

MICHAEL TRUMPER
LEV VIRINE

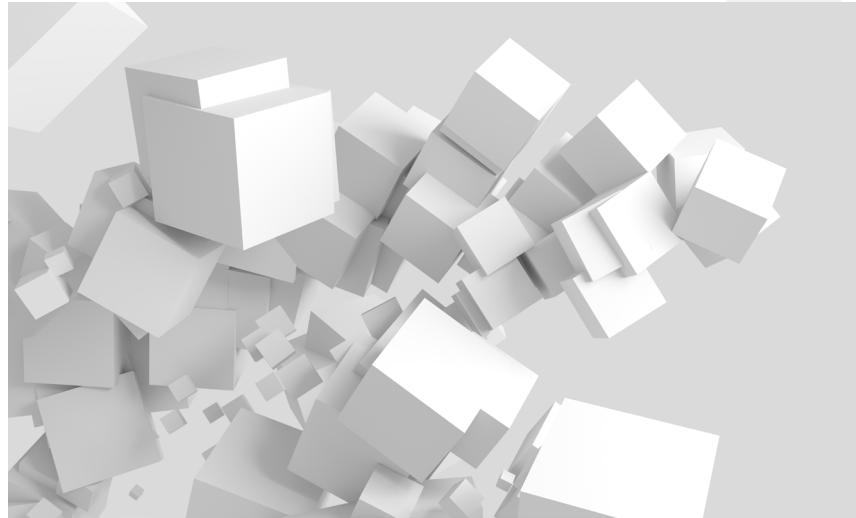
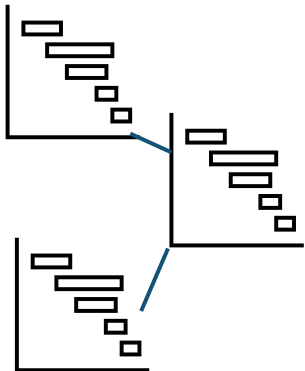
Cost and Schedule Risk Analysis of Megaprojects

**SUBMITTED TO ICEAA
2022 WORKSHOP**

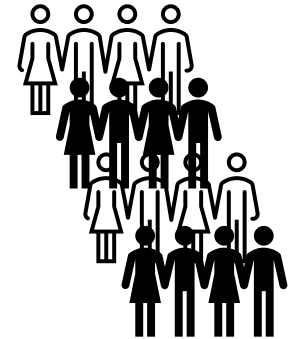


Risk Analysis: Overcoming Complexity

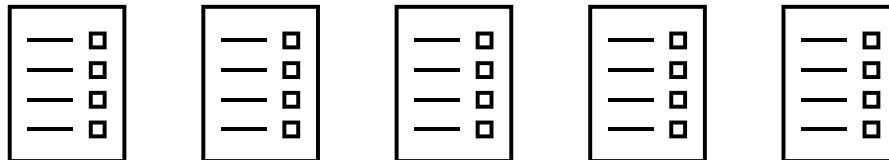
Master Schedules
Interlinked Subprojects
tend to become
unsynchronized



Multiple Teams =
Inconsistent
Processes, Security
Issues

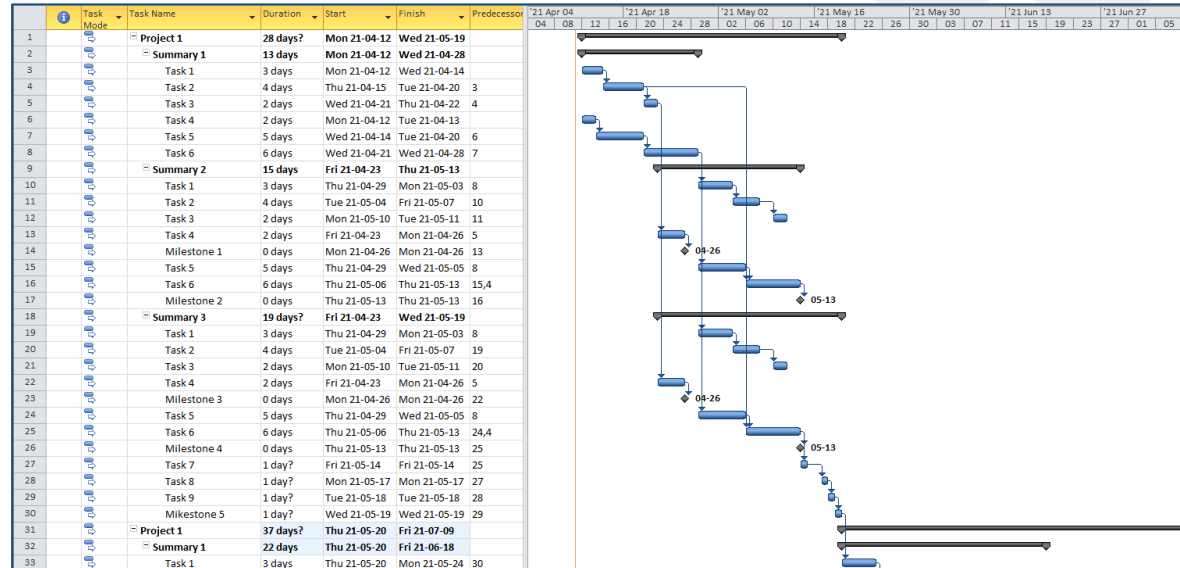


Multiple risk registers



What is a Project Portfolio with Risks

Integrated Project Schedule:
many interlinked projects



Consistent process of assigning uncertainties, managing priorities, set of risk properties and categories

