INCOSE

The International Council on Systems Engineering

MEMBERS NEWSLETTER

A better world through a systems approach

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Editor's Letter

Dear INCOSE Members,

Welcome to the Q2 INCOSE Members Newsletter! I am thrilled to share with you the incredible work of our global systems engineering community highlighted in our Q2 edition. This quarter's theme, "Local Power, Global Impact," highlights the incredible contributions and far-reaching influence of our members, chapters, and working groups.

We kick off with insightful messages from our leadership, an inspiring letter from our President, and an update from our Executive Director on our ongoing initiatives.

We are excited to announce that INCOSE has joined the World Federation of Engineering Organizations. David Long provides an update on our strategic planning, and we welcome new CAB/AC members: Wabtec Corporation, UFMG, and WSU. We are not only celebrating the expansion of the INCOSE CAB; our Marketing & Communications team is also celebrating significant growth.

Our chapters are the heart of INCOSE. Explore their dynamic activities through a hyperlinked map graphic. Highlights include SESA's 30th Anniversary, the Thailand Chapter's upcoming symposium, JCOSE's symposium, and the LA Chapter's STEM Faire. San Diego's David Voelker shares insights on Zero Trust implementation, while the Brazil Chapter and Huntsville Chapter

provide exciting updates. The Rocket City Student Division hosted a successful paint night, and the German Chapter has started the CASCaDE Initiative. Additionally, the Turkey Chapter held a successful meet-up, and NORSEC announced speakers for the Kongsberg Systems Engineering Event 2024.

Our working groups continue to drive innovation. Lou provides an update on the Requirements Working Group, while Chris Unger shares insights from the 9th Annual Healthcare Working Group Conference. Bijan Elahi highlights the First International Conference on Medical Device Risk Management, and Mark Winstead updates us on the Systems Security Engineering Working Group.

We celebrate our members' achievements with updates from the INCOSE Foundation and Brazil's support of UMFG. Marco Forlingieri is featured in our Member Spotlight, and Alejandro and Paul Wach recap CSER and SEANET. We also pay tribute to the passing of one of INCOSE's first members, Bernard (Barney) G. Morais.

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Andreas Spenninger and Mohamadreza Sabaghian discuss Agile Robots, and Renee shares the Texie Awards Booz Allen recognition.

Stay informed with updates from our Services Team, the new SEBoK 2.9 system security article, and the latest PDP updates. We spotlight SE Lab Tool vendors and introduce AI4SE by Innoslate.

Looking ahead, Donna Long previews the International Symposium, the WSRC Committee calls for sponsors, and provides an event overview. Explore upcoming global events with our interactive map.

Thank you for your dedication and contributions. Your local efforts create a global impact. Together, we are shaping the future of systems engineering.

Warm regards,

Honor A. Lind, Director of Marketing and Communications

Editor in Chief, INCOSE Newsletter

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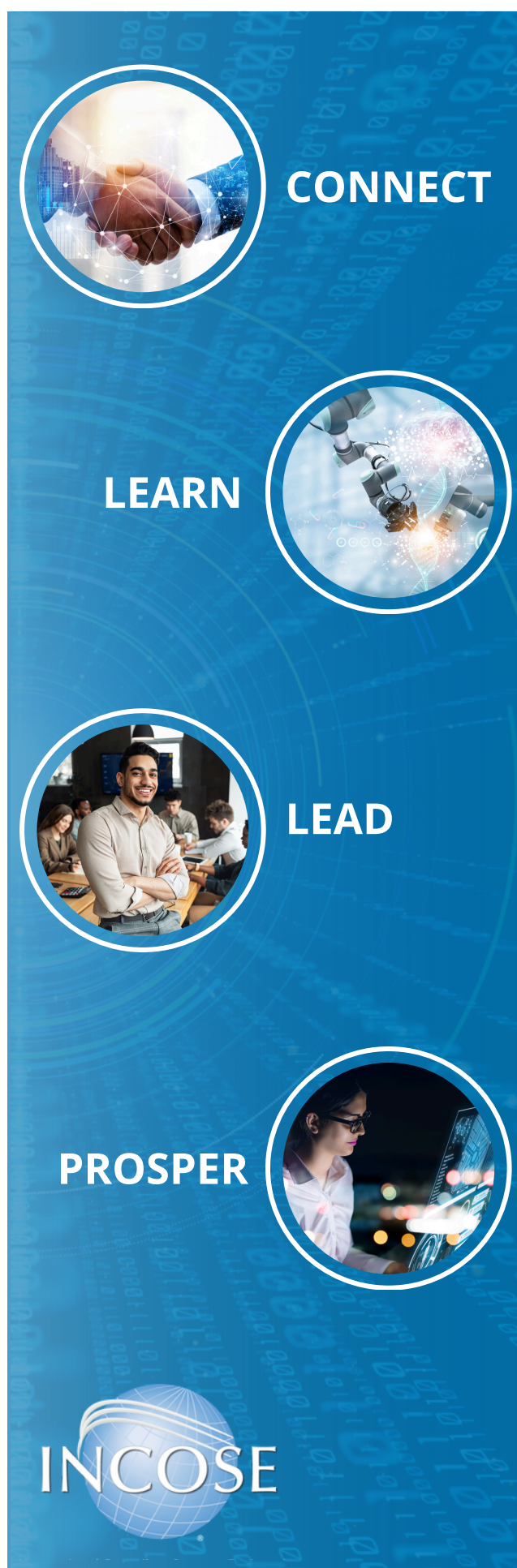
INCOSE

A Message from the INCOSE President

Dear INCOSE Members Worldwide,

Three months ago, I highlighted some key priorities for this year and beyond, focusing on completing and implementing the first version of our Strategy. This initiative aims to foster the "One INCOSE" spirit and amplify our global presence and influence.

Since then, we have made significant progress. As detailed in this newsletter, the draft version of the INCOSE Strategy presented at IW earlier this year has evolved into version 1, which is expected to be approved by the board this month. We anticipate its availability by the end of the month. This has been a comprehensive journey, embodying the "One INCOSE" spirit by inviting contributions and feedback from the entire community. We received numerous inputs, ensuring that this strategy truly reflects the collective vision of INCOSE rather than just a small group of leaders.

Our efforts to expand our global presence and influence are already evident in the chapter updates and the global events map featured in this newsletter. These demonstrate a continually growing number of global activities and a vibrant community of enthusiastic, engaged leaders and members. This progress is encouraging.

A significant milestone in our quest for global recognition was achieved with our new membership in the World Federation of Engineering Organizations (WFEO).

We are committed to continuously delivering and improving our products and services for you, our members. This newsletter showcases numerous examples of these efforts. I want to take this opportunity to thank all our volunteers and staff for their tireless work in advancing our discipline and providing specific benefits to our members. Volunteers remain the lifeblood of INCOSE, and I am deeply grateful for the time and dedication our volunteers contribute to the organization.

INCOSE's strategy includes an objective for operational excellence. To achieve this, Steve Records, our Executive Director since April 2023, is consolidating a team of professional staff to support INCOSE. This next step in INCOSE's evolution aims to maximize the time and energy of our volunteers and continuously increase staff

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support. While showing a good impact already now, it remains a mid- and long-term challenge.

I eagerly look forward to meeting many of you at our events this year, especially at our 24th Annual International Symposium in Dublin, Ireland, at the beginning of July. If you cannot attend this inspiring flagship event in person, consider registering for the virtual component, which offers great content and live transmission of all keynotes.
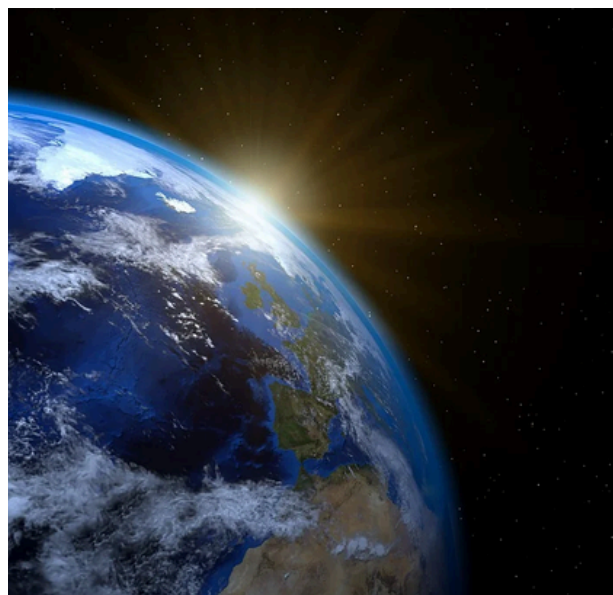
Ralf Hartmann

INCOSE President

Thank you to our platinum partner, Dassault Systemes, for their ongoing support!

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A Message from the Executive Director

INCOSE Members,

I am betting that almost every one of you has heard the phrase 'Think global, act local.' The phrase was coined as part of the environmental movement and embraced by Earth Day years before INCOSE was ever formed. These campaigns were the origins of the modern sustainability movement that Systems Engineering (SE) is committed to today. The SE discipline embodies this every day with lifecycle thinking and its efforts to meet the UN sustainability goals. 'Think global, act local' also applies to how INCOSE should work, too!

Like many professional associations, our impact is delivered through localized connections and networks, whether geographic or based on special interests. I want to give a special 'Thank You' to our chapter leaders who connect our members locally. Likewise, I would also like to thank our working group leaders who connect our members by interest group. Your leadership matters!

While I certainly expect the level of activity in our chapters and working groups to continue at a high level, I'd like to elevate the 'think

global' part of the mantra and challenge that we can do more as One INCOSE. Beyond anything else, INCOSE is a global network of professionals. I fully believe that there are more things that unite us as a community and discipline than divide us via language, geography, or industry.

As members and volunteers, all the energy you put into INCOSE is a discretionary effort on top of your real job and personal and family interests. I want you to know it does not go unrecognized – Thank you! My call to action today is to give one additional consideration about how the work we are doing locally can potentially impact the work we do globally. If we collectively send that extra email, ask that additional question, or make one more phone call to connect us and our ideas beyond our local efforts, we all, and INCOSE, will have an even larger impact.

Steve Records
Executive Director

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INCOSE Joins the World Federation of Engineering Organizations (WFEO)

By Kelly Henseler

INCOSE is proud to announce that it has officially joined the World Federation of Engineering Organizations (WFEO). This prestigious organization brings together engineering societies from around the world, representing millions of engineers across disciplines.

INCOSE President Ralf Hartmann, Outreach Director Dr. Bernardo Delicado, and Executive Director Steve Records were introduced to the WFEO Executive Council at the WFEO's World Engineering Day in Lisbon this March. INCOSE's membership in WFEO will provide several benefits to our members and the systems engineering community as a whole:

New INCOSE Strategic Plan Alignment

Joining the WFEO is a strategic outreach effort that aligns with INCOSE's new objective of being the trusted authority in systems engineering. Currently, INCOSE is the only organization with a systems engineering focus within the network.

Records says, "We believe we can lead and advance SE by creating awareness to organizations and disciplines where SE is still novel or unknown." This key role in the organization will help elevate INCOSE as the systems engineering authority on the world stage.

Increased Global Collaboration

WFEO membership will allow INCOSE to collaborate with other engineering societies globally, fostering the exchange of ideas and best practices in systems engineering worldwide. Not only will this help attract new members, but it will also introduce INCOSE to geographies and populations in which we currently don't have a widespread presence, such as Africa, Southeast Asia, and South America. Records says, "While we have nearly 25,000 members and associates, INCOSE is still largely unknown to many engineering disciplines and certain parts of the world. By joining WFEO, INCOSE is making contacts and connections with leading engineering organizations with whom we had no previous relationship. As we build relationships and highlight the impactful work of INCOSE and the value of our member network, we will attract many new members that will help us grow and expand."

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Participation in Global Engineering Initiatives

As a WFEO member, INCOSE will have the opportunity to shape global engineering initiatives and standards. This will ensure a systems engineering voice is heard at the highest levels. One way that INCOSE plans to do this is to start a Systems Engineering Working Group within the WFEO led by Dr. Delicado. This participation fosters collaboration among international engineering bodies, promoting a more unified approach to solving global challenges with systems engineering at the forefront.

We believe that INCOSE's membership in WFEO will be a significant step forward for the advancement of systems engineering around the world. We look forward to working with our fellow WFEO members to promote the importance of systems engineering in addressing the world's most pressing engineering challenges.

For more information on WFEO, visit www.wfeo.org.

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Sharpening Our Vision for the Future

By David Long, Director for Strategy, david.long@incose.net

When you look into the future, what do you see? *Systems Engineering Vision 2035: Engineering Solutions for a Better World* casts a vision for how the context and environment for systems engineering are changing, what new technologies are emerging, and how the practice of systems engineering must evolve to effectively address the challenges of tomorrow. It frames a to-be state for our practice just ten years into the future.

But what about INCOSE, who we want to be, and the value we seek to deliver? *Vision 2035* is silent on that as it should be because it is a vision for the discipline, not our organization. For that reason, as we shared in the March 2023 newsletter, INCOSE has been working on a new strategic plan to guide us as we advance the state of the art, state of the practice, and state of INCOSE to better serve our members, our profession, and our stakeholders.

To lay the foundations for this plan, in 2023 we conducted a SWOT survey (strengths, weaknesses, opportunities, threats) with INCOSE leadership, a member engagement survey, and structured interviews with senior leaders across industry, government, and academia. Building upon these insights, the Strategic Planning Committee drafted v0.75 of the new INCOSE strategic plan which we shared at IW 2024 and in the March newsletter. This draft was mature enough to seek feedback while maintaining the flexibility to respond to review and feedback.

To mature the draft plan, we commissioned

four different reviews:

- A review by current and former members of the Board of Directors,
- A chartered review team led by former Director of Strategic Integration Art Pyster and comprised of senior INCOSE members and leaders from across the global systems engineering community,
- A second chartered review team led by TLI member Karman Joshi and comprised primarily of early-career individuals from around the world who are newer to INCOSE,
- An open review in which all chapter leaders, working group leaders, committee chairs, CAB organizations, and IW 2024 delegates were invited to participate.

What did we learn? First and foremost, we were reminded just how passionate our leaders, members, and stakeholders are. They were generous with their feedback, and we are thankful for the constructive critiques and insights shared. The open review resulted in 49 pages of feedback from 5 chapters, 3 CAB organizations, and 36 individuals. The other reviewers were similarly generous in their feedback.

Given the diversity of perspectives, we often received conflicting feedback on aspects of the plan. However, several key themes emerged. First, the plan was not as cohesive as we imagined, with gaps between the vision and mission we defined and the supporting objectives and strategies to advance INCOSE towards the future.

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Second, while there was resonance and support for the four primary objectives, the framing of these objectives could be improved to enhance their power and appeal. Third, some of our principles and values which we hold as an organization were not clearly reflected in the plan, most notably our commitment to partnership as we create the future. Fourth, the brief statements of objectives, key results, and strategies were subject to misinterpretation without greater context and explanation – not surprising, but valuable feedback nonetheless. There were many more insights large and small that the Strategic Planning Committee took away from the feedback, but these themes stood out.

plans to guide our efforts and to which we will hold ourselves accountable.

Version 1.0 of the strategic plan will be highlighted during the Joint Leadership Meeting of all international, chapter, working group, and committee leaders planned for July. Key topics drawn from the plan will seed the virtual strategy sessions conducted with leaders in Q3. We look forward to publishing the plan broadly as we seek to leverage it as a tool to align INCOSE's international, regional, and local efforts around the world.

It's an exciting time to be a systems engineer and a dynamic time for INCOSE as we

Advance systems engineering as the world's trusted authority

Expand the systems engineering community while growing INCOSE

Develop the systems engineering workforce

Achieve operational excellence

What's next? Since the review closed in March, the committee has worked to digest the feedback, reflect, reform, and revise the plan based on new insights. A mature draft will be shared with the Board of Directors in June with a recommendation to adopt the new vision, mission, and the four objectives highlighted above along with the corresponding key results and supporting strategies. When adopted, this strategic plan lays the foundation for the definition of tactics that will form the annual operating

sharpen our vision for the future, working together to create a better tomorrow!

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INCOSE Marketing & Communications Growth

By Kelly Henseler, Content Marketing Manager

The INCOSE Marketing and Communications (MarCom) team acts as the voice of INCOSE, promoting the field of systems engineering and the value INCOSE brings to its members.

Key activities include:

- **Content Creation and Management:** The MarCom team develops and manages content across various platforms to share hot topics, member spotlights, stories from the field, industry discussions, and INCOSE promotions.

- **Digital Presence:** The team manages all of INCOSE's social media channels, including LinkedIn, Facebook, Instagram, Twitter, and YouTube, to increase engagement and brand awareness.

- **Member Publications:** They edit and produce the quarterly Members Newsletter and monthly member eNote to ensure the community stays updated on the latest INCOSE news and events.

- **Member Engagement:** They highlight and elevate the valuable INCOSE resources, events, training, and networking opportunities to maximize an individual's membership benefits.

- **Public Awareness and Thought Leadership:** The team works to raise awareness of INCOSE and the importance of systems engineering to a global audience, promoting a strong and unified international INCOSE presence.

In 2023, the MarCom team used various media channels to promote INCOSE accomplishments, events, and other relevant industry topics. In 2024, the team is committed to exploring new ways to attract new members from diverse engineering backgrounds and increase collaboration with industry partners to showcase the real-world impact of systems engineering.

2023 HIGHLIGHTS

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SURPASSED 30,000 FOLLOWERS ON LINKEDIN

5 CALLING ALL SYSTEMS SESSIONS

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New Corporate Advisory Board (CAB) and Academic Council (AC) Members

By Kelly Henseler, Content Marketing Manager

INCOSE welcomes three new members to the Corporate Advisory Board (CAB): Wabtec Corporation, Universidade Federal de Minas Gerais (UFMG), and Weber State University (WSU).

The CAB is the "Voice of the Customer"; it comprises a distinguished group of industry leaders and academic representatives who provide strategic guidance to INCOSE's technical leadership team. This guidance leads to the development of systems engineering products and standards. UFMG and WSU are also joining INCOSE's esteemed Academic Council (AC), a subset of the CAB that facilitates discussion and exploration of issues relevant to academia.

Wabtec Corporation

Wabtec Corporation is a global freight transportation leader focused on providing cutting-edge technology and services for locomotives, freight cars, transit vehicles, and related services. They have a long history of innovation and hold patents on important technologies that have improved efficiency and performance in the rail industry. Involvement in the CAB will help Wabtec ensure that their voice is heard by the global systems engineering community.

Universidade Federal de Mias Gerais (UFMG)

UFMG is a free-of-charge, world-renowned public educational institution and the oldest university in the state of Minas Gerais. UFMG is consistently ranked among the top universities in Latin America and boasts a strong engineering program. Their addition to the CAB and AC broadens INCOSE's international reach and fosters collaboration on research and development projects of mutual interest.

Weber State University (WSU)

WSU provides transformative educational experiences and high-quality degrees while granting access to key aerospace and defense industry companies in the surrounding area, ensuring that students learn the standards, foundations, and skills that they can immediately apply. WSU was also recently recognized for courses that have been assessed to have Academic Equivalence (AcEq), which allows students that have successfully passed the course to bypass the certification knowledge exam when applying for ASEP and CSEP Certification.

To learn more about the CAB and AC, visit www.incose.org.

