32nd Annual **INCOSE**
international symposium

hybrid event

Detroit, MI, USA
June 25 - 30, 2022

Developing Competence in the Systems Engineering Professional Competencies

www.incose.org/symp2022

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**

INCOSE SE Competency Framework Elements

- Title and description

- Why it's important

- KSAs needed at each of five levels of competence

The Need for Professional Skills

- Key to success
- Must be able to:
  - Identify key stakeholders
  - Understand and negotiate the problem spaces
  - Coach others on technical processes
  - Manage team dynamics
  - Be empathetic and able to communicate with all types of stakeholders

Developing in the Professional Competencies

- Self-assessment of proficiency is important
  - If the absence of a competency or the need for improvement is recognized, one is more likely to seek development
  - Helps in deciding how deeply to pursue development resources
- Caution that individuals may over- or under-state their competence

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
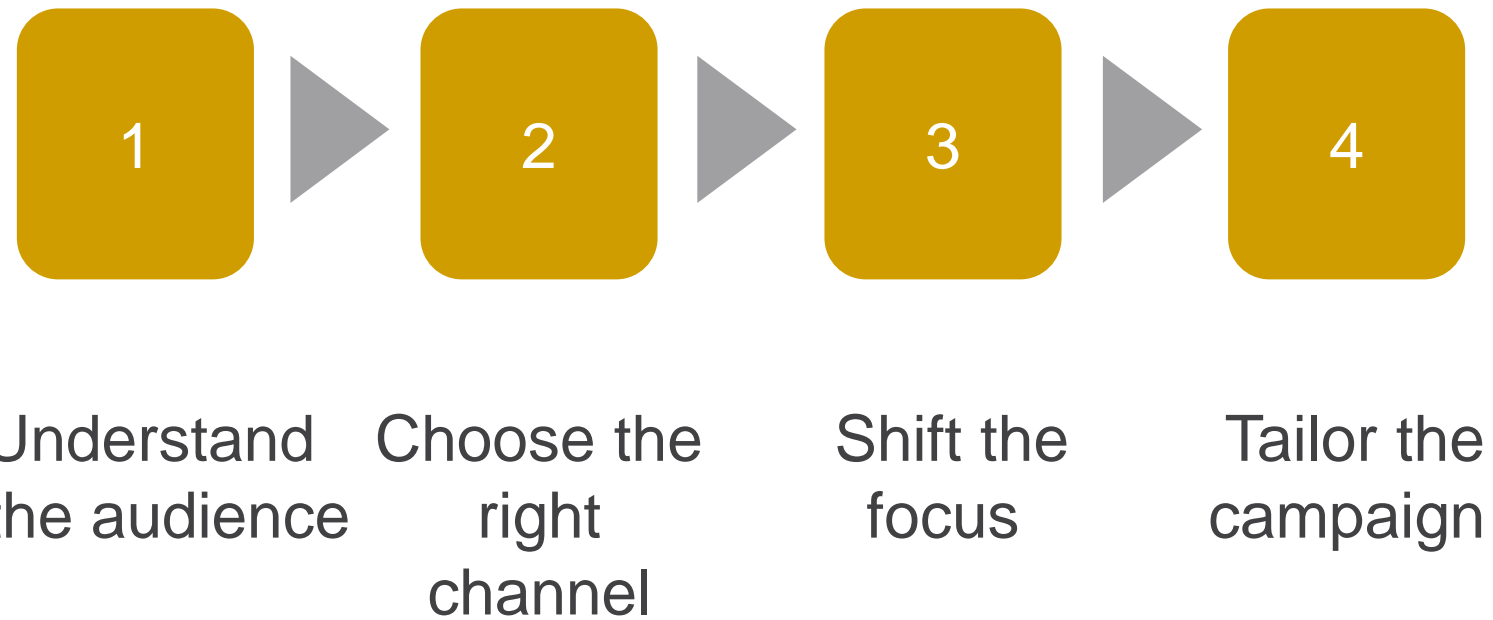
The Precision Model of Communication

- Contains specific behaviors and guidelines to improve requirements definition

  - Challenging universals and generalizations
  - Clarifying nouns and verbs
  - Challenging deletions

Multichannel Communications

Four step process

1	2	3	4
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
- Benefits
  - Structured approach
  - Results in several possible solutions
  - Collaborative in nature

