Cleveland-Northern Ohio Chapter Meeting – July 8, 2024

Welcome to all members and guests!

Agenda - C-NO Café #4

- Welcome, Announcements, and Info   6:00 pm ET
  - Dennis Rohn, President, C-NO Chapter
- Design, Analysis, and Implementation   6:15 pm ET
  - Dennis Rohn
- Q & A   7:15 pm ET
- Adjourn   7:30 pm ET

Introductions

Upcoming C-NO Chapter Activities

- Chapter Meetings:
  - August 12, 12:00 PM (tentative) Virtual – Café #5
  - September 9, TBD – Café #6
  - October 24, TBD

- Next newsletter will be August, need input by July 31

- Elections for 2024 Officer should occur in October

2024 C-NO Chapter Officers

- President: Dennis Rohn

- Vice President: Amber Waid

- Secretary: Sam Ciccone

- Treasurer: Brian Hallett

- At-Large Director: Anna Sanford

- At-Large Director: Joel Knapp

Why Join INCOSE?

- INCOSE is the global Systems Engineering professional society – providing the **opportunity for life-long learnin**g in systems approaches.

- A community of peers, **resources** for your **career**, and a place to be a **leader.**

- INCOSE members stand out and are often sought after as **experts**. INCOSE members share practices and learn from each other.

- INCOSE members create **products**, produce **events** and represent the organization in international forums.

- INCOSE members increase the body of knowledge and **advance the practice** of systems engineering.

- **Network** with over 21,000 members in 75 countries.

- Increase your professional stature with the INCOSE Systems Engineering Professional **Certification.**

Mission and Vision

VISION: A better world through a systems approach.

MISSION: To address complex societal and technical challenges by enabling, promoting, and advancing Systems Engineering and systems approaches.

OBJECTIVE: Global leader for systems engineering professionals for career development.

FUTURE: Lead the future of systems engineering, academically, in emerging domains, and in practice.

Membership Benefits

A global network of colleagues who understand systems engineering

Collaborate with experts and practitioners **worldwide**

Certification Opportunities

Exclusive access to INCOSE Connect, the collaborative space for **INCOSE** Members Only

Access to quarterly e-Publications, *INSIGHT* and *Journal of Systems Engineering*

Member discounted registration to the International Workshop and International Symposium.

Electronic version of the Systems Engineering Handbook

65 Chapters Worldwide

Chapters play an essential role in the achievement of INCOSE's goals and objectives:

- Organizing a multitude of professional and social programs
- Attracting new members from industry, government and academia
- Supporting technical activities striving to advance the state and art of systems engineering
- Showcasing INCOSE as the international authoritative body on systems engineering that it is.
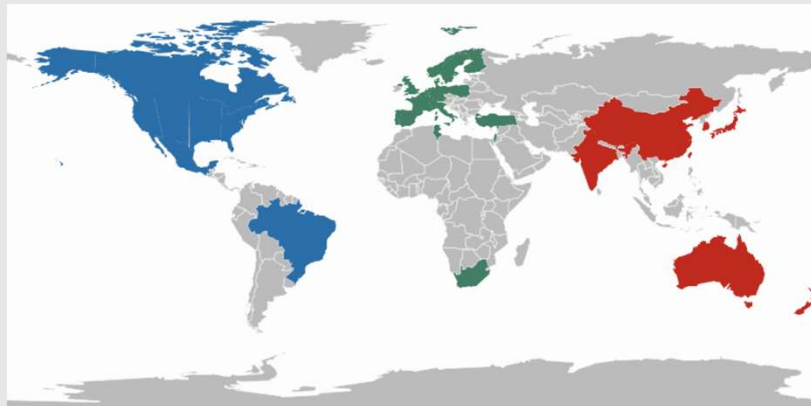
LEARN MORE
incose.org/chapters

Student Divisions

A Student Division is comprised of a group of undergraduate or graduate students who wish to become actively involved in INCOSE while enrolled in an accredited course of study at a college or university. Student Divisions are operated as a component of a nearby chartered INCOSE chapter.

In order for a Student Division to be created, it requires:
- A student body interested in becoming involved with systems engineering/INCOSE,
- A faculty member who is a member of INCOSE and willing to act as the Division mentor and liaison between INCOSE and the university, and,
- An active sponsorship and participation by a chartered INCOSE chapter.

There are currently 16 Student Divisions
listed on the INCOSE website

Student dues are $50/year

LEARN MORE
www.incose.org/communities/
student-divisions

Working Groups

INCOSE has over 50 active Working Groups. Some of the Working Groups are:

- Artificial Intelligence Systems
- Automotive
- Human Systems Integration

- MBSE Initiative
- Natural Systems
- PM-SE Integration

- Requirements
- Smart Cities
- Social Systems

Working groups are the resource practitioners need.

Discuss, collaborate, share in person, and online with a wide diversity of interests.

