Schedule Risk Analysis for Insurance

How SRA can benefit the insured, the insurer and broker alike



Content Overview

- Schedule Risk Analysis
- Monte Carlo
- Benefits



Quantitative Analysis







Schedule Risk Analysis

What is it?

Schedule Risk Analysis

- 2 ingredients
 - Schedule/Plan
 - Uncertainty & Quantified Risks



- Monte-Carlo Simulation of 000's of different forecasted outcomes
- Aggregation of results provides an S-Curve from which we can draw information from to improve decision making.
 - P10-50-P90





• A Project Schedule is a dynamic representation of the project activities and their execution sequence.

- Dynamic Model Not a Calendar
- Dates should be <u>OUTPUTS</u> not inputs



Schedule / Plan

WBS

Logic

Activities

Durations

Activit	ties							_						_				_			
Proje	cts Activities Reports																				
∠ La	yout: Farned Value Management Layout	Filter: All Activities											-								
#	Activity ID Activity Name	Original Duration Start	Finish		January 2015	1	February 2015		1	Mar	ch 2015	;				April 2	015				
	N N			28	04 11 18 25	01	08 15	22	01	08	15	22	T	29	05	12		19	26	03	Ē
1	= 🚔 Wellmont Substation	58.0d 05-Jan-2015 A	08-Apr-2015		· •										-	Wellmo	ont Su	bstatio	1		Ξ
2	W1000 Notice to Proceed	0.0d 05-Jap-2015 A			 Notice to Proceed, Notice 	to Proc	eed		1												
3	W1010 Project Start	0.0d 07-Jan-2015 A			└┿ Project Start, Project St	art								8							
4	W1020 Project Management	56.0d 07-Jan-2015 A	08-Apr-2015			-	_		-					-	-	Project	Mana	agemei	nt		
5	W1030 Project Complete	0.0d	08-Apr-2015			1									- +	Project	Com	plete, F	roject (Comp	p
6	🗆 🖬 Mobilization	10.0d 09-Jan-2015 A	19-Jan-2015 A		Mobilizat	on			1												
7	w1040 Mobilize	10.0d 09-Jan-2015 A	19-Jan-2015 A		Mobil	70			1												
8		31.0d 19-Jan-2015.A	12-Mar-2015				-		1		Constru	uction									
9		13.7d 19- Jan-2015 A	10-Eob-2015		↓		Relow Grad	le	1												
10	W1050 Grade Site	8 0d 19-Jan-2015 A	03-Eeb-2015 A			-	Grade Site														
11	W1060 Set Foundation	9.0d 21-Jan-2015 A	04-Feb-2015 A				Set Foundati	ion								d <mark>reesee</mark>					
12	w1070 Install Conduit	3.0d 03-Feb-2015 A	10-Feb-2015			+	Install Con	duit	1												
13	📟 W1080 Dig Cable Trench	4.0d 04-Feb-2015 A	10-Feb-2015			╘╼┲	Dig C	Cable	Trench												
14	🖃 🖷 Above Grade	18.8d 10-Feb-2015	12-Mar-2015				•		-	— A	Above	Grade									
15	W1090 Erect Steel Structures	8.0d 10-Feb-2015	24-Feb-2015						Erect Stee	el Structi	ures										
16	🔲 💭 🔲 🔲 🔲 🔲	6.0d 11-Feb-2015	19-Feb-2015				-		nstall Equ	uipment											
17	🔲 W1110 Install Grounding	2.0d 24-Feb-2015	26-Feb-2015					-	Insta	allGroun	ding			1							
18	🔲 💭 W1120 Install Bus and Jumpers	8.0d 24-Feb-2015	10-Mar-2015							al . 🗖	stall Bu	sand .	Jum	pers							
19	🔲 W1130 Lay Control Cable	12.0d 23-Feb-2015	12-Mar-2015				4	- <u>-</u>			l	Lay Cor	ntrol	Cable							
20	🖻 📲 Fence	7.0d 03-Feb-2015 A	17-Feb-2015				V Fen	ice													
21	🔲 📟 W1140 Install Fence	7.0d 03-Feb-2015 A	17-Feb-2015*				Ins	stall F.e	ерсе												
22	Site Restoration	23.0d 11-Feb-2015	23-Mar-2015			ł.			1		ear	I Sit	te R	estora	ation						
23	👄 W1150 Remove Equipment	5.0d 16-Mar-2015	23-Mar-2015			E .			1		-		Re	emove	Equi	pment					
24	🔲 💭 W1160 Lay Stoning	2.0d 11-Feb-2015	12-Feb-2015			Į.	™ ¶∎.La	y.Stop	ing												
25	🔲 💭 W1170 🛛 Lay Roadway	4.0d 11-Feb-2015	17-Feb-2015					🗕 Lay	y.Roadwa	ay				<u>.</u>							
26	🖃 🖬 Project Closeout	10.0d 24-Mar-2015	08-Apr-2015									-			-	Project	Close	eout			
27	🔰 🔲 🗰 🔲 🔤 🔲 🔲 🔲 🔲	10.0d 24-Mar-2015	08-Apr-2015			1			1								Subst	antial C	omple	tion	



Why do we schedule a project?