Osborn Parnes Creative Problem Solving Process

Four step process

1	2	3	4
Clarify	Ideate	Develop	Implement
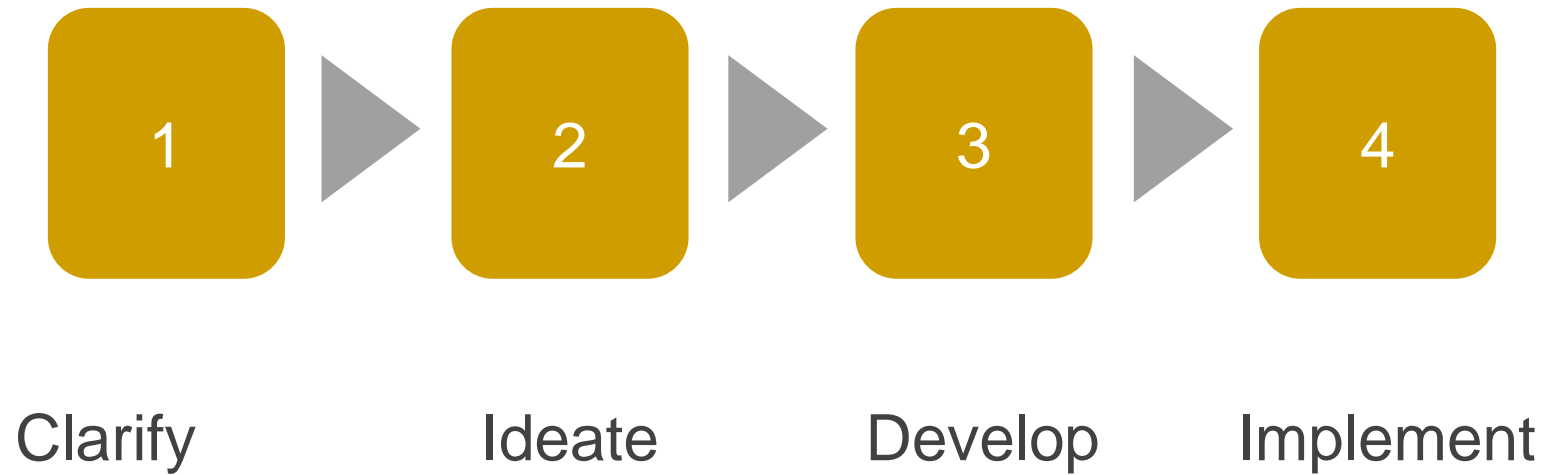
Design Thinking

Five phases

Empathize – gather and organize data

Define – identify the issues

Ideate – brainstorm, discuss, sort multiple solutions

Prototype to determine feasibility and proof-of-concept

Test – find the faults and improve

# 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

Resources for Developing in the Negotiation Professional Competency

- ## WinWin Negotiation Model
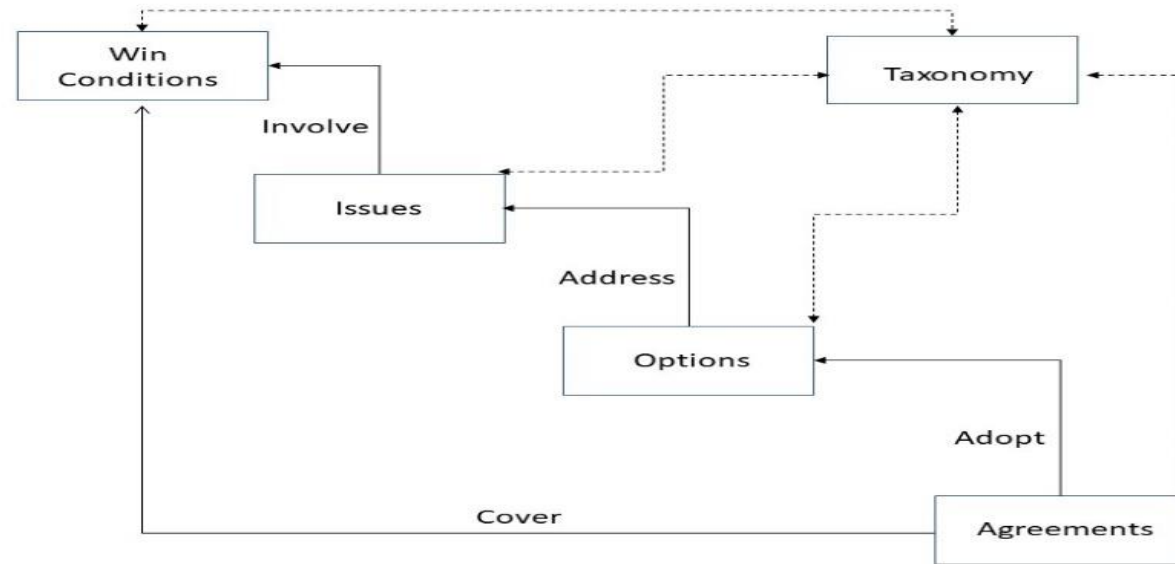
WinWin Artifact Relationships and Taxonomy
(Boehm and Egyed 1998)

- ## 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
- Leaders need to attend to evolutionary stages and SPLIT elements to maximize team performance
- Improving team dynamics improves communication and EI competencies
- Also related to technical leadership and facilitation competencies