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

Help develop and review international standards

Bring value to other INCOSE stakeholders in your interest area

WGs run events, workshops, panels and much more

Systems Engineering vision 2035

This **Systems Engineering Vision was sponsored by INCOSE and produced by a team of leaders from the systems community, with inputs from across industry, academia, and government. The Systems Engineering Vision 2035 addresses:**

- The **Global Context for Systems** Engineering
- The **Current State of Systems Engineering**
- The **Future State of Systems Engineering**
- **Realizing the Vision**

We encourage you to work with INCOSE to help realize this vision.

The complete **Systems Engineering Vision 2035** is available as a website and PDF

LEARN MORE: incose.org/sevision

Initiatives

FuSE

FuSE refines and evolves the SE Vision 2035 across competencies, research, tools and environment, practices, and applications; identifies critical gaps towards the vision realization and initiates and supports relevant actions; fosters involvement and collaboration within and outside of INCOSE; and educates, shares success, and expands.

The Technical Leadership Institute (TLI) is a global network of INCOSE members committed to improving technical leadership skills to better address the complex sociotechnical challenges of the twenty-first century. TLI members come from a wide range of countries.

LEARN MORE:
incose.org/tli

SySTEAM aims to promote a more just, equitable, and transparent approach to education in general, and interdisciplinary systems thinking/systems engineering competencies in particular, aimed at reducing disparities in educational quality, access, and competency attainment.

LEARN MORE:
incose.org/systeam

EWLSE's mission is to create an open systems engineering environment welcoming to all; promote the demonstrated value of women as systems engineers and leaders; engage women in engineering and systems engineering at all levels of education around the world; and enable increased participation and retention of women in systems engineering leadership.

LEARN MORE:
incose.org/ewlse

Professional Certification

If you have just started practicing – or want to start practicing – systems engineering, then ASEP is for you. This certification is for people at the beginning of their career as a systems engineer. The ASEP has "book knowledge" but not yet significant experience as a systems engineer.

If you are a practicing Systems Engineer with more than five years of systems engineering professional work experience, then CSEP is for you.

If you are a systems engineering leader with recognized systems accomplishments and have many years of systems engineering professional work experience, then ESEP is for you.

LEARN MORE:
https://www.incose.org/certification

Corporate Advisory Board

Corporate Advisory Board membership allows organizations to guide the direction of the discipline.

- Employees can gain access to the state-of-the-art products.
- Align with peers and fellow industry leaders, grow your global footprint, and learn about how other industry leaders are applying systems engineering to solve business problems.
- Gain better access to talent – find and hire competent, certified Systems Engineers through your INCOSE connection

The INCOSE Corporate Advisory Board (CAB) is the Voice of the Customer to the INCOSE leadership.

The CAB provides strategic guidance to technical leadership, leading to the development of systems engineering products and input to standards to meet their needs.

LEARN MORE: incose.org/cab www.incose.org/cleveland | 15

Academic Council

A branch of the Corporate Advisory Board facilitating discussion and exploration of issues relevant to academia and strategic collaborations within INCOSE.

A well-educated workforce is key to Global Prosperity.

Council member organizations offer bachelors, masters, and doctorate degrees in systems engineering and related programs.

Active in advancing the state-of-the-art of systems engineering through academic programs.

Resources

Conferences and Events

International Symposium 2024

34th Annual INCOSE international symposium
hybrid event
Dublin, Ireland
July 2 - 6, 2024

International Workshop 2025

2025 Annual INCOSE international workshop
HYBRID EVENT
Seville, SPAIN
February 1 - 4, 2025

Human Systems Integration 2024

HSI2024
Human Systems Integration
International Conference
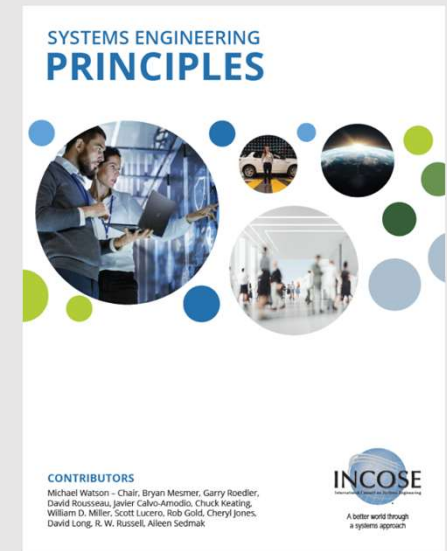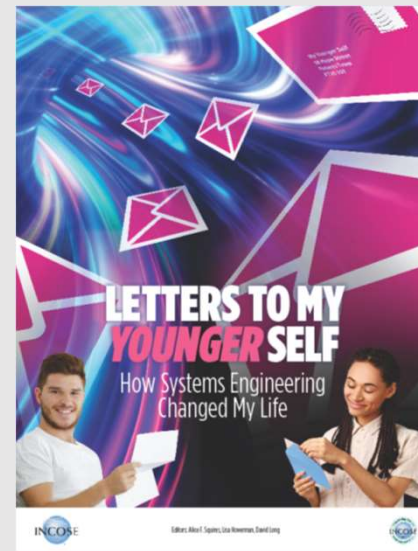HYBRID EVENT, Jeju, Korea
August 27-29, 2024
INCOSE

**2024 Annual INCOSE Western States Regional Conference (WSRC)
Sep 19 - 21, 2024**

INCOSE | WSRC
Western States Regional Conference

LEARN MORE:

incose.org/events

Publications

The INCOSE Foundation

Committed to rewarding skills through scholarships for those engaged in finding solutions to complex technical challenges at all stages of their education or career.

