

	Case Name: Kitchen Tower Anderlecht	Sector	Construction (Institutional 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	Tim Vandenbussche		
Date	February 2, 2013		
File Name	C2013-04 Kitchen Tower Anderlecht.p2x	Project Control Automatic tracking Tracking based on user input	

1. Project description

Project authenticity

The construction of a fourteen-storey kitchen tower for the cooking school of Anderlecht (Belgium). The project as presented here is limited to the structural work.

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	252
Planned Duration (PD)	333 days*
Budget At Completion (BAC)	2,113,684 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	47%
Activity Distribution (AD)	59%
Length of Arcs (LA)	0%
Topological Float (TF)	63%

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	8.5	8.1	3.7
CRI-rho	12.2	12.2	2.5
CRI-tau	32.7	20.4	1.7

	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	1.7	9.9	6.6
SI	3.3	12.4	5.7
SSI	0.2	3.5	15.8
CRI-r	9.2	7.9	2.3
CRI-rho	10.2	8.3	1.9
CRI-tau	29.1	12.4	-0.4

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) have 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	20.1	19.8
PV - SPI	31.1	30.9
PV - SCI	31.3	31.1
ED - 1	17.8	17.5
ED - SPI	30.7	30.5
ED - SCI	30.8	30.5
ES - 1	18.5	18.4
ES - SPI(t)	31.6	31.5
ES - SCI(t)	31.6	31.6

Simulated EAC accuracy		
method (PF)	MAPE [%]	MPE [%]
1	0.2	0.0
CPI	0.2	0.0
SPI	11.4	11.4
SPI(t)	11.8	11.8
SCI	11.4	11.4
SCI(t)	11.8	11.8
0.8 CPI + 0.2 SPI	4.0	4.0
0.8 CPI + 0.2 SPI(t)	4.2	4.2

According to the MAPE values¹ the best performance for time forecasting can be expected from the unweighted Earned Duration 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 11 tracking periods with irregular lengths varying from approximately one month 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	-229.714	-334.405	-94.14	0.88	0.77	0.66	0.99
std dev	145.692	246.606	19.74	0.04	0.18	0.08	0.01
final	-398.84	0	-120.00	0.84	1.00	0.74	1.00

2.3.3.2. Time forecasting

PD	333 days
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Real Duration	453 days
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Late	36.04%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	385.68	38.84	14.9	-14.9
PV - SPI	458.16	112.06	22.7	1.1
PV - SCI	516.53	104.96	22.6	14.0
ED - 1	417.92	15.88	7.7	-7.7
ED - SPI	494.56	77.70	14.7	9.2
ED - SCI	512.17	89.52	17.8	13.1
ES - 1	427.14	19.74	5.7	-5.7
ES - SPI(t)	509.15	66.61	12.4	12.4
ES - SCI(t)	529.55	76.80	16.9	16.9

2.3.3.3. Cost forecasting

BAC	2,113,684 €
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Real Cost	2,512,524 €
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Over Budget	18.87%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	2,343,398	145.692	6.7	-6.7
CPI	2,407,700	109.567	4.2	-4.2
SPI	2,803,405	369.113	12.2	11.6
SPI(t)	2,812,495	359.736	12.0	11.9
SCI	2,906,205	439.183	15.8	15.7
SCI(t)	2,917,855	432.487	16.1	16.1
0.8 CPI + 0.2 SPI	2,460,428	51.765	2.1	-2.1
0.8 CPI + 0.2 SPI(t)	2,462,273	55.604	2.0	-2.0