

	Case Name: Town Square	Sector	Construction (Civil)	
	OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be	Baseline Schedule	Schedule with resources	
		Risk Analysis	Schedule with costs	
			Random simulation	
Submitted by	N/A		One of nine std. scenarios	
Date	June 28, 2013		User defined distributions	
File Name	C2013-10 Town Square.p2x	Project Control	Automatic tracking	
			Tracking based on user input	

1. Project description

Project authenticity

The enhancement of a town square, including the construction of a wide promenade and an underground car park and the redesign of the surrounding roads.

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	197
Planned Duration (PD)	786 days*
Budget At Completion (BAC)	11,421,890 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	18%
Activity Distribution (AD)	36%
Length of Arcs (LA)	0%
Topological Float (TF)	62%

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	4.6	20.9	4.4
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	11.7	32.1	2.4
SI	5.6	10.6	4.3
SSI	1.5	7.7	7.3
CRI-r	8.1	8.2	2.5
CRI-rho	11.5	12.5	2.1
CRI-tau	20.2	22.7	2.4

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	58.5	47.0	1	N/A	N/A
PV - SPI	99.3	99.3	CPI	N/A	N/A
PV - SCI	99.3	99.3	SPI	N/A	N/A
ED - 1	29,294.4	29,294.4	SPI(t)	N/A	N/A
ED - SPI	99.3	99.3	SCI	N/A	N/A
ED - SCI	99.3	99.3	SCI(t)	N/A	N/A
ES - 1	11.5	6.7	0.8 CPI + 0.2 SPI	N/A	N/A
ES - SPI(t)	35.5	32.2	0.8 CPI + 0.2 SPI(t)	N/A	N/A
ES - SCI(t)	35.5	32.2			

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 30 tracking periods with irregular lengths varying from approximately a couple of days to two 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	2,476,655	-1,203,052	-27.16	1.93	0.84	0.96	0.92
std dev	1,387,021	813.851	12.00	0.60	0.09	0.02	0.07
final	-3,797,033	0	1.00	0.75	1.00	1.00	1.00

2.3.3.2. Time forecasting

PD	786 days
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Real Duration	794 days
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Late	1.02%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	868.78	56.00	10.7	10.7
PV - SPI	944.15	89.62	20.3	20.3
PV - SCI	503.86	165.67	38.0	-35.8
ED - 1	893.06	54.82	13.8	13.8
ED - SPI	944.42	89.16	20.3	20.3
ED - SCI	803.52	68.01	7.8	2.4
ES - 1	811.46	11.48	3.4	3.4
ES - SPI(t)	816.54	13.41	4.0	4.0
ES - SCI(t)	742.40	50.66	6.4	-5.4

2.3.3.3. Cost forecasting

BAC	11,421,890 €
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Real Cost	15,218,926 €
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Over Budget	33.24%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	8,945,234	1,387,021	41.2	-41.2
CPI	6,197,844	2,446,906	59.3	-59.3
SPI	10,040,407	1,503,839	34.0	-34.0
SPI(t)	9,124,288	1,369,658	40.1	-40.1
SCI	6,685,500	2,293,234	56.1	-56.1
SCI(t)	6,280,598	2,427,522	58.7	-58.7
0.8 CPI + 0.2 SPI	6,497,556	2,301,439	57.3	-57.3
0.8 CPI + 0.2 SPI(t)	6,461,606	2,311,969	57.5	-57.5