International Council on Systems Engineering
A better world through a systems approach

How INCOSE is Advancing the Practice of Systems Engineering

Tami Katz, ESEP, INCOSE Technical Director

Welcome!!

- Welcome to the Technical Operations track at IS2025.

- Today we will share how we create all the helpful systems engineering material from INCOSE.

- This presentation provides an overview of the efforts, then several of our leaders will come up and share the exciting work being done by our volunteers.

Introducing INCOSE Technical Operations (Tech Ops)

- Technical Operations is the organization that provides leadership, infrastructure, process support, and authorization for technical product publication.

- This is the "home" of the INCOSE Working Groups

- This is also the team that coordinates the product development process and oversees technical review.
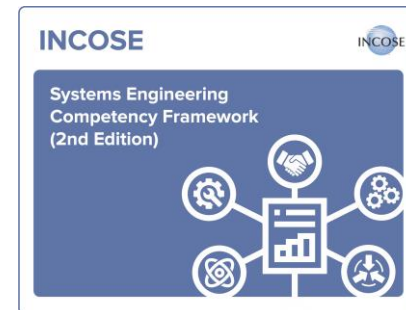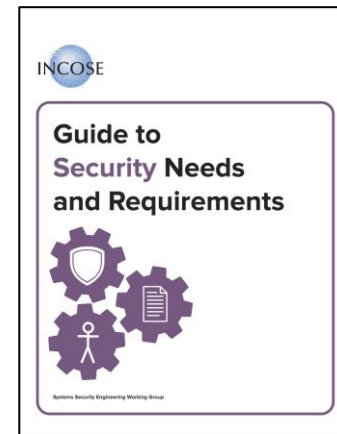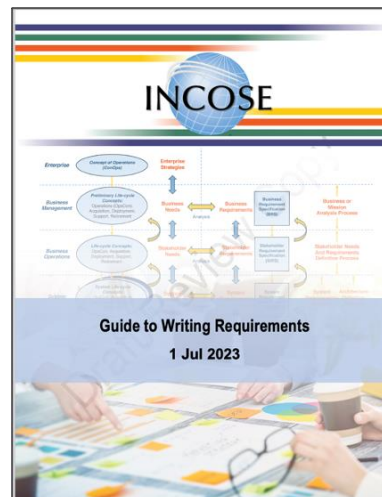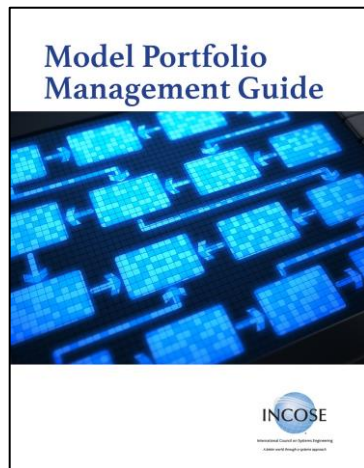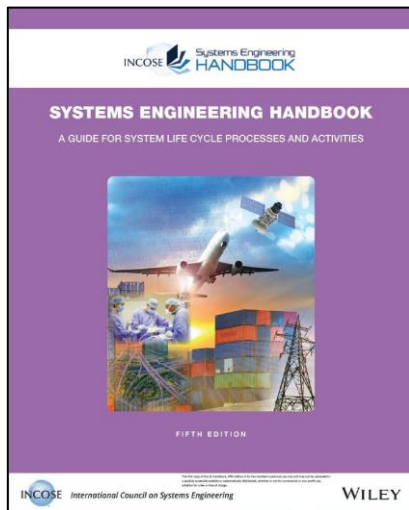
Technical Operations

Technical Operations are the Leaders behind the Working Groups.

MEET THEM HERE

INCOSE Technical Publications

49 products are in the INCOSE store, most are free for INCOSE members!

INCOSE Systems Engineering Products

- Have you ever browsed the INCOSE Store and observed there are dozens of systems engineering technical products available?

