NEEDS ELICITATION FOR COMPLEX SYSTEMS ENGINEERING

Good Practice Description

This practice builds on the sound systems engineering practice for needs elicitation. It extends the practice to emphasize important considerations, strategies, and key questions to consider. The practice ensures needs elicitation is conducted throughout the evolving system's lifecycle, involving a large set of stakeholders, who may have changing needs as the system evolves.

Problem

Clients and end users for a system often have vague, ambiguous ideas about the system they wish to acquire. Systems engineering needs to use good elicitation techniques to draw out and clarify these needs and transform them to requirements. The problem becomes increasingly difficult as more stakeholders are involved in systems and system of systems, involving extended enterprises and systems with long life cycles where stakeholders and their needs change over time.

Context of Practice

- Complex systems or system of systems with long life cycles where stakeholders and their needs change over time.
- Development and operations of system involves extended enterprise with multiple contractors and suppliers, and possibly joint operations
- Elicitation will take place periodically throughout the lifecycle of the complex system or system of systems

Challenges

- Joint capabilities planning and development brings multiple stakeholders with differences in perceptions, priorities, and areas of emphasis
- Long overall lifecycle(s) resulting in periodic changes in scope and boundaries, which will change the requirements
- System of systems involve legacy and evolving systems with independent lifecycles which involve elicitation
- Engineering work is often in ECPs rather than new start program driving the need for interim needs elicitation
- Funding irregularities and schedule pressures drive development teams to respond to new needs and requirements on demand
- As components become obsolete and are changed out, or new ones added, the interface needs and requirements may change

Heuristics

- Bring as many of the stakeholders as possible together at one time to clarify and prioritize needs
- Ensure all stakeholders understand the boundaries and scope for the needs elicitation activity

- Delay transforming needs to requirements until there is stakeholder agreement on the operational concepts
- Where joint capabilities are involved, ensure this is perceived as a key driver by all stakeholders
- Know which specialty areas are important (e.g., security, safety, etc.) and ensure these stakeholders are sufficiently involved in the elicitation activity
- Good questions for systems leaders to ask in support of needs elicitation include:
    1. What is the initial operational concept for nominal operation? When is this needed?
    2. Who are the stakeholders across the entire lifecycle?
    3. How robust and flexible does this system need to be, and how is this defined?
    4. What new capabilities must be developed to meet stakeholder needs?
    5. What is the high level functional architecture?
    6. Which systems of the SoS already exist and what is their lifecycle phase? How might these existing systems evolve during the lifecycle?
    7. How many new systems will need to be developed to meet stakeholder needs?
    8. What are the cost and schedule resources and constraints?
    9. Who is the primary decision authority for resolving any conflicting prioritization of needs?

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