Offers possibilities for people to pursue goals that anticipate the future – for them and for the world.

SCHOLARSHIPS INCLUDE:
- ISEF, the International Science and Engineering Fair INCOSE Award to a pre-college student

- The Chesapeake Chapter Award

- The Stevens Doctoral Award for Promising Research
  in Systems Engineering to a PhD Candidate

- The James E. Long Award for Post Doctoral work

Tonight's Topic – C-NO Café #4

- The primary source for the following material is the SEBoK
  - SEBoK Editorial Board. 2024. The Guide to the Systems Engineering Body of Knowledge (SEBoK), v. 2.10, N. Hutchison (Editor in Chief). Hoboken, NJ: The Trustees of the Stevens Institute of Technology. Accessed July 7, 2024. www.sebokwiki.org. BKCASE is managed and maintained by the Stevens Institute of Technology Systems Engineering Research Center, the International Council on Systems Engineering, and the Institute of Electrical and Electronics Engineers Systems Council.
  - This material is used under a Creative Commons Attribution-NonCommercial ShareAlike 3.0 Unported License from The Trustees of the Stevens Institute of Technology. See Stevens Terms for Publication located in Copyright Information.

System Design

- System architecture and system design are different and separate sets of activities, but concurrent and strongly intertwined.
- System design includes activities to conceive a set of system elements that answers a specific, intended purpose, using principles and concepts; it includes assessments and decisions to select system elements that compose the system, fit the architecture of the system, and comply with traded-off system requirements. It is the complete set of detailed models, properties, and/or characteristics described into a form suitable for implementation.
- Relation with System Architecture: System design is intended to be the link between the system architecture and the implementation of technological system elements that compose the physical architecture model of the system.
  - ? Consider an automobile – general configuration that allows a person (5' or 6') to operate it versus specific measurements
  - ? Do systems engineers do system design?
  - ? Is system architecture top down and system design bottoms up?
- A pitfall: Consider the design of each system element separately.
- A proven practice: Architecture and design mutual support - Discipline engineers perform the design definition of each system element; they provide strong support (knowledge and competencies) to systems engineers or architects in the evaluation and selection of candidate system architectures and system elements. Inversely, systems engineers, or architects, must provide feedback to discipline engineers to improve knowledge and know-how.

System Analysis

- System analysis provides a rigorous approach to technical decision-making. It is used to perform trade-off studies, and includes modeling and simulation, cost analysis, technical risks analysis, and effectiveness analysis.

  ? What system analysis do systems engineers in your organization do?

  ? How often are multiple concepts analyzed to enable trade decisions?

- Pitfalls:

  - Analytical modeling gives analytical results from analytical data. It has to be considered as an aid and not as a decision tool.
  - A model can be well adapted to a level n of a system and be incompatible with the model of the higher level which uses the data coming from the lower level. It is essential that the systems engineer ensures the coherence of the various models used.
  - The general optimization of the system-of-interest is not the sum of its optimized systems and/or system elements.

- Proven Practices

  - Models can never simulate all the behavior/reactions of a system: they operate only in one limited field with a restricted number of variables. When a model is used, it is always necessary to make sure that the parameters and data inputs are part of the operation field. If not, there is a high risk of irregular outputs.
  - Models shall evolve during the project: by modification of parameter settings, by entering new data when modified (modification of assessment criteria, functions to perform, requirements, etc.), by the use of new tools when those used reach their limits.
  - It is recommended to concurrently use several types of models in order to compare the results and/or to take into account another aspect of the system.
  - Results of a simulation shall always be given in their modeling context: tool used, selected assumptions, parameters and data introduced, and variance of the outputs.

System Implementation

- Implementation is the process that yields the lowest-level system elements in the system hierarchy (system breakdown structure).

- System elements are made (produced), bought, or reused.

- These make/buy decisions recursively occur starting at the top of the system hierarchy and recursively occur until decided to buy a part (or portion of the system) or make it from raw materials.

- Production involves the hardware fabrication processes of forming, removing, joining, and finishing, the software realization processes of coding and testing, or the operational procedures development processes for operators' roles.

- The production process may involve supporting systems and enterprise infrastructure.

- Often thought of as producing the final system elements, it is also part of the earlier phases, producing models (physical, design, and analytical)

www.incose.org/cleveland