



32nd Annual **INCOSSE**
international symposium

hybrid event

Detroit, MI, USA
June 25 - 30, 2022

Developing Competence in the Systems Engineering Professional Competencies



Focus of This Presentation

- The INCOSE Professional Competencies
 - Communications
 - Ethics and Professionalism
 - Technical Leadership
 - Negotiation
 - Team Dynamics
 - Facilitation
 - Emotional Intelligence
 - Coaching and Mentoring
- Why?
 - Little alignment with the current version of the Systems Engineering Handbook
 - Highly correlated with the INCOSE Technical Leadership Model
 - **Being able to capitalize on systems engineers' strengths while minimizing weaknesses regarding the Professional Competencies is key to project success**



The Need for Professional Skills

- Systems engineers must be able to:
 - Identify key stakeholders
 - Understand and negotiate the problem space
 - Coach others on the technical processes
 - Manage team dynamics
 - Be empathetic and able to communicate with all types of stakeholders

Criteria for Selecting Development Resources



- No generalized “soft skills” training
- Methods needed to be engineering-oriented or applicable across multiple *technical* disciplines

Resources for Developing in the Communications Competency



- Precision Model of Communication
 - Specific to developing system requirements
 - Also shown to have a salutary effect on team dynamics
- Multichannel Communications
 - Due to the move towards digital transformation in engineering



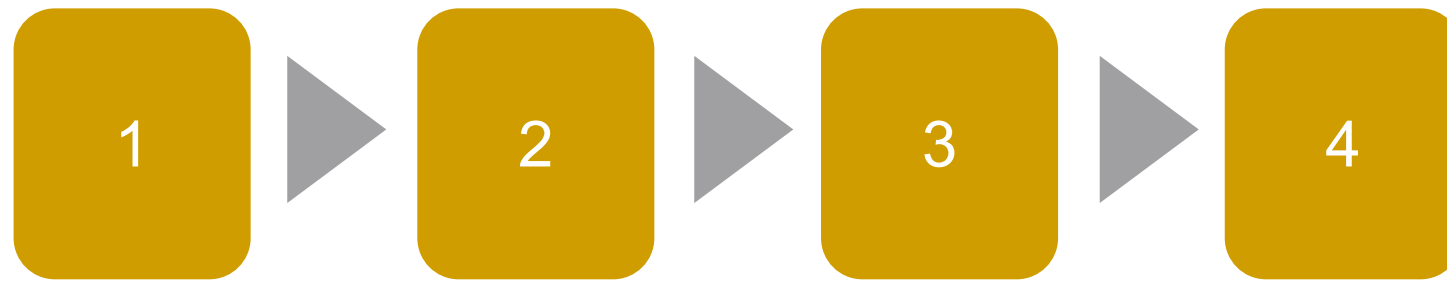
The Precision Model of Communication

- Contains specific behaviors and guidelines to improve requirements definition
 - Challenging universals and generalizations
 - Clarifying nouns and verbs
 - Challenging deletions



Multichannel Communications

Four step process



Understand
the audience

Choose the
right
channel

Shift the
focus

Tailor the
campaign

Resources for Developing Ethics and Professionalism



- Analysis of case studies is a good way to develop in ethical decision making
 - The American Society of Mechanical Engineers at http://www.asme.org/NewsPublicPolicy/Ethics/Ethics_Center.cfm
 - The Center for the Study of Ethics in Society at Texas A and M University at <http://ethics.tamu.edu>
 - The National Society of Professional Engineers at <http://www.nspe.org/Ethics/EthicsResources/index.html>
- Most problems related to unprofessional behavior due to poor interpersonal skills and inappropriate communication styles
 - Developing in Communication and EI should help