Common risk register

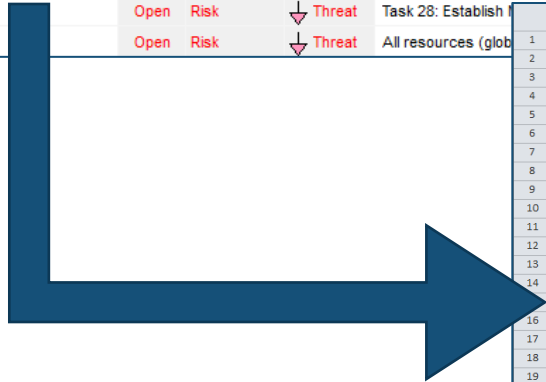
Integrated resource pool

Common depository of mitigation and response plans

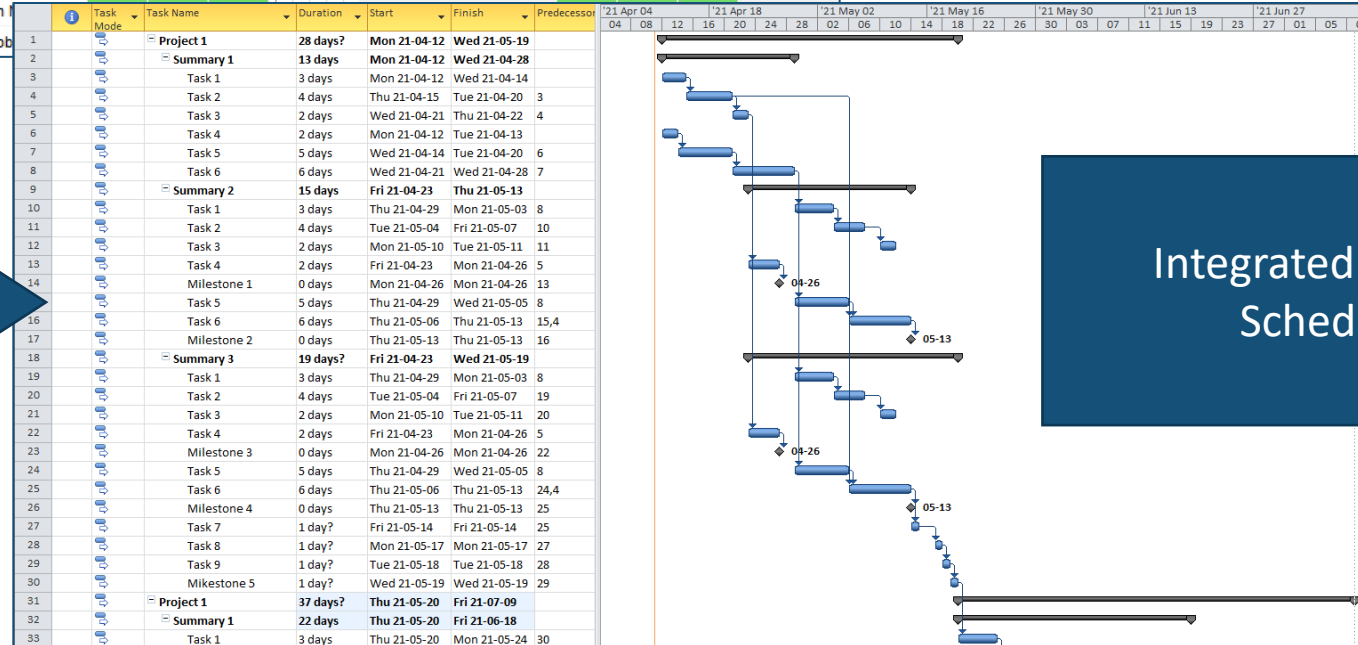
Common Risk Register

Risk Name	Oper	Risk/Issu	Threat/C	Risk Assigned To	Pre-Mitigation				Pre-Mitigation					
					Prol	Impi	Scd	Score	Cost (Pre)	Cost (Miti)	Prol	Impi	Scd	Cost (Pos)
1 Delay in Financing	Open	Risk	Threat	Task 55: Acquisition of Financi	65.0 %	60.4 %	39.2 %		\$4,499.80	\$0.00	65.0 %	60.4 %	39.2 %	\$0.00
2 Not enough information about competitors	Open	Risk	Threat	Assigned to 4 tasks/resource	96.7 %	26.7 %	25.8 %		\$0.00	\$0.00	96.7 %	26.7 %	25.8 %	\$0.00
3 Other risks, related to the project	Open	Risk	Threat	All tasks (global)	20.0 %	67.4 %	13.5 %		\$5,432.65	\$0.00	20.0 %	67.4 %	13.5 %	\$0.00
4 Delay in patent and trademark search	Open	Risk	Threat	Assigned to 2 tasks/resource	38.1 %	9.95 %	3.79 %		\$1,545.33	\$0.00	38.1 %	9.95 %	3.79 %	\$0.00
5 Risks affecting whole company/division	Open	Risk	Threat	All tasks (global)	4.00 %	34.4 %	1.37 %		\$2,609.32	\$0.00	4.00 %	34.4 %	1.37 %	\$0.00