- Hundreds of INCOSE members are actively at work, volunteering their time to research, collaborate, and generate content to support and advance the practice of systems engineering across the globe.

- INCOSE has developed an infrastructure that enables its members to bring their knowledge and research into technical products that are published and made available for others.
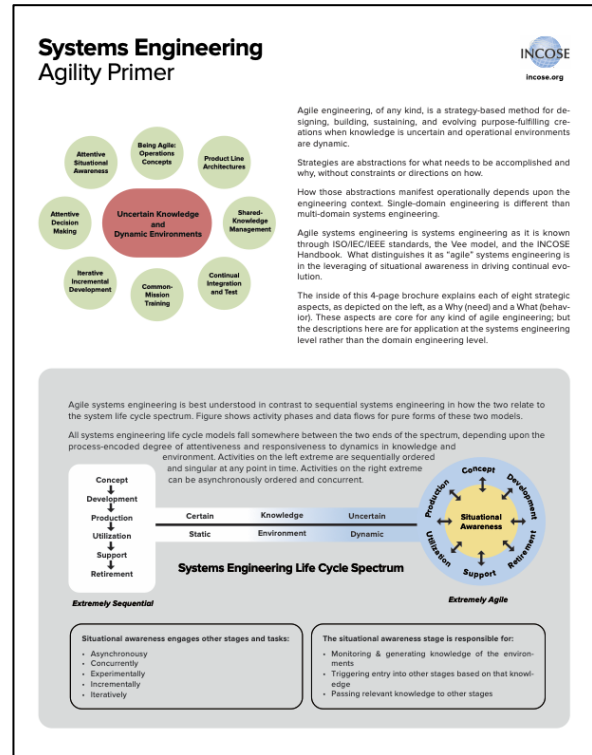
Who Generates this Content?

Working Groups & Initiatives

Technical Operations' Working Groups & Initiatives create the resources that both scholars & practitioners need to succeed.

LEARN MORE ABOUT OUR WORKING GROUPS

- The INCOSE systems engineering content is generated by volunteers.

- Most are practicing systems engineers who participate in the INCOSE Working Groups, while others are from Chapters or chartered project teams.

INCOSE Working Groups

- INCOSE Working Groups are chartered groups of INCOSE members which collaborate on addressing a specific systems engineering focus area.

- WGs often produce products which advance the state, art and practice of systems engineering

- WG membership is open to INCOSE members

- INCOSE has 52 working groups working on various projects and activities

Agile Systems and Systems Engineering
Transformational
Rick Dove, Chair
Robin J. Yeman, Co-Chair
Ron H. Lyells, Co-Chair

LEARN MORE

Architecture
Process Enablers
Anand Kumar, Co-Chair
Jean-Luc GARNIER, Co-Chair
Richard A. Martin, Co-Chair
Rolf Siegers, Co-Chair

LEARN MORE

Artificial Intelligence Systems
Transformational
Ali K. Raz, Chair
Ramakrishnan "Ramki" Raman, Co-Chair

LEARN MORE

www.incose.org

https://www.incose.org/communities/working-groups-initiatives

INCOSE Working Groups

- **Analytic Enablers**
  - Competency
  - Complex Systems
  - Decision Analysis
  - Human Systems Integration
  - Natural Systems
  - Product Line Engineering
  - Resilient Systems
  - System Safety
  - System Security
  - Systems of Systems
- **Process Enablers**
  - Architecture
  - Configuration Management
  - Integration, Verification and Validation
  - Measurement
  - PM-SE Integration
  - Requirements
  - Risk Management
  - SE Quality Management

