

# EVMS Research Study with ASU - UPDATE -



**NDIA**

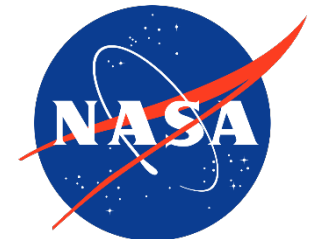
**CAIWG**



**ASU**



**Melvin Frank**  
**Project Controls Division (PM-30)**  
**Office of Project Management (PM)**  
**US Dept. of Energy**



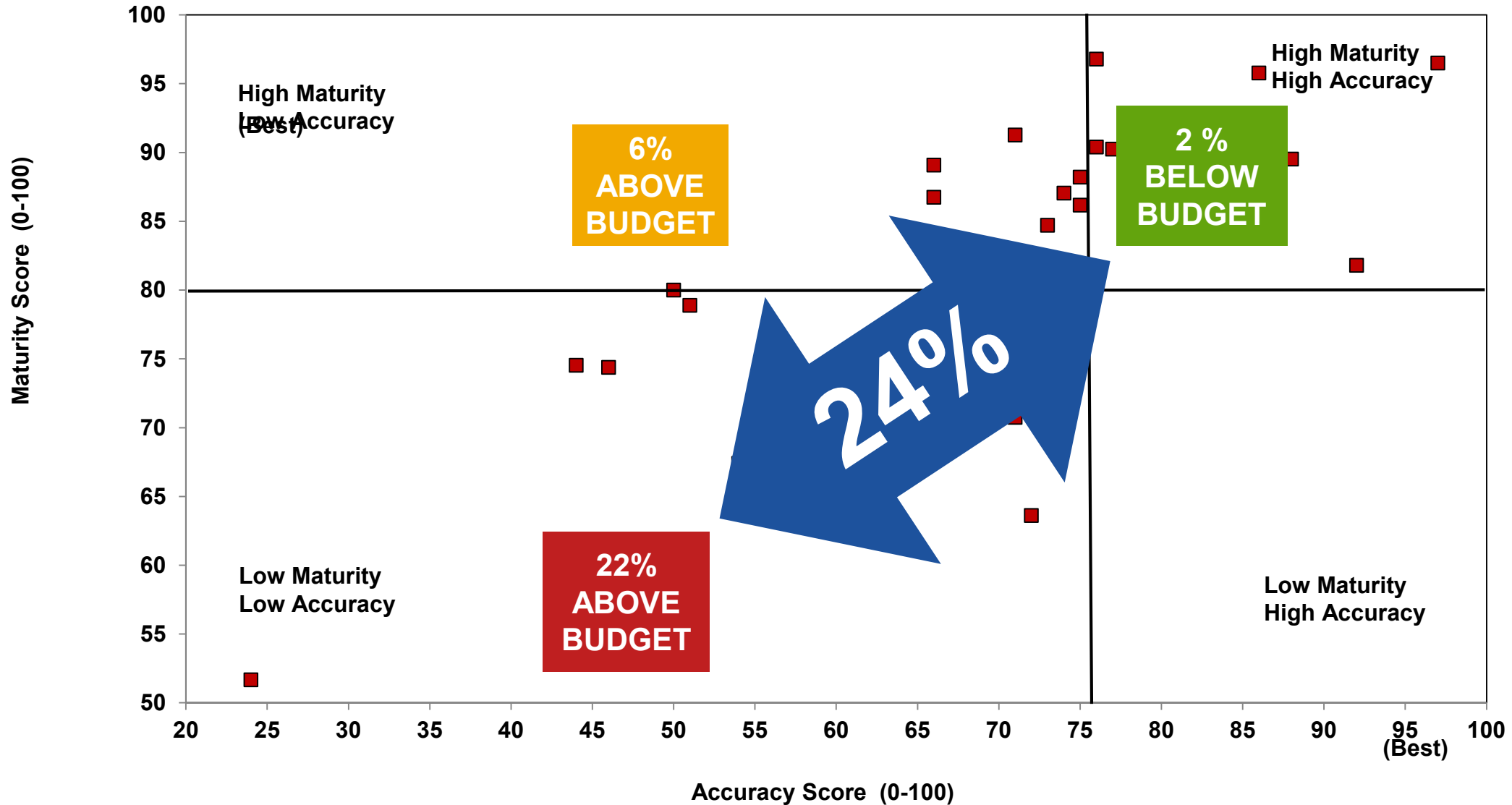
**April 16, 2020**

- **EVMS Research Study: Better Governance Through Improving the Reliability of EVMS Implementation - Development of an EVMS Maturity Level Rating Index**
- **Aims and Objectives**
  - Elevate the worth and utility of the EVMS through unbiased scientific research
  - Develop a tailorable EVMS Maturity Model inclusive of EIA-748 compliance requirements that can accommodate the unique missions, program and project types of the DOE, DoD, NRO, NASA, and other CFAs, as well as commercial ventures requiring disciplined scope, schedule, and cost management
  - Develop weighted EVMS Maturity Score for insight into implementation risks/opportunities
    - **EVMS Maturity Score can reflect the importance of a management process or attribute, individually or collectively** during the planning and execution of a program or project
  - Work towards OMB Goal for Reciprocity
  - Inform EIA-748-E Update



