

INCOSE Los Angeles



# Tensions and Opportunities: Program Management and Systems Engineering

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Dr. Tina P. Srivastava (MIT) | Mark S. Kaufman (MITRE) | August, 2024



# LEARNING OBJECTIVES

*At the conclusion of this session, participants will be able to:*



**1**

Identify opportunities to achieve improved program outcomes and reduced overruns in complex environments.

**2**

Critically evaluate and, when necessary, credibly challenge management on potentially unrealistic expectations related to project cost, schedule, scope, and risk.



MARK KAUFMAN



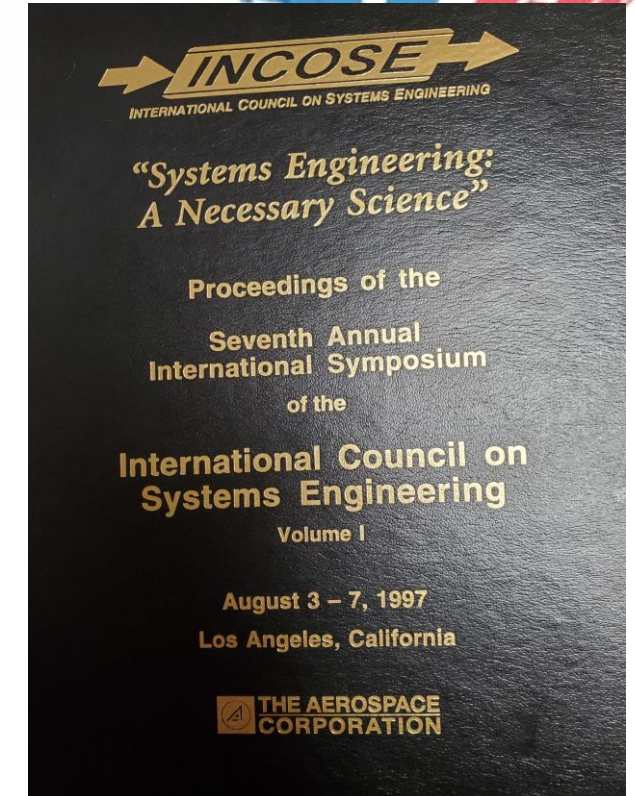
Bachelor Engineering



M.S. Electrical Engineering



EARTH OBSERVING SYSTEM





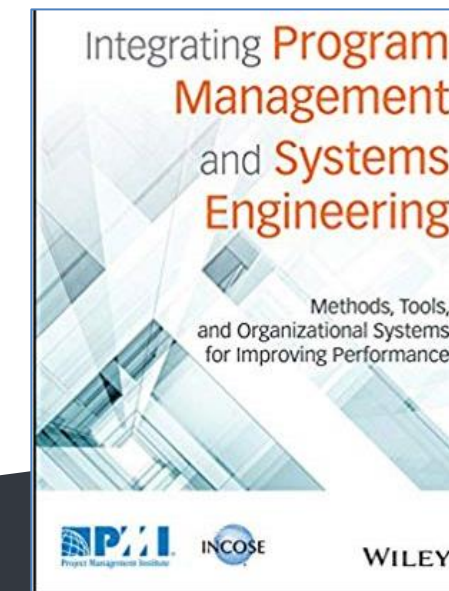
# DR. TINA P. SRIVASTAVA



- S.B. Aeronautics & Astronautics, MIT
- S.M. Engineering & Management, MIT
- Ph.D. Strategy, Innovation, & Engineering, MIT



Founded security company with fellow MIT alums; exited to public company



- Board of Directors
- Co-author

Co-Founder  
Badge Inc.

badge



Zero-Gravity  
Flight Testing

Pilot

Raytheon



- Chief Engineer, Raytheon
- \$40M Radar Program
- Team of 30
- Received National Recognition for Technical Innovation



Author





**Project Manager**



**Systems Engineer**

**EXERCISE:**

"Who Has the Responsibility?"



# EXERCISE:

"Who Has the Responsibility?"