- **Application Domains**
  - Automotive
  - Critical Infrastructure Protection and Recovery
  - Defense Systems
  - Healthcare
  - Information Communications Technology
  - Infrastructure
  - Materials in System Engineering
  - Power and Energy Systems
  - SE in Early-Stage Research and Development
  - Smart Cities Initiative
  - Space Systems
  - SE and Lawmaking
  - SE for Industrial Systems
  - Transportation
- **Transformation Enablers**
  - Agile Systems and SE
  - AI Systems

- DE Information Exchange
- Embedding SE into Organizations
- Enterprise SE
- Integrative Ventures
- Knowledge Systems
- MBSE Initiative
- MBSE Patterns
- NAFEMS-INCOSE System Modeling and Simulation
- Object-Oriented SE Methods
- Small Business SE
- Social Systems
- Sustainability
- System Adaptability
- Systems Science
- Systems-Software Interface
- Tools Integration and Model Lifecycle Management
- WFEO-INCOSE Empowering Engineering Disciplines through SE

- **Professional Communities**
  - Empowering Women Leaders in Engineering
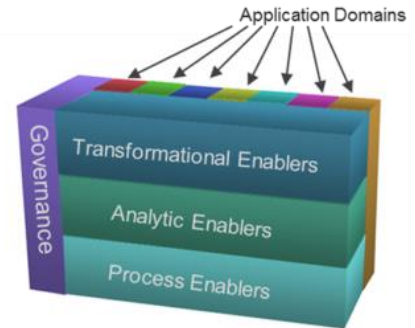
Typical Working Group Activities

Develop content

SEBoK

Primers, Guides

INSIGHT Articles

Symposium Papers

Models

Webinars

Engage members from various SE backgrounds

Engage with other Working Groups

Regular meetings

Promote Collaboration

Support INCOSE Initiatives

Workshops
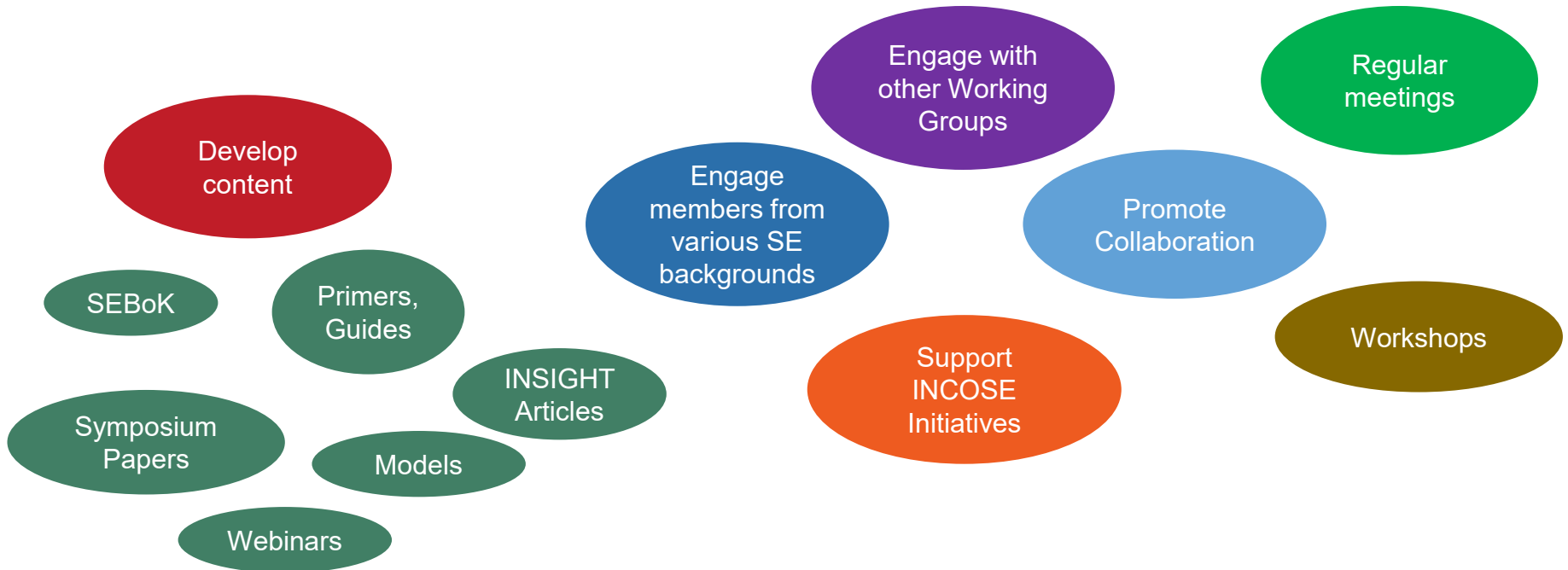
Working Group Activities Advance the Practice of Systems Engineering!

