

	Case Name: Wiedauwkaai Fenders	Sector	Construction (Civil)	
	OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be	Baseline Schedule	Schedule with resources	
Submitted by	Pieter Buyse	Risk Analysis	Schedule with costs	
Date	January 15, 2013		Random simulation	
File Name	C2013-01 Wiedauwkaai Fenders.p2x	Project Control	One of nine std. scenarios	
			User defined distributions	
			Automatic tracking	
			Tracking based on user input	

1. Project description

Project authenticity

The renovation of the wooden fenders and dolphins protecting the Wiedauwkaai railway bridge in Ghent (Belgium) from boat collisions.

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	42
Planned Duration (PD)	152 days*
Budget At Completion (BAC)	1,069,533 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	48%
Activity Distribution (AD)	45%
Length of Arcs (LA)	0%
Topological Float (TF)	68%

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	11.3	13.1	0.9
CRI-rho	32.8	17.0	-0.3
CRI-tau	48.6	45.0	0.2

	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	2.4	15.2	6.5
SI	12.2	17.5	3.8
SSI	2.4	15.2	6.5
CRI-r	9.0	15.2	5.3
CRI-rho	13.7	18.0	3.3
CRI-tau	21.0	27.4	2.3

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	14.5	13.6
PV - SPI	29.8	29.7
PV - SCI	30.2	30.1
ED - 1	17.8	17.1
ED - SPI	29.7	29.5
ED - SCI	29.8	29.6
ES - 1	13.2	12.6
ES - SPI(t)	26.0	25.9
ES - SCI(t)	26.1	26.0

Simulated EAC accuracy		
method (PF)	MAPE [%]	MPE [%]
1	0.6	-0.2
CPI	0.7	0.0
SPI	15.4	15.4
SPI(t)	13.0	13.0
SCI	15.5	15.5
SCI(t)	13.1	13.1
0.8 CPI + 0.2 SPI	6.1	6.0
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 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 6 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	-106.44	-9.147	-2.04	0.92	0.94	0.93	0.90
std dev	102.535	13.996	3.18	0.15	0.11	0.15	0.12
final	-245.052	0	0.00	0.81	1.00	1.00	1.00

2.3.3.2. Time forecasting

PD	152 days
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Real Duration	152 days
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On Time	0.00%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	153.31	1.99	1.3	0.9
PV - SPI	163.75	23.05	9.3	7.7
PV - SCI	180.98	24.72	24.7	19.1
ED - 1	153.81	2.60	1.6	1.2
ED - SPI	163.75	23.05	9.3	7.7
ED - SCI	166.02	19.82	13.7	9.2
ES - 1	154.04	3.18	1.7	1.3
ES - SPI(t)	170.13	37.55	13.3	11.9
ES - SCI(t)	171.65	29.62	17.2	12.9

2.3.3.3. Cost forecasting

BAC	1,069,533 €
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Real Cost	1,314,585 €
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Over Budget	22.91%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	1,175,973	102.535	10.5	-10.5
CPI	1,193,822	180.925	11.4	-9.2
SPI	1,249,465	145.918	9.3	-5.0
SPI(t)	1,294,040	228.365	12.7	-1.6
SCI	1,262,467	164.531	7.0	-4.0
SCI(t)	1,302,000	200.136	9.9	-1.0
0.8 CPI + 0.2 SPI	1,197,777	155.24	9.8	-8.9
0.8 CPI + 0.2 SPI(t)	1,201,297	151.083	9.5	-8.6