

	Case Name: Claeys-Verhelst Premises	Sector	Construction (Commercial Building)
	OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be	Baseline Schedule Schedule with resources Schedule with costs	
Submitted by	Laura Demeyere	Risk Analysis Random simulation One of nine std. scenarios User defined distributions	
Date	December 23, 2011		
File Name	C2011-12 Claeys-Verhelst Premises.p2x	Project Control Automatic tracking Tracking based on user input	

1. Project description

Project authenticity

The expansion of the company premises of sanitary specialist Claeys-Verhelst, located in Oudenburg (Belgium), through the construction of a new three-floor building harboring a warehouse, office space, a small showroom and recreational facilities for the employees.

The project consists of activity, resource and cost data that were obtained directly from the actual project owner.

2. Project properties

2.1. Baseline Schedule

General	
# Activities	49
Planned Duration (PD)	442 days*
Budget At Completion (BAC)	3,027,133 €
Renewable Resources	12
Consumable Resources	-

Network topology	
Serial/Parallel (SP)	41%
Activity Distribution (AD)	50%
Length of Arcs (LA)	5%
Topological Float (TF)	43%

* standard eight-hour working days

2.2. Risk Analysis

Use of many different non-standard triangular distribution profiles inputted by the user (mostly skewed), complemented by some predefined symmetrical, skewed and risk-free distributions.

	Cost sensitivity		
	avg [%]	std dev [%]	skew [-]
CRI-r	7.7	13.2	2.5
CRI-rho	35.2	18.8	-0.6
CRI-tau	61.6	43.3	-0.3

	Time sensitivity		
	avg [%]	std dev [%]	skew [-]
CI	17.0	28.0	1.8
SI	42.9	29.2	0.4
SSI	3.5	8.8	3.2
CRI-r	6.6	10.4	2.6
CRI-rho	20.3	19.5	0.7
CRI-tau	33.0	41.4	1.0

	Resource sensitivity		
	avg [%]	std dev [%]	skew [-]
CRI-r	17.9	22.4	1.3
CRI-rho	34.0	20.8	-0.3
CRI-tau	44.6	41.2	0.5

2.3. Project Control

2.3.1. Simulated forecasting accuracy

The accuracy of time and cost forecasting methods has been evaluated based on Monte Carlo simulation runs using the risk profiles described in section “2.2. Risk Analysis”. Based on these risk profiles, the Mean Absolute Percentage Error (MAPE) and Mean Percentage Error (MPE) has been calculated to evaluate the expected accuracy of the time and cost predictions, EAC(t) and EAC, respectively.

Simulated EAC(t) accuracy			Simulated EAC accuracy		
method - PF	MAPE [%]	MPE [%]	method (PF)	MAPE [%]	MPE [%]
PV - 1	4.9	3.0	1	0.7	0.6
PV - SPI	38.3	-29.2	CPI	0.7	0.6
PV - SCI	38.4	-29.3	SPI	36.1	-33.2
ED - 1	9.7	6.0	SPI(t)	18.6	-17.3
ED - SPI	38.0	-29.5	SCI	36.2	-33.2
ED - SCI	38.1	-29.6	SCI(t)	18.7	-17.3
ES - 1	3.5	1.9	0.8 CPI + 0.2 SPI	2.3	0.3
ES - SPI(t)	18.7	-13.7	0.8 CPI + 0.2 SPI(t)	2.2	-1.3
ES - SCI(t)	18.7	-13.7			

According to the MAPE values¹ the best performance for time forecasting can be expected from the unweighted Earned Schedule method. For cost forecasting the unweighted and CPI-weighted methods should yield the best results.

2.3.2. Tracking description

Tracking authenticity

Manual tracking was performed over 8 tracking periods with irregular lengths varying from approximately one month to six months. The Real Duration and Real Cost mentioned in section “2.3.3. Earned Value Management” are based on manual user input.

The tracking information obtained from the project owner and introduced in ProTrack includes actual activity start dates and durations, but no actual activity costs.

¹ The MAPE gives the best indication for the forecast accuracy (the lower the MAPE, the more accurate the method) since all deviations from the targeted real duration (real cost) are cumulated, whereas for the MPE underestimates can be compensated by overestimates and vice versa, possibly leading to an overly positive evaluation of a certain method. However, the MPE can provide useful information about the nature of the deviations, i.e. does the method rather underestimate or overestimate the real duration (real cost)?

2.3.3. Earned Value Management

2.3.3.1. Performance metrics

	CV [€]	SV [€]	SV(t) [d]	CPI [-]	SPI [-]	SPI(t) [-]	p-factor [-]
avg	-51.705	-214.051	-22.20	0.96	0.82	0.92	1.00
std dev	30.253	240.842	14.86	0.03	0.23	0.07	0.00
final	-75.263	0	-12.00	0.98	1.00	0.97	1.00

2.3.3.2. Time forecasting

PD	442 days
----	----------

Real Duration	454 days
---------------	----------

Late	2.71%
------	-------

EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	473.52	35.18	6.7	4.3
PV - SPI	624.66	295.86	39.9	37.6
PV - SCI	659.19	342.84	45.9	45.2
ED - 1	490.61	51.57	9.2	8.1
ED - SPI	627.47	294.16	39.2	38.2
ED - SCI	4649.98	336.28	44.2	43.2
ES - 1	464.52	14.90	3.0	2.3
ES - SPI(t)	484.11	38.61	7.3	6.6
ES - SCI(t)	493.09	50.47	9.3	8.6

2.3.3.3. Cost forecasting

BAC	3,027,133 €
-----	-------------

Real Cost	3,102,395 €
-----------	-------------

Over Budget	2.49%
-------------	-------

EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	3,078,838	30.253	0.9	-0.8
CPI	3,152,058	100.643	2.3	1.6
SPI	4,113,269	1,842,501	33.2	32.6
SPI(t)	3,272,787	238.336	6.1	5.5
SCI	4,284,566	2,159,545	38.7	38.1
SCI(t)	3,361,159	356.377	9.0	8.3
0.8 CPI + 0.2 SPI	3,249,074	243.574	5.3	4.7
0.8 CPI + 0.2 SPI(t)	3,174,061	122.906	2.9	2.3