



Helber Macedo



is presenting

Credible Cost Estimates

at the

2024 International Training Symposium




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iceaaonline.com/its2024

Helber Macedo

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- Costing Manager at **Baker Hughes**  – Subsea Projects
- Author of book *A Practical Guide to Cost Engineering* (Routledge 2023)
- Certified by AACE – CCP (2014)
- Has over 17 years of experience in the energy industry.
- The author of a number of technical papers, developed and taught a variety of in-house cost estimating, construction, planning and industrial assembly courses for Petrobras.

Reality Check

I) Is it possible to avoid a cost overrun?

A) Yes

B) No

II) The majority of projects that you have been working

A) Respect the budget.

B) Has a cost overrun.

Go to the **slido.com** with **#4245857**

Objective

- Learn the ten critical factors to create a credible cost estimate.
- Embrace the probabilistic way to estimate the cost contingency.
- Change your cost review and validation through the Power BI dashboards.

Experience And Knowledge To Overcome Repeated Failures

I have been working on a major project since 2007, and because of the challenges and cases of cost overrun, I started to study the topic.



Several institutions and documents were used to support this presentation.



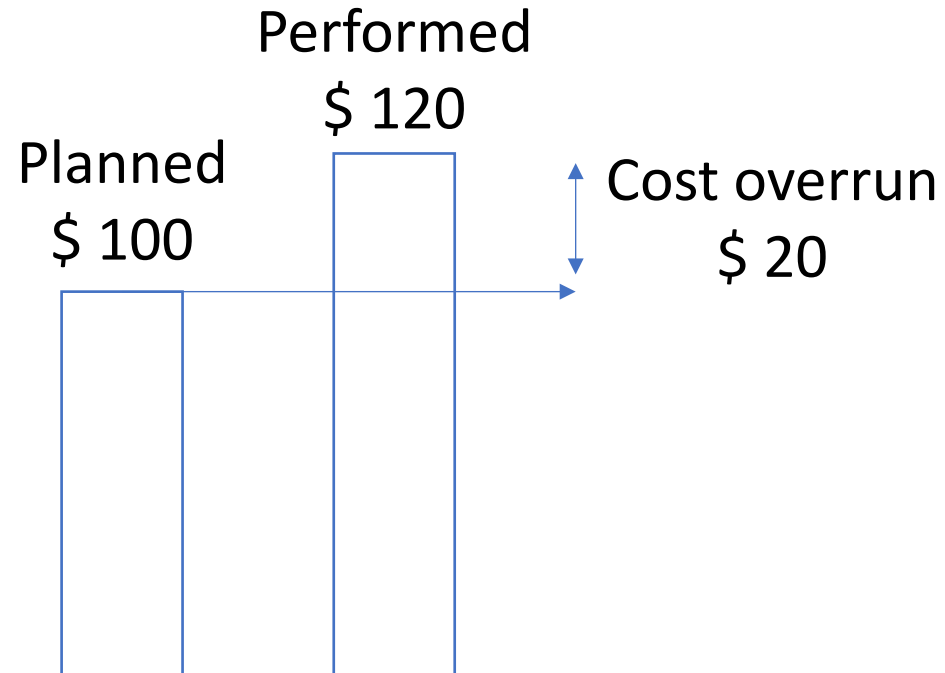
Cost Overruns



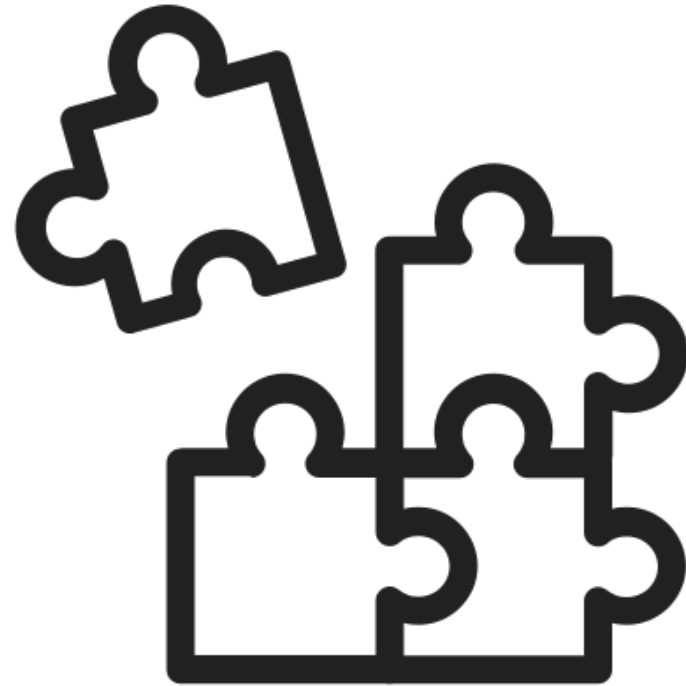
Cost Overrun Definition

“The actual costs for the work performed to date minus the estimate or value for that same work. If the actual costs are greater, it is an overrun; if the actual costs are less, it is an underrun.”

