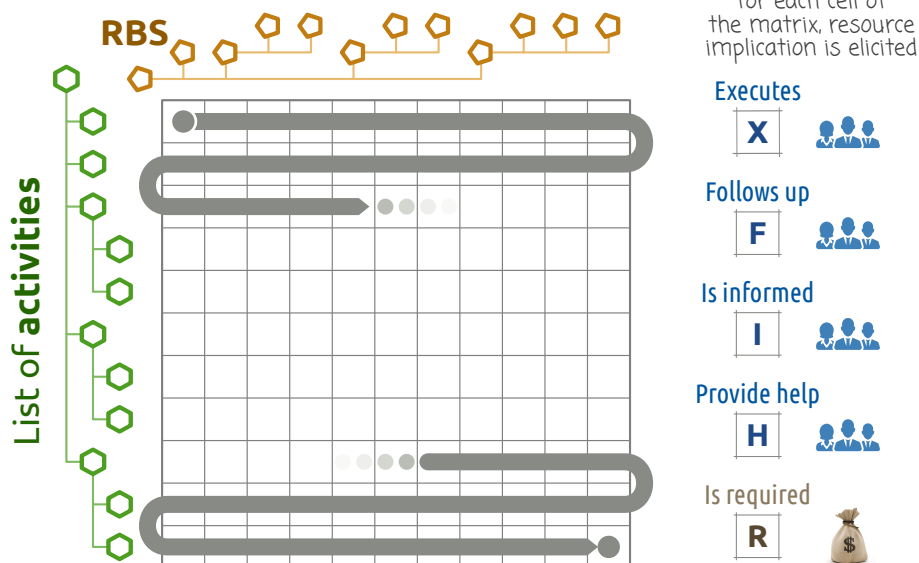
- 2.1 Identifying the **resources** that are **available**
 ➔ The **Resource Breakdown Structure (RBS)**
- 2.2 Estimating the **resources** that are **required**
 ➔ *See section dedicated to Project Costing*
- 2.3 Assigning **resources** to **activities**
 ➔ The **RACI Matrix**



Coordination Planning & Scheduling

2 Identifying the **resources** available, estimating the **resources** required









2.3 Assigning **resources** to **activities** → **RACI Matrix**

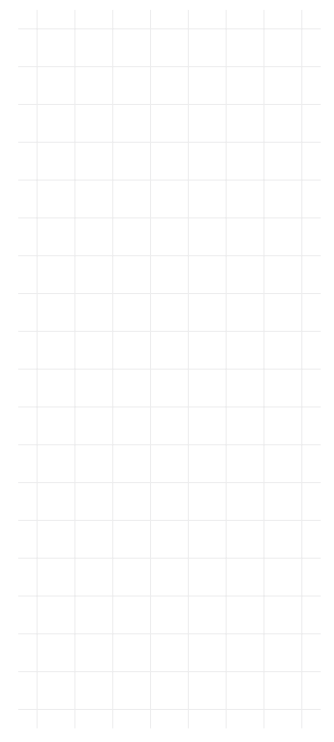


Coordination Planning & Scheduling

2 Identifying the **resources** available, estimating the **resources** required

2.3 Assigning **resources** to **activities** → RACI Matrix

Executes  X	Is responsible  X X X	Participate to decisions  X X X
Follows up  F	F F F	F F F
Is informed  I	 ⚠ Only one per row!	I I I
Provide help  H		H H H
Is required  R		

