Promoting Collaborative Systems Thinking Through the Alignment of Culture and Process: Initial Results

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Agenda

• Motivation
• Research Framework
• Key Constructs
• Objectives
• Research Methods
• Current Progress
• Conclusions and Next Steps
Motivation

• Aging demographics within engineering
  – Average age of engineer within US = 45 (NA Report, 2006)
  – Average age of engineer at NASA = 49 (Lemos, 2006)

• Increasing system complexity and development time (Murman, et.al, 2002)
  – 48 military aircraft program starts in 1950’s
  – 7 program starts in 1990’s

• Experiential learning best for systems thinking development (Davidz, 2006)

• Process certification increasingly contractually required

• Team is the primary working unit
Research Framework

- 3 key concepts
  - Standardized process
  - Culture
  - Systems thinking
- Desire to explore construct interactions
- Identify enablers and barriers to collaborative systems thinking
# Standardized Process

**Process:** A logical sequence of tasks performed to achieve some objective. Process defines what is to be done without specifying how it is to be done.

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- Codify best practices and facilitate effective coordination and communication.
- Drive interactions within teams and between teams.
- Reduce ambiguity and unpredictability (Schein, 2004).
- Process alone insufficient to guarantee success in product development (Dougherty, 1990; Spear and Bowen, 1999).
Culture

Culture: a dynamic phenomenon and a set of structures, routines, and norms that guide and constraint behavior.

--Edgar Schein, 2004

• Components of culture
  – Norms of behavior
  – Espoused beliefs
  – Basic underlying assumptions
• Norms most visible component of culture
• Effective team norms do not evolve naturally and must be fostered (Hackman, 2002)
• Team norms constitute unwritten set of standardized processes
Systems Thinking

Systems thinking: the analysis, synthesis, and understanding of interconnections, interactions, and interdependencies that are technical, social, temporal, and multi-level.

--Heidi Davidz, 2006

- Experientially developed skill that facilitates system design
- Five types of systems thinking (Roberts, 1999)
  - Open: flows and constraints
  - Social: relationships
  - Systems dynamics: causal loops
  - Process: ways in which information flows
  - Living: interactions
Collaborative Systems Thinking

Collaborative systems thinking: systems thinking as a property of an engineering team or organization.

- Term coined to refer to higher-level systems thinking in engineering contexts
- Systems dynamics/organizational learning current context for most organizational systems thinking research
- How might collaborative systems thinking differ from individual systems thinking?
  - Teams and organizations produce products
  - Borrow ideas of value and efficiency from lean thinking
Research Objectives

- Operational definition of collaborative systems thinking (CST)
- Identify enablers and barriers to CST
  - Standardized process
  - Culture
- Explain how CST develops
- Identify best practices, heuristics for aligning culture and process
  - Ways to tailor process
  - Feedback mechanisms
  - Best practices
Research Methods

- Grounded theory based research
  - Characterized by concurrent and systematic data collection, analysis, and theory development (Glaser and Strauss, 1967)
- Pilot interviews
  - Identify and define key concepts
- Secondary case study analysis
  - Identify linkages between concepts
  - Drive interview and survey questions development
- Case studies
  - Interviews
  - Primary document
  - Focus groups (simulations)
  - Surveys
Progress to Date

- Wrapping up pilot interviews
- Completing secondary case study analysis
- Depth case study selected
  - Collecting background information
  - Will collect team-based data starting April/May
- Breadth case studies still to be identified
Preliminary Results

• Process tools (value stream mapping, process roadmaps) facilitate forming mental models of development process
• Process facilitates communication—necessary precursor for CST
• Identifying with product an enabler of CST
  – Startups
  – Black programs
• Leadership is key component of CST
  – Leader with systems thinking capabilities
  – Leader working closely with systems thinkers on team
• CST requires a critical mass of systems thinkers
Conclusions and Next Steps

- Links do exist between systems thinking and standard process
- Culture plays a mediating role in success of standard process
- Next steps
  - Complete pilot interview and secondary case study analysis stage
  - Design interview and survey tools for case studies
  - Complete case studies
  - Data coding and analysis
Selected References