AACE International



Reasons for a cost overrun



FACTOR ONE

Poor scope definition

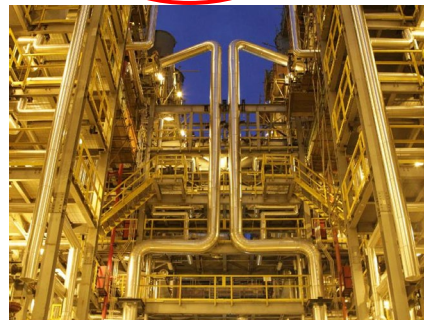
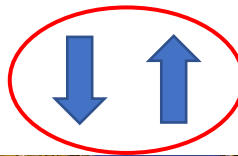
I- Poor Cost Scope Definition

- The most common reason for a cost overrun is **unclear scope definition**.
- Scope definition: “The sum of all that is to be or has been invested in and delivered by the performance of an activity or project.” (AACE International)



I- Poor Cost Scope Definition - Example

WBS - I		
Level	Description	%
1	Water Plant	30
1.1	Design	5
1.2	Procurement	35
1.3	Civil Construction	20
1.4	Mechanical and Elec. Assembly	35
1.5	Commissioning	5
2	Process Plant	70
2.1	Design	5
2.2	Procurement	32
2.3	Civil Construction	18
2.4	Mechanical and Elec. Assembly	38
2.5	Commissioning	7



Process Plant

WBS - II		
Level	Description	%
1	Water Plant	25
1.1	Design	5
1.2	Procurement	35
1.3	Civil Construction	20
1.4	Mechanical and Elec. Assembly	35
1.5	Commissioning	5
2	Process Plant	60
2.1	Design	5
2.2	Procurement	32
2.3	Civil Construction	18
2.4	Mechanical and Elec. Assembly	38
2.5	Commissioning	7
3	OFF-SITE (interconnection)	15
3.1	Design	3
3.2	Procurement	35
3.3	Civil Construction	25
4.4	Mechanical and Elec. Assembly	32
3.5	Commissioning	5

I- Poor Cost Scope Definition

How to mitigate

- Establish a clear process through a procedure.
- Define a method to define the scope (e.g., surveys, checklist, flowchart).
- Incorporated lessons learned.
- Consider a process to include the clarifications.
- Create a change management process.

FACTOR TWO

Significant changes were not
included

II- Significant Changes Were Not Included

- Changes will always be happening during the cost estimation process.
- Changes which are not adequately incorporated are one of the most common reasons for cost overruns.
- Typical changes
 - Different client requirements
 - Supply change
 - Strategy change

II- Significant Changes Were Not Included

Supply Change Case – Vessel Assembly

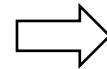
Supplier A provides material and labor assembly.

Supplier B provides only the labor assembly.

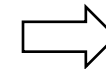


Supplier A

Quote Jan
Material \$ 0.5m
Labor \$ 1.6 m
Total \$ 2.1m



Variation



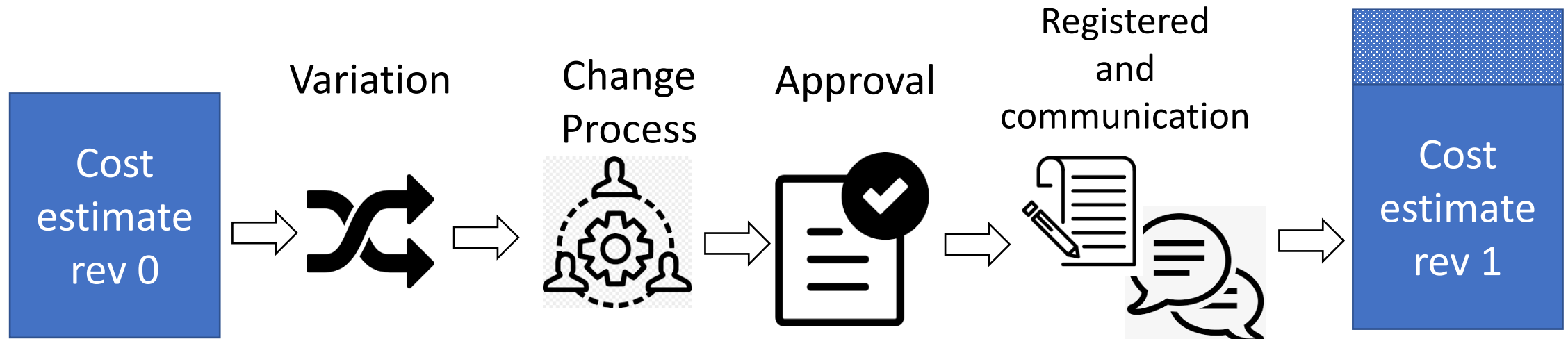
Supplier B

Quote Jan
Material not included
Labor \$ 1.2m
Total \$ 1.2m

II- Significant Changes Were Not Included

How to mitigate

- The revision control is critical.
- Cost estimation tool should support the control.



FACTOR THREE
Excluded costs were not
identified

III- Excluded Costs Were Not Identified

- Assumptions, constrains, and excluded cost should be identified and justified.
- Examples
 - Execution strategy
 - Work conditions
 - Weather conditions
 - Cost methodology
 - Cost references

III- Excluded Costs Were Not Identified

How to mitigate

Create a Basis Of Estimate (BOE). BOE is a document that defines the scope of the project, and ultimately becomes the basis for change management - AACE International

Have you been used a BOE?

