



WELCOME!

INCOSE Enchantment Chapter Monthly Meeting



We're glad you're here.

We respectfully request:



ComputerHope.com

- Mute your audio when you are not speaking

Discussion and questions are encouraged!

Put questions in the chat box or unmute yourself to speak up.



Meeting Materials

If authorized by the speaker, the presentation can be downloaded prior to start of the meeting from the Meeting Materials page of our website:

<https://www.incose.org/incose-member-resources/chapters-groups/ChapterSites/enchantment/resources/meeting-materials>

If recording is authorized by speaker, the video will be posted at the link above within 24 hours.



2023 Enchantment Chapter Board of Directors

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SEP Training

CSEP Courses by *Certification Training International*:

CTI currently is offering online course offerings, see

<https://certificationtraining-int.com/incose-sep-exam-prep-course/>

Our chapter has two SEP mentors:

Ann Hodges alhodge@sandia.gov

Heidi Hahn drsquirt@outlook.com

Upcoming meetings/events

- 2/8/23: Casey Medina: “Model Based Systems Engineering”, <https://www.studiose.design>

Introductions

- Please type your name, position, and organization in the Chat window



Collaborative Systems Thinking Culture

A Path to Success for Complex Projects

Raymond Wolfgang - Sandia National Labs
Alex Deng - SNC-Lavalin Atkins
Jean Duprez - Airbus Operations SAS
Anabel Fraga - Carlos III of Madrid University
Leema John - Eli Lilly & Company
Ryan Noguchi - Aerospace Corporation

Erika Palmer - Cornell University
Jay Patel - Lockheed Martin Corp.
Natalie Davila-Rendon - Lockheed Martin Corp.
Michael Wozniak - Lockheed Martin Corp.
Maria Romero - Aerospace Corporation
Mickael Bouyaud - Ingenico SAS

Raymond Wolfgang

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- Sandia Labs – Systems Engineering
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- I help teams solve problems early by improving their requirements
 - Analysis
 - Reviews
 - Use Cases
- LinkedIn



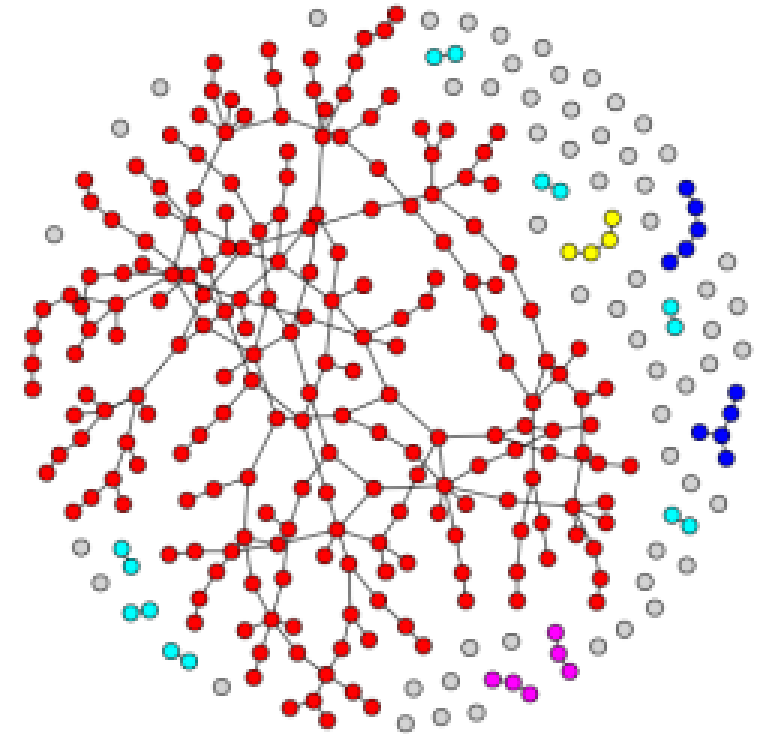
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Agenda

- Problem Statement and Proposed Solution
- Collaborative Systems Thinking Culture (CSTC)
 - CSTC Goals
 - Motivation for adopting CSTC
 - Problems and Benefits
- Phases for Implementing CSTC in an Organization
- Enablers and Barriers
- Workshop Results
- Conclusion

Problem Statement and Solution

- The world is more complex, with rapid changes requiring more integrated collaboration to solve the tough technical problems organizations face.
- To solve these problems, a mindset shift centered on collaborative systems thinking culture (CSTC) will assist substantially.
- 7-step process to make this transition in the organization



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CSTC Definition

- Collaborative Systems Thinking:

“An emergent behavior of teams resulting from the interactions of the team members and utilizing a variety of thinking styles, design processes, tools, and communication media to consider the system, its components, interrelationships, context, and dynamics toward executing systems design (Lamb, Rhodes et al., 2008).”