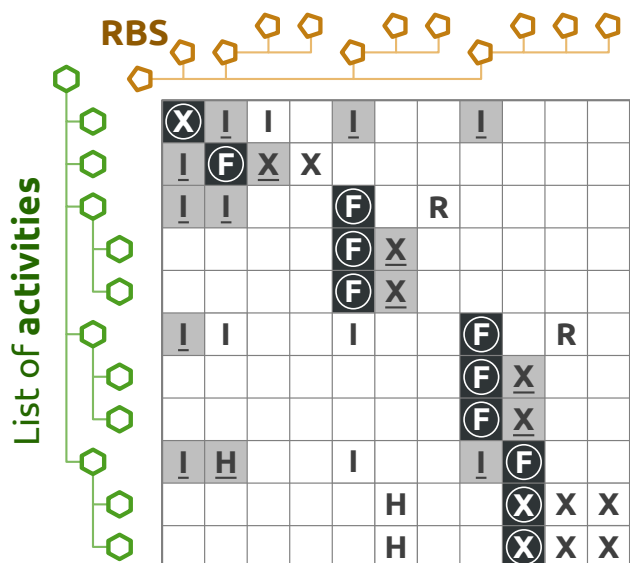


Coordination Planning & Scheduling

2 Identifying the **resources** available, estimating the **resources** required

2.3 Assigning **resources** to **activities** → RACI Matrix

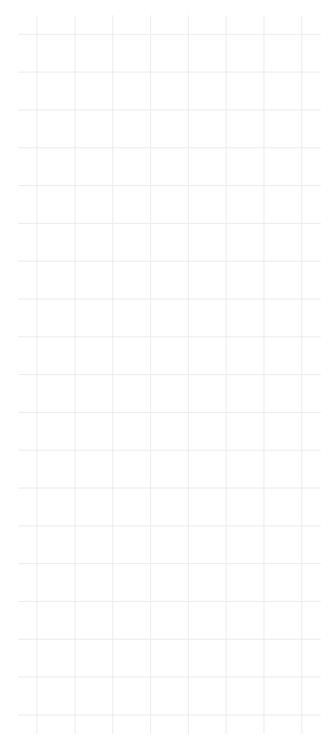
RBS



X	I	I		I			I			
I	F	X	X							
I	I			F		R				
				F	X					
				F	X					
I	I			I			F		R	
							F	X		
							F	X		
I	H			I			I	F		
					H			X	X	X
					H			X	X	X

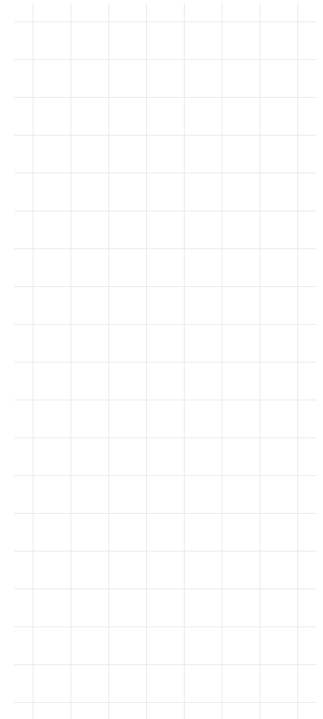
The purpose of this RACI matrix is twofold:

1. identifying the required resources ('X', 'R' and sometimes 'F' and 'H')
2. organizing information circulation (mailing lists)



Coordination Planning & Scheduling

- 3 Scheduling the **activities**
 - 3.1 Estimating the **duration** of the activities
 - 3.2 Defining **technical constraints** between activities
 - 3.3 If required, getting rid of **loops**
 - ⇒ **DSM** (Design Structure Matrix)
 - 3.4 If required, defining **temporal constraints**
 - 3.5 Calculating earliest/latest start/finish **dates, floats + critical path(s)**
 - ⇒ **PDM** (Precedence Diagramming Method) + **Gantt Chart**
 - 3.6 If required, defining **resource constraints**
 - 3.7 Calculating (earliest) start/finish **dates** and **floats**
 - ⇒ **RCPS** (Resource-Constrained Project Scheduling) + **Gantt Chart**

