



# 2024 NASA Cost and Schedule Symposium

## Lessons Learned from NASA Goddard Space Flight Center's Product Development Lead Training Schedule and Cost Development Workshop: Continuous Improvement

### Authors:

- Geraldine Robbins (GSFC/590 – McCallie Associates)
- JW McKeever (GSFC/460 – X3M Systems)
- Lindsay MacLeod (GSFC/590 – McCallie Associates)
- Rebecca Derro (GSFC/592 – Civil Servant)
- Phyllis Hestnes (GSFC/590 – Civil Servant)
- James Marsh (GSFC/435 – Civil Servant)

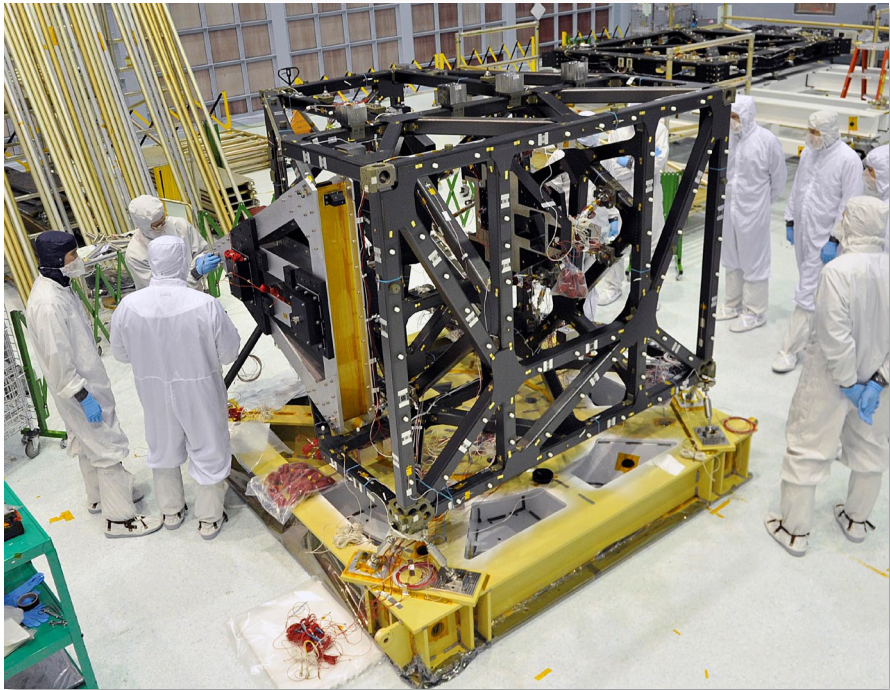


# Agenda

Topic	Presenter
Product Development Lead Training Program - Purpose and Overview	<b>Jimmy Marsh</b> <i>NASA GSFC Project Manager</i>
Continuous improvement through program evaluation - focus on the logic model	<b>Geraldine Robbins</b> <i>Program Evaluator</i>
Earned Value Management (EVM) need identified - Module established then expanded	<b>J. McKeever</b> <i>EVM Analyst</i>

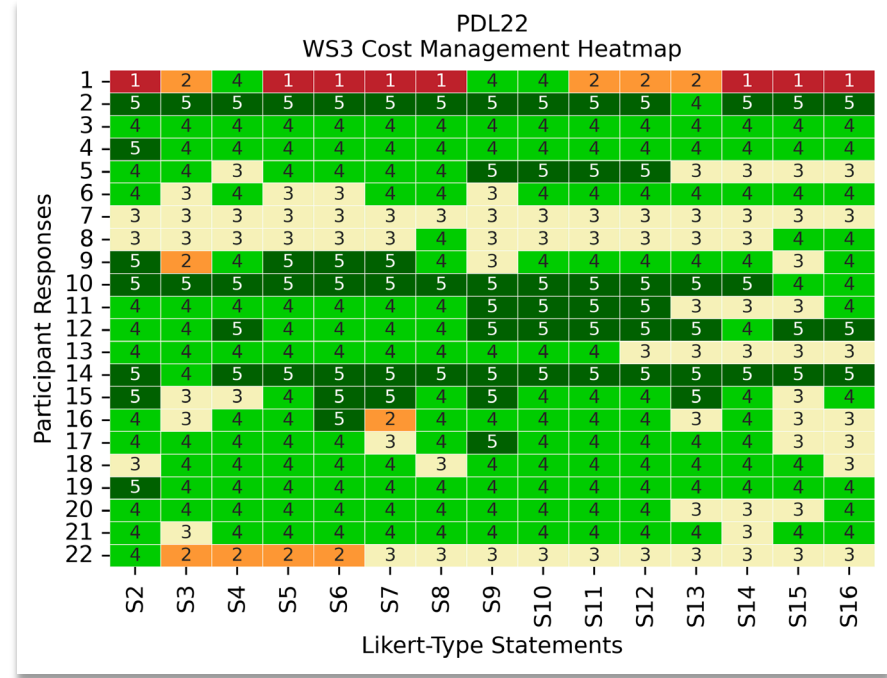
# Product Development Lead (PDL) and Training Feedback