- EVMS Research Study will result in a **method to assess the maturity of management processes and attributes** which comprise the EVMS and the **environment factors** in which the EVMS operates
  - Define the attributes of an **effective EVMS at various maturity stages**
  - Define the **key enablers and barriers to the effectiveness of the EVMS**
- **Study leverages the Construction Industry Institute's (CII) Front End Engineering Design (FEED) Maturity and Accuracy Total Rating (MATRS) methodology** as a guide for its work
  - CII FEED MATRS consists of 46 engineering design elements and 27 accuracy factors that **generates two separate scores: a maturity score and an accuracy score**
- The FEED MATRS methodology lays the foundation for predictable and efficient project delivery through better Front End Planning (FEP), and has been a **CII Best Practice for over 24 years resulting in project cost savings and project schedule reductions**

# CII's FEED MATRS (An Example)





- By **looking at compliance in a different and holistic manner**, are there significant opportunities to **improve the reliability of EVMS implementation**?
  - Can EVMS implementation (and EIA-748 compliance expectation) be better served by **using a “sliding scale” to consider project phase, cost, and risk levels**?
  - To what extent do **environment factors, both internal and external to a project**, affect the reliability of EVMS implementation?



# EVMS Research – Timeline

Research Schedule		PHASE 1												PHASE 2																								
		2019												2020						2021																		
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
	<i>NDIA IPMD Conf.</i>		◆						◆						◆						◆							◆						◆				
	<i>Team meetings (tentative)</i>		◆			ASU			◆		ASU			ASU	◆	Zoom	Zoom	Zoom				◆		ASU		ASU			◆						◆		◆	◆
	<i>Interim Reports</i>								◆				◆							◆					◆						◆							
	<i>Training</i>																																		◆	◆		
<b>1</b>	<b>Review of Literature and State of Practice</b>	█	█																																			
<b>2</b>	<b>Recruit Team</b>	█	█	█																																		
<b>3</b>	<b>Define Project</b>	█	█	█	█																																	
<b>4</b>	<b>Finalize Scope and Objectives</b>		█	█	█	█																																
<b>5</b>	<b>Questionnaire</b>			█	█	█	█	█																														
<b>6</b>	<b>Develop Draft Assessment Tool</b>				█	█	█	█	█	█	█	█	█	█	█	█	█	█	█																			
6a	Overall Tool Layout				█	█	█	█	█	█	█	█	█	█	█	█	█	█	█																			
6b	Maturity Assessment								█	█	█	█	█	█	█	█	█	█	█																			
6c	Environment Assmt.																																					
6d	Combining M&E																																					
<b>7</b>	<b>Identify Data Sample</b>							█	█	█	█	█	█	█	█	█	█	█	█																			
<b>8</b>	<b>Conduct Workshops</b>																			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
<b>9</b>	<b>Finalize and Test</b>																																					
9a	Workshop Testing																																					
9b	Software Developmt.																																					
9c	Ongoing Project Tests																																					
<b>10</b>	<b>Synthesize Results into Guide</b>																																					
<b>11</b>	<b>Develop Publications and Presentations</b>																																					

# EVMS Research – Team Members



Role	Name	Organization	Name	Organization
Chair/Vice-Chair	Melvin Frank	DOE/PM-30	Amy Basche	Mission Support Alliance - EFCOG
Principle Investigator (PI) /Co-PI	Edd Gibson	ASU	Mounir El Asmar	ASU
Grad Students	Namho Cho	ASU	Vartenie Aramali	ASU
Govt. /Industry Reps	Dave Kester	DOE/PM-30	Craig Hewitt	EFCOG – Contract Support
Govt. /Industry Reps	Zac West	DOE/PM-30	Jeffrey King	BAE
Govt. /Industry Reps	Garrett Richardson	DOE/PM-30	Doug Marbourg	Los Alamos National Lab
Govt. /Industry Reps	Betsy Ballard	DOE/EM	Derek Lehman	Washington River Protection Solutions
Govt. /Industry Reps	Danielle Bemis	DoD/DCMA	Robert Sudermann	Fluor Government Group
Govt. /Industry Reps	Bill Weisler	DoD/DCMA	Tony Spillman	Washington River Protection Solutions
Govt. /Industry Reps	Ivan Bembers	NRO	John Post	Jacobs
Govt. /Industry Reps	Barry Levy	NRO – Contract Support	Tom Carney	Lockheed Martin
Govt. /Industry Reps	Jerald Kerby/Stefanie Terrell	NASA/CAIWG	Vaughn Schlegel	Lockheed Martin
Govt. /Industry Reps	Ben Pina	DOE/NNSA	Russ Rodewald	Raytheon
Govt. /Industry Reps	Wayne Harris	DOE PM-30 – Contract Support	Paul Sample	CACI