6 Cost information is not available	Open	Risk	Threat	Assigned to 2 tasks/resource	55.3 %	0.00 %	0.00 %		\$0.00	\$0.00	55.3 %	0.00 %	0.00 %	\$0.00
7 Delay in getting level advice	Open	Risk	Threat	Task 29: Determine the legal t	85.0 %	0.00 %	0.00 %		\$0.00	\$0.00	85.0 %	0.00 %	0.00 %	\$0.00
8 Lack of knowledge of the specific area	Open	Risk	Threat	All resources (global)	9.00 %	0.00 %	0.00 %		\$0.00	\$0.00	9.00 %	0.00 %	0.00 %	\$0.00
9 Not enough data to analyze demand level	Open	Risk	Threat	Assigned to 2 tasks/resource	86.1 %	0.00 %	0.00 %		\$0.00	\$0.00	86.1 %	0.00 %	0.00 %	\$0.00
10 Not enough data to plan management of demanc	Open	Risk	Threat	Task 23: How will you manag	20.0 %	0.00 %	0.00 %		\$0.00	\$0.00	20.0 %	0.00 %	0.00 %	\$0.00
11 Problem with hiring	Open	Risk	Threat	Task 58: Hiring of key employ	15.0 %	0.00 %	0.00 %		\$0.00	\$0.00	15.0 %	0.00 %	0.00 %	\$0.00
12 Selected name is taken	Open	Risk	Threat	Task 28: Establish										
13 Staff turnover	Open	Risk	Threat	All resources (glob										

Common Risk Register for all projects in the portfolio



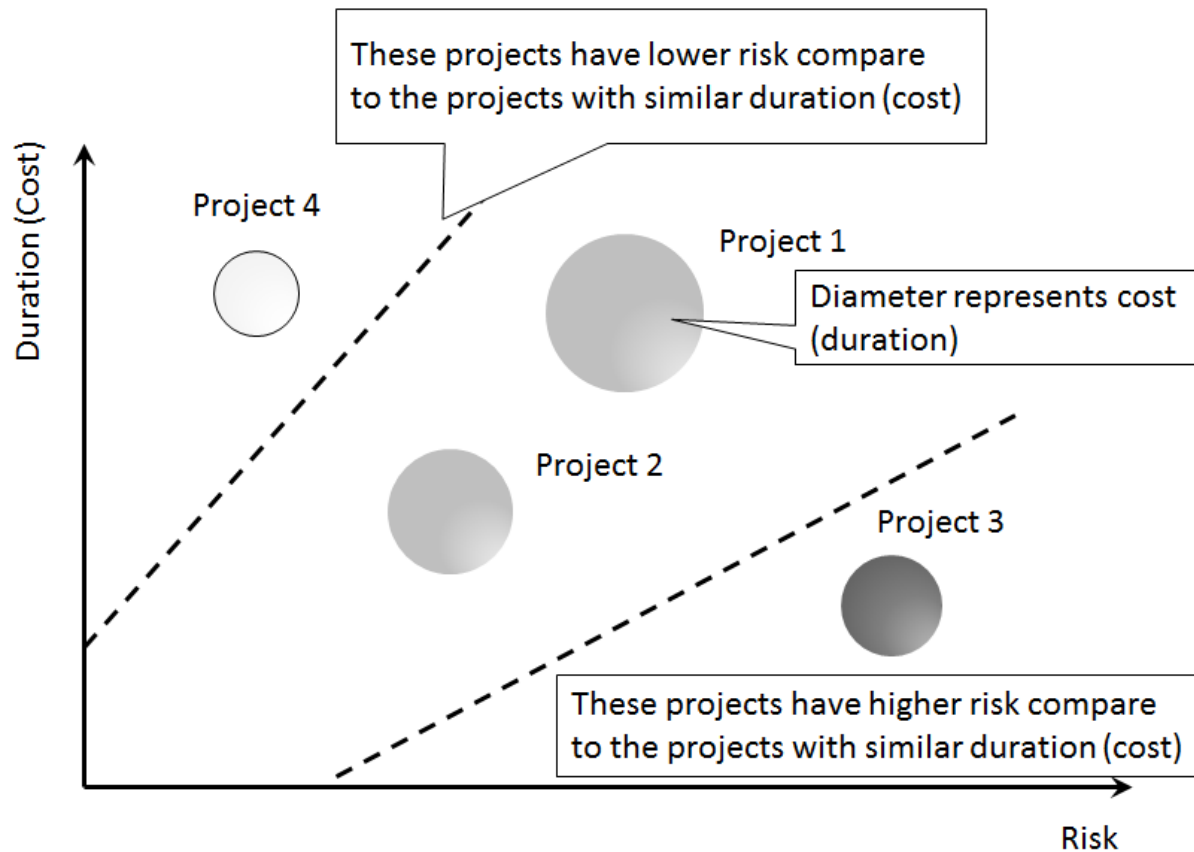
Risks from risk register can be assigned to different projects and tasks



