

Smarter Risk Management Through Digital Project Twin for Cost, Schedule and Risk

January 16, 2021

International Construction Project Management Summit 2021

RiskConsult GmbH
Olympiastr. 39 • 6020 Innsbruck • Austria
www.riskcon.at

1. Introduction to RiskConsult
2. Risk Management Objectives
3. Problem Definition for Major Infrastructure Projects
4. System Integration

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Head of the Institute
Prof. Dr. Philip Sander





Founded in 2007

20 Employees

Headquarters:

- Olympiastr. 39
6020 Innsbruck, Austria

Additional Offices:

- Vienna, Austria
- Munich, Germany

Experts in Construction Cost and Risk Management:

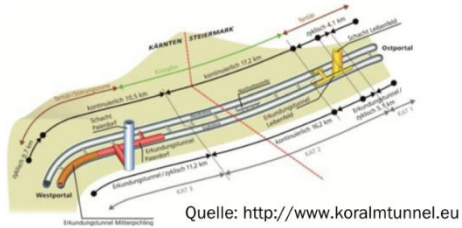
- Risk Management
- Cost Estimating
- Project Cost Controlling
- Alternative Contract Models
- RAMS - Reliability, Availability, Maintainability, Safety – Analysis
- Software Development

Proven experience from years of supporting large infrastructure projects in Europe, North and South America and Australia.



Risk Management – Infrastructure Projects

Rail Tunnel



ÖBB Koralm Base Tunnel

Project volume appr. € 1.5 billion



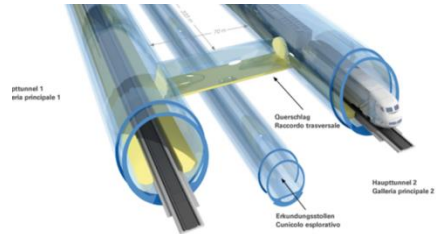
Hydropower Plant



Gemeinschaftskraftwerk Inn

Project volume appr. € 500 million

Rail Tunnel



Brenner Base Tunnel

Project volume appr. € 9 billion



Airport



New International Airport Lima

Project volume appr. \$ 2.5 billion



High-Speed Rail



ÖBB Lower Inn-Valley Railway

Project volume appr. € 2.3 billion



Water Supply



Delaware Aqueduct
New York City DEP



Risk Management – Urban Transit (Metros/Subways)

Vienna



Crossing / Extension U2/U5

Project volume appr. € 1 billion



New York



MTA Canarsie Tunnel, L-Train

Project volume appr. \$ 1.5 billion



Munich

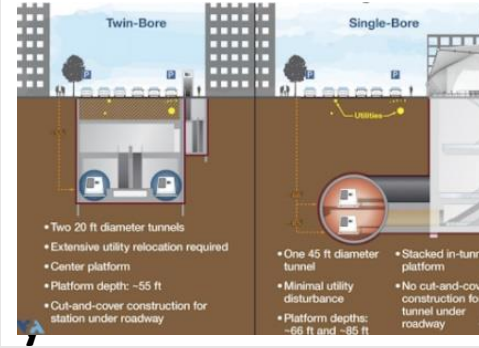


U6 Extension Martinsried

Project volume appr. € 150 million



SF Bay Area, USA



BART Silicon Valley – San Jose Ext.

Project volume appr. \$ 6 billion



Hamburg

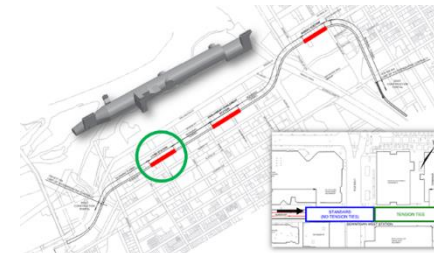


U5 East (Phase 1)

Project volume appr. € 1.7 billion.



Ottawa, Canada



Confederation Line

Project volume appr. \$ 2 billion



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Interaction of RM, Project Cost Control and Budget Planning

