

	Case Name: Urban Development Project	Sector	Construction (Commercial Building)
	OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be	Baseline Schedule Risk Analysis	Schedule with resources Schedule with costs Random simulation One of nine std. scenarios User defined distributions
Submitted by	N/A	Project Control	Automatic tracking
Date	June 28, 2013		Tracking based on user input
File Name	C2013-09 Urban Development Project.p2x		

1. Project description

Project authenticity

The transformation of an old industrial site into a suitable location for a library, residential and commercial units, offices, and multiple public services.

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	71
Planned Duration (PD)	291 days*
Budget At Completion (BAC)	1,537,398 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	34%
Activity Distribution (AD)	51%
Length of Arcs (LA)	6%
Topological Float (TF)	16%

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	0.0	0.0	N/A
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	36.6	48.2	0.6
SI	49.8	40.8	0.3
SSI	6.7	11.8	2.0
CRI-r	11.2	8.8	1.1
CRI-rho	11.4	8.7	1.1
CRI-tau	14.8	12.7	1.2

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	3.6	0.0	1	N/A	N/A
PV - SPI	12.8	10.6	CPI	N/A	N/A
PV - SCI	12.8	10.6	SPI	N/A	N/A
ED - 1	4.2	-0.6	SPI(t)	N/A	N/A
ED - SPI	12.8	10.6	SCI	N/A	N/A
ED - SCI	12.8	10.6	SCI(t)	N/A	N/A
ES - 1	2.8	0.0	0.8 CPI + 0.2 SPI	N/A	N/A
ES - SPI(t)	14.8	13.4	0.8 CPI + 0.2 SPI(t)	N/A	N/A
ES - SCI(t)	14.8	13.4			

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 10 tracking periods with irregular lengths varying from approximately two weeks to five 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, 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	-77.585	-42.557	-21.89	0.94	1.01	0.95	1.00
std dev	57.724	72.558	27.06	0.03	0.18	0.12	0.02
final	-159.574	0	-69.00	0.91	1.00	0.81	1.00

2.3.3.2. Time forecasting

PD	291 days
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Real Duration	360 days
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Late	23.71%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	299.05	13.73	16.9	-16.9
PV - SPI	293.60	38.00	18.4	-18.4
PV - SCI	314.70	45.37	13.0	-12.6
ED - 1	312.88	25.61	13.1	-13.1
ED - SPI	307.43	45.96	14.6	-14.6
ED - SCI	313.43	45.53	12.9	-12.9
ES - 1	312.89	27.06	13.1	-13.1
ES - SPI(t)	310.59	37.00	13.9	-13.7
ES - SCI(t)	316.68	35.55	12.5	-12.0

2.3.3.3. Cost forecasting

BAC	1,537,398 €
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Real Cost	1,696,972 €
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Over Budget	10.38%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	1,614,983	57.724	4.8	-4.8
CPI	1,644,331	45.931	3.1	-3.1
SPI	1,586,136	177.127	6.6	-6.5
SPI(t)	1,601,743	121.146	5.8	-5.6
SCI	1,615,844	178.197	5.9	-4.8
SCI(t)	1,631,615	118.404	4.5	-3.9
0.8 CPI + 0.2 SPI	1,628,612	77.177	4.0	-4.0
0.8 CPI + 0.2 SPI(t)	1,634,488	61.448	3.7	-3.7