**Project Manager**

**Technical Requirements?**



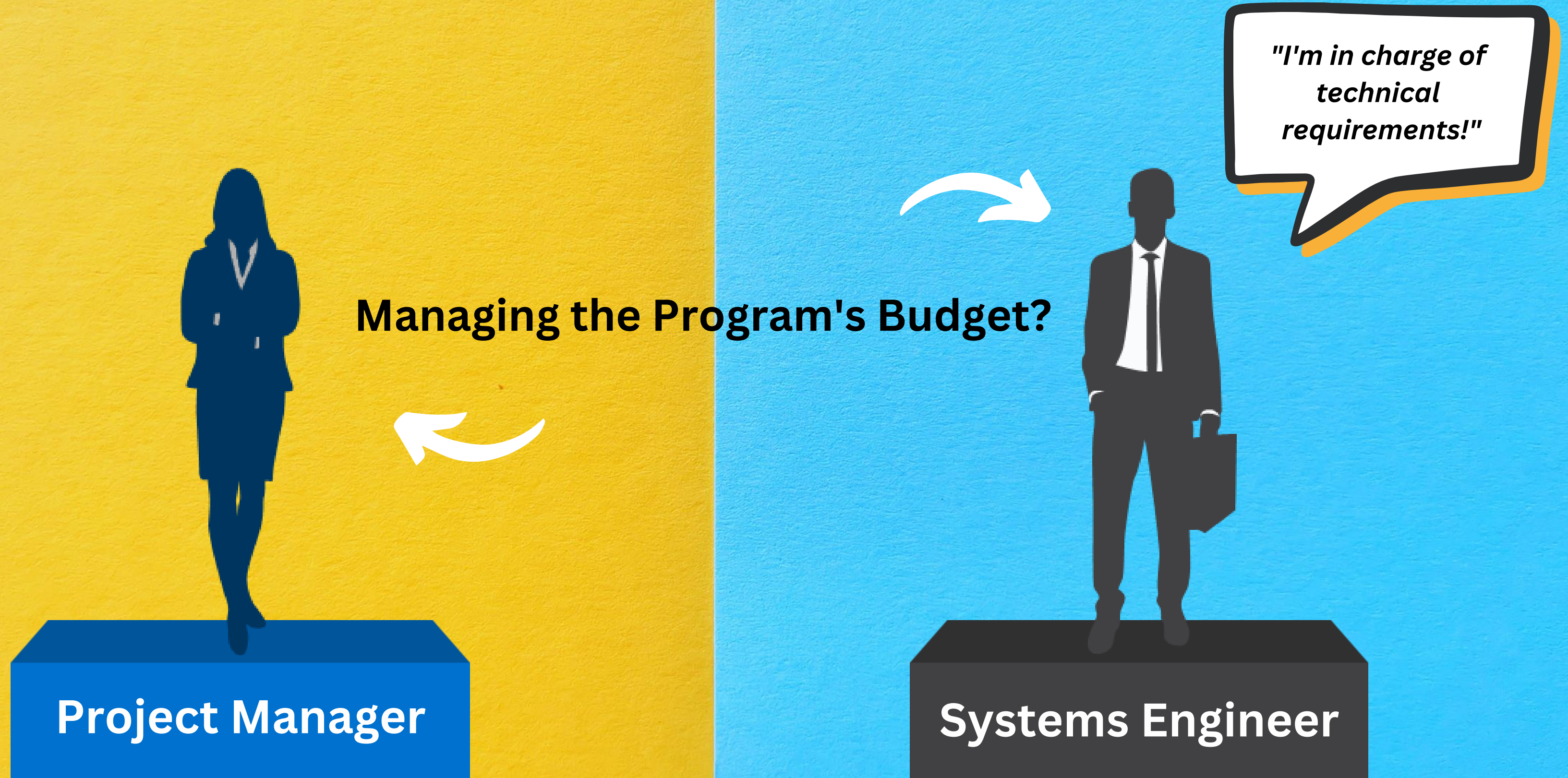
**Systems Engineer**





# EXERCISE:

"Who Has the Responsibility?"



Managing the Program's Budget?

*"I'm in charge of technical requirements!"*

**Project Manager**

**Systems Engineer**



# EXERCISE:

"Who Has the Responsibility?"

*"I manage the project's budget!"*



**Project Manager**



**Responsibilities:**

- Technical Requirements

**Systems Engineer**



# EXERCISE:

"Who Has the Responsibility?"

Life Cycle  
Planning?

External Supplier  
Relations?

Program/Project  
Risk?

## Responsibilities:

- Managing the project budget



**Project Manager**

## Responsibilities:

- Technical Requirements

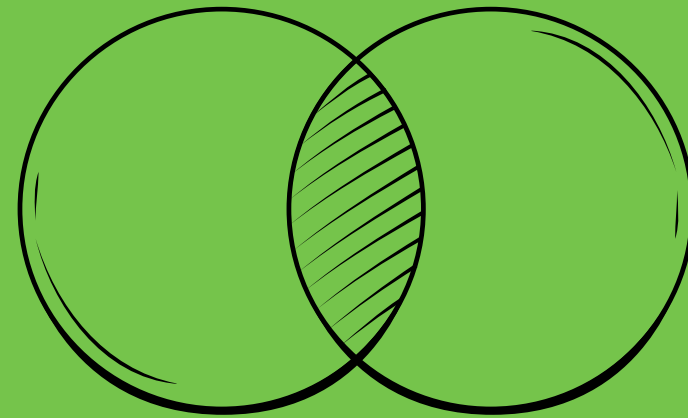


**Systems Engineer**



# EXERCISE:

"Who Has the Responsibility?"



