



On Developing a Relevant Systems Engineering Value Proposition/Description

INCOSE Enchantment Chapter Presentation
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Agenda

1. Background
2. Process to develop a relevant systems engineering value proposition/description
3. Future work



Background

- The INCOSE Embedding Systems Engineering into Organizations (ESEIO) Working Group identified a number of roles and organizational contexts that are candidates for receiving a description of SE
- The INCOSE SE in Early-Stage R&D (ESRD) working group has developed a draft framework to guide SE practices and deliverables using a risk-informed graded approach; a value proposition for stakeholders/roles is one of the key facets of the framework
- No single description of SE will fit all roles or even a specific role in different organizational context
- Therefore, a process to determine the appropriate SE description/value proposition for a role in a given context will be described
 - Leverage the work to benefit these 2 working groups

Background

Embedding SE into Organizations (ESEIO) WG



INCOSE

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Embedding Systems Engineering Into Organizations Working Group

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856 members, initiated in 2023

Activities and technical product architecture:

1. Define the problem
2. Organization survey
3. Literature survey
4. Initial outputs – solutions to problems
5. Modeling

Mission

The mission of the working group is to produce guidance for members of INCOSE on how to embed Systems Engineering into an organization.

The Working group will look at organizations and produce guidance to help ensure that Systems Engineering is done appropriately, in terms of roles, processes, tools, knowledge and interfaces with other disciplines in order that the value from a systems approach can be achieved. Will need to recognize that given the diverse range of domains, solutions produced and organization types (and the wide potential applications of Systems Engineering) there cannot be any single recommended organizational solution.

Leaders

Chair

Richard Beasley

Co-Chair

Sarah Sheard

Background

SE in Early-Stage R&D (ESRD) Working Group



Why:

Promote SE value in ESRD resulting in decreased risk of transition to development and productization

Avoid “Valley of Death” and improve research and early development ROI

How:

Focus on Technology Readiness Levels 1-5

Provide ESRD framework with guidelines, processes (“right” + “right-sized”)

applicable to gov’t, industry, academia
Papers, articles, briefings, tutorials

Case studies

What:

To provide an open forum for development, application, and usage of SE principles, best practices – provide guidelines and framework(s) to applying SE in ESRD

Who:

Chair – A. Hodges

Co-chairs - Dr. M. DiMario, E. Danis

851 members

Background

SE in Early-Stage R&D



WG formation

2020

2021

2022

2023

2024

2025

- IW20: Determine WG interest
- 4/20: Officially recognized
- IS20: (Hahn 2020)
- Core team formed

- IW21: WG meetings
- INSIGHT: (DiMario 2021) article
- 5/21: LA Chapter presentation
- IS21: (Hodges 2021)
- General WG meetings

- Evaluate WG input
- Model problems, solutions
- Identify focus areas
- 6/22: LA Chapter presentation

- Draft framework developed
- INSIGHT 9/23 issue, co-chairs are theme editors
- INSIGHT 9/23 papers: (DiMario 2023), (Hodges 2023), (Sly 2023), (Ruth 2023), (Williams 2023), (Granados 2023), (Ritter 2023)
- WSRC 2023 briefing on (Hodges 2023)

- IW24: Sought collaborative partnerships with other WGs, FuSE integration, CAB case study possibilities
- INCOSE leadership briefing
- Determine technical work products
- Tutorials: IS24, WSRC 2024
- Chapter presentations: Enchantment, LA, Philadelphia)
- Monthly Intl collaboration mtgs

- Submit INCOSE plan for technical product
- Develop framework technical product
- WG member feedback on technical roadmap facet
- Collaborate with ESEIO working group on SE description / value proposition framework facet
- Periodic Intl collaboration mtgs

Background

SE in ESRD Framework elements



**Value
Proposition**

Principles

**Standards
Based**

**Risk-Informed
Graded
Approach**

MBSE

**TRL Context
Sensitive**

**Research
Domain Types**

Training

**Measures and
Metrics**

Improvement



Background

INCOSE Technical Product Library

Online Store

Categories

Search product catalog

0.00 USD [Checkout](#)

Sort by Alphabetical (A-Z)

- All
- Codes
- Hard Copy
- Member & CAB Associates
- Member Only!
- Soft Copy**
- Technical Products
- Webinar Products

A Complexity Primer for Systems Engineers (Soft Copy)

Member Price: 0.00 USD
Non-Member Price: 0.00 USD

Automotive Vision 2025 (Soft Copy)

