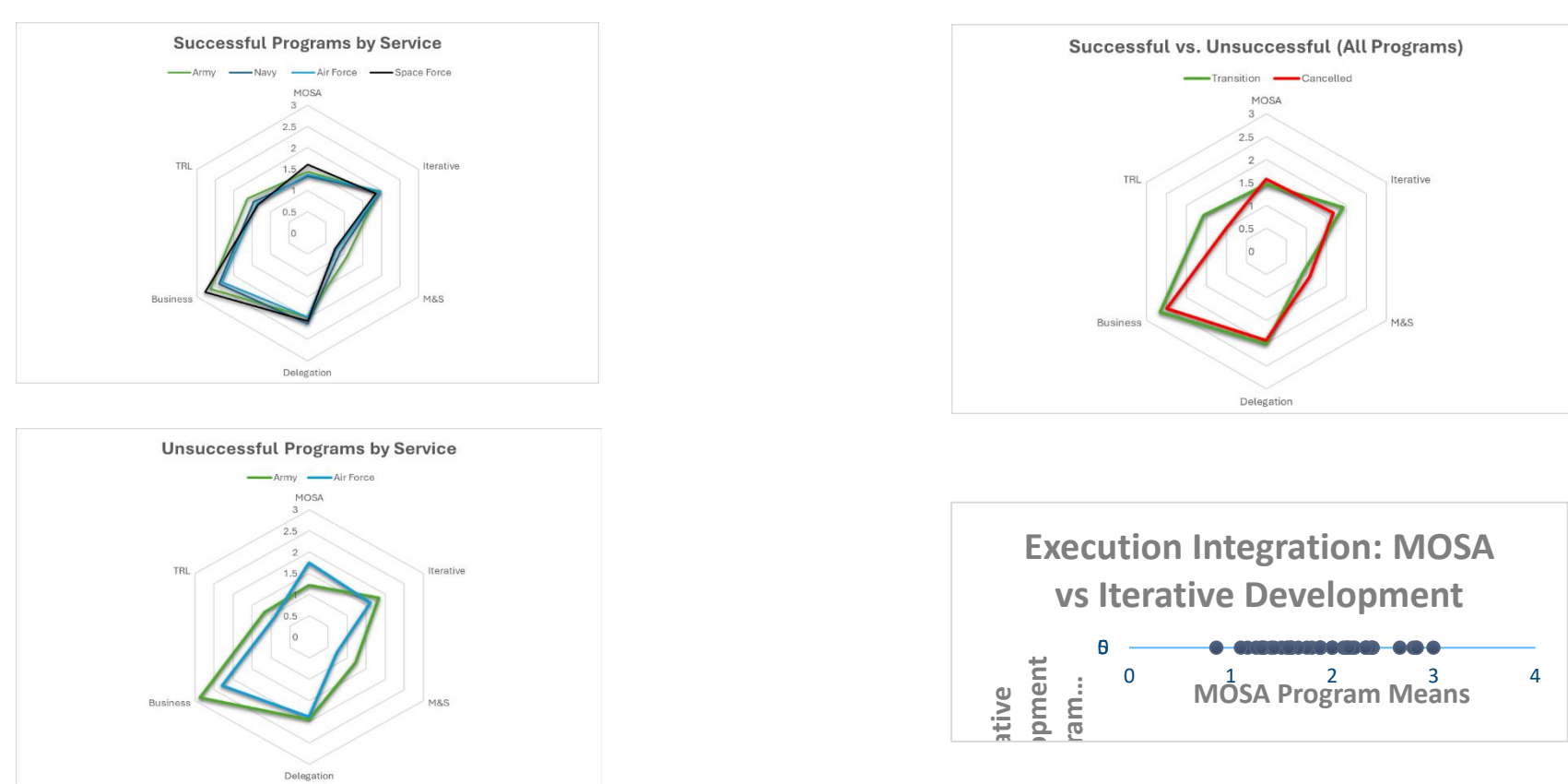


Abstract

- The Department of Defense increasingly relies on the Middle Tier of Acquisition (MTA) pathway to rapidly prototype and field capabilities in response to evolving operational threats. However, MTA program outcomes vary significantly across programs and Services. Existing oversight identifies several acquisition best practices associated with improved outcomes, but there has been limited cross-program analysis examining how consistently these practices are implemented across MTA rapid prototyping efforts.
- This research evaluates the extent to which DoD MTA rapid prototyping programs demonstrate alignment with selected acquisition best-practice constructs and how that alignment varies across programs and Services. It also conducted an exploratory regression analysis among the best-practice constructs.
- The study analyzed six acquisition best-practice constructs: Modular Open Systems Approach (MOSA), Iterative Development, Modeling & Simulation (M&S), Delegation of Authority, Business Case Quality, and Technology Readiness Level (TRL).

Methods

- MTA program artifacts were collected from the Defense Acquisition Visibility Environment (DAVE) Acquisition Information Repository (AIR).
- Structured prompts and scoring rubrics were developed for each construct, and with the assistance of a Large Language Model (GenAI.mil Gemini), all available program artifacts were coded and ordinally scored for strength of construct application. Program-level scores were then aggregated and analyzed using document-level heatmap visualizations, service-level radar chart comparisons, single-construct variate regression, and multivariate regression.



| Regression Relationship (X → Y) | OLS B | STD B | SE | R ² | 95% CI [Lower, Upper] | P-value |
|------------------------------------|--------|--------|---------|----------------|-----------------------|-----------|
| MOSA → Iterative Development | 0.6125 | 0.6957 | 0.10396 | 0.4840 | [.402, .823] | p < 0.001 |
| M&S → Iterative Development | 0.4482 | 0.4717 | 0.13775 | 0.2225 | [.169, .727] | 0.0024 |
| MOSA → M&S | 0.5895 | 0.6363 | 0.1174 | 0.4049 | [.351, .828] | p < 0.001 |
| TRL → Business Case | 0.4431 | 0.3875 | 0.1733 | 0.1502 | [.092, .794] | 0.0147 |
| TRL → Iterative Development | 0.2657 | 0.2054 | 0.2081 | 0.0422 | [-.156, .687] | 0.2097 |
| Modeling and Simulation → TRL | 0.2877 | 0.3916 | 0.1111 | 0.1533 | [.063, .513] | 0.0137 |
| Delegation → Iterative Development | 0.2366 | 0.1963 | 0.1944 | 0.0385 | [-.157, .630] | 0.2311 |
| Delegation → MOSA | 0.0876 | 0.1199 | 0.2235 | 0.0144 | [-.289, .617] | 0.4671 |

Results & Impact

- Successful programs generally demonstrated stronger alignment in: Technology Readiness Level (TRL); Business-case-related practices; Modeling & Simulation. There was minimal variation in the Service level application of the constructs.
- Technology maturity at program entry appeared to distinguish successful from unsuccessful programs: Successful programs demonstrated a 57% higher TRL score compared with unsuccessful programs.
- MOSA demonstrated the strongest relationships with Iterative & M&S, suggesting that execution-oriented variables possess a degree of interdependence.
- Delegation of authority, a governance variable, consistently demonstrated weak relationships with other constructs.
- TRL, a risk management variable, showed limited cross-construct relationships; its clearest associations were with another risk management variable, business case strength, and, to a lesser extent, M&S, an execution variable.

Future Research

- Expand the analysis across a larger and more longitudinal MTA dataset to improve statistical robustness, trend analysis, and eventually map downstream operational value.
- Incorporate Manufacturing Readiness Level (MRL) into future MTA program evaluations.
- Examine how intellectual property strategies and MOSA implementation influence integration, competition, and adaptability.