

	Case Name: Playing Cards	Sector	Engineering
	OR-AS Operations Research - Applications and Solutions www.or-as.be info@or-as.be	Baseline Schedule Risk Analysis	Schedule with resources Schedule with costs Random simulation One of nine std. scenarios User defined distributions
Submitted by	N/A	Project Control	Automatic tracking
Date	February 9, 2014		Tracking based on user input
File Name	C2014-02 Playing Cards.p2x		

1. Project description

Project authenticity

The automatization of some production processes at a playing card manufacturer.

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	23
Planned Duration (PD)	124 days*
Budget At Completion (BAC)	191.493 €
Renewable Resources	-
Consumable Resources	-

* standard eight-hour working days

Network topology	
Serial/Parallel (SP)	81%
Activity Distribution (AD)	94%
Length of Arcs (LA)	0%
Topological Float (TF)	14%

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	78.8	32.0	-1.5
SI	83.7	30.5	-2.1
SSI	13.0	12.4	1.3
CRI-r	17.1	14.8	1.0
CRI-rho	21.2	16.4	0.8
CRI-tau	23.5	26.5	2.1

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			Simulated EAC accuracy		
method - PF	MAPE [%]	MPE [%]	method (PF)	MAPE [%]	MPE [%]
PV - 1	2.7	0.6	1	N/A	N/A
PV - SPI	4.8	2.4	CPI	N/A	N/A
PV - SCI	4.8	2.4	SPI	N/A	N/A
ED - 1	2.7	0.7	SPI(t)	N/A	N/A
ED - SPI	4.8	2.4	SCI	N/A	N/A
ED - SCI	4.8	2.4	SCI(t)	N/A	N/A
ES - 1	4.0	-2.9	0.8 CPI + 0.2 SPI	N/A	N/A
ES - SPI(t)	16.5	-13.7	0.8 CPI + 0.2 SPI(t)	N/A	N/A
ES - SCI(t)	16.5	-13.7			

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 29 tracking periods with a length 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.

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	540	-13.362	-9.62	1.00	0.91	0.91	1.00
std dev	690	13.393	8.25	0.01	0.09	0.08	0.00
final	1.226	0	-22.00	1.01	1.00	0.85	1.00

2.3.3.2. Time forecasting

PD	124 days
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Real Duration	146 days
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Late	17.74%
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EAC(t)		Real Accuracy		
method - PF	avg [d]	std dev [d]	MAPE [%]	MPE [%]
PV - 1	132.66	8.67	9.4	-9.1
PV - SPI	137.41	13.80	9.7	-5.9
PV - SCI	136.85	13.44	9.7	-6.3
ED - 1	134.69	9.47	8.2	-7.7
ED - SPI	139.58	13.78	8.6	-4.4
ED - SCI	139.42	13.63	8.5	-4.5
ES - 1	133.62	8.25	8.5	-8.5
ES - SPI(t)	137.90	11.86	7.8	-5.6
ES - SCI(t)	137.78	11.78	7.8	-5.6

2.3.3.3. Cost forecasting

BAC	191.493 €
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Real Cost	190.267 €
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Under Budget	0.64%
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EAC		Real Accuracy		
method (PF)	avg [€]	std dev [€]	MAPE [%]	MPE [%]
1	190.953	690	0.5	0.4
CPI	190.776	934	0.5	0.3
SPI	198.29	9.411	4.2	4.2
SPI(t)	197.657	8.064	3.9	3.9
SCI	198.074	9.245	4.1	4.1
SCI(t)	197.448	7.958	3.8	3.8
0.8 CPI + 0.2 SPI	192.036	1.589	1.0	1.0
0.8 CPI + 0.2 SPI(t)	191.956	1.502	0.9	0.9