Resources for Developing in the Technical Leadership Competency

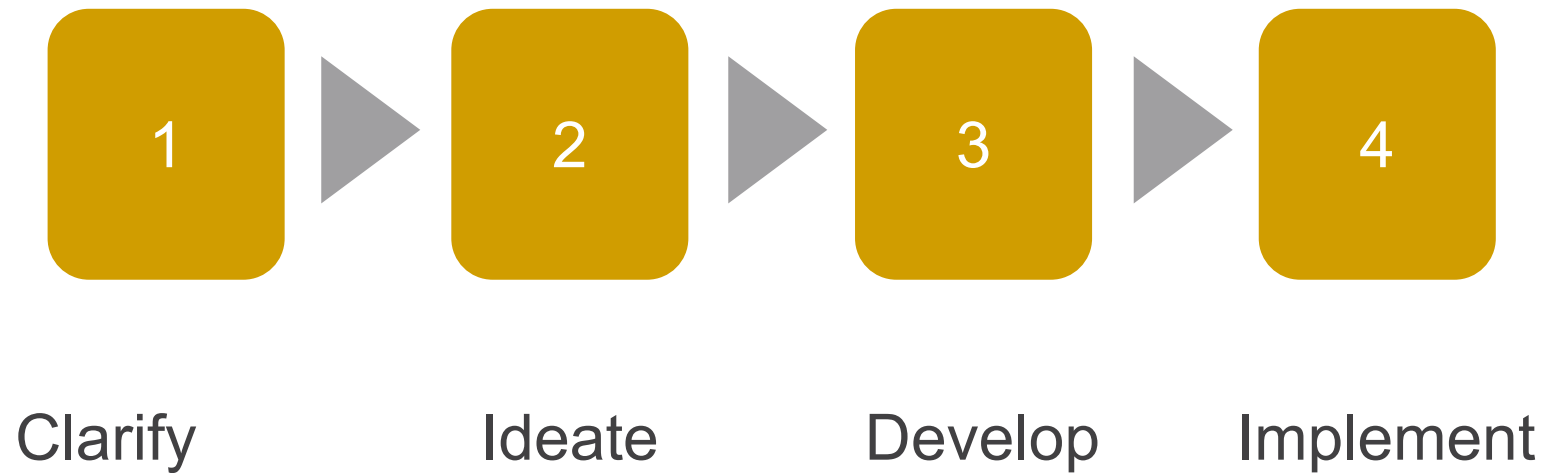


- Revolves primarily around developing creative problem-solving skills
- Three methods
 - Osborn Parnes Creative Problem Solving Process
 - Design Thinking
 - TRIZ

Osborn Parnes Creative Problem Solving Process



Four step process





Design Thinking

Five phases



TRIZ – Theory of Inventive Problem Solving



- Provides principles for resolving several contradictions simultaneously
- Developed from an analysis of patents to identify how innovation took place
 - Focus was on what contradictions were resolved and how
- Key elements:
 - Analyzing the contradiction
 - Searching for one or more principles that help resolve it
 - Pursuing the ideal solution

