

# Using CMMI® to Improve Earned Value Management

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**Paul Solomon PMP**

**Software Engineering Institute and**

**Northrop Grumman Integrated Systems**

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# Agenda

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- **Process Improvement using SEI Technical Note**
- **Earned Value Management (EVM) Overview**
- **Comparison of CMMI to EVM Standard**
  - **Strong Relationships**
  - **Shortcomings of EVM Standard**
- **Technical Performance Measurement (TPM)**
- **Performance-Based Earned Value (PBEV)**
- **Process Improvement and Appraisal**

# Performance-Based Management

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- **U.S. National Standards**
  - ANSI/EIA 748-A-1998, “Guidelines for EVM Systems” (EVMS)
  - Project Management Body of Knowledge (PMBOK®), ANSI/PMI 99-001-2000
- **Policies for Performance-Based Management Systems**
  - Meet Guidelines in EVMS
  - Federal agencies: OMB Circular A-11
  - DoD 5000.2-R



# Principles of EVMS

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- Key EVMS Principles With Regard to CMMI:
  - Break Down and Assign **Work Scope** to Control Project Objectives
  - Integrate Project **Work** Objectives Into Performance Measurement Baseline
    - Work Scope
    - Schedule
    - Cost
  - **Objectively** Assess Accomplishments at Work Package Level

# Comparison of CMMI to SW-CMM: EVM

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- - Integrate Project Planning Parameters:
    - Cost
    - Schedule
    - Technical Performance
  - Establish Measurement Objectives
  - Establish Precise, Quantifiable Measures
  - Earned Value
- Measurement Elevated to a Separate Process Area

# **Strong Relationship: CMMI to EVMS**

- **16 Specific Practices (SP) Have Informative Components With Strong Relationships**
- **Highly Consistent With EVMS**
  - **Project Planning**
  - **Project Monitoring and Control**
  - **Supplier Agreement Management**
  - **Integrated Project Management**

# **Leverage Strong Relationship**

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- **EVM Implementation May Aid Appraisal**
  - **Indicate High Capability and Maturity**
  - **Provide Objective Evidence to Substantiate Practice Implementation**

# Strong Relationships

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<b>Project Planning</b>	<b>Goal 2: Develop a Project Plan</b>	<b>EVMS</b>
<b>SP 2.4 Plan for Project Resources</b>	<b><u>Informative Components</u></b>  Typical work products: WBS work packages WBS task dictionary Staffing requirements based on project size and scope	<b>2.2.e</b>  Establish budgets and work packages



# Strong Relationships

<p><b>Project Monitoring &amp; Control</b></p>	<p><b>Goal 1: Monitor Project Against the Plan</b></p>	<p><b>EVMS</b></p>
<p><b>SP 1.1</b></p> <p><b>Monitor Project Planning Parameters</b></p>	<p><u><b>Informative Components</b></u></p> <p><b>Measure actual values of planning parameters</b></p> <p><b>Compare to plan</b></p> <p><b>Identify significant deviations.</b></p> <p><b>Subpractices: Monitor Progress against the schedule</b></p> <p><b>Cost and expended effort</b></p> <p><b>Attributes of work products, tasks</b></p>	<p><b>2.4.a</b></p> <p><b>Compare to plan. Identify schedule and cost variances</b></p>

# Strong Relationships

<p><b>Integrated Project Management</b></p>	<p><b>Goal 1: Use the Project's Defined Processes</b></p>	<p><b>EVMS</b></p>
<p><b>SP 1.4</b></p> <p><b>Manage the Project Using the Integrated Plans</b></p>	<p><b><u>Informative Components</u></b></p> <p><b>Typical work products:</b></p> <p>Work products, collected measures, progress records, revised requirements, plans</p> <p><b>Subpractices</b></p> <p>Monitor and control activities and work products</p> <p>Review and align project's performance with projected needs, objectives, requirements</p>	<p><b>2.1.c</b></p> <p><b>2.1.e</b></p> <p><b>2.2.d</b></p> <p><b>2.4.a-f</b></p> <p><b>2.5.a</b></p> <p><b>2.5.e</b></p>

# Shortcomings of EVM Standard

- **Regarding Achieving EVMS Principles**
  - **–CMMI: More Explicit Guidance than EVMS**
  - **–Control of Technical Objectives**
  - **–Objective Assessment of Accomplishments**
- **EVMS Excludes Risk Management**