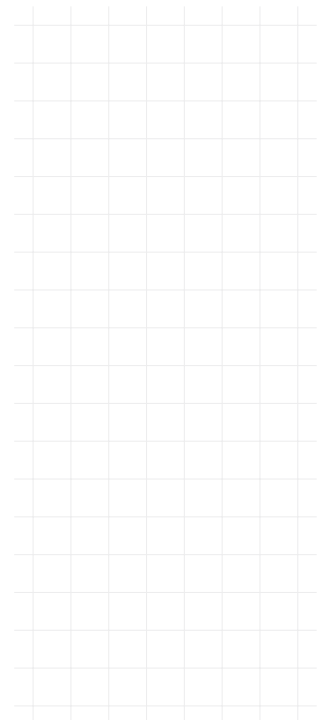


Project Costing

Project Costing

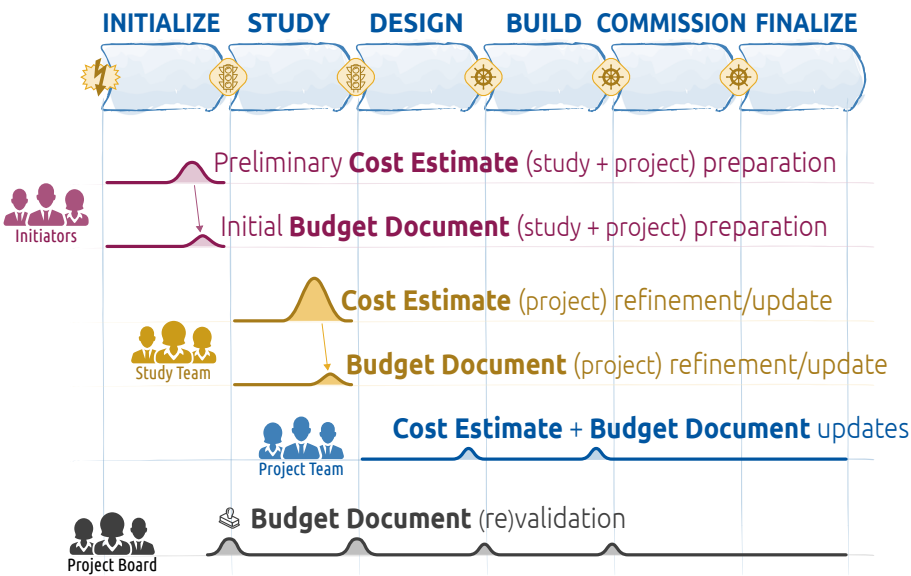
A three-step process

- 1 **Estimating** the resources required to perform the project
 - ⇒ The (project) **Cost Estimate**
- 2 **Budgeting** the resources allocated to the project
 - ⇒ The (project) **Budget Document**



Project Costing

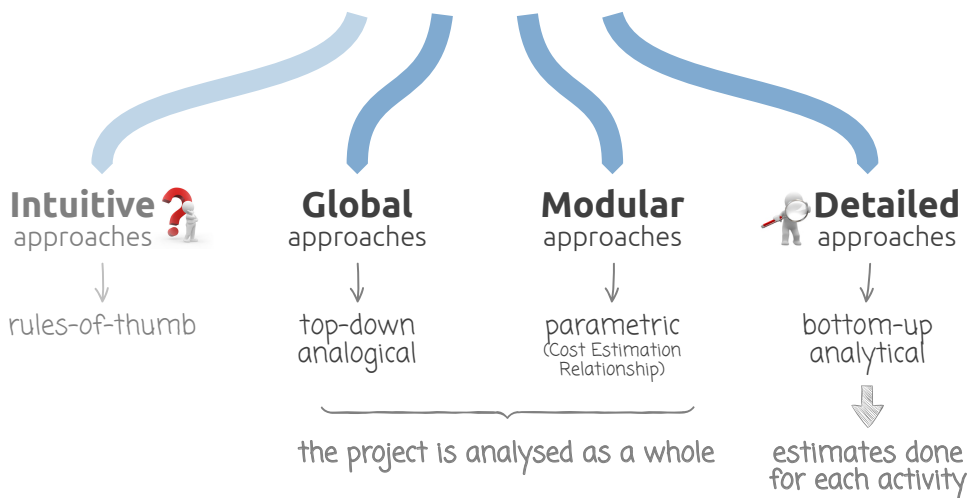
When and which effort?