**PDLs at work**



<https://www.flickr.com/photos/nasawebbtelescope/>

**Feedback Heatmap**



A Product Development Lead is the individual responsible for leading the development and delivery of hardware or software that meets technical requirements within approved schedule and cost.

Another term synonymous with PDL is Cost Account Manager (CAM).

# PDL Schedule and Cost Workshop - Learning Objectives

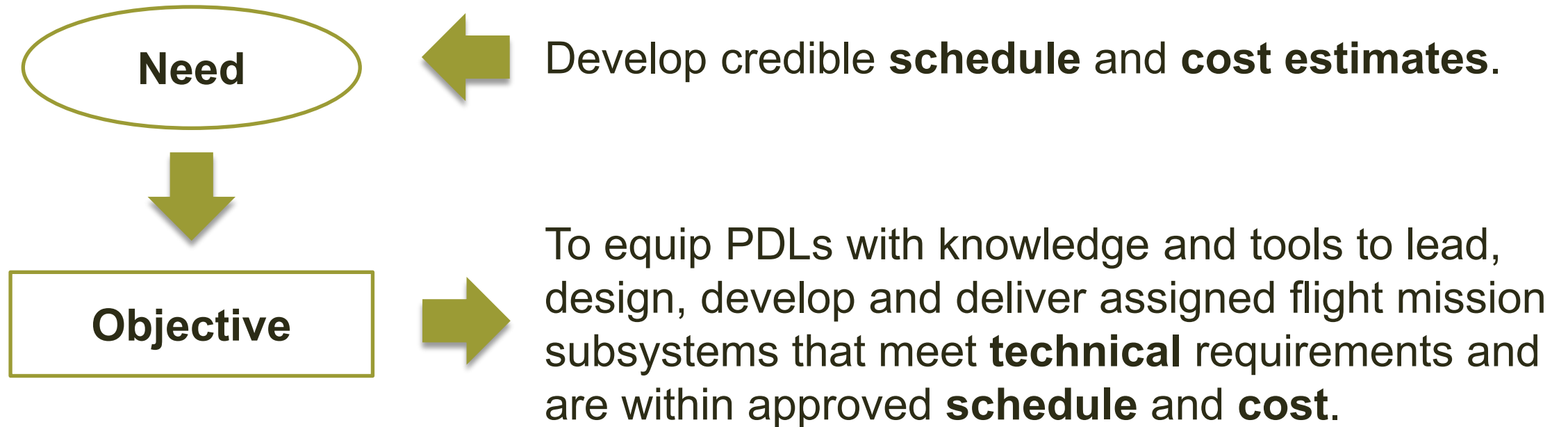
## **Upon completion of this workshop, participants will be able to:**

- Work with a Planner to develop a credible subsystem schedule
- Work with a Resource Analyst to develop a credible subsystem cost estimate
- Work with a Resource Analyst to integrate a subsystem schedule and subsystem cost into a spending plan
- Interpret and explain programmatic performance data to manage performance
- Utilize Earned Value (EV) and recognize terms

## **The purpose of PDL Training Program evaluation is to determine:**

- Is the program operating as designed?
- Is the program successful?
- What changes, if any, are necessary?