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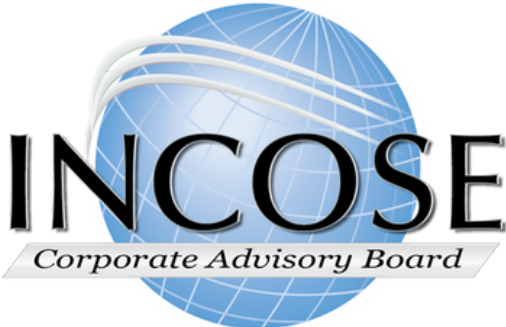
34th Annual INCOSE international symposium

hybrid event

Dublin, Ireland
July 2 - 6, 2024

Join us for the #INCOSEIS 2024

and be part of The Premier International Systems Engineering Conference!

It's time to start planning your agenda for the Annual INCOSE International Symposium!

Discover the inspiring keynotes and over 250 presentations, panels, and tutorials that await you in Dublin.

We can't wait to give you one of the famous 100,000 welcomes to Ireland!

Our Keynotes

Brian Collins
University College London
Emeritus Professor of Engineering Policy - Department of Civil, Environmental and Geomatic Engineering
Vice Chair, National Preparedness Commission

Dave Snowden
The Cynefin Center
Director and Founder

Mark Kelly
AI Ireland
Global AI Transformation Leader
President of AI Ireland

Kathryn Cormican
University of Galway
Professor of Systems Engineering and Director of the Enterprise Research Centre in the School of Engineering

One event Two experiences

In person participation	Virtual participation

4 days
Keynotes
Best papers presentations
Broadcast sessions available for replay on app
Recordings of all sessions available from the INCOSE website 60 days post IS

In person participation	Virtual participation
On-site Program (6 parallel tracks)	Virtual Track (1300-1850 EDT)
Weekend SE Tutorials (1 day)	IS Chat
Networking Gatherings	

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Stay tuned for more! www.incose.org/symp2024
#INCOSEIS - Join the conversation

Why not to miss the #INCOSEIS 2024?

- Learn something new that you can use on the job

- Enjoy a diversified program on different application domains

- Expand your worldwide network of colleagues in the SE community

- Get inspired by forward-looking thought leaders

- Share your own experience and contribute to advancing the discipline

- Gain knowledge that goes beyond your field or interest

- Keep up to date with the latest from our sponsors and exhibitors

- Benefit from Professional Development Units for your participation

- Take the INCOSE knowledge exam for certification as ASEP or CSEP

- Engage in open discussions with INCOSE Leadership during social events

It's still time register

Member:
In-person: $1,995 - Virtual: $650

Non Member:
In-person: $2,495 - Virtual: $825

Senior Member:
In-person: $1,195 - Virtual: $475

Student member:
In-person: $650 - Virtual: $225

Certification

#INCOSEIS 2024 is just one of many events eligible for PDUs. You can claim 1 PDU towards your INCOSE Systems Engineering Professional (SEP) certification per hour of participation.

Thanks to our sponsors

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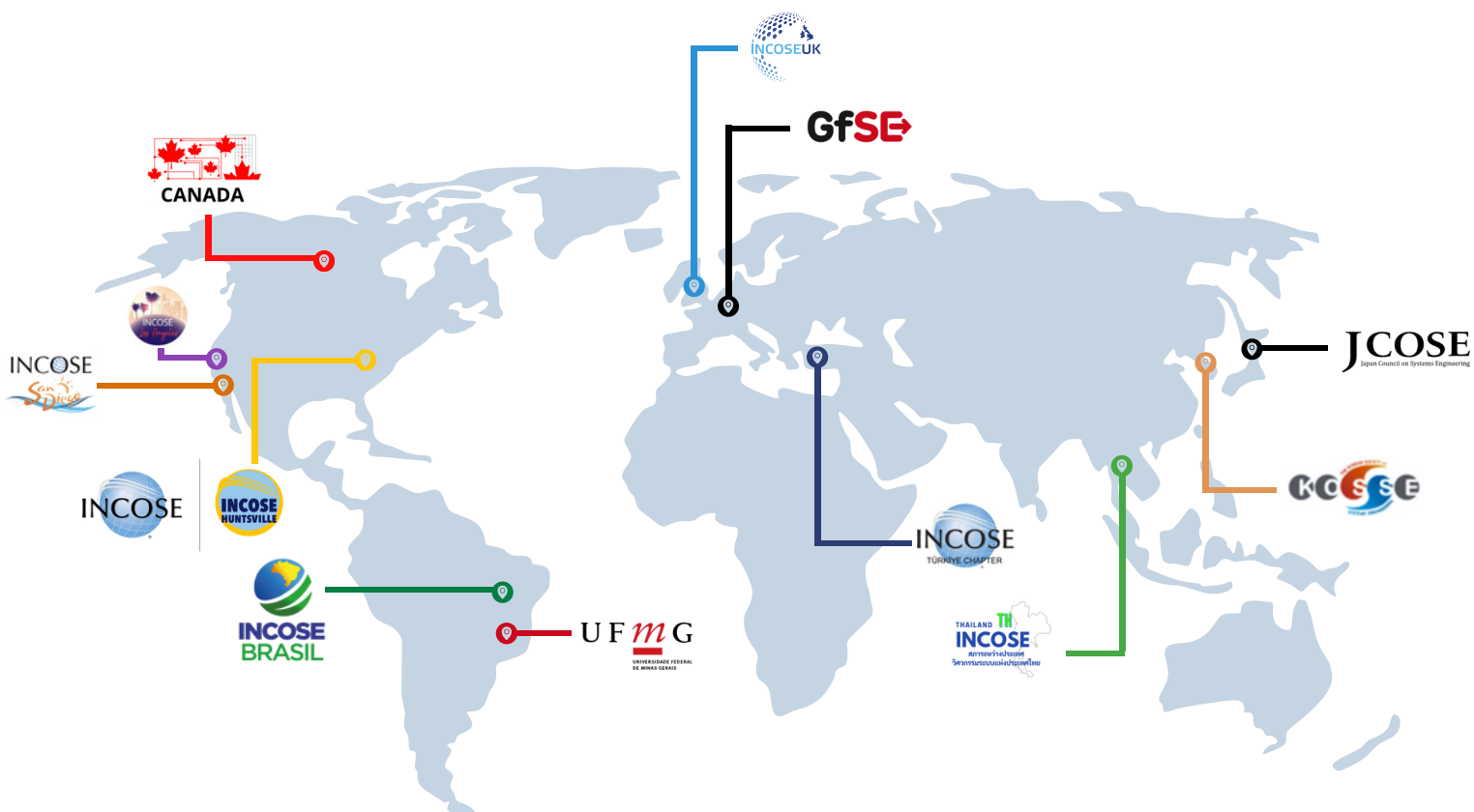INCOSE
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Chapter Updates

Click on the chapter logo to go straight to their update

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INCOSE Thailand Chapter Update

By Vorachet Jaroensawas

Congratulations to the new interim officers of INCOSE Thailand!

Following a successful nomination process on May 7th, 2024, we're thrilled to announce the official results and acceptance of new interim officers into their leadership positions who will lead the emerging INCOSE chapter today: Vithaya Suharitdamrong, PhD (Interim President), Chaiwat Klampol, PhD (Interim Vice President), Vorachet Jaroensawas (Interim Secretary & Acting Interim Treasurer), Arnon Phuekfhon, PhD (Interim Director of Marketing and Communication), Pongsatorn Sukhum (Interim Director of Professional Programs), and Thanaphon Chearanai (Interim Director of Academic Programs).

to announce the TSEC2024 - Thailand Systems Engineering Conference! The conference is happening from August 6th to 9th, 2024, at the Pathumwan Institute of Technology right in the heart of Bangkok. Get ready for an awesome program that supports the goals of Thailand's SE professional society. Here's a quick look at what's happening over the 4 days:

Day 1: INCOSE Thailand Chapter Annual Meeting: Members will map out the future of the emerging chapter, talking about what's next and how it can be used in Thailand.

Day 2 (Co-organized with the Engineering Institute of Thailand): Collaboration time! Join us for a day of talks and discussions

Asst Prof. Dr. Vithaya Suharitdamrong

President

Dr. Chaiwat Klampol

Vice President

Vorachet Jaroensawas

Secretary

Acting Treasurer

Dr. Arnon Phuekfhon

Director of Marketing and Communication

Pongsatorn P. Sukhum

Director of Professional Programs

Asst. Prof. Thanaphon Chearanai

Director of Academic Programs

We are confident that under their dedicated time for the volunteers and their guidance, INCOSE Thailand will continue to thrive and achieve great things.

INCOSE TSEC 2024 - Thailand Systems Engineering Conference

INCOSE Thailand is also excited to

featuring leading figures from universities and businesses. They'll delve into the latest advancements in SE for Thailand, focusing on how to address emerging needs in the field. Don't miss the special TSEC2024 van tour visiting several organizations leading the way in SE initiatives in Thailand.

Day 3 & 4 (Public Event): Calling all Thai

technical leaders and engineers! Learn more about SE topics specific to Thailand and get inspired by speakers sharing their real-world experiences that matter to Thailand. There are over 10 sessions and workshops on Model-Based Systems Engineering (MBSE) led by industry experts and vendors.

Stay tuned for more info on signing up, dates, and the venue!

Stay connected with TSEC 2024: https://www.incose-thailand.org/conferences/tsec2024

Thailand Website

JOIN A LOCAL CHAPTER

Local chapters play an essential role in the achievement of INCOSE's goals and objectives!

incose.org/chapters

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JCOSE Update

By Midori Daida

INCOSE Japan Symposium 2024

On February 21, 2024, JCOSE hosted the INCOSE Japan Symposium 2024 at the Hiyoshi Campus of Keio University, Fujiwara Hiroshi Hall in Yokohama, Japan. This event marked a significant milestone with over 200 attendees participating in a hybrid format that combined both in-person and online modalities to reach a broader audience.

The event featured two influential keynotes delivered by David Hetherington of System Strategy, Inc., and Steve Records, the Executive Director of INCOSE. In addition to the keynotes, the event included four case studies that highlighted innovative applications of systems engineering across different industries including aerospace, service robotics and urban air mobility.

A highlight of the event was the panel discussion entitled "Our Aims for Tomorrow's Systems Engineering in Japan". This discussion focused on the future direction of systems engineering in Japan.

Following the formal sessions, a networking reception was held, where the lively exchange of ideas and experiences took place. Participants, including attendees, speakers, and sponsors, engaged in discussions that not only bonded them through shared professional interests but also allowed them to delve into the current state of systems engineering. The reception proved to be the perfect setting for strengthening relationships and considering future initiatives.

The diverse participation from various industries underscored the event's role as a pivotal platform for professionals to share knowledge and collaborate on advancing systems engineering practices. The success of the INCOSE Japan Symposium 2024 exemplifies JCOSE's commitment to enhancing the systems engineering community in Japan and beyond.

Japanese translation of SE books

Two books related to systems engineering have been translated into Japanese by JCOSE steering committee members. The first, "Systems Engineering Demystified" by Jon Holt, had its Japanese edition published in May 2024. The second book, "Don't Panic! – The Absolute Beginners Guide to SysML v2" by Tim Weilkiens and Christian Muggeo, is expected to be published soon. Additionally, JCOSE is honored to host an online joint book launch event with the original authors on June 15th.

JCOSE Website

KOSSE (The Korean Society of Systems Engineering) Spring Symposium 2024

The Korean Society of Systems Engineering (KOSSE) wrapped up a successful two-day symposium on May 31st, 2024, at The Grand Hotel in Daegu, South Korea. The event brought together systems engineering professionals and academics from across the country, fostering collaboration and knowledge exchange.

The symposium's theme was "Systems Engineering-based Convergence Technology for the Realization of a Carbon-Neutral Society," chosen to celebrate the society's 13th anniversary of its founding. Attendees discussed the importance of systems engineering and the role of convergence technology in realizing a carbon-neutral society. They explored industrial and social changes and technological challenges toward carbon neutrality from various angles to seek ways to cooperate to solve them.

Industry Leaders and Renowned Speakers

The KOSSE Spring Symposium, opened by the KOSSE's president, Joo-Yeoun Lee, boasted an impressive lineup of speakers, including keynote addresses from Vice Chairman Kim Ji-chan (LIG Nex1), CEO Park Tae-wook (YMX), Director Yonghee Son (Korea Robot Industry Promotion Agency), and Director Lee Chang-woo (Defense Agency for Technology and Quality). Their speeches covered topics

ranging from digital twin application cases to robot cooperation for carbon-neutral societies and more. Among the keynotes, it is worth highlighting Captain Yong Woo's contribution, focused on the transformation of the Korean Army and the application of the Korean Enterprise Architecture Framework.

Steve Records, Executive Director of INCOSE, shared an insightful opening presentation about "The Future of Systems Engineering and INCOSE's Role in It" and Marco Forlingieri, Assistant Director of the AO Sector at INCOSE, offered a captivating presentation on "What is MBSE?" (Model-Based Systems Engineering)."

There was also a panel discussion chaired by Professor Hyuk Jin Kwon of the Seoul National University, which explored the current and future state of Korean systems engineering development and discussed INCOSE's international cooperation plans.

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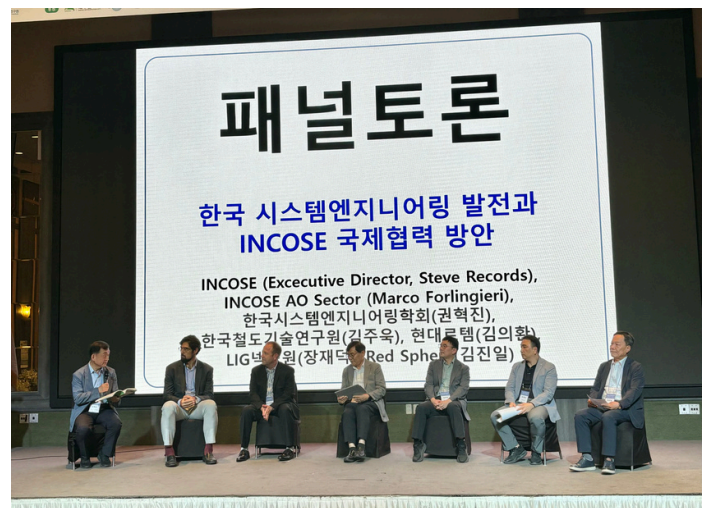
A Showcase of Excellence

The symposium wasn't just about talks. A highlight of the event was the "Excellent Paper Award" ceremony. KOSSE congratulated numerous winning researchers for their work, a testament to the innovative spirit within the Korean systems engineering community. Two notable mentions were Jun-Mo Yang for his paper discussing how architecture models impact software development performance and Yeonju Lee for her paper on speech-to-text (STT) applications for efficient voice communication in military environments.

Collaboration and Looking Ahead

The KOSSE Spring Symposium provided a valuable platform for professionals from diverse fields, including defense, research, railway, and robotics, to connect and share their expertise. The closing ceremony, marked by a commemorative photo with the speakers and participants, solidified the sense of community fostered throughout the event.

The 2024 KOSSE Spring Symposium undoubtedly served as a catalyst for advancing the field of systems engineering in South Korea. With its focus on collaboration, knowledge exchange, and recognizing excellence, the event paves the way for a bright future in this crucial domain.

KOSSE Website

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INCOSE Los Angeles Chapter Highlights

By Victoria Patterson, INCOSE-LA 2024 Secretary and
Nazanin Sharifi, INCOSE-LA 2024 President

The first Tuesday of every month INCOSE-LA Chapter hosts hybrid Speaker Meeting Events where the in-person usually is located at Aerospace in El Segundo California. On April 9th, 2024, Dr. Brown presented, "ChatGPT for SE" to the INCOSE-LA Chapter; 33 attendees in-person and 24 virtually online. His talk on how cutting-edge AI technologies impacts every aspect of life and work for the domain of systems engineering was insightful.

Dr. Barclay Brown is the Associate Director for AI Research at Collins Aerospace, a division of Raytheon Technologies. Dr. Brown holds a bachelor's degree in electrical engineering, master's degrees in psychology and business, and a PhD in Industrial and Systems Engineering. He is the author of Engineering Intelligent Systems, published by Wiley, and is a certified Expert Systems Engineering Professional (ESEP), certified Systems Engineering Quality Manager, and former CIO of INCOSE. He's also a part of INCOSE's AI Systems Working Group.

To us engineers in the field of system engineering, we understand how text heavy this line of work really is; considering requirements, architecture documents, specifications, contracts, statements of work, the list goes on. INCOSE-LA's phenomenal Speaker Meeting attendance proved how HOT of a topic generative AI systems, like ChatGPT, really are in the realm of systems engineering! Leaving us to wonder, "Can generative AI take some of the burden off systems engineers when it comes to keeping track of all that textual information?"

INCOSE Los Angeles Celebrates at Annual STEM Faire Gala

On April 6th, the INCOSE Los Angeles Chapter participated in their local & annual City of STEM + Los Angeles Maker Faire. The event is Southern California's largest STEM celebration of science, making, creativity, invention, and fun! Almost 200 Exhibitors were there that presented & demonstrated a wide variety of STEM-related organizations! (Note: Last year's Faire featured Bill Nye, The Science Guy!) The free event, hosted by the LA Library Dept, was open to the public and very well attended, with hands-on activities, workshops, lectures, and appearances by famous creators and science celebrities.

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The newly elected INCOSE-LA Chapter Vice President Fred Lawler booked, coordinated & helped staff their first-ever booth, whose Theme was:

"Tackling Complex Systems Engineering Projects"

Their Booth featured all of the following:

- Several Key INCOSE Documents (eg, Vision-2035, Systems Engineering Handbook v5, Letters to my Younger Self & Systems Engineering Competency Assessment)!
- A Unique & Very Tall Jenga puzzle tower, where each block that participants successfully pulled out included a card with INCOSE guidance information!
- Engaged & conducted Q&A with Interested Adult & Child attendees!

Their all-day Exhibit yielded 40+ Interested Sign-ups, that were followed-up by their standard 'Welcome to Our INCOSE-LA Chapter" e-Letter!

To read more about INCOSE Los Angeles's activity and community involvement, visit their Chapter webpage and follow them on LinkedIn.

Los Angeles Website

www.incose.org

Mr. David Voelker Presents on the U.S. Department of Navy Implantation of Zero Trust

By Dr. Julia Taylor

On April 24th, 2024, INCOSE San Diego was pleased to host a presentation by Mr. David Voelker, U.S. Department of the Navy's Chief Information Officer (CIO) for Zero Trust.

Zero Trust (ZT) is an approach to the strategy, design and implementation of system security - particularly cyber security. ZT's primary motto is "Never trust, always verify", and is implemented by establishing strong identity verification, validating devices' compliance prior to granting access, and ensuring least privilege access only to explicitly authorized resources.

access the recorded presentation at the INCOSE SD website at https://drive.google.com/file/d/19iZmjZRAXxCFM4oPniznNwyv8xMVxfPc/view?usp=drive_link

San Diego Website

INCOSE San Diego (SD) would like to thank Mr. Voelker for his outstanding, in-depth presentation! His lecture was very well-received as indicated by the many questions from the audience. Interested viewers can

INCOSE Huntsville Regional Chapter (HRC) Update

By Tony Lindeman

INCOSE HRC April Meeting

The INCOSE – Huntsville Regional Chapter (HRC) hosted their monthly hybrid chapter meeting at the Auburn University Research and Innovation Center (AURIC) in Huntsville, Alabama, on Thursday, April 18, 2024. Jennifer Montgomery, a Systems Engineer supporting the Army Aviation Missile Command (AvMC), was the guest speaker and presented Model-Based Systems Engineering (MBSE): Keys to Success in Department of Defense (DoD) Programs. Jennifer emphasized the need to explain the Return on Investment (ROI) benefits of introducing and employing MBSE into a DoD program to gain buy-in and commitment from key stakeholders. Her four key tenants to a successful MBSE deployment include:

- Comprehensive Definition and Approach of MBSE
- MBSE differences between government and industry
- Influencing culture change at all levels
- Early implementation within the Acquisition Lifecycle

Jennifer emphasized achieving a collective understanding amongst the key stakeholders by establishing a common set of definitions that are used to develop an MBSE implementation strategy within the Systems Engineering Plan. Part of the efforts for this include the understanding of "what are we modeling" and "are we modeling it the right way?". She also stressed the need to define

the scope of the word "model" as it is a broad term that means significantly different things to different individuals. She highlighted that the government uses MBSE as part of its "integrator" role while industry uses MBSE as part of its "system developer" role and the connectivity of these two roles is crucial to success. Meanwhile, she stated the need to discuss and understand how a program will utilize MBSE at the time of contract award as digital artifacts will be submitted and used to satisfy technical review criteria and other contractual obligations. If implemented in an established DoD program, proper implementation of MSBE can provide early identification of system capability gaps prior to delivery to the end user.