Project Costing

1 **Estimating** the resources required to perform the project

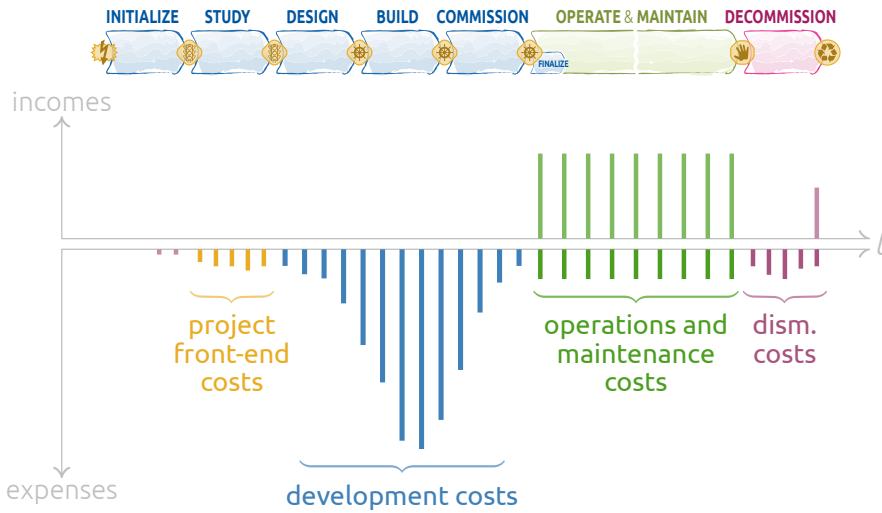
4 families of **cost estimating** approaches



Project Costing

1 **Estimating** the resources required to perform the project

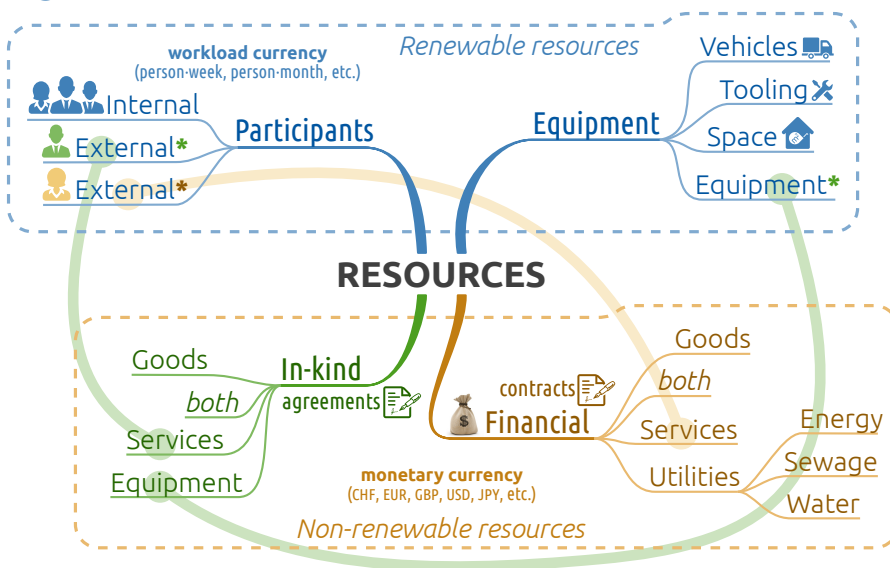
? Which **costs** (and incomes) to take into account?



Project Costing

1 **Estimating** the resources required to perform the project

? Which **costs** to take into account?



Project Costing

1 **Estimating** the resources required to perform the project

? Which **costs** (and incomes) to take into account?

▶ Only **chargeable costs** shall be considered !