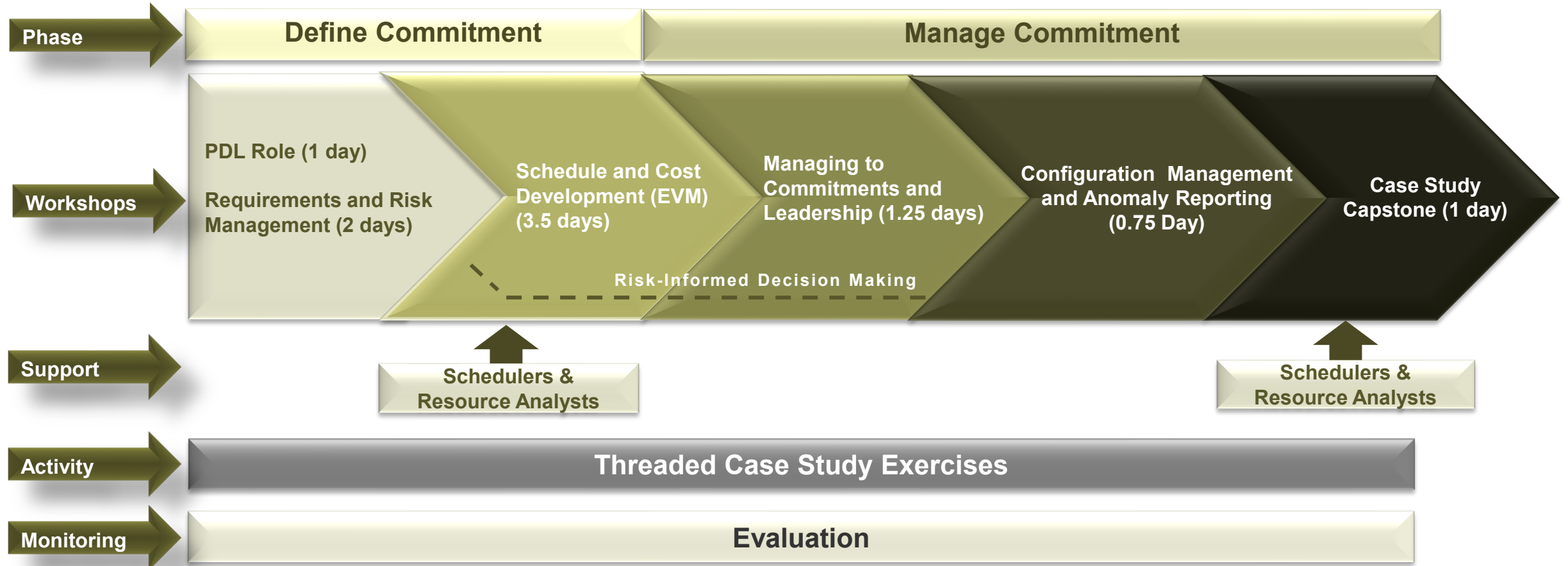
# PDL Training addresses a Goddard need...



## In a nutshell:

The purpose of the PDL Training program is to teach PDLs how to **define** a credible commitment and **manage** to that commitment.

# Overall PDL Training Program Architecture



- 25 participants selected by nomination
- Participants are divided into 5 diverse teams
- 9 days of training spread over 10-13 weeks

# What is the program logic model?

The logic model is a simplified version of a requirements document.

## **It is a process-tool that:**

- facilitates stakeholder participation & influence, and
- focuses stakeholder assumptions & expectations (Kellogg, 2004; Weiss, 1998; and Wholey et al., 2004).

## **Using the logic model:**

- stakeholders negotiate problem statement & objectives, and
- define success using measurable outputs and outcomes