# Survey – Final Results



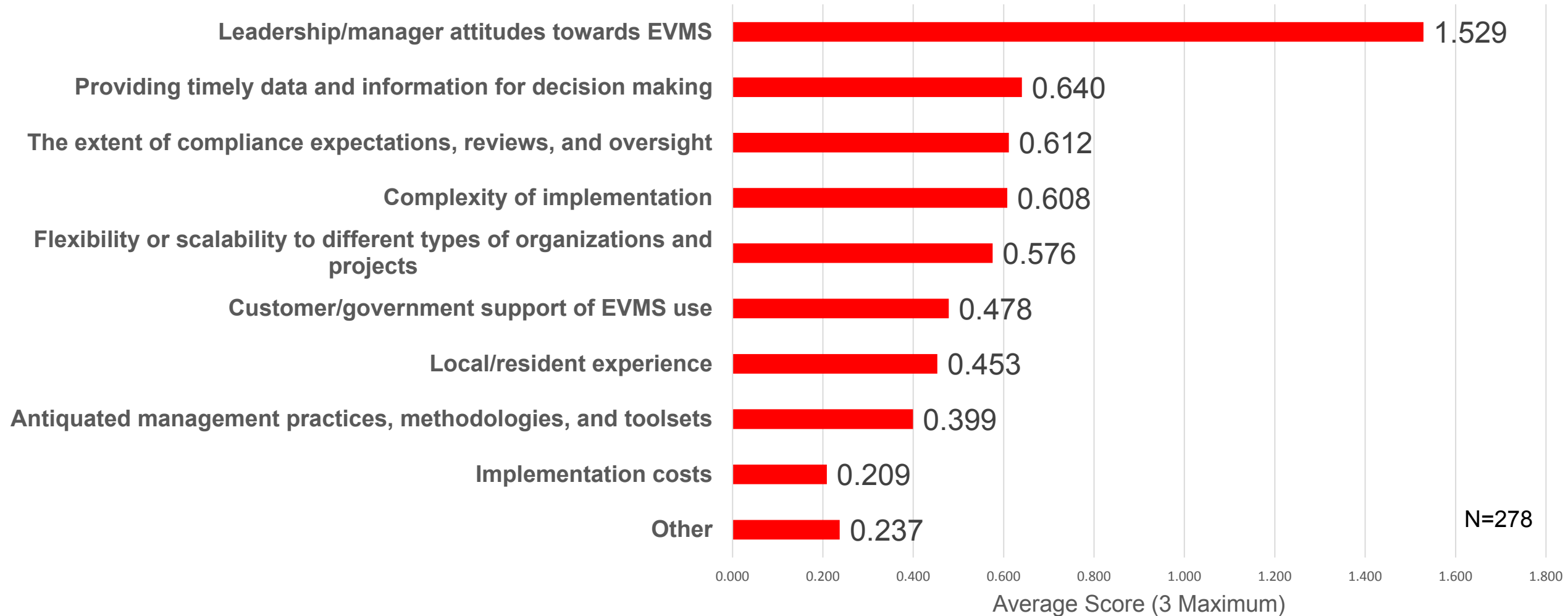
Slide 8

- **Purpose**
  - Check our definitions
  - Feedback on our approach
  - Assist in development of our tool
- **August 29, 2019 to October 31, 2019**
  - Well over 500 solicitations
  - Project and program management/leadership
- **294 usable responses**



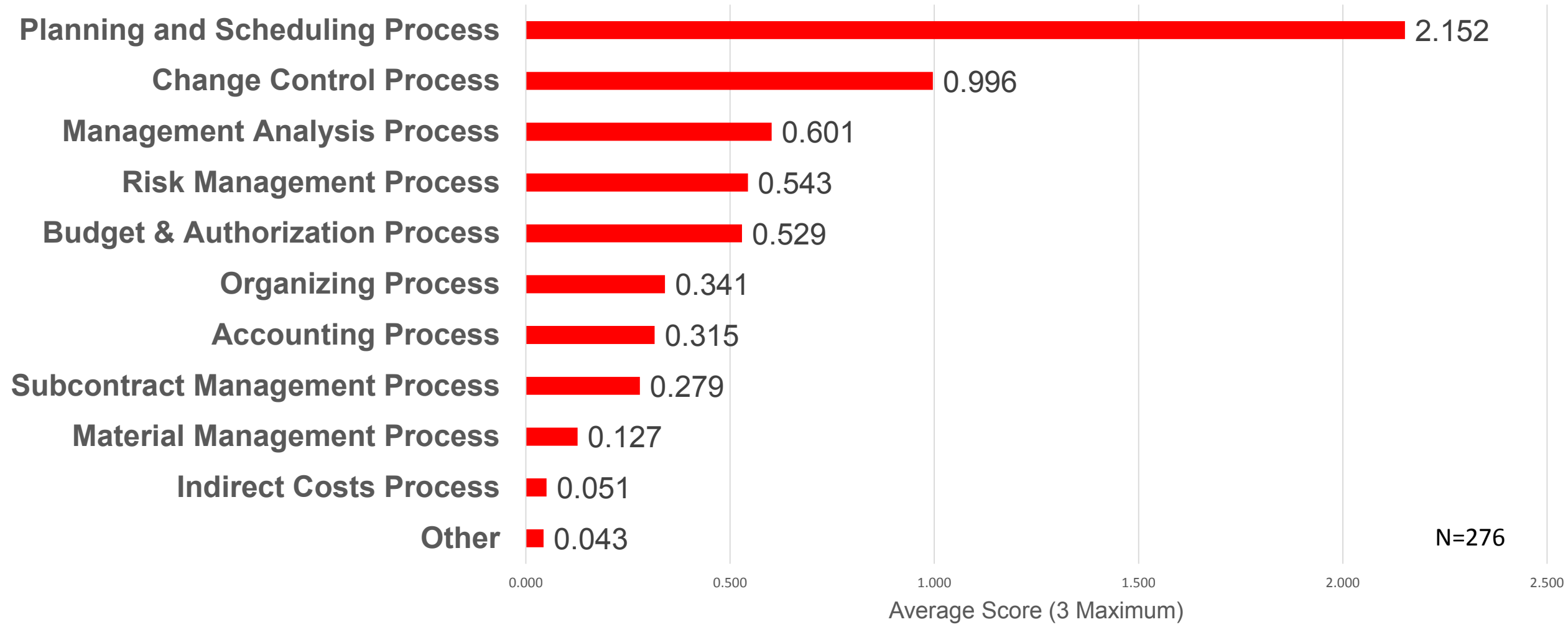
# What are the most challenging aspects of managing a project/program using the Earned Value Management System (EVMS) (top three ranked)

Most challenging aspects by overall score



# Core processes typically make up an Earned Value Management (EVM) system. The top three ranked in terms of its impact on EVMS effectiveness.

