2016 Conference on Systems Engineering Research

Enhancing systems engineering education through case study writing

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NASA/ Marshall Space Flight Center
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Agenda

• Case Study Writers Workshop
• SE educational need
• Improvement with Subject Area Knowledge
• Future Research
Why Case Study Writing?

• Wide variety of styles for a plethora of purposes
  • Advertising — Academic Research
  • Focus on teaching, instructional case studies, and decisional (~3-10 pages)

Learning from case studies “stretches your mind for 30 minutes. It won’t go back exactly to the shape it was before”

Ed Rogers, GSFC Chief Knowledge Officer
SE Educational Need

• Systems Engineering grand challenges and agendas for research
• The Silver Tsunami
• “Grow your own” systems engineers
  • Soft skills, picture skills, interviewing skills, teaming skills

Essential Elements of Systems Engineering Thinking
Case Study Writers Workshop (2-day) and Writer’s Experience (18 weeks)
SE skills

Case Study Writing
Case Study Writer’s Experience

• Interviews with people who know
• Finding the story in the quagmire of information
• Concept mapping to connect the story
• Balancing viewpoints
• Being comfortable with non-closure
• Structured process, on schedule
• Editing out nice but not necessary
• Opportunity to present at RWMMS*
• Interviewing/inquiry skills
• Appreciation emotional content of work environment
• Deep contextual knowledge about a real world event or situation

*RWMMS= Real World Marshall Mission Success course

Behaviors of Good Engineers
(Gentry Lee, JPL)

• Intellectual curiosity
• Sees Big Picture view
• Sees connections
• Comfortable with change
• Comfortable with uncertainty
• Proper paranoia
• Tracks margins and resources
• Communication skills
• Self-confidence and energy
• Appreciation for process
• Personality
• Add to the knowledge of the world
Case Study Writers Workshop

- Impact of subject knowledge to success in producing quality case study
  - Criteria for success: usable in the Real World Marshall Mission Success Course

<table>
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<th>Subject Area</th>
<th>Mentor (if any)</th>
<th>Senior Partner Subject Knowledge (range)</th>
<th>Junior Partner Subject Knowledge (range)</th>
<th>Relative Success</th>
<th>No. Pages</th>
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Case Study Writers Workshop

- Success and progression of knowledge and writing capability
Future Research

• Future research options
  
  • Exploring the pedagogical benefits of using case study-based learning in the engineering classroom
  
  • Studying the impact of systems engineering skills improvement with intentionally-taught case study writing skills included in the curriculum
  
  • Identifying systems engineering research enhancements through rigorous case study-based qualitative research applied to systems engineering practice
  
  • Examining impact of case study-based learning and writing skills on increased knowledge of systems approach in traditional engineering curriculum

• Working on
  
  • Civil servant students partner with industry and government systems engineers to capture real world situations