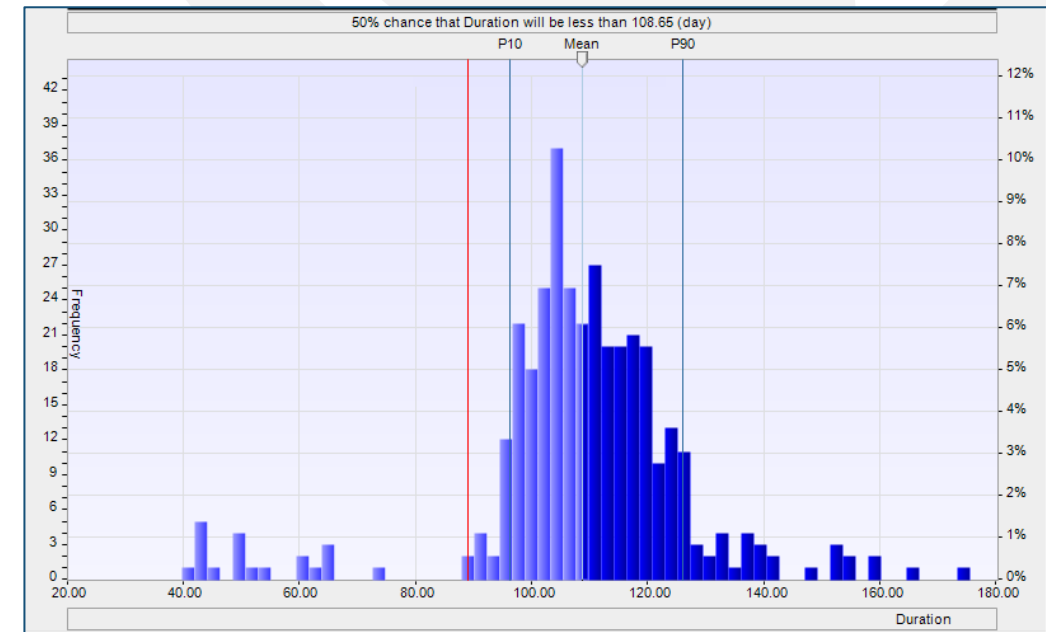
Integrated Project Schedule

Project Portfolio Risks Profile

Comparing Projects Based on Their Risk Profile:
What project is riskier and require more attention



Distribution of Project Duration:
Component of Project Risk Profile



Objectives of The Methodology

Schedule for managing project
and project control



Schedule for risk analysis

- ***Generate a risk profile*** of each project and complete portfolio
- ***Recalculate of risk profile*** fast and on a regular basis based on input from project control
- ***Quicky interpret the results*** of an analysis.
- Streamline process of assessment and management of ***mitigation and response plans***.

Three Solutions

Schedule and
Risk Assignment
Quality Control



Schedule
Consolidation



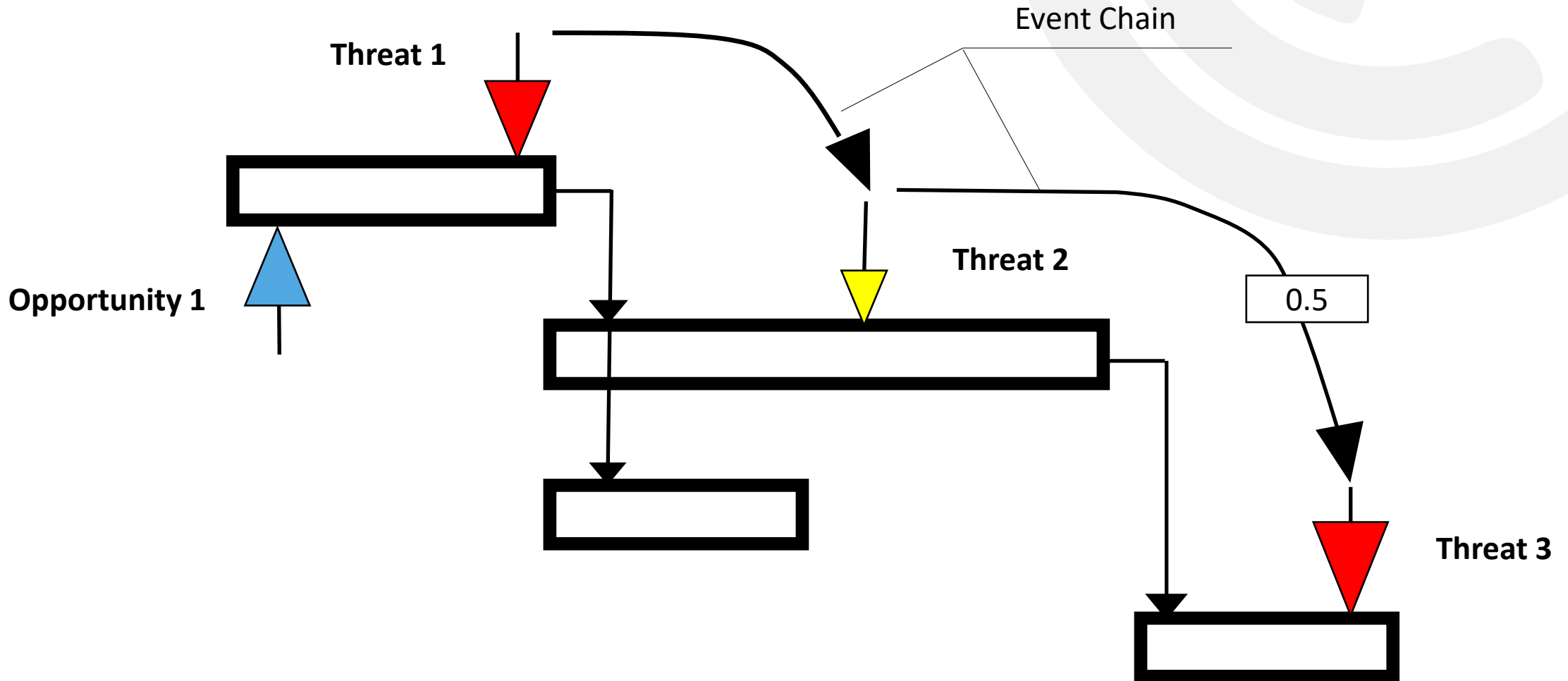
Subprojects with
Risks and
Uncertainties



