PS-13: Commercial Sector EVM Implementation in Europe at Fabricom

Case Study

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EVM World 2012 Conference
Fabricom, a GDF Suez Company

- 5,444 active people on the pay-roll
- 645 new appointments in 2011
- 860 M€ Turn Over 2011
...active in most of today’s key sectors

ENERGY
- High Voltage
- Distribution networks
- Power Plants
- Nuclear
- Renewable
- Waste to Energy
- Maintenance Services

INDUSTRY
- E&I
- P&M
- Process Solutions
- Maintenance & Specialized Services

INFRA STRUCTURE
- High Voltage
- Distribution networks
- Underground
- Rails, Roads, Waterways, Ports, Airports
- Environment
- Maintenance services

TERTIARY
- Electricity
- Communications & Networks Integration
- Data Centers
- Security
- Distribution
- Maintenance Services

OIL, GAS & POWER
- E&I
- P&M
- Onshore & Offshore
- Power Plants
- Tanks
- Bending & Prefab
- Maintenance Services
Agenda

• Background

• Introducing EVM Principles @ Fabricom

• Current Developments

• Future Developments
End 2007: Launch of “Fabricom’s P.M. School”
- Called “ION”
- Aim: to define a project management training program

Analysing project portfolio
- Need for 2 different training programs

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Small / Medium Sized Projects</th>
<th>Large / Complex Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Nrs. Of Projects / Year</td>
<td>500</td>
<td>450</td>
</tr>
<tr>
<td>100%</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>Contribution to Turn Over</td>
<td>100%</td>
<td>25%</td>
</tr>
</tbody>
</table>
## Training Programs

<table>
<thead>
<tr>
<th>Training Program</th>
<th>fusION Training Programme</th>
<th>connectION Training Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Small / Medium Projects National Allignment</td>
<td>Large / Complex Projects International Allignment</td>
</tr>
<tr>
<td><strong>Reference</strong></td>
<td>Basic P.M. 6 Days / 2 Modules</td>
<td>Advanced P.M. 11 Days / 3 Modules</td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td>Dutch / French</td>
<td>English</td>
</tr>
<tr>
<td><strong>EVM Related</strong></td>
<td>Basic EVM</td>
<td>Advanced EVM</td>
</tr>
<tr>
<td><strong>ION Certificates</strong></td>
<td>M1 Hard Skills: 465 M2 Soft Skills: 499</td>
<td>M1 PM Awareness: 121 M2 Triple Constraint: 270 M3 Advanced PM: 252</td>
</tr>
</tbody>
</table>
EVM Roadmap

• Step 1: Introducing EVM
  – Focus on cost control
  – Status: implemented

• Step 2: Current Developments
  – Focus on time control / Earned Schedule
  – Status: being implemented on large / complex projects

• Step 3: Future Developments
  – Advanced applications
  – Status: ad hoc applications
Agenda

- Background

- Introducing EVM Principles @ Fabricom

- Current Developments

- Future Developments
Extract Procedure Fabricom

3.8 INGAVE ETC (ESTIMATE TO COMPLETE).

Op geregelde tijdstippen moet de Project Manager een inschatting maken van de kosten en opbrengsten (nog te factureren) die nog nodig zijn om het project af te werken. Deze inschattingen noemt men de ETC waarden (Estimate to Complete).

Het is heel belangrijk dat de Project Manager zo juist mogelijke schattingen geeft van de ETC waarden, omdat deze een rechtstreekse invloed hebben op het resultaat. Uitgaande van de FES waarden wordt namelijk per project het resultaat berekend dat rechtstreeks in de Profit & Loss rekeningen wordt opgenomen. Daarom worden bij elke ETC oefening de resultaten besproken door de Business Controller, de Project Manager en zijn operationele hiërarchie.