Future of Systems Engineering (FuSE)

FuSE Program Mission Statement.

FuSE refines and evolves the SE Vision 2035 across competencies, research, tools & environment, practices, and applications.

FuSE identifies critical gaps towards the vision realization and initiates & supports relevant actions

FuSE fosters involvement and collaboration within and outside of INCOSE.

FuSE educates, shares success, and expands.

- FuSE sponsors activities for realizing the SE Vision 2025

- The FuSE Assistant Director Bill Miller coordinates with Working Groups in various activities, including development of products which implement the Vision

Standards

Overview of the SC 7 Standards Collection
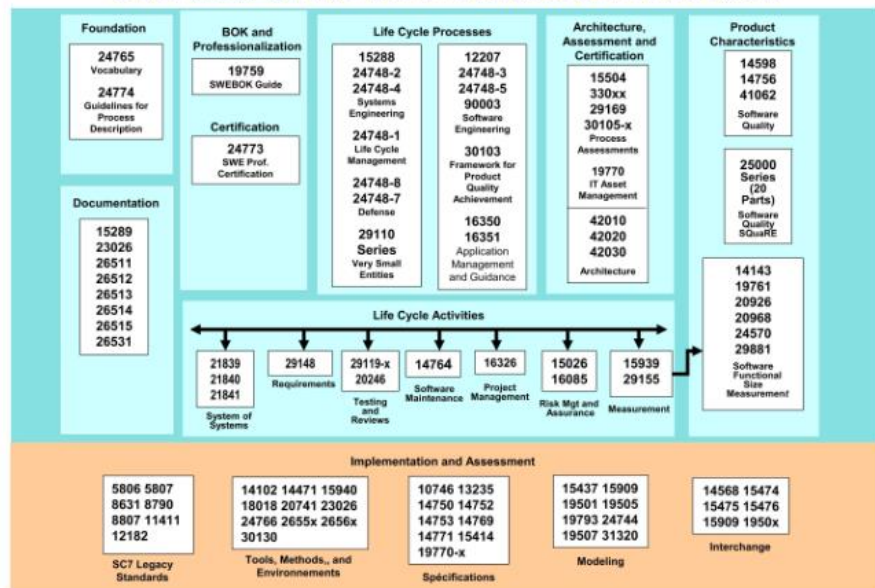
- Tech Ops standard development department oversees the INCOSE contribution to various Standard organizations, including ISO/IEC/IEEE standards.

- This team is currently evaluating INCOSE's future approach towards contribution and growing our capability "in-house" for Standard development and publication

Technical Product Development

- The outcome of the Working Group activities often includes developed technical products

- INCOSE has a process for product development and publication

- Includes generation of a Technical Product Plan (TPP) identifying the product and associated authors, reviewers, and resources needed.