**Life Cycle Planning**

**External Supplier Relations**

**Program/Project Risk**

## Responsibilities:

- Managing the project budget



**Project Manager**

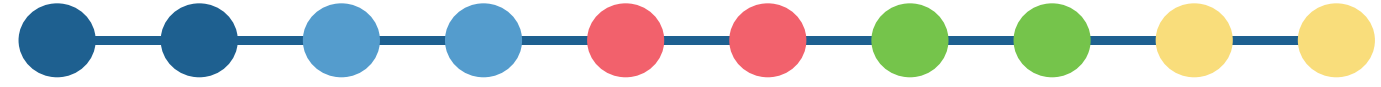
## Responsibilities:

- Technical Requirements



**Systems Engineer**

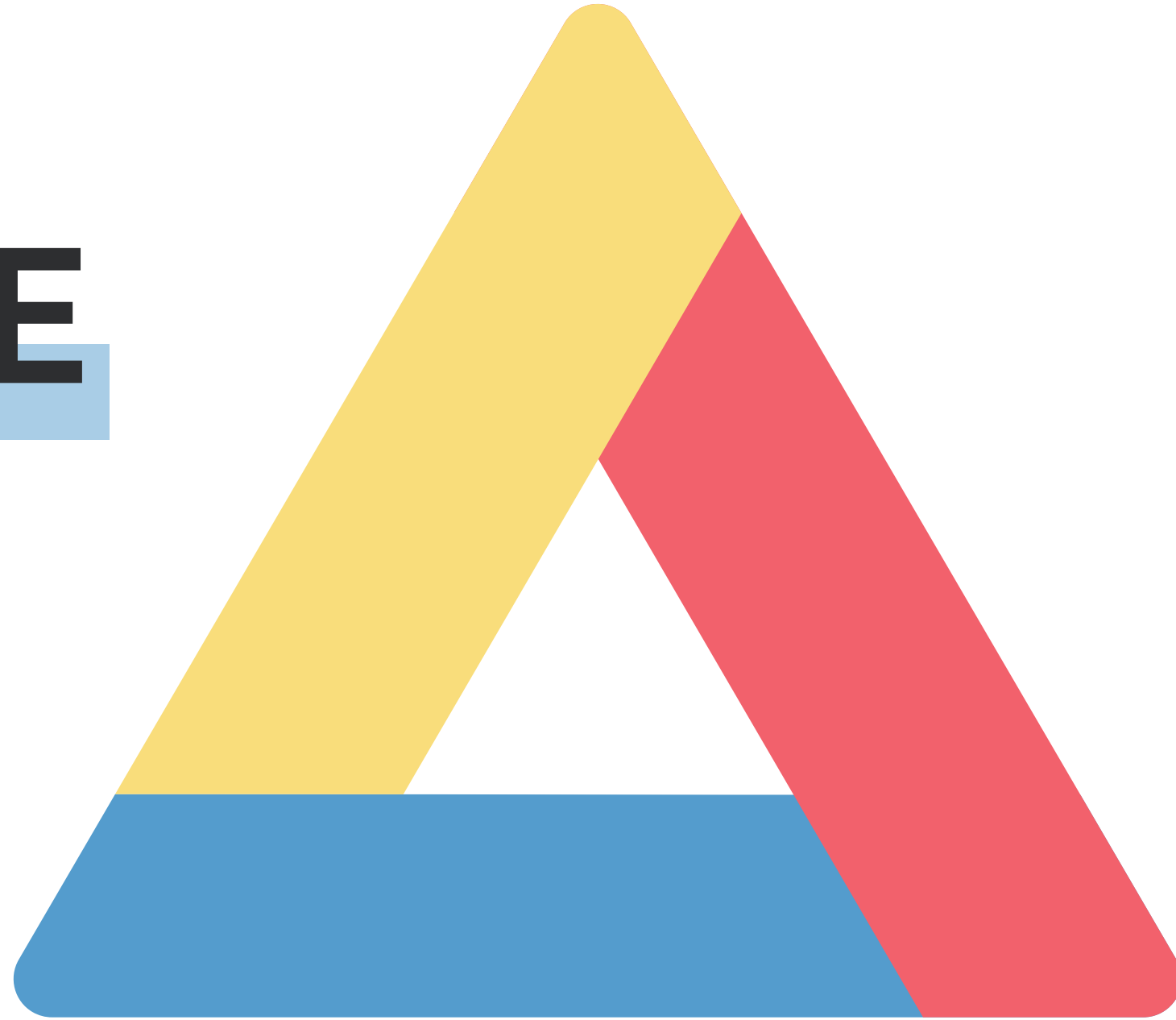




**Schedule**

# **IRON TRIANGLE**

**Cost**



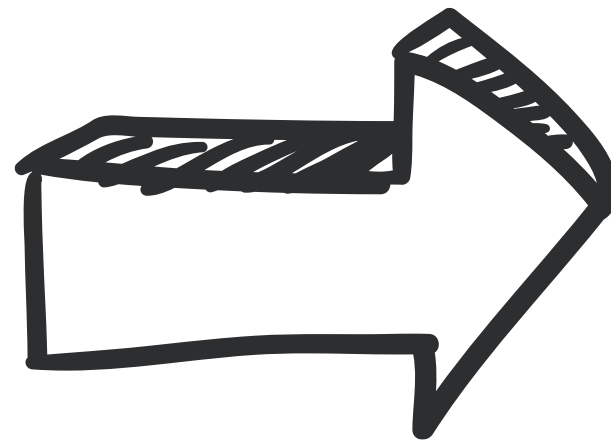
**Performance**



# HOW DO WE ACHIEVE A VISION OF INTEGRATED PROJECT MANAGEMENT AND SYSTEMS ENGINEERING?



- Who controls **scope**?
- How do we meet **budget**?
- Who is responsible for **delays**?



Successful delivery of stakeholder value requires contribution, collaboration, and cooperation across disciplines.







## OVERLAPPING RESPONSIBILITIES:

## THE SYSTEMS ENGINEER VIEW

### SOMETIMES:

- THE PROJECT MANAGER IS THE TECHNICAL LEADER
- THE SYSTEMS ENGINEER IS THE PROJECT MANAGER



### SYSTEMS ENGINEERING VIEW:

- Systems engineering **integrates all disciplines and specialty groups into a team effort** forming a structured development process that proceeds from concept to production to operation.
- Systems Engineering considers both the business and technical needs of all customers with the goal of providing a quality product that meets the user needs.<sup>1</sup>

<sup>1</sup> Source: INCOSE Web Site





**OVERLAPPING  
RESPONSIBILITIES:**

**THE PROJECT MANAGER VIEW**



**PROJECT MANAGEMENT VIEW:**

- Project managers play the lead role in planning, executing, monitoring, controlling, and closing out projects.