Member Price: 0.00 USD
Non-Member Price: 0.00 USD

Digital Engineering Measurement Framework (Soft Copy)

Member Price: 0.00 USD
Non-Member Price: 0.00 USD

Digital Systems Engineering Process Model

Member Price: 0.00 USD
Non-Member Price: 0.00 USD

Guidance to ISO/IEC/IEEE 42020 — Architecture Processes (Soft Copy)

Member Price: 0.00 USD
Non-Member Price: 20.00 USD

Guide for the Application of Systems Engineering in Large Infrastructure Projects (Soft Copy)

Member Price: 0.00 USD
Non-Member Price: 0.00 USD

Background



Extracted from slide 2 [Find your own definition adventure \(to describe SE\).pptx](#)
from an INCOSE IS2025 ESEIO working session

- C-Suite
- Project or program manager
- Product or technical manager
- Capability manager
- Engineer / developer (not SE)
- Systems engineer (different roles)
- Designer
- Analyst
- Attorney
- Politician
- Marketer/strategist
- Finance
- Verification Engineer
- Test Engineer
- Service / product support / logistics
- Other SE specialist (or domain specialist– e.g. member of other Engineering org –WFEO)
- HR
- Educators
- Scientists / Researchers
- Manufacturing Engineers
- Software
- Regulators
- Architects



Background

ESEIO – Organizational Context

- Size of company
- Experience with applying SE
- Organizational structure
- Culture
- Available resources and capabilities

Process

Developing an SE Description/Value Proposition Considerations



- Process developed by an ESEIO subteam (technical product #4): Ann Hodges, Jeff Loren, Ivan Rodrigues
- Perspective of the systems engineer in an SE advocate role applying the process
- No all-inclusive answers, evolution of the process is expected
 - Give the SE practitioner the right questions instead of focusing on the right answers
 - Reframe the terms in the stakeholder’s language, not redefining SE
- Base systems engineering definition on the issues and needs of the stakeholders
- Understand the SE value proposition(s), tailor practices and deliverables to meet intent
- Provide guidelines for how to deal with varying levels of SE maturity
- Identify likely pitfalls (“There be dragons here”), and approaches for addressing the pitfalls
- Examples will include services provider, Federally Funded R&D Center (FFRDC), government leadership, as well as “heavy metal” organizations (i.e., organizations that produce a tangible hardware or software product)