- How to implement?

- Requires deep understanding of **systems thinking**
- Need a sense of an organization’s **culture**

Movement towards a CSTC requires understanding both!

Three Steps to Adopt a CSTC



Problems Addressed and Benefits Provided



Interface Management

- Changes produce rework or redesign.
- Benefit - Early work on interfaces, more robust design, less rework

- Higher cost estimates not communicated
- Benefit - Accurate estimates given to project leadership

Testing

- Missing updates on prototype
- Benefit - reduction in rework

Design

- Re-baseline needed late in program
- Benefit - Customer expectations included in project

Project Management

- Designers isolated, scope added with good intention
- Benefit - Designers get input earlier, at appropriate intervals.

Sub-System Design

Phases for Implementing in an Organization

CSTC



Phase 01: Awareness and Documentation



Understand the culture of the corporation by conducting interviews and/or employee research on *how* they perceive the organization is run.



Determine if the employees perception of the vision and mission of the corporation does not align with the goals of the VPs and CEO.



Identify disconnects and work the gap(s) in the early phases.

There may be a lot in your organization already – this we can leverage

Phase 02: Investigation of Current State



Investigate if a CSTC is practiced in the corporation. While the term may not be widely used, the employees could be practicing it without knowing it.



Include a variety of individuals from as many different groups as possible to get a thorough understanding of the *interaction* between various groups.



Training on systems thinking for those providing input to the investigation may help discover existing systems thinking processes as well as potential areas of improvement.

We may be in better shape, than we realize

Phase 03: Early Adoption / Management Buy-In



Start small: A 'bottom-up' piece that contains a demo project or small well-contained sample effort can show how a systems-thinking approach is used, and collaboration is emphasized.



Management is then approached with this small victory as a lead in for future support. Obtain buy-in from the management, and build on those CSTC elements that already exists.



Give employees a voice on the development of the methodology and implementation.

Phase 04: Methodology



Develop the methodology to implement CSTC elements in the organization, and implement needed changes and process improvements. This will vary widely between organizations.



Continuous communication allows team members to develop ideas for process improvements which implement the CSTC and discuss them to get them approved, funded, and implemented.



The systems engineering organization should drive the **deployment of CSTC in the organization**. This implies systems engineers should be placed at every level of the organization.

Phase 05: Removal of Barriers



In growing a CSTC the removal of barriers may include reducing multiple hierarchy levels and approval layers to perform a task. This requires management buy-in.



This should result in a more efficient team and may be the greatest source of quick wins.



This is also a place where tailoring to the needs of the organization can take place.

Phase 06: Fill the Gaps



Gaps differ from barriers in that there is something missing that is needed which would improve a team's ability to get the work done. May be in knowledge, tools or adequate workspace.



Solution? Set up Communities of Practice or Lunch & Learns for information exchange / training. Participants bring problems and share lessons learned.



This will expose holes in the process and also foster the collaboration needed to work interfaces. Problems with too much collaboration, can also be addressed (Goldilocks Principle)

Phase 07: Training / Continuous Improvement



The training should explain the reason why a change on culture was needed, its impact, and stress that the cultural aspect is as important as the technical ones.

