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Novak, William E.; Moore, Andrew P.; Cohen, Julie B.; Marchetti, Jay D.; Collins, Matthew L.

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The Decline and Fall of Joint Acquisition Programs

William E. Novak
Andrew P. Moore
Julie B. Cohen
Jay D. Marchetti
Matthew L. Collins

2014 AFCEA Acquisition Research Symposium

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Findings from Prior Joint Program Research

- "Joint programs, whether large or small, in development or production, and irrespective of age, are statistically more likely to encounter programmatic breaches than their single system counterparts."

  — "*The Acquisition of Joint Programs: The Implications of Interdependencies* " by Brown, Flowe, Hamel

- "The resistance to bi-service programs is thus deep-seated and powerful… When asked to consolidate programs they will make powerful arguments in favor of the attributes of their own proposal and against the attributes of the other service's proposal."

  — "*Inter-Service Weapons Rivalry* " by Robert F. Coulam

- "The common problems that cause delays and cost overruns can typically be attributed to 'mission creep' requirements that surface during the SDD phase."

  — "*Program Management Challenges in a Joint Service Environment*" by LtCol Dorothy E. Taneyhill

- "…Service parochialism… conspires to ensure that individual Service equities… dominate the acquisition process."

  — "*Reforming the Joint Acquisition Process* " by Brinson, Jones, and Kelly

- "Pentagon decisionmaking reforms since World War II are largely a history of efforts to curtail the power of the Services to veto joint solutions that serve the entire military better."

  — "*Reforming Pentagon Strategic Decisionmaking*" by Lamb, Lachow

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The Decline and Fall of Joint Acquisition Programs

Joint Programs

1. A JPO PM has six stakeholder programs planning to use their joint infrastructure software…

2. …but each program demands at least one major feature be added to the software just for them.

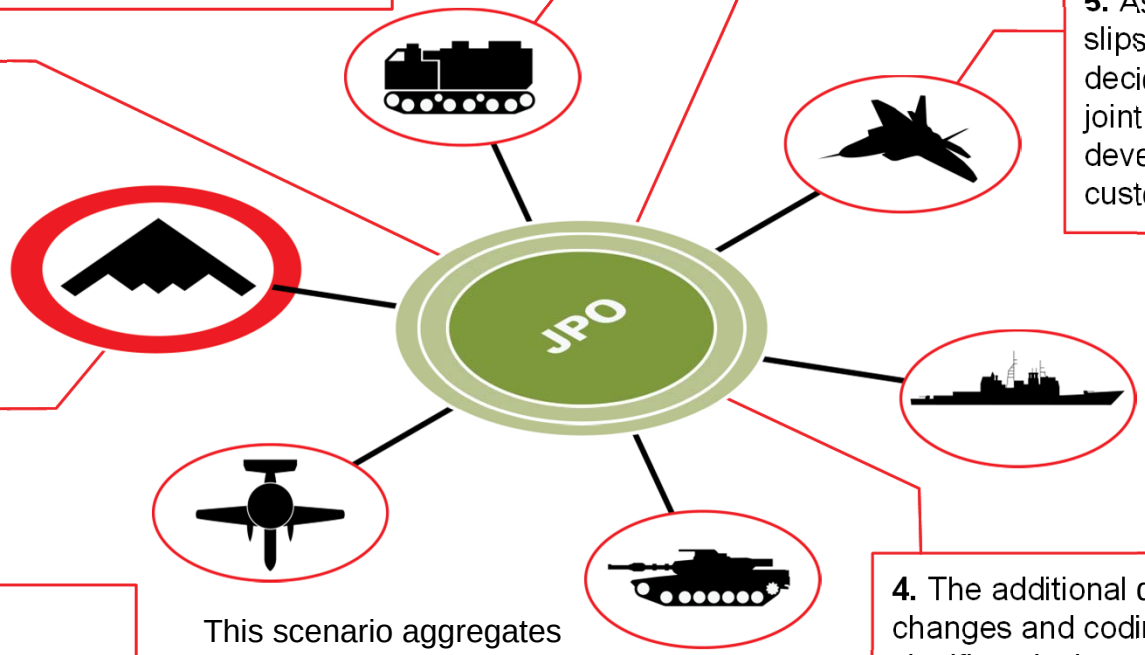
3. The JPO agrees to the additional requirements, for fear of losing stakeholders (who could build custom software).