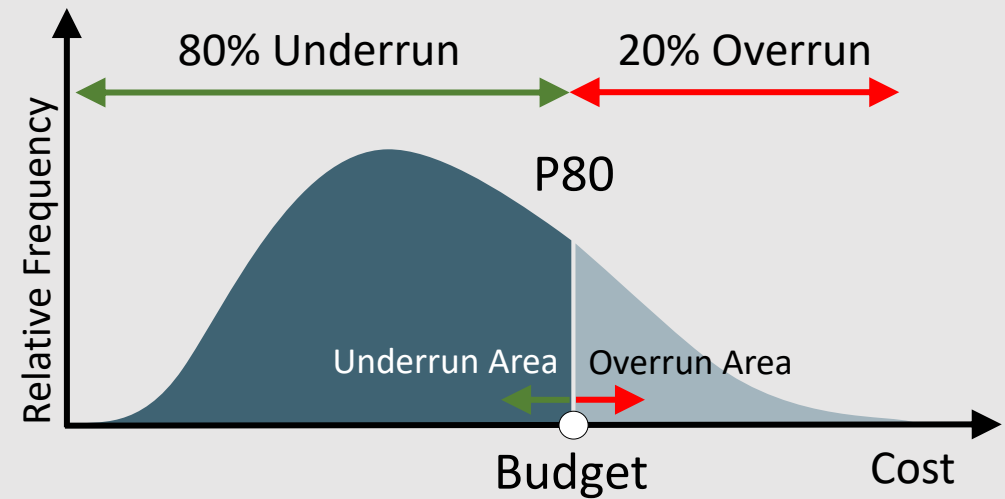
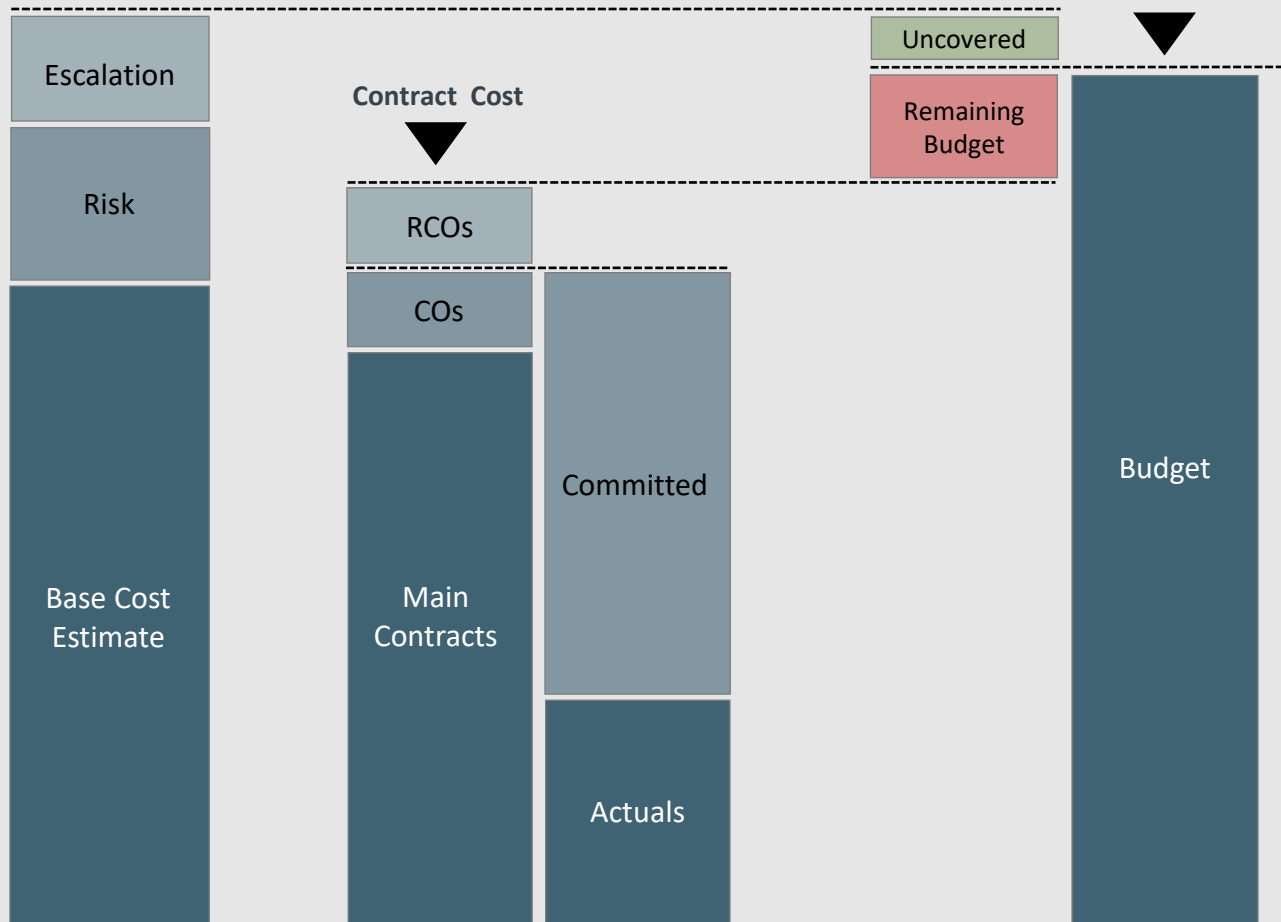
Risk Management

Project Cost Control

Budget Planning

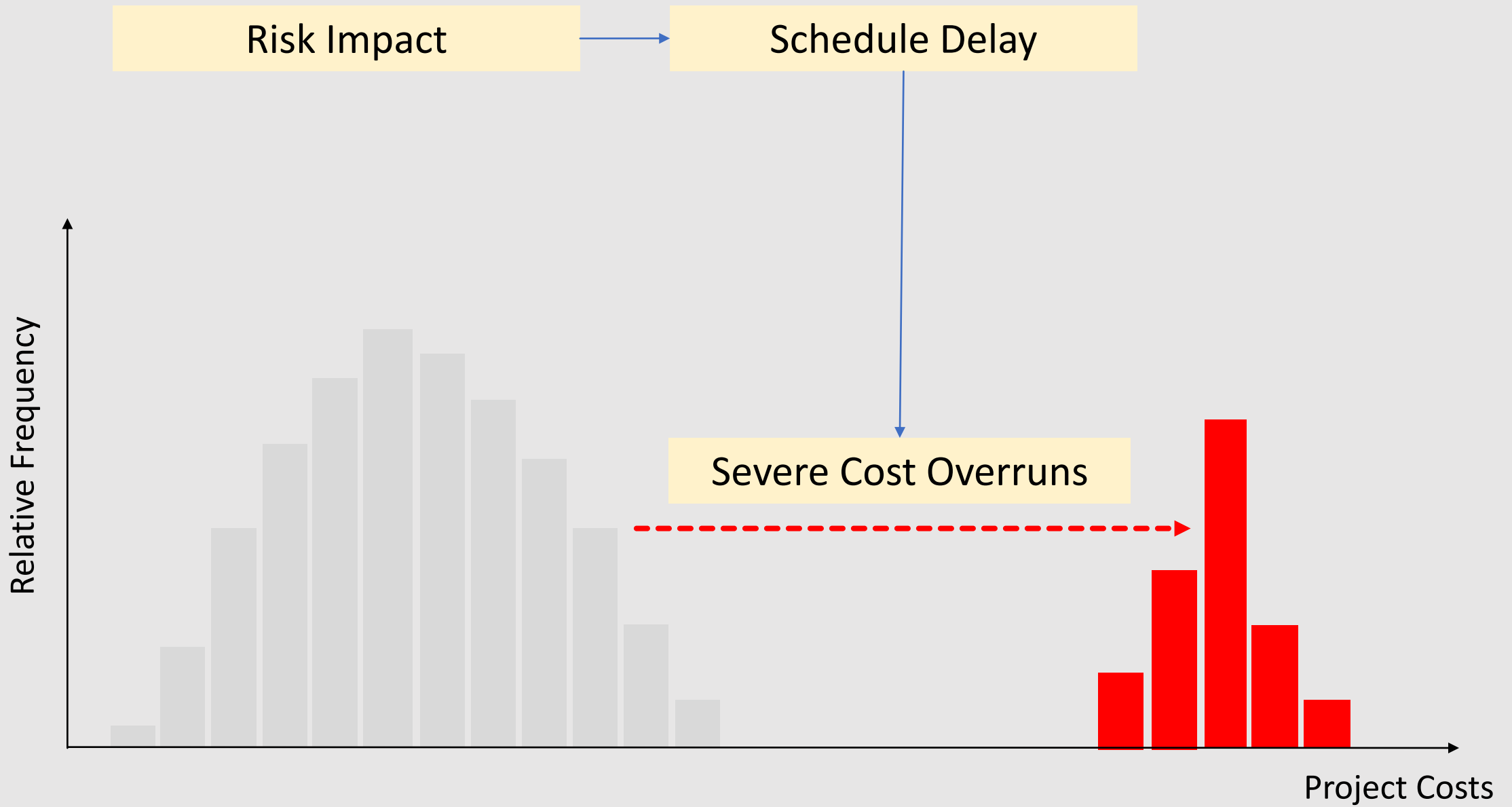
Total Cost Prediction
(Range)