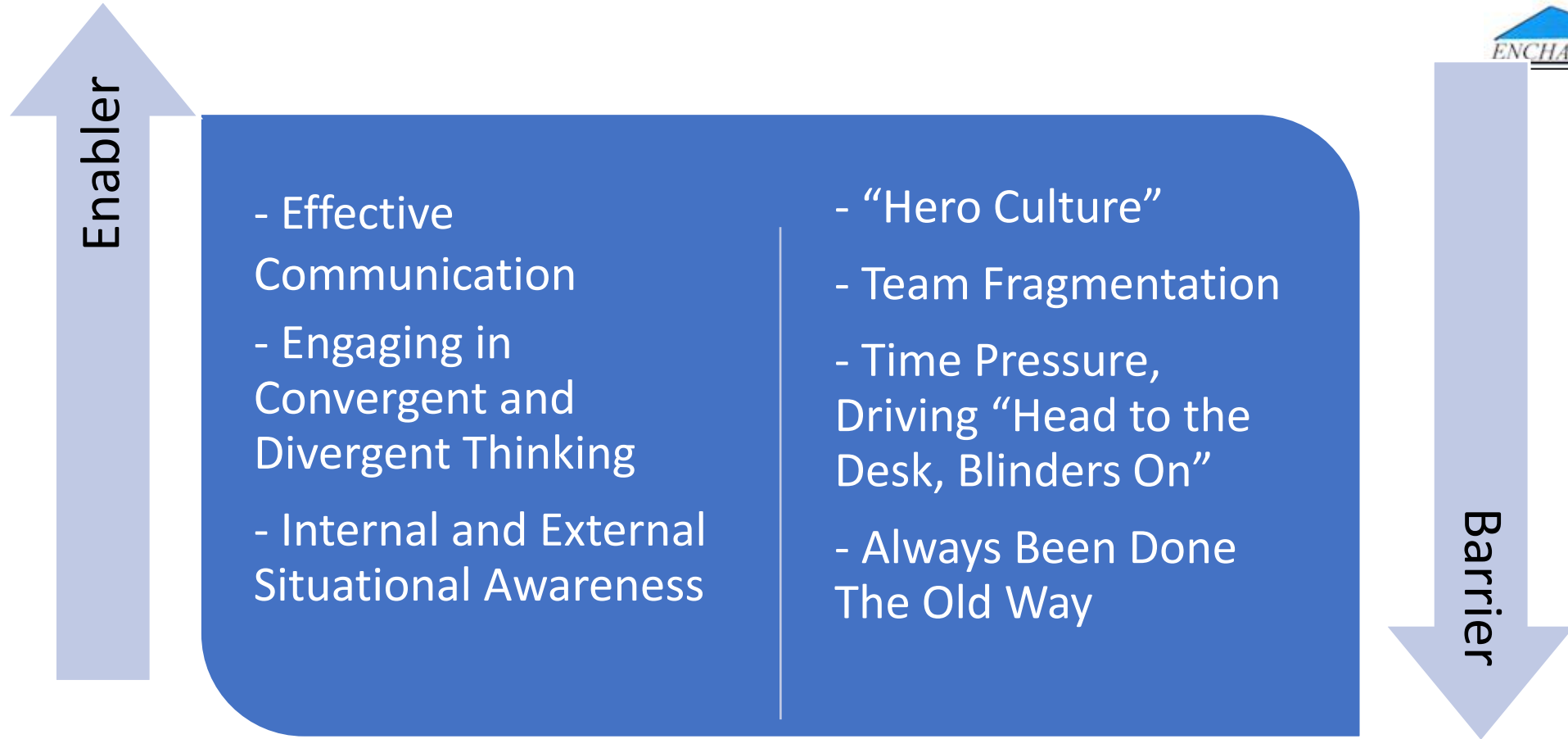


At this point it is needed to establish common Systems Engineering terminology, processes and concepts. Training facilitates adoption, and reduces confusion on the new approach to engineering work.



Provide sufficient funding for training on both new tools, and processes. This may include granting scope/schedule relief on other projects to allow personnel to be trained en-masse.

Enablers and Barriers to CSTC



The incentive structure – formal or informal – must be aligned

CTSC in the Organization - Workshop

- Workshop held Nov 8-9, 2022
- INCOSE Tech Leadership Inst. Community
- Brainstorming session
 - Ideas and experience on all 7 areas
 - General thoughts
- Shared workspace exercise (Miro)
 - Reach out for a deep-dive!

