

Risk Leadership in Complex Project Management

Achieving Risk Leadership with Improved Schedule Analysis and Prediction Techniques



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Achieving Leadership in Complex Project Management

Risk = Sum {Probability_i x Impact_i (\$\$, time)}

- Does the management method selected, such as <u>Earned</u> <u>Value Management</u>, inject additional risk?
 - Inappropriate management action
 - Loss of time and money



Overview

- Breaking new ground with improved techniques and methodology
- Introducing <u>Earned Schedule</u> a schedule analysis enhancement to Earned Value Management
- Advancement in predictive techniques made possible by Earned Schedule
- Planning for uncertainty and analysis of project performance with statistical methods



- Shedding our traditional thinking that constrains us
- Change is a <u>departure</u> from our past ... there is no such thing as a smooth transition
- Required is a recognition that something better is needed ...by all involved
- Questions you've likely had from time to time
 - Why can't we plan our projects better?
 - Why aren't project reserves related to risks?
 - Why is schedule analysis separate from EVM analysis?
 - We do EVM analysis ... so what?
 - Why can't we do a better job of forecasting outcomes?

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- Earned Value Management (EVM) integrates cost, schedule, and requirements
 - Provides structure for planning
 - Requires project schedule
 - Accounts for project cost reserves
 - Indicators provide information about project performance
 - Provides facility to forecast project outcome
- Seemingly, EVM answers the questions
 - Those that govern the practice appear satisfied
 - Those that teach & consult prefer the status quo
 - Practitioners want more, but use what is available

<u>EVM is in a rut</u>



- Compounding the <u>rut</u>, EVM has deficiencies and needs improvement
 - Schedule indicators are flawed for late projects
 - EVM is extremely limited for schedule performance analysis EVM practitioners pay attention to Cost and ignore Schedule data EVM has become focused in financial management
 - Indicators are not directly connected to deliverables
 - EV is not required to be earned synchronously with the schedule
 - Indicators do not explicitly lead to appropriate management action
 - EVM does not offer management guidance for project control

EVM can be better



- Four actions will significantly improve EVM and diminish the deficiencies identified
 - Resolve the EVM schedule indicators flaw
 - Connect EVM to the network schedule
 - Connect project performance information with possible management actions
 - Make use of historical project data

The Path to Improvement



EVM Schedule Indicators



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EVM Schedule Indicators

- SV & SPI behave erratically for projects behind schedule
 - SPI improves and equals 1.00 at end of project
 - SV improves and concludes at \$0 variance

Regardless of lateness !!

- Schedule indicators lose predictive ability over the last third of the project
- Why does this happen?
 - At planned completion, PV = BAC
 - At actual completion, EV = BAC



Earned Schedule Concept





Earned Schedule Indicators

 What happens to the ES indicators, SV(t) & SPI(t), when the planned project duration (PD) is exceeded (PV = BAC)?

They Still Work ... <u>Correctly</u>!!

- ES will be \leq PD, while AT > PD
 - SV(t) will be negative (time behind schedule)
 - SPI(t) will be < 1.00

Reliable Values from Start to Finish !!



Schedule Analysis with EVM?

- The general belief is EVM cannot be used to predict schedule duration
- Most practitioners analyze schedule from the bottom up using the network schedule"It is the only way possible."

Analysis of the Schedule is overwhelming

- Critical Path is used to shorten analysis
 (CP is longest path of the schedule)
- Prediction/forecasting using Earned Schedule provides macro-methods similar to those for estimating Cost

- <u>a significant advance in practice</u>



Earned Schedule Predictors

• Can the project be completed as planned?

TSPI = Plan Remaining / Time Remaining

= (PD - ES) / (PD - AT)

where (PD - ES) = PDWR

PDWR = Planned Duration for Work Remaining

- ...completed as estimated?
 - TSPI = (PD ES) / (ED AT)

where ED = Estimated Duration

TSPI Value	Predicted Outcome
≤ 1.00	Achievable
> 1.10	Not Achievable

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Forecasting with Earned Schedule

• Long time desire of EVM practitioners...

Prediction of total project duration <u>from EVM data</u>

- Independent Estimate at Completion (time)
 - IEAC(t) = PD / SPI(t)
 - IEAC(t) = AT + (PD ES) / PF(t)

where PF(t) is the Performance Factor (time)

- Analogous to IEAC used to predict final cost
- Independent Estimated Completion Date (IECD)
 - IECD = Start Date + IEAC(t)



Detailed Schedule Analysis

- Earned Schedule facilitates easier, simpler analysis of the network schedule
 - Total Project
 - Critical Path
 - Control Account
 - Individual Task
- ES analysis identifies potential process constraints and impediments and the likelihood of future rework
- ES couples EVM to the schedule & deliverables
 - Allows measuring "Schedule Adherence"
 - Facilitates concept of "Effective Earned Value"
- ES with EVM provides a more complete understanding of project performance, thereby improving outcome prediction for <u>schedule and cost</u>



Earned Schedule Bridges EVM to Network Schedule





Graphs of CPI, CPI(e) & P - Factor (notional data)





Schedule & Cost Prediction

(notional data)



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Connecting Performance to Action

- EVM does not provide managers with a description of how to use the cost and schedule indicators for project control
- What is to be done when cost performance is good but schedule is not? ...and vice versa
- What are the manager's strategies?
- Is more information needed beyond the EVM indicators?
- When should a manager take action?

Not acting appropriately ... Consumes Time & Budget



Project Control Strategies

	Cost Performance	Schedule Performance	Actions
	Green	Green	Reward Employees
	Green	Yellow	Increase OT
	Green	Red	Increase OT or People
	Yellow	Green	Decrease OT
	Yellow	Yellow	Review & Adjust Assignments
	Yellow	Red	Adjust Assignments; Consider Negotiation (Schedule)
	Red	Green	Decrease OT or People
	Red	Yellow	Adjust Assignments; Consider Negotiation (Funding)
	Red	Red	Negotiation (Funding/Schedule/Rqmts);Examination
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Management Action Process





Current EVM Understanding

- Prediction expectation for final cost comes from one primary researcher
- Using US DoD project data
- Do the results apply to your projects?
- If they don't should you base management decisions on these published results?
- What alternative is available?

Your Intuition



Application of Statistics

- Available pertinent project performance data facilitates the application of statistical methods
- Confidence Limits can be used for
 - Strategizing management reserves
 - Forecasting range of possible outcomes
- Knowledge of Probability
 - Increases management understanding of trade-off between reserves and competitiveness
 - Provides management information, especially for when renegotiation is necessary
- Wide-spread application will require statistical tools tailored to EVM/ES data

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My Future Vision

- EVM data is retained, classified, and available for retrieval
 - Within company division
 - Across company
 - Across like industries
 - Totally shared across all applications & organizations
- Benefits of having historical EVM data
 - Facilitates broad-based empirical studies
 - Improves planning & performance
 - Decrease in re-plans & re-negotiation
 - Better, more complete project records
 - Improves prediction & management

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Wrap Up

- EVM has flaws that can inject risk to project control
- ES improves schedule indicators & facilitates duration prediction
- ES connects EVM to the schedule & project deliverables, yielding new schedule analysis methods and improved forecasting
- Management decisions require more than EVM data
- Use of Statistics improves project planning & control
- Historical project records are key to the future



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