Top processes by overall score

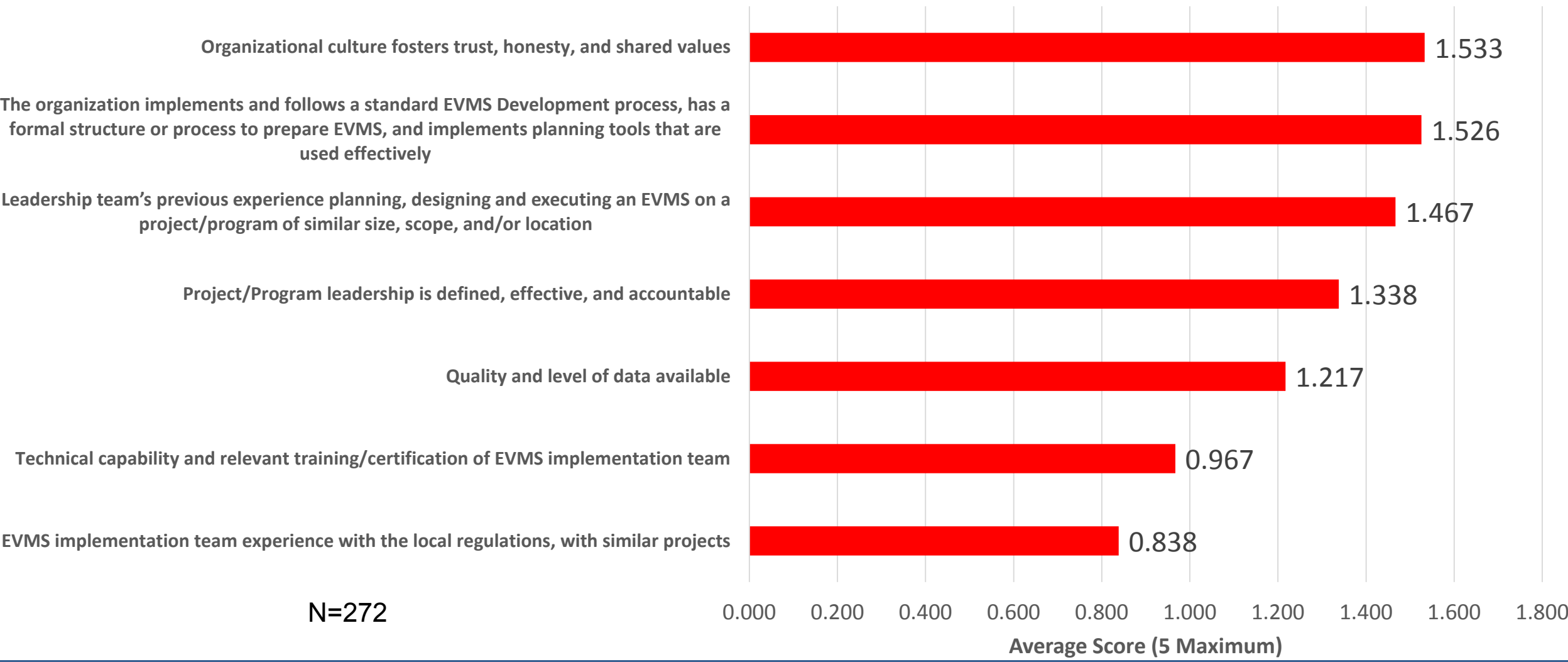




**Factors that influence the degree of confidence in the outputs of the EVM system, associated processes, and deliverables that serve as a basis for effective program/project management and decision making.**

# Factors impacting the Environment of Earned Value Management (EVM) systems

## Top factors that affect environment by overall score



## **EVMS Maturity:**

The degree to which an implemented system, associated processes, and deliverables serve as the basis for an effective and compliant EVMS.

## **EVMS Process:**

A series of interrelated tasks that, together, transform inputs into a system to achieve EVM.