Total Budget

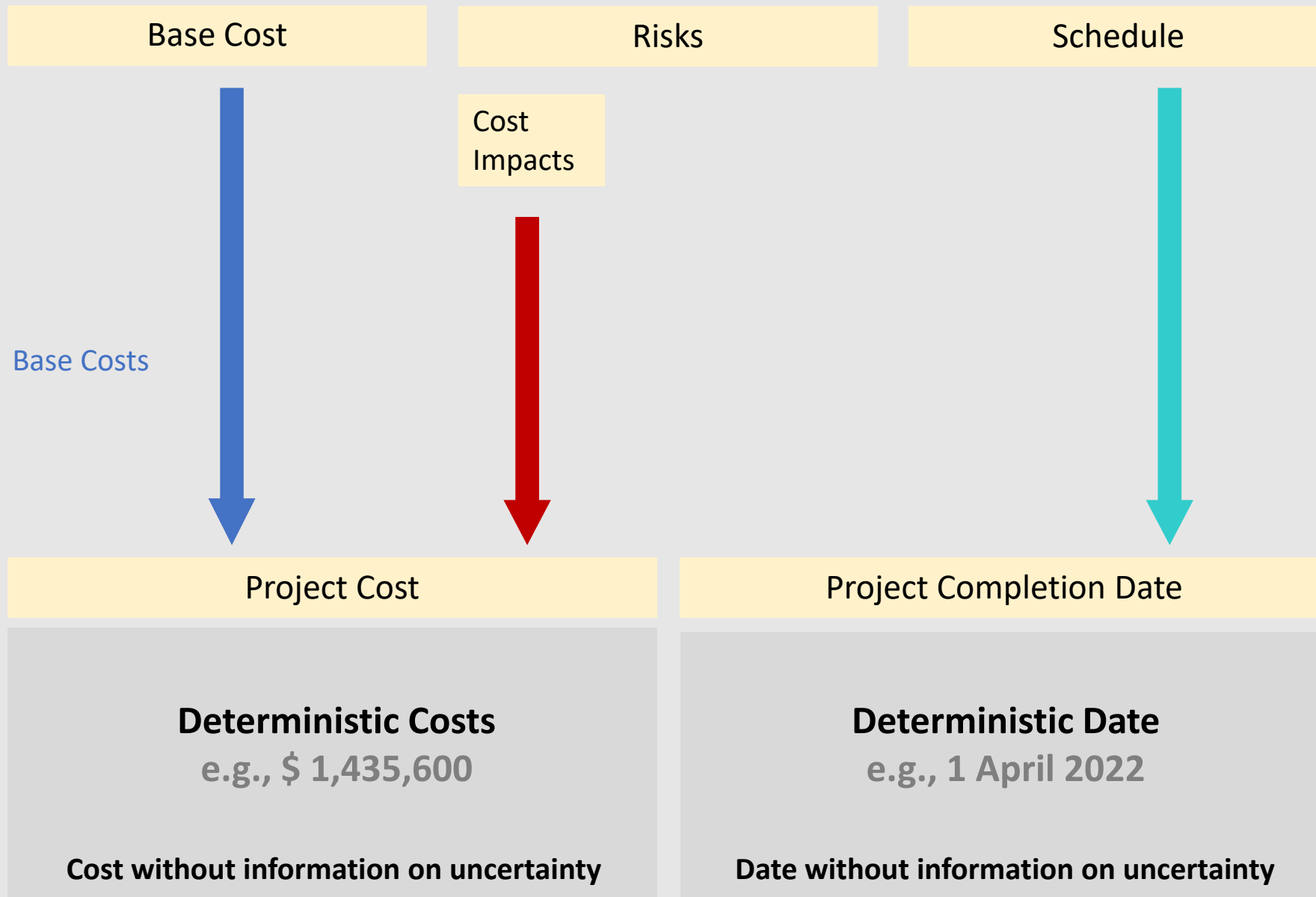


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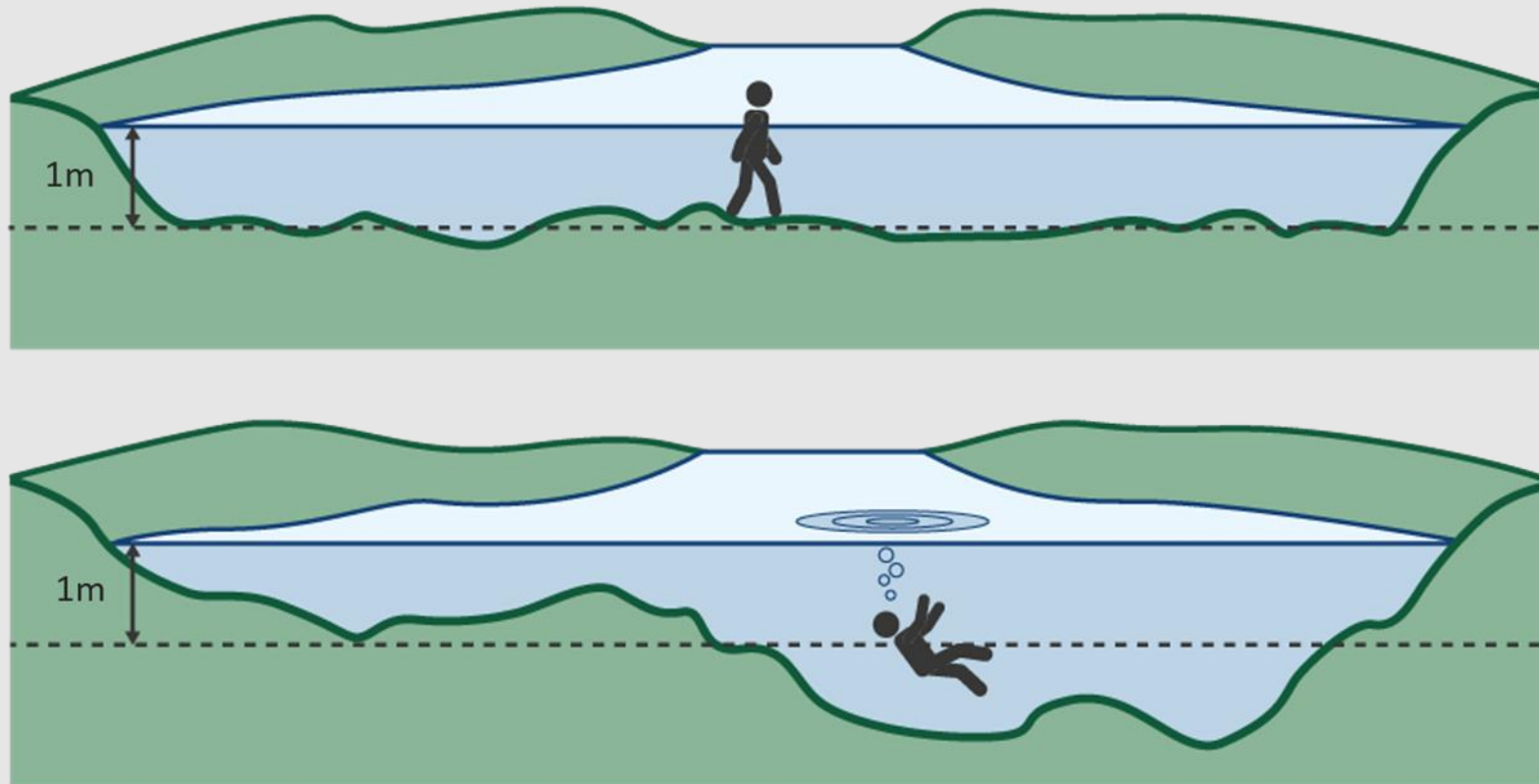
Impact of Delays on Project Costs