- They are accountable for the entire project scope, the project team and resources, the project budget, and the success or failure of the project.<sup>2</sup>

<sup>2</sup> Source: cio.com



# WHAT CAUSES THE TENSION?



- Conflicting practices between the two roles
  - + Focus on achieving objectives defined by discipline
- Not valuing the other role
- Lack of planning for the integration of roles
- Roles and responsibilities not clear or respected
- Who works for who?
- Not having clearly defined authority
- Failing to communicate a common set of objectives and vision
- Unclear communication



*How Do We Manage Unproductive Tension?*



# TANGIBLE EFFECTS OF UNPRODUCTIVE TENSION



Source: <https://project-management.com/how-to-avoid-project-failure-effective-scheduling>



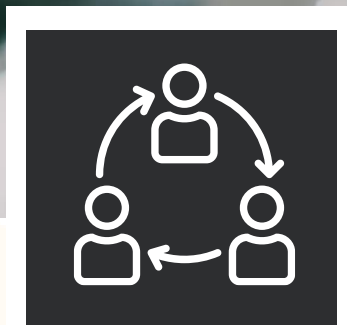
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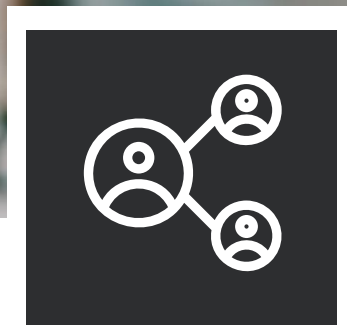
# INTEGRATING THE ROLES



**The Team Recognizes  
their Shared  
Objectives**



**The Team  
Understands the  
Objectives and  
How Each  
Contributes to  
Them**



**The Team  
Understands Each  
Other's Role**



**The Team Respects  
All the Roles and  
Their Associated  
Contributions**



**The Team Values  
"Collaboration" over  
"Competition"**





# PROJECT MANAGER AND SYSTEMS ENGINEER ARE DISTINCT ROLES – WITH SOME IMPORTANT OVERLAP

## Project Managers (PM) view their responsibilities as:

- Overall Results
- Goals & Objectives
- Program & Project Risk
- External Supplier Relations
- Lifecycle Planning

## Systems Engineers view their responsibilities as:

- Technical Requirements
- Systems Definition
- Systems Requirements
- Configuration Management

