A Neat Solution for the EVM Schedule Problem
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EVM - basics

$K

Weeks

SPI = EV / PV
CPI = EV / AC

PMBOK: 7.3.2 Control Costs: Tools and Techniques

PV: budget for work to be performed
EV: budget for work completed
AC: cost of work completed

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EVM – cost performance metrics

- This program is overrun
  - Metrics are good indicators of cost performance
  - Ending metrics indicate “poor” cost performance
- Can predict an estimate at completion from metrics
  - $EAC = \frac{BAC}{CPI_{\text{cum}}}$

Target Completion Date =

CV = EV – AC

CPI = EV / AC
EVM – schedule performance metrics

- This program is late!
- Schedule metrics are misleading
  - Indicate improving schedule after ½ point
  - Indicate “perfect” schedule performance at end
- SV $ = how much time?
- When will the project end?
  - Cannot predict program end with metrics

SV = EV – PV

SPI = EV / PV
Schedule performance – earned schedule (ES)

Week | 1  | 7  | 8  | 10 |
AC    | 7  | 52 | 60 | 84 |
EV    | 5  | 38 | 43 | 48 |
PV    | 6  | 46 | 52 | 71 |

SV($) = EV – PV = 48 – 71 = $ – 23K
SPI($) = EV \[ EV \quad PV \] = 48 \[ 71 \] = 0.68

SV(t) = ES – AT = 7.33 – 10 = – 2.67 weeks
SPI(t) = ES \[ ES \quad AT \] = 7.33 \[ 10 \] = 0.733
Calculate earned schedule (ES)

- PV \text{(Week 7)} < EV < PV \text{(Week 8)}
- ES is into Week 8 of the project baseline
  - Calculate what fraction of Week 8 is earned

\[
ES = 7 + \frac{EV - PV_7}{PV_8 - PV_7} = 7 + \frac{48 - 46}{52 - 46} = 7 + \frac{2}{6} = 7.33
\]
ES-based (time-based) schedule metrics formulas

\[ ES = n + \frac{EV - PV_n}{PV_{n+1} - PV_n} \]  
where \( n \) is the period when \( PV_n < EV < PV_{n+1} \)

\[ PD = \text{original planned duration of project} \]
\[ AT = \text{actual time} = \text{time now} \]

Cumulative \( SV(t) = ES - AT \)

Cumulative \( SPI(t) = \frac{ES}{AT} \)

Monthly \( SV(t) = (ES(\text{cum})_{AT} - ES(\text{cum})_{AT-1}) - (AT(\text{cum})_{AT} - AT(\text{cum})_{AT-1}) \)

Monthly \( SPI(t) = \frac{ES(\text{cum})_{AT} - ES(\text{cum})_{AT-1}}{AT(\text{cum})_{AT} - AT(\text{cum})_{AT-1}} \)
## PMI NOT-POTY Schedule Metrics

### $-based metrics

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<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
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### Time-based metrics

| Week (W) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|----------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| ES (weeks) |   |   |   |   |   |   |   |   |   |   | 0.83 | 1.67 | 2.50 | 3.25 | 4.00 | 4.67 | 5.20 | 6.25 | 6.50 | 7.33 | 8.63 | 9.82 | 10.45 | 10.82 | 11.14 | 11.86 | 12.83 | 14.00 |
| Monthly SV(t) | -0.17 | -0.17 | -0.17 | -0.25 | -0.25 | -0.33 | -0.47 | 0.05 | -0.75 | -0.17 | 0.29 | 0.19 | -0.36 | -0.64 | -0.29 | -0.02 | 0.17 |
| Monthly SPI(t) | 0.83 | 0.83 | 0.83 | 0.75 | 0.75 | 0.67 | 0.53 | 1.05 | 0.25 | 0.83 | 1.29 | 1.19 | 0.64 | 0.36 | 0.32 | 0.71 | 0.98 | 1.17 |
| Cumulative SV(t) | -0.17 | -0.33 | -0.50 | -0.75 | -1.00 | -1.33 | -1.80 | -1.75 | -2.67 | -2.38 | -2.16 | -2.55 | -3.18 | -3.86 | -4.14 | -4.17 | -4.00 |
| Cumulative SPI(t) | 0.83 | 0.83 | 0.83 | 0.81 | 0.80 | 0.78 | 0.74 | 0.78 | 0.72 | 0.73 | 0.76 | 0.82 | 0.80 | 0.77 | 0.74 | 0.74 | 0.75 | 0.76 |

**Target Completion Date =**
PMI NOT-POTY Schedule Metrics (continued)

PMI POTY Cumulative EV & PV

PMI POTY Cumulative SV(t)

Target Completion Date =
Earned Schedule (ES) as a predictor

- When will the project end?

Projected Project Length = \frac{\text{Planned duration}}{\text{Schedule efficiency}} = \frac{PD}{SPI(t)} = \frac{14}{0.733} = 19.1 \text{ weeks}
Earned schedule (ES) is NOT conversion of $ to time

Scenario – 1 task remaining, PV = $12K, estimated completion = 1 month
   \[ SV = -$12K \]
   \[ SV(t) = -1 \text{ month} \]

1 month later task – still not done!
   \[ SV = -$12K \]
   \[ SV(t) = -2 \text{ months} \]

2 months later task – still not done!
   \[ SV = -$12K \]
   \[ SV(t) = -3 \text{ months} \]
ES – analysis

• SV(t) = -2.67 weeks

- Review the IMS
- Determine where SV(t) applies
  - If not on critical path (CP) – no issue!
  - If on CP, discuss impact and recovery plan
Earned Schedule (ES) – takeaways

• ES-based schedule metrics
  • Based on WHEN the work was planned to be done
  • EVM data already available
    • Non-complex calculations
  • Behaves like EVM cost metrics throughout the project
    • No misleading metrics
    • Can project end date

• Material and travel can skew schedule statistics
  • Labor only might provide a better indicator of schedule status

• How does this jive with critical path analysis?
  • You know how many days slip you need to mitigate
Earned Schedule (ES) – recommendation

• Use ES if:
  • Schedule performance on your project is critical
  • Schedule performance is significantly ahead or behind
  • You want to step up your level of communication regarding schedule performance

• Do not use ES if:
  • Schedule performance is stellar
    • ES requires customer education
    • Do not give customer something to shoot at
Earned schedule references

• “Schedule is Different”; Walter Lipke; Software Division; Oklahoma City Air Logistics Center; March 2003

• “Not your Father’s Earned Value”; Ray Stratton; February 2005

• http://www.earnedschedule.com/

• Acknowledgement: PMIWDC August 2009 Fairview Park Luncheon