4. The additional design changes and coding significantly increase total cost, schedule, complexity, and risk.

5. As the schedule slips, one program decides to leave the joint program and develop its own custom software.

6. With one stakeholder gone, the amortized costs for the other programs increase further—and another program leaves.

7. As cost escalates and schedules lengthen, participation in the joint program unravels and collapses.



This scenario aggregates three SEI software-reliant system acquisition ITAs conducted in 2006-2009.

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What are Social Dilemmas?

What if we all could be better off, but no one has an incentive to change? Dilemmas are all about cooperation—and there are two basic types:

Social Trap: "*The Tragedy of the Commons*"

- Someone wants a *benefit* that will *cost* everyone else
- Some are tempted by that benefit, but if *all* do, everyone is worse off.

Social Fence: "*Producing a Public Good*"

- Someone faces a near-term *cost* that would *benefit* everyone else
- Some try to avoid the cost, but if *all* do, everyone is worse off.

Social Trap Examples:
Overfishing: Everyone catching more fish will mean there are no more fish
Congestion: Everyone using a car for their convenience creates traffic jams
Pollution: It's cheaper to pollute, but everyone else pays the price in smog

"Individually optimal decisions lead to collectively inferior solutions"

Key Idea

The "Tragedy of the Commons" is a multi-player version of the "Prisoners' Dilemma"

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What Key Mechanisms Undermine Joint Programs?

Stakeholders of joint programs demand additional (custom) requirements later in the lifecycle

- The more time that elapses between establishing the baseline requirements and introducing new requirements, the more effort it takes to develop the software for those requirements.

Underbidding is used to win development contracts

- Underbidding leads to schedule pressure that can shortcut quality processes and increase firefighting and staff burnout.

Developers are motivated to show good progress early in development

- Failing to address the hardest requirements early in the development lifecycle (such as in the first increment) in order to show better progress, leads to greater rework to address them later in the lifecycle, slowing progress.

Take-away

Understanding the underlying mechanism that drives joint program collapse is essential to fixing it

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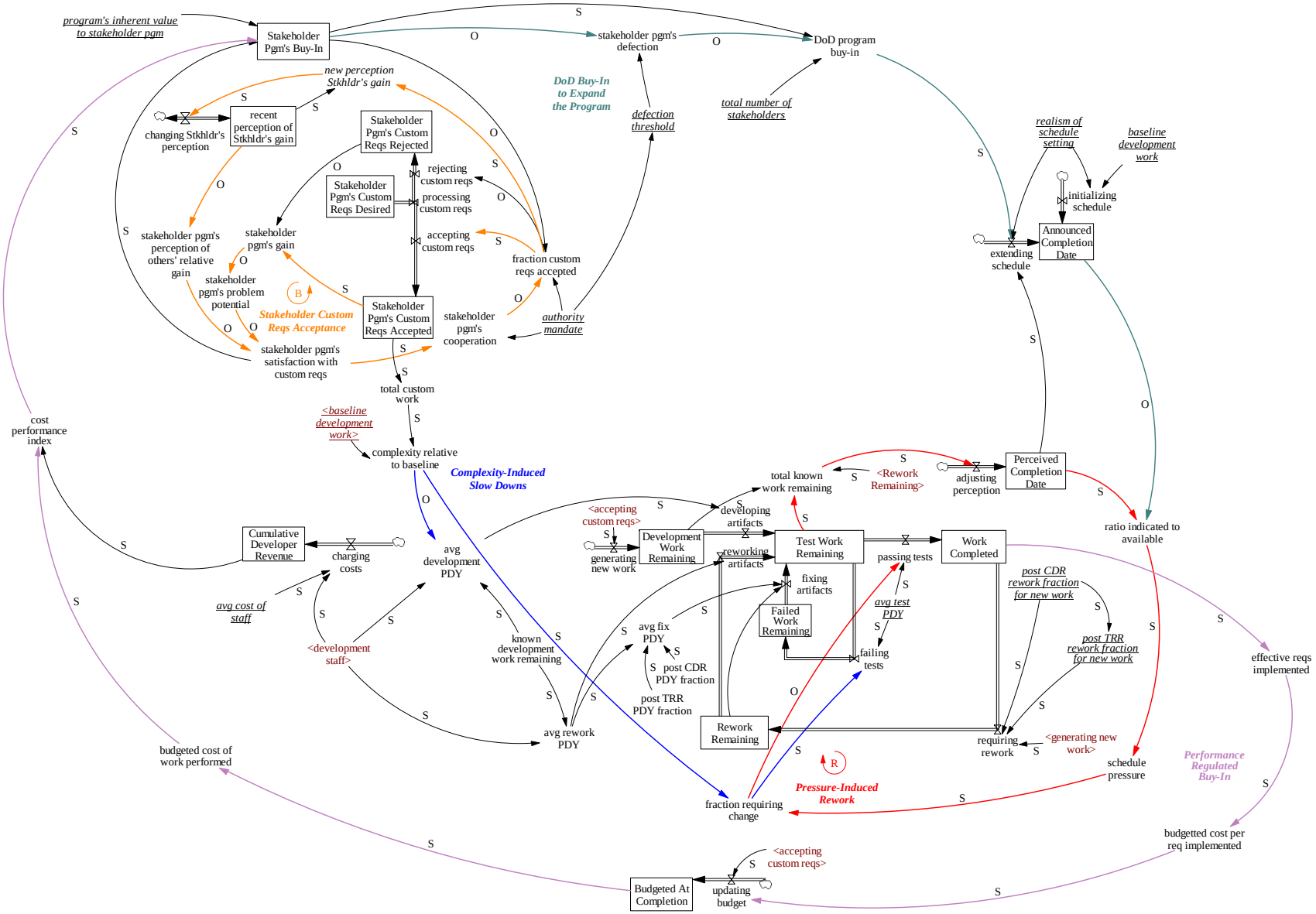
The Decline and Fall of Joint Acquisition Programs

