Finding opportunities for commonality across complex systems: A study of unmanned aircraft systems

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Motivation / Problem

- The DoD is making large investments in acquiring combat capability through acquisition of UASs
- In order to meet combatant commanders’ requirements for ‘The Long War (Global War on Terrorism), services have increased the quantities and types of UASs fielded
- Many contractors and program offices have independently developed and fielded systems with overlapping functionality
- The GAO and OSD have directed that commonality be increased so that cost savings are realized
- As more systems are fielded, logistics tails for independent systems must be maintained at costs of inventory, transportation, training, repair, and more
- Literature focus is on developing commonality from “clean sheet” designs for product families instead of the case of increasing commonality across existing architectures and systems

Key Question(s)

- How can opportunities for commonality be discovered across multiple systems?
- How can decisions be made to determine the technical applicability of a proposed system as a replacement for a current system?
- How do stakeholders impact the implementation of commonality across systems?

Methodology

Hypothesis: Driving commonality across complex systems requires a rigorous process to implement and realize the benefits

The Research

- Developed taxonomies for identifying functions across systems
- Functional decompositions of systems performed and multiple levels compared to find common modules
- Systems characterized through activity modeling using IDEF0
- Comparisons performed by calculating differences between activity model generated matrices and analyzing differences
- Stakeholders identified and mapped to their interests related to commonality
- Commonality solution developed by screening technically feasible solutions with stakeholder preferences

Preliminary Results

- Method for finding commonality opportunities has been developed and tested by the researcher in several domains
- The functional decompositions can be mapped to physical instantiations and compared across systems
  - Specifications can be compared to determine suitability of physical modules into another system

Remaining Research

- Transition from researcher-led method applications to practitioner-led studies
  - Evaluate method from observer status
- Future Research
  - Formalize cost estimating analysis to improve financial estimates
  - Automate comparisons of systems

Wrap Up

- Expected Contributions
  - Process to allow DoD system program managers to identify opportunities for commonality with other complex systems
- Areas for future consideration:
  - Communication systems
  - Ship management
  - Aircraft engines

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