The Earned Value Body of Knowledge (EV-BOK)

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Primavera

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APUBLIC RELEASE

See report.

http://www.acq.osd.mil/pm/paperpres/paperpres.html

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Project Management Institute (PMI)

“The Project Management Body of Knowledge (PMBOK) … describes the sum of knowledge within the profession of project management.”

PMBOK Guide 1996
Agenda: The Earned Value Body of Knowledge

- Evolution into a Management Science
- The Earned Value Body of Knowledge
- Our opportunity to Leave a Legacy
A “Management Science”

“The utilization of scientific methodology or principles in solving management problems.”

Dr. David Cleland & Dr. Harold Kerzner
A Project Management Dictionary of Terms
Remember the Scientific Method:

1. Formulate a testable hypothesis
2. Design an experiment to test
3. Conduct controlled experiments
4. Compare results with predictions
5. Develop theories from the results
6. Document & continue the evolution
Early Management Scientists:

- Frederick W. Taylor
- Frank & Lillian Gilbreth
- Henry Laurence Gantt
- Henri Fayol
- and others...
Circa 1890s...
...in the Industrial Factories

1. “Management by Exception”...to a baseline

\[ \text{PS} \quad \text{ES} \quad \text{AC} \]

Exceptional = +1.0
Perfect = 1.0
Poor = -1.0

2. “Factory Standards”
Neo Management Scientists:

- Robert Kemps (DOD; DOE)
- Gary Christle (DOD)
- Wayne Abba (DOD)
- Dr. David Christensen (AFIT)
- and many others...
Circa 1974
the Bob Kemps’ road shows

The DOD’s
new C/SCSC

CPR & C/SSR
& the Baseline
Circa 1991
the Christle & Abba road shows

Postmortem
on the
The Navy A-12
Cancellation
Circa 1993 through 1997
Dr. Christensen’s published studies:

- The CPI
- Stability
- EAC Performance Indices
- A Review of EAC Research

NCMA, PMA, PMI, SCEA Magazines...
Earned Value Applications... happen all the time

- Architectural Design work
- Construction
- Ship Building
- Lender agreements
- Performance Based Payments
The times...They have Changed
---the climate is right---

Circa 1987

**USG:** Here are 174 criteria, take it...

**Industry:** Can’t we talk about it!

Circa 1997

**USG:** Let’s work together...

**Industry:** What did they say?
Documenting an Earned Value Body of Knowledge

Chapter 3
Fleming & Koppelman
PMI October 1996
Empirical documentation of actual performance results from over 700 projects
Contracts at 15% complete point  
(Gary Christle)

• GIVEN:  
  1. Overrun at completion will not be less than overrun to date.  
  2. Percent overrun at completion will be greater than percent overrun to date.

• CONCLUSION: You can't recover!!

• WHO SAYS: More than 300 major DOD contracts since 1977.

• WHY: If you underestimated the near, there is no hope that you did better on the far term planning.
#2

A single management control system providing enterprise-wide data on all projects & all production work
Government is ahead of private industry

--- Industry still has opportunities ---
An “integrated” management control system combining the project’s technical + time + resources
Which management approach is most effective?

Engineering = Technical Scope

Contracts = Statement of Work

Finance = Budget Controls

Planning = Scheduling

Control Account Plans
1. Technical Scope
2. Budget
3. Schedule
The use of Management by Exception (MBE) to monitor performance against baselines
#5

The utility of the Cost Performance Index\((e)\) to report the true cost “efficiency” on all projects
Monitoring project performance: focus on cum CPI_{efficiency}
**Stability of the Cumulative CPI**

*(Dr. David Christensen-study of 155 contracts 1971 to 1991)*

- Cumulative CPI stabilizes at 20% point
- At 20% point variances only +/- 10%
- Variances get tighter to the end

---with the CPI one can forecast the end---
The utility of a period

Cost Performance Index\((p)\) to monitor

a production standard
Monitoring production effort: focus on the weekly CPI (performance)

Equivalent Unit Costs (EUC)

"what it cost to hit one standard"

Weekly EUC Plan

CPI(p) = \frac{Actual Costs}{Earned Value} = \frac{ACWP}{BCWP}

Formula

time in weeks
The utility of the Schedule Performance Index (SPI) to isolate & quantify the value of work scheduled...but not performed
Comparison of the earned value schedule position with the critical path...prevents the wastage of project resources
#8

The utility of the Cumulative CPI\(_{(e)}\) to statistically forecast a “low-end” Estimate at Completion
The Cumulative CPI as a Forecaster

(Dr. David Christensen—study of 155 contracts 1971 to 1991)

- Non-cumulative CPI lacks predictive value
- Weighted 20/80 formula lacks predictive value
- Short period averages have predictive value
- Longer period averages do not
#9

The utility of the Cumulative $\text{CPI}_{(e)}$ times the $\text{SPI}$ to statistically forecast a “high-end” Estimate at Completion
Cost Risks Can Be Managed (with an “early warning” signal)

$PM's\ EAC = BAC$

15% Complete

Statistical EAC Range
#10

The utility of Earned Value Management to monitor the remaining effort within management’s expectations
Side-by-Side Displays

Cumulative Performance Curves

- Design Freeze
- First Article Complete
- Testing Complete

Planned Value (32)
“Earned Value” (24)
Actuals (29)

100 90 80 70 60 50 40 30 20 10 0

Project Dollars

Cumulative Variance Trends

- Design Freeze
- First Article Complete
- Testing Complete

Management Reserve
Cost Variance
Schedule Variance

EVPM page 93
"To Complete (the work) Performance Index" (TCPI) to focus on goals set by management: BAC / EAC / Ceiling

![Diagram](image)

**Formula:**

\[
\frac{\text{Work Remaining}}{\text{Funds Remaining}} = \text{TCPI}
\]
In Summary

- EV has become a Management Science
- We should welcome this direction
- It is now time to formalize the:

“Earned Value Body of Knowledge”