## **EVMS Attribute:**

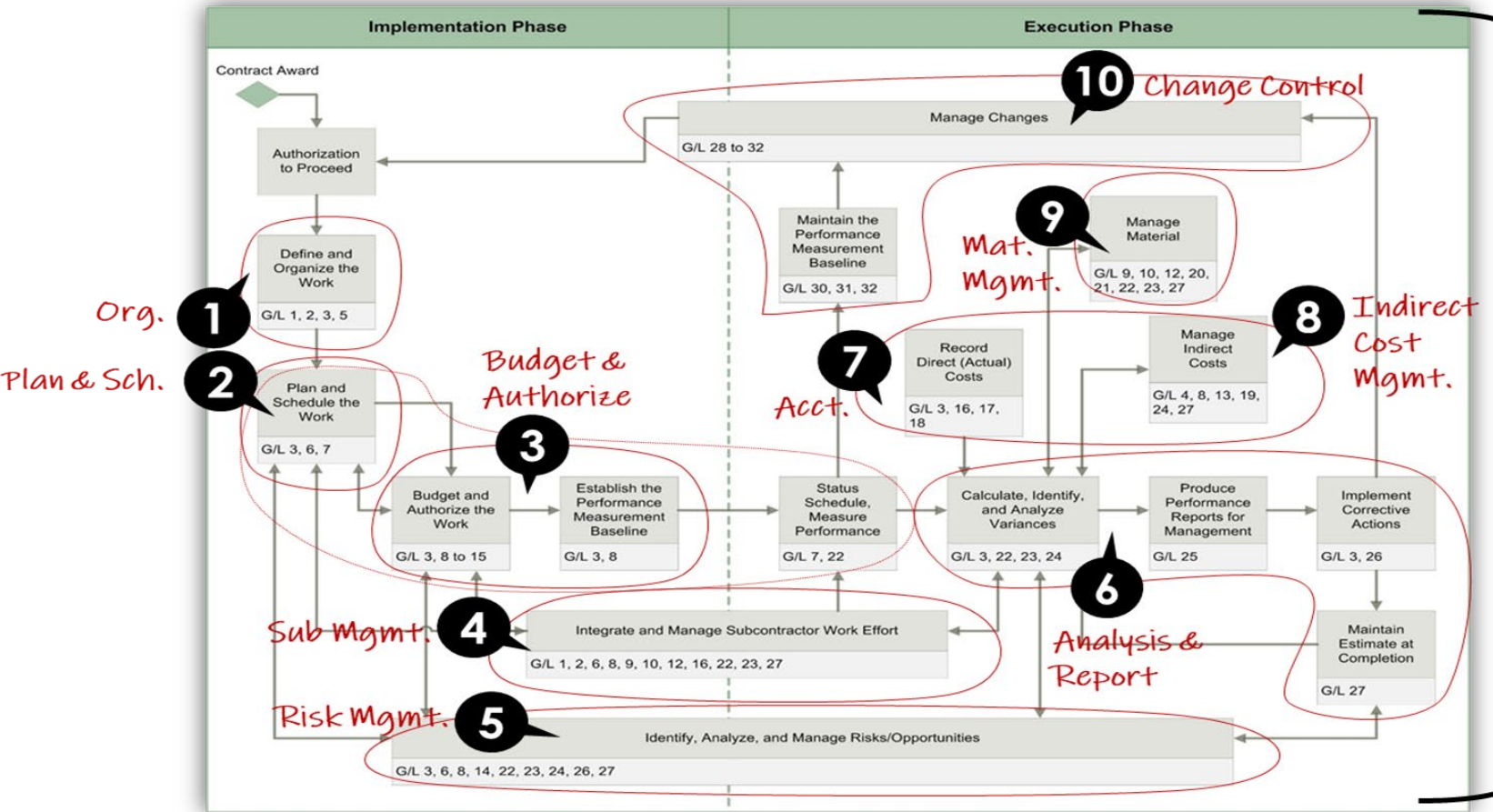
Core characteristic or quality that is essential to fielding an effective EVMS.

## **EVMS Environment:**

The conditions that impact the degree of confidence in the outputs of the EVM system, associated processes, and deliverables that serve as a basis for effective program/project management and decision making.



# EVMS Core Processes



- 1) Organizing
  - 2) Planning and Scheduling
  - 3) Budgeting and Work Authorization
  - 4) Subcontract Management
  - 5) Risk Management
- System of Systems**
- 6) Analysis and Management Reporting
  - 7) Accounting Considerations
  - 8) Indirect Cost Management
  - 9) Material Management
  - 10) Change Control

Source: NDIA EVMS Scalability Guide

# EVMS Processes and Maturity Attributes



## A. ORGANIZING

- A.1. Product-Oriented Work Breakdown Structure (WBS) (Ref: 1.1, 1.2)
- A.2. Vertical Hierarchy and Reporting Requirements (Ref: 1.3, 1.4)
- A.3. Organizational Breakdown Structure (OBS) (Ref: 2.1, 2.2)
- A.4. Integrated System with Common Structures (Ref: 3.1)
- A.5. Control Account (CA) to Organizational Element (Ref: 5.1, 5.2, 5.3, 5.4)

## B. PLANNING AND SCHEDULING

- B.1. Authorized, Time-Phased Work Scope (Ref: 6.1)
- B.2. Schedule Provides Current Status (Ref: 6.2)
- B.3. Horizontal Integration (Ref: 6.3)
- B.4. Vertical Integration (Ref: 6.4)
- B.5. Integrated Master Schedule (IMS) Resources (Ref: 6.5)
- B.6. Schedule Detail (Ref: 6.6)
- B.7. Critical Path and Float (Ref: 6.7)
- B.8. Schedule Margin (SM) (Ref: 6.8)
- B.9. Progress Measures and Indicators (Ref: 7.1)
- B.10. Time-Phased Performance Measurement Baseline (PMB) (Ref: 8.2)

