

	Case Name: Racing car upgrading	Sector	Engineering	
	OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be	Baseline Schedule	Schedule without resources	
			Schedule without costs	
		Risk Analysis	Random simulation	
Submitted by	Marina Aristotile, Claudio Galli and others		One of nine std. scenarios	
Date	April 28, 2020	Project Control	User defined distributions	
File Name	C2020-01		No tracking	
			No tracking	

1. Project description

Project authenticity

The goal of the project is to upgrade a racing car for a Race Team implemented by Formula Student team of the University of Florence, Italy.

2. Project properties

2.1. Baseline Schedule

General	
# Activities	54
Planned Duration (PD)	45 days*
Budget At Completion (BAC)	-
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	7%
Activity Distribution (AD)	42%
Length of Arcs (LA)	1%
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	N/A	N/A	N/A
CRI-rho	N/A	N/A	N/A
CRI-tau	N/A	N/A	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	8.0	22.6	3.3
SI	25.0	25.9	1.7
SSI	4.0	13.0	4.5
CRI-r	6.0	12.5	4.3
CRI-rho	6.0	12.3	4.3
CRI-tau	8.0	8.4	3.2

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	-	-	1	-	-
PV - SPI	-	-	CPI	-	-
PV - SCI	-	-	SPI	-	-
ED - 1	-	-	SPI(t)	-	-
ED - SPI	-	-	SCI	-	-
ED - SCI	-	-	SCI(t)	-	-
ES - 1	-	-	0.8 CPI + 0.2 SPI	-	-
ES - SPI(t)	-	-	0.8 CPI + 0.2 SPI(t)	-	-
ES - SCI(t)	-	-			

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 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	-	-	-	-	-	-	-
std dev	-	-	-	-	-	-	-
final	-	-	-	-	-	-	-

2.3.3.2. Time forecasting

PD	45 days	Real Duration	-		-
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EAC(t)	Real Accuracy			
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	-	-	-	-
PV - SPI	-	-	-	-
PV - SCI	-	-	-	-
ED - 1	-	-	-	-
ED - SPI	-	-	-	-
ED - SCI	-	-	-	-
ES - 1	-	-	-	-
ES - SPI(t)	-	-	-	-
ES - SCI(t)	-	-	-	-

2.3.3.3. Cost forecasting

BAC	-	Real Cost	-		-
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EAC	Real Accuracy			
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	-	-	-	-
CPI	-	-	-	-
SPI	-	-	-	-
SPI(t)	-	-	-	-
SCI	-	-	-	-
SCI(t)	-	-	-	-
0.8 CPI + 0.2 SPI	-	-	-	-
0.8 CPI + 0.2 SPI(t)	-	-	-	-