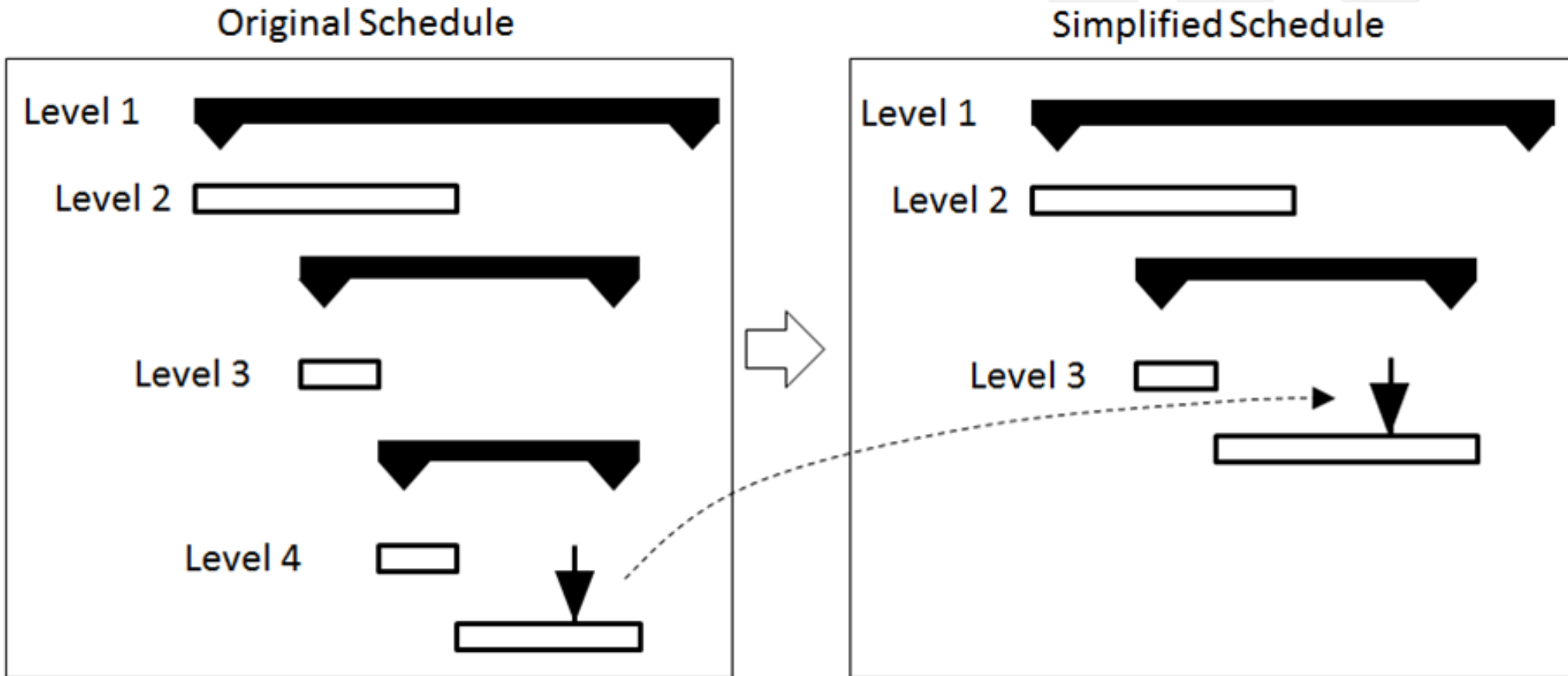
Result:

