“A simple and reliable method forecasting time and costs of E&C projects”

Dr. Tom Johns, Ph.D., PE, PMP, MAPM

Business Management Consultants (BMC)
“The problem in America is that our fascination with the tools of Management obscures our apparent ignorance of the ‘Art’”

Tom Peters, “In search of excellence”, (1983)
The most successful companies of the future …

Peter Drucker,
“The coming of the new organization
HBR, 1988

Tom Johns, “The Art of Project Management - Complexity”
PMI® Global Congress, 2008
For an E&C project
To be
In-control
Measure → Evaluate → Correct
Each task must be “In-Control”
For Control of an E&C task

First the establish the Performance Baseline In terms of Measurable Elements

![Number of Examinations to Date](chart.png)

- **Expected**
- **Completed**

**Forecast**
Newton's First Law

"A body at rest will remain at rest and a body in motion will continue in motion in a straight line, as long as no unbalanced force acts on it."

Sir Isaac Newton, Philosophiae Naturalis Principia Mathematica, (1687)
For Control of an E&C task

First the establish the Performance Baseline
In terms of Measurable Elements

An Emerging Practice

PMI “Practice Standard for EVM”, an Emerging Practice, (2005), pg 18
Another Example from a Space System E&C

The State-of-the-art of Forecasting

NOTE: CURRENT EST FOR TOTAL DRAWINGS REQUIRED 1250, WEIGHT REDUCTION BOGEYS TO BE ASSESSED.
Complexity Simplified to Milestone Slip

$$\text{SPI}^{*}_{\text{Alternative}} = \frac{t_{\text{Actually done}}}{t_{\text{Planned to be done}}} = \text{Constant}$$

*Called 1/SPI(t)* PMI “Practice Standard for EVM”, an Emerging Practice, (2005), pg 18

The performance baseline

- Planned Work $f_n(t)$
- Actual Work Produced $f_n(t/\beta)$

When Planned - Actual Slip

Work Products

Planned - Actual

time
Complexity Simplified to Milestone Slip

Forecasted Duration = \frac{t_{\text{Actually done}}}{t_{\text{Planned to be done}}} \times \text{Planned Duration}

\[ f_n(t) \]

\[ f_n(t/\beta) \]

Work Products

Planned

Actual

Slip

When Planned

Actual

The performance baseline

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When can I use this?

\[ \text{SPI}_A^* = \frac{t \text{ Actually done}}{t \text{ when work was Planned to be done}} \]

*Called 1/\text{SPI}(t)* PMI “Practice Standard for EVM”, an Emerging Practice, (2005), pg 18
How soon can I use it?

In General by

25-40 %

Complete

SPI_{A} = \frac{t_{\text{Actually done}}}{t_{\text{when work was Planned to be done}}}

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An E&C Example: **Houston Metro - Pinemont Park and Ride**

- Actual Data
- Re-plotted Data
- **SPI**
- **Alternative**
- Re-plotted % Complete and SPI_{Alt}
An E&C Example: Houston Metro - Pinemont Park and Ride

Take Phase I Alone

SPI Weekly Alternative

SPI Accum Alternative

% Complete

Stabilized
An E&C Example: **Houston Metro - Pinemont Park and Ride**

And, taking Phase II Alone

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**SPI**

**Weekly Alternative**

**SPI**

**Accum Alternative**

**% Complete**

Again stabilized
An E&C Example: a New Aircraft

Overall Systems S-Curve

Reference milestones: 10% to 120%

- Current baseline
- Milestones Achieved

- Slip
- 4.5 months
- 20 months
An E&C Example: a New Aircraft

Overall Systems S-Curve

4.5 months
An E&C Example: a New Aircraft

Overall Systems S-Curve

PMO reported

4.5 months
An E&C Example: a New Aircraft

The reality was

Overall Systems S-Curve

4.5 months

20 months

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Establishing the Performance Baseline

Let’s Simplify the Math

The performance baseline

Planned Work $f_{N}(t)$

Actual Work Produced $f_{N}(t/\beta)$

When Planned

Actual

Work Products

time

Slip

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Let’s Simplify the Math

Where

\[ \text{Slip} = t_{\text{actual}} - t_{\text{planned}} \]

The performance baseline

Work

Products

Planned Work

\( f_N(t) \)

Actual Work Produced

\( f_N(t/\beta) \)

When Planned

Slip

Actual

Time
Let’s Simplify the Math

Dividing both sides of the equation by \( t_{\text{planned}} \)

\[
\text{Slip} = \frac{t_{\text{actual}}}{t_{\text{planned}}} - \frac{t_{\text{planned}}}{t_{\text{planned}}}
\]

\[
\% \text{ late} = \frac{\text{SPI}}{\text{Alternative}} - 1 \quad \text{(a constant)}
\]
Setting up a Simple Control System

Definition
Brochures
Margin
Stock Profile
Support
Training
Acceptance
Go, No-Go Decision
Advertising
Stocking & Measuring Sys.
Sales Ads, Brochure Production
Go, No-Go Launch
Program Launch
Sales

25-40%
Control system for the E&C Project

Beyond Earned Value Metrics (EVM)

25-40%
PMBOK Schedule Performance Index

Caution

\[
SPI_{PMBOK} = \frac{BCWP (EV)}{BCWS (PV)}
\]

“Cannot” be used to forecast slip
Does this work also for Cost Performance?

Cost Performance Index (CPI)
Cumulative and Monthly 1/CPI

\[
CPI_{PMBOK} = \frac{EV, BCWP}{AC, ACWP}
\]
Thank you!

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