| | | | |
|---|---|---|---|
| OR-AS Operations Research Applications and Solutions | Case Name: **Nursing Home Noordhinder** | Sector | Construction (Commercial Building) |
| | **OR-AS**<br>Operations Research - Applications and Solutions<br>www.or-as.be<br>info@or-as.be | Baseline Schedule | Schedule with resources<br>Schedule with costs |
| | | Risk Analysis | Random simulation<br>One of nine std. scenarios<br>User defined distributions |
| Submitted by | Nathan Goddefroy | | |
| Date | December 22, 2011 | Project Control | Automatic tracking<br>Tracking based on user input |
| File Name | C2011-01 Nursing Home Noordhinder.p2x | | |

# 1. Project description

Project authenticity

The construction of a multi-facility five-storey nursing home in Knokke-Heist (Belgium) housing one hundred residents with different care needs.

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 | 153 |
| Planned Duration (PD) | 766 days* |
| Budget At Completion (BAC) | 4,679,795 € |
| Renewable Resources | 12 |
| Consumable Resources | - |

| Network topology | |
|---|---|
| Serial/Parallel (SP) | 61% |
| Activity Distribution (AD) | 65% |
| Length of Arcs (LA) | 26% |
| Topological Float (TF) | 6% |

* standard eight-hour working days

## *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 | 6.8 | 9.9 | 4.1 |
| CRI-rho | 25.5 | 21.0 | 0.4 |
| CRI-tau | 48.1 | 42.0 | 0.3 |

| | Time sensitivity | | |
|---|---|---|---|
| | avg [%] | std dev [%] | skew [-] |
| CI | 58.0 | 45.4 | -0.3 |
| SI | 70.4 | 37.9 | -0.8 |
| SSI | 4.7 | 8.2 | 2.2 |
| CRI-r | 8.0 | 7.8 | 1.4 |
| CRI-rho | 16.8 | 16.3 | 1.2 |
| CRI-tau | 28.3 | 33.4 | 1.5 |

| | Resource sensitivity | | |
|---|---|---|---|
| | avg [%] | std dev [%] | skew [-] |
| CRI-r | 21.2 | 22.6 | 2.4 |
| CRI-rho | 18.9 | 22.7 | 2.8 |
| CRI-tau | 13.2 | 18.5 | 3.0 |

## *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** | | |
|---|---|---|
| method - PF | MAPE [%] | MPE [%] |
| PV - 1 | 4.5 | -3.1 |
| PV - SPI | 5.4 | -1.6 |
| PV - SCI | 5.4 | -1.2 |
| ED - 1 | 4.5 | -3.4 |
| ED - SPI | 5.4 | -1.6 |
| ED - SCI | 5.4 | -1.4 |
| ES - 1 | 3.5 | -3.2 |
| ES - SPI(t) | 3.8 | -1.5 |
| ES - SCI(t) | 3.9 | -1.2 |

| **Simulated EAC accuracy** | | |
|---|---|---|
| method (PF) | MAPE [%] | MPE [%] |
| 1 | 0.2 | -0.1 |
| CPI | 0.4 | 0.1 |
| SPI | 1.7 | 1.3 |
| SPI(t) | 1.7 | 1.1 |
| SCI | 2.2 | 1.5 |
| SCI(t) | 2.1 | 1.3 |
| 0.8 CPI + 0.2 SPI | 0.7 | 0.4 |
| 0.8 CPI + 0.2 SPI(t) | 0.6 | 0.3 |

According to the MAPE values[1] the best performance for time forecasting can be expected from the Earned Schedule methods. For cost forecasting the unweighted and CPI-weighted methods, or even the two methods using a composite performance factor, should yield the best results.

### *2.3.2. Tracking description*

The user has not performed any project control and therefore no tracking periods have been defined. Tracking periods can now be generated automatically by ProTrack or by manually inputting tracking data period by period.

[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)?