Culture change is challenging for any organization, so recognizing these challenges is vital to overcoming digital transformation barriers. She stated a key component of successful culture change is to demonstrate to leaders, particularly non-engineers, the benefits implementing MBSE will provide them. The final tenant of Jennifer's presentation reviewed the DoD Adaptive Acquisition Framework adoption in 2019 and how it allows for easier implementation of MBSE at any phase in the product lifecycle. Jennifer wrapped up her presentation by summarizing her 4 key tenets and further challenged the MBSE community to get out and educate key stakeholders who must be won over as part of achieving a wider adoption and
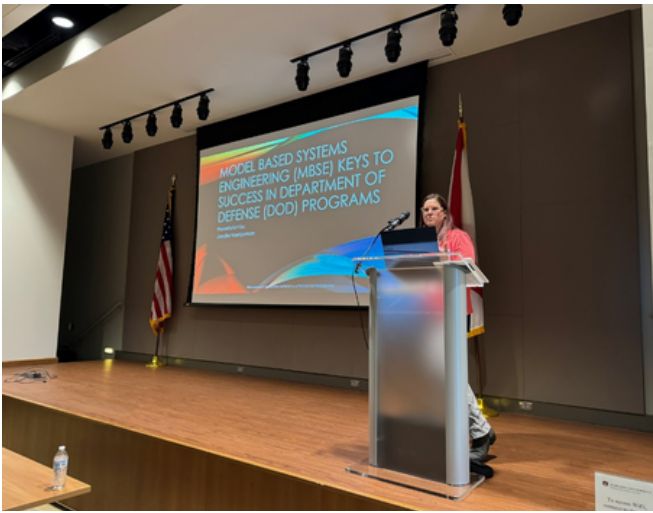
deployment of MBSE.

Digital Engineering/Model-Based Systems Engineering (DE/MBSE) Symposium

INCOSE HRC cohosted a Digital Engineering/Model-Based Systems Engineering (DE/MBSE) Symposium at the Jackson Center in Huntsville, Alabama, on May 1-2, 2024 . Over 150 attendees were offered insightful and pertinent topics on Artificial Intelligence/Large Language Models (AI/MML), Transition Guidance from SysML v1 to SysML v2, and Digital Transformation Workforce Initiatives.

Dr. Mike Watson, INCOSE President-Elect, provided a keynote presentation on INCOSE's strategic initiatives that address changes underway to support membership growth at the chapter and student division levels. Mike wrapped up by announcing that INCOSE had just approved within the last week, the establishment of two additional INCOSE Student Divisions at Auburn University and Calhoun Community College. Tony Lindeman, INCOSE-HRC President, noted that defense, aerospace, and space industries are prominent and well-established in Huntsville and the north

Alabama region. Tony said that the level of participation at this premiere event validated a long sought-after interest within this community to share and learn more about developments and advances being made in systems engineering. INCOSE-HRC and NDIA-TVC have already begun planning to host another digital transformation symposium next year at a larger venue; so, stay tuned for more details in the coming months!

Huntsville Website

www.incose.org

INCOSE Rocket City Student Division Paint Night

By Kelly Campo, Rocket City INCOSE Student Division President

The Rocket City INCOSE Student Chapter (https://rcincose.uah.edu/) hosted a paint night on March 4, 2024, that included their annual officer election for the 2024-25 academic year. The students had an enjoyable time creating art pieces while unequivocally proving that Systems Engineers are artistically talented by their very nature! They enjoyed getting to know and talk with other systems engineering majors outside of classes.

Their discussions included batting around ideas to promote interest in systems engineering amongst fellow students while becoming more engaged in the local systems engineering community when they return to the campus for their fall semester. The INCOSE – Huntsville Regional Chapter (HRC) currently sponsors INCOSE Student Divisions at the University of Alabama in Huntsville (UAH), Auburn University, and Calhoun Community College.

Rocket City INCOSE Student Chapter Website

www.incose.org

INCOSE Brasil Chapter Update

By Bruno Soares, Director of Communications of INCOSE Brasil

INCOSE Brasil's Birthday and New Board

On March 26th, INCOSE Brasil celebrated two important milestones: the 12th anniversary of the chapter and the start of the new board of directors, which will lead the chapter activities for the next two years.

After a smooth transition, the new leaders are at full speed executing the plan defined for the year, including closer relationships with our members and the at-large systems community in Brazil, increasing knowledge sharing through different channels, strengthening connection and collaboration through proactive outreach to industry, academia, government organizations, as well as other professional associations, continuing support to the certification program, and many other new initiatives.

Please join us in welcoming our new leaders. If you are interested in exploring ways of involvement with the local Brazilian community, even if you are not based in Brazil, feel free to reach out at info@incosebrasil.org.br. We have plenty of ideas and will always find room for new volunteers to contribute to growing systems engineering in our region.

UFMG CAB member

With great satisfaction, we announce that the Federal University of Minas Gerais (UFMG) has become the latest member of INCOSE's Corporate Advisory Board (CAB). UFMG is the first university to join the CAB in Latin America, reaching this milestone with the support of INCOSE Brasil and funding from the INCOSE Foundation.

This new partnership between INCOSE and academia in Brazil holds immense potential to not only strengthen our community but also to open up a world of new opportunities for professionals in the field. We are deeply grateful to the INCOSE Foundation for their instrumental role in making this partnership a reality.

The INCOSE Brasil chapter is working closely with UFMG to establish a SEP Academic Equivalency program in 2025. Our goal is to have a high-quality Portuguese program that allows Brazilian professionals to obtain an education in Systems Engineering and become ASEPs.

INCOSE Brasil's presentation at the MBSE event sponsored by Dassault Systèmes

INCOSE Brasil played a pivotal role at the event sponsored by Dassault Systèmes on April 25th, held at the Technology Park São José dos Campos, with a primary focus on exploring innovation and Model-Based Systems Engineering (MBSE). The purpose of this gathering was to delve into various topics related to MBSE and its applications in driving innovation across industries. The

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participation of INCOSE Brasil was characterized by enthusiastic engagement and insightful contributions to the discussions.

During the event, INCOSE Brasil presented the INCOSE 2035 Vision perspective on the topic, providing attendees with valuable insights into the future of systems engineering. Additionally, technical publications and resources addressing MBSE were highlighted, offering practical knowledge and best practices to the audience of 143 attendees. Events like these serve as vital platforms for knowledge exchange and networking, crucial for cultivating a strong professional community of systems engineers in Brazil.

events like this, INCOSE Brasil contributes significantly to the growth and development of systems engineering in Brazil, nurturing a community committed to driving innovation and excellence in this critical field.

Brazil Website

Diego Rangel, President-Elect of INCOSE Brasil,
during his presentation at the event.

Such engagements not only advance the understanding and adoption of MBSE principles but also foster collaboration and synergy among industry experts, academia, and practitioners. By actively participating in

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INCOSE Canada Chapter Update

April 29th - Needs, Requirements, Verification, and Validation Management (NRVVM) *(Event Recording Link)*

This was a no-cost virtual event featuring speaker Lou Wheatcraft, senior consultant and managing member of Wheatland Consulting, LLC. In this session, the activities associated with preparing for Needs, Requirements, Verification, and Validation Management (NRVVM) and performing NRVVM activities were discussed as described in the INCOSE Requirement Working Group (RWG) Needs and Requirements Manual (NRM).

In-person meet-ups

INCOSE Canada Chapter hosted in-person meet-ups in Downtown Vancouver, BC, at Tap & Barrel - Convention Centre on Thursday, May 9 and in Toronto, ON at the Arts & Letters Club on May 17. The purpose of these events is to provide an opportunity for systems engineers with varying levels of experience to meet up, mingle with each other, and discuss various systems engineering topics.

The 18th Annual IEEE International Systems Conference

Our very own Past President, Ray Barton, attended the IEEE's SYSCON 2024 Conference held on April 15th to 18th, 2024, in Montreal, Canada, in coordination with INCOSE Central, and attended the multiple tracks as part of IEEE SYSCON's Technical Program such as System-of-Systems and System Architecture, to name a few.
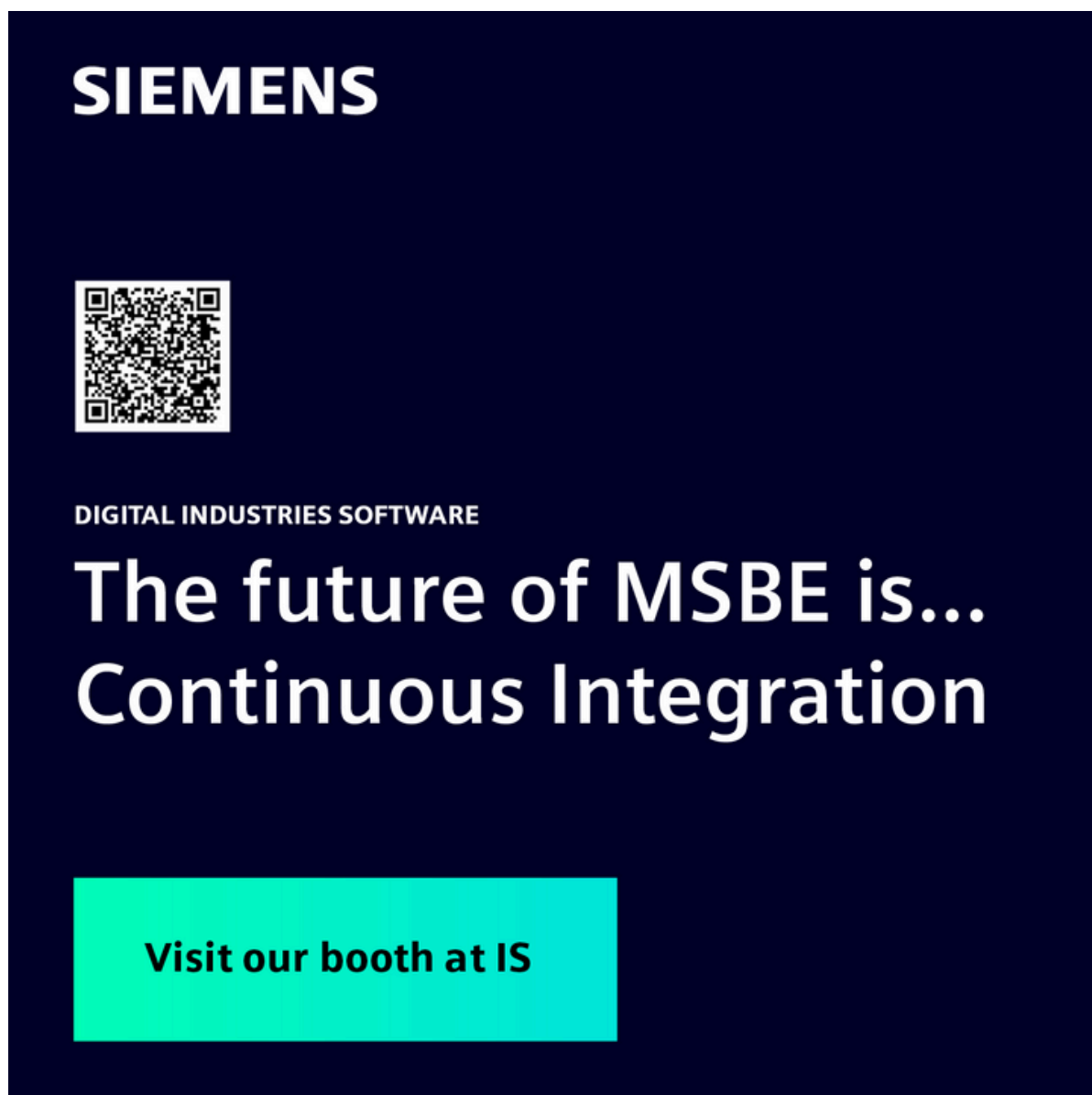
As for the presence of INCOSE and having a booth, INCOSE got full value for its sponsorship of the conference. INCOSE members could register at the same registration fee as IEEE members. INCOSE was featured in the hardcopy Program Schedule handout with two full pages on INCOSE. At the conference and during the sessions, INCOSE members conversed with one another, and many said they would see each other again at 2024 IS in Dublin.

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Canada Chapter's Study Group

In the Spring the Canada Chapter teamed up with the Michigan Chapter and Huntsville Chapter to initiate a SEP Study Group open to INCOSE members to join a cohort and study the INCOSE SE Handbook v5 over a period of 13 weeks. The uptake from members exceeded expectations whom we separated into 10 teams with the mandate to study a designated section on the handbook each week and present their findings to the rest of the cohort. We plan to kick off the second round of SEP Study Group in the Fall so any interested members looking to prepare for the SEP exam you can express your interest to us at canada@incose.net

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German Chapter of INCOSE (GfSE) started CASCaDE – joined standardization process with VDA and Prostep iViP at OMG

On 18.03.24, a small delegation of the German Chapter of INCOSE (GfSE) participated in the Object Management Group's (OMG) quarterly technical meeting (TC) in Reston, Virginia near Washington DC. In attendance were the chairman of the GfSE Walter Koch, the representative of the GfSE in the OMG and member of the board of directors of OMG, Uwe Kaufmann, the representative of corporate members and association cooperation, Christian von Holst, and our valued member and SysML v2 developer, Tim Weilkiens.

A meeting of the "Manufacturing Technology & Industrial Systems Domain Task Force (ManTIS DTF)" was held on Monday morning. In this meeting, the joint project of

the GfSE with the German Association of Automotive Industry (VDA) and the Prostep iViP for standardizing interlinked data, the current working name CASCaDE (Collaborative Advanced Specification, Content and Data Exchange), was presented. In this project, the two formats SpecIF of the GfSE and "Digital Data Packet (DDP)" of the prostep iViP are harmonized and merged into a common standard. This is to be developed and published by OMG (similar to ReqIF, SysML and others) and then also become ISO standard via the ISO PAS process.

The goal is to have an international standard available that allows the exchange of linked data between development partners across
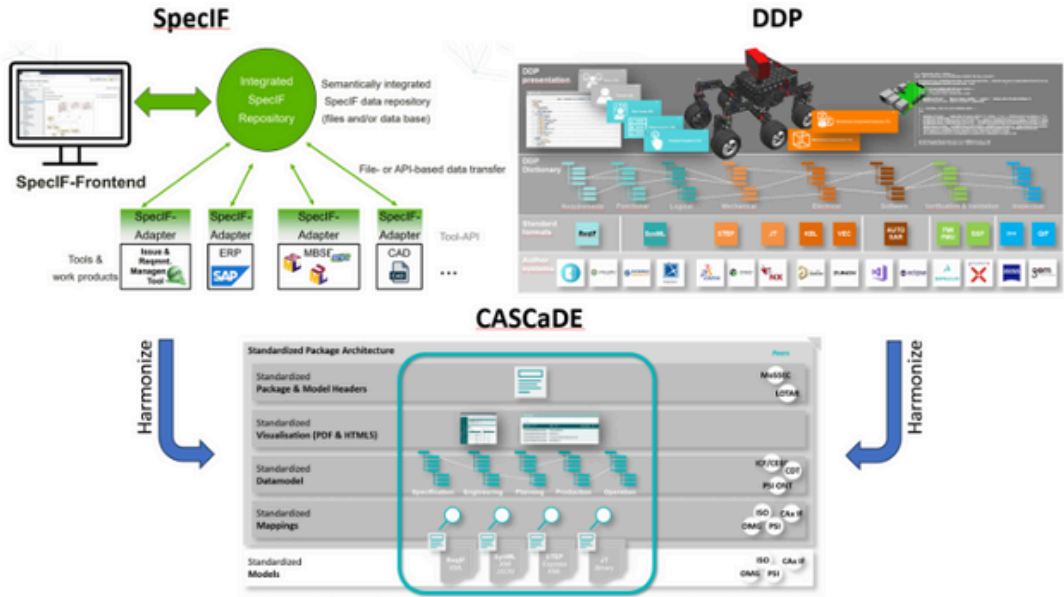
Harmonization of SpecIF and DDP in new standard proposal CASCaDE

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departments and organizations, regardless of the tool. The keywords here are "model-based collaboration" (e. g. MoSSEC) and "exchange of digital twins" (see "Collaborative Digital Twin"). This standard will also support other current activities relaying on connected data, like "long term archiving" (e. g. LOTAR) or supporting the "Code of PLM Openness (CPO)". This initiative was presented at the Assembly of Members of the GfSE last November and is now entering the working phase.

This is a novel approach of the GfSE to form strategic alliances with other important associations and also focus more on standardization activities and processes. The next steps here are the preparation of a so-called "Request for Proposal (RfP)" and its presentation at the OMG in the next meeting in Las Vegas in June. Later this year, a first submission of a harmonized standard is planned in the Q3 or at least the Q4 meeting of OMG. Overall, the project is planned to last three years in order to achieve a harmonized and published standard.

GfSE Website

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INCOSE UK Chapter Upcoming Events

One Day Online Course

Don't Panic! The Absolute Beginner's Guide to MBSE

Tuesday 8th October 2024

Duration: 7 hrs

Book now on Eventbrite

INCOSEUK ENDORSED TRAINING PROVIDER

EICC, Edinburgh
5-6 Nov

ASEC 2024

INCOSE UK Annual Systems Engineering Conference 2024

INCOSE UK hosted its first ASEC in 2010. Now in its 14th year, the two-day conference has evolved and adapted to become the UK's flagship Systems Engineering conference.

Join us in Edinburgh as we mark not only the 30th year of INCOSE UK but also the inaugral year of the Institute for Systems Engineering (IfSE).

Booking opening soon

www.asec2024.org.uk

#ASEC2024UK

INCOSE UK Website

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INCOSE Turkey Chapter Istanbul Meet Up

By Ebru Çağlayan

As INCOSE Turkey Chapter, our first in-person event (since the pandemic), the INCOSE TR Istanbul Meet Up was held on May 3rd 2024, with a brilliant keynote speech "Extended Systems Engineering Toolbox for Sustainability" by our valuable ESEP guests Cecilia Haskins and Terje Fossnes ESEP from Norway.

We all had a great time while listening to their engaging presentation about the essential quality characteristic in systems engineering for a sustainable environment: Sustainability Engineering.

Our keynote speakers have introduced "CapSEM-project", Capacity building in Sustainability and Environmental Management. According to this project, by structuring sustainability methods and concepts the potentially daunting expanse of topics are taught in a manageable and logical way for practical application and knowledge transfer. A systematized collection of assessment and management tools for sustainability and environmental

management is known as the Capacity building in Sustainability and Environmental Management model (the CapSEM Model).

Cecilia and Terje have also shown us an award-winning design Ål-hytta, "people's cabin" for a sustainable environment. This cabin is based on Norwegian building traditions and is affordable to construct and maintain. Our keynote speakers have shown us how to have a sustainable systems engineering solution on this topic for our future.

Meanwhile, we had the opportunity to network face-to-face and plan for our next events in INCOSE Türkiye Chapter with our valuable participants from various systems engineering disciplines and companies.