Discussion on Creative Problem Solving Techniques

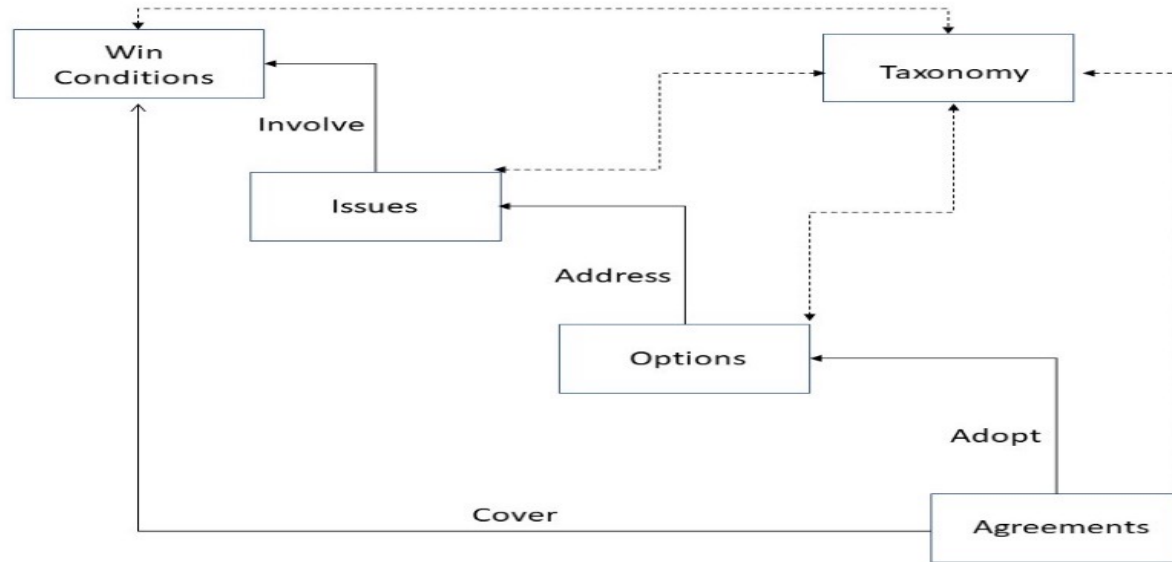


- Osborn Parnes and Design Thinking both
 - Balance divergent and convergent thinking
 - Use the term “Ideate” to mean generating solutions using brainstorming
 - Frame the problem as a Design Challenge
- In Osborn Parnes, “Implement” means developing an action plan
- Design Thinking uses rapid evolution of prototype and test to build out the solution
- TRIZ first focuses down then expands back up to locate all possible factual solutions
- Before moving to solution space, all three emphasize
 - Gaining thorough knowledge of the problem
 - Framing the need
 - Identifying gaps

Resources for Developing in the Negotiation Professional Competency



- WinWin Negotiation Model



WinWin Artifact Relationships
and Taxonomy
(Boehm and Egyed 1998)

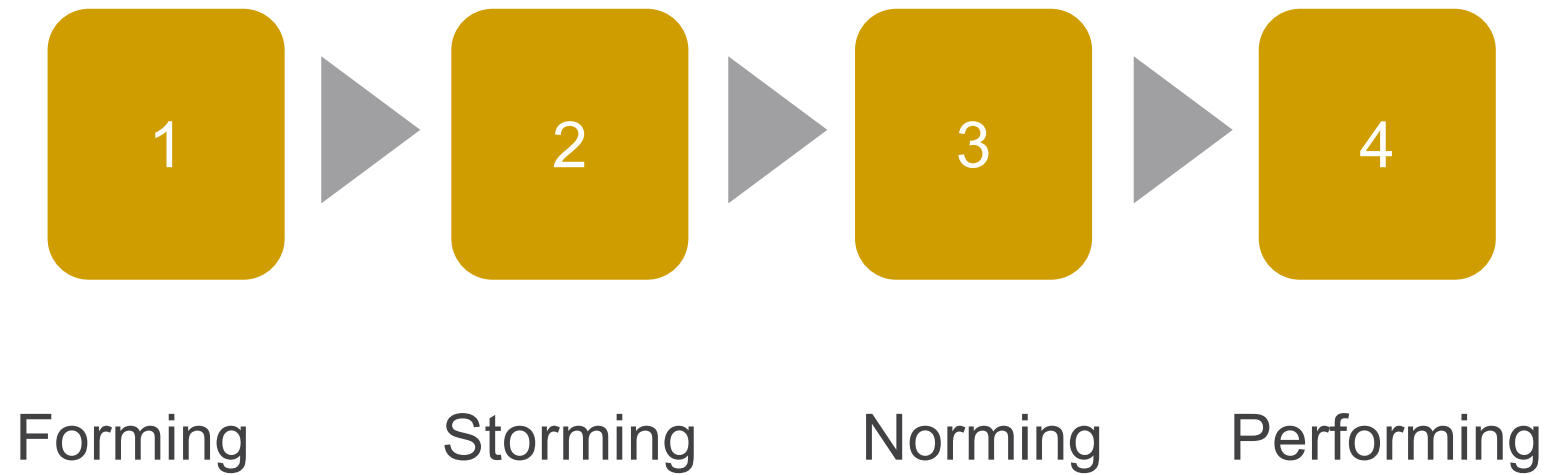
- May improve team dynamics

Resources for Developing in the Team Dynamics Professional Competency



- Understanding High-Performing Teams
 - Evolution of Team Dynamics
 - DISC Assessment
 - SPLIT Framework
- Team dynamics relates to communication, technical leadership, facilitation and EI competencies