https://www.incose.org/publications/products

Process Steps
Project Initiation
Pre-TPP Meeting
TPP Submission and Approval
Development Phase
Review Process
Formatting and Design
Final Approval
Publication and Distribution
Marketing and Promotion
Maintenance and Updates
Retirement
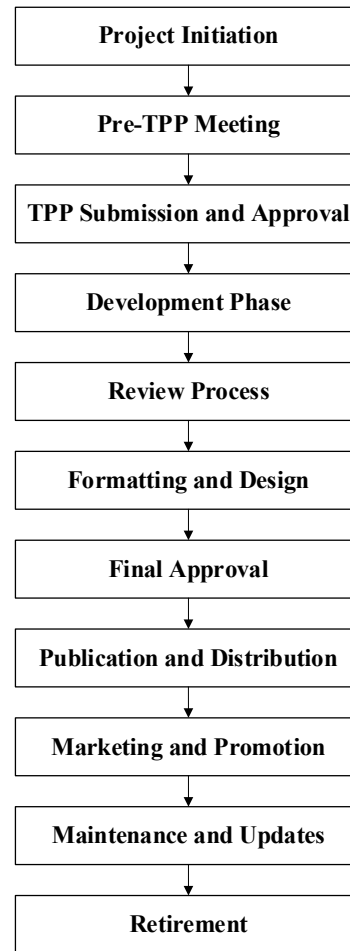
Lifecycle of a Technical Product

Significant Content Update

Product Initiation
- Submit Technical Product Plan (TPP)

Product Development
- Have regular meetings with team
- Create draft product
- Review & Revise within team
- Formally agree on IP
- Formally review for release/launch

Product Maintenance
- Market, Advertise & Distribute
- Configuration Management
- Minor corrections & format changes
- Reviews for retirement
- Archive & Retirement

TPP Approved

Product Launch

Product corrected

Product Retired and Archived

Technical Products In-Work

- Multiple products are currently in work by volunteers

- These include guides, primers, and even system models and frameworks

Challenges of Digital Engineering Information Exchange

As more organizations and disciplines move towards a holistic, integrated Digital Engineering (DE) approach, there is a growing need to share, cross-reference, integrate, reuse, and extend models of various kinds to digitally represent a total system model. Industries and governments have a long history of using a document-based engineering exchange approach; they must now convert to model-based digital artifacts and grapple with a currently disjointed use of those models. As such, industries now have the added challenge of exchanging engineering information in a new digital environment, while addressing issues like tool interoperability, model language and standards, obsolescence, workforce development, and organization cultural change. Overcoming these challenges require one to synthesize actionable knowledge from various sources of digital information and models as depicted in Figure 1.

Digital Artifacts

Ontological Traceability Supported by a Digital Engineering Ecosystem

- Finite Element Model (Abaqus)
- Digital System Model (Cameo)
- Requirements Model (DOORS)
- 3D Geometry Model (Creo)
- Electrical Model (NX)

Digital Viewpoint Model (DVM)

Digital Views

(3D Visualization, Dashboard, Web Portal, Diagram, etc.) Content and format driven by specific perspective and need of stakeholder
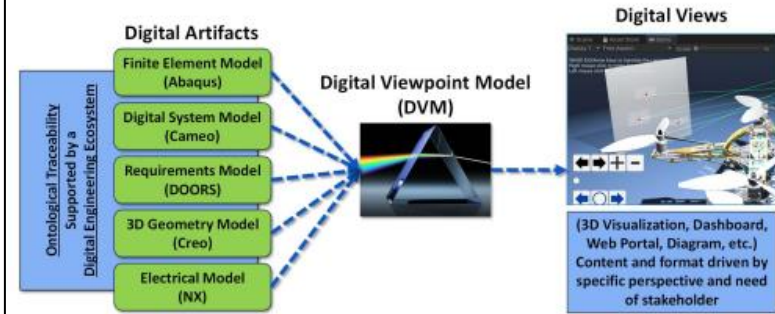
Figure 1: Transformation of Digital Information

