Predicting The Future
Peter Hayward
BAE Systems Insyte
Predicting The Future

• Steve said to me that perhaps I could maybe touch on one or two main issues with forecasting the Estimate To Complete
Predicting The Future

- Steve said to me that perhaps I could maybe touch on one or two main issues with forecasting the Estimate To Complete
- Problem is, there aren’t any. Anyone can predict the future. The issue is actually:
Predicting The Future

• Steve said to me that perhaps I could maybe touch on one or two main issues with forecasting the Estimate To Complete
• Problem is, there aren’t any. Anyone can predict the future. The issue is actually:

  • Recognition of what the data is telling you – getting them to believe
Agenda

• Methods of predicting the future!
  • Statistical EACs
  • TCPIle
  • Earned Schedule
Statistical EACs

- Most of the data looked at in Earned Value terms are backward looking, i.e. where we are today
- However, there are some good ways to take past performance trends and do a what if for the future
- Most tools will do this for you
Statistical EACs

• The Estimate At Complete (EAC) costs are the sum of what you have spent to date, Actual Cost of Work Perfomed (ACWP) plus the Estimate To Complete (ETC)
• In BAE Systems Insyte, we gather the forecast (ETC) from the CAM each month, this is a manual ETC
• This can then be compared with the statistical EACs to give indications of impending problems
Statistical EACs

• Taking the performance to date (CPI) you can predict the costs in the future if there is no change in performance

\[
\text{CPI} = \frac{\text{BCWP}}{\text{ACWP}} \quad \text{if} \quad \frac{\text{BCWP}}{100} = \frac{\text{CPI}}{0.75} \quad \frac{\text{ACWP}}{133}
\]

This means that for every £1 of work being done it is costing you £1.33 to do it!
Statistical EACs

• So consider this. If you had a budget of £200k and you are performing at 0.75 then why wouldn’t the EAC be £200k/0.75 = £266.7k

• OK, so you may have done half of the work then a more precise formula would be ACWP + BAC-BCWP = £133k + £200k - £100k

\[
\frac{0.75}{0.75}
\]

which still equals £266.7k because the performance (CPI) in this example is constant
Statistical EACs

• Now it gets more interesting when you start to introduce the current SPI as well
• Thus if you are over spending and behind schedule (CPI and SPI <1) then the EAC will be even higher. Consider this:

\[
\frac{\text{BAC - BCWP} + \text{ACWP}}{\text{CPI} \times \text{SPI}}
\]

• Then you can weight what amount of the CPI or SPI that you use
• Then you can start to use average CPIs, last 3 months and last 6 months
• And then
  • And then
    • And then
    • And then
Statistical EACs – Some Formulas

BCWR = BAC - BCWP (CUM)

- 3 Period Av = \( \frac{BCWR}{3 \text{ Per Av CPI}} \)
- 6 Period Av = \( \frac{BCWR}{6 \text{ Per Av CPI}} \)
- Cum CPI = \( \frac{BCWR}{\text{CPI (Cum)}} \)
- Cur CPI = \( \frac{BCWR}{\text{CPI (Cur Period)}} \)
- CPI x SPI = \( \frac{BCWR}{\text{CPI (CUM)) SPI (CUM)}} \)
- Cost & Sched = \( \frac{BCWR}{\text{CPI (CUM)) SPI (CUM)}} \)

- Linear Regression
  The linear regression formula is calculated by finding the formula for the straight line that best fits the plot of cumulative ACWP vs. cumulative BCWP, then entering the BAC into that formula to calculate the EAC
- MICOM
  Uses the 6 period Av CPI x SPI

And then do you include MR or not?
Statistical EACs

• Don’t remember the formulas
• Use the data
Statistical EACs – Ideal Chart?

![Chart Image]

<table>
<thead>
<tr>
<th>Element: W</th>
<th>(Default) Compare EACs</th>
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</thead>
<tbody>
<tr>
<td>Pounds in Millions</td>
<td></td>
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<tr>
<td>AUG</td>
<td>4.130</td>
</tr>
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</table>

Legend:
- BAC
- LRE
- CUM CPI
- MICOM
- MvAvCPI
- CPI/SPI
- LINREGR

INTEGRATED SYSTEM TECHNOLOGIES
Statistical EACs – Ideal Chart?

Tight group though manual EAC (LRE) is higher than ALL statistical EACs
Statistical EACs – Would You Question This Chart

<table>
<thead>
<tr>
<th>Element:</th>
<th>Compare EACs</th>
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<tbody>
<tr>
<td></td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td>OCT</td>
</tr>
<tr>
<td>CUM CPB.137</td>
<td>6.235</td>
</tr>
<tr>
<td>MvAvCPB0.058</td>
<td>6.774</td>
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</table>

Statistical EACs

CAM EAC
Statistical EACs – What happened so far?

Current budget as of May 09 is £12.72M
They are looking to rebaseline in the next month!!!!!
October 2005, the Independent Estimate At Complete shows you are going to overspend and is predicting about £7.75m. Do you believe it?

BCWS
IAC
ACWP
BCWP
Linear (IAC)
Linear (IAC)
Statistical EACs - Predicts The Future

October 2006, now do you believe it?
TCPI – Now it gets really interesting

• So if the CPI gives you Cost Performance in the past, what about Cost Performance in the future
• This is where TCPI comes in, To complete Cost Performance Index
• It shows you the Cost Performance in the future required to get back to Budget (TCPlb) and to get to the Estimate (TCPlE) – remember in BAE Systems Insyte the Estimate (ETC or LRE) is from the CAM, manual ETC
TCPlte

• Another formula

\[
\text{BCWR} \\
\text{ETC}
\]

or

\[
\text{BAC-BCWP} \\
\text{EAC-ACWP}
\]
TCPlE – How Does It Work?