# How the logic model influences curriculum

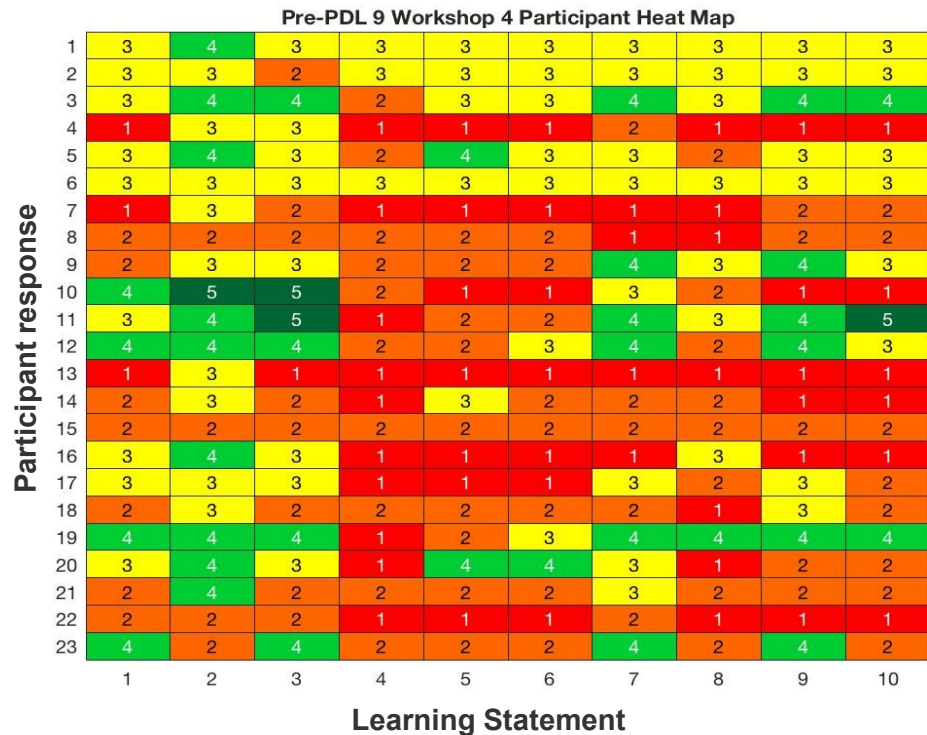
PDL training uses programmatic and workshop-level logic models. These drive program improvement and change using stakeholder feedback.

## Data

- are collected at the end of each workshop (WS), and (generally) annually,
- are used to identify trends in the areas of **learning, implementation, and benefit to the Center,**
- allow for continuous improvement and maintaining relevance.

# PDL-9 Schedule and Cost Workshop - Evidence of Learning

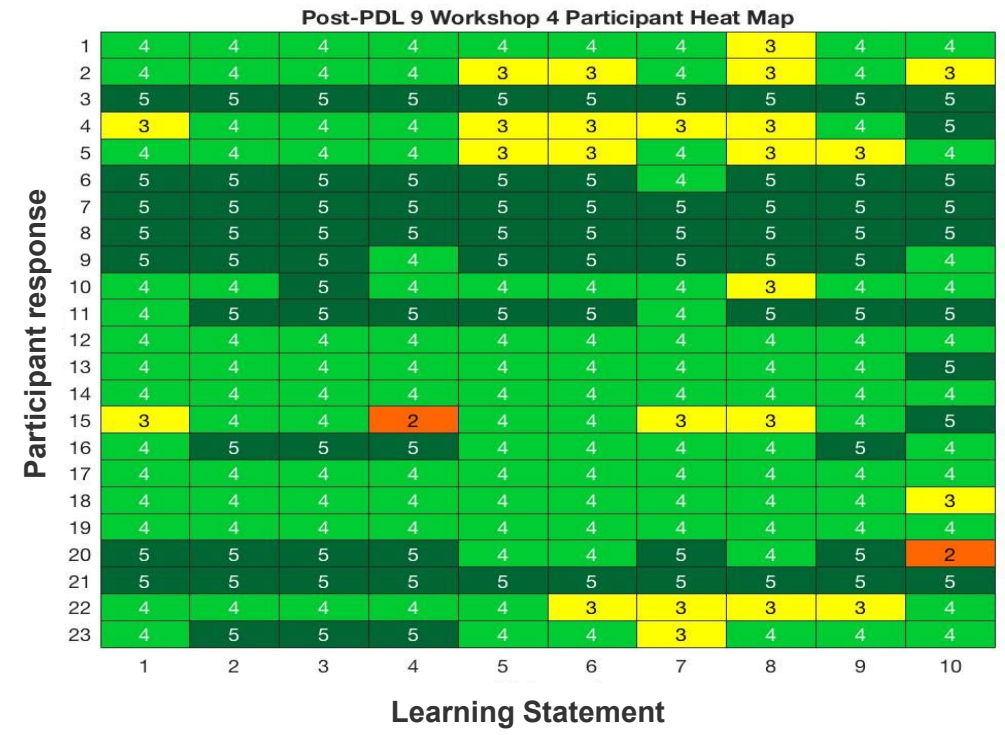
**Learning outcomes are met – evidence from pre- and post- training data**  
 (post training mode  $\geq 4$  & subject matter expert (SME) concurrence; data collected 11/2016)