Yes

No

FACTOR FOUR

Stakeholders were not engaged

IV- Stakeholders were not engaged

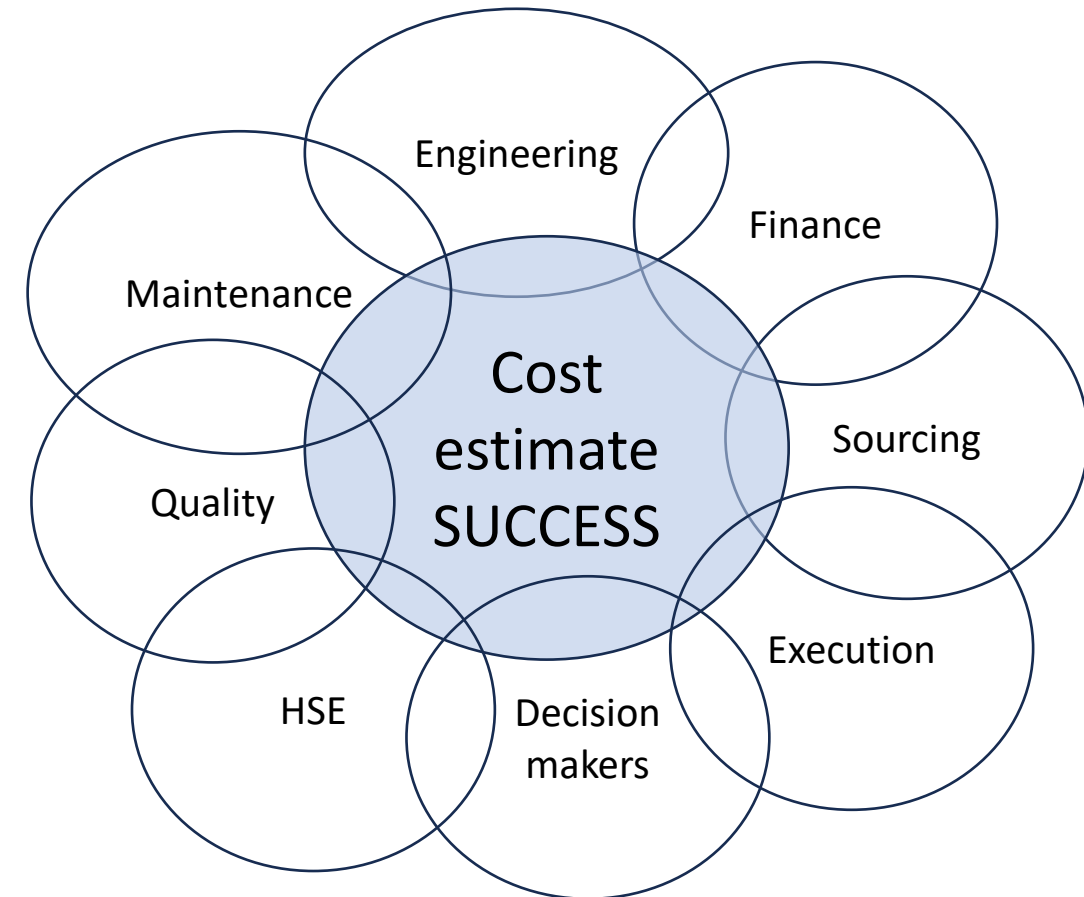
- All stakeholders should be engaged during the cost estimation process.
- Functions examples that the cost estimators team should engage.
 - Finance
 - Supply team
 - Engineering
 - Operation
 - ExecutionMaintenance
 - Decision makers
 - HSE
 - Quality
 - Sales & commercial

IV- Stakeholders were not engaged

How to mitigate

All stakeholders should be engaged during the cost estimation process.

- Meetings
- Decision gates
- Checklists
- Surveys
- Action Trackers (to do list)



FACTOR FIVE

Escalation were not included

V- Escalation were not included

Escalation refers to a persistent rise in the price of specific commodities, goods, or services due to a combination of inflation, supply/demand, and other effects such as environmental and engineering changes.

Factors



Inflation



Engineering changes



Political effects



Supply / Demand



Environmental effects

V- Escalation were not included

How to mitigate

Escalation must be estimated, and it contains the inflation.

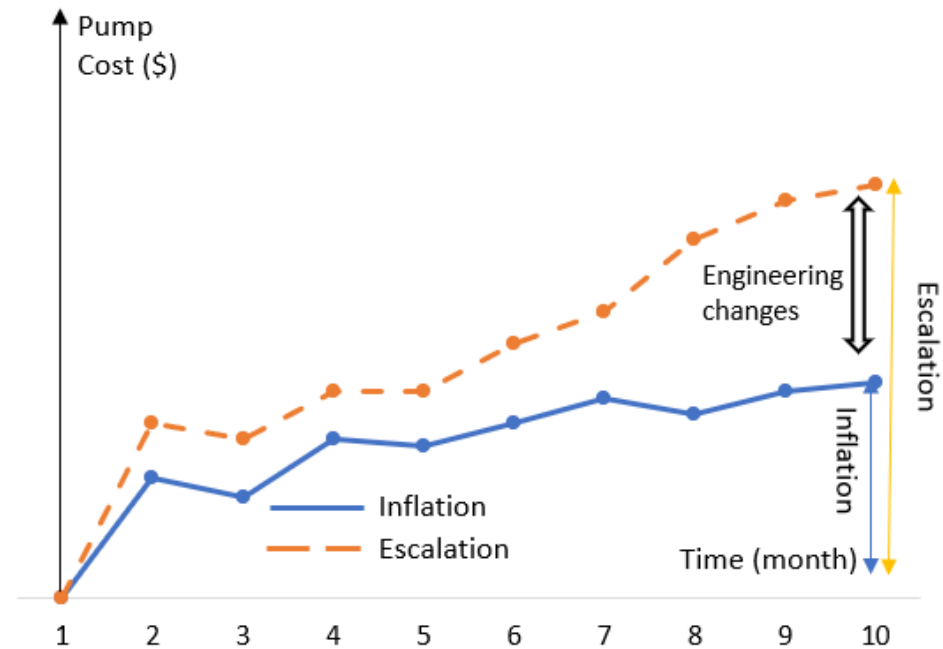
Overall, escalation is estimated by: **Cost x Index.**

