

	Case Name: IT data migration	Sector	IT	
	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	
Submitted by	Stef Pauwels and Emile Van de Walle		One of nine std. scenarios	
Date	June 4, 2023		User defined distributions	
File Name	C2023-05	Project Control	Automatic tracking	
			Tracking based on user input	

1. Project description

Project authenticity

This project was defined to resolve the issues of previously started project at a company in Brussels-Capital Region. The project includes activities of migrating the company's hardware to two data centres in Ghent and Oostkamp (Belgium).

The goal of this project is to ensure uninterrupted service for end users by implementing a fail-over system where, in the event of a server crash in Ghent, the Oostkamp server would seamlessly take over customer service and vice versa.

The project consists of activity, resources and cost data that were obtained directly from the actual project owner.

2. Project properties

2.1. Baseline Schedule

General	
# Activities	76
Planned Duration (PD)	143 days*
Budget At Completion (BAC)	€ 112,000
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	83%
Activity Distribution (AD)	86%
Length of Arcs (LA)	13%
Topological Float (TF)	28%

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	6.52	11.34	4.80
CRI-rho	6.22	11.18	4.83
CRI-tau	6.49	8.40	3.22

	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	85.75	33.99	-2.07
SI	89.00	28.82	-2.52
SSI	8.30	9.49	3.72
CRI-r	8.89	9.54	3.47
CRI-rho	8.87	9.49	3.54
CRI-tau	6.32	6.83	2.61

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**			Simulated EAC accuracy**		
method - PF	MAPE [%]	MPE [%]	method (PF)	MAPE [%]	MPE [%]
PV - 1	3.6	0.6	1	4.6	-1.6
PV - SPI	6.1	0.0	CPI	6.1	-1.3
PV - SCI	12.2	-1.0	SPI	6.4	-1.4
ED - 1	3.6	0.5	SPI(t)	6.2	-1.3
ED - SPI	5.9	-0.5	SCI	10.4	-2.0
ED - SCI	9.1	-0.9	SCI(t)	9.5	-2.0
ES - 1	3.1	0.2	0.8 CPI + 0.2 SPI	6.2	-1.3
ES - SPI(t)	4.7	-0.5	0.8 CPI + 0.2 SPI(t)	6.1	-1.3
ES - SCI(t)	7.7	-0.8			

**values are stated according on the figure

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.

Tracking authenticity

2.3.2. Tracking description

Manual tracking was performed over 17 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	-51,000	-22769.10	-62.5	0.5	0.66	0.57	0.98
std dev	35776.33	24088.65	43.87	0.16	0.30	0.22	0.04
final	-105,800.00	0.00	-125	0.51	1	0.53	1.00

2.3.3.2. Time forecasting

PD	143 days	Real Duration	299 days	Late	109%
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EAC(t)			Real Accuracy	
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	189.31	34.58	36.64	36.64
PV - SPI	235.93	81.18	30.38	21.04
PV - SCI	422.44	181.75	49.98	-41.38
ED - 1	239.14	54.39	19.97	19.97
ED - SPI	283.56	71.32	17.73	5.10
ED - SCI	373.92	139.16	36.25	-25.14
ES - 1	228.79	51.01	23.43	23.43
ES - SPI(t)	260.42	52.45	14.34	12.85
ES - SCI(t)	328.89	77.93	20.87	-10.07

2.3.3.3. Cost forecasting

BAC	€ 112,000	Real Cost	€ 217,800	Over Budget	94.5%
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EAC			Real Accuracy	
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	163,000.00	35,776.33	25.16	25.16
CPI	200,799.76	33,349.62	9.80	7.81
SPI	194,381.51	44,161.76	16.23	10.75
SPI(t)	187,741.36	38,384.66	14.49	13.80
SCI	262,266.15	96,687.35	33.22	-20.43
SCI(t)	248,603.75	70,645.75	25.19	-14.14
0.8 CPI + 0.2 SPI	198,880.18	35,146.74	11.15	8.69
0.8 CPI + 0.2 SPI(t)	197,592.66	33,849.20	10.45	9.28