## Both roles are responsible for:

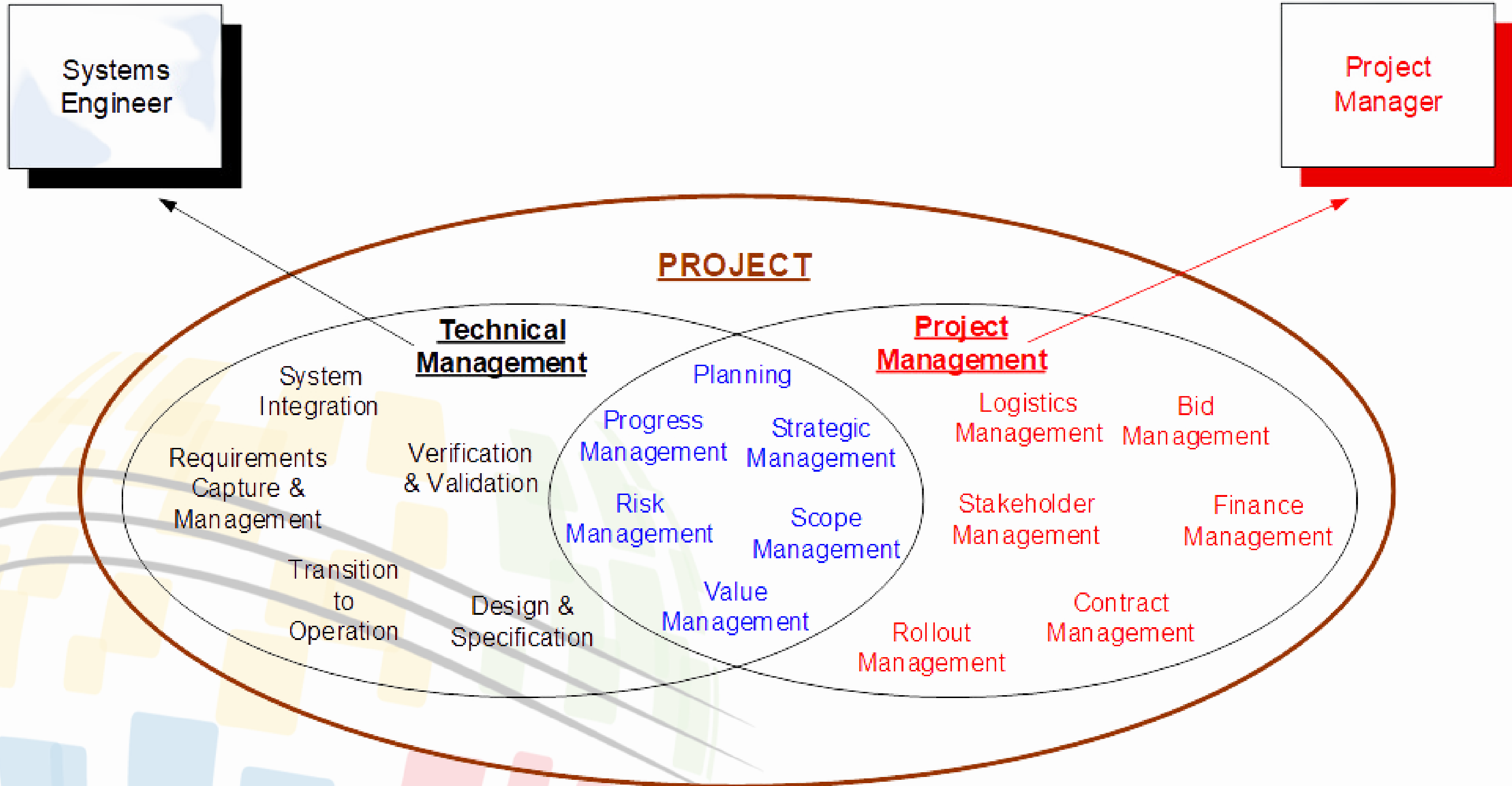
- Program/Project Risk
- External Supplier Relations
- Quality Management
- Lifecycle Planning

The integration must clarify how

- **Responsibility can be effectively shared** for risk management, external suppliers, quality management and lifecycle planning; and
- **Communication optimized** for the other domains of responsibility.