**Agreement Scale**

- 1 = strongly disagree**
- 2 = disagree**
- 3 = neither**
- 4 = agree**
- 5 = strongly agree**

Each block represents one person's response



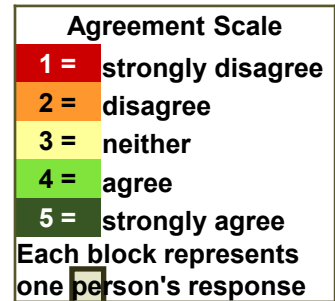
# PDL Schedule and Cost Workshop - Logic Model

Situation	Objective	Outputs	Outcomes			
			Reaction	Learning	Behavior	Results
<p>There is a need for product development lead engineers at GSFC to deliver spacecraft and instrument subsystem hardware/software that meet technical requirements and are within approved schedule and cost.</p> <p>Historically, there has been no specific training providing the skills to address this need.</p>	<p>To equip PDLs with knowledge and tools to lead, design, develop and deliver assigned flight mission subsystems that meet cost, schedule, and technical requirements.</p>	<p>Participant deliverable is a team-product, a solution/ response/ or presentation to the case study exercise.</p>	<p><b>During</b> Participants agree content is relevant to their work; presenters are prepared; and/or the presenters answer questions competently</p> <p><b>After</b> Participants agree they are better prepared for PDL role; the material is applicable to their work; and/or the program is a worthwhile investment of time; recommends the program to others.</p>	<p>Using the case study exercise, participants shall be able to define scope of work, decompose and write requirements, identify and evaluate risks, develop a schedule and spending plan, interpret programmatic performance data, respond to change requests to schedule and spending plan</p> <p><b>Learning Outcomes.</b> <i>After the workshop, participants agree or strongly agree that they know</i></p> <ol style="list-style-type: none"> <li>1. How to work with a Planner to develop a credible subsystem schedule</li> <li>2. How work with a Resource Analyst to develop a credible subsystem cost estimate</li> <li>3. How to work with a Resource Analyst to integrate a subsystem schedule into a spending plan</li> <li>4. How to work with a Resource Analyst to integrate a subsystem cost estimate into a spending plan</li> <li>5. How to interpret programmatic performance data</li> <li>6. How to explain programmatic performance data</li> <li>7. How to recognize EV terms</li> </ol>	<p>At least __% of the responding graduates implement at least three (3) newly learned concepts/ tools/ tips within 1 year of graduating from PDL training.</p> <p><b>DRAFT: 19Jan2023</b></p>	<p>Long-term: Within __ years, __% of responding graduates are within __% of approved schedule and budget at specific milestones.</p> <p>Near-term: Collect planned vs. actual census data (all PDLs) at specific milestones.</p> <p>Add milestone check-ins as necessary. Optional pulse-check to see if on right track. Guidance provided if/as necessary.</p>

Adapted by Robbins from Kirkpatrick Model using <https://nifa.usda.gov/sites/default/files/resource/Generic%20Logic%20Model%20for%20NIFA%20Reporting.pdf>

# PDL-22 Schedule and Cost Workshop - Learning outcomes

**Identified EVM as area of need - EVM learning outcome not met**  
 (post training mode  $\geq 4$ ; data collected 10/2023)



Following the completion of the Schedule and Cost Workshop, I know how to...