▶ Cash flows that are **distorted** (i.e. suppressed or modified)

▶ Cash flows that are **generated** by the project

$$\text{Cash flows of the project} = \text{Cash flows of the organisation with the project} - \text{Cash flows of the organisation without the project}$$

▶ Past or irrecoverable costs: no! ← These costs will exist whatever the decision

▶ Renunciation costs: yes! ← Eg. the consequence of stopping a project that is already on-going

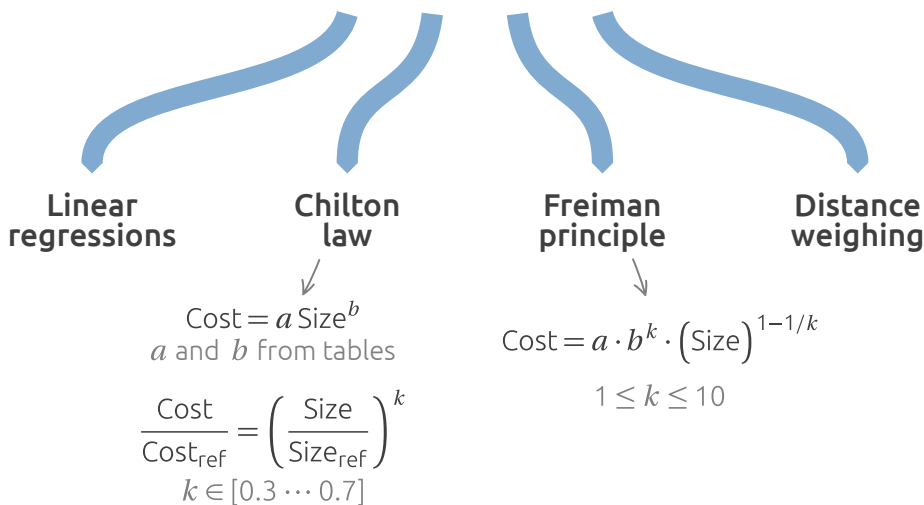
▶ Unquantifiable costs: no! ← Benefits sometimes replace incomes

Project Costing

1 **Estimating** the resources required to perform the project

1.1 Estimating with **global approaches**

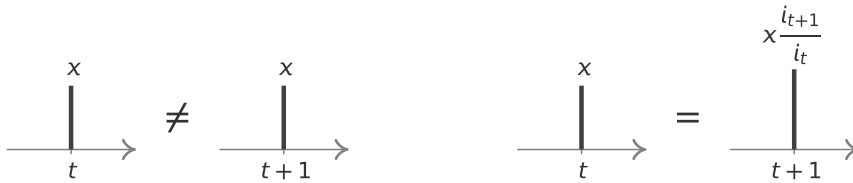
Global approaches



Project Costing

1 **Estimating** the resources required to perform the project

? Dealing with **price escalation**



$$\text{Cost}_{\text{now}} = \text{Cost}_{\text{past}} \cdot \left(\sum_{i=1}^n \omega_i \frac{\text{El}_{i \text{ now}}}{\text{El}_{i \text{ past}}} \right)$$

where

$\omega_i \rightarrow$ weighing coefficients so that: $\sum_{i=1}^n \omega_i = 1$
 $\text{El}_{i,t} \rightarrow$ appropriate economical indices

Project Costing

1 **Estimating** the resources required to perform the project

12 Estimating with **modular approaches**

Project cost as a function of several sizing parameters:

$$\text{Cost} = f(p_1, p_2, \dots, p_n)$$

where p_i are the sizing parameters

Software:

- ➔ TruePlanning® [PRICE System] (www.pricesystems.com)
- ➔ Cost+ [3F] (www.3f-fr.com)
- ➔ COCOMO for IT projects (csse.usc.edu)

