



INTEGRATING PROGRAM MANAGEMENT & SYSTEMS ENGINEERING FOR STRONGER PERFORMANCE

Panel session at the Naval Postgraduate School Acquisition Research Summit
Monterey, California
26-27 April 2017

Lead Researcher: Eric Rebentisch, Ph.D.

Discussants: Elizabeth "Betsy" Clark and Jeffrey Morris

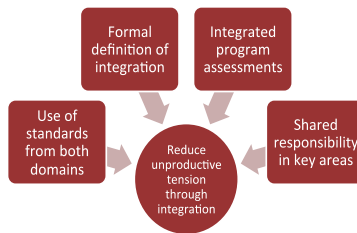
Panel Moderator: Stephen Townsend

RESEARCH QUESTIONS

- What is integration between program management and systems engineering?
- Is there a relationship between integration and unproductive tension?

RESEARCH PHASES

1st Phase
Survey (n=694)
*Exploratory
Investigation*



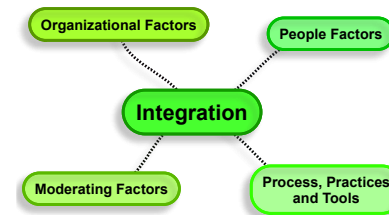
Identified common elements that could reduce unproductive tension, *e.g., use of standards; formal definition of roles; shared responsibilities, etc.*

2nd Phase
Case Studies (n=9)
*No/low unproductive
tension*



Identified factors beyond practices, tools and techniques that contribute to integration, such as: *organizational factors; people competences, etc.*

3rd Phase
Case Studies (n=7)
*High unproductive
tension*



Refined the four factors that contribute to integration:

- *Organizational*
- *Processes, Practices and Tools*
- *People*
- *Moderating factors*



INTEGRATION IS...

- Having a shared set of objectives defined by the success of the overall effort...
- Everyone knowing what those objectives are...
- Clarity and understanding around everyone's roles and how they contribute to achieving the objectives...
- Respecting the value of the others' role and contribution to achieving the objectives...
- Valuing and promoting "collaboration" over "competition"...

FEW ORGANIZATIONS HAVE INTEGRATED

Most organizations are *somewhat* or *mostly* integrated and its occurring as a mix of formal and informal methods

Majority find the integration of the two roles to be *somewhat effective*

Some unproductive tension is occurring between the roles that makes it challenging for them to work together

Lack of planning for the integration is seen as the main source of tension

Integration/Alignment of PM and CSE Roles & Practices

Those who perform both roles are more likely to rate the integration at their organization as *highly effective*

Systems engineers are more likely to say there is unproductive tension between the roles than program managers

Systems engineers are more likely to attribute the tension to unclear expectation and authority than program managers

WHAT MATTERS FOR INTEGRATION?



- A number of factors were attributed to more effective integration
- In combination they characterize the culture of the organization
 - Shared beliefs
 - Relationships
 - Tools and processes

FRAMEWORK FOR INTEGRATION

Dimension I

Processes, Practices, and Tools

- Use of combined standards
- Clear roles and responsibilities
- Assessing use of leading practices
- Boundary-spanning systems

Dimension II

Organizational Environment

- Promote the right culture
- Value knowledge sharing
- Reward and recognition
- Strong executive support

Dimension III

People Competencies

- Experience in different roles
- Education and certifications
- Leadership and communications skills
- Fast learning attitude

Dimension IV

Contextual Factors

- Program characteristics
- Team characteristics
- Organizational structure
- Stakeholders alignment

Dimension V

Effective Integration

Rapid and effective
decision making

Effective
collaborative work

Effective
information sharing

INTEGRATION IN PRACTICE CASE STUDY: F/A-18E/F SUPER HORNET

- The F/A-18E/F program delivered ahead of schedule, within cost and under weight (critical for fighter aircraft)
- The program reflected a deliberate shift away from disciplinary stovepipes to collaborative, Integrated Product Teams
- Technical and management frameworks were aligned
 - Work Breakdown Structure (WBS), organizational structure, Earned Value Management (EVM), Technical Performance Measures (TPMs)
- Shared objectives across the entire government-contractor team were facilitated by:
 - alignment in government and contractor organizational structures
 - clear roles, responsibilities, authorities and accountabilities (i.e., people empowered to act within their area of authority)
 - Program-wide technical and management databases for effective information sharing
- Collaborative behavior was demanded from leadership at the top within both the government and the contractor

“There is a cultural change required. We’re not taught to be team players.”

