

	Case Name: Bikesharing	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	Mayté & Thymo		One of nine std. scenarios	
Date	2018		User defined distributions	
File Name	C2018-08 Bikesharing	Project Control	Automatic tracking	
			Tracking based on user input	

1. Project description

Project Authenticity

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

2. Project properties

2.1. Baseline schedule

General	
# Activities	23
Planned Duration (PD)	393 days*
Budget at Completion (BAC)	€ 5.611.571,00
Renewable Resources	3
Consumable Resources	-

* Standard eight-hour working days

Network Topology	
Serial/Parallel (SP)	36%
Activity Distribution (AD)	41%
Length of Arcs (LA)	7%
Topological Float (TF)	20%

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	17,77	16,67	0,7
CRI-rho	23,34	18,50	0,5
CRI-thau	25,22	30,63	1,9

	Resource sensitivity		
	avg (%)	std dev (%)	skew (-)
CRI-r	52,33	25,77	-1,7
CRI-rho	51,00	23,37	-1,7
CRI-thau	36,00	17,72	-1,7

	Time sensitivity		
	avg (%)	std dev (%)	skew (-)
CI	31,5	45,6	0,9
SI	48,1	40,4	0,3
SSI	9,1	16,8	1,9
CRI-r	16,1	17,7	1,6
CRI-rho	16,1	17,4	1,8
CRI-thau	12,3	12,0	1,6

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	86,63%	-15,24%
PV - SPI	74,74%	0,33%
PV - SCI	66,59%	8,70%
ED - 1	418,22%	319,01%
ED - SPI	74,74%	0,33%
ED - SCI	67,64%	6,81%
ES- 1	39,45%	-39,14%
ES- SPI(t)	17,87%	8,63%
ES - SCI(t)	18,47%	11,62%

simulated EAC accuracy		
Method - PF	MAPE (%)	MPE (%)
1	0,48%	-0,48%
CPI	4,26%	4,03%
SPI	6,94%	6,92%
SPI (t)	23,31%	23,30%
SCI	10,69%	10,68%
SCI (t)	25,38%	25,38%
0.8 CPI + 0.2 SPI	5,22%	5,20%
0.8 CPI + 0.2 SPI (t)	11,52%	11,49%

According to the MAPE values the best performance for time forecasting can be expected from the SPI(t)-1 weighted Earned Schedule method *method/methods*. For cost forecasting the unweighted method should yield the best results.

2.3.2. Tracking description

Tracking Authenticity

Manual tracking was performed over 118 tracking periods with *regular* lengths of approximately one week. 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.

2.3.3. Earned Value Management

2.3.3.1. Performance metrics

	CV (€)	SV (€)	SV(t) (d)	CPI(-)	SPI (-)	SPI(t) (-)	p-factor (-)
avg	-51308,76	-687493,27	-690,59	0,96	0,86	0,71	1,00
std dev	22497,95	1654633,02	418,47	0,04	0,30	0,04	0,01
final	-83220,50	0,00	-1576,00	0,99	1,00	0,67	1,00

2.3.3.2. Time forecasting

PD	393 days	Real duration	590 days	Late	50,12%
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EAC (t)	Real Accuracy			
Method - PF	avg (d)	std dev (d)	MAPE (%)	MPE (%)
PV - 1	441,64	116,43	31,8	-25,1
PV - SPI	1021,80	1622,80	127,8	73,2
PV - SCI	1117,92	1837,58	139,8	89,5
ED - 1	460,69	81,33	23,0	-21,9
ED - SPI	1055,78	1610,57	122,0	78,9
ED - SCI	1142,44	1817,15	134,3	93,6
ES- 1	479,72	52,49	18,7	-18,7
ES- SPI(t)	555,13	29,84	6,6	-5,9
ES - SCI(t)	571,19	39,42	6,2	-3,2

2.3.3.3 Cost forecasting

BAC	€ 5.611.571,00	Real cost	€ 5.694.790,99	Over Budget	1,48%
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EAC	Real Accuracy			
Method - PF	avg (€)	std dev (€)	MAPE (%)	MPE (%)
1	5662879,79	22497,93	5,6	-5,6
CPI	5872088,95	251820,95	3,1	2,8
SPI	13948142,63	21420168,51	13,2	12,9
SPI (t)	6727926,42	1131608,77	13,0	13,0
SCI	15187841,94	24265370,72	15,2	15,0
SCI (t)	7026378,98	1460425,47	15,5	15,5
0.8 CPI + 0.2 SPI	6033832,46	632704,33	5,0	4,7
0.8 CPI + 0.2 SPI (t)	6006603,64	368524,73	5,0	4,8