Standard Approach - Deterministic

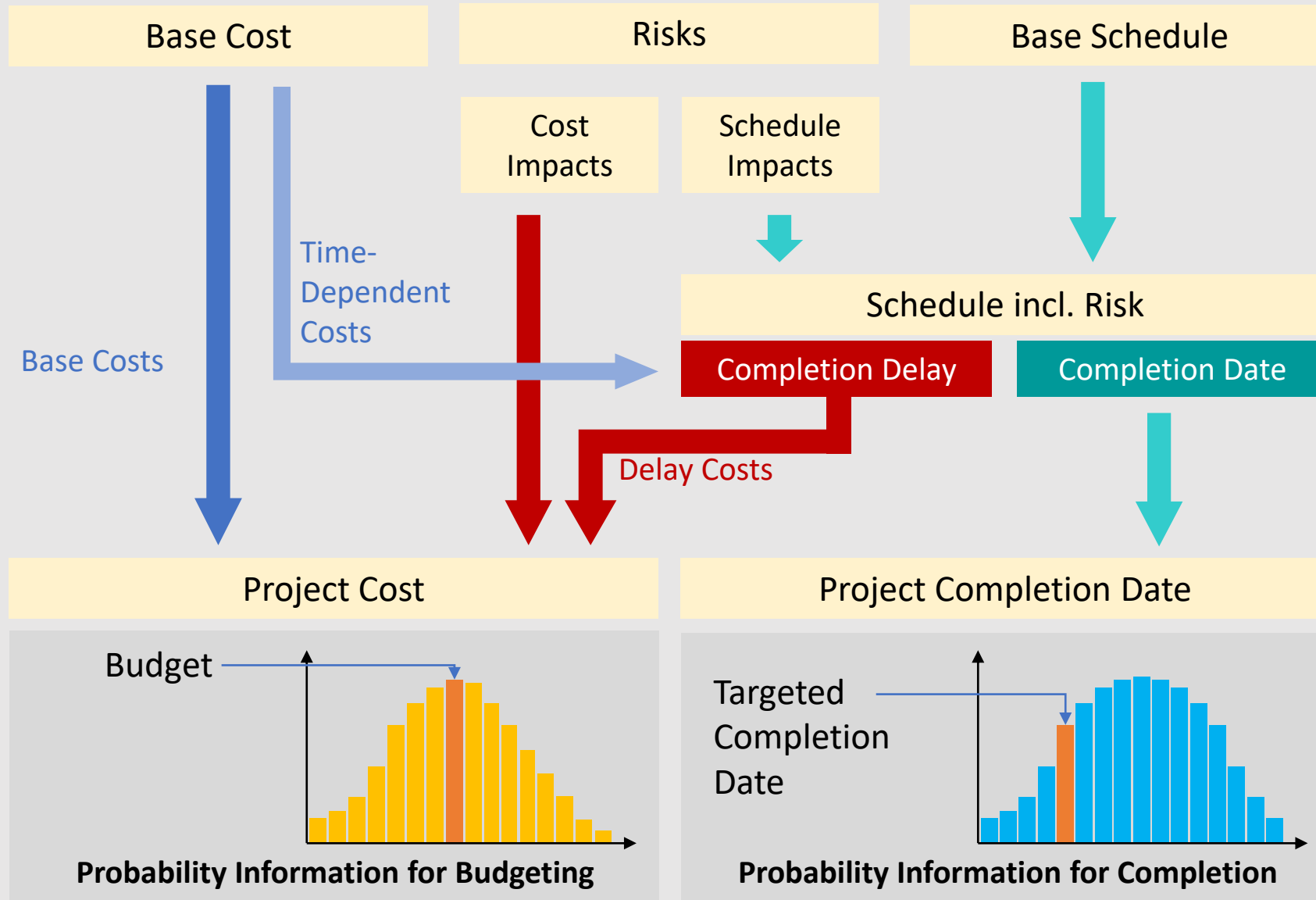


Would you wade across a river with