- P.M. provides on a regular way a ETC
- ETC has to be:
  - “As good as possible” (direct influence on Profit / loss reports)
  - Periodically discussed with B.C. / P.M. / Steering Committee
How we implement this

<table>
<thead>
<tr>
<th>Input</th>
<th>P.M.</th>
<th>B.C.</th>
<th>P.M.</th>
<th>B.C.</th>
<th>Director</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>PV</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>AC</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>ETC</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Status</th>
<th>Performance</th>
<th>Forecast</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>xPI</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>EAC</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Evaluate</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Director</th>
<th>Bi Monthly</th>
<th>Monthly</th>
</tr>
</thead>
</table>
Review: use of evaluation rules

• Once a contract is more than 15-20% complete, the final overrun will be worse than the present overrun (Christensen/Wilson 1992)

\[ CV_{\text{final}} - CV_{20\%} < 0 \]

• Once a contract is over 20% complete, the CPI does not change by more than 10%, and in most cases it worsens (Christensen/Heise 1993)

\[ | CPI_{\text{final}} - CPI_{20\%} | \leq 0.10 \]

• Calculate a range of outcomes:

  CPI-based EAC is a floor to final cost (Christensen, 1996)
  SCI-based EAC is often the most accurate estimate (Fleming & Koppelman 2000, Humphreys & Associates 2002)

\[ \text{EAC}_{\text{cpi}} < \text{EAC} < \text{EAC}_{\text{SCI}} \]
Once a contract is more than 15-20% complete, the final overrun will be worse than the present overrun.

- **ION** Give attention to detailed planning in early stages
  - Strict planning / control in the early stages is needed

Once a contract is over 20% complete, the CPI does not change by more than 10%, and in most cases it worsens.

- **ION** CPI shows more variability during early & middle stage
  - Compare TCPI & CPI

Calculate a range of outcomes: CPI-based EAC is a floor to final cost, SCI-based EAC is often the most accurate estimate.

- **ION** CPI-EAC is a lower bound, SPI - EAC is an upper bound
  - For critical projects, a cost simulation exercise is done
## Real Life Application – Status Month 5

### PROJECT INFO @ M5

<table>
<thead>
<tr>
<th>Budget at Completion</th>
<th>BAC</th>
<th>2.875</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Cost</td>
<td>AC</td>
<td>from B.C.</td>
</tr>
<tr>
<td>Progress</td>
<td>% Compl</td>
<td>from PM</td>
</tr>
<tr>
<td>Estimate to Complete</td>
<td>ETC</td>
<td>from PM</td>
</tr>
</tbody>
</table>

### STATUS

<table>
<thead>
<tr>
<th>EV</th>
<th>EV = %Compl x BAC</th>
<th>1.466</th>
</tr>
</thead>
<tbody>
<tr>
<td>% SPENT</td>
<td>% Spent = AC / BAC</td>
<td>54%</td>
</tr>
</tbody>
</table>

### PERFORMANCE

<table>
<thead>
<tr>
<th>Cost Variance</th>
<th>CV</th>
<th>CV = EV - AC</th>
<th>-96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Performance Index</td>
<td>CPI</td>
<td>CPI = EV / AC</td>
<td>0.94</td>
</tr>
</tbody>
</table>

### FORECAST

| Estimate at Completion | EAC | EAC = AC + ETC | 3.020 |

To be analysed
# Real Life Application – Evaluate EAC

## FORECAST EVALUATION @ M5

### Iteration 1: EAC = 3.020 (given by PM)

<table>
<thead>
<tr>
<th>Rule 1:</th>
<th>VAC &gt; CV</th>
<th>overrun increases from 96 --&gt; 145</th>
<th>ok</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 2:</td>
<td>TCPI &lt; CPI</td>
<td>TCPI = 0,97 &gt; CPI = 0,94</td>
<td>not ok</td>
</tr>
<tr>
<td>Rule 3:</td>
<td>EACcpi &lt; EACpm &lt; EACsci</td>
<td>3.020 &lt; 3.063 &lt; 3.440</td>
<td>not ok</td>
</tr>
</tbody>
</table>

### Iteration 2: EAC = 3.150 (done by B.C.) (TFA = Total Funds Available = BAC + MR)

<table>
<thead>
<tr>
<th>Rule 1:</th>
<th>VAC &gt; CV</th>
<th>overrun increases from 96 --&gt; 275</th>
<th>ok</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 2:</td>
<td>TCPI &lt; CPI</td>
<td>TCPI = 0,89 &lt; CPI = 0,94</td>
<td>ok but...</td>
</tr>
<tr>
<td>Rule 3:</td>
<td>EACcpi &lt; EACpm &lt; EACsci</td>
<td>3.063 &lt; 3.150 &lt; 3.440</td>
<td>ok</td>
</tr>
</tbody>
</table>