During the opening speech, our chapter leads Ebru Çağlayan from FEV Türkiye and Serkan Kekec from Aselsan informed about INCOSE membership, systems engineering and INCOSE TR Chapter events as well as symposiums and workshops.

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We thank our keynote speakers for their contributions and time and thank all our participants for their attendance and insightful questions.

We would like to express our special thanks to Teknopark İstanbul A.Ş.for their amazing support in this organization.

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THE INCOSE 2023 ANNUAL REPORT IS HERE!

Get a comprehensive look at INCOSE's achievements and impact in 2023.

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Federica Robinson-Bryant Takes the Helm as the New Associate Director for Diversity, Equity, and Inclusion

At this year's International Workshop (IW), Federica Robinson-Bryant was appointed the new Associate Director of the Diversity, Equity, and Inclusion (DEI) initiative.

As a seasoned systems engineer and an INCOSE member who has been actively involved with the DEI initiative for seven years, Federica couldn't be a more appropriate person to assume the leadership role and help strengthen INCOSE's commitment to inclusivity.

Federica started her journey into systems engineering at the United States Department of Defense (DoD). As a Program Executive Office Simulation, Training, and Instrumentation (PEO STRI) Systems Engineer, she was responsible for planning, organizing, and conducting engineering activities for DoD training systems in live, virtual, and constructive domains while supporting numerous defense contractors in a logistics capacity. Her next career step was into the world of academia. For the last

15 years, Federica has taught at Embry-Riddle Aeronautical University, one of the world's premier institutions for aerospace and aeronautics in higher education.

It didn't take long for Federica to become involved with the DEI initiative at INCOSE after being introduced to the Empowering Women Leaders in Systems Engineering (EWLSE) group. Federica said, "EWLSE has been my main interface with the organization, joining its efforts nearly immediately after joining the organization. It gives individuals from across the world an opportunity to contribute to work that has the potential to impact so much. EWLSE has always made me feel welcome in the INCOSE organization and empowered me to keep learning and contribute as much as I could along the way."

Federica naturally stepped into a leadership position within EWLSE by serving as the Persistence Lead for several years, which included co-writing book chapters in INCOSE products such as Emerging Trends in Systems Engineering Leadership: Practical Research from Women Leaders, contributing to the Letters to My Younger Self publication, and more. Federica even writes for future women leaders in systems engineering! In 2022, she released a series of children's books titled Systems At Any Age. She says, "The early education books and programming depict a black mother as the main character and attempt to introduce

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several topics from systems engineering and systems thinking. These efforts are not an attempt to sway every young mind toward STEM but rather a desire to awaken curiosity and awareness among our younger generations so that their frame of future decision-making is more grounded." Federica knows the value of introducing systems thinking at a younger age and is helping inspire the next generation of systems engineers. The Systems At Any Age series is available in most major online bookstores.

Her children's book series is only one of many ways that diversity, equity, and inclusion play a part in Federica's life at work and home. Federica says, "I am diversity. In more ways than I can count. As an under-40 black mother of four from rural Florida with visible and invisible disabilities, I find it difficult to separate my passion for DEI in my personal and professional spaces." She is a living, breathing example of the value of diverse voices and how an equitable and inclusive systems engineering community leads to better innovations and solutions.

Federica looks forward to using her life experience and professional expertise in her new role. When asked how the DEI initiative plays a vital role in the INCOSE community, she said, "DEI is often tackled as a standalone activity undertaken to satisfy some political aim. My role as Associate Director is to infuse DEI into existing INCOSE functions and operations. I am looking forward to working with people from across the globe on a topic that we each interact with in some way. Inevitably, DEI applies to everyone and everything. I look forward to being in a post that allows me to continue to better understand and impact myself, others, and the world we all share."

In her new role as Associate Director of the DEI initiative, Federica Robinson-Bryant is poised to be a leading voice at INCOSE for a future where diversity, equity, and inclusion are not just buzzwords but integral components of every aspect of the organization's operations and ethos.

Learn more about EWLSE and get involved!

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Harnessing the Grit to Climb and Persist

By Drs. Federica Robinson-Bryant, Alice Squires, and Eric Specking

The path to success in systems engineering leadership is akin to scaling a mountain – it requires unwavering persistence and a clear view of the summit. Just as Tenzing Norgay and Edmund Hillary persevered through years of climbing and overcoming near-death experiences to become the first to summit Everest, so too must technical leaders demonstrate unwavering focus. Their vision must extend beyond the immediate challenges to reach the ultimate goal: a well-functioning, integrated system.

Past studies have identified many enablers for persistence that echoes the experience of mountain climbers who benefit from learning from seasoned veterans. Just as skilled climbers rely on strong ropes, strategy, and teamwork, effective systems engineering leaders foster strong teams and leverage the expertise of those around them.

However, the summit of successful systems engineering is not a solitary peak. Ample emphasis must be given to the importance of Diversity, Equity, and Inclusion (DE&I) for technical leadership success. A team with varied backgrounds and skillsets fosters a richer understanding of the complex systems being developed. Leaders who champion DE&I create an environment where everyone feels empowered to contribute, leading to more innovative and robust solutions.

At this year's International Workshop (IW), the INCOSE DEI team led an inquiry to understand the single most important enabler and/or inhibitor to persistence in technical leadership, one of the professional competencies in the INCOSE Competency Framework. Gender identity and each participant's perception of their technical leadership proficiency was obtained. The written experiences of the participants proved helpful in better understanding the group's journey to date.

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Word clouds were generated from the submitted responses, highlighting the key terms and topics that participants focused on throughout the discussion of both enablers and inhibitors.

The figure at the bottom summarizes the findings from the IW session, highlighting common themes that emerged across all proficiency levels defined by the INCOSE Competency Framework. Interestingly, while the session included participants at all proficiency levels and several gender identities, the majority of the participants represented in this dataset identified as women.

Inhibitors to Persistence

Enablers to Persistence

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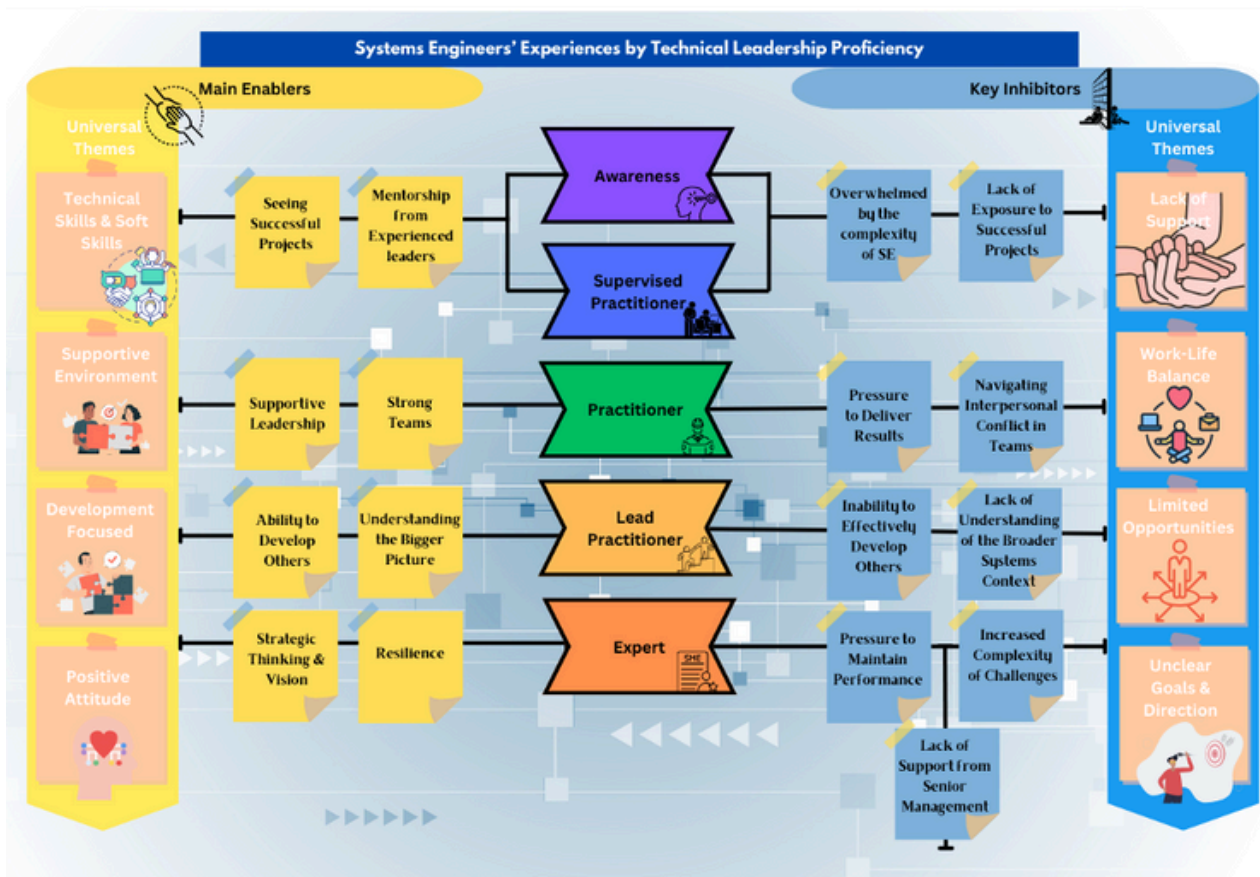
By examining both enablers and inhibitors, the data provides valuable insights into the factors that influence persistence in technical leadership among systems engineers. For example, at the entry levels (Awareness and Supervised Practitioner), seeing successful projects and having mentorship from experienced leaders are critical enablers. This highlights the importance of introducing newcomers to real-world applications of systems engineering and providing them with guidance from seasoned professionals. Furthermore, experts noted that the pressure to maintain performance at a high level and the increasing complexity of challenges were major inhibitors. A lack of support from senior management was also captured as a demotivator for even the most experienced leaders.

The insights gained offer a roadmap for fostering a more supportive environment that empowers current and future technical leaders in systems engineering. By prioritizing these needs, we can cultivate both persistence and inclusion – essential ingredients for reaching the summit of SE success. Here are some actionable strategies to consider:

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	Mentor Programs	Studies show that mentorship programs are highly effective in boosting retention and knowledge transfer. Pair experienced leaders with less experienced individuals to foster a sense of belonging and empower them to navigate the challenges ahead.
	Focus on Skills, not Backgrounds	Research points to the importance of focusing on skills and experience during recruitment and promotion. This ensures the best person for the job gets the opportunity, regardless of background.
	Open Communication & Psychological Safety	Studies highlight the importance of creating a safe space for open communication. Leaders who encourage diverse voices and perspectives create a more engaged and innovative team environment.

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EWLSE Inspires Inclusion on International Women's Day

By Alice Squires, Stueti Gupta, Federica Robinson-Bryant, Lydia Kaiser, Victoria Patterson, Anabel Fraga
Also Featuring: Dipika Singh (invited speaker) and Ralf Hartmann (invited speech)

In the spirit of the theme of International Women's Day (IWD) March 8, 2024 "Inspire Inclusion", Stueti Gupta led the Empowering Women Leaders in Systems Engineering (EWLSE) in planning three IWD webinars around the world, one for each sector: EMEA (hosted by Lydia Kaiser), Asia-Oceania (hosted by Stueti Gupta), and the Americas (hosted by Victoria Patterson). Each webinar started with a message from Ralf Hartmann (INCOSE President), Alice Squires (INCOSE EWLSE Founder), the INCOSE sector President for that sector (EMEA - Sven-Olaf Schulze, Asia Oceania - Quoc Do, and regrets from Americas - Renee Steinwand), Federica Robinson-Bryant (INCOSE Associate Director of DEI), and Dipikia Singh (Invited Speaker, She Means Business), with participation from the audience members.

A summary of the messages from INCOSE

leadership to all three sectors includes the following:

In his speech for International Women's Day (IWD), Ralf Hartmann, President of INCOSE, reminds us that diversity, equity, and inclusion are obviously major values for our global society. He points out that women serve in leadership roles throughout INCOSE, including the past two INCOSE Presidents. But, he adds, this is not enough. He recounts that he recently attended World Engineering Day, and he notes that in the audience of global engineering leaders, the number of women was well below 20%. He also observes a masculine bias in how we communicate about science, technology, engineering, and mathematics. He suggests three main takeaways for IWD: 1) lobby science, engineering, and mathematics to

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boys and especially to girls to make a difference in the future of our planet, 2) be more welcoming to women at all levels, and 3) especially inspire and attract those women who already are in engineering professions to step up into leadership positions.

Next, Alice Squires, Founder of EWLSE, focuses on the IWD theme of "Inspire Inclusion" in her talk. She reminds the audience of the vision of Empowering Women Leaders in Systems Engineering (EWLSE), which aims for equitable representation of women and men in systems engineering leadership. She emphasizes that EWLSE membership is inclusive to all genders, promoting global inclusion. She contrasts an inclusive environment with a homogenous environment that may seem harmonious but often leads to groupthink, reduced creativity, and less innovation. Alice refers to research that shows that excluding women results in suboptimal system designs and higher injury rates for women. She refers to the digital gender divide, where women are disproportionately excluded from internet access, costing over $1 trillion US dollars globally (A4AI, 2021). Alice also shares research on the gap that exists between employers' perceptions of inclusivity and employees' experiences. Closing this perception gap by only half could increase global profits by $3.7 trillion US dollars (Sweet and Shook, 2019), and would improve employee satisfaction and retention. The steps to inclusivity are: 1) prioritize and communicate the importance of inclusion, 2) implement family-friendly, gender-supportive, and bias-free policies, and 3) establish a continuous open dialogue that fosters an empowering environment. Alice encourages everyone to inspire inclusion in their own

spheres of influence, starting immediately.

Dr. Federica Robinson-Bryant, the new Associate Director of Diversity, Equity, and Inclusion (DEI) for INCOSE, introduces herself and outlines her goals for advancing DEI. With over 15 years of experience in various sectors, she aims to "Engage, Educate, Elevate, and Transform" to create a more inclusive world. She emphasizes that diversity is not just about visible indicators like race and gender but also about fostering true inclusivity and equity. The goal is to transform individuals, groups, organizations, and the world towards optimal inclusivity. Dr. Robinson-Bryant shares her personal background as a black, under-40 mother of four from rural Florida, highlighting her faith, introversion/extroversion balance, and experiences with disabilities. Her vision for INCOSE is to be internationally recognized as a diverse and inclusive systems engineering community where members can be their authentic selves while collaborating globally to build a better world. She shares that her objectives for INCOSE DEI will focus on extensive planning, learning, relationship-building, and initiating a long-term transformation. She invites those interested in DEI work to volunteer or reach out via the dei@incose.net email for more information.

As the main feature of each IWD webinar, the Invited Speaker, Dipikia Singh (Founder, She Means Business), led the audience through an interactive workshop that combined stories of leading women and a personal development activity. With guidance from Dipikia, audience members developed five personal hashtags across four areas: skills, values, passion, and purpose; by leveraging their strengths – what they were good at, their values – what was most important to them, their passions – what they

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loved to spend time doing, and their life purpose – their reason for being. During her talk, Dipikia also recommends several references including 168 Hours: You Have More Time Than You Think (Vanderkam, 2010) which segments time into a week instead of a day and encourages readers to break free from the day-to-day and navigate the week with intentionality – scheduling priorities instead of prioritizing schedules. She also recommends exploring Business Wars Season 49: Estée Lauder vs L'Oréal.

As an example of an outcome of the IWD webinars, after participating in the workshop activity twice, Alice Squires developed these personal five hashtags (for now!):

- Skill: #TakingOnToughChallenges
- Values: #Fairness #Humor
- Passion: #EngagingThroughStories
- Purpose: #EmpoweringOthers

Are you interested in participating in INCOSE EWLSE activities? Please join us by adding "Empowering Women" to your working groups and committees on your INCOSE profile.

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Laura Vanderkam (2010). 168 Hours: You Have More Time Than You Think.

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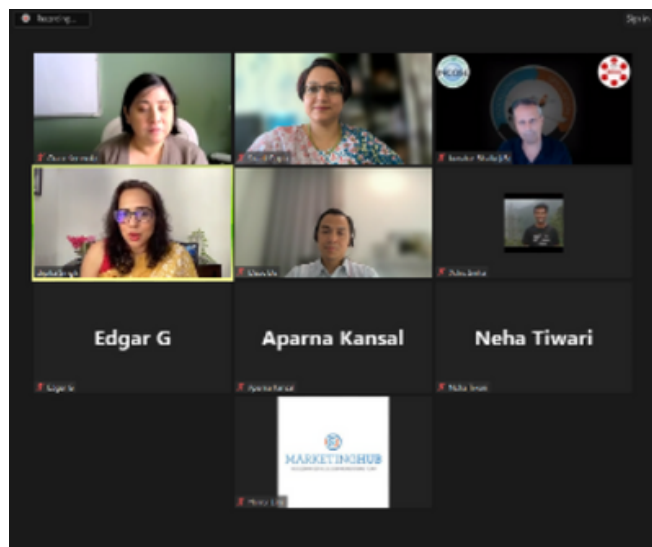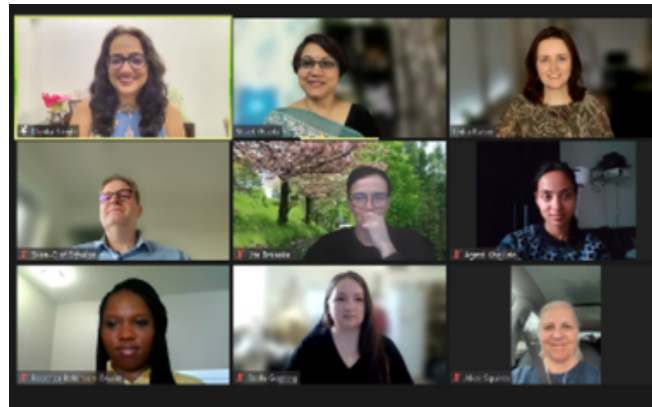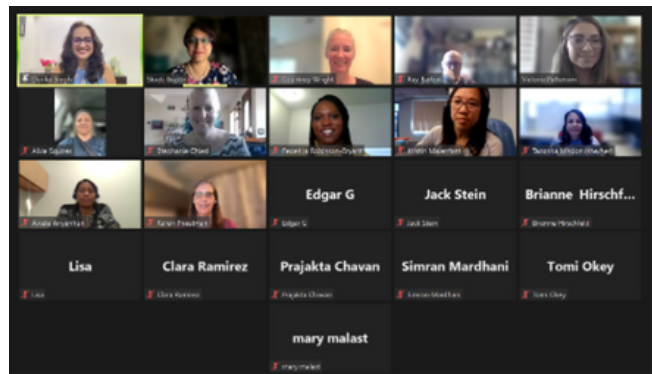
The Requirements Working Group Hybrid Session at IS2024

The Requirements Working Group (RWG) is excited to announce that we are having a hybrid session during the International Symposium (IS2024) in Dublin, Ireland. This will be an RWG general meeting to welcome new members and introduce attendees to the working group, our purpose, goals, objectives, products, accomplishments, and plans for the rest of 2024.

We have been busy since the International Workshop (IW2024) in January, updating the RWG Charter, working with Wiley to publish version two of the Needs and Requirements Manual (NRM), preparing updates to the SEBoK (Systems Engineering Body of Knowledge), conducting our monthly meetings, updating both our public facing and internal iNet web pages, and preparing

an initial draft of a new Guide to Model-based Needs and Requirements. As time permits, we will have an "Ask the Experts" session, opening the session to general topics and questions from the attendees.