an average depth of one meter?

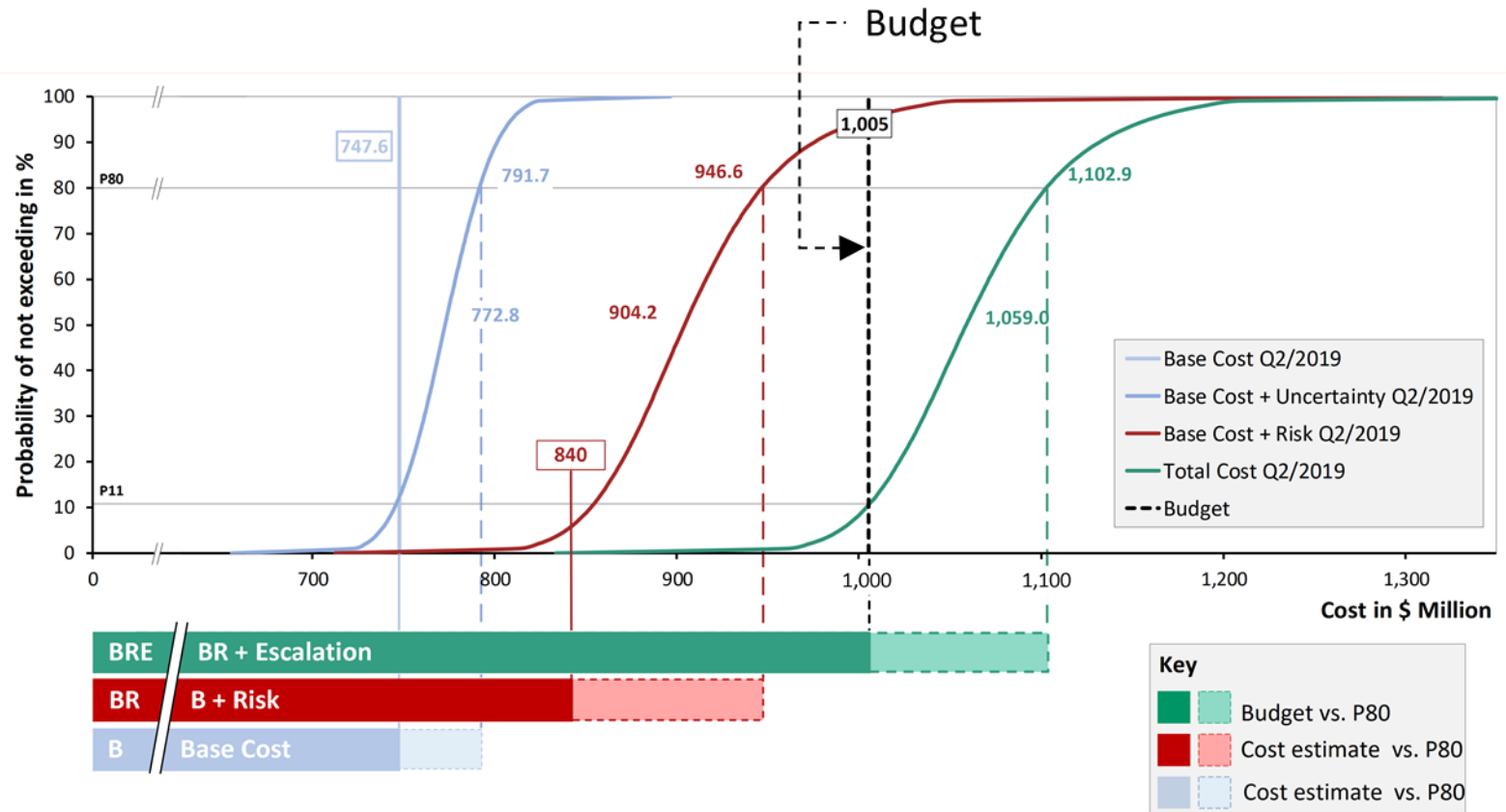
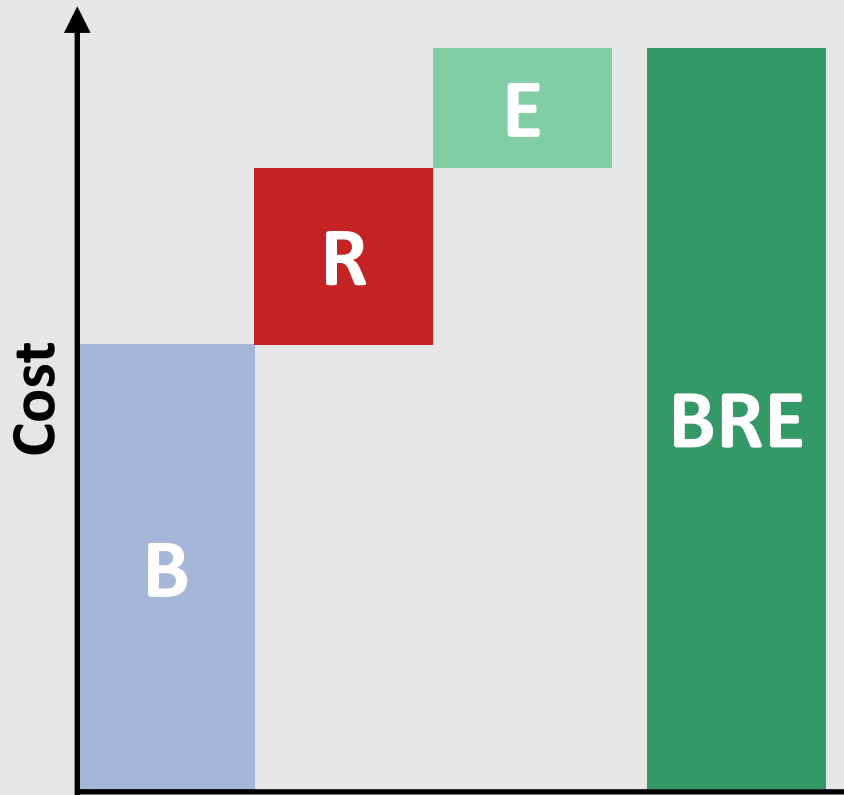