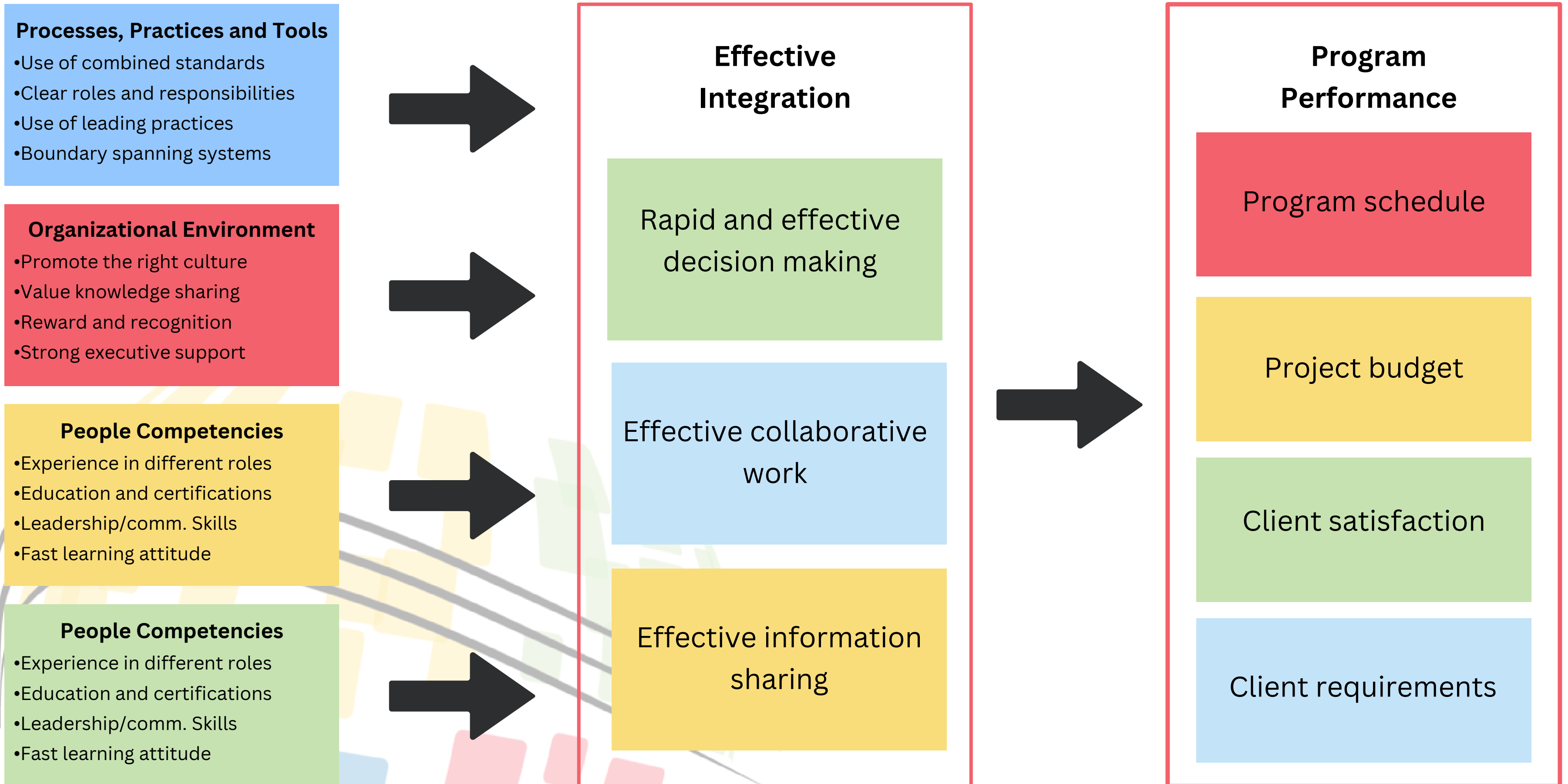


# WHAT ARE THE PM AND SE INTERSECTIONS?





# VIEW OF PM/SE INTEGRATION



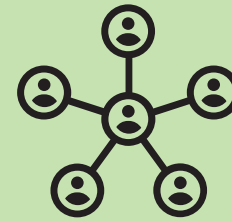


# PUTTING THIS INTO PRACTICE



## Processes, Practices, and Tools

- Enable communication and common understanding
- Define specific work activities
- Establish expectations for each person
- Coordinate and tack work efforts
- ID critical points where work efforts come together
- Facilitate problem identification and resolution
- Best practices



## Organizational Environment

- Establish positive culture
- Grace and respect
- Narrow the cultural divide between PM and SE
- Team building
- Develop respect for views and opinions across disciplines
- Establish working relationship between PM and SE management
- Build trust between executives and project team

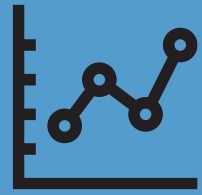


## Integration Competencies in Staff Members

- Develop standard role definitions and communicate
- Develop integration competencies and teaming behaviors on project staff
- Manage integration competencies in the workforce at individual and organizational level

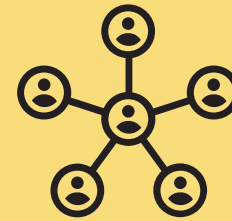


# PUTTING THIS INTO PRACTICE



## Contextual Factors

- Tailor management approach to project realities
- Develop and own project culture to influence behavior throughout the project life cycle
- Stakeholder and team alignment
- One view of the project
- Transparency
- Engagement - Community



## Integration as Organization Characteristic

- Combine PM and SE practices, tools and techniques
- Establish culture to meet common objectives