The session is scheduled for two and half hours on July 5, 2024, 9:30 AM - 12:00 PM Central Time (US); 15:30 – 18:00 BST (UK).
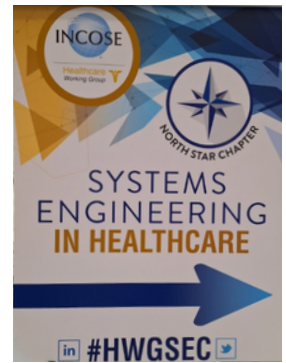
Please register in advance for this meeting using this link.

After registering, you will receive a confirmation email containing information about joining the meeting.

We are looking forward to seeing you all at IS2024!

**Requirements Working Group
IS 2024**

Hybrid Meeting

Friday, July , @ 9:30 AM - 12:00 PM Central Time (US)
15:30 - 18:00 BST (UK)
Zoom Registration:
https://incose-org.zoom.us/meeting/register/
tZMuceGuqD4vEtXpZRqIozEi-M6j5691BWWR

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International Council on Systems Engineering
A better world through a systems approach / www.incose.org

INCOSE's 9th Annual Systems Engineering in Healthcare Conference

By Kelly Henseler

The 9th Annual Systems Engineering in Healthcare Conference held this April in Bloomington, Minnesota, was a landmark event! It saw record attendance and introduced a new format featuring a full day of practical tutorials the day before the conference. With over 150 attendees (20% registration growth from 2023), the conference served as a platform for systems engineers, developers, and healthcare leaders from across the industry to share best practices and explore how systems engineering can revolutionize healthcare delivery.

Key Takeaways and Trends

The theme was "Advancing the Practice of Systems Engineering in Healthcare." The conference's four tracks reflected current critical themes in the industry:

- **Artificial Intelligence (AI) & Machine Learning:** "The significant strides in AI for systems engineering in MedTech were impressive to learn about," shared Chris Unger, one of the event's organizers. "It's exciting to see AI not just embedded in the product but also used to improve the systems engineering process itself."

- **Cybersecurity:** With the growing importance of software in medical devices, cybersecurity has become a top priority. The dedicated cybersecurity track at the conference had numerous trending topic discussions, including practical medical device threat modeling, the FDA's cybersecurity architecture views, and an expert panel on best practices for managing security risk in medical devices.

- **Digital Systems Engineering:** "Increased interest in 'Digital SE' (simulation and MBSE) over the last five years' was a clear trend," noted Chris. While many companies are still in the early stages of digital adoption, advanced users are finding success with MBSE, leading to a growing interest in the field.

- **Safety and Risk Management:** This track's presentations covered a range of topics, including Failure Mode and Effects Analysis (FMEA), enhancing medical device safety through MBSE, and how to integrate safety considerations throughout the entire product lifecycle.

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Collaboration and Attendee Experience Take Center Stage

The conference prioritized the attendee experience and fostered a collaborative environment. While planning the event, the Healthcare Working Group emphasized creating a space for connection and knowledge exchange. "Every industry is different, but for us, people like the ability to network and talk to colleagues who are facing the same challenges," explained a Working Group member.

The focus on experience resonated with attendees. The unconference held after the event included open discussions on a wide range of topics and proved particularly popular. It allowed attendees to continue the conversations and provide feedback on what they would like to see at future events. Feedback reflected an appreciation for the conference sessions, which focused on practical applications and best practices rather than sales-driven tool demonstrations that can be found at many industry events.

Insights for Other Working Groups

The INCOSE Healthcare Working Group offered valuable advice for other INCOSE Working Groups who would like to plan similar conferences:

- Prioritize attendee experience: Focus on good technical setup, food, and opportunities to network and connect with colleagues.
- Start small and grow organically: Build momentum through word-of-mouth and avoid overwhelming volunteers.
- Facilitate collaboration: Attendees value the chance to connect with others facing similar challenges.
- Secure a strong keynote speaker: A well-respected speaker can significantly boost attendance.

The 9th Annual INCOSE Systems Engineering in Healthcare Conference served as a testament to the growing influence of systems engineering in the healthcare field. By fostering collaboration and prioritizing attendee experience, the conference provided a valuable platform for knowledge sharing and professional development within the industry.

Congratulations to all of the volunteers who put valuable time into the event and for being an exemplary model to other INCOSE Working Groups for how a successful domain-specific event can be curated.

If you want to get involved with the HCWG, visit their webpage.

First International Conference on Medical Device Risk Management Convenes in Minneapolis

By Kelly Henseler

For decades, medical device safety has been a paramount concern, yet there often seemed to be a lack of dedicated space for focused discussion and knowledge sharing. That all changed in April 2024 with the inaugural International Conference on Medical Device Risk Management, spearheaded by Bijan Elahi, a longtime advocate for robust risk management practices in the MedTech industry.

A Vision Takes Shape

"This conference was a dream of mine for 15-20 years," Elahi says. He had previously sought to integrate medical device risk management into existing system safety conferences, but industry-specific content remained elusive. "So finally," he explains, "I decided last year to host a special conference for the MedTech industry."

The response was overwhelming. The conference sold out, drawing hundreds of attendees from 13 countries, with many traveling significant distances. This international participation underscores the critical need for a platform dedicated to medical device risk management.

Key Highlights and Takeaways

The conference boasted a diverse range of speakers, including the CEO of Medtronic,

representatives from the FDA, and experts within the medical, academic, and engineering fields. Elahi emphasizes the importance of this inclusivity: "From the feedback that I have received so far, I think the richness of the topics, ranging from technical to clinical to regulatory to academic, was very appreciated."

Specific sessions that sparked high levels of engagement included those featuring insights from the FDA and presentations on the ever-evolving role of Artificial Intelligence in medical devices.

A Catalyst for the Future

The success of the conference is a testament to the collective drive for advancements in medical device safety. As Elahi reflects, "There is a hunger for education and knowledge in medical device risk management."

For other Working Groups looking to embark on similar ventures, Elahi offers sage advice: "Start early." His meticulous planning, which lasted 11 months, allowed for a robust speaker selection process, comprehensive feedback on presentations, and the creation of a well-rounded, informative agenda.

The First International Conference on Medical Device Risk Management has

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undoubtedly filled a vital void within the MedTech industry. With its focus on collaboration, education, and the exchange of knowledge, this conference is poised to become a cornerstone event, shaping the future of medical device safety on a global scale.

To: newsletter@inco...

Subject: Newsletter Article Submission

🔔 Submit your articles

Are you an INCOSE member doing great work in the systems engineering community?

Let INCOSE spotlight you in an upcoming newsletter!

Email newsletter@incose.net indicating your interest and our MarCom Staff will be in touch.

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Updates from INCOSE's Technical Leadership Institute

By Suja Joseph-Malherbe, TLI Coach, suja.joseph-malherbe@incose.net

The twenty members of Cohort 8 are nearing the end of their initial two-year experience and will be inducted as full members of the Institute in June 2024. In the spirit of *learning by serving others*, Cohort 8 explored the leadership needs problem space for three stakeholder groups (Chapter Leaders, Working Group Leaders, and INCOSE members), identified the highest value leadership need, and developed the offering or artifact to address it. They are now sharing these items and working with the groups to maximize the value.

Cohort 8 also completed three major projects as part of their journey. One will be presented at IS 2024 and the other two will be shared using other vehicles:

- *Establishing psychological safety in remote and hybrid systems engineering teams*

- *Leading in uncertainty: A framework to improve performance*
- *A tinkerer's mindset: Safe-to-fail probing as a tool for informing judgement*

Continuing with our virtual topical engagement series, the TLI had the pleasure of Zane Scott sharing his insights on negotiation and its relevance to our context. The engagement was titled, "How a Hostage Negotiator Negotiates in the Workplace: Try this at home, you are professionals!". Some of the learning points include the role of ethics, the value of establishing relationships to be able to negotiate, remaining curious, and most of all recognizing that we are all negotiators involved in small negotiations as part of a team.

We are looking forward to the social and topical engagements at IS 2024 in Dublin

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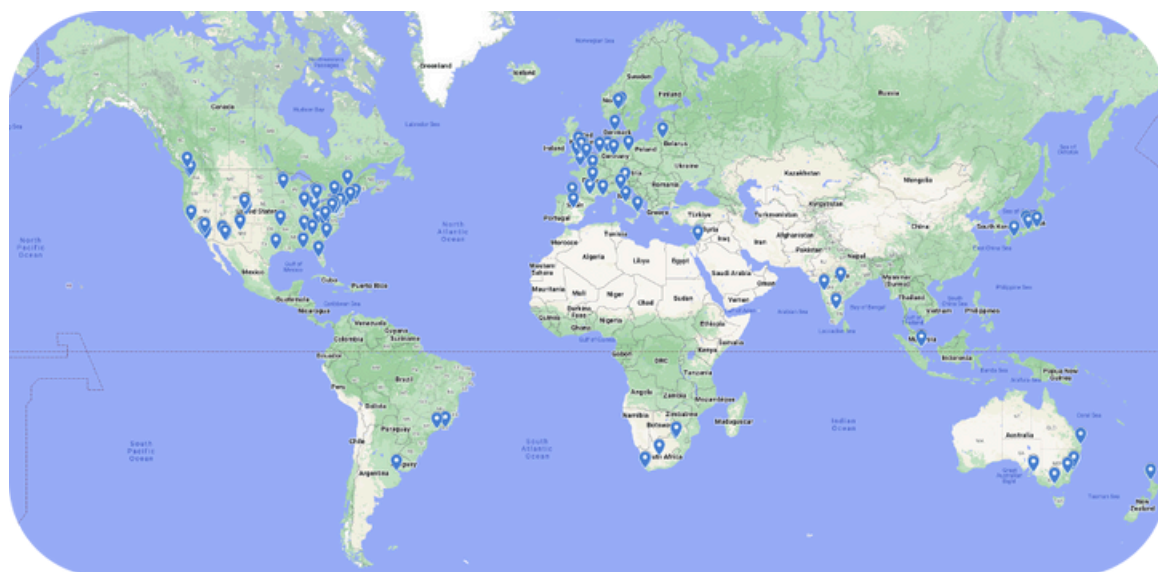
where over 25 members of the Institute will gather in-person. It is a privilege to have a private topical engagement with Dave Snowden who will deliver the Wednesday keynote. Dave will address the role of complexity in understanding and creating new approaches to risk management in projects. This will include Cynefin as well as Estuarine and some of the European Union field guide concepts on sensor networks. Dave will also fold in insights drawn from his involvement with long-term leadership development learning efforts.

With the learning journey for Cohort 10 set to begin with a kick-off workshop in June 2024, the Institute's global reach and diversity of thought continue to expand. The TLI now has 164 members from 20 countries around the world. We look forward to listening, thinking, and learning together with the members of Cohort 10.

Top Row (left to right): Daria Wilke (Germany), Ryan Ligon (USA), Glenda Alvarenga (USA), Colleen Olson (USA), Raquel Hoffman (Japan), Natalie Weaver (USA), Raven Moreland (USA), Erica Barrett (Australia), Filippo Farina (UK), Carlos Coehlo (Brazil), Hai Tao Wu (Canada), Angie Hodd (USA)
Bottom Row (left to right): Hunter Miller (USA), Taconna Mhoon (USA), Natalia Rocha (Brazil), Sahithi Gattupalli (Norway), Patrick Rye (USA), Daniel Grivicic (Australia), Paul Pierce (Australia), Alex Blekhman (Israel), Yutaro Ito (Japan), Dillan Christensen (USA), Payal Parate (India), Tugba Karabiyik (USA)

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SSE WG's FuSE-Security Project talks Collaboration Opportunities with Ron Ross

By Mark Winstead

The May 2nd meeting of Systems Security Engineering (SSE) Working Group's Future of Systems Engineering – Security project team featured guest Dr. Ron Ross. Dr. Ross is a United States National Institute of Standards and Technology (NIST) Technical Fellow instrumental with numerous NIST publications and standards including the Risk Management Framework (RMF) and various security controls documents. The two-hour discussion centered on collaborations on the future of systems engineering's role in security.

After Rick Dove, chair of the SSE Working Group's opening remarks and brief to Dr. Ross on the working group's futures project, including the need for systems engineers to own the need for functional perseverance in a hostile perseverance, Dr. Ross spoke and largely agreed with the approach. Despite his central role with RMF and NIST Special Publication (SP) 800-53 Security and Privacy Controls, Dr. Ross went on to discuss the need for a different alternative for the security problems with cyber-physical systems, increasingly complex systems, and other systems.

"The only way to really solve this problem is from an engineering point of view, really lock down these systems much more than they can ever hope to be under a kind of a superficial framework, [such as] the Cybersecurity Framework, RMF or ISO 27000 - those are superficial attempts at a very difficult and challenging problem … security controls are not talking the language of the engineers".

Dr. Ross went on to discuss NIST SP 800-160 Volume 1's second iteration, *Engineering Trustworthy Secure Systems*, was revised to see that "everything starts with the systems engineers". He explained RMF and other past NIST cybersecurity was firewalled off when revising Volume 1. He also thanked the INCOSE SSE Working Group members who participated in a special "pre-public" review of a draft and went on to talk about next steps.

The give and take discussion of the next steps for the community by those in attendance spoke to the need for continuing to build a body of knowledge, in part through pilots and pathfinders to build practical knowledge. NIST and Dr. Ross are involved with the US National Aeronautics and Space Administration (NASA) and the Jet Propulsion Laboratory (JPL) on one such pilot, which he briefed as well. Additionally, he invited INCOSE to develop and include more information in resources such as the Systems Engineering Book of Knowledge (SEBoK), as well as contributing candidate material for future NIST special publications and future updates to NIST SP 800-160 Volume 1.

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Figure courtesy of Dr. Ron Ross (NIST), Engineering security needs a new path using systems engineering.

Another need discussed was workforce development and training. Co-chair Beth Wilson contributed on some efforts of the working group, including a future INCOSE credential for systems security now in planning. Additionally, a day long tutorial by Volume 1's coauthor and SSE Working Group cochair Mark Winstead is being offered at INCOSE IS 2024 in Dublin.

The discussion served to validate much of what each party participating is doing and served to solidify collaborative partnerships and networks for achieving the security tenets within the Systems Engineering Vision 2035. It further underscored the need for security as a foundational systems

engineering perspective in order to meet stakeholder needs.

INCOSE Systems Security Engineering (SSE) Working Group Website

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University in Brazil makes INCOSE history

By Beth E. Concepción

A Brazilian university -- Universidade Federal de Minas Gerais – has become the first Latin American university to become a member of the INCOSE Corporate Advisory Board. The INCOSE Foundation sponsored the membership. Sponsorships like these are a crucial part of the foundation's mission to expand access to best practices in systems engineering.

"UFMG's participation in the CAB fosters growth, knowledge sharing, and collaboration, benefiting both the university and the broader systems engineering community along with expanding the sphere of INCOSE into Latin America," said Tyrone Theriot, who ended his rotation on the foundation at the end of 2023.

The collaboration with UFMG started as a certification opportunity for INCOSE in Brazil.

"Our initial goal was to establish a SEP Certification Academic Equivalency -- a move that would not only harness the potential of certified professionals but also enhance their involvement within the INCOSE community," said INCOSE Certification Director Raquel Hoffman.

UFMG was a good option because of the fact that the university started an undergraduate course in 2010 that could integrate the systems engineering field of knowledge with emerging social demands. There were no systems engineering courses in Brazil at that time. A committee of faculty members working in areas related to systems engineering developed the first version of the course with the INCOSE Systems Engineering Handbook as an important reference.

"The partnership between UFMG and INCOSE symbolizes the recognition of over a decade of work, a strong prospect for the consolidation of systems engineering in Brazil, and an opportunity to provide a systems engineering undergraduate course even more updated and aligned with international standards," said UMFG professor Ana Liddy.

"With this partnership, we expect not only an improvement in the quality of education provided by UFMG but also a better dissemination of global systems engineering within Brazil," Liddy said. "Moreover, the professors and students interested in systems engineering will have the opportunity to participate, learn, and collaborate with the INCOSE working groups and initiatives."

Hoffman agreed. "We expect that the systems engineering course with Academic Equivalency offered by the UFMG will push the bar higher for working professionals and make undergrad students more prepared for the industry."

In fact, UFMG systems engineers are working or taking graduate courses in more than 10 countries in companies such as

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Embraer, Amazon, Google, Deloitte, Tactile Games, The Bank of London, and the Giant Magellan Telescope Organization.

"Membership in the CAB enhances UFMG's visibility within the systems engineering community. It showcases their commitment to excellence and positions them as a thought leader in the field," Theriot said. The CAB discussions and strategic guidance sessions provide UFMG with insights into the future direction of systems engineering. They can align their curriculum, research, and projects accordingly.

The search for partners does not end with UFMG, though.

"We are also in talks with other universities to explore the potential for additional SEP Academic Equivalency programs," Hoffman said. "Our overarching goals include increasing the number of certified professionals, regular, and associated members, and hosting a systems engineering conference with hybrid participation."

Experienced INCOSE mentors who speak Portuguese are needed to help UFMG leverage INCOSE publications, webinars, events, and networks with their faculty and students. Contact Raquel Hoffman at raquel.hoffmann@incosebrasil.org.br if you can provide this support.

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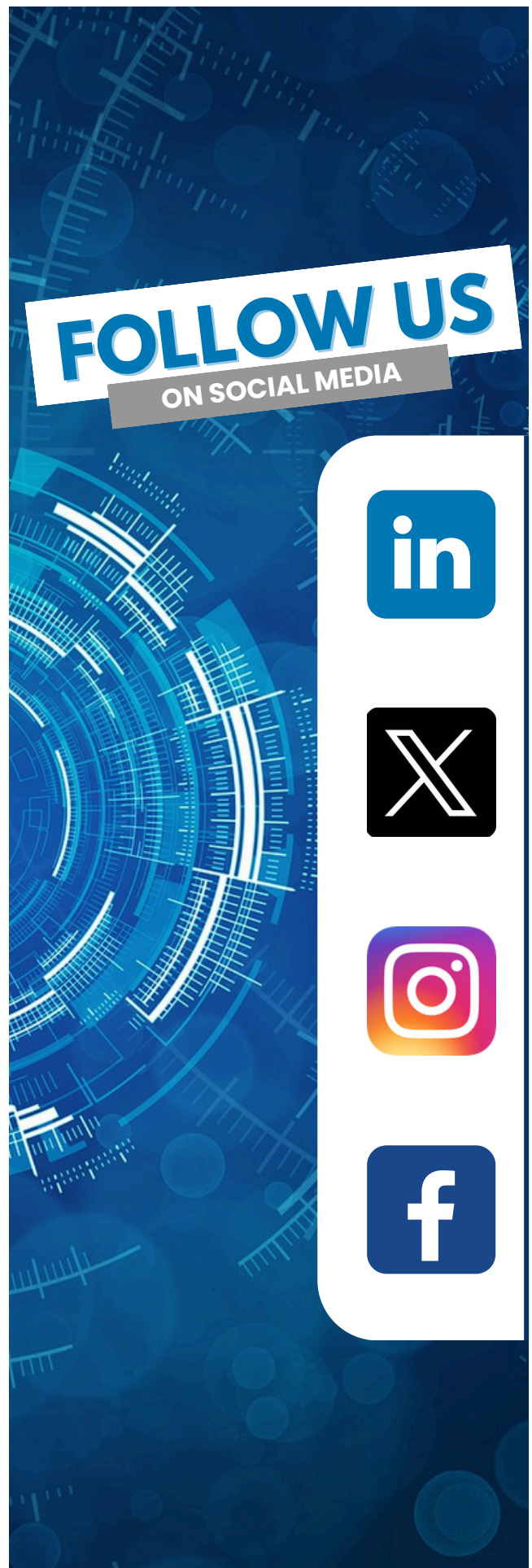
INCOSE Awards Thirteen Students at the 2024 International Science and Engineering Fair (ISEF)

By Regina M Griego, Ph.D., INCOSE Fellow; Contributions by Eileen Arnold, Mike Dickerson, Leone Young, Rich Johns, and Phyllis Marbach

*Note: This is an article abstract. You can read the <u>full article here.</u>

INCOSE has participated in the International Science and Engineering Fair (ISEF) as a Special Award Organization since 2009 to provide awareness of Systems Engineering for exceptionally talented high school students from all over the globe. This year, students were awarded a total of over $8 million in special awards from over 40 organizations, and INCOSE provided three cash awards and ten Honorable Mentions that totaled $11,000 in cash and non-cash awards. Every project is impressive, and the hardest part of our participation is choosing the winners. We applaud our winners and wish them success.