Risk & Uncertainty

Quanitification

Risk & Uncertainty





Risk & Uncertainty







Estimating Impacts











H&S? Reputation? Quality? Environment?

Durations Estimate Uncertainty

- Estimate stance decided
 - Optimistic, Pessimistic or Neutral?
- Apply + and ranges
 - Run Analysis



WBS	Op/Pes/Neutral?	Min	Estimate (ML)	Мах
Design Durations	Optimistic	-10%	30 weeks	+20%
Engineering Durations	Pessimistic	-20%	24 weeks	+5%
Excavation Durations	Neutral	-20%	6 weeks	+20%
Piling	Optimistic	-5%	4 weeks	+20%
Fabrication	Pessimistic	-20%	32 weeks	+5%
T&C	Pessimistic	-20%	12 weeks	+5%

• Duration Uncertainty

) 🛛) 🔒	🎒 💁 👗 🗈 🖀 🗮 🗙 🕊) (° i 🛛 📾	5.0 I	<u></u>		i 🖪 🙋	👗 🖄	- 🐁 🛛	🕸 🗄 տե	l 🖉 🔻	🛃 🕀	E .			
	•	⊳ 4	🖕 🖫 🧮 🍞 🔻 🍸 🏋 🧏 -	- ≵ ↓ _₹ : 🖻	<mark>- کر</mark> –	- 🙀	-) 🕭 d	8 🐨	÷ Β	ΙŪ	ĒĒ	┋,;		\$8 -		
		ID	Description	Remaining Duration	Jun ' ₅	17 12	19	26	Jul '17 3 10	17	24	31	Aug '1 7 1	Minimum Duration	Most Likely	Maximum Duration	Labor Remaining
		A11(Logging 04-16	55													
-		Q-26-	Completion	16													
		A119	Completion 04-16	16										16	16	20	
		A119	Perforation 04-16	16										10	16	20	
-	Q	-26-0	Well 04-17 (WQ2-160)	358				-									
-		Q-26-	Drill Well	65		-											
		A111	Drilling 04-17	65	i	/								60	65	81	
		A111	Logging 04-17	65										60	65	81	
-		Q-26-	Completion	16		\square	1										
		A119	Completion 04-17	16			<u> </u>							16	16	20	
		A12(Perforation 04-17	16										16	16	20	
	Q	-26-0	Well 04-18 (WQ2-109)	309		U											
-		Q-26-	Drill Well	50		, i		-									
		A114	Drilling 04-18	50										50	50	63	
		A114	Logging 04-18	50		с+°	:			•			1	50	50	63	
-		Q-26-	Completion	16													
	T0	TALS															\$0
•		III		•	•								•	•			
	TO Pri	TALS	ra Gantt Llogic Trace Risk Ing	puts Ris	∢ k Outpu	ts	Gantt	and Gran	h Gan	tt and Sh	eet	Import C	heck	•	111		\$0



Quantifying Risk Events

• Each Risk given a Min,

Most Likely & Max impact

- Min = Optimistic but realistic outcome
- Most Likely (ML) = Expected most probable outcome
- Max = Pessimistic worst case outcome
 - Should not include force majeure or project stopping outcome
- In Accordance with qualitative probability chart each risk is given a probability of occurrence.







Risk Reg	ister	ga hard	5.348	grotes	-						
e Edit	View Tools Reports	Help									
ualitative	Quantitative										
Pre-mitiga	ted Post-mitigated										
Risk View	Task View										
Details	·			\frown			' 1	6 E 🔩 🗆 🖷	• 🔨		
ID	T/O Title		Quantified	robabili.	Impacted Task	c ID(s)					
001	Example Risk 1	Î		109	6 A31900, A5100						Jearc
002	Example Risk 2			509	6 A4980,A4990			⊡. 	6-002-001.0519	9.1230 - Completi	on
003	Example Risk 3			309	6 A5100,A5110,A	4990, 44980			A9250 - Completio A9250 - Perforatio	n 05-19	
004	Example Risk 4			509	6				02-001.0601 - V	Vell 06-01 (WQ2-	166)
005	Example Risk 5			209	6			□ □ □ □ □ 0 -2	6-002-001.0601	L.2450 - Drill Well	
006	Example Risk 6			709	6				A2930 - Logging 0	6-01	
007	Example Risk 7			109	6				A32760 - Logging	06-01	
								Q-2	6-002-001.0603 A31900 - Completi	0.06-01 (phase 2 -	ON CT)
									A4980 - Completio	n 06-01 (phase 1)	
									A4990 - Perforatio	n 06-01	152)
								<u> </u>	6-002-001.0602 - 0	2.2470 - Drill Well	153)
4									13100 - Drilling 06	-0.2	h.
	C D: 1 001	<u></u>			0.1				0.11		
Impacts	for Risk 001	Schedule			Cost				Correlate	E	
Task ID	Description	Shape	Min	Likely N	lax Shape	Min	Likely	Max	Impact Ranges	Event existence	
A31900	Completion 06-01 (Triangle	7	14	21 Uniform	\$600,000		\$1,200,000			
A5100	Completion 06-02 (Triangle	1	14	21 Uniform	\$600,000		\$1,200,000			