Pump cost 2022 - \$ 100

Pump index to 2024 - 15%

Pump cost escalation

$$100 \times 1.15 = \$115$$



FACTOR SIX
WBS & CBS were not
standard

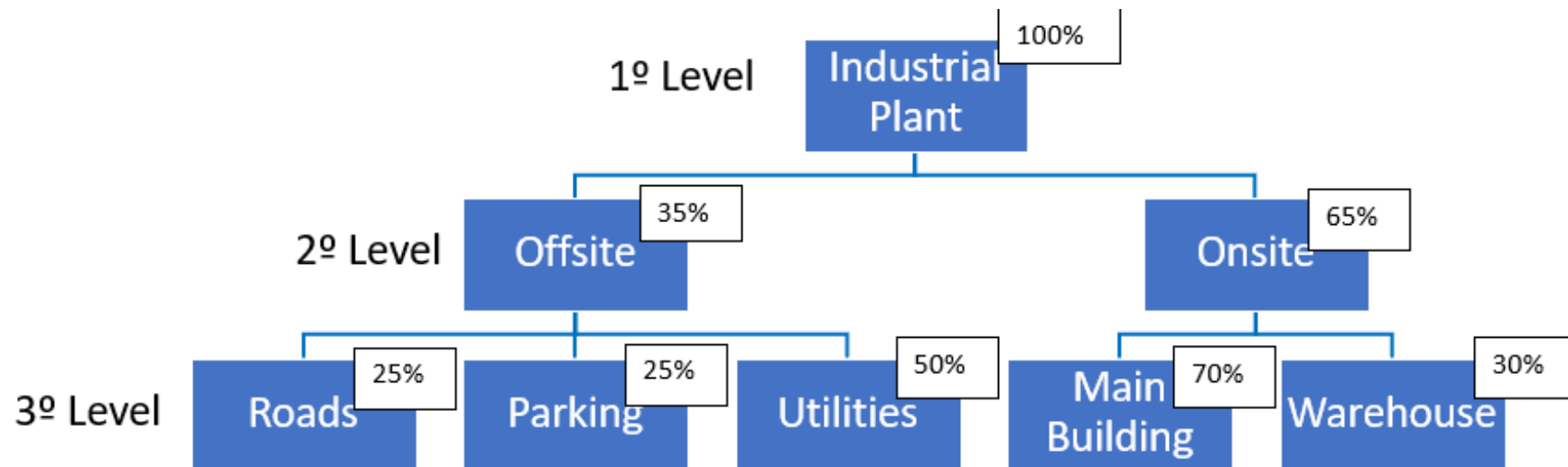
VI- WBS & CBS were not standard

- The lack of standards increases the probability of having a miss or error.
- The company should have standards that allow different systems, functions and segments to be adopted at the WBS and CBS (minimum for the top levels) to improve traceability and management.

VI- WBS & CBS were not standard

How to mitigate

- WBS dictionary: Document that describes in brief narrative format what work is to be performed in each WBS element.
- Publish a standard WBS

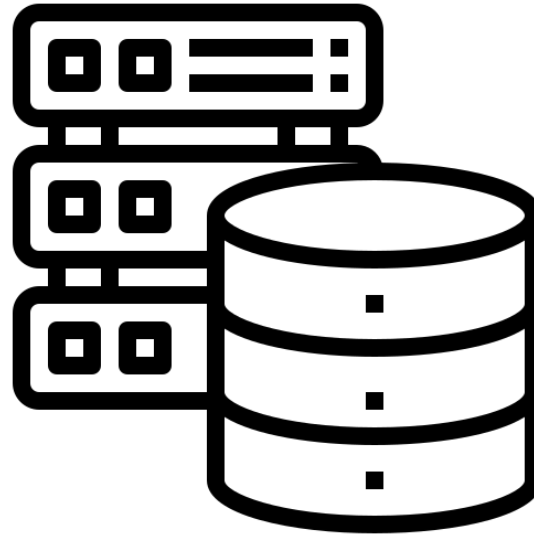


FACTOR SEVEN

Poor cost database

VII- Poor cost database

- Poor cost database promotes overtime activities, weak traceability, and low-cost accuracy.