## C. BUDGETING AND WORK AUTHORIZATION

- C.1. Scope, Schedule and Budget Alignment (Ref: 8.1)
- C.2. Over-Target Baseline (OTB) Authorization (Ref: 8.3)
- C.3. Summary Level Planning Packages (SLPP) (Ref: 8.4)
- C.4. Work Authorization Documents (WADs) (Ref: 9.1)
- C.5. Work Authorization Prior to Performance (Ref: 9.2)
- C.6. Elements of Cost (EOC) (Ref: 9.3)
- C.7. Work Package Planning, Distinguishability, and Duration (Ref: 10.1, 10.5, 10.7)
- C.8. Measurable Units and Budget Substantiation (Ref: 10.3, 10.8, 11.1)
- C.9. Appropriate Assignment of Earned Value Techniques (EVTs) (Ref: 10.4, 10.6)
- C.10. Management of Level of Effort (LOE) Work Scope (Ref: 12.1, 12.2, 12.3)
- C.11. Identify Management Reserve (MR) (Ref: 14.1)
- C.12. Identify Undistributed Budget (UB) (Ref: 14.3)
- C.13. Reconcile to Target Cost Goal (Ref: 15.1)

## D. ACCOUNTING CONSIDERATIONS

- D.1. Actual Cost Reconciliation (Ref: 16.1)
- D.2. Classification of Direct Costs and Credits (Ref: 16.2)
- D.3. Control Account (CA) Direct Costs (Ref: 16.3)

- D.4. Project/Program Control Accounts (CAs) (Ref: 16.4)
- D.5. Direct Cost Summary by Work Breakdown Structure (WBS) (Ref: 17.1)
- D.6. Direct Cost Summary by Organizational Breakdown Structure (OBS) (Ref: 18.1)

## E. INDIRECT COST MANAGEMENT

- E.1. Indirect Account Organization Structure (Ref: 4.1)
- E.2. Indirect Budget Management (Ref: 13.1)
- E.3. Indirect Costs (Ref: 19.1)
- E.4. Indirect Variance Analysis (Ref: 24.1, 24.2)

## F. ANALYSIS AND MANAGEMENT REPORTING

- F.1. EVMS Formulas Used Appropriately (Ref: 22.1, 22.2)
- F.2. Variances to Control Accounts (CAs) (Ref: 23.1, 23.2)
- F.3. Performance Measurement Information (Ref: 25.1)
- F.4. Management Analysis and Corrective Actions (Ref: 26.1, 26.2)
- F.5. Estimates at Completion (EAC) (Ref: 27.1, 27.2, 27.3, 27.4, 27.5)

## G. CHANGE CONTROL

- G.1. Controlling Management Reserve (MR) and Undistributed Budget (UB) (Ref: 14.2)
- G.2. Changes to the Performance Measurement Baseline (PMB) (Ref: 28.1, 28.2, 28.3, 29.1, 29.2, 29.3, 32.1)
- G.3. Control of Retroactive Changes (Ref: 30.1)
- G.4. Preventing Unauthorized Revisions (Ref: 31.1)

## H. MATERIAL MANAGEMENT

- H.1. Unit Costs and Recurring/Nonrecurring Costs (Ref: 20.1)
- H.2. Recording Actual Material Costs (Ref: 21.1)
- H.3. Material Performance (Ref: 21.2)
- H.4. Residual Material (Ref: 21.3)
- H.5. Material Price/Usage Variance (Ref: 21.4)

## I. SUBCONTRACT MANAGEMENT

- I.1. Subcontractor Requirements Flow Down (Ref: 3.2)
- I.2. Subcontractor Integration (Ref: 2.2)

## J. RISK MANAGEMENT

- J.1. Identify, Analyze and Manage Risk (Ref: 6.9)
- J.2. Risk Integration





- **People/Culture**

- Corporate Commitment
- Previous experience
- Customer influence on the Contractor's EVMS
- Etc.

- **Practices**

- Clear priorities among EVMS requirements and project/program objectives
- Significant input of Subject Matter Expert knowledge
- Scalability and tailoring of processes
- Etc.

- **Resources**

- Commitment of key personnel
- Sufficient budget to implement EVMS
- Availability and use of technology/software and tools for the integrated EVM system
- Etc.





# EVMS Maturity Attribute – OTB Authorization

PROCESS C: BUDGETING AND WORK AUTHORIZATION	Maturity Level				
C.2. Over-Target Baseline (OTB) Authorization	LOW	MEDIUM		HIGH	
	1	2	3	4	5
<p>In cases where additional scope is identified, the Over-Target Baseline (OTB) and Over-Target Schedule (OTS) must be approved and reflected in the Performance Measurement Baseline (PMB). OTB and OTS will reflect increases to the total allocated budget value and the resources planned to perform the authorized work scope. Prior customer authorization is needed when they exceed the Contract Budget Base (CBB).</p> <p>Items to consider include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> OTB/OTS Agreement</li> <li><input type="checkbox"/> Use of EVMS cost tools</li> <li><input type="checkbox"/> Control Account / Work Package grouping in Integrated Master Schedule (IMS)</li> <li><input type="checkbox"/> Impact on IMS</li> <li><input type="checkbox"/> Changes to statement of work/objectives</li> <li><input type="checkbox"/> Other</li> </ul> <p>The Over-Target Baseline Authorization process should be coordinated with the Analysis and Management Reporting process.</p> <p><i>References:</i> DoD EVMSIG GL 8 DOE CAG GL 8 NDIA EIA748-D GL 8</p>	<p><b>Not yet started.</b></p>	<p><b>OTB/OTS scope is performed without customer notification and no reflection in PMB.</b></p> <p>OTB/OTS work is performed resulting in a discrepancy between CBB and PMB.</p> <p>No notification to customer.</p>	<p><b>OTB/OTS scope is performed with customer notification without written approval.</b></p> <p>Customer is notified of OTB/OTS scope, but no written approval is given. The new PMB is not updated prior to implementation.</p>	<p><b>OTB/OTS scope is performed with customer notification and written approval.</b></p> <p>The customer is notified of OTB/OTS scope. An updated PMB is negotiated and written approval is granted to proceed with the OTB/OTS scope. The PMB is updated to reflect OTB/OTS and CBB is adjusted.</p> <p>The Over-Target Baseline Authorization process has been coordinated with the Analysis and Management Reporting process.</p>	<p><b>OTB/OTS scope is proactively addressed with customer approval after thorough analysis.</b></p> <p>After a thorough analysis of the budget variance, a solution is developed between parties with realistic goals and agreed upon through written approval. PMB reflects OTB/OTS and is integrated across the EVMS.</p> <p>The Over-Target Baseline Authorization process has been fully integrated with the Analysis and Management Reporting process.</p>