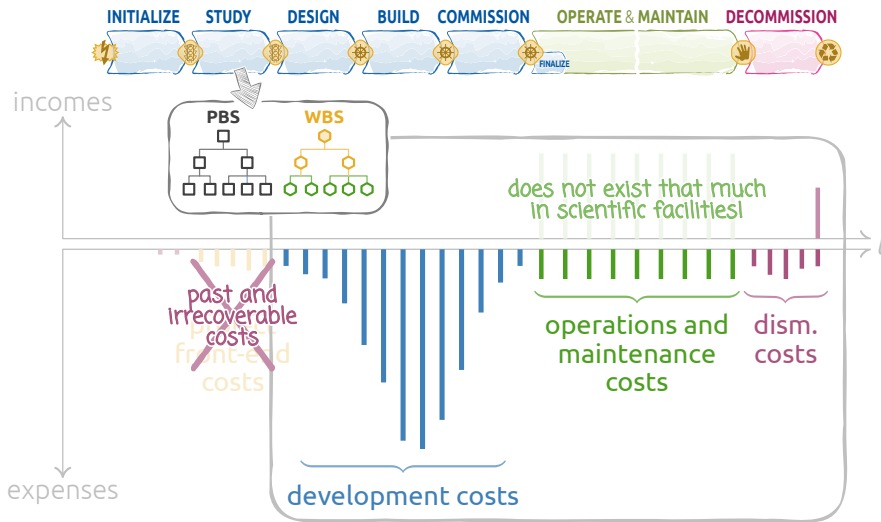
Handbook:

- **ISPA** (International Society of Parametric Analysts)
 Parametric Estimating Handbook (www.ispa-cost.org)

Project Costing

1 **Estimating** the resources required to perform the project

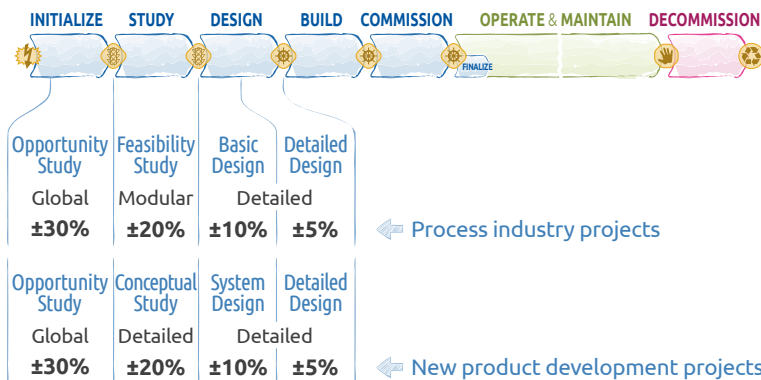
1.3 Estimating with **detailed approaches**



Project Costing

1 **Estimating** the resources required to perform the project

? Which **accuracy** can be obtained?



! imprecision ≠ uncertainty!

deterministic nature

probabilistic nature

Project Costing

1 **Estimating** the resources required to perform the project

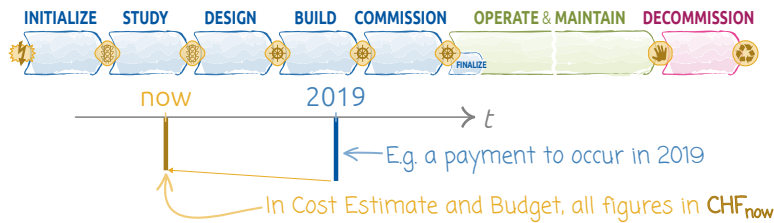
? How to deal with **interest rates** and future **price escalation**?

! cost of money \neq price escalation!

↑
interest rates
(financial concept)

↑
inflation
(economical concept)

▶ **All CF's shall be set as if they were paid now!**



Cost Estimate

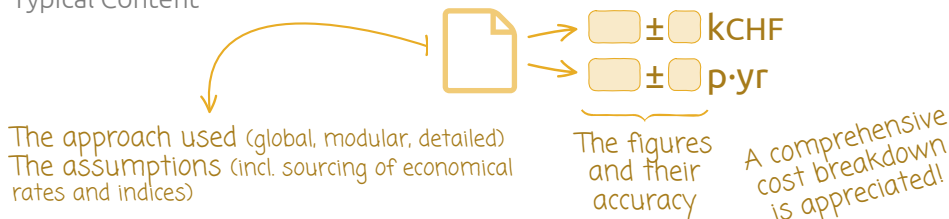
Editorial Process

⇒ **Authoring:** Study (or Project) Manager + a few Key Study (or Project) Participants