# Impact of Shortcomings

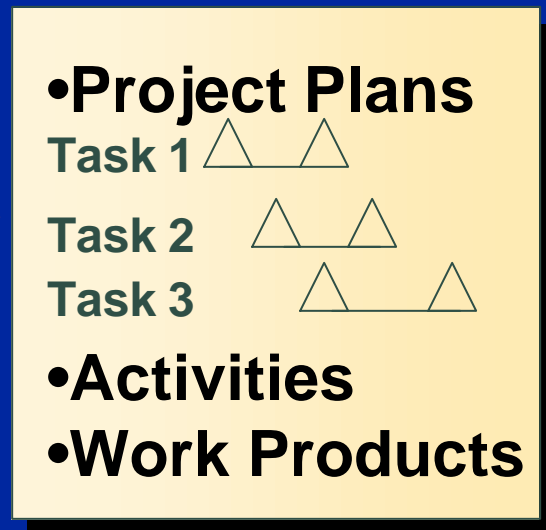
- **Organization May Implement EVMS *But***
  - **Fail to Implement Practices of EVMS-related CMMI Process Areas**
  - **Need to Identify and Implement Process Improvements to**
    - **Achieve Related CMMI Goals**
    - **Increase EVM's Capability to Control Technical, Schedule and Cost Objectives**

# Framework for Process Improvement

- **More Explicit Guidance Than EVMS**
  - Requirements Management
  - Measurement and Analysis
  - Process and Product Quality Assurance (QA)
  - Requirements Development
  - Risk Management
- **CMMI Practices not in EVMS but,  
If Added to Organization's Processes,  
Will Strengthen Adherence to EVM Principles**

# Requirements Management Gaps

- **CMMI:** Identify Inconsistencies Between



- **EVMS:**

- Addresses Only *Work* Requirements
  - WBS-oriented
  - *Work* Scope Needed for Cost Accounting and Work Authorization
- Silent on *Product* Requirements

# Measurement & Analysis Gaps

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- **CMMI:**

- Establish *Quantifiable* Measures
  - Stated in *Precise, Unambiguous* Terms
- Operational Definitions for the Measures
- Specify How Measurement Data Will Be Obtained

- **EVMS:**



- % Complete May Be by Management Assessment



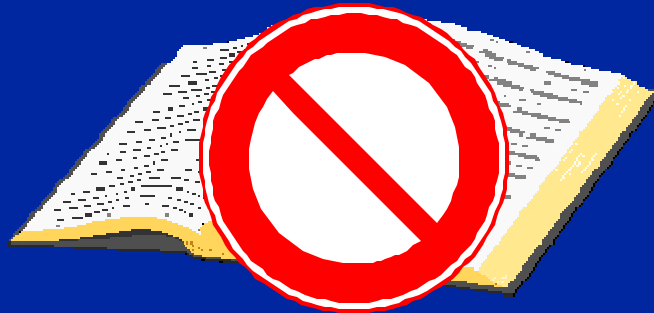
# Process and Product QA Gaps

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- **Process QA**

- **CMMI:** *Objectively* Evaluate Processes for Adherence to Procedures

- **EVMS:**





# Process and Product QA Gaps

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- **Product QA**

- **CMMI:**

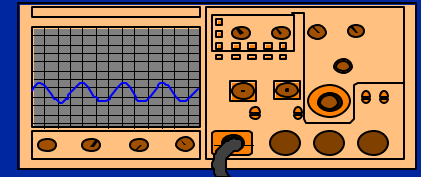
- *Objectively* Evaluate Work Products  
Against Clearly Stated Criteria

- *Minimize Subjectivity*

- **EVMS:**

- EV Is Measurement of *Quantity* of Work

- *Quality* and *Technical* Content of Work  
Performed Are *Controlled by Other Means*



# Requirements Development Gap

- **CMMI:**

- Product and Product-Component
- Identify Key Requirements
  - Influence
    - Cost
    - Schedule
    - Functionality
    - Risk
    - Performance
  - Will Be Used to Track Technical Progress

- **EVMS:** Addresses Only *Work* Requirements

# Risk Management Gaps

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- **CMMI:**

- Refers to Other Process Areas
  - Project Monitoring and Control
  - Project Planning
- Define Risk Parameters
- Identify, Analyze Risk
- Mitigate

- **EVMS:**



# Risk Management Gap Closure

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- Integrate Processes

- Examples:

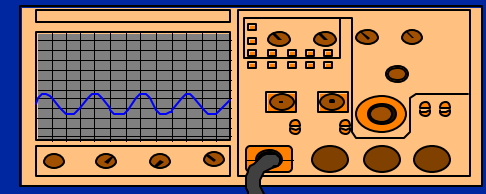
- Revise Estimate at Completion If Likelihood and Cost Impact of Risk Evaluation Exceed Thresholds

Probability 5	2	3	6	9	12
4	2	3	5	8	11
3	1	2	4	7	10
2	1	2	3	5	8
1	1	1	2	3	5
	1	2	3	4	5