# EVMS Environment Factor - Leadership

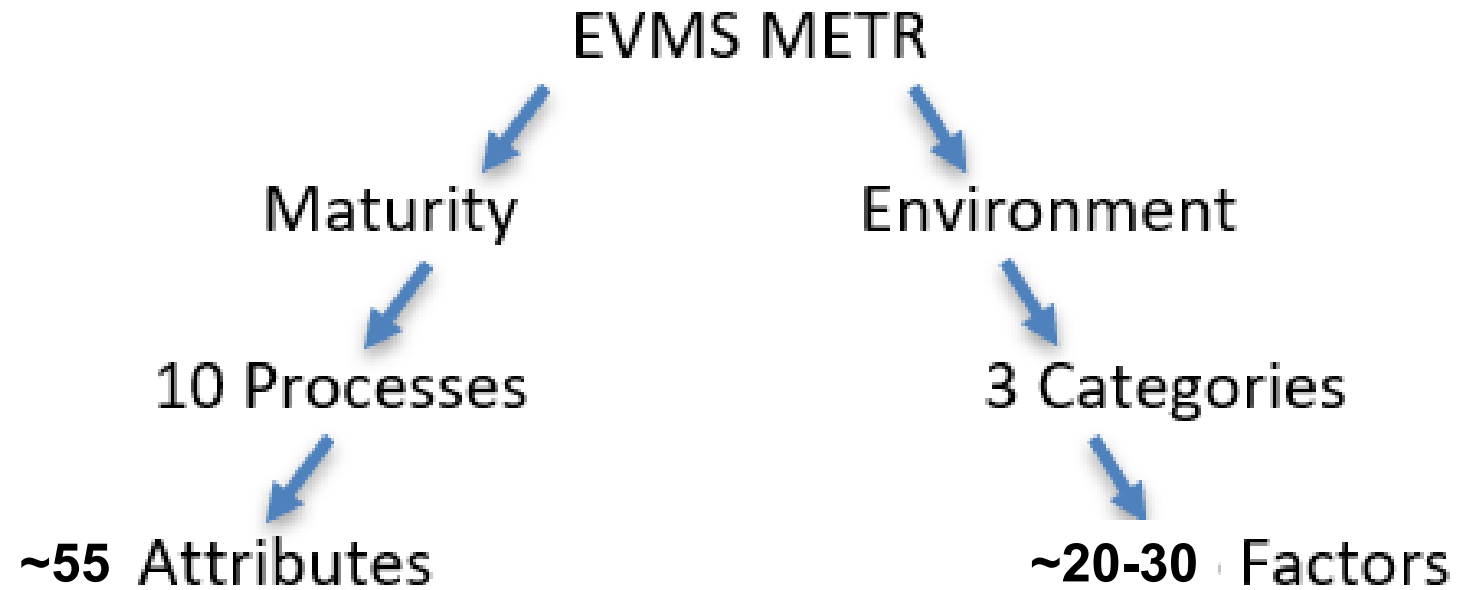


Factor	From EVMS Survey	Description
1c	Project/Program <b>leadership</b> is defined, effective, and accountable	<p>Project/Program leadership roles will vary across organizations and typically include a venture manager, project sponsor, project director, execution/manufacture manager, operations manager, and others. Additionally, organizational structure typically follows the hierarchy of executive steering committee, project leadership team and project execution team. The project sponsor and executive leadership can dramatically affect the accuracy of EVMS implementation. These individuals ultimately will be held accountable for project success. Moreover, components of good leadership typically include:</p> <ul style="list-style-type: none"> <li>• Good general knowledge of EVMS, contracting strategy, project phases, and project delivery systems</li> <li>• Good understanding of related business critical success factors</li> <li>• Capacity to determine and align the needs of the key stakeholders</li> <li>• Adequate understanding of technical requirements</li> <li>• Good understanding of assessing and managing uncertainties and risks</li> </ul>

