

 OR-AS Operations Research Applications and Solutions	Case Name: Young Cattle Barn	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	N/A		
Date	June 28, 2013		
File Name	C2013-12 Young Cattle Barn.p2x	Project Control Automatic tracking Tracking based on user input	

1. Project description

Project authenticity

The demolition and reconstruction of a young cattle barn on an experimental farm.

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	27
Planned Duration (PD)	115 days*
Budget At Completion (BAC)	818.440 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	64%
Activity Distribution (AD)	77%
Length of Arcs (LA)	6%
Topological Float (TF)	54%

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	0.0	0.0	N/A
CRI-rho	100.0	0.0	N/A
CRI-tau	100.0	0.0	N/A

	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	64.3	47.1	-0.6
SI	65.5	42.1	-0.5
SSI	12.2	14.1	1.2
CRI-r	16.4	13.9	1.0
CRI-rho	19.8	15.1	0.9
CRI-tau	18.9	24.1	2.7

The remarkable results for cost sensitivity can be explained by the absence of variable activity costs.

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		
method - PF	MAPE [%]	MPE [%]
PV - 1	11.9	11.4
PV - SPI	23.7	23.3
PV - SCI	23.7	23.3
ED - 1	12.0	11.5
ED - SPI	23.7	23.2
ED - SCI	23.7	23.2
ES - 1	12.7	9.8
ES - SPI(t)	24.8	21.5
ES - SCI(t)	24.8	21.5

Simulated EAC accuracy		
method (PF)	MAPE [%]	MPE [%]
1	N/A	N/A
CPI	N/A	N/A
SPI	N/A	N/A
SPI(t)	N/A	N/A
SCI	N/A	N/A
SCI(t)	N/A	N/A
0.8 CPI + 0.2 SPI	N/A	N/A
0.8 CPI + 0.2 SPI(t)	N/A	N/A

According to the MAPE values¹ the best performance for time forecasting can be expected from the unweighted Planned Value and Earned Duration methods. Cost forecasting is not relevant since there are only fixed activity costs in this project.

2.3.2. Tracking description

Tracking authenticity

Manual tracking was performed over 5 tracking periods with irregular lengths varying from approximately two weeks 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	-30.39	-117.019	-46.60	0.94	0.73	0.44	0.94
std dev	19.389	104.761	25.71	0.04	0.17	0.22	0.09
final	-61.413	0	-73.00	0.93	1.00	0.61	1.00

2.3.3.2. Time forecasting

PD	115 days
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Real Duration	198 days
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Late	72.17%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	131.45	14.73	30.1	-30.1
PV - SPI	165.70	37.77	19.9	-11.9
PV - SCI	175.83	36.88	16.3	-6.5
ED - 1	161.55	31.90	16.5	-14.1
ED - SPI	196.98	19.02	9.5	4.8
ED - SCI	201.83	14.62	8.6	7.4
ES - 1	163.60	27.98	15.1	-13.0
ES - SPI(t)	197.55	41.57	18.7	5.1
ES - SCI(t)	204.70	50.12	22.5	8.9

2.3.3.3. Cost forecasting

BAC	818.440 €
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Real Cost	879.853 €
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Over Budget	7.50%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	848.83	19.389	3.5	-3.5
CPI	871.655	35.206	3.3	-0.9
SPI	1,092,763	251.419	24.3	24.2
SPI(t)	1,065,746	271.227	23.9	21.1
SCI	1,126,502	258.469	28.0	28.0
SCI(t)	1,112,637	339.449	29.0	26.5
0.8 CPI + 0.2 SPI	899.933	34.937	3.3	2.3
0.8 CPI + 0.2 SPI(t)	894.687	60.477	4.9	1.7