S9 : Work with a Planner to develop a credible subsystem schedule

S10 : Work with a Resource Analyst to develop a credible subsystem cost estimate

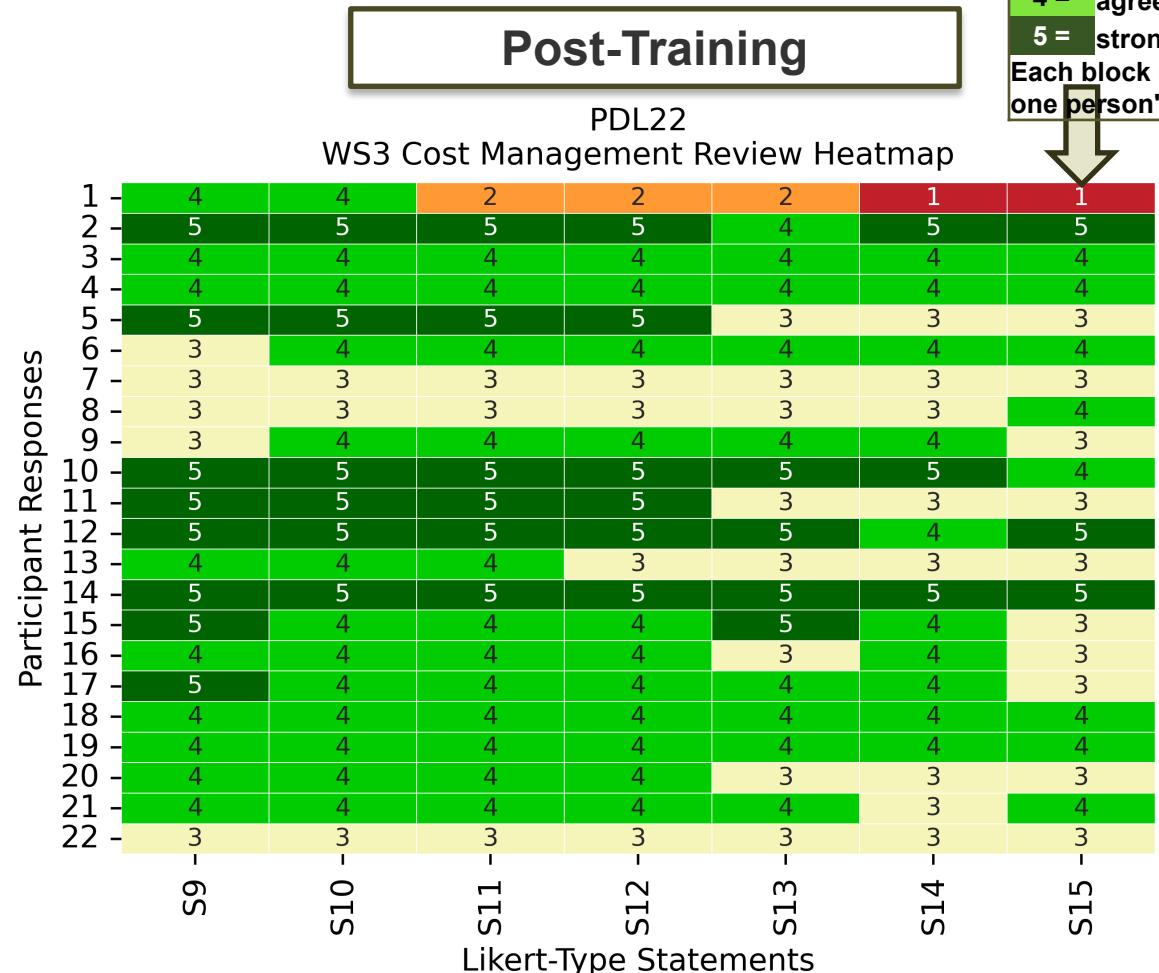
S11 : Work with a Resource Analyst to integrate a subsystem cost estimate into a spending plan

S12 : Work with a Resource Analyst to integrate a subsystem schedule into a spending plan

S13 : Interpret programmatic performance data

S14 : Explain programmatic performance data

**S15 : Recognize EV terms**




# PDL Training Efficacy Pilot Study (data collected 12/2022)

**Stakeholders rated PDLs - identified EVM as area of need**

**Prompts: Rate each PDL regarding their ability to...**

- 409: Develop an executable schedule
- 410: Develop an executable budget
- 411: Manage within an approved schedule
- 412: Manage within an approved budget
- 413: Identify when a schedule is going off plan
- 414: Respond effectively when schedule goes off plan
- 415: Identify when spending is going off plan
- 416: Respond effectively when spending goes off plan
- 417: Identify what drives project decisions on resources  
(technical, schedule, budget)
- 418: Work effectively with a Scheduler/Planner
- 419: Work effectively with a Resource Analyst
- 420: Work effectively with Project Management
- 421: Understand EVM terms relating to schedule & cost performance**
- 422: Understand how risk decisions impact schedule & budget