Process

Goal

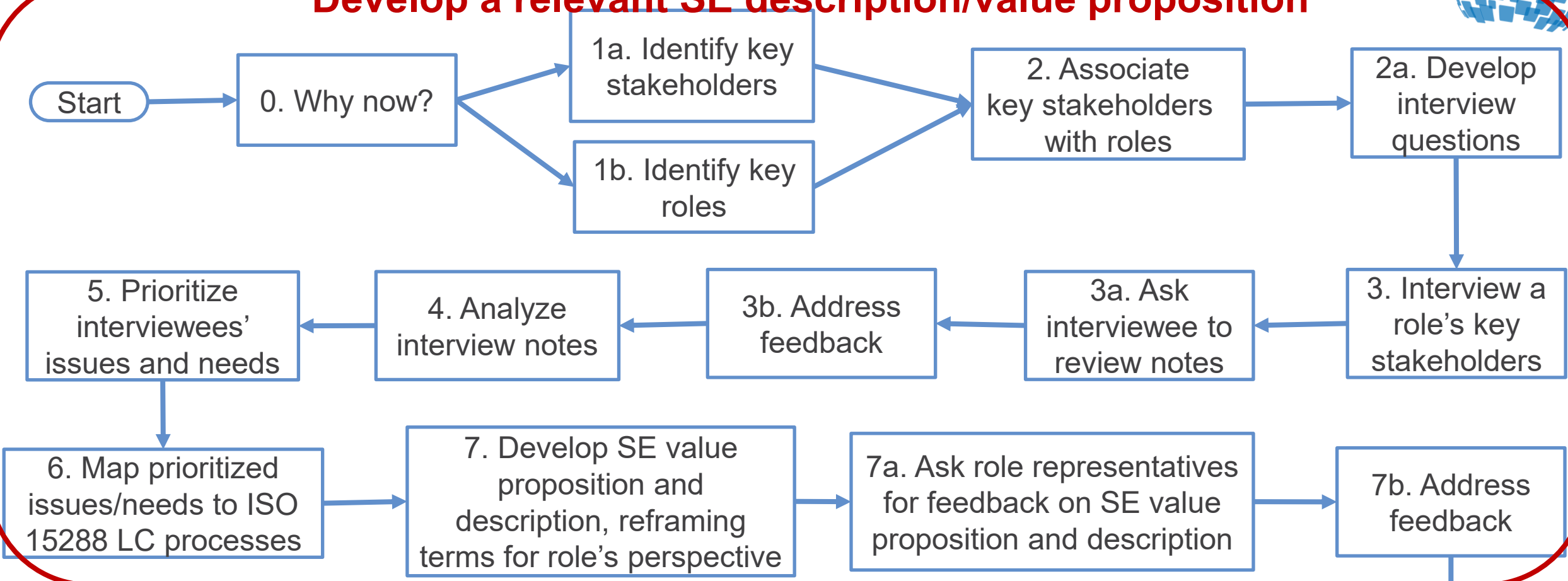


- Base description on the role's needs and issues
 - Establish a “pull” for SE rather than a “push” that may not address concerns
- Lead by following
 - **Establish ownership and engagement** on the part of the recipients
 - Acknowledge the activities and deliverables that are already doing are SE-focused
 - Given the plethora of ISO 15288 process areas, not all process areas are of equal importance at any given stage in the project and product life cycles
 - Provides flexibility for identifying and addressing more pressing needs
- Match the SE capabilities with the stated needs
 - “Pull”
 - Starts embedding SE in the organization

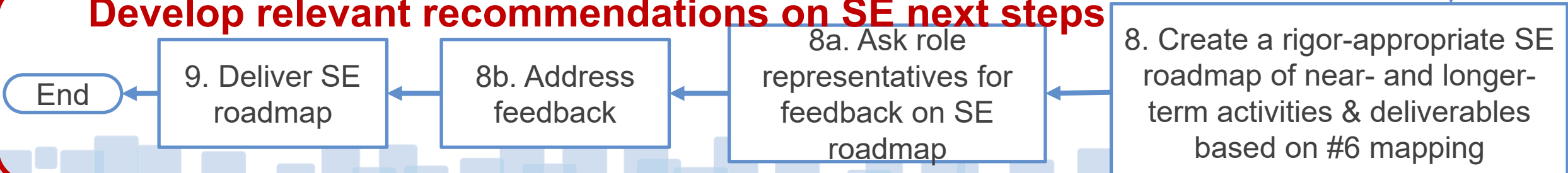
Process



Develop a relevant SE description/value proposition



Develop relevant recommendations on SE next steps





Process

0. Why now?

- Get clarity on why you, as an SE advocate, are seeking this conversation
- Examples of opportunities for applying the process:
 - New activity in an organization/project not familiar with SE
 - Improvement activity (assigned or developing a recommendation)
 - Cultivate SE champions



Process

2a. Develop interview questions

- General points to consider ("CORE" questions with respect to the "target" role):
 - Description of background ("C")
 - Summary of issues/opportunities ("O")
 - Summary of results ("R")
 - SE description, roadmap - expectations of ideal outcome ("E") (output of steps 7 and 8)

Process

{3,7,8}+{a,b}. Ask for and address interviewee feedback



- Establishing a partnership
 - Respect
 - Trust
 - Ownership: you're developing "with" them, participative – the output becomes *theirs*