### Iteration 3: EAC = 3.200 (decided during review)

<table>
<thead>
<tr>
<th>Rule 1:</th>
<th>VAC &gt; CV</th>
<th>overrun increases from 96 --&gt; 325</th>
<th>ok</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 2:</td>
<td>TCPI &lt; CPI</td>
<td>TCPI = 0,86 &lt; CPI = 0,94</td>
<td>ok</td>
</tr>
<tr>
<td>Rule 3:</td>
<td>EACcpi &lt; EACpm &lt; EACsci</td>
<td>3.063 &lt; 3.200 &lt; 3.440</td>
<td>ok</td>
</tr>
</tbody>
</table>
Real Life Application

- P.M.'s tend to forecast too optimistic!
First Implementation Results

Reported Deviation vs. Progress

- After - ION
- Before - ION

Progress:
- 0%
- 20%
- 40%
- 60%
- 80%
- 100%

Reported Deviation:
- -35%
- -30%
- -25%
- -20%
- -15%
- -10%
- -5%
- 0%
- 5%
- 10%
- 15%
Experiences

• ION trainings program increased project management maturity level

• Findings on project level:
  – Cost forecasts are more reliable and stable
  – Early visibility of potential cost overruns
  – P.M.’s tend to estimate too optimistic

• Findings on portfolio level:
  – Cashflow profile has been reversed into positive (over 3 years)
Agenda

- Background
- Introducing EVM Principles @ Fabricom
- Current Developments
- Future Developments
The Need for ES

• Costs are better managed...and thus under control

• But Project delays are becoming an issue

• Making a sound schedule is a difficult job
  • In most cases there is no dedicated “scheduler”
  • Updating schedules is very difficult

• So we are currently implementing Earned Schedule for large / complex projects
Chapter 3

- Describes 3 real life cases
- Discusses the use of ES versus EV methods

ES indicators / forecasts are reliable

A healthy baseline is needed

ES to be used in conjunction with a schedule
Agenda

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For a claimed amount of EV at a status point AT, the amount of work which should be accomplished is identified by PV at ES.
What really happens....

It is more likely performance is not synchronous with the schedule, the EV has a different distribution.
ES allows for detecting tasks done “out of schedule”:

Tasks behind: indicates the possibility of constraints (ex. Tasks 2, 4, 6)

Tasks ahead: indicates the possibility of future rework (ex. 7,8)
Schedule adherence (P-Factor):

\[
P\text{-Factor} = \frac{\text{EV according to plan}}{\text{Total Claimed EV}}
\]

A measure how well the scheduling process is being followed
Value between 0 (out of sequence) and 1 (according to schedule)
Effective Earned Value

- \( EV = EV(p) + EV(r) \)
  - \( EV(p) = P \times EV \)
    - portion of EV according to plan
  - \( EV(r) = (1 - P) \times EV \)
    - portion of EV not to plan, at risk
    - high likely a source of rework

- \( EV(r) = EV(r1) + EV(r2) \)
  - \( EV(r1) = \) usable portion of \( EV(r) \)
  - \( EV(r2) = \) unusable portion of \( EV(r) \)

- \( EV(e) = \text{Effective Earned Value} \)
  - \( EV(e) = EV(p) + EV(r1) \)
    - \( = f(P, \% R) \times EV \)
    - \( = a \times EV \)
Further Extensions - Application

As progress advances ‚† more information available ‚† %Rework decreases
EARNED VALUE MANAGEMENT

INPUT

STATUS
PERFORMANCE
FORECAST

EARNED VALUE MANAGEMENT

AC  PV  EV

CV  CPI

SV  SPI

EAC  TCPI

EAC(t)

ES

SV(t)  SPI(t)

EAC(t)  TSPI(t)

Earned Schedule

Schedule Adherence

Effective Earned Value

P-Factor

% Rework

Task ahead/delay

EV(e)  ES(e)

CV(e)  CPI(e)

EAC(e)  TCPI(e)

SV(te)  SPI(te)

EAC(te)  TSPI(te)

Earned Schedule INPUT

STATUS PERFORMANCE FORECAST

P-Factor

Schedule Adherence

Effective Earned Value
Final Notes

• EVM / ES:
  – Training / assistance is needed → requires an investment
  – R.O.I.:
    • More accurate and reliable cost / duration forecasts
    • Better cashflow management
  – Project orientated organisation → may be makes it easier

• ES Extensions:
  – Use of P-Factor → leads to more accurate / stable EAC predictions
  – Looks very promising