INCOSE Best Use of Systems Engineering Award - $1,500, free registration and Exhibitor Booth at a future INCOSE Symposium
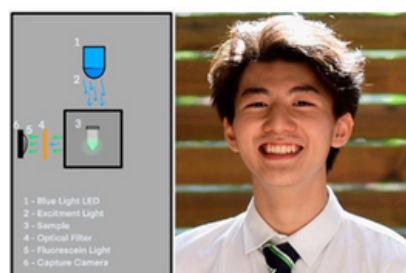
Micro RNA223-Biomarker Based Exponential Rolling Circle Amplification CRISPR -Cas12a System for Disease Detection and COPD Diagnostics
Robin Dao from Exeter, NH, USA developed a low-cost way to detect chronic obstructive pulmonary disease (COPD).
https://projectboard.world/isef/project/166139

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Second Place INCOSE Best Use of System Engineering Award - $800, 1-year free student membership to INCOSE, and free virtual admission to the 2023 International Symposium

UpLift Mobility: Robotic Lift to Elevate Frequently Falling Individuals – Jeslyn Tan from Sydney, Australia developed a lift that can be used by frequently falling individuals as they age, providing them with more independence. Her final product can lift up to 200 Kgm, is operated using a game controller, and appears to be a regular piece of furniture.
https://projectboard.world/isef/project/167368

INCOSE Bill Ewald Socio-Technical Systems Engineering Award - $1000, a 1-year free student membership to INCOSE, and free virtual admission to the 2023 International Symposium
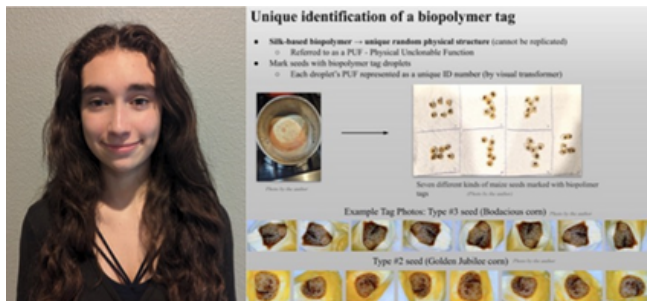
Securing Global Food: Biopolymers, Cryptography, and Visual Transformers for Affordable Anti-Counterfeit Seed Protection

Diana Martynova from Los Gatos, CA, USA, developed an affordable anti-counterfeit seed protection system combining biopolymer tags, cryptography, and visual transformers that can be done on a smartphone or other inexpensive computing device.
https://projectboard.world/isef/project/168550

Ten Certificates of Honorable Mention, each with a 1-year free student membership and free virtual admission to the 2023 International Symposium

Generative AI System for the Visually Impaired – Ryan Xu from Plano, TX, USA, developed an accurate, descriptive, multi-lingual, real-time, affordable vision system to alleviate visual impairment utilizing regenerative artificial intelligence to replicate detailed visual vocabulary.
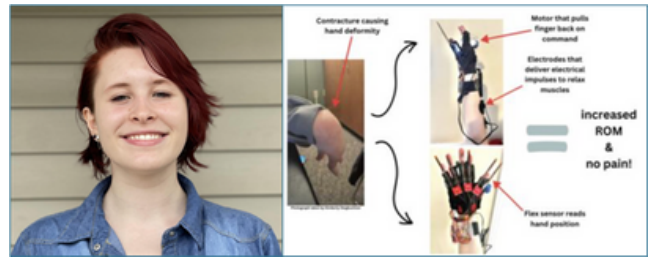https://projectboard.world/isef/project/162597
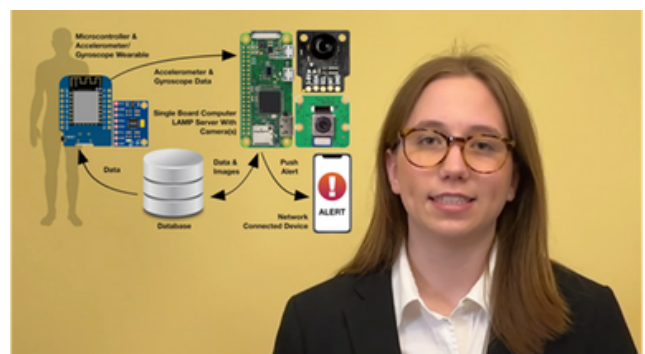
Mitigation of Pressure Injuries Utilizing an Inertial Wearable, Computer Vision, and Machine Learning - Maya Trutschl from

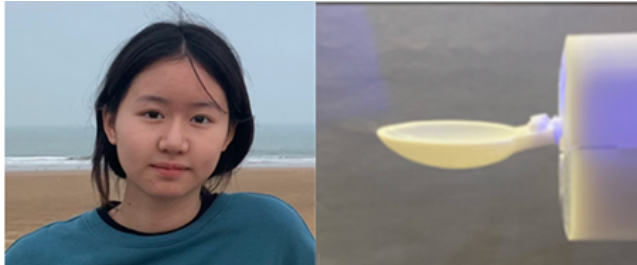© INCOSE - International Council on Systems Engineering   www.incose.org

Shreveport, LA, USA, developed two system units that show the position where pressure sores could develop for patients in long term hospital care confined to a bed and notifies a nurse within 30 minutes.
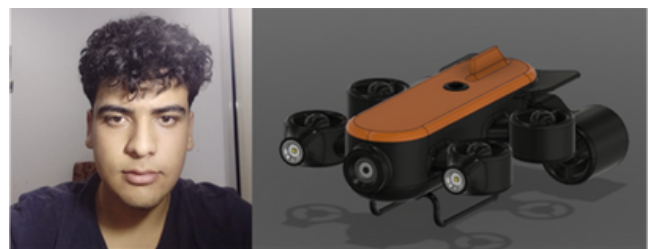https://projectboard.world/isef/project/167603

Tableware Jitter Elimination Technology for Parkinson's Disease (PD) – Susie Yuan from Beijing, China, developed a low-cost jitter elimination device for PD patients suffering from random and sudden tremors during eating. Her design uses artificial intelligence to adapt tableware to reduce unwanted movements, record the severity of the patient's movements, and provide a diagnosis.
https://projectboard.world/isef/project/162412

NeuroHAT: Democratizing Brain-Wellness Monitoring Developing A Wearable System with fNIRs & EEG Multimodality Classification Engine & Miniaturized Device Jingjing Liang from Cupertino, CA, USA, developed a safe, affordable, and accessible brain monitor with high temporal and spatial resolution. Her goal is to make regular, noninvasive brain monitoring more accessible.
https://projectboard.world/isef/project/165472

Orthotic Hand Brace to Improve Range of Motion in Patients With Cerebral Palsy Sophia Caramanica from Shrewsbury, MA, USA, developed an orthotic hand brace to improve range of motion in patients with cerebral palsy. The glove has motors that pull back the fingers on command and a transcutaneous electrical nerve stimulation (TENS) unit to relax the nerves leading to the hand.
https://projectboard.world/isef/project/167114

Development of Oil Collecting Submarine Using AI and Hydro-Filter Solution – Ayhem Bouker from Sousse, Tunisia, developed a drone style submarine with a top-mounted camera that navigates underwater, and detects and cleans oil spills. Using an AI technology camera and a 3D printing prototype, the drone submarine was operated and showed successful oil separation and collection.
https://projectboard.world/isef/project/168115

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SkyLinker: UAV Autonomous Perpetual Solar Flight for Facilitation of Mobile Communication and Long-Distance Surveillance – Michael Xu from Morristown, NJ, USA, developed a low-cost, lightweight, solar-powered unmanned aerial vehicle (UAV) with on-board power storage making multi-day and perpetual flight possible. This novel aircraft demonstrates the feasibility of constructing cost-effective solar-powered UAVs capable of long loiter times.
https://projectboard.world/isef/project/166748

The Virtual Cardiologist: Three Deep Learning Pipelines in an Inexpensive Portable Device and Web/Mobile Application for Rapid Cardiovascular Diagnosis and Clinical Decision-Making – Shiv Mehrotra-Varma from Fresno, CA, USA, developed a portable, inexpensive Raspberry-Pi device, mobile application, and website for detection of multiple cardiovascular morbidities.
https://projectboard.world/isef/project/164260

Zenith Soar X-4: Autonomous Drone for Disaster Relief and Detection – Daniel Williams from Newnan, GA, USA, developed a cost-effective autonomous drone system tailored for disaster relief and emergency response. Equipped with cameras, sensors, and advanced algorithms, it provides real-time crisis data collection and mapping capabilities.
https://projectboard.world/isef/project/168143
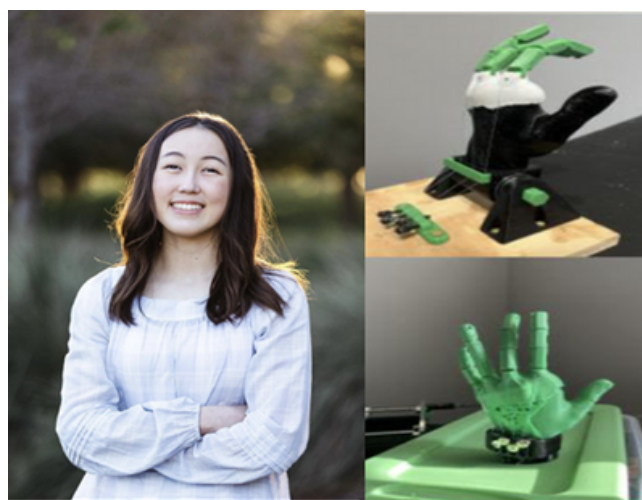
Software for Customized Development of Low-Cost Partial Hand Prostheses in the 3D-Printed Prosthetics Community – Katherine Robertson from Newport Coast, CA, USA, developed an innovative, user-friendly software designed to improve the creation of 3D-printed prostheses for individuals with partial hand loss.
https://projectboard.world/isef/project/166532

In Memory of Bernard (Barney) G. Morais

By Bob Kenley

On January 24, 2024, INCOSE lost one of its founding members - Bernard (Barney) G. Morais.

Barney received a Bachelor of Science in Electronics Engineering in 1959 from the California Polytechnic State University in San Luis Obispo and began a 24-year career at Lockheed in Sunnyvale, California. He retired in 1983 from his position as Director of Systems Engineering, 15 years before Lockheed merged with Martin Marrietta. In 1974, he received a Master of Science in Systems Management from the University of Southern California. He founded Synergistic Applications in 1989 to provide consulting services until he closed the company in 2006. Barney was pre-deceased by his wife, Pam Morais, in 2015. She worked at Lockheed, where she directed training programs in systems engineering and program management and was an active member of INCOSE.

In 2001, Barney received the INCOSE Founders' Award. The citation reads, "A Founding Member and unrelenting supporter of INCOSE from its inception, he helped organize the first annual meeting of NCOSE, served as its first Treasurer, and as its first Executive Director." Barney maintained his membership in INCOSE until 2011, five years after his retirement.

Barney published six symposium papers:
1. Morais, Bernard G., and Michael Grygiel. 1994. "Application of Systems Engineering Into an Ongoing Operation."

2. Barter, Robert H., and Bernard G. Morais. 1999. "Systems Engineering Applied to Integrated Safety Management for High Consequence Facilities
3. Grady, Jeffrey O., Ben R. Jurewicz, James E. Long, Brian W. Mar, and Bernard G. Morais. 1999. "Systems Engineering Realisation"
4. Mar, Brian W., and Bernard G. Morais. 2001. "Systems Engineering Heuristics – Is there a need to innovate, integrate and invigorate?"
5. Mar, Brian W., and Bernard G. Morais. 2002. "FRAT – A Basic Framework for Systems Engineering."
6. Morais, Bernard G., and Brian W. Mar. 2003. "Product Development Interrelationships."

Dorothy McKinney describes meeting Barney when INCOSE was being formed: "I met Barney Morais in 1991, when I was asked by a senior Vice President in my company to set up the San Francisco Bay Area chapter of the National Council On Systems Engineering (NCOSE), as it was originally called. Barney and the small company he ran were providing administrative support for the fledgling NCOSE organization, including keeping membership records, and lists of email contacts. One of the tasks he had was to incorporate NCOSE as a non-profit

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organization. I had recently completed this process for a nursery school I was helping to get off the ground, so I offered to do it for NCOSE. Barney gratefully accepted my offer, and we coordinated through this process, resulting in NCOSE becoming a California non-profit corporation. Barney helped me contact key systems engineering leaders in aerospace companies with offices in the San Francisco Bay Area, which was enormously helpful in getting the chapter started. Barney was a thorough gentleman, and a real pleasure to work with. Ultimately, his small company was overwhelmed by the NCOSE workload, and NCOSE hired a professional industry organization manager to take over the administrative tasks, and he happily returned to his main business."

Serah Sheard recalls, "Barney was a founding member of NCOSE. He did the original business management of NCOSE in terms of taking in member dues and passing out member numbers, all from his home. When I helped NCOSE (Ginny Lentz), pick a professional association management service, they took over from Barney Morias, who had been doing it all himself. I believe this was in 1995. He was of great help to the original Seattle group including Brian Mar in starting the original organization in 1991 and 1992. I'm not sure we would be what we were today without his help."

Dave Walden recalled how Barney helped with the formation of local chapters of INCOSE: "Barney was the face of INCOSE in the mid-1990s when we were forming the INCOSE North Star Chapter (Twin Cities, Minnesota, USA). Barney worked tirelessly to help us get the chapter chartered. We could not have done it with him (and Nancy Rundlet as Local Chapter Affairs lead)."

Dave Paul worked with Barney at Lockheed and recalled how it was to collaborate with him, "I was working late on a classified proposal in another building on the other side of campus from Barney's office. I looked up and saw him going over the proposal on the wall. As far as I knew, his being there was unbidden by either the program manager or myself as systems engineering manager. I got up from my office, went over to the proposal wall and said, "Hey, Barney good to see you!! What are you doing here late at night? "Well, I tell you,' he said. 'This Proposal and this piece of business are not the project managers and it's not yours. It's an important piece of business for our whole company, and I need to help make sure it's the best it can be!!' He was like that, even late at night, almost 40 years ago, creating advice for a young manager!! Thank you, Barney, rest well."

Regina Griego shared this short poem in remembrance of Barney:

Barney Morais

An infectious smile he leans in to greet me.
A wry sense of humor with a sly side-look.
Gleaming eyes as he explains risk and decision analysis.
Generous spirit as he hands me a disc for my use.
I smiled every time I saw him.
He lightened the room instantaneously, especially when he chuckled deeply.
I missed his presence in INCOSE over these last years.
Now he rests and I am grateful I knew him.

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Mark Powell also worked with Barney at Lockheed and shares his experience with Barney. "I met Barney Morais in the fall of 1982 at Lockheed Austin Division when he came down from Lockheed Missiles and Space in Sunnyvale to do a one-day class on Systems Engineering. At the time, he was the head of Systems Engineering for the Aerospace Systems Division of LMSC, and my faded recollection is that his official title may have been as a Vice President of LMSC. Just starting the second assignment of my life as a Chief Systems Engineer, every note in his class resonated with me rather dramatically. I went up to him after class to share this with him, and we had a short, but lively discussion."

Mark continues, "The following week, I was surprised to receive from Barney a pre-publication copy of the System Engineering Management Guide from the Defense Systems Management College. Barney produced this fine systems engineering product for DSMC to be released in early 1983. To date, this document is in my view the best systems engineering guide ever written. It has been a primary source for every single systems engineering course and NCOSE/INCOSE tutorial I have developed since 1989."

"Over the next few years during my Lockheed incarnations, whenever I would travel to Sunnyvale, I would make it a point to visit Barney in his office. He always made time for me on these unannounced visits, sometimes more than a few hours, and we would discuss systems engineering concepts, philosophies, and practices, as well as commiserate on systems engineering challenges, we each had at our respective divisions of Lockheed."

"After a few years I left Lockheed, and the next time Barney and I crossed paths was at one of the earliest winter workshops for the newly formed National Council on System Engineering. We of course naturally picked up where we left off as if no years had passed at all. We continued our conversations and explorations of systems engineering at NCOSE (and eventually INCOSE) events and expanded to online and telephone discussions when both e-mail became mainstream, and $3/minute long distance went away."

"I was never and am still not Barney Morais' peer in Systems Engineering, yet Barney always made me feel as if I were his systems engineering peer. I always learned a lot from over 40 years of conversations and discussions with Barney on systems engineering, not to mention from the System Engineering Management Guide that he edited. I will really miss Barney but will forever hear his voice whenever I need to teach something in systems engineering or run into some systems engineering issue."

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CSER 2024 features new ideas and interactive sessions

By Beth E. Concepción

The Conference on Systems Engineering Research was held March 25-27, 2024, at the University of Arizona – home of the world's first department of engineering. According to Conference Chair Arizona Associate Professor of Systems Engineering Alejandro Salado, there were three noteworthy differences with this conference:

"The first difference is that we tried new kinds of sessions that were more interactive," Salado said. "We had an open podcast booth. We had an idea board for people to write ideas and exchange thoughts. We had unconference sessions."

By "unconference," he means that there were open spots on the second day where attendees would sign up to speak.

"You didn't know who was going to speak or what they were going to speak about," he said. "It was basically created during the conference."

The second new item on the agenda was a workshop the day before the conference that was dedicated to tenured and tenure-track faculty.

"We have created a community of interest," Salado said. "We just wanted to grow the community and that sense of belonging and help each other."

The final difference is that he and the other organizers put emphasis on openly

discussing what the future of the academic community is for systems engineering.

"We put that at the front of the conference," he said. "The landscape has changed for us. What do we want to be?"

The conference also featured the Systems Engineering and Architecting Doctoral Student Network (SEANET), which exists to "advance systems engineering research by providing a collegial support network, research resources, and contacts that will enable the completion of doctoral dissertations related to systems engineering."

More than 100 people attended the conference, which celebrated its 21st year.

"I feel that [this year] was more diverse in terms of topic and internationality," Salado said.

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SEANET at CSER 2024

By Paul Wach, PhD, Assistant Director, Student Matters, Academic Matters

The Systems Engineering and Architecting Doctoral Network (SEANET) held an event on March 25th in Tucson Arizona at the 2024 Conference on Systems Engineering Research. The event focused on the overall PhD process and gave graduate students the opportunity to meet other students and interact with mentors. The event was a full day, with guest speakers in the morning and roundtable discussion in the afternoon.

SEANET typically has a range from guest speakers from late to early career academics. Guest speakers included Dr. George Hazelrigg, from George Mason University, and Dr. Taylan Topcu, from Virginia Tech. Dr. Hazelrigg provided his seasoned "Thoughts on a Theory of Systems Engineering". As a relatively new PhD graduate, Dr. Topcu discussed "Navigating Graduate School and Preparing for What is Next."

