	Case Name: **Family Residence**	Sector	Construction (Residential 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	Project Control	Automatic tracking	
Date	June 28, 2013		Tracking based on user input	
File Name	C2013-07 Family Residence.p2x			

1. Project description

The construction of a turnkey family residence.

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	46
Planned Duration (PD)	170 days*
Budget At Completion (BAC)	180.476 €
Renewable Resources	-
Consumable Resources	-

Network topology	
Serial/Parallel (SP)	40%
Activity Distribution (AD)	44%
Length of Arcs (LA)	3%
Topological Float (TF)	25%

* standard eight-hour working days

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

Time sensitivity			
	avg [%]	std dev [%]	skew [-]
CI	41.3	48.6	0.4
SI	55.7	41.5	-0.1
SSI	5.9	15.4	4.4
CRI-r	10.3	12.9	4.2
CRI-rho	11.0	13.1	4.3
CRI-tau	29.5	14.1	-0.3

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

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		
method - PF	MAPE [%]	MPE [%]
PV - 1	52.7	-52.7
PV - SPI	47.1	-46.8
PV - SCI	47.1	-46.8
ED - 1	57.6	-57.6
ED - SPI	47.7	-46.8
ED - SCI	47.1	-46.8
ES - 1	43.4	-43.4
ES - SPI(t)	25.7	-20.4
ES - SCI(t)	25.7	-20.4

Simulated EAC accuracy		
method (PF)	MAPE [%]	MPE [%]
1	N/A	N/A
CPI	N/A	N/A
SPI	N/A	N/A
SPI(t)	N/A	N/A
SCI	N/A	N/A
SCI(t)	N/A	N/A
0.8 CPI + 0.2 SPI	N/A	N/A
0.8 CPI + 0.2 SPI(t)	N/A	N/A

According to the MAPE values[1] the best performance for time forecasting can be expected from the SPI(t)- and SCI(t)-weighted Earned Schedule methods. 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 11 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	5.02	-10.641	-8.81	1.05	0.88	0.89	0.99
std dev	1.329	15.504	5.72	0.02	0.22	0.10	0.03
final	5.446	0	-13.00	1.03	1.00	0.93	1.00

2.3.3.2. Time forecasting

PD	170 days		Real Duration	200 days		Late	17.65%

EAC(t)			Real Accuracy	
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	180.03	14.61	5.9	-1.6
PV - SPI	239.81	191.78	37.5	31.0
PV - SCI	226.20	175.53	37.1	23.6
ED - 1	179.47	9.03	4.5	-1.9
ED - SPI	243.50	190.69	38.1	33.1
ED - SCI	234.25	173.52	35.8	28.0
ES - 1	180.35	8.34	3.8	-1.5
ES - SPI(t)	195.72	27.48	9.6	7.0
ES - SCI(t)	190.20	23.21	8.4	3.9

2.3.3.3. Cost forecasting

BAC	180.476 €		Real Cost	175.031 €		Under Budget	3.02%

EAC			Real Accuracy	
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	175.457	1.329	0.4	0.2
CPI	171.501	2.884	2.1	-2.0
SPI	238.917	190.141	36.7	36.5
SPI(t)	190.231	29.605	8.8	8.7
SCI	230.143	172.799	33.1	31.5
SCI(t)	185.231	24.292	6.7	5.8
0.8 CPI + 0.2 SPI	175.29	6.924	2.1	0.2
0.8 CPI + 0.2 SPI(t)	174.213	2.58	1.1	-0.5