VII- Poor cost database

How to mitigate

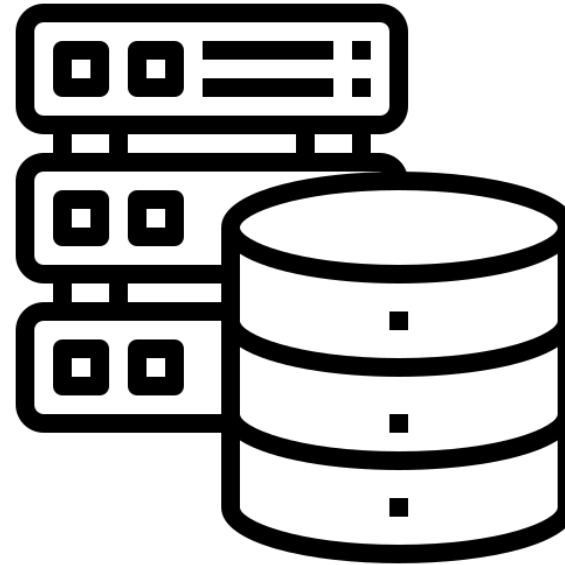
- Each cost reference should have:

ID Unique identifier (e.g.,
part number)

Reference date

Currency

Unit



Purchase order or quote
number

Quantity

Location

Supplier name

FACTOR EIGHT

Quick Turnaround

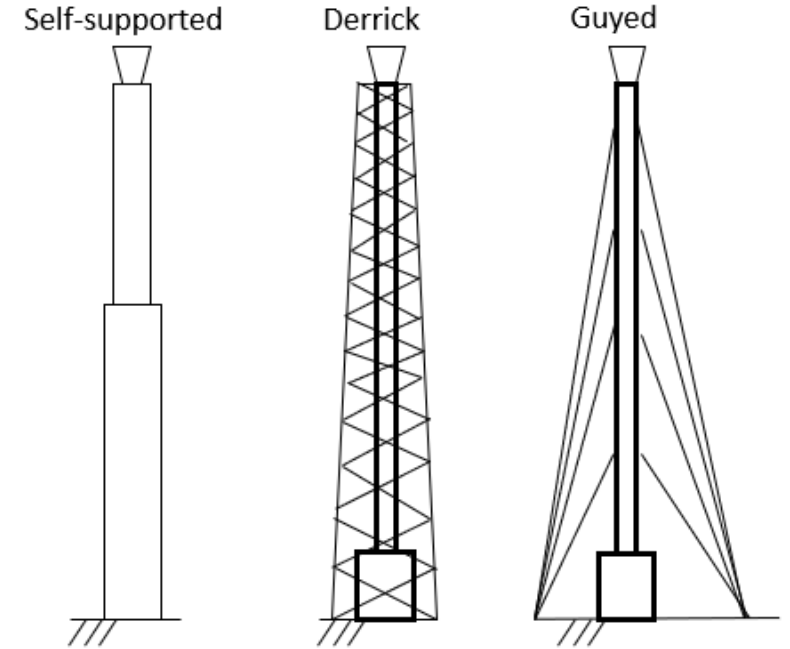
VIII- Quick Turnaround

- There is a direct correlation with errors or misses if there is not enough time to elaborate the cost estimate .

How to mitigate

- Cost Configurators provide a cost estimation based on previously defined costs.
- It combines conceptual and detailed methods, allowing a quick estimate and considerable accuracy and detail.

VIII- Quick Turnaround Cost Configurator Example



Flare structure type	Cost reference \$ million	Instrumentation	Factor instrumentation	Field	Factor field	Capacity (diameter)	Factor diameter
Derrick	35	Automatic	10%	Greenfield	25%	6"	0%
Guyed	28	Semi-automatic	0%	Brownfield	0%	8"	6%
Self-supported	33					10"	10%
						12"	15%

