

	Case Name: Government Office Building	Sector	Construction (Institutional Building)
	OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be	Baseline Schedule Schedule with resources Schedule with costs	Risk Analysis Random simulation One of nine std. scenarios User defined distributions
Submitted by	N/A		
Date	June 28, 2013		
File Name	C2013-06 Government Office Building.p2x	Project Control Automatic tracking Tracking based on user input	

1. Project description

Project authenticity

The construction of a fourteen-storey office building, including an underground parking. The building will accommodate several government departments.

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

2. Project properties

2.1. Baseline Schedule

General	
# Activities	276
Planned Duration (PD)	352 days*
Budget At Completion (BAC)	19,429,808 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	10%
Activity Distribution (AD)	36%
Length of Arcs (LA)	0%
Topological Float (TF)	34%

2.2. Risk Analysis

Random simulation by ProTrack was performed using the default symmetric triangular risk distribution profiles.

	Cost sensitivity		
	avg [%]	std dev [%]	skew [-]
CRI-r	14.1	34.8	2.1
CRI-rho	100.0	0.0	N/A
CRI-tau	100.0	0.0	N/A

	Resource sensitivity		
	avg [%]	std dev [%]	skew [-]
CRI-r	N/A	N/A	N/A
CRI-rho	N/A	N/A	N/A
CRI-tau	N/A	N/A	N/A

	Time sensitivity		
	avg [%]	std dev [%]	skew [-]
CI	8.4	26.9	3.1
SI	15.8	27.4	2.5
SSI	1.2	5.3	8.6
CRI-r	9.0	8.0	3.5
CRI-rho	9.0	8.2	3.4
CRI-tau	10.6	9.6	3.7

The remarkable results for cost sensitivity can be explained by the absence of variable activity costs.

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	8.8	4.8	1	N/A	N/A
PV - SPI	28.1	24.7	CPI	N/A	N/A
PV - SCI	28.1	24.7	SPI	N/A	N/A
ED - 1	11.9	7.7	SPI(t)	N/A	N/A
ED - SPI	28.1	24.7	SCI	N/A	N/A
ED - SCI	28.1	24.7	SCI(t)	N/A	N/A
ES - 1	4.6	4.2	0.8 CPI + 0.2 SPI	N/A	N/A
ES - SPI(t)	21.7	21.4	0.8 CPI + 0.2 SPI(t)	N/A	N/A
ES - SCI(t)	21.7	21.4			

According to the MAPE values¹ the best performance for time forecasting can be expected from the unweighted Earned Schedule method. Cost forecasting is not relevant since there are only fixed activity costs in this project.

2.3.2. Tracking description

Tracking authenticity

Manual tracking was performed over 18 tracking periods with a length of approximately one month. 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, durations and 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	-753.659	-182.373	-0.74	0.94	0.97	0.97	0.95
std dev	739.394	447.968	6.01	0.02	0.09	0.09	0.06
final	-2,117,042	22.484	8.00	0.90	1.00	1.02	1.00

2.3.3.2. Time forecasting

PD	352 days
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Real Duration	352 days
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On Time	0.00%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	355.30	8.12	3.4	3.3
PV - SPI	366.60	36.90	8.4	6.6
PV - SCI	392.01	39.02	14.8	14.0
ED - 1	355.70	9.58	3.6	3.4
ED - SPI	366.60	36.90	8.4	6.6
ED - SCI	378.72	41.26	11.2	10.1
ES - 1	353.18	5.63	2.7	2.7
ES - SPI(t)	367.34	43.34	7.8	6.8
ES - SCI(t)	379.92	54.28	10.6	10.4

2.3.3.3. Cost forecasting

BAC	19,429,808 €
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Real Cost	21,546,846 €
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Over Budget	10.90%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	20,183,481	739.393	6.3	-6.3
CPI	20,781,733	500.534	3.6	-3.6
SPI	20,807,488	1,633,301	6.3	-3.4
SPI(t)	20,964,860	2,132,096	6.9	-2.7
SCI	21,443,955	1,770,766	5.3	-0.5
SCI(t)	21,635,140	2,641,050	6.5	0.4
0.8 CPI + 0.2 SPI	20,763,491	562.157	3.6	-3.6
0.8 CPI + 0.2 SPI(t)	20,793,484	686.409	4.0	-3.5