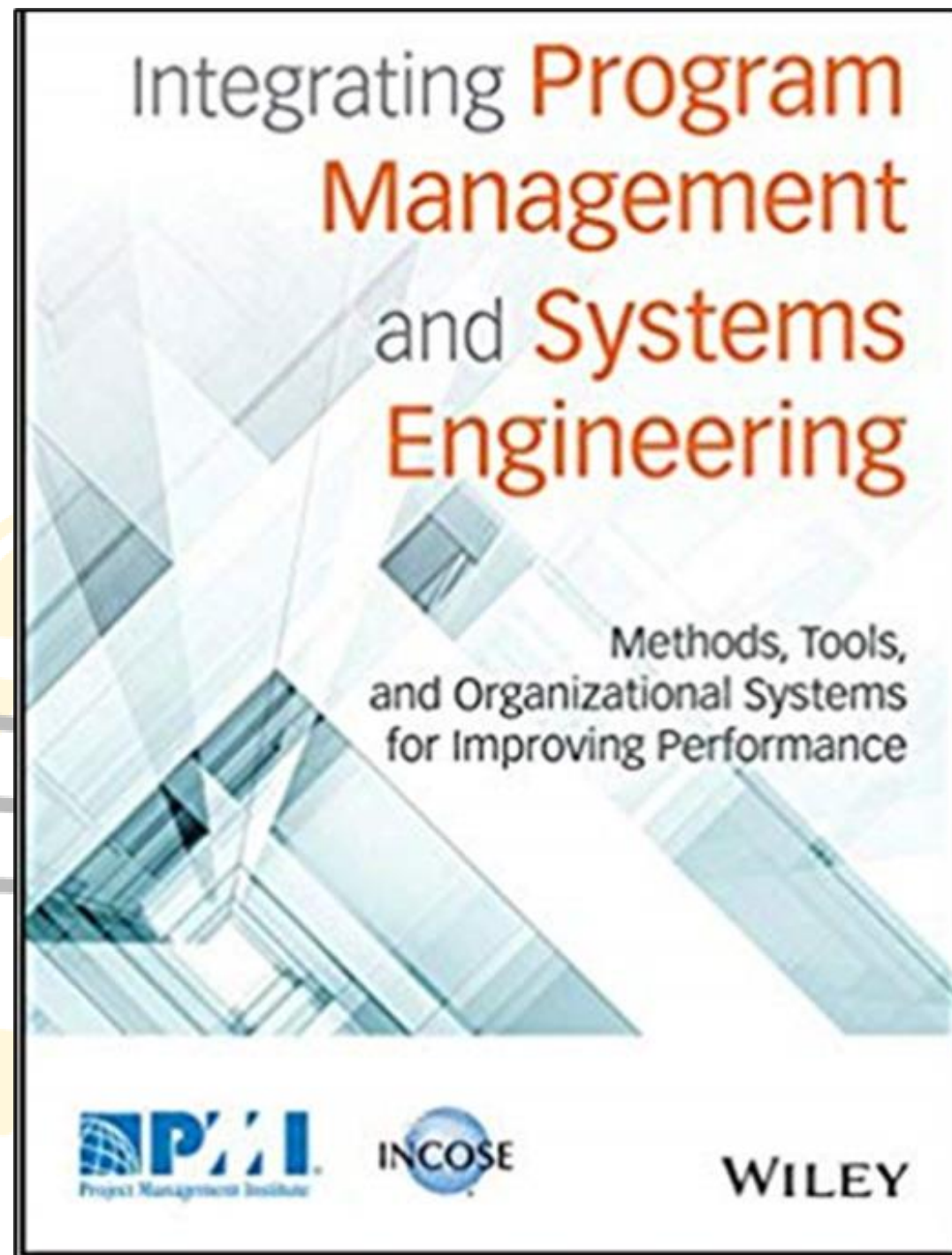
## Program Performance

- Higher integration yields better cost and schedule metrics
- More predictable outcomes
- More resilience to schedule pressures



# PMI AND INCOSE RECOGNIZE THE ISSUE

## PM-SE Integration WG *Purpose*



- PMI and INCOSE have been working together for over 10 years, and have identified specific value for integration between PM and SE.
- 2011 Reference: Toward a New Mindset - <https://www.pmi.org/learning/library/bridging-gap-program-management-systems-engineering-6213>
- PMI and INCOSE recently co-authored a book: <https://www.amazon.com/Integrating-Program-Management-Systems-Engineering/dp/1119258928>



## RECOGNITION

*“On behalf of PMI, I congratulate the MIT-PMI-INCOSE team on their receipt of the Shingo Research and Professional Publication Award for their work on ‘The Guide to Lean Enablers for Managing Engineering Programs,’”* said Mark A. Langley, president and CEO of Project Management Institute (PMI). *“This team clearly demonstrated the added value that can be delivered through integrated program management and systems engineering.”*

