

	Case Name: Office Finishing Works (5)	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	Project Control Automatic tracking Tracking based on user input	
Date	August 7, 2013		
File Name	C2013-17 Office Finishing Works (5).p2x		

1. Project description

Project authenticity

The finishing works inside an office building, comprising the interior joinery and the placement of plaster walls, partition walls (also acoustic), raised floors, suspended ceilings, and furniture.

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	23
Planned Duration (PD)	161 days*
Budget At Completion (BAC)	244.205 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	36%
Activity Distribution (AD)	38%
Length of Arcs (LA)	20%
Topological Float (TF)	32%

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	17.6	15.0	1.2
CRI-rho	19.6	15.6	0.9
CRI-tau	20.1	20.5	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	12.7	30.5	2.3
SI	35.0	34.4	0.8
SSI	9.2	24.0	2.7
CRI-r	11.0	19.1	4.3
CRI-rho	13.9	20.8	3.4
CRI-tau	18.1	25.5	2.7

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	13.5	10.2	1	0.9	-0.5
PV - SPI	27.7	26.3	CPI	1.4	0.0
PV - SCI	28.6	27.5	SPI	14.6	10.6
ED - 1	16.8	13.8	SPI(t)	10.6	10.6
ED - SPI	27.7	26.3	SCI	14.8	14.8
ED - SCI	28.0	26.6	SCI(t)	10.9	10.9
ES - 1	9.4	7.2	0.8 CPI + 0.2 SPI	6.6	6.5
ES - SPI(t)	21.0	20.7	0.8 CPI + 0.2 SPI(t)	3.2	3.2
ES - SCI(t)	21.4	21.1			

According to the MAPE values¹ the best performance for time forecasting can be expected from the unweighted Earned Schedule method. For cost forecasting the unweighted and CPI-weighted methods should yield the best results.

2.3.2. Tracking description

Tracking authenticity

Manual tracking was performed over 5 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	24.973	31.33	20.25	1.08	1.19	1.14	0.80
std dev	21.418	39.336	25.49	0.22	0.51	0.38	0.21
final	40.599	18.046	29.00	1.20	1.08	1.22	1.00

2.3.3.2. Time forecasting

PD	161 days
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Real Duration	132 days
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Early	18.01%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	140.35	25.94	15.5	6.3
PV - SPI	193.23	147.74	66.0	46.4
PV - SCI	220.30	238.36	104.1	66.9
ED - 1	140.70	29.60	17.0	6.6
ED - SPI	193.23	147.74	66.0	46.4
ED - SCI	228.77	225.09	96.2	73.3
ES - 1	140.75	25.49	14.8	6.6
ES - SPI(t)	176.85	108.74	45.8	34.0
ES - SCI(t)	205.30	170.08	69.6	55.5

2.3.3.3. Cost forecasting

BAC	244.205 €
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Real Cost	203.606 €
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Under Budget	16.62%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	219.233	21.418	9.1	7.7
CPI	236.52	58.075	18.5	16.2
SPI	299.446	203.339	52.2	47.1
SPI(t)	279.23	149.288	39.9	37.1
SCI	356.755	321.423	81.6	75.2
SCI(t)	325.142	245.085	63.1	59.7
0.8 CPI + 0.2 SPI	241.518	73.572	21.0	18.6
0.8 CPI + 0.2 SPI(t)	241.721	69.645	21.2	18.7