Process

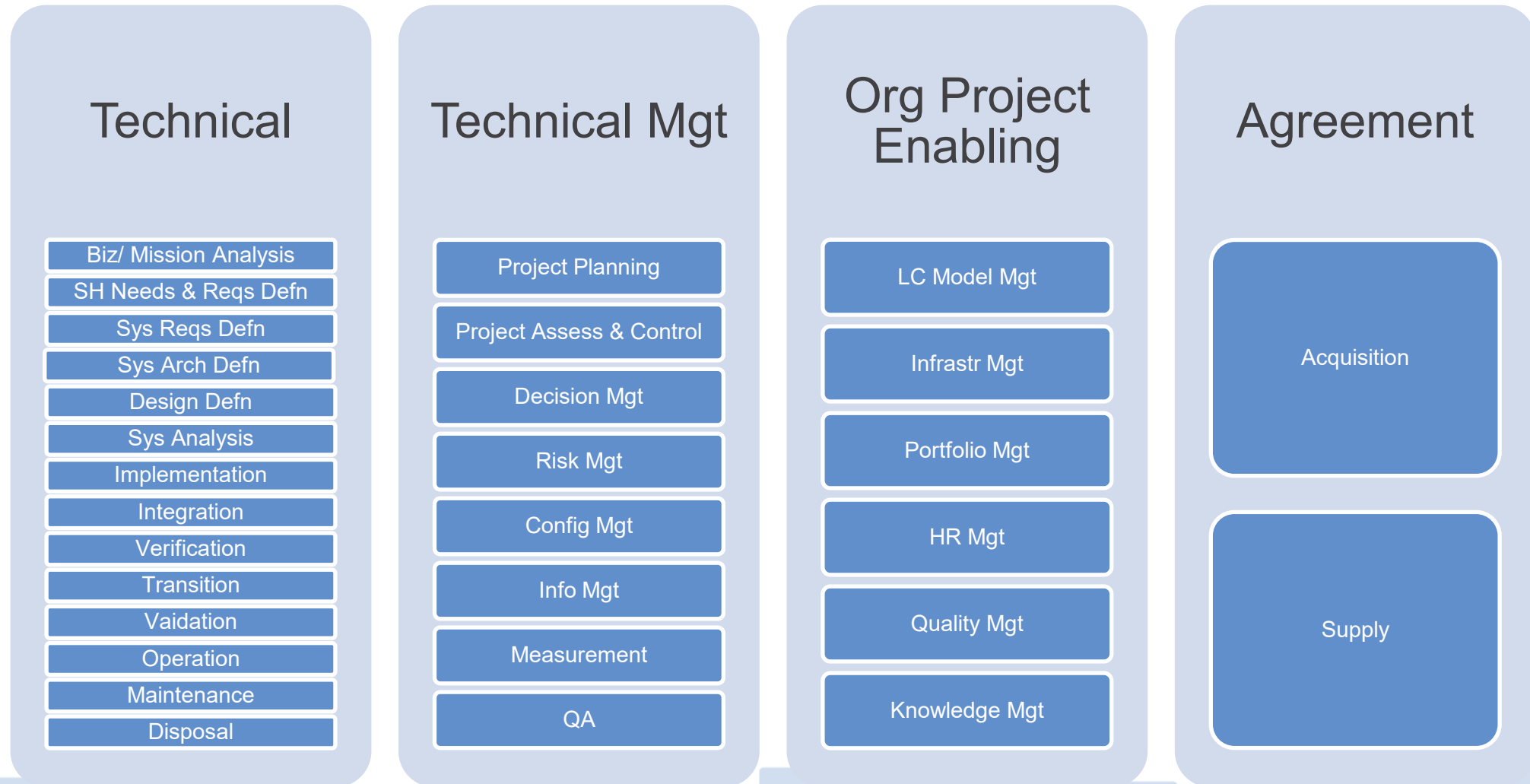
5. Prioritize interviewees' issues and needs

- Typically the importance of the issues and needs is evident from the discussion
 - If not, ask!
 - Show stopper, important, “nice to have”

Process



6. Map prioritized issues/needs to ISO 15288 life cycle processes*



*Adapted from (ISO 15288, 2023)