**Ability to perform risk analysis of project
of any size fast and on a regular basis**

Event Chain Diagrams: Quality Control of Risk Assignment



Schedule Consolidation



Example of Schedule Consolidation

Original Schedule

Equivalent Consolidated Schedule

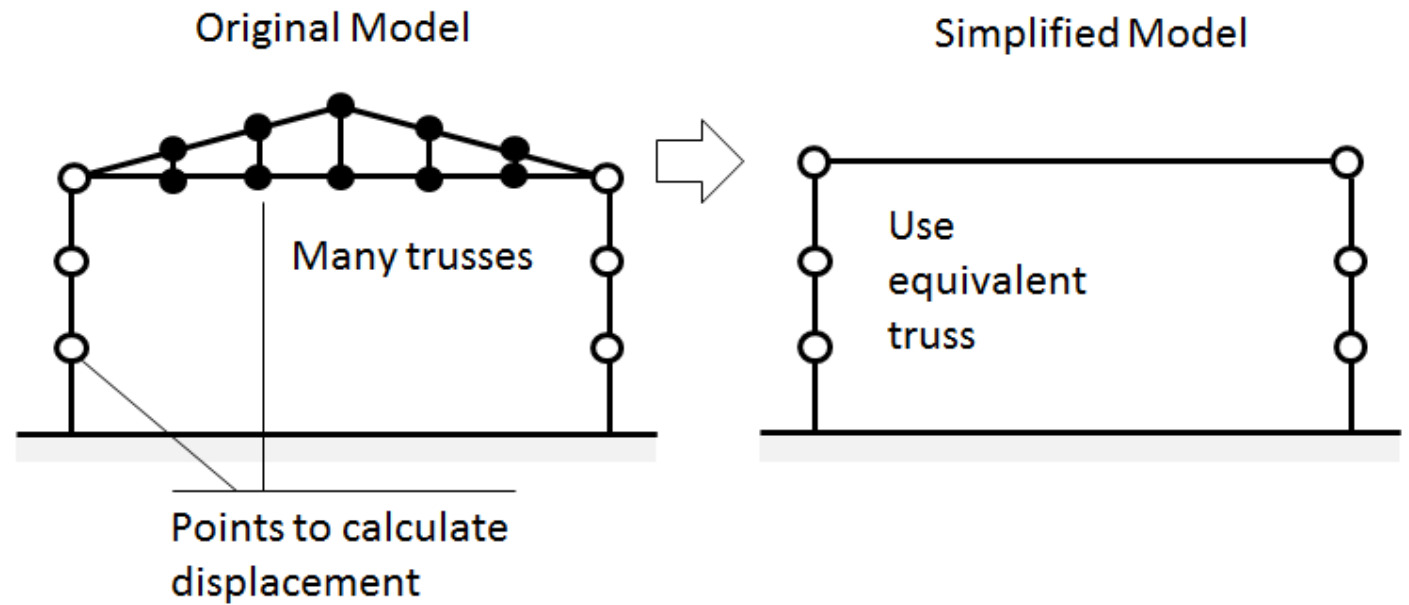
Task Name	Low D	Finish	Resource
1 Elmworth Pad 5 well:			
2 SCL HZ GC35A ELI			
3 Rig Mobilization 1.9 days			
4 Drilling 13.5 days			
5 Rig Release 1.9 days			
6 Gamma Ray Test 0.95 days			
7 Completion			
8 Surface Casin 1.9 days			
9 Cementing 1.9 days			
10 Fracking - 27 3.8 days			
11 Gamma Ray Test 4.75 days			
12 Connection 0.95 days			
13			
14 SCL HZ GC35B ELI			
15 Rig Mobilization 1.9 days			
16 Drilling 14.4 days			
17 Rig Release 1.9 days			
18 Gamma Ray Test 0.95 days			
19 Completion			
20 Surface Casing 1.9 days			
21 Cementing 1.9 days			
22 Fracking - 26 sta 2.85 days 3 days 3.15 days 4 01/31/17 17:00 02/01/17 17:00 Fracking			
23 Gamma Ray Test 4.75 days 5 days 5.25 days 1 02/01/17 17:00 02/08/17 17:00 Wireline			
24 Connection 0.95 days 1 day 1.05 days 0 02/08/17 17:00 02/09/17 01:00 Connection			
25			
26 SCL HZ GC35C ELI 35.13 days 0 02/24/17 08:00 03/24/17 17:00			
27 Rig Mobilization 1.9 days 2 days 2.1 days 1 02/24/17 08:00 02/27/17 17:00 Drilling Rig			
28 Drilling 14.4 days 16 days 17.6 days 2 02/28/17 08:00 03/21/17 17:00 Drilling Rig			
29 Rig Release 1.9 days 2 days 2.1 days 1 03/22/17 08:00 03/23/17 17:00 Drilling Rig			
30 Gamma Ray Test 0.95 days 1 day 1.05 days 2 03/24/17 08:00 03/24/17 17:00 Wireline			