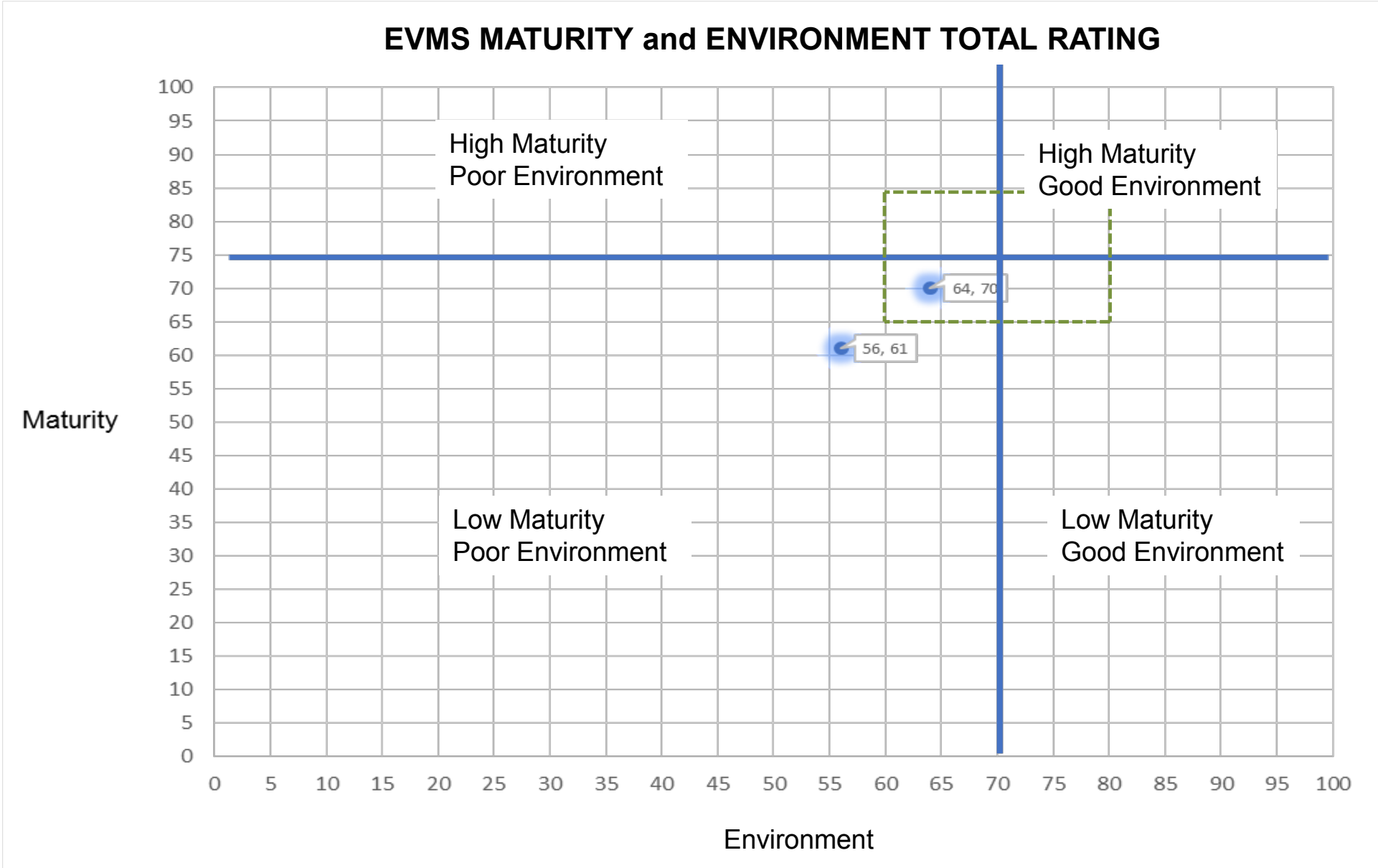
## Level of Assessment

N/A	High Performing	Meets Most	Meets Some	Needs Improvement	Not Acceptable
Not required for project.	Rating a factor High Performing indicates the factor's criteria are fully met within the context of their respective category, e.g., project leadership, execution, management, or project resources.	Rating a factor Meets Most indicates that the factor's criteria are consistently met and understood with minor deficiencies.	Rating a factor Meets Some indicates that the factor's criteria are partially met and without improvement, project success could be in jeopardy.	Rating a factor Needs Improvement indicates that the factor's criteria are not consistent in meeting project expectations and without improvement, the project is at risk. Substantial action to meet expectations is required.	Rating a factor Not Acceptable indicates that the factor's criteria are consistently below expectations and current performance is unacceptable. Project success cannot be achieved in this current state and actions are required to improve.

# EVMS Maturity and Environment Total Rating (METR)



# Envisioned EVMS METR Plot



- **Finalize Survey Analysis**
- **Develop Maturity Elements and Environment Factors**
- **Test in Workshops**
  - Summer-Fall 2020
  - Adjust Model
  - Follow-on Workshops
- **Collect Empirical Data**
- **Test on Real EVMS Implementations**
  - Late CY2020
- **Publications**
- **Presentations**
- **Training**
  - Spring 2021

- **Objective:**
  - Cold-eyes EVMS METR evaluation
  - Weighting of attributes and factors
  - Collection of maturity/environment assessment and basic data on completed projects
- **Attendees:** Looking for ~10 attendees per session, with minimum 10 years experience in project controls
- **Logistics:**
  - Beginning in summer 2020
  - ~8 workshops expected - virtual vice in person
  - Morning and afternoon sessions each about 3 hours

**If you're interested in participating, please contact us**  
ASU can provide CEUs/PDHs to participants

Create a high-value and innovative assessment and rating mechanism that specifically applies to the EVMS with high usage and impact for government and industry. Deliverables include:

- A proven EVMS implementation and assessment mechanism/process;
- Automated Toolset with associated user instruction documentation;
- Research summary giving an overview of the research and key findings;
- Research report providing a detailed discussion of all research work;
- Informs EIA-748E update;
- Training sessions; and
- EFCOG/NDIA conference presentations.



# QUESTIONS