Process



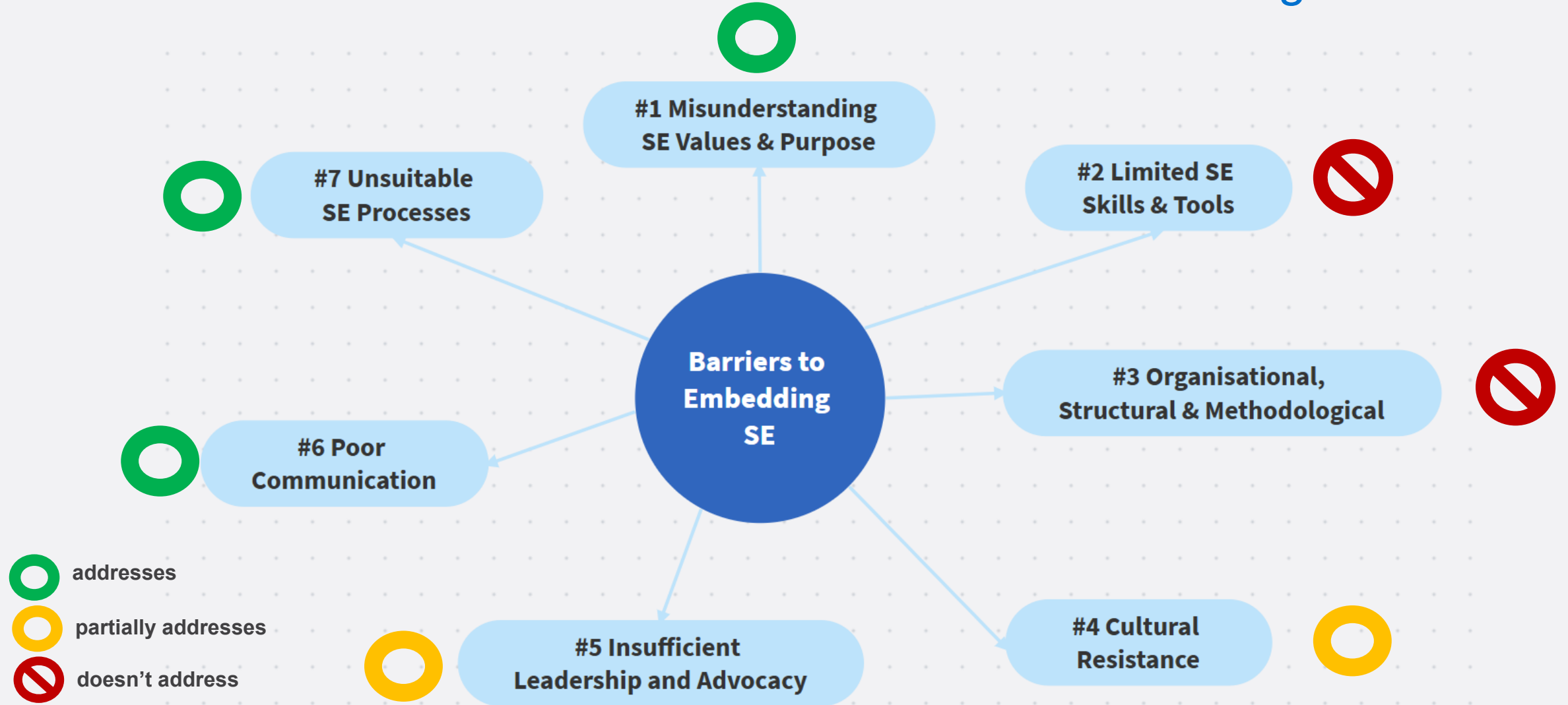
8. Create a rigor-appropriate SE roadmap of near- and longer-term activities & deliverables based on #6 mapping

- Application of rigor to practices and deliverables should be informed by the risk of the activity
 - Rigor is a function of timing, scope and formality
- Graded approach adapted from (Hodges 2013) to determine relevant rigor includes consideration of intrinsic characteristics of both the research and the project, including:
 - Urgency of research deliverable(s)
 - Research objectives/requirements stability
 - Reliance on maturity level of underlying technology and/or manufacturing
 - Complexity of the technical, organizational, or procurements to support the research
 - Presence and availability of infrastructure (experimental, laboratory, test facilities)
 - Stakeholder expectations
- For example, research projects' appropriate rigor is generally low based on risk (consequence of failure \times likelihood of failure); higher consequence of failure (e.g., “grand challenge” or “moon shot” projects) will result in higher rigor recommendation



Process

How Does this Process Address Barriers to Embedding SE?*



*E. Jamieson, N. Rocha, R. Beasley, "Understanding the Barriers to Embedding Systems Engineering", [white paper](#), ESEIO Working Group, 11/10/2025. ESEIO technical product area "1. Define the problem"



Process

The technical product will include:

- Each step is described, provides additional guidance
- Examples of applying the process

Outcome:

- A needs-based description, value proposition and draft roadmap
 - Establishes initial path to embedding SE in the organization

The stakeholders are engaged in developing the description, and it addresses their concerns – it's *meaningful*



Future work

- Review the process by role-play
 - Seeking participants from a variety of domains and organizations to provide their perspectives, knowledge and experience
 - Seeking participants that include, but are not limited to, service, scientific/research, IT, AI, civil infrastructure organizations/domains as well as "heavy metal" product development (e.g., systems including hardware, software, firmware)
 - Include examples in the published technical product
 - **Contact Ann Hodges** (ann.hodges@incose.net) **to get involved!**
- Publish the process as an INCOSE Technical Product
 - Integrate with SE in ESRD and ESEIO working groups' technical product development

Questions



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