Four Stages in the Evolution of Team Dynamics

1	2	3	4
Forming	Storming	Norming	Performing
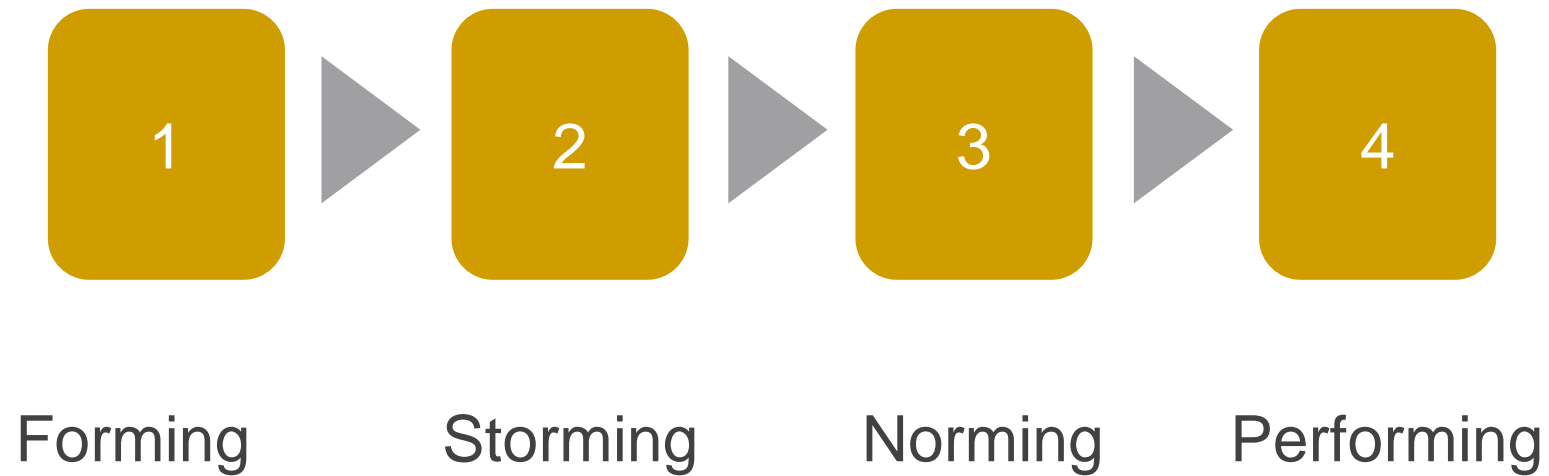
DISC Assessment

- Useful during the forming stage
- 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

Structure

Process

Language

Identity

Technology

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

- ## EI Assessment
  - DISC

- ## Ways to improve
  - Harvard Professional Development's (HPD's) improvement suggestions
  - Ni's six "abilities" and how to improve them

Ways to Improve EI

- HPD's (2019) suggestions
  - Recognize emotions and name them
  - Ask for 360◦ feedback
  - Read stories with complex characters
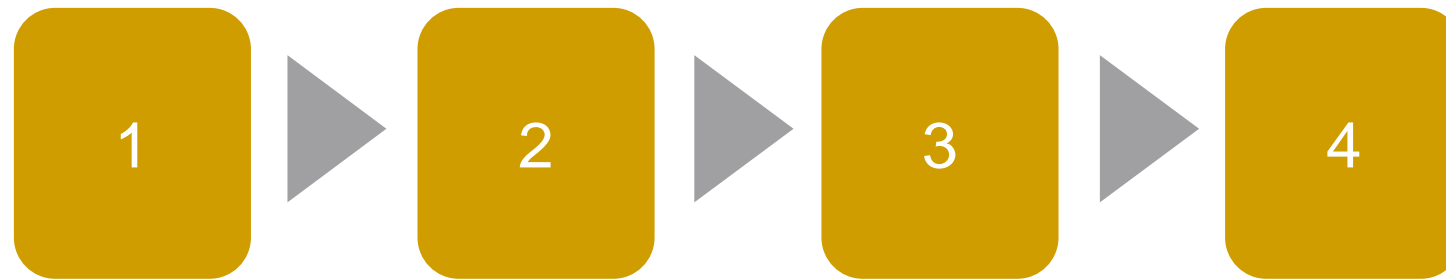
More Ways to Improve EI

- Ni's (2014) "abilities" and how to improve them
  - 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)

1	2	3	4
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

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

Observations

- Critical self-assessment is key to targeting development activities

- Need to understand interrelationships among competencies

- Development alone is not enough – Practice, practice, practice!

Next Steps

- Systems Dynamics model exploring interrelationships among the Professional Competencies and between them and other competency areas

- Context is important – will employ a use case scenario in modeling

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