Collaborative Systems Thinking:
Identifying the enablers and barriers of higher-level systems thinking in aerospace engineering teams

Caroline Twomey Lamb, PhD in Aeronautics and Astronautics (expected in 2009)
Committee: Prof. Deborah Nightingale, chair; Prof. Annalisa Weigel; Dr. Donna Rhodes

Motivation
Systems thinking development takes time and experience.

Why then, study team-level systems thinking?

Demographics: 50% of the aerospace workforce, those with the greatest levels of experience, are eligible to retire by 2013.

Program Tends: The aerospace industry has fewer (larger and longer) programs than 50 years ago. This results in fewer opportunities to gain systems experience.

Workforce Development: It is hoped that team-level systems training will provide the supportive environment and care/guidance required to develop good systems thinking engineers.

Integrated Design Practices: Integrated Product Development (IPD) improves design through early integration of multiple disciplines. IPD is practiced on teams of engineers working closely together on systems-level issues.

Research Design
This research follows grounded theory methods and uses surveys and interviews to collect data on the role of culture, process, and team composition in collaborative systems thinking.

Case Study Insights
Average team experience is not an indicator of collaborative systems thinking.

Teams with <7 years of average experience behave similarly to those with >30 years of experience.

An internally consistent view of decision making is an enabler of collaborative systems thinking.

Teams with higher self-reported and observe CST have more consistently shared views of how decisions are made.

High collaborative systems thinking team members identify themselves as team players who are reliable performers.

Lower systems thinking teams' members rate themselves relatively higher in detail orientation and coordination.

Expected Outcomes and Future Work
Understanding team-level systems thinking.

A possible tool for workforce development.

Expected Outcomes
1. An operational definition of collaborative systems thinking
2. Heuristics for enabling collaborative systems thinking
3. Descriptive theory of collaborative systems thinking
4. Data for improving workforce development initiatives

Future Work

1. Tracking members of ‘middle tier’ to measure effectiveness of participation for systems skill development
2. Longitudinal study to explore relationships between final system performance and collaborative systems thinking in systems architecture teams

Related Publications

For more information, please visit:
http://seari.mit.edu