Four Stages in the Evolution of Team Dynamics





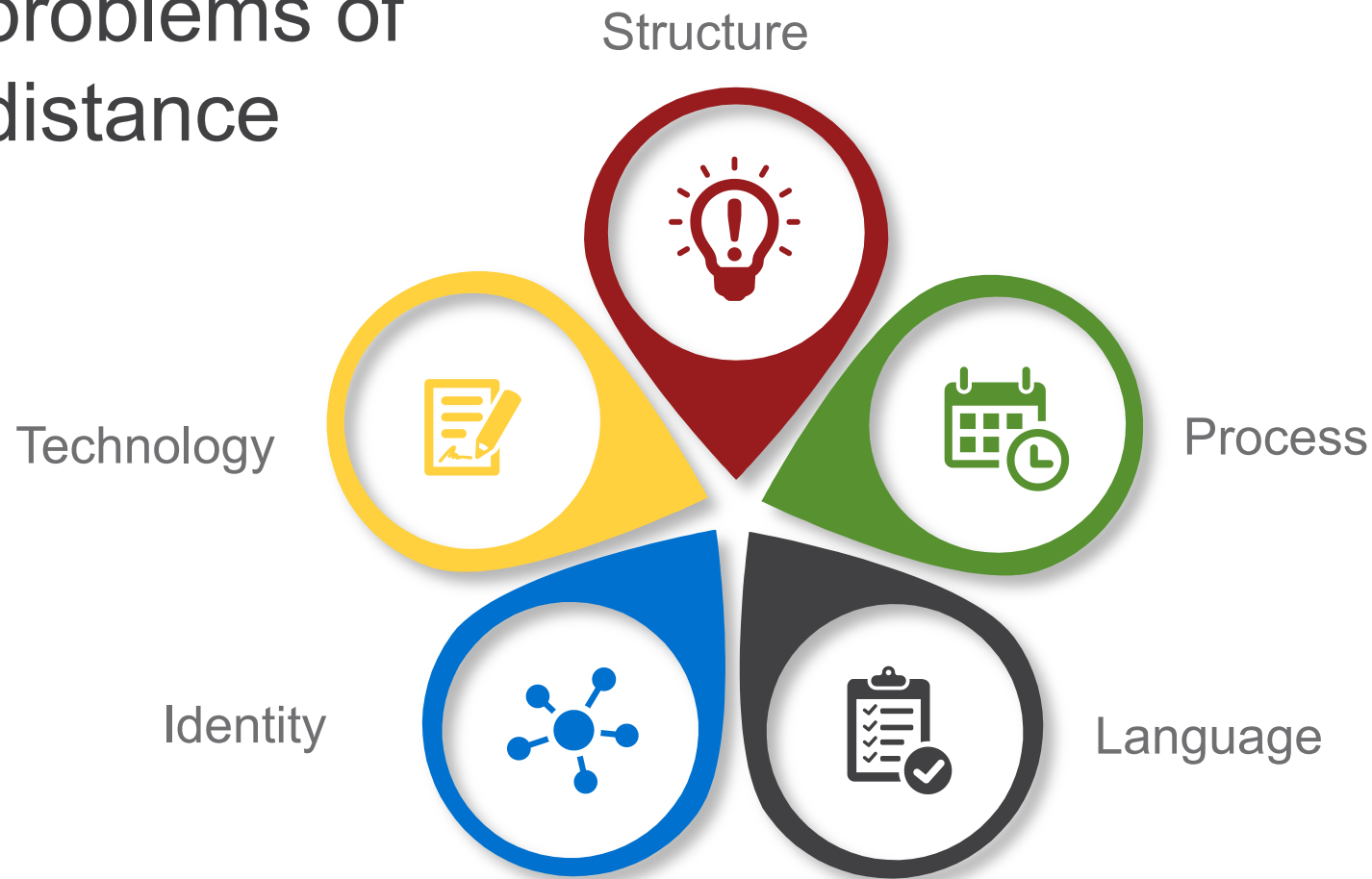
DISC Assessment

- Ranks individuals in four areas of behavior
 - Dominance, Influence, Steadiness, Conscientiousness
- Allows individuals to better understand their own and others' strengths and weaknesses
- Facilitates conflict management and team cohesiveness