⇒ **Verification:** Some other Key Study (or Project) Participants + some experts in the fields

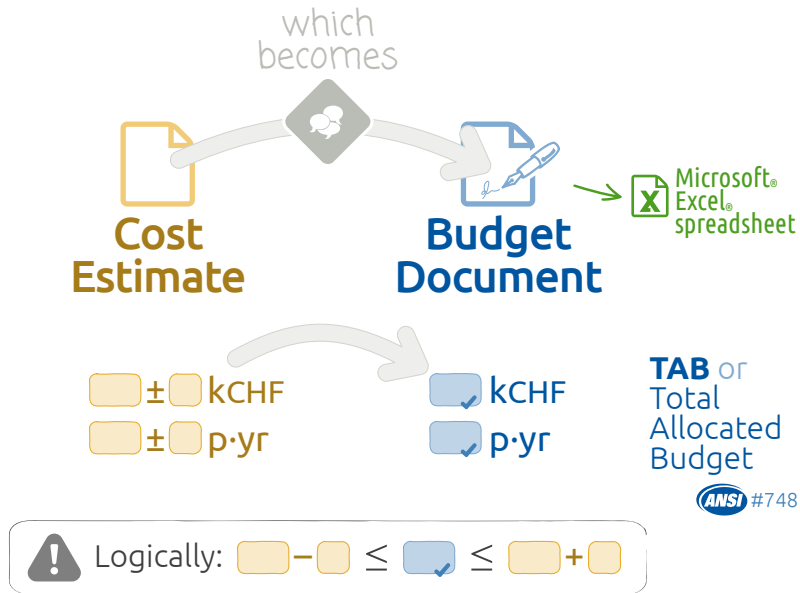
⇒ **Validation:** **Study (or Project) Manager**

Typical Content



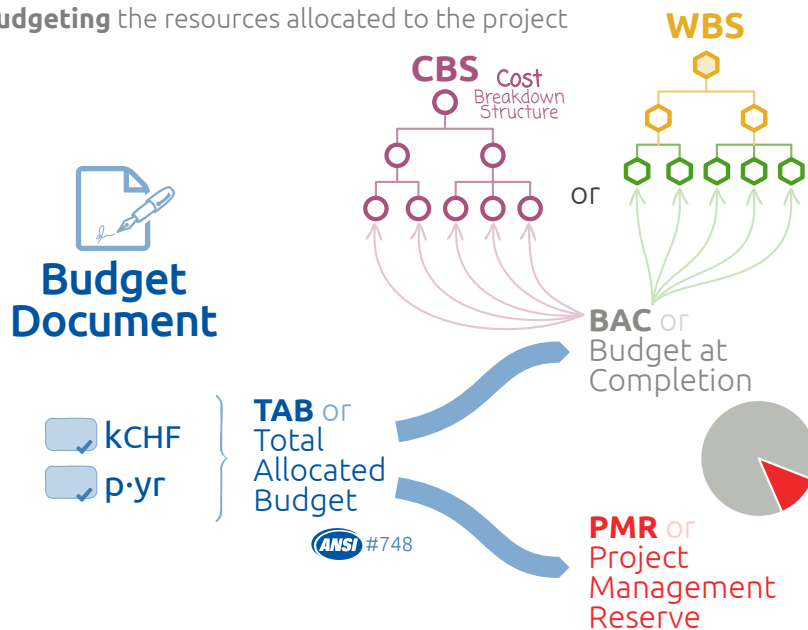
Project Costing

2 **Budgeting** the resources allocated to the project



Project Costing

2 **Budgeting** the resources allocated to the project



Budget Document

Editorial Process