- Risk Mapping to Plan
- Can be multiple activities
- Entering Schedule Delay impacts (Min, ML, Max)





Monte Carlo Analysis

Quantification & Risk Analysis

Quantitative Risk Analysis - Distribution

What is a Distribution?

- Graphical representation of occurrences of a variable, e.g. cost, duration, date, etc.
- Example: "Two Dice" ullet

Sum Dice#1 + Dice#2	# Occurrences Dice#1 + Dice#2	Combinations	# Comb.
2	136	1+1	1
3	264	1+2; 2+1	2
4	425	1+3; 3+1; 2+2	3
5	513	1+4; 4+1; 2+3; 3+2	4
6	703	1+5; 5+1; 2+4; 4+2; 3+3	5
7	857	1+6; 6+1; 2+5; 5+2; 3+4; 4+3	6
8	690	2+6; 6+2; 3+5; 5+3; 4+4	5
9	600	3+6; 6+3; 4+5; 5+4	4
10	373	4+6; 6+4; 5+5	3
11	307	5+6; 6+5	2
12	132	6+6	1
Grand Total	5000		

"Two Dices" - Histogram Simulation (5000x)







• Montecarlo Analysis plots potential finish dates for each activity/milestone over 1000 iterations and creates an S-curve of probabilistic outcomes.







 Analysis calculates the <u>probabilistic</u> (Not actual) completion dates of milestones/activities



• Therefore P50, P90 etc are created from statistical outputs of 1000 different randomly generated outcomes based on input data.



Top Risks & Top sensitive Activities Identified



- These can then be areas of focus for improvement and mitigation
- These can named or omitted on Insurance policies





- "What If" Scenarios
 - Tool to understand effect of mitigations and schedule changes
- Change Risk Profile and Run analysis to understand effect of mitigation of key risks
 - Omitted risks etc
- Value Management
 - Option Selection/analysis
 - Identify key activities (Critical and Duration)
 - Change Schedule (parallel working, additional resource, reduced scope etc)
 - Reduce Schedule





SRA Applications

Why?

Schedule Risk Analysis Benefits



- Forecasting for contracts, monitoring, target setting, Insurance
- Identification of Key Activities and Risks
 - Risk Mitigation Focus
- Promotes Project and Schedule understanding



Insurance Coverage







Benefits

Insured & Insurer



Project Benefits

- Key to ensuring project success
 - Identification of project interdependencies
 - Management of Risk to allow project completion of time and on budget
 - Helps control the cost of a project
 - Validation of Project Information
 - Fosters a Clear Understanding of Challenges ahead
 - Improved Project Communication
 - Improved Schedule / Cost Performance





- PRM compliments and enhances ERM
 - Provides more complete data for better decision-making
 - Effective Project Portfolio Management
 - Improved Stakeholder Satisfaction
 - Encourages Lessons Learned
 - Helps to validate & improve project control measures
 - Option Analysis for better decision making
 - Quantification of Risk for financial & schedule forecasting
 - Cashflow
 - Insurance cover dates and finance





Insurer & Broker Benefits

• Processes:

- Auditable and Accountable Process
- Identifies Key Risks & Uncertainties which can be named on policies with different rates, excesses etc
- Information Sharing (Early) and Transparency
- Milestone Focus... MC, T&C (LMA5197A), RFSU or Phased handovers etc
- Removes Bias, Heuristics and Independent Analysis removes internal politics

• Time, Fees & Costs:

- Mitigation Focus...less claims
- Dates with more certainty
- Insurance cover dates / Construction to Operations



• Provides more complete data for better decision-making and forecasting



Independent

For Better Results



Independent Analysis

- Collaboration between Insurer/Broker and Project/Client
- Independent commission
 - Risk Analysis Expert & Industry Planner
 - Test Schedule, Uncertainty and Risks
 - Run Analysis
 - Provide Report and Feedback
- Basis of insurance, fees, transition periods and future negotiations and relationship
- Removes internal bias, politics and agendas
- Shared Costs



Conclusion



Greater certainty, less admin, set fees, smoother transition of insurances, better forecasting and financial planning Overruns & Admin Reduced

Fees

Fixed

Relationship