Nassim Nicholas Taleb: „The Black Swan“

Integrated Cost and Schedule Model



Cost Components and Probabilistic Results



Project Risk Twin

Input

Project Risk Twin

Output/Results

Cost

Schedule

Risk

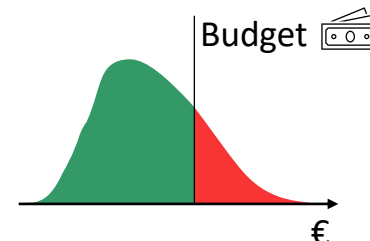
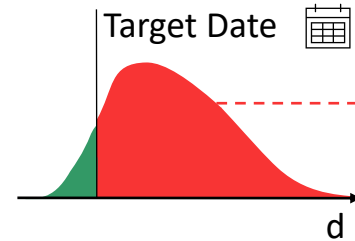
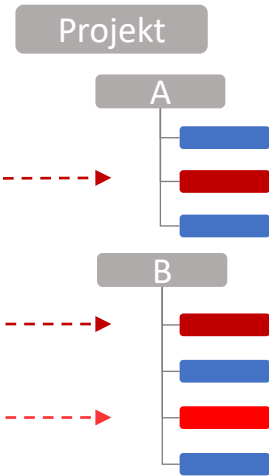
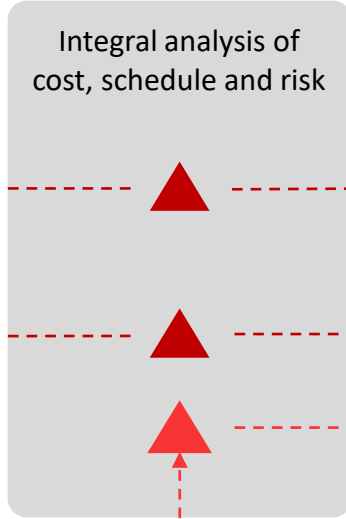
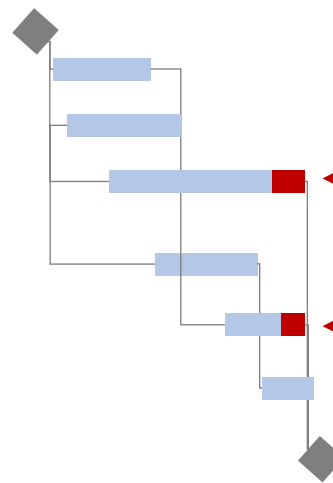
Budget



