Identifying and Mitigating Risk Across Organizational Boundaries In Software-intensive Space System Programs

Donald R. Greer and Dr. Laura J. Black
Greer Black Company

Richard J. Adams
The Aerospace Corporation

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Agenda

• Presenting problem & definition
• Two baseline model (SPO and Contractor)
• Four baseline model (SPO, Contractor, Sub, and Vendor)
• Partial research findings
  • Simulation results from key scenarios
  • Points of leverage
  • Boundary Objects what they are and why they matter
• Summary
Presenting Problem

**How to maintain alignment between the SPO-approved and contractor’s baselines?**

**Definition**

“Disconnects” are latent differences in understanding among groups that can negatively affect the program should they remain undetected or unresolved.
Disconnects meet “Wicked Problem” criteria

- The problem is an evolving set of interlocking issues and constraints
- There is no definitive statement of the problem
- You don’t understand the problem until you have developed a solution
- Many stakeholders care about how the problem is resolved, making the problem solving process fundamentally social
- Getting the “right answer” is less important than obtaining the stakeholders’ acceptance of the emerging solution
- Solution constraints (e.g. resources and political ramifications) change over time
- Stakeholder constraints change due to: stakeholder turnover, changed opinions, failure to communicate, or other rule changes by which the problem must be solved
- Since there is no definitive problem, there is no definitive solution
- The problem-solving process ends when you run out of time, money, energy, or some other resource, not when some perfect solution emerges

2 Adapted from: http://www.3m.com/meetingnetwork/readingroom/gdss_wicked.html
Created a SPO-Contractor Interaction Model

KTR = Contractor
SPO = System Program Office

These relationships create a dual floating-goal structure
Expanded the Interaction Model to Four Players

- Requirement Changes Switch
- Requirement Changes to Baseline
- Initial Baseline
  - SPO
  - Contractor
  - Sub-Contractor
  - Vendor
- Decision and Action Delay
- Adjusting Baseline
- Observation and Orientation Delay
- Perceived Baseline
- Clarity of Baseline Communication Sent
- Orientation Expertise Level
- Baseline

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Base Case

Government and Contractor Baselines

- SPO Baseline
- KTR Baseline
- SUB Baseline
- VEN Baseline

• Disconnect index 2529
Scenario A: Turning Off the “Requirements Grenade”

Interviews revealed beliefs that disconnects arise from “out there”—because external stakeholders change requirements

- **Scenario A: Turn the Requirement Changes Switch “off”** (No party receives external requirements changes)
Scenario A:  
*Turning Off the “Requirements Grenade”*

Government and Contractor Baselines

- Disconnect index 2288—only a 9.5% improvement
Scenario C:  
Points of Leverage in Reducing Disconnects

The research team ran a variety of scenarios focused on reducing the duration and magnitude of disconnects

• Scenario C-1: Increases the SPO’s orientation expertise level from 0.5 to 0.75 and increases clarity of communication sent from 0.6 to 0.9

• Scenario C-2: Same as C-1 and reduces the SPO’s observation and orientation delay from 5 months to 1

Scenario C-1 & C-2

Scenario C-2 only

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Scenario C-2: Reducing Disconnects—Higher Expertise, Greater Clarity, Faster Observation and Orientation

Government and Contractor Baselines

- Disconnect index 1409—a 44.3% improvement
Partial research findings

• Solving “wicked problems,” such as disconnects, requires a problem-solving approach that is primarily social

• Changing how knowledge is represented in “boundary objects” improves performance at primary leverage points
What is a “Boundary Object³”?

- A boundary object is an artifact (or sometimes a person) that enables individuals to collaborate effectively across some form of boundary.

- Boundaries are gaps or differences in organization structures or entities, political power, relative expertise, knowledge domains, timing, and/or locations among the players.

- The artifact represents key dependencies (dimensions of shared interest) among the players.

- It is an “impoverished replica” of the salient shared dependencies.

- To be a boundary object (not a bludgeoning tool) the artifact must be transformable by all parties involved in the collaboration.

“Boundary Objects” Provide Leverage

- Leverage points identified in the simulated world
  - Increase the collective expertise brought to bear when assessing change (orientation expertise level)
  - Increase clarity of communication
  - Reduce the sense-making time required for a change (observation and orientation delay)

- Knowledge represented in “boundary objects” address all three dimensions

Helps shorten the time to understand changes

Helps compensate for differences in organizations, relative expertise, knowledge domains, timing and location of collaborators

Helps compensate for low expertise levels and leverages high expertise levels
Summary

• Disconnects are caused by ineffective and slow social construction of solutions, **not** changing requirements

• Rapid program-wide sense making of change is critical because…

• Disconnects become wicked problems when they are not promptly resolved

• Boundary objects are a significant point of leverage to enable improved collaborative performance

• Programs must accept responsibility for how quickly and effectively they **socially construct** solutions
Backup Charts
Scenario B: Speeding Up the SPO

Interviews revealed beliefs that, if the SPO decided and acted more quickly, fewer disconnects would result.

- **Scenario B-1**: Reduces the SPO’s *decision and action delay* from 5 months to 1.
- **Scenario B-2**: Reduces the SPO’s *observation and orientation delay* from 5 months to 1.
Scenario B-1: Speeding Up the SPO—Accelerating Decision and Action

Government and Contractor Baselines

- Disconnect index 2635—a 4.2% deterioration
Scenario B-2:
Speeding Up the SPO–Accelerating Observation and Orientation

Government and Contractor Baselines

• Disconnect index 1918—a 24.1% improvement
Scenario C-1: Reducing Disconnects—Higher Expertise and Greater Clarity

Government and Contractor Baselines

- **SPO Baseline**
- **KTR Baseline**
- **SUB Baseline**
- **VEN Baseline**

• Disconnect index 1717—a 32.1% improvement

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