

	Case Name: Office Finishing Works (1)	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	Risk Analysis Random simulation One of nine std. scenarios User defined distributions
Submitted by	N/A		
Date	August 7, 2013	Project Control Automatic tracking Tracking based on user input	
File Name	C2013-13 Office Finishing Works (1).p2x		

1. Project description

Project authenticity

The finishing works inside an office building, mainly consisting of the placement of partition walls.

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	11
Planned Duration (PD)	236 days*
Budget At Completion (BAC)	1,118,497 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	20%
Activity Distribution (AD)	49%
Length of Arcs (LA)	33%
Topological Float (TF)	6%

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	17.4	26.9	3.0
CRI-rho	17.5	27.1	2.9
CRI-tau	17.3	26.1	2.7

	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	63.6	43.3	-0.6
SI	22.1	36.8	1.5
SSI	44.0	38.0	0.2
CRI-r	15.0	24.6	2.8
CRI-rho	14.7	24.3	2.8
CRI-tau	14.2	20.4	2.2

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	16.2	-16.0	1	1.7	-0.4
PV - SPI	33.4	6.9	CPI	0.6	0.0
PV - SCI	33.7	8.0	SPI	17.0	17.0
ED - 1	39.8	2.6	SPI(t)	11.4	11.4
ED - SPI	33.4	6.9	SCI	17.0	17.0
ED - SCI	33.4	7.3	SCI(t)	11.5	11.5
ES - 1	15.7	-15.6	0.8 CPI + 0.2 SPI	10.7	10.7
ES - SPI(t)	12.7	5.7	0.8 CPI + 0.2 SPI(t)	4.0	3.9
ES - SCI(t)	13.6	6.0			

According to the MAPE values¹ the best performance for time forecasting can be expected from the SPI(t)-weighted Earned Schedule method. For cost forecasting the CPI-weighted method should yield the best results.

2.3.2. Tracking description

Tracking authenticity

Manual tracking was performed over 9 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	98.009	104.631	15.76	1.15	3.13	1.28	0.97
std dev	77.091	91.944	19.22	0.16	5.42	0.33	0.03
final	162.567	1.093	19.00	1.17	1.00	1.09	1.00

2.3.3.2. Time forecasting

PD	236 days
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Real Duration	217 days
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Early	8.05%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	213.93	19.41	8.8	-1.4
PV - SPI	181.42	69.84	23.8	-16.4
PV - SCI	162.65	58.67	25.0	-25.0
ED - 1	197.47	71.14	16.7	-9.0
ED - SPI	181.42	69.84	23.8	-16.4
ED - SCI	177.21	65.72	22.7	-18.3
ES - 1	220.24	19.22	5.6	1.5
ES - SPI(t)	195.25	42.80	17.2	-10.0
ES - SCI(t)	188.31	41.17	18.4	-13.2

2.3.3.3. Cost forecasting

BAC	1,118,497 €
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Real Cost	955.929 €
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Under Budget	14.53%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	1,020,487	77.091	6.8	6.8
CPI	990.451	125.576	8.6	3.6
SPI	866.469	243.623	11.7	-9.4
SPI(t)	928.606	127.045	6.6	-2.9
SCI	865.837	248.232	11.5	-9.4
SCI(t)	914.328	173.677	8.0	-4.4
0.8 CPI + 0.2 SPI	924.868	219.093	11.3	-3.2
0.8 CPI + 0.2 SPI(t)	974.185	119.051	7.8	1.9