- Revise Plan, Schedule, Budget to Incorporate Risk Mitigation Plan

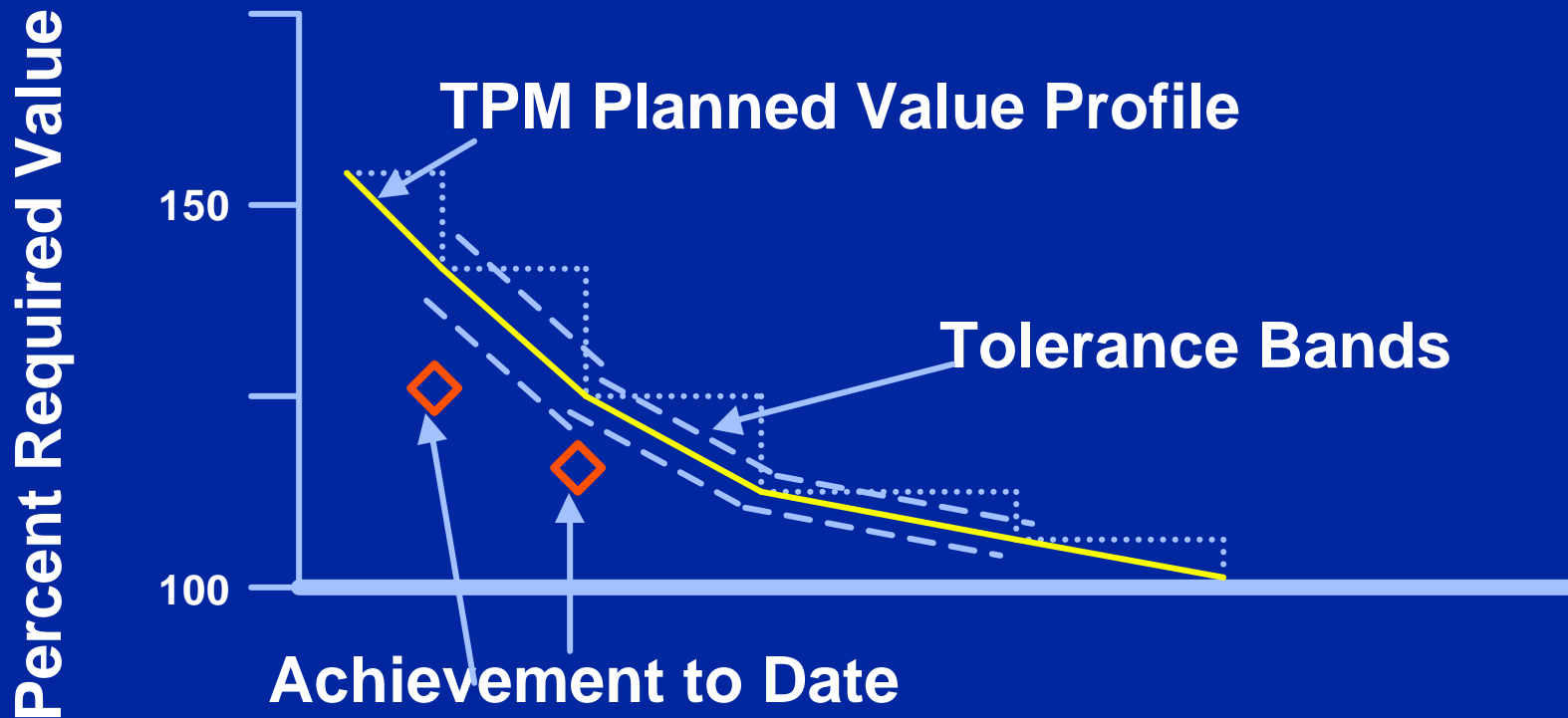
# Technical Performance Measurement

- Performance-Based Management Systems
  - DoD 5000.2-R, Para. 5.2.3.4.7
    - Performance Parameters Identified by Operational User
- Systems Engineering Capability Model (EIA/IS-731)
  - Predict Future Value of Key Technical Parameters of the End System
    - Based on Current Assessments of the Systems That Make up That End System
- **Key Base Measure of EV**



# Additional Examples for TPM Users

## Work Products and Attributes of Work Products Not in CMMI:

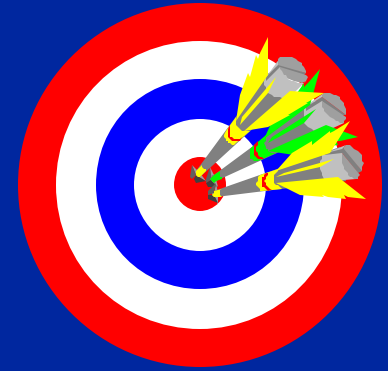


**Recommend: Organizations Include TPM Examples as Part of Framework for Process Improvement**

# Performance-Based EV

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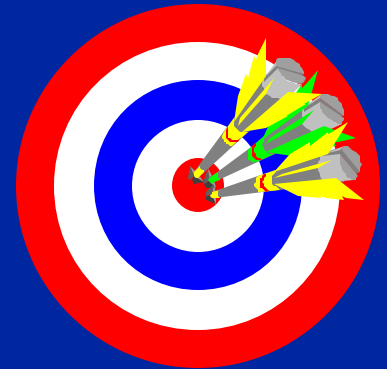
- **Best Practices of EVMS and CMMI**
  - Requirements-Driven Planning
  - Objective EV Measurement
- **Cost-Effective Use of EVM**
  - Progress of Work Products
- **Undiluted Schedule Variance Analysis**