The afternoon consisted of a roundtable discussion led by the faculty mentors. Topics were (1) scoping, designing, and applying research approaches and methods; (2) performing data collection, interviews, modeling, and experiments; and (3) research end game – committee meetings, defending, publishing, and finding opportunities. Faculty mentors included Ricardo Valerdi, from the University of Arizona; Eric Specking, from the University of Arkansas; Gerrit Muller, from the University of South-Eastern Norway; and Cecilia Haskins, from the Norwegian University of Science and Technology. A special thank you goes to Cecilia for hosting the virtual participants.

Two students, Jannatul Shefa and Md Doulotuzzman Xames provided descriptions of their experiences. According to Shefa, "SEANET offered me an opportunity to connect with fellow PhD students and distinguished professors in Systems Engineering. It was a great networking event with valuable experience and insights from the community that will help me to shape my path ahead and, certainly, has opened the door for possibilities of collaborative works." Xames suggested that "Attending my first SEANET was a truly enriching experience. Connecting with my peers and future colleagues was rewarding, as we shared ideas and learned from each other during the three interactive research roundtables. The event also provided me with invaluable guidelines for navigating grad school." Shefa and Xames are both PhD students from Virginia Tech.

The next SEANET event will be held in conjunction with the INCOSE International Symposium (IS). SEANET at IS will be focused on disseminating systems engineering research to (1) practitioners and (2) academics. We welcome mentors from both practice and academia. Perspective mentors should email me (Paul) at paul.wach@incose.net. More details about SEANET at IS to follow.
See you in Dublin!

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TeXie Awards at Booz Allen Hamilton

Earlier this year, Booz Allen Hamilton held its second annual X Summit. The summit included 69 sessions over three days, reaching more than 500 in-person attendees and a virtual audience of 5,000+.

X Summit 2024 included the first-ever TeXie Awards, hosted by Susan Penfield, Chief Technology Officer. It recognized employees for excellence in delivery, community building, rising star status, driving reuse, and technical luminary status. 375 nominations were received and judged by a set of 38 peers; 120 award winners received a trophy designed and printed in the Panama City office.

Two recipients of the inaugural awards included notable INCOSE leaders!

INCOSE Americas Sector Director Renee Steinwand received the Community Builder Award for her work in encouraging and helping staff achieve systems engineering professional certification. The Community Builder Award recognizes employees who support and connect people with common needs or interests.

Renee's work as the INCOSE Americas Sector Director contributed to her receipt of the award, as did her work within the Booz Allen Systems Engineering Technical Experience Groups (TXG). She is also the go-to resource for all things Systems Engineering Professional (SEP) Certification within the firm. She is among fewer than 10 Booz Allen Hamilton employees recognized as an Expert Systems Engineering Professional (ESEP). She has developed many of the standard processes Booz Allen Hamilton uses throughout the firm for systems engineering.
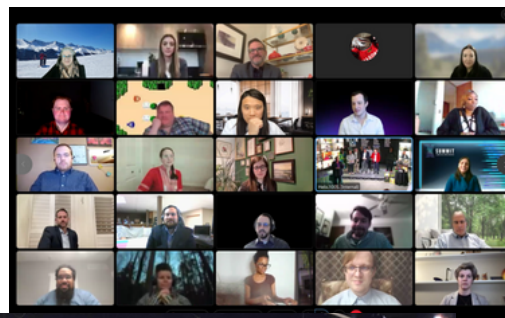
INCOSE Americas Deputy Sector Director Kevin Weinstein received the Technical Luminary Award for his work in leading technical solutions for multiple proposals and client engagements. This award recognizes technical leaders who shape client vision, brand reputation, and the technical landscape.

Kevin is a thought leader in systems and digital engineering that directly benefits Booz Allen clients and staff. He has also been awarded his ESEP certification based on his breadth and depth of systems engineering knowledge over the past 20 years. He is energetic and passionate about increasing employee skill sets and networking with other systems engineers, encouraging advanced degrees and certifications. He is a strong advocate for programs to adopt sound systems engineering processes from concept through development and fielding.

Congratulations to Renee and Kevin for their much-deserved awards!

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Not for Women Only

By Heidi Hahn

In a previous column (Q4 2023), I reported on a tactic for addressing equity gaps in course grades. Voicing concerns by some that measures like eliminating gifted program to promote inclusion and equity would diminish excellence in their domain (physics), Professors Cassandra Paul and David Webb (reported by Wright, 2023) focused instead on changing the course structure as a way to address the grade gap. Specifically, Paul and Webb changed the teaching approach to address concepts first, only adding problem solving and calculations-related content toward the end of the course. They also changed the assessment method and had students take short biweekly quizzes with retakes possible in the intervening week.

The changes were implemented in two physics classes, one calculus-based and another introductory. The teaching strategy change resulted in underrepresented students receiving higher grades vs those received in topically organized courses, though it did not close the grade gap between men and women. The retake option eliminated the grade gap for women but not for minority students.

Paul and Webb (in Wright, 2023) provided several explanations for these results. Students who identify as both women and minority have more of a grade gap than students identifying as just one of these, so the observed effects may be differentially impacted by structural sexism and racism; they do not speculate on how these variables influence student outcomes. More

generally, Paul and Webb explain that the results for the concepts-based teaching approach may result from increased student interaction with the material. The retake approach allows students to learn from their mistakes, which also enhances engagement.

Andrew Heckler (also in Wright, 2023), a physics professor at the Ohio State University, sees the results obtained by Paul and Webb as promising, but cautions that they may not be generalizable.

As I stated in the previous newsletter, I was willing to give replicating Paul and Webb's results a try, having seen a general decline in grade attainment overall, but particularly by some minority students, in my engineering management classes. Here's a preliminary take on how it went:

My class involves a team assignment (planning, but not executing, an engineering project) that begins in week six of the 16-week semester. Because the planning methods used are highly quantitative, it was not possible to achieve the 60% concept 40% execution balance recommended by Paul and Webb (in Wright, 2023). Homework assignments given in weeks three through five were structured to give the students individual practice on the planning exercises needed for the team assignments.

Introducing bi-weekly quizzes with a retake option was straightforward. There was no mid-term exam – the average of the grades on the quizzes and homework assignments to that point was reported as the mid-term

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grade. There was a 25-question comprehensive final exam, with 15 questions from the previously quizzed content (to check retention) and 10 from the last two lectures and associated readings, which had not been quizzed.

I also added another restructuring element in response to student feedback over the years that the 3-hour online format was too long, such that students were having difficulty remaining attentive throughout. Instead, I pre-recorded 1- to 1 ½-hour lectures and gave the students note-taking assignments. These assignments were then used as inputs to 1- to 1 ½-hour online synchronous classes, which included quizzes, discussion of the lecture topics, and review of homework and team assignments.

My implementation of Paul's and Webb's (in Wright, 2023) ideas was not a controlled experiment: there wasn't a group A vs group B treatment condition within the same course. I do, however, have grade and demographic information for students from the previous year that I can use for comparison purposes. Because the semester has just ended, I have not had the chance to statistically analyze the results of this implementation experiment and certainly

not to look at any demographically based differences between the two years, but the preliminary results are encouraging. In 2024 the average grade at mid-term was 89.1 vs 78.3 in 2023; the average final grades were 90.2 vs 84.6 in 2024 and 2023, respectively. (The large jump between mid-term and final grades in 2023 is attributable to the fact that team assignment grades, which typically run in the high eighties to low nineties, are counted as 35% of the final grade but are not included in the mid-term grade.)

On the quizzes, the average grade on the first attempt was 68.0. On the retake, it was 90.9.
Finally, on the final exam, there was an average of 81.7% correct rate on the questions that the students had seen previously vs 66.6% on the new questions. This may be an indicator that the retake option improved retention.

More to come.

References
Wright, K. Restructuring classes can level the playing field. APS News, November 2023, 22 (10).

Forlingieri eyes expansion of INCOSE in Asia, along with Product Line Engineering

By Beth E. Concepción

When you get the invitation to webinars organized by the Product Line Engineering Working Group, you will be seeing the work of Marco Forlingieri. He's one of the many dedicated INCOSE members all over the world who are making a difference in the organization.

For him, joining the group was a logical extension of his career in product line engineering at organizations such as Airbus Group in Germany and IBM Engineering in Singapore, where he has served as Senior Technical Leader for nearly two years.

"INCOSE was a natural decision -- a natural flow when you are in the systems-engineering field as an expert working for big companies," he said. "You need to be in touch with a community of experts -- not just to learn but to give back. [It helps to] increase your knowledge and knowledge of the company."

Forlingieri officially has been a member of INCOSE since 2018, but started participating in events in 2015, shortly after he finished his master's degrees in Business Administration from the University of Twente and Innovation Management and Entrepreneurship from Technische Universität Berlin.

"The network is for me the most valuable thing about INCOSE," he said.

Forlingieri also is Deputy Director of INCOSE's Asia and Oceania Sector. In this role, he says he has two main goals.

"One is to promote product line engineering," he said. "How to boost systematic reuse in system development. How companies can save money with it, and how they can be better at what we do."

His second goal relates to taking advantage of the fact that INCOSE is becoming more and more of an international organization.

"I want to increase outreach from INCOSE," he said. "To give more importance to better reach to this area of the world, the Far East."

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Evolving INCOSE Services to Enhance Member Benefits

By Heidi Davidz

The objective for INCOSE Services is to "provide value through impactful services." The INCOSE Services team continues to evolve structure and content to enhance the value provided to members. Inspired by the Systems Engineering Vision 2035 and the Future of Systems Engineering (FuSE), INCOSE Technical Operations (TechOps) has responsibility to develop technical content, and the INCOSE Services organization has responsibility to deliver that content to members. In Q2, there were some changes to the Services structure. As shown in the graphic below, Events has been moved out of the Services portfolio, and additions include the Job Board, Job Fair, Publications, INCOSE Store, INCOSE.chat, Training, and the Systems Engineering Tools Database (SETDB).

Coming in Q4, the Job Board and Job Fair will provide members improved access to employment opportunities. INCOSE.chat is an artificial intelligence application which will respond to natural language prompts drawing from INCOSE materials, and the minimum viable product is planned for release at the International Symposium in July 2024. A long-standing service, SETDB, has been added to the Services organization to enhance integration with other services.

The grouping formerly called "Community Offerings" has been renamed the "Forum," and this includes Calling All Systems (CAS), Webinars, and Cafes. Improved integration between these offerings is in work. CAS is a talk-show-style INCOSE production to reach a broader audience, with the first CAS of
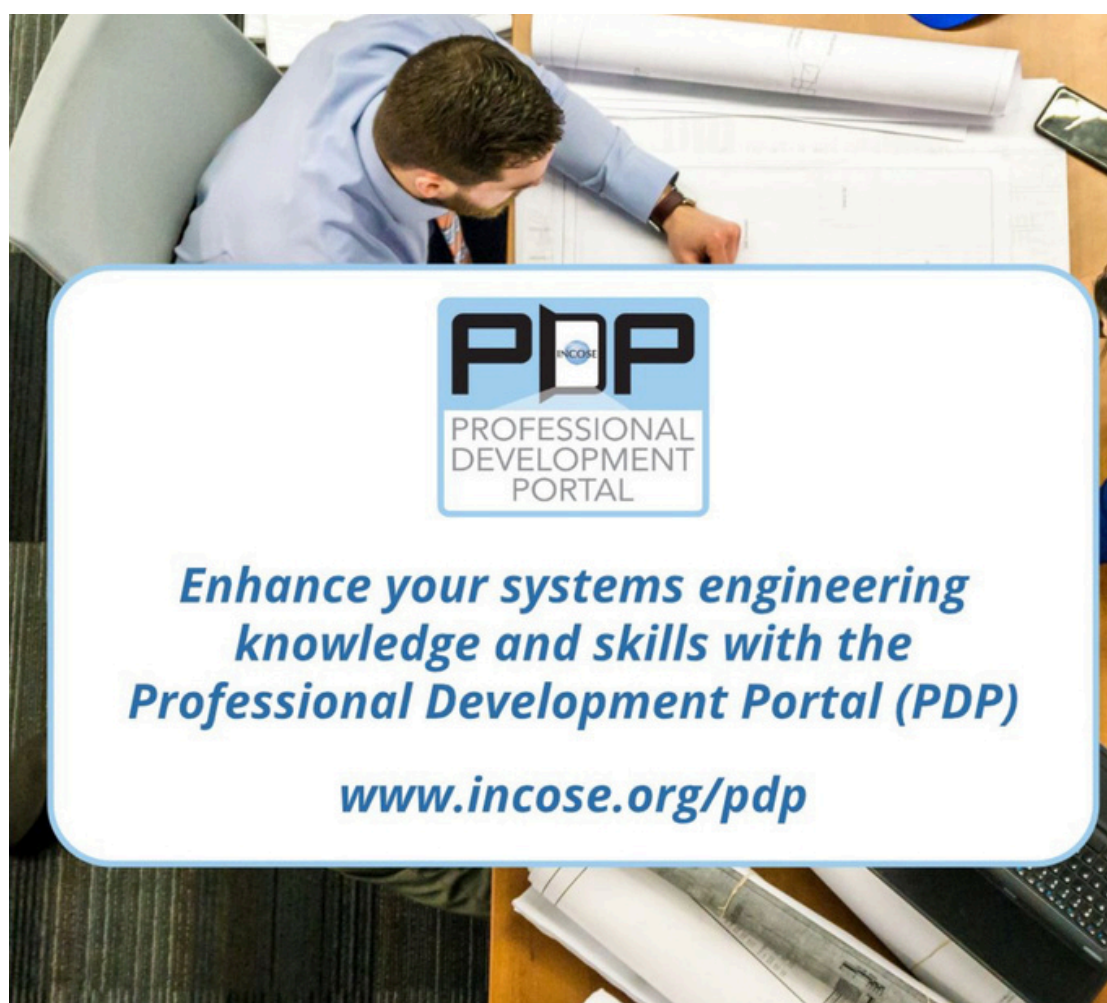
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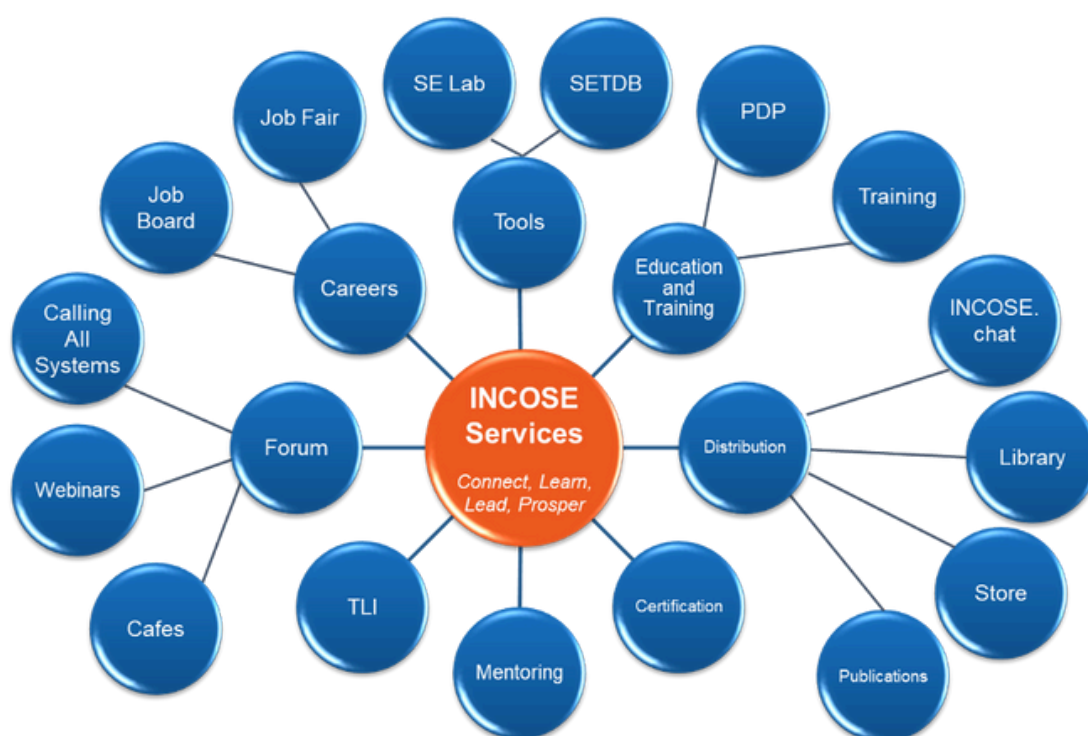
2024 being "Complex, Costly, and Challenging: The Science of Resilient Systems" that was held on 22 May.

Acceptances for Cohort 10 of the Technical Leadership Institute (TLI) have been sent out, and more details can be found in the newsletter article, "Update from INCOSE's Technical Leadership Institute." The Professional Development Portal (PDP) has over 1470 learning resources, and new metrics are now in place. The latest features added are described in the newsletter article, "New Capabilities for the Professional Development Portal." The Certification team continues to pursue new academic equivalencies. Three new universities are in

review with two universities close to approval. The SE Lab continues to add vendors and users. New vendors are highlighted in the newsletter. The Mentoring team continues to enroll new mentors and mentees.

If you have questions on the Services organization or the individual offerings, please do reach out. We encourage you to fully utilize the benefits included in INCOSE membership, and we look forward to continuing to enhance the value and impact these services provide to you in 2024!

Preparing for the INCOSE Systems Engineering Professional (SEP) Certification Knowledge Exam

By Courtney Wright, CSEP, Certification Program Manager

Preparing for the INCOSE knowledge exam? Or just wondering what it's like? Future, current, and past Systems Engineering Professionals (SEPs) of all levels are welcome to take the practice exam now offered by INCOSE's online exam provider.

The practice exam is unproctored, which means you won't get the full exam experience, nor will you pay the full cost associated with bringing in another human to watch you. It is a great chance to interact with online exam questions. This is the first new set of sample questions the certification program has published since 2015, and they follow the new format used for the exam questions. These questions all have four options to choose from, and only one of them is right. These replace the much-hated multiple-selection questions.

The practice exam is only 20 questions long, compared to the standard exam that has 100 scored questions. The standard computer exam also has 20 unscored questions, for a total of 120 questions. Those unscored questions are new questions we are trying out to see how well they correlate with candidates who pass the exam. The practice questions are the rejects from the unscored questions. These questions may have been too hard, too easy, or too similar to existing questions.

On the actual exam, we have a detailed recipe of how many questions we pull from each important topic in the handbook. We don't publish that recipe, but we do list the ingredients in the form of the Learning Objectives flyer. The practice exam questions are like the leftover ingredients, and the number of practice questions on each topic is not representative of how many questions are on that topic in the scored exams.

The practice exam costs $10 for each attempt. We only have a single bank of 20 questions, with an update planned for late 2024. We do not store your results. Unlike on the scored exam, you will be shown your score and you'll be able to check which questions you got right. On the standard exam, you are only told if you passed or failed.

If you are currently a SEP, you are banned from taking the actual, scored exam. But you are welcome to take the practice exam! Its questions are from the hybrid exam, meaning the answers are found in both the Fourth and Fifth Edition of the handbook. We'll continue testing on the hybrid exam until at least the end of 2024. We expect to release a new set of practice questions around the same time we transition to the Fifth Edition exam.