System Dynamics Simulation Model Overview



Grounding and Validating the Model

Model Validation Approaches:

1) Historical Joint Program Performance Data
   - Data tracking the monthly progress was obtained from the PMO and contractor, and correlated with a timeline of other events/actions/decisions

2) Joint Acquisition Program Workshops
   - Conducted two 2-day workshops, each held with senior experts from a single joint program
   - Human subject research protocol ensured confidentiality of the data collected

3) Game-based Joint Program Experiment
   - Some "less attractive" behaviors of joint program stakeholders aren't willingly revealed
   - Developing web-based game engine to host controlled experiments with experienced acquisition staff, to collect data on realistic behaviors in joint acquisition scenarios

Collected Quantitative and Qualitative Data Corrects and Refines the Initial Model
   - Refine joint program model structure based on the empirical stakeholder behaviors
   - Use collected performance data to drive selected joint program model inputs
   - Compare model simulation performance to historical program performance

Take-away

It's not enough to have only a notional or qualitative understanding of joint program dynamic behaviors.

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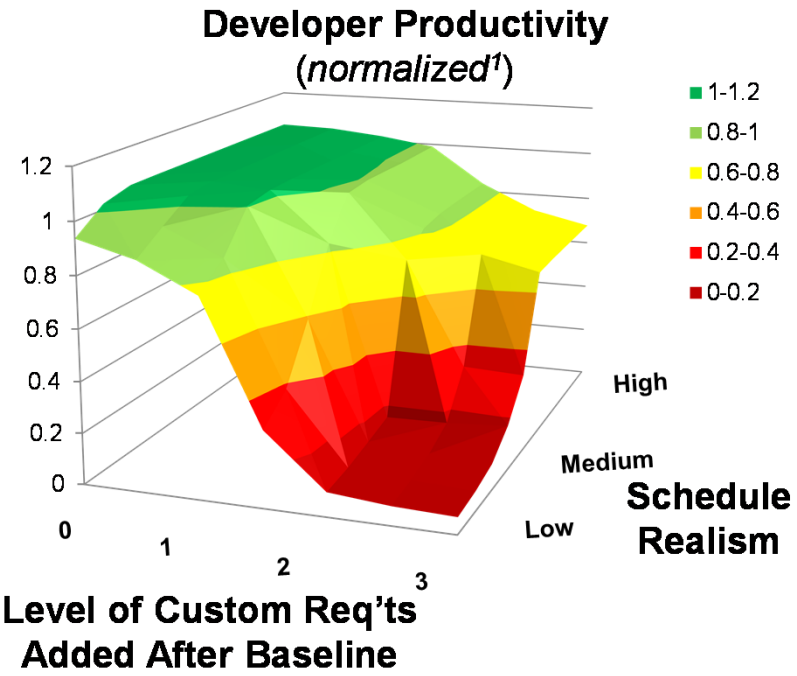
Key Research Findings