# Performance-Based EV

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- ***CrossTalk* Articles on PBEV**
  - Determine Information Needs and Objectives
  - Specify Measures Based on
    - Practical Software and Systems Measurement (PSM)
    - Technical Performance
    - Requirements Management
    - CMMI Typical Work Products
- Consider for Process Improvement





# Process Improvement and Appraisal

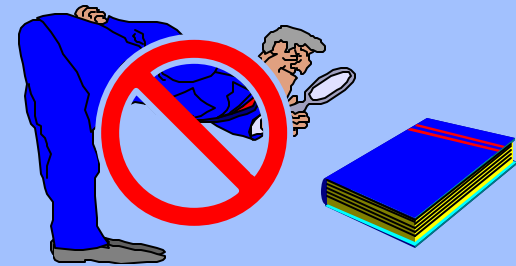
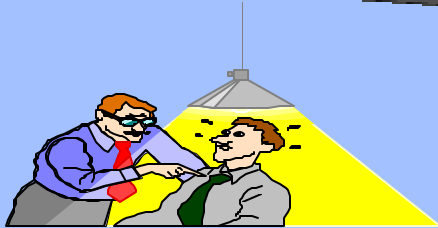
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- Objective:
  - Reduce Cost of Process Improvement and Appraisal
- Share Objective Evidence That Substantiates Implementation of Model Practices
- Share Additional Mechanisms Such As Oversight Activities As Evidence



# Cost Savings: SCAMPI Appraisal

Internal/External  
Audits



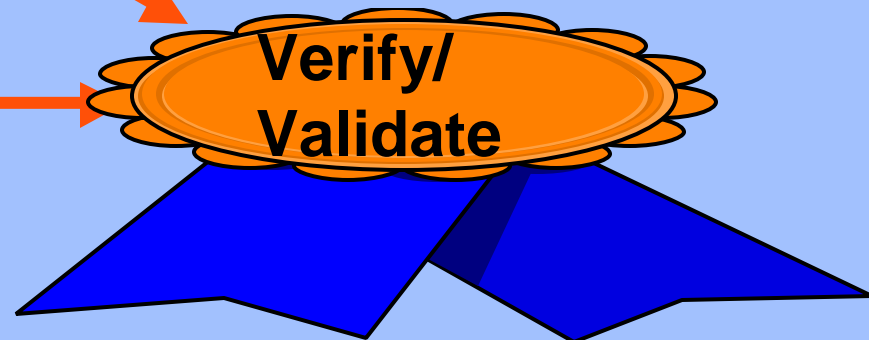
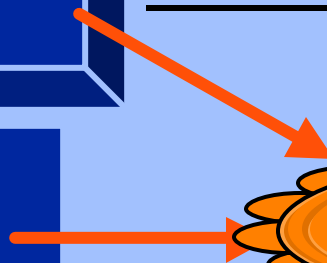
**Oversight: Implementation  
of Model Practices Including  
EVMS**

**Minimize On-Site Interviews  
And Document Reviews:**



**Instruments:  
Mapping Tables**

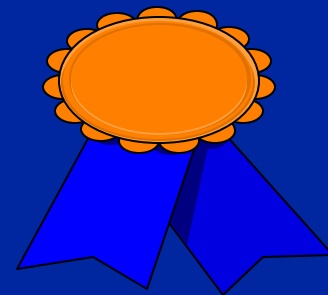
**Verify/  
Validate**



# Conclusion

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- **EVM – Tool to Effectively Integrate a Project’s Technical, Schedule and Cost Objectives**
- **SEI Technical Note**
  - **Reconciles Implementation of EVM With CMMI**
  - **Identifies Practices in CMMI That Will Strengthen Adherence to EVM Principles**
  - **Consider TPM and PBEV in Framework**
  - **Prepare for Cost-effective Process Improvement and Appraisal**



# References

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[www.sei.cmu.edu/publications/documents/02.reports/02tn016.html](http://www.sei.cmu.edu/publications/documents/02.reports/02tn016.html)
- CMMI Is Registered by Carnegie Mellon University in the U.S. Patent and Trademark Office
- Performance-Based Earned Value and PBEV Are Service Marks of Paul Solomon
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