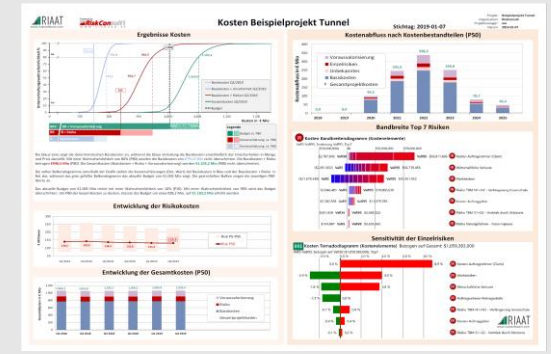
Condensed Schedule

Risk Register

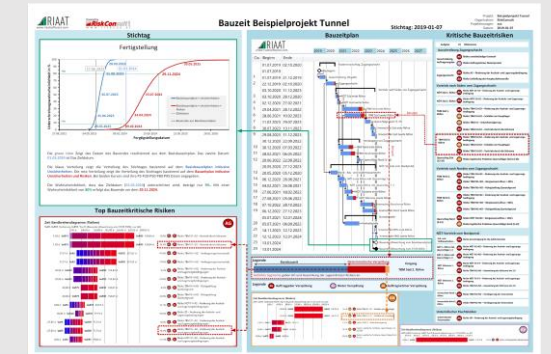
WBS Cost



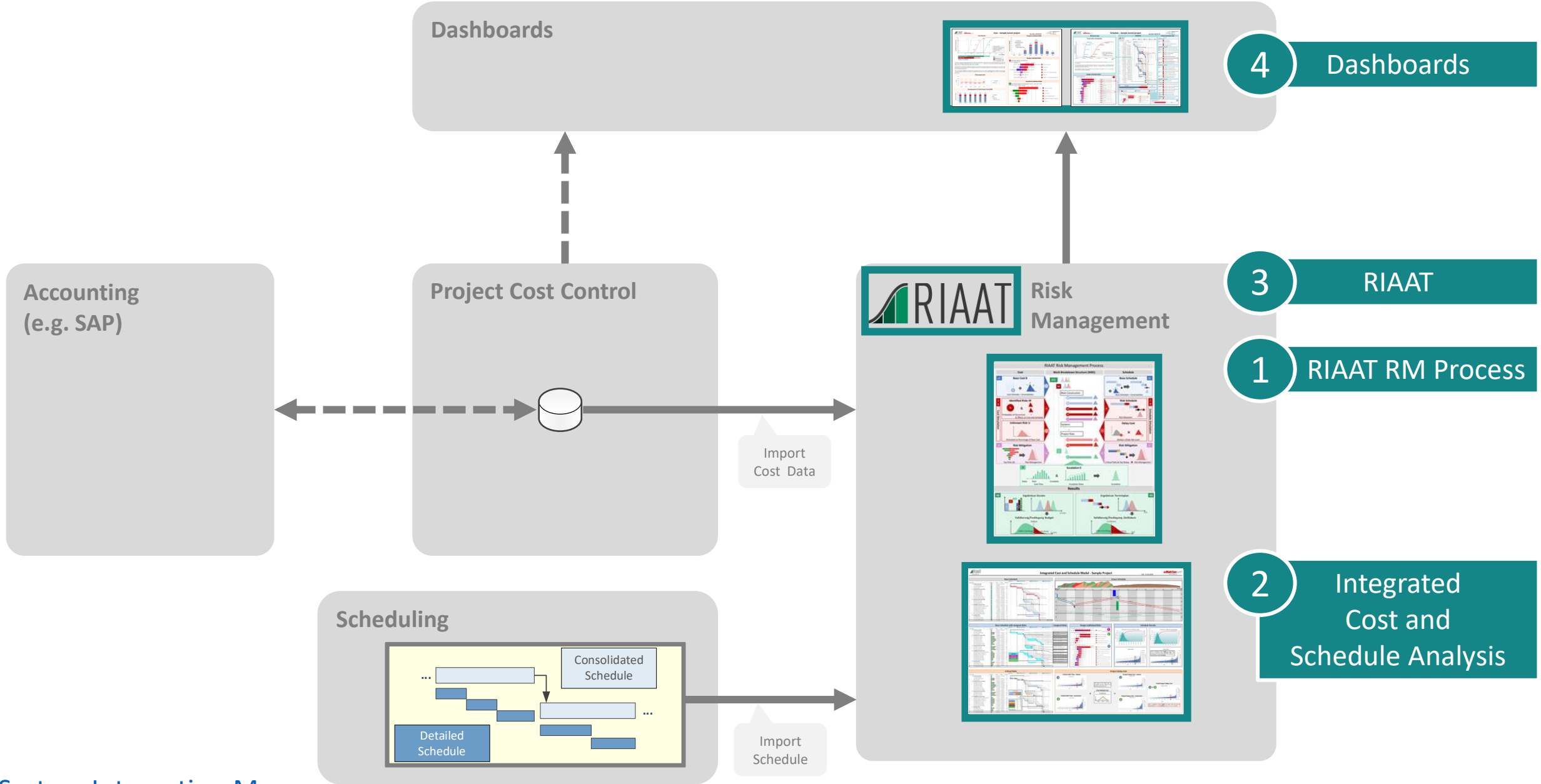
Dashboard Cost



Dashboard Schedule



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System Integration Map

Open Tunneling Project in RIAAT

The screenshot displays the RIAAT v2.7.1.3335 software interface, divided into three main panels for a project named '02 Sample tunnel project_en_V03_Assistance.riaat'.