VIII- Quick Turnaround Cost Configurator Example

Inputs - O&G - Flare configurator

Flare structure Capacity
Instrumentation Field

Calculate

The cost estimated is \$ 28 million

Inputs - O&G - Flare configurator

Flare structure Capacity
Instrumentation Field

Calculate

The cost estimated is \$ 51.5 million

FACTOR NINE

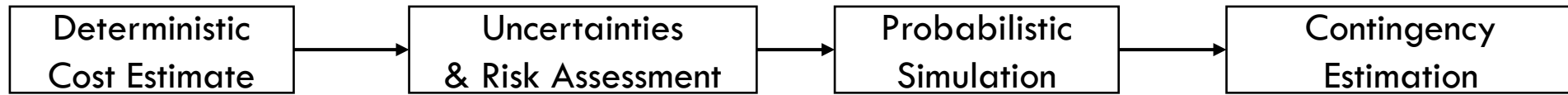
Poor contingency Estimation

IX- Poor contingency Estimation

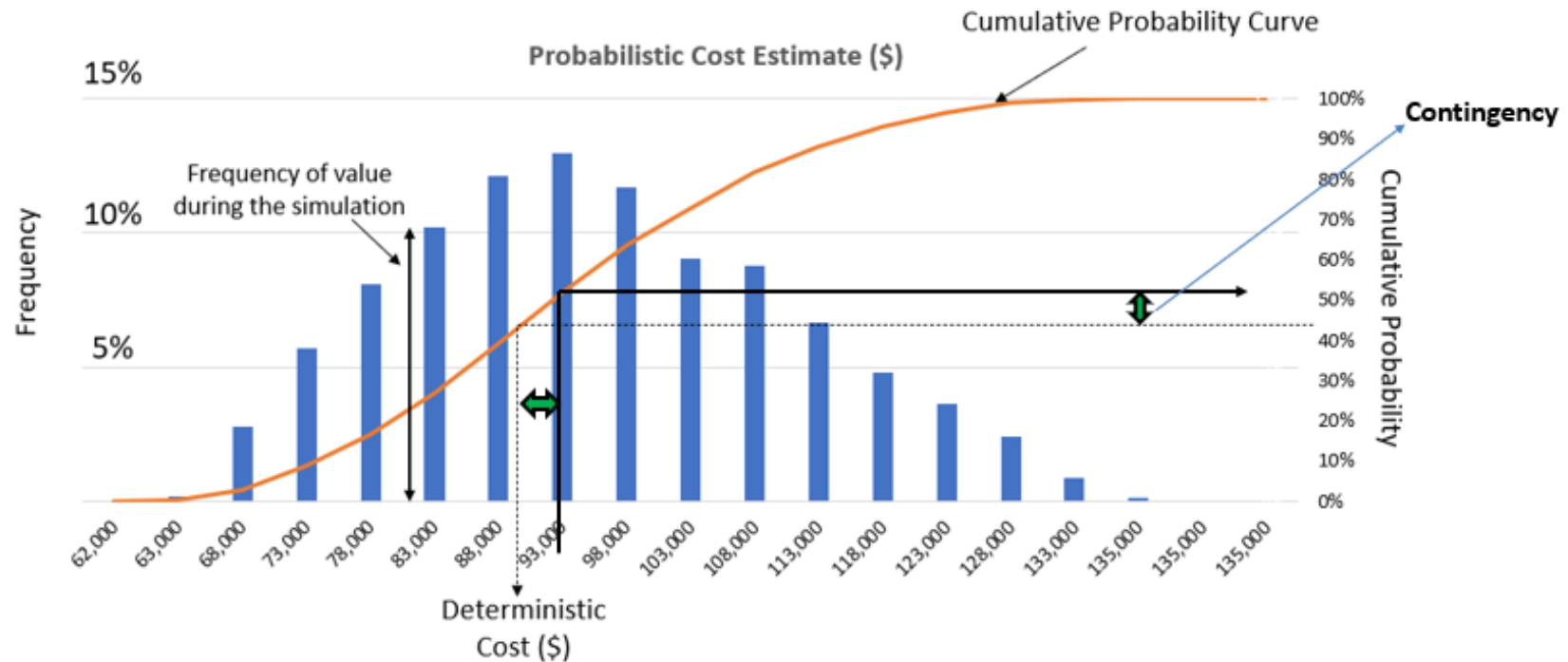
- Risks and uncertainties should be covered by cost contingency.
- Contingency could be estimated by different methods.
 - Predetermined Percentage
 - Expert Judgment
 - Parametric Modeling
 - Risk Analysis

IX- Poor contingency Estimation

How to mitigate - Probabilistic Method



\$ 4k (4%) should be added as a contingency to ensure that 50% of interactions are covered.



FACTOR TEN

Lack of independent review
and cost validation

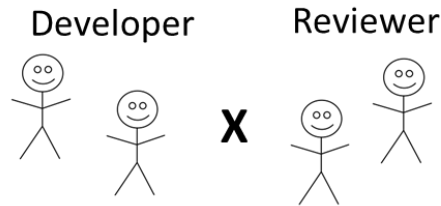
X- Lack of independent review and cost validation

- Pressure
- Urgency
- Lack of resources

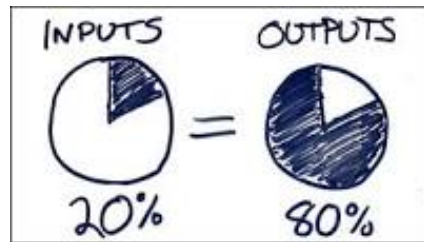
X- Lack of independent review and cost validation