Takeaways: Culture is Tricky

- Cannot just tell people, “Ok, now – collaborate!”
- Systems-Thinking also hard to command
- Small steps can have big impact
 - Collaborative tools, Miro/Others, like the workshop!
- Can prevent avoidable problems
 - Rework, in 20/20 hindsight, often painful
- Not the cure all
- Formal training, with budget, required to penetrate culture

CTSC is Hard Work, and Do-able!

- Many groups – already do one or both
 - Collaboration, and Systems Thinking – but with different names
- Do not need a technical background
 - Technicians, Proj. Mgmt. staff – can be great systems thinkers
- Relationships count – as does longevity
 - Design, Production halves of an industry
 - “Phone a Friend..”
 - Models can help, as can a Digital Environment
- We behave as per our incentives!
 - What is *really* rewarded, formally or informally?

Potential Upside is Large

- CSTC helps to **increase customer satisfaction**, and boost the organization's bottom line as well as their overall contribution to society.
- **Cut development time** with reduced rework.
- Systems Engineers and SE leaders should consider steps towards a CSTC mindset **in themselves first**, and then the organization, to continue to provide solutions to modern complex problems.



- CSTC can provide Systems Engineers with a **mindset ready to solve complex problems** and grow leadership within engineering domains.

Questions?





Survey

The link for the online survey for this meeting is

- <https://www.surveymonkey.com/r/SKGVZST>

Your feedback is important!

Enchantment Chapter Monthly Meeting



Collaborative Systems Thinking Culture: A Path to Success for Complex Projects

Abstract: The world is filled with hard, complex problems seeking solutions. To make these often daunting problems more manageable to solve, both a mindset shift, and key candidate methodologies centered around a collaborative systems thinking culture are proposed. The idea is to introduce not just some collaborative practices, or systems-thinking approaches. Rather, the proposal for solving the tough problems – complex problems that basic approaches do not seem to solve – is to move an organization beyond basic techniques into a culture that has as its core a collaborative and systems-thinking theme. This paper will present an introduction to what a collaborative systems thinking culture (CSTC) is and looks like. The paper starts with exploring the state of the practice, presents the mindset change involved with systems thinking, propose that a collaborative approach is a part of this shift, and then conclude with the 7 phases that the reader can introduce into their organization to realize some of the benefits. What the attendee will learn, is a practical, 7-step approach to help facilitate moving their group to a more collaborative culture. Not all steps must be done at once, and the approach of course is tailorable to the attendee's situation. Cultural change can be hard, but this presentation will provide ideas and a process to get started. The intent is that with the right amount of CSTC in the organization, projects will produce results of higher quality, with better schedule and cost performance.

This work first appeared at the 2022 INCOSE International Symposium, and is the culmination of the research performed by the INCOSE Technical Leadership Institute (TLI) Cohort 6. Authors for the original work also include Mickael Bouyaud (Ingenico SAS), Natalie Davila-Rendon, Jay Patel and Michael Wozniak (Lockheed Martin), Alex Deng (SNC-Lavalin Atkins), Jean Duprez (Airbus), Anabel Fraga (Carlos III of Madrid University), Leema John (Eli Lilly), Ryan Noguchi and Maria Romero (Aerospace Corporation) and Erika Palmer (Cornell University). The original paper is available in the IS 2022 proceedings.

Speaker Bio



Raymond Wolfgang helps a variety of National Systems complete projects on-time and on-budget through crafting and managing requirements, verification, and validation activities. He currently serves as a Systems Engineer at Sandia National Laboratories in Albuquerque, NM. He has led requirements authorship and analysis for several programs, at both the systems-level and for multiple components. He has deployed several process improvement initiatives in requirements management, and currently leads an effort to complete a large program's use case portfolio. His INCOSE papers focus on requirements state-of-practice, and injecting MBSE into current programs that are already midway into the lifecycle. Raymond currently serves on the INCOSE Requirements Working Group, and as a member of the INCOSE Technical Leadership Institute (TLI). Before Sandia, while working for the US Navy (NAVWAR in San Diego), Raymond managed installation requirements for a critical ship-board technology refresh and served as a systems engineer and electrical engineer on several research and development programs. Raymond has a Master's degree in Electrical Engineering from Purdue University (USA), and remains involved in Toastmasters International as well as the Enchantment chapter of INCOSE in the southwest US. He is originally from the Philadelphia, PA, USA area.