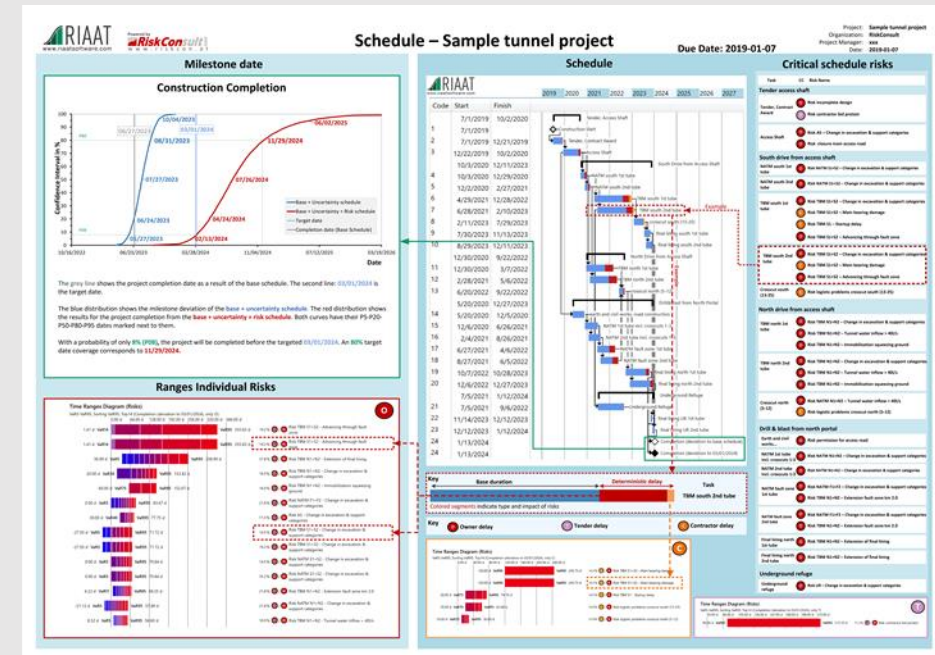
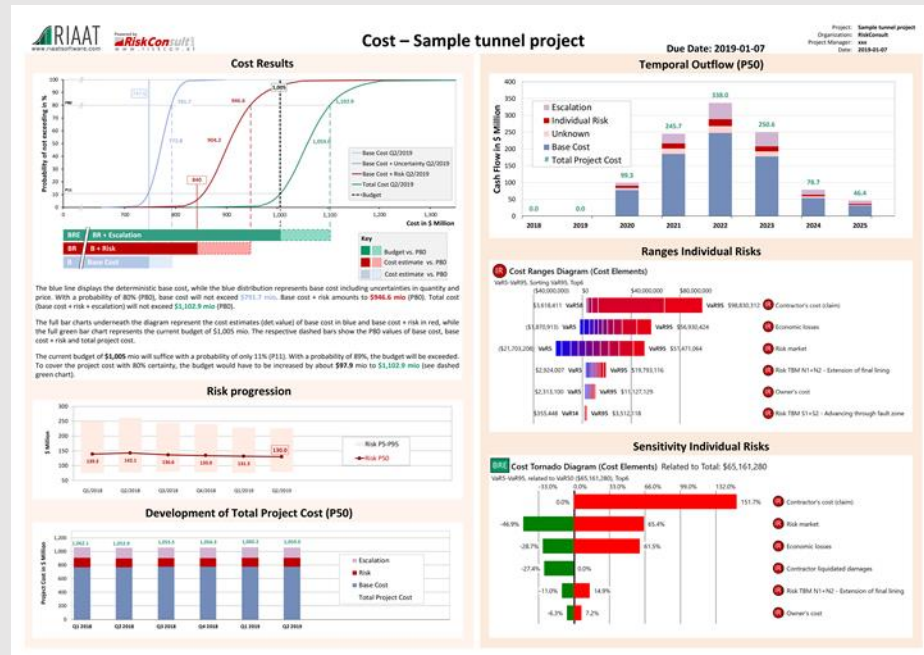
Left Panel: Project Tree
 Shows a hierarchical structure of project components with associated costs. Key items include:
 - PRJ Tunnel Project (MS 1212.621, MS 1016.530)
 - PRJ.01 Owner's Indirect Cost (MS 200.203, MS 1...)
 - PRJ.01.P Property (MS 2.644, MS 2.503)
 - PRJ.01.I Investigation (MS 1.989, MS 1.900)
 - PRJ.01.D Design & Engineering (MS 105.123)
 - PRJ.01.R General Risks (MS 62.047, MS 32.47)
 - PRJ.01.E Escalation (MS 27.363, MS 21.363)
 - PRJ.02 Construction Contract (MS 1009.695, MS...)
 - PRJ.02.T Tunnelling Works (MS 503.172, MS...)
 - PRJ.02.T.01 NATM Tunnel (MS 90.260, MS...)

Middle Panel: Fundamentals & Cost Analysis
 - **Fundamentals:** Due date: 8/25/2016, Created: 3/25/2014 4:13:14 PM, Last modified: 5/13/2020 12:32:59 PM.
 - **Cost Analysis:** Set of evaluated cost components: Standard. Total Project Cost: Det. \$1,016,529,964.24.
 - **Distribution Function:** A histogram showing the impact in USD x1,000. The x-axis ranges from 950,194.9 to 1,722,135.1. The y-axis shows Relative Frequency from 0.0% to 16.1%.
 - **Cost Breakdown Table:**

BR	Base Cost + Risk	Det.	\$887,604,544.75
B	Base Cost	Det.	\$747,661,893.29
R	Risk	Det.	\$139,942,651.46
IR	Identified Risks	Det.	\$80,129,700.00
U	Unknown	Det.	\$59,812,951.46
E	Escalation	Det.	\$128,925,419.49

Right Panel: Gantt Chart (Base + Risk Schedule)
 - **Project Start:** 12/25/2018 (Co...)
 - **Calendar:** 2021, 2022, 2023, 2024, 2025, 20
 - **Tasks:** Tender, Access Shaft; South Drive from Access Shaft; North Drive from Access Shaft; Drill&Blast from North; Underground Refuge.
 - **Sub-tasks include:** Construction Start, Tender, Contract Award, Access Shaft, NATM south 1st/2nd tube, TBM south 1st/2nd tube, crosscut south (13-25), final lining south 1st/2nd tube, TBM north 1st/2nd tube, crosscut north (5-12), earth and civil works, road construction, NATM 1st/2nd tube incl. crosscuts 1-3, NATM fault zone 1st/2nd tube, final lining north 1st/2nd tube, Underground Refuge, final lining UR 1st/2nd tube.

Tunneling Project Dashboards



Content adjusted according to the organization / project