- VADM (Ret) Joe Dyer, former F/A-8 E/F Program Manager

- Trade-offs between requirements and cost were made right at the beginning of the program
- The entire government-contractor team demonstrated effective and rapid decision making
 - E.g., engine problem (fracture of a stationary airfoil) was diagnosed, a correction implemented and new engine parts installed in six weeks versus “five or six months under the old way of doing things”



INTEGRATION IN PRACTICE CASE STUDY: ELECTRONIC SUPPORT UPGRADE FOR THE ROYAL AUSTRALIAN NAVY'S ANZAC CLASS FRIGATE

- High priority capability directed by the Chief of Navy to be delivered as rapidly as possible
- Program delivered the capability early, within budget and with minimal defects
- The Program Manager and Chief Engineer
 - worked closely together to foster a laser-like focus on the outcome of delivering capability to the Navy among all program participants
 - sponsored a series of early risk reduction workshops that brought together technical staff from **seven different companies** that developed systems or subsystems that had to work together seamlessly for the entire capability to work. During these workshops, risks and issues were identified and addressed.
 - encouraged all contractors to talk directly to each other rather than channeling communications through a third-party bottleneck
- Contractors provided each other with computer simulations of their interfacing systems/subsystems to enable early integration testing
- The entire program team (government and contractor) demonstrated creative problem-solving and a “can-do” attitude despite major barriers put in their way

INTEGRATION IN PRACTICE CASE STUDY: F-35 LIGHTNING II



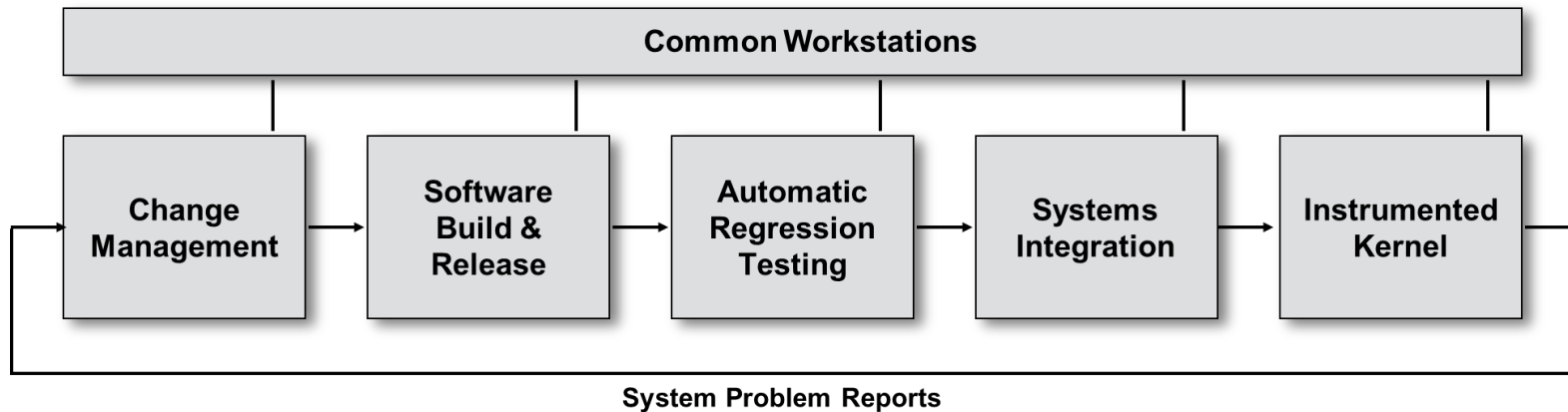
The Situation - The Actions

- Nunn-McCurdy breach
- On-board Mission Systems software
- Sensing sessions with engineers
- Identifying key enablers
- Engaging program management
- Providing confidence to all stakeholders
- Re-Baseline, Performance proof via metrics



Process & Infrastructure Improvements

The “*Initiatives*”



**An Integrated Program Management &
Systems Engineering Solution**



The Results

- Addressed specific engineering needs
- Established a solid re-baseline plan
- Measured, predicted, met plan & KPIs
- Restored organizational credibility
- Motivated all stakeholders

A stable, high performance, 5th generation fighter jet for US & Allied Forces