Technical Products in Development

Title	Affiliation
A Primer on Artificial Intelligence and the Role of Systems Engineering	AI WG
Systems Engineering Quality Management Primer	SE for Quality Mgt WG
Future of Systems Engineering Roadmap	FuSE
Application Guide for Systems Engineering in the Infrastructure Domain	Infrastructure WG
Agile Systems Engineering Decision Guidance Method	Agile SE WG
Digital Engineering: Practical Considerations for Implementation across the System Lifecycle	DEIXWG
MBSE Cheat Sheet for Managers	NAFEMS WG
Needs and Requirements Management Fundamentals	Requirements WG
Systems Engineering Agility Guide	Agile SE WG
Systems Engineer's Security Primer	System Security WG
Guide to Model-based Needs & Requirements	Requirements WG
SEREA (Systems Engineering Reference Enterprise Architecture) for Systems Life Cycle Management	GfSE (German Chapter)
Guidelines for Applying a Digital Engineering Approach throughout the System Life Cycle	DEIXWG
SysML v2 for Product Line Engineering: How to start!	Product Line Engineering WG
SE in Early-Stage R&D Framework to Support Transition from Research to Engineering	SE in Early Stage R&D
Making the Improbable Possible, A Tradecraft Guide for Systems Engineers	Complex Systems WG
Digital Viewpoint Model (DVM) Framework	DEIXWG
Guide to Model-based Needs & Requirements - Model	Requirements WG
Summary of (potential) problems faced when Embedding Systems Engineering into an Organization	ESEIO
Systems Engineering for Industrial Systems	SE for Industrial Systems WG
Hospital Resilience under Black Sky - Continuity of Operations (Model)	CIPR WG
Letters to My Younger Self: How Systems Engineering Changed My Life	EWLSE

How to Become Involved

- As a member of an INCOSE Working Group you can

  - Bring value to other INCOSE stakeholders in your interest area

  - Build expertise and contacts

  - Help develop and review international standards

  - Share information across Working Groups

  - Create products to advance the state, art and practice of systems engineering

- Members can join a working group by visiting the member portal and selecting the link to *join a working group*; this puts you on a distribution list to receive working group correspondence.

- Learn more at www.incose.org!

INCOSE Technical Operations Track

We encourage you to enjoy the presentations in the Tech Ops track!

These talks are sponsored by various volunteers and working groups to share highlights of their activities, many of which will result in more INCOSE publications.

Wed 30 10:00 10:40 EDT
How INCOSE is Advancing the Practice of Systems Engineering
Presenter(s): Tami Katz
Session: 7.6.1 - Tech Ops Track

Wed 30 10:45 11:25 EDT
How are We Doing? FuSE Report Card on Realizing the Systems Engineering Vision 2035
Presenter(s): Bill Miller
Session: 7.6.2 - Tech Ops Track

Wed 30 11:30 12:10 EDT
AI for SE and SE for AI
Presenter(s): Ali Raz ; Tom McDermott
Session: 7.6.3 - Tech Ops Track

Wed 30 13:30 14:30 EDT
Shaping the Future with Complex and Adaptive Systems
Presenter(s): Mike Watson ; Andy Pickard ; Haifeng Zhu ; Rob Vingerhoeds
Session: 8.6.1 - Tech Ops Track

Wed 30 14:30 15:00 EDT
Conserving Energy as a Strategy for Dealing with Uncertainty and Dynamics in SE
Presenter(s): Rick Dove
Session: 8.6.2 - Tech Ops Track

Wed 30 15:30 15:55 EDT
Addressing Sustainability through a new INCOSE Working Group
Presenter(s): Alain Dauron
Session: 9.6.1 - Tech Ops Track

Wed 30 16:00 16:25 EDT
Rally the Troops! The Secret Energy Driving All Innovation Ecosystems
Presenter(s): Bill Schindel
Session: 9.6.2 - Tech Ops Track

Wed 30 16:30 16:55 EDT
Smarter Delivery of Infrastructure
Presenter(s): Dale Brown
Session: 9.6.3 - Tech Ops Track

Thank You!

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