Number of tasks before consolidation: 56

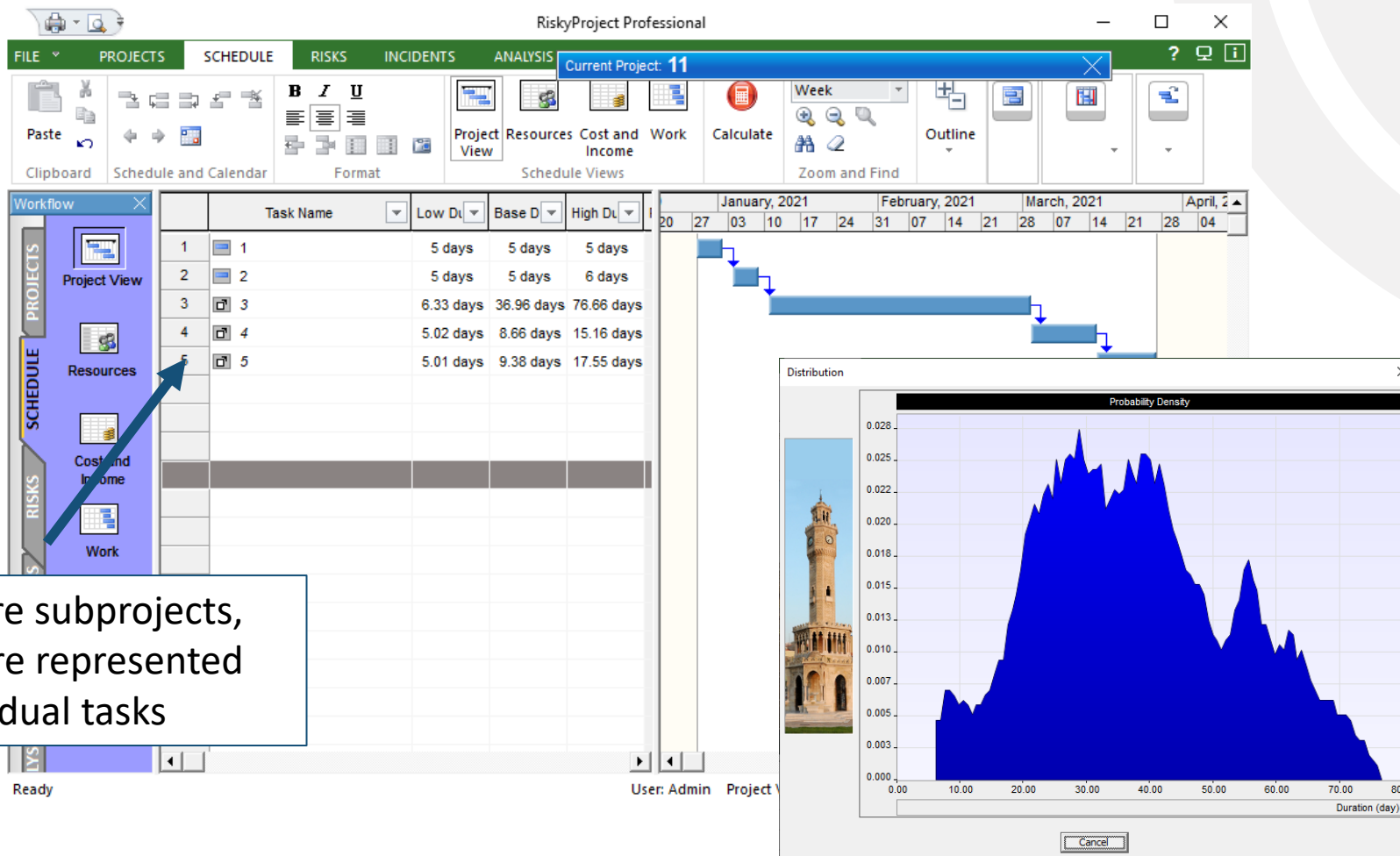
Number of tasks after consolidation: 35

Task Name	Low D	Finish	Resource
22 Connection 1 day 1 day 1 day 1 03/31/17 17:00 04/01/17 01:00 Connection			
23 SCL HZ GC35D ELI 35.13 days 0 03/24/17 08:00 04/21/17 17:00			
24 Rig Mobilization, I 20 days 20 days 20 days 4 03/24/17 08:00 04/20/17 17:00 Drilling Rig			
25 Gamma Ray Test 1 day 1 day 1 day 2 04/21/17 08:00 04/21/17 17:00 Wireline			
26 Completion 7 days 0 04/21/17 17:00 04/24/17 01:00			
27 Surface Casing, C 7 days 7 days 7 days 10 04/21/17 17:00 04/24/17 01:00 Casing,Cementing,Fra			
28 Gamma Ray Test 5 days 5 days 5 days 2 04/24/17 08:00 04/28/17 17:00 Wireline			
29 Connection 1 day 1 day 1 day 1 04/28/17 17:00 04/29/17 01:00 Connection			
30 SCL HZ GC35E ELI 25.13 days 0 04/24/17 08:00 06/02/17 01:00			