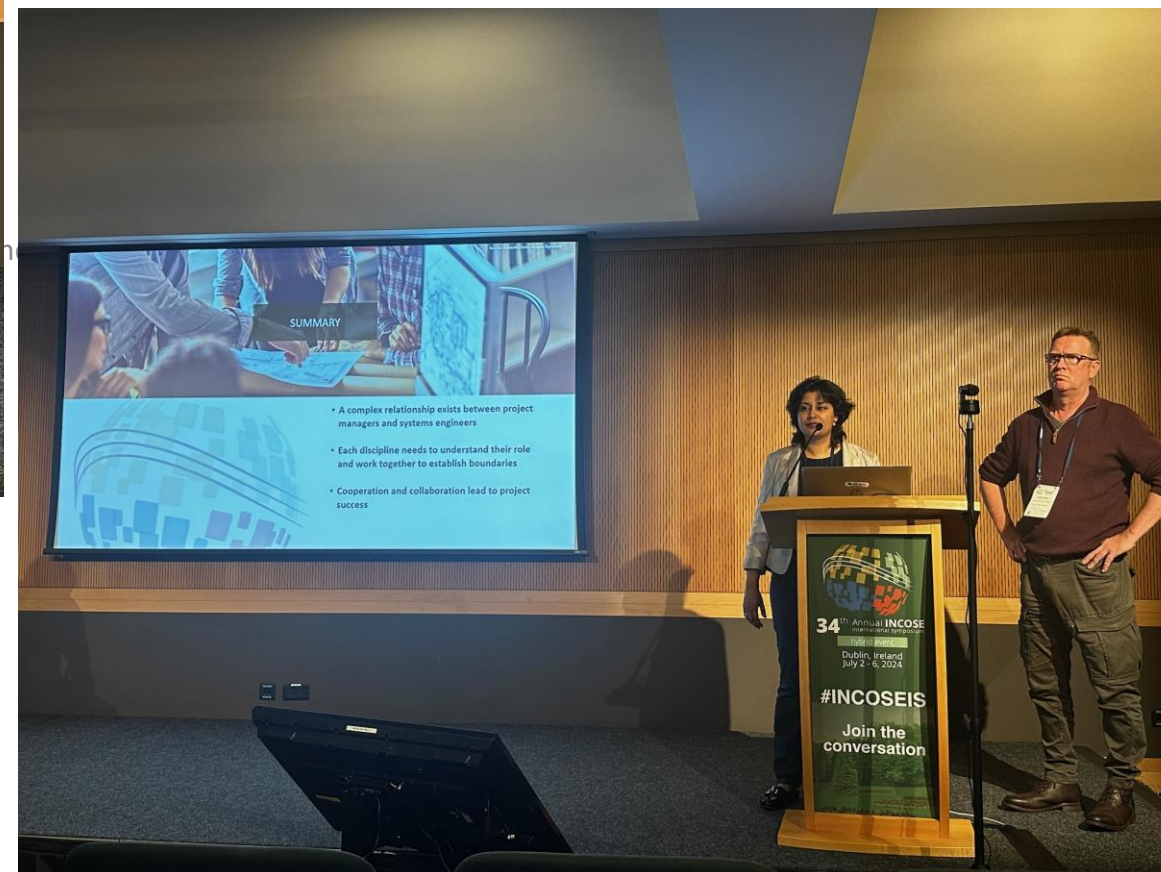


<https://www.incose.org/events-and-news/incose-and-se-news/2013/06/20/mit-pmi-incose-team-receives-the-shingo-prize-for-the-guide-to-lean-enablers-for-managing-engineering-programs->



# PM-SE Integration WG

## IS2024





## SUMMARY



- A complex relationship exists between project managers and systems engineers
- Each discipline needs to understand their role and work together to establish boundaries
- Cooperation and collaboration lead to project success



# REFERENCES

- J.W. Boswell, F.T. Anbara, and J.W. Via, “Systems Engineering and Project Management: Points of Intersection, Overlaps, and Tensions”, 2017 Portland International Conference on Management of Engineering and Technology (PICMET)
- Nelson, Marvin, “Integrating Program Management and Systems Engineering”, MIT Consortium for Engineering Program Excellence
- Rebentisch Eric (Editor) – Integrating Program Management and Systems Engineering Methods, Tools and Organizational Systems for Improving Performance
- Van Gemert, Dennis, “Systems Engineering the Project” PMI Global Congress, 2013
- INCOSE Webinar Series, “What PMI and INCOSE are doing to advance the Future of PM-SE Integration”, April 2021





**QUESTIONS?**



THANK YOU!

Let's continue the conversation.

Connect with us on LinkedIn!



**Tina Srivastava, PhD**

Innovator, Entrepreneur, Author, and Technologist

United States · [Contact info](#)

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Badge Inc.



Massachusetts Institute  
Technology



**Mark Kaufman** · 2nd

Department Head at MITRE

Columbia, Maryland, United States · [Contact info](#)

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