A key tipping point is crossed due to unrealistic schedules/late requirements

- Developer productivity as a function of schedule realism & late-addition req'ts
- Program managers need to know if they're about to "fall off a cliff" at a tipping point

Stakeholders played "Schedule Chicken"

- Stakeholder platforms hid their own performance problems behind the joint program's schedule issues

There is an inherent "social trap" at the heart of a joint program

- The JPO accepting more late custom requirements to keep stakeholder programs engaged (to prevent defection/collapse) is a "no win" social trap that leads to program collapse, especially when an unrealistic schedule exacerbates the expanded scope.

Mandated joint program participation can have severe unintended consequences

- If a stakeholder program is unwillingly forced to join a joint program, they will find a way to leave—and their defection will likely lead to a cascade of defections that will collapse the joint program

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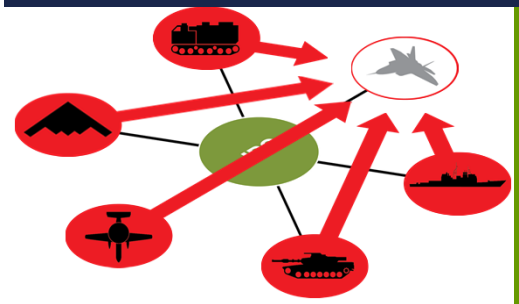
Candidate Social Dilemma Solutions

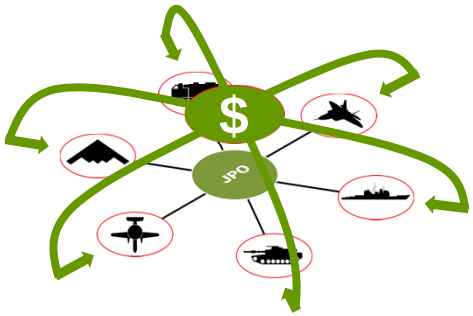
Goal: Decrease custom requirements demanded by stakeholder programs
Goal: Increase realism of development schedule

Altruistic Punishment



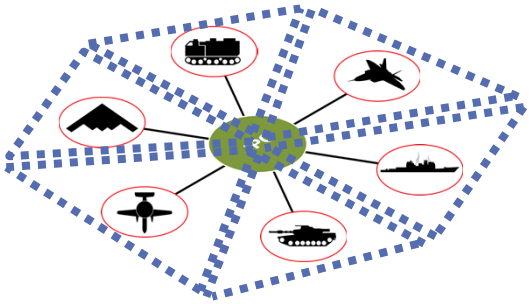
- PRO: Pay to penalize uncooperative partners
- CON: May escalate and cause retaliation

Shared Destiny



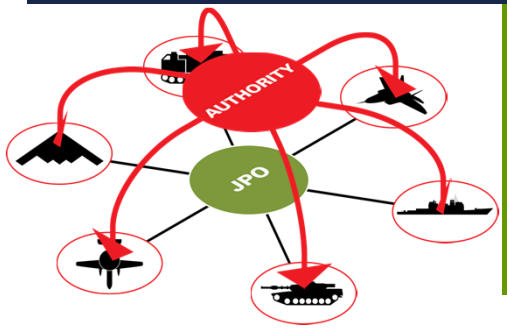
- PRO: Incentivize based on program outcome
- CON: Incentive may be far in the future

Privatization



- PRO: Gives incentive to care for what's yours
- CON: Loses reason for cooperation

Authority



- PRO: Regulates the good, prevents overuse
- CON: Unpopular to enforce a mandate

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Conclusions

Current Status

- Preliminary observations show a tipping point toward much lower overall development productivity contributing to the joint program social dilemma

Potential Areas of Future Research

- Model possible solution approaches and analyze their effectiveness
  - Identify the most promising solution(s) to be piloted on real programs
- Forecast acquisition program performance
  - Use a parameterized model as a management decision support tool
  - Run “what if?” scenarios on acquisition programs in progress & compare outcomes
  - Generate 3-D maps of the decision space to help decision-makers navigate it
- Influence future policy for joint acquisition programs
  - Help shape how joint acquisition programs are conducted through policy changes via the Service Component Acquisition Executives (CAEs) and DoD
- Create an acquisition *Management Flight Simulator*
  - Educate program staff as to pitfalls awaiting them, as well as potential mitigations

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