Subprojects with Risks and Uncertainties



Example of project with subproject

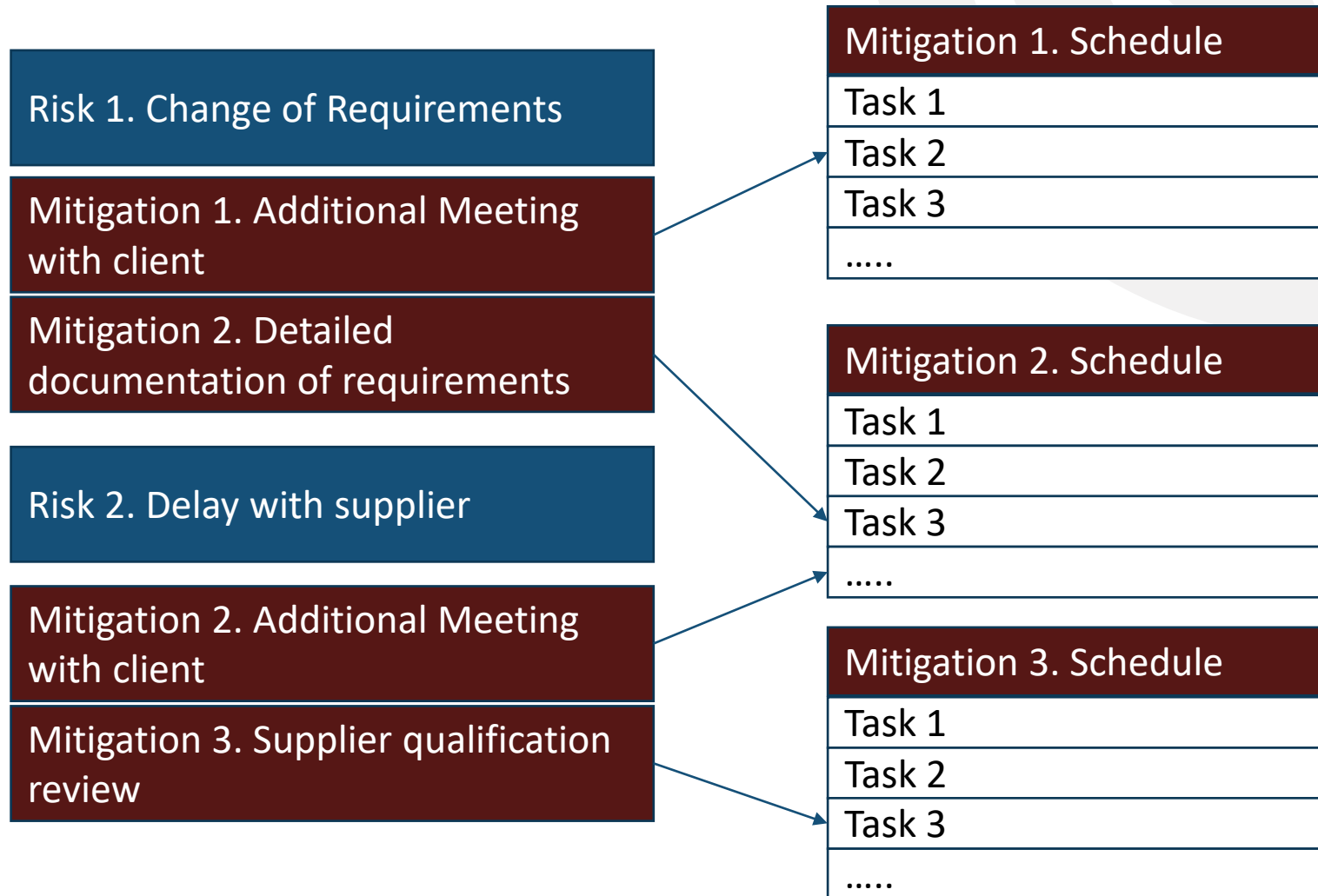


These are subprojects, which are represented as individual tasks

Monte Carlo for each subproject is performed separately. The project is inserted to the portfolio and can be refreshed when subproject is calculated again.

Risk Profile for duration of individual project

Subprojects For Mitigation/Response



Conclusions

- Managing risks and uncertainties in integrated project portfolio is a complex process.
- Quality of risk analysis can be improved if analysis is performed on consolidated project schedules
- Risk analysis of individual schedules can be done separately but can share a common risk register.
- The methodology simplifies interpretation of results of risk analysis and reporting.
- The methodology improves the management mitigation and response plans.

About Intaver Institute

Intaver Institute Inc. develops the RiskyProject suite of project risk management and project risk analysis software. We believe that advanced technology based on operational research can significantly contribute to the successful management of projects.

About the Presenter

Michael Trumper has over 25 years of experience project risk analysis and management training and consulting, instructional and software design, and technical communication. Michael is partner at Intaver Institute Inc., a Calgary (Canada)-based vendor of project risk management and risk analysis software. Michael has authored papers on quantitative methods in project estimations and risk analysis. Michael has consulted in the development and delivery of project risk analysis and management solutions to clientele that includes NASA, DOE, Lockheed Martin, USAF, MBDA, and others.

Michael Trumper is a co-author of 'Project Decisions: the Art and Science, 2nd Ed', Berrett-Koehler Publishers (November 5, 2019) ; 'Project Think: Why Good Managers Make Poor Project Choices', Gower Publishing, England, 2013; and, 'Project Risk Analysis Made Ridiculously Simple', World Scientific-Now Publishers Series in Business, USA, 2017. Michael can be reached at mtrumper@intaver.com