SPLIT Framework

Addresses problems of
high social distance



Resources for Developing in the Facilitation Professional Competency



- Facilitative Leadership and Enablement
 - Zavvy's Eight Tips
 - SHRM on moving teams through evolutionary phases
- Related to the technical leadership, team dynamics, and EI competencies



Facilitative Leadership and Enablement

| Zavvy (2022) | SHRM (2022) |
|--|--|
| Set SMART goals & communicate benefits | Keep purpose & goals relevant & communicate how roles contribute |
| Understand available resources, how individuals use them, & identify gaps | Ensure individuals have the right skills & maintain & enhance them |
| Enable an open, collaborative work environment; invite open discussion & collaboration | Build commitment |
| Optimize workflows & processes | Manage external relationships to remove roadblocks |
| Tailor learning & development programs | Provide development opportunities |
| Empower team autonomy | Work alongside team members |
| Have teams build a knowledge base | |

Resources for Developing in the Emotional Intelligence Professional Competency



- Harvard Professional Development's (HPD's) improvement suggestions
- Ni's six "abilities"



Ways to Improve EI

- HPD's (2019) suggestions
 - Recognize emotions and name them
 - Ask for 360° feedback
 - Read stories with complex characters



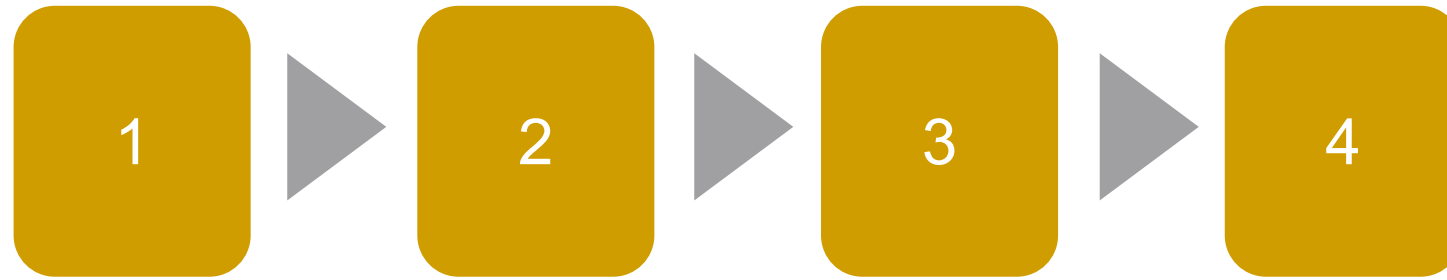
More Ways to Improve EI

- Ni's (2014) “abilities”
 - Reduce negative emotions
 - Stay calm and manage stress
 - Be assertive and expressive, and set boundaries
 - Stay proactive
 - Bounce back
 - Express intimate emotions

Resources for Developing in the Coaching and Mentoring Professional Competency



- The GROW Model (Goal, Current Reality, Options, Will)



Establish a
SMART goal

Look at
Current
Reality

Brainstorm
options

Help
establish
the “will”

- Most important skills are the ability to ask good questions and to use active listening skills



Observations

- Critical self-assessment is key to targeting development activities
- Need to understand interrelationships among competencies
- Development alone is not enough – Practice, practice, practice!



Conclusions

- Improving competence in the Professional Competencies should improve SE effectiveness and overall project performance
 - Helps develop common understanding and build relationships
 - Ensures that trust is maintained and professional standards are met
 - Helps teams meet high levels of technical excellence
 - Enables gaining agreement among diverse groups of stakeholders
 - Improves overall team performance
 - Makes it easier for team members to achieve agreed upon goals
 - Allows for success in interacting with colleagues and stakeholders and in managing conflicts and stress
 - Provides for targeted development and guidance
- And should also result in more well-rounded, resilient systems engineers



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www.incose.org/symp2022