How to mitigate

- Independent team



- Benchmarking and indicators to support the comparisons



Direct Cost
Indirect Cost

Equipment Cost
Total Cost

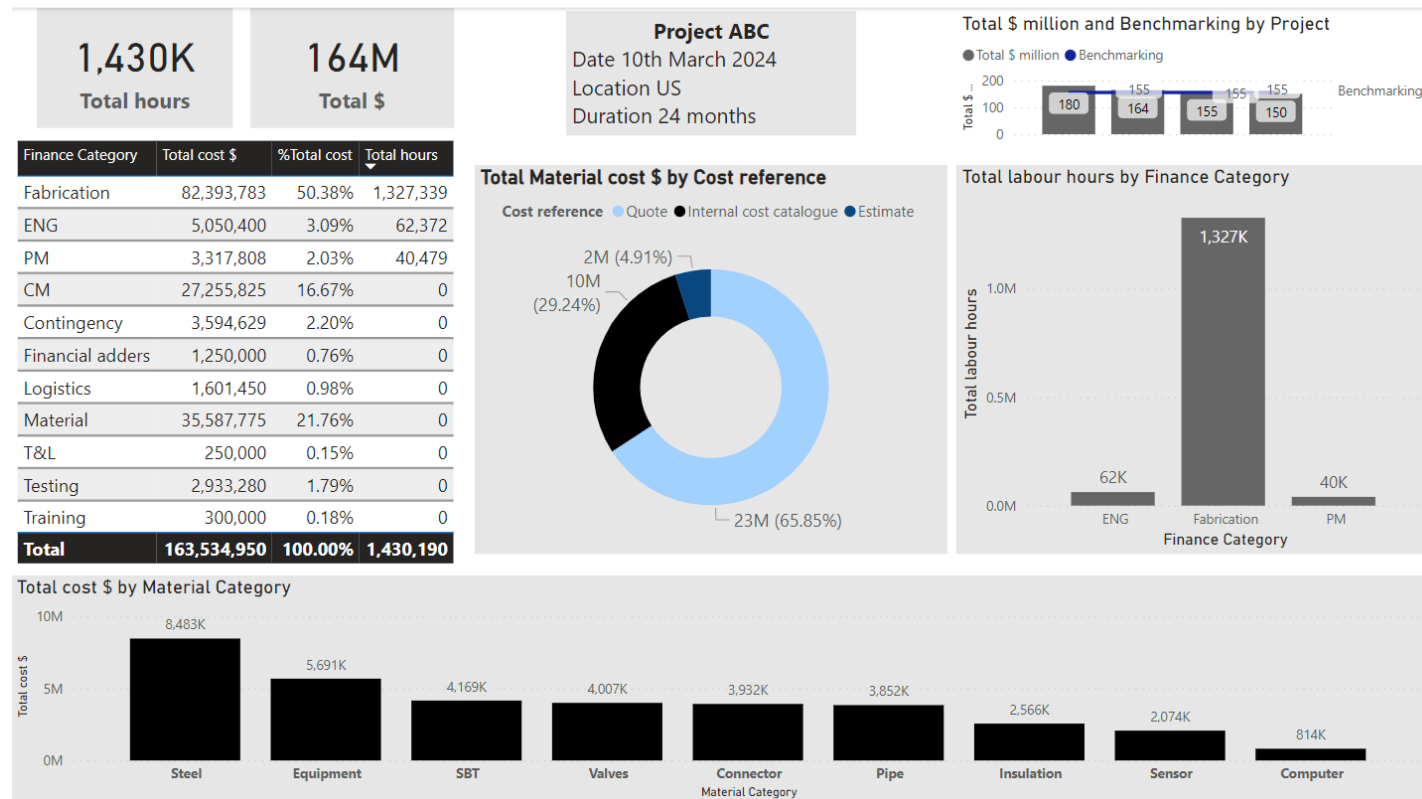
- Pareto principle



- Checklists

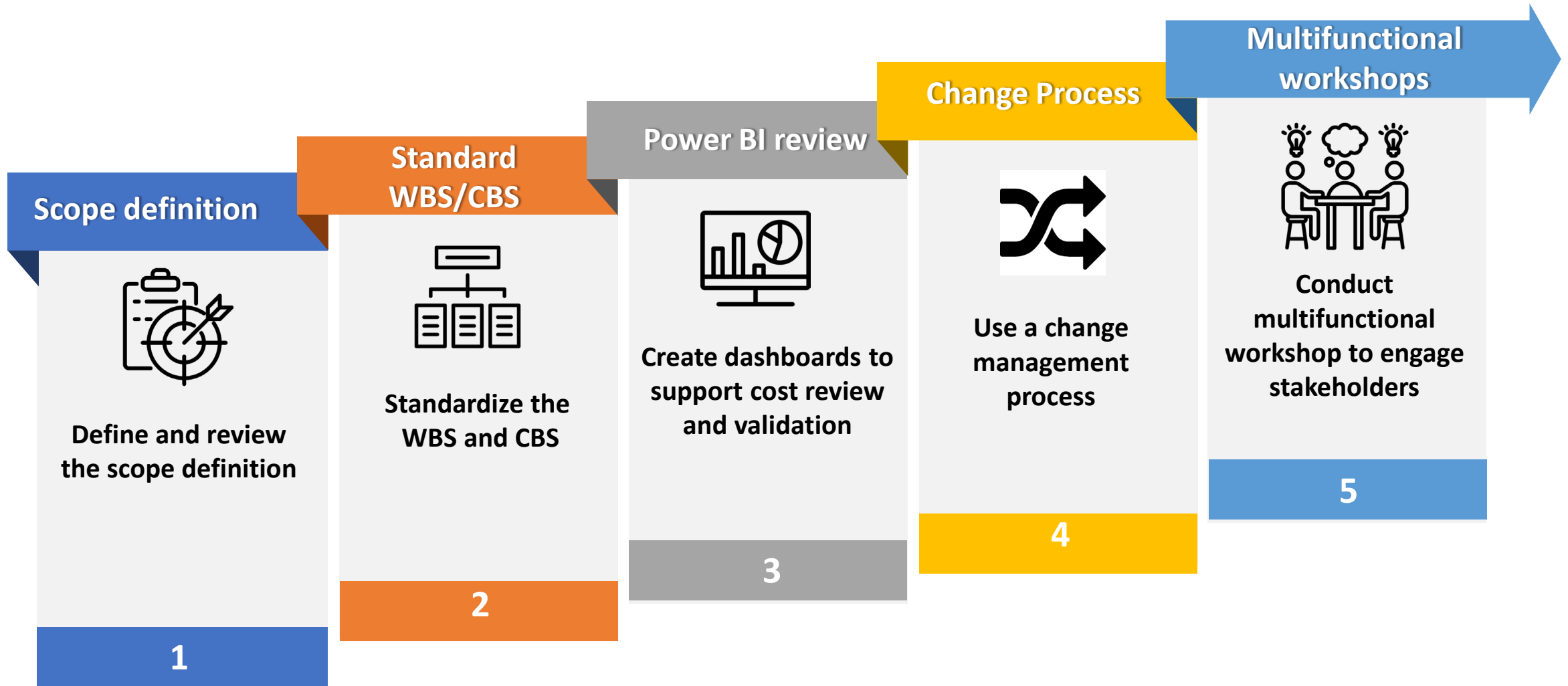
X- Lack of independent review and cost validation Power BI dashboard

