Acquisition Risks in a World of Joint Capabilities

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Purpose

Despite the most intense management efforts of the best-trained, best-qualified acquisition professionals; despite vigorous acquisition reform, oversight, and scrutiny, cost overruns and schedule delays of technological developments remain unacceptably high.

examines the funding and data interdependencies that exist among MDAPs to determine if it problems may be due to the interdependent nature of joint capabilities.
Join Capabilities and Network Centric Warfare

is an emerging theory of war based on the concepts of nonlinearity, complexity, and chaos. It is less deterministic and more emergent; it has less focus on the physical than the behavioral;

*and it has less focus on things than on relationships*

ADM Cebrowski
Complexity and Joint Capabilities

Nonlinear interaction: Combat forces composed of a large number of nonlinearly interacting parts.

Decentralized Control: There is no master “oracle” dictating the actions of each and every combatant.

Self-Organization: Local action, which often appears “chaotic,” induces long-range order.

Non-equilibrium Order: Military conflicts, by their nature, proceed far from equilibrium. Correlation of local effects is key.

Adaptation: Combat forces must continually adapt and coevolve in a changing environment.

Collectivistic Dynamics: There is a continual feedback between the behavior of combatants and the command structure.

-- Moffat
Vulnerabilities

- Incomplete Information
- Incomplete Payoff Structures
- Inability to Isolate Cause and Effect
- Unknown Response Options
- Multiple and Conflicting Representations of Environmental variety
- Perturbations
- Multiple Constraints

Cost Overruns
Schedule Delays
Feature Shortfalls
Research Objectives

Applied Research :: 2011

- Identify and characterize the nature of MDAP interdependencies.
- Test to see if performance breaches (specifically, feature changes, cost overruns, and budget shortfalls) correlate with any of the interdependency characteristics.
- Isolate the extent to which acquisition performance breaches (i.e. per unit cost growth, schedule delays, and feature shortfalls) in an upstream ram cascade to downstream interdependent MDAP programs.
- Compute overall annual MDAP network metrics of complexity dating back to 2005 to see how they might relate to the total acquisition spending.
Interdependency Dimensions & Data

**Resource**
- Financial
- Data
- Authority
- Labor
- Information

**Direction**
- Pooled
- Sequential
- Reciprocal

**Characteristics**
- Joint
- Stage
- Turnover
- Development
- Estimate

- DAES
- RDOCs
- Damir
- SAR
Data Interdependencies

Growing Interdependencies and Growing Complexity

97 Nodes
353 Links
18% Density
Funding Networks

Fiscal Year 2004

39 Links

4% Density
Funding Networks

Fiscal Year 2005

64 Links

5% Density
Fiscal Year 2006

87 Links

6% Density

Funding Networks
Funding Networks

Fiscal Year 2007

152 Links

19% Density
Funding Networks

Fiscal Year 2009

291 Links
23% Density
Funding Interdependencies

Percent of MDAPs that Share a Funding Account

- 2004
- 2005
- 2006
- 2007
- 2009
Scale Free Networks

Number of MDAPs vs. Number of Data Links

Number of MDAPs vs. Number of Funding Links
Data & Funding Interdependencies

Percent of MDAPs that Share Both Data & Funding Interdependencies

![Bar Chart]

- 2004: 0%
- 2005: 10%
- 2006: 15%
- 2007: 20%
- 2009: 35%
Regression Models

**Summary of Regression Findings***

<table>
<thead>
<tr>
<th></th>
<th>Pct Growth From Baseline</th>
<th>RDT&amp;E PAUC Pct Growth</th>
<th>APB Pert Breaches</th>
<th>Schedule Cost Variance</th>
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*Controlling for Development Estimate, Turnover, Stage
### First & Second Order Cascades

**Summary of First Order Cascades**

- `+` = Positive Cascade
- `-` = Negative Cascade
- `x` = Positive Cascade for MDAPs that experience Greater than 13% Growth
- `z` = Negative Cascade for MDAPs that experience Greater than 13% Growth

<table>
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<th>Year</th>
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### Second Order:

**PAUC Pct Growth**

- `>13 PAUC Pct Growth`:

- `>13 Pct Growth From Baseline`
## Take Aways

1. **Growth in Complexity**

2. **Data & Funding Networks are Scale Free**

3. **Regressions**
   - Data Links → Schedule Cost Variance
   - Data and Funding Links → APB Performance Breaches

4. **Cascades**
   - Data Links
   - RDT&E PAUC Pct Growth
   - APB Perf Breaches
   - Engineering Cost Variance
   - Funding Links
   - RDT&E PAUC Pct Growth
   - Pct Growth From Baseline

5. **Tipping Point**
   - Pct PAUC Growth
   - Pct Growth From Baseline
Next Steps

- Incorporate 2010 Data
- Test the Influence of Dyadic Analysis as a Measurement Tool
- Test the Influence of Structural Equation Modeling as a Measurement Tool