BAC = 500

Time Now

ACWP = 100
CPI = 80/100 = 0.8

BCWP = 80
BCWR = 500 – 80 = 420
TCPIe – How Does It Work?

- **Time Now**
  - **ACWP = 100**
  - **BCWP = 80**
  - **ETC = 400**

- **CPI = 80/100 = 0.8**

- **BCWR = 500 – 80 = 420**

- **BAC = 500**
TCPIe – How Does It Work?

- **BAC** = 500
- **Time Now**
- **ACWP** = 100
- **CPI** = 80/100 = 0.8
- **BCWP** = 80
- **BCWR** = 500 – 80 = 420
- **ETC** = 400
- **TCPIe** = BCWR/ETC
  - \[= \frac{420}{400} = 1.05\]
TCPIe – How Does It Work?

Time Now

BAC = 500

ACWP = 100

CPI = 80/100 = 0.8

BCWP = 80

BCWR = 500 – 80 = 420

ETC = 400

TCPIe = BCWR/ETC

= 420/400

= 1.05

Question to CAM – How are you going to improve your current performance?
TCPIe – How Should It Work?

BAC = 500

Time Now

ACWP = 100  CPI = 80/100 = 0.8
BCWP = 80   BCWR = 500 – 80 = 420
ETC = 400   TCPIe = BCWR/ETC
= 525       = 420/525
             = 0.8
TCPie – It works the other way as well

<table>
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<tr>
<th>CPI</th>
<th>1.72</th>
<th>1.76</th>
<th>1.69</th>
<th>1.68</th>
<th>1.64</th>
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<th>1.97</th>
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<td>0.76</td>
<td>0.76</td>
<td>0.77</td>
<td>0.77</td>
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<td>0.56</td>
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<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
<td>91.5</td>
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<td>39.2</td>
<td>39.2</td>
<td>40.8</td>
<td>42.6</td>
<td>42.9</td>
<td>42.9</td>
<td>43.2</td>
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Earned Schedule

- In the summer of 2002 Walt Lipke developed a new concept – Earned Schedule and the seminal article was published in the March 2003 issue of the Measurable News (the publication of PMI-CPM).
- The new concept uses a new set of EV measures
- This is not an Earned Schedule master class – please attend the Earned Schedule workshop on Thursday of this week with Mick Higgins and Alex Davis or see Walt Lipke or Kim Henderson for that
- One of the new measures is Schedule Performance Index Time (SPI(t))
- The advantage of SPI(t) is that, unlike the SPI, it DOES NOT return to 1 at completion
Earned Schedule – What It Isn’t

SV in currency

Baseline
Performed
Earned Schedule – What Is It?

Time Now

Baseline
Performed
Earned Schedule – What Is It?

Time Now

SV in time

Baseline
Performed
Earned Schedule – What Is It?

Time Now

SV in time

Baseline
Performed
Earned Schedule – What Is It?

• The amount of full periods earned plus the amount of part periods earned
Earned Schedule – What Is It?

- The amount of full periods earned plus the amount of part periods earned
- From our chart you can see that we have earned 6 full periods plus a fraction of a period
- The calculation for the fraction:

\[
\text{ES} = \frac{\text{BCWP(Cum)} - \text{BCWS(Last Full Period)}}{\text{BCWS(Last Full Period+1)} - \text{BCWS(Last Full Period)}}
\]

\[
\text{ES} = 6.25
\]
Earned Schedule – SPI(t)

• Schedule Performance Index Time SPI(t) = ES/AT where AT = Actual No periods at Time Now
• From the example

ES = 6.25
AT = 7
SPI(t) = 6.25/7 = 0.89
Earned Schedule – SV(t)

• Schedule Variance Time SV(t) = ES - Actual No periods at Time Now

• From the example

   ES = 6.25
   AT = 7
   SV(t) = 6.25 - 7
   = -0.75
## Earned Schedule – Plot The Data

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<tr>
<th>BCWS</th>
<th>BCWP</th>
<th>AT</th>
<th>SPI</th>
<th>FULL</th>
<th>PART</th>
<th>ES</th>
<th>SV(t)</th>
<th>SPI(t)</th>
<th>SV</th>
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Earned Schedule – Plot The Data

SV(t)
Earned Schedule – Add a Trend Line
Earned Schedule – Pick a Point
Earned Schedule – Pick a Point

1.9 periods late
Earned Schedule – Look at SV
Earned Schedule – Three Months Later

1.4 periods late
The Project was due to complete in February 2006 but the SV(t) shows you will be anywhere from 7 to about 20 months late. Do you believe it?
The Project finishes in February 2007 (12 months late), now do you believe it?
Recap

• This has not been a master class but should be food for thought
• It’s not getting the data
• It’s getting someone to believe and do something about it….
Questions?
BAE Systems Integrated System Technologies (Insyte) Limited
Victory Point
Lyon Way, Frimley, Camberley
Surrey, GU16 7EX
United Kingdom
Telephone +44 (0) 1276 603000
Fax +44 (0) 1276 603001

e-mail insyte@baesystems.com
www.baesystems.com/insyte