The Power BI dashboard should be used to analyze the cost estimation through different approaches.

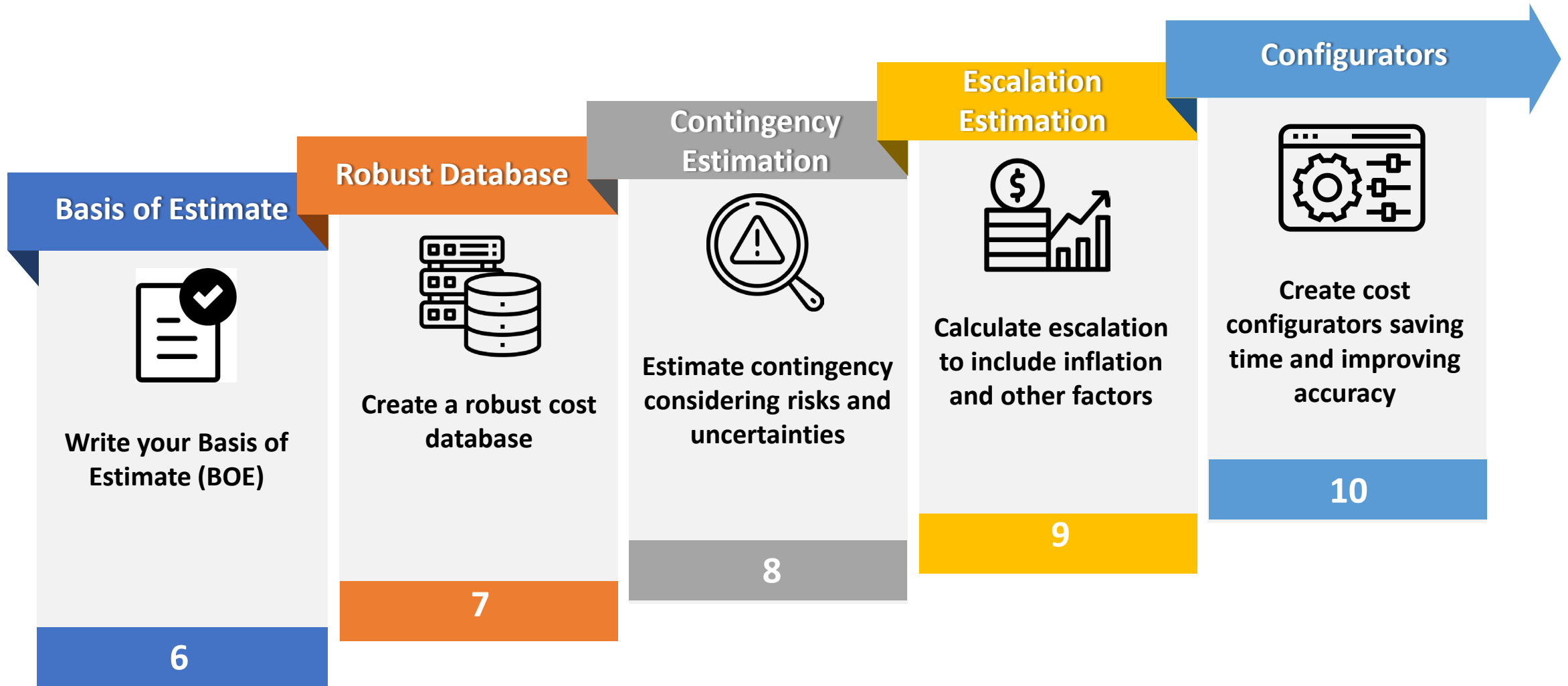


Summary & Action steps

10 Strategies In Creating A Credible Cost Estimate



10 Strategies In Creating A Credible Cost Estimate



Action steps

Yes, it is possible to have a credible estimate:

1. Implementing an independent cost review and validation through benchmarking.
2. Creating new tools to make quick cost estimations with good accuracy, such as configurators.
3. Elaborating standards WBS and CBS for your projects.
4. Using the Power BI dashboard to analyze and review your cost estimate.
5. Estimating your contingency through the probabilistic method.

Thank you!
Questions?

Additional Resources

A Practical Guide to Cost Engineering

1st Edition (By: Helber Macedo)

Promotional discount → 60%

Code PGCE60

To get a copy of the book, visit www.routledge.com

- ⦿ Direct link to the book: <https://www.routledge.com/A-Practical-Guide-to-Cost-Engineering/Macedo/p/book/9781032505824>