Pilot Study ratings



PDL: #	409	410	411	412	413	414	415	416	417	418	419	420	421	422
<u>2</u>	3	2	2	2	2	2	2	3	2	2	2	3	NA	3
<u>3</u>	2	2	2	3	2	2	2	3	3	3	2	3	1	3
<u>5</u>	3	3	3	3	3	4	3	3	3	3	3	3	2	4
<u>7</u>	4	4	4	4	4	4	4	4	4	5	4	4	2	4
<u>12</u>	4	4	4	4	4	5	4	5	5	5	5	5	2	4
<u>16</u>	2	2	2	2	3	2	2	3	3	3	3	4	2	3
<u>20</u>	3	3	3	2	3	4	2	2	4	4	4	4	2	3
<u>23</u>	4	4	4	4	4	3	3	4	4	4	4	5	2	3
<u>24</u>	3	4	3	4	3	4	3	4	4	4	4	5	2	4
<u>26</u>	4	4	4	4	4	4	4	4	4	4	4	4	2	4
<u>31</u>	4	4	4	4	4	4	4	4	3	5	5	5	2	3
PROMPT	409	410	411	412	413	414	415	416	417	418	419	420	421	422
Mode	3	4	4	4	3	4	2	4	4	4	4	4	2	3

Scale

1 =	Poor
2 =	Fair
3 =	Good
4 =	Very Good
5 =	Excellent
N/A	No opportunity to assess

# Introduction and Implementation of EVM in the Curriculum

- **Background:**

- Fundamentals of Earned Value Management existed in the scope/requirements establishment, schedule development and cost estimating
- PDLs / CAMs were encountering the deployment and expectation to manage work using EVM (limitations of plan vs actual)

- **Where we started with adding an EVM curriculum:**

- Added a 45-minute (brief) section with basics
  - Primarily consisted of an introduction to terms (EV lingo)
  - Introduced concepts of “accomplishment” highlighting schedule and cost performance (indices)

# Introduction and Implementation of EVM in the Curriculum

- **Continuous improvement**

- Feedback loop drove the need to expand the EVM brief
  - 45-minutes expanded to 2-hours (Spoiler alert ... still wasn't enough time)
- Curriculum changes ...
  - Added quizzes to establish basics of baseline plan measurement
    - Measurement of accomplishment ... independent of cost
      - Linchpin of EVM
      - Schedule Variance
        - How much work is getting done independent of cost
      - Cost Variance
        - ... compared to the work accomplished not the budget
- Feedback ... improvement ... but more was needed
  - Importance of the Performance Measurement Baseline (PMB)
    - Scope Schedule and Cost integration

# Introduction and Implementation of EVM in the Curriculum

- **Just like change management we added more scope and ...**
  - Duration of the brief expanded to 4 hours
    - Provided an overview of the EVM 32 criteria representing the fundamentals of project management
    - Introduced the Integrated Baseline Review (IBR) and the expectations of CAM role in the review
    - Developed a “Simple” exercise in building a plan ... start using the plan, calculating the performance metrics and reviewing the metrics for context
- **Feedback so far ... beyond the formal feedback loop**
  - If I had known of this as a CAM managing a subcontractor ...
  - From my teams messaging ... Now I finally understand the reports the analysts are sending me on my work ...

# Introduction and Implementation of EVM in the Curriculum

- **Preparing another scope change ...**
  - Topics and improvements to address
    - Variance Analysis (writing)
    - Finding and using a completed project to case study having a more robust set of artifacts
      - Basis of Estimates, Integrated cost and schedule, associated financial, variance analysis
        - Allows for a review of tying it all together and context to be applied as a CAM
    - Developing reasonable estimates in family with performance
- **Goal is to improve the managing of commitments by increasing awareness of concepts of all stakeholders**

# Closing

- PDL training provides valuable learning opportunities to up-and-coming leads
- Key to success is continuous feedback and improvement

# References

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