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INCOSE Learning Objectives	INCOSE Systems Engineering Handbook	
	5th Edition	**4th Edition**
Systems Engineering and Life Cycle Overview • Identify systems engineering definitions, principles, and concepts • Define awareness level concepts of systems thinking	Part 1	Chapter 2
Lifecycle Models and Concepts • Define awareness level concepts for lifecycles • Define awareness level concepts of acquisition and supply • Define awareness level concepts of business and enterprise integration *(Includes Infrastructure, Portfolio, Human Resources, Knowledge, Quality Management, and Quality Assurance)*	Part 2	Chapters 3, 5, 6, 7
Technical Management Processes • Define awareness level concepts of planning • Define awareness level concepts of monitoring and control • Define awareness level concepts of decision management • Define awareness level concepts of risk and opportunity management • Define awareness level concepts of configuration management • Define awareness level concepts of information management	Part 2	Chapter 5
Technical Processes • Define awareness level concepts of requirements definition • Define awareness level concepts of architecture definition • Define awareness level concepts of design for systems realization • Define awareness level concepts of modeling and analysis • Define awareness level concepts of integration • Define awareness level concepts for verification • Define awareness level concepts for transition • Define awareness level concepts for validation • Define awareness level concepts for operation and support	Part 2	Chapter 4
Methods and Analysis • Define awareness level concepts of design for quality characteristics • Define awareness level concepts for interfaces	Part 3	Chapters 9, 10
Application Considerations • Define how systems engineering is applied *(Includes MBSE, Agile, Lean, PLE, System Types, Domains)*	Part 4	Chapters 8, 9
Systems of Systems • Define the complexities of a System of Systems	Part 4	Chapter 2
Systems Engineering in Practice • Identify aspects of systems engineering in practice	Part 5	N/A - not on hybrid exam

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SEBoK 2.9 Welcomes New System Security Article

The recently released SEBoK v2.9 introduces a significant update to the System Security article, replacing the previous version with a fresh perspective on this critical sub-discipline of systems engineering. Written by lead author Mark Winstead, and contributing authors Terri Chan and Keith Willett, this article delves into the core concepts of system security within the context of the SEBoK's mission to provide a comprehensive guide to systems engineering knowledge.

What is System Security?

The new article defines System Security as ensuring systems deliver their intended capabilities for intended users while safeguarding against unintended consequences. This definition emphasizes the importance of security throughout a system's lifecycle, from conception to disposal, particularly in "contested operational environments" like cyberspace or the physical world. This revised definition reflects the ever-growing importance of security in today's interconnected systems.

A Transdisciplinary Approach

The article positions Systems Security Engineering (SSE) as a transdisciplinary endeavor. It draws upon principles and concepts from systems engineering, systems thinking, security engineering, and other relevant fields. This integrative approach highlights the need for collaboration between various engineering disciplines to achieve robust system security. Systems Security Engineers (SSEs) are emphasized as integral members of systems engineering teams, working alongside other engineers to ensure security considerations are woven into the fabric of the system throughout its lifecycle.

Personnel Considerations

Personnel is crucial in achieving effective system security. This includes not only the expertise of SSEs but also the security awareness and practices of all personnel involved in the system's development, deployment, and operation. Building a culture of security consciousness within the organization is paramount for successful system security implementation.

The Evolving Landscape of System Security

The dynamic nature of system security adversities is acknowledged. Attackers are constantly evolving, necessitating a proactive loss-driven approach to security. The SEBoK itself is a living document, continuously updated to reflect the evolving field of systems engineering. Similarly, system security practices must also adapt to stay ahead of emerging threats.

Looking Ahead

The new System Security article serves as a valuable starting point for ongoing discussions and advancements in this critical

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field. As systems become more complex, technology continues to evolve, and adversaries become more sophisticated, so too will the practices and approaches within Systems Security Engineering. The SEBoK's commitment to continuous updates ensures that this knowledge base remains relevant and comprehensive, supporting systems engineers in their pursuit of secure and dependable systems.

To read the new System Security article, visit the SEBoK at: https://sebokwiki.org/wiki/System_Security.

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New Capabilities for the Professional Development Portal (PDP)

Since the Q1 Newsletter, there have been two capability updates for the Professional Development Portal: (1) Sorting the Browsing and Searching Results and (2) Sub-Pages to Manage Learning Resources on their Bookshelf.

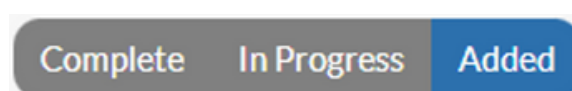## Sorting the Browsing and Searching Results

When the Browsing & Searching the Content Catalog page is opened, the 1470+ learning resources are displayed in a random order. Then, after any browsing & searching, originally the resulting Learning Resource Results Card order will be listed with last added to the PDP first. At the end of March, an "Order" button was added to the top right of the Learning Resource Results cards. This allows the users to determine how they want their results listed, i.e., title alphabetically (A to Z or Z to A) or publication date (oldest to newest or newest to oldest).


Sub-Pages to Manage Learning Resources on their Bookshelf

For INCOSE Members and CAB Associates, there are now 3 sub-pages to manage their Learning Resource Results Cards on their My Bookshelf page -- Complete, In Progress,

and Added. Above the Learning Resource Results Cards, there is a button to "toggle" between the Completed, In Progress, and Added sub-pages. When the user clicks one of the sub-pages, just the Learning Resource Results Cards they have on that page will be displayed.

When users click the "Add to Bookshelf" button on the lower right-hand corner of the Learning Resource Results Cards while on the PDP's Browsing and Searching page, it will go to the "Added" sub-page (i.e., just added to their bookshelf) on their My Bookshelf page. Once the Learning Resource Results Card is on their bookshelf, the bottom right button changes to "Move on Bookshelf." The individual user can now move their cards to the In Progress sub-page, the Completed sub-page, or remove it from their bookshelf.
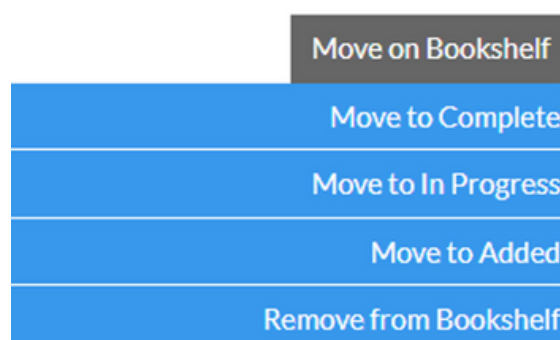
For any questions on the PDP, please contact the PDP PM Kirk Michealson (kirk.michealson@incose.net) or the Services Manager Alex Kowalski (Alexandra.kowalski@incose.net).

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INCOSE SE Lab Tool Vendor Spotlights

The <u>SE Lab</u> is an exclusive online environment provided by INCOSE that allows members to access and use third-party vendors' systems engineering tools. These full version products are intended for non-commercial use related to INCOSE activities and provide a platform for members to gain experience with industry-standard systems engineering tools without having to purchase them individually.

A few examples of the tools available to members are:

Spec Innovations Innoslate

<u>Innoslate</u>, the first web-based MBSE tool, was developed by SPEC Innovations to support the entire system or product lifecycle. It simplifies system or product development while reducing time-to-market, cost, and risk. This cloud or on-premise application uses a modern web browser, with an intuitive graphical user interface.

SPICY SE

<u>Spicy SE</u> is an all-in-one solution for the Core of Systems Engineering. Develop along the complete V-cycle in one comprehensive tool that is so easy to understand and use that everyone—systems engineering experts as well as all other members of the development team—will happily use it.

Trace.Space

<u>Trace.Space</u> is an AI-enhanced requirements management tool that accelerates product development with robust traceability, time-based & custom versioning, item level attributes, and flexibility to adapt to workflows.

Vitech GENESYS

<u>GENESYS</u> is an integrated model-based systems engineering software tool that comprehensively covers all four domains of systems engineering (requirements, behavior, architecture, and V&V) and much more.

Visit the <u>INCOSE SE Lab</u> to try any of the above-mentioned tools and to view the full list of SE Lab Tools.

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AI4SE

By Dr. Steven Dam, President of SPEC Innovations

AI4SE or Artificial Intelligence for Systems Engineering has been a topic of interest to the systems engineering community for many years. IBM popularized it over a decade ago with their Watson product. The form of AI that Watson uses is Natural Language Processing or NLP. The figure below shows the NLP pipeline (1), which shows how NLP algorithms read and understand human language.
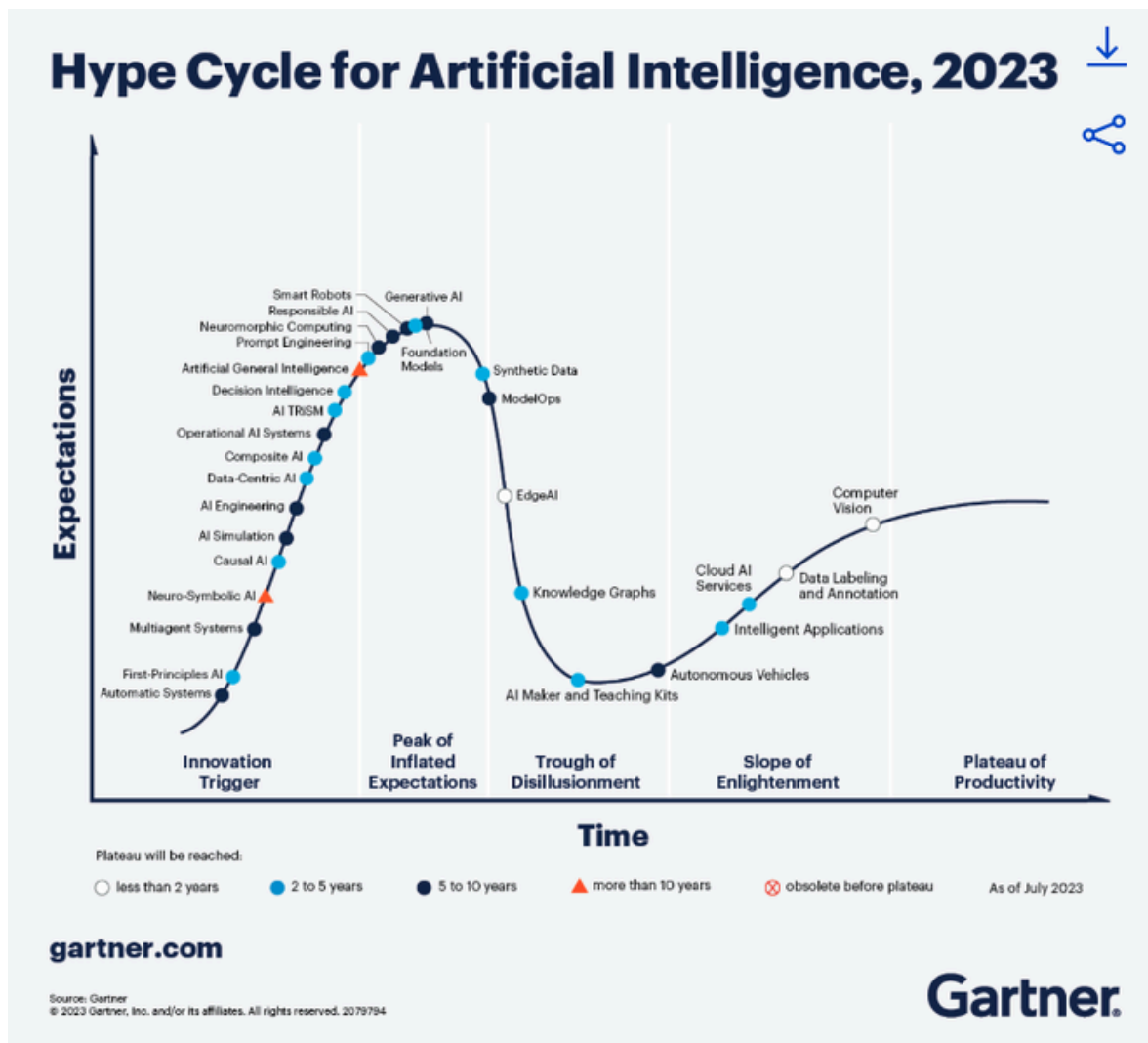
In these steps, the algorithm:

- divides the entire paragraph into different sentences
- breaks the sentence into separate words
- analyzes the parts of speech to figure out what exactly the sentence is talking about
- removes inflectional endings and returns the canonical form of a word
- considers the importance of each word in the sentence to focus on the most important words finds out how all the words in a sentence are related to each other

- tags verbs, adverbs, nouns, and adjectives that indicate the meaning of words in a grammatically correct way

So, how does NLP aid the systems engineer? One of the common applications of NLP is to aid in assessing the quality of requirements. The INCOSE Requirements Working Group has developed several quality measures that can be used to determine if a requirement is clear, complete, verifiable, etc. Several tools, including Watson, Innoslate, QVscribe and RQA, use NLP to check the quality of requirements today. Other uses of NLP in tools today include checking for model validation heuristics and requirements traceability. But NLP has proven to be somewhat limited.

The exciting "new" branch of AI, Generative AI or GAI uses large language models (LLMs) to provide creative responses to queries. GAI is current at the top of the "hype curve" (2).

Natural Language Processing Pipeline

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
Sentence segmentation	Word tokenization	Stemming	Lemmatization	Stop word analysis	Dependency parsing	Part-of-speech tagging

Turing

Hype Cycle for Artificial Intelligence, 2023

Dr. Barclay Brown, former INCOSE CIO and currently the Associate Director for AI Research at Collins Aerospace, has made many presentations on the use of GAI, including several sessions at the recent INCOSE International Workshop. His recent book, Engineering Intelligent Systems, discussed the "challenges and opportunities in the use of artificial intelligence to create better technological and business systems." (3)

We at SPEC Innovations have just completed a NASA STTR with George Mason University that has investigated the GAI capabilities of several platforms, including ChatGPT and ClaudeAI. As a result of that work, ChatGPT was integrated

into Innoslate to enable systems engineers to explore its use in a systems engineering environment. Innoslate is now available with this capability to the open AWS Cloud users of the tool, including students and INCOSE Working Groups. Innoslate was recently added to the new INCOSE SE Lab capabilities, which was spearheaded by Dr. Brown in his CIO role. We recommend trying it out yourself and seeing what you can create.

SPEC Innovations also sponsored a Capstone project at GMU in the Fall of 2023. The title of this project was "A Proposal for Integrating Generative AI into Innoslate (4)." Although the students focused on Innoslate, the lessons learned from this project should

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be of value to other tool vendors, researchers, and practitioners. As SPEC Innovations had already created the initial ChatGPT integration, which included training the GAI on the Innoslate Help Center to provide a natural language intelligent chat capability for helping find information about how to use the tool, the objective of the project was to "explain the potential of integrating generative AI within Innoslate. By bridging the capabilities of generative AI with Innoslate's robust structure, *the project aims to unveil a vision where tasks and processes are not just facilitated but revolutionized* (5)" [emphasis added]. The report goes on to say, "Through this project, our objective is not to delve into the intricate technicalities of the integration but rather to present a compelling narrative of the "what"—the change that could reshape the user experience within the system."

This research looked at the potential to enhance support to a wide variety of stakeholders, including end users, product development teams, decision makers, training and support teams, clients and partners, competitors, and potential investors. The expected benefits from this research include enhanced efficiency, improved accuracy, personalized user experience, future-proofing the software, cost savings in the long run, enhanced decision-making, boosting innovation, and strengthening market position.

The results from this work provided several opportunities. Some of those opportunities are specific to Innoslate, so I won't discuss them here. However, there were several that should be of general interest to the community.

The first of these was the use of GAI in generating quality scores and recommending changes. Although Innoslate already does some of this, specific suggestions to break up a paragraph or sentence into separate requirements or rewording the requirement to enhance the quality would provide a more complete solution to poor requirements. It could also enable the user to specify new rules that would apply their standards to the evaluation. In particular identifying a threshold, e.g. 70% score, as acceptable.

Another opportunity was to use GAI to create diagrams and enhance the layout automatically. A companion tool to Innoslate, Sopatra, already does some of this using NLP algorithms developed in house as part of a NASA STTR project, but the GAI has the potential to greatly enhance this capability. They suggested a modeling assistant that could:

"1. Transforms user descriptions into graphical representations.
2. Modifies and extends existing diagrams based on user requests, establishing new relationships and associations.
3. Offers guidance to users for enhancing their diagram descriptions or improving the diagrams themselves.
4. Follows the user-specified numbering scheme for diagram elements."

A final one I will mention is related to verification and validation (V&V). We have seen that the GAI we currently use (ChatGPT) can provide the steps for the V&V method suggested, including specific test processes that could be used to verify a requirement. This capability can be used to generate test cases as the requirement is being finalized. Doing so we ensure that the requirement is verifiable! It will also enable a more complete and rapid development of

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V&V plans, which we streamline the right side of the "V."

I am personally committed to continuing this research and development of products that can enhance how we do systems engineering now and in the future. We support the INCOSE Future of Systems Engineering (FuSE) initiative as well for this reason. Systems engineers need to embrace these new technologies to remain relevant in a rapidly changing world. If we don't, we will be left behind and the discipline will suffer, as will society as it has been proven when systems engineering is ignored, systems fail and they often fail catastrophically!

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INCOSE International Events

By Donna Long, AscD Events, donna.long@incose.net

What better way to spend the first week in July than to join your fellow systems engineers at the International Symposium (IS) happening in Dublin, Ireland. The event takes place 2-6 July at the Convention Centre of Dublin located near the iconic Harp bridge on the river Liffey. The main technical event is occurring Tuesday through Friday with tutorials held on Saturday, 6 July. I hope to see you there.

If you cannot make it to Ireland, you can still join the conference. Our virtual content includes broadcasted content from the in-person event Tuesday through Friday as well as three tracks of dedicated virtual content Tuesday through Thursday following the in-person program. All broadcasted presentations will be made available on the platform within 24 hours of broadcast so you can watch it on demand.

The technical program for the in-person program includes:

- 4 invited keynotes (full plenaries will be broadcast)
- 4 full days of technical content, 6 tracks each plus posters (2 tracks will be broadcast)
- dedicated tracks addressing MBSE, verification and validation, artificial intelligence, education, sustainability, technical leadership, and much more
- 7 tutorials on Saturday (in-person only)
- 3 days of virtual presentations to complement the hybrid sessions broadcast from Dublin

All in-person and virtual attendees will have access to all IS recordings from the INCOSE Content Library after the platform closes including both broadcasted and non-broadcasted recordings. More information, including the IS registration link, is available from the IS website at https://www.incose.org/symp2024.

International events in 2025 begin with the International Workshop (IW) in Seville, Spain 1-4 February. The IW team is working diligently to shape a dynamic agenda as we work together to advance the state of the art, the state of the practice, and the state of INCOSE. Then the IS will travel to Ottawa, Canada in late July. Submissions for the IS will be due 30 November 2024.

There are many local and regional events happening around INCOSE. Look for more information on these events from the INCOSE events webpage. Please let us know if you are planning an event using https://app.smartsheet.com/b/form/8755a0e866854485b7ffb8b9ec9aa02c. We can help with resources and getting the word out!

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Upcoming Events

INCOSE UK Annual Systems Engineering Conference 2024
5 - 6 November 2024
Edinburgh, Scotland

INCOSE International Symposium 2024 (IS2024)
2-6 July 2024
Dublin, Ireland

Nordic Systems Engineering Autumn Tour 2024
16-18 September 2024
Oslo (Norway), Stockholm (Sweden), Helsinki (Finland)

7th Annual INCOSE Western States Regional Conference
19 - 21 September 2024
Albuquerque, New Mexico

INCOSE Human Systems Integration Conference 2024
27 - 29 August 2024
Jeju, Korea / Hybrid

Thailand Systems Engineering Conference 2024
4 - 9 August 2024
Bangkok, Thailand

Systems Engineering Test and Evaluation (SETE) Conference 2024
22 - 25 September 2024
Melbourne, Australia

7th Annual INCOSE Western States Regional Conference

📅 19 - 21 September 2024

📍 Albuquerque, New Mexico

Sponsor WSRC 2024

INCOSE Members Newsletter

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Editor: Honor Lind, newsletter@incose.net

Member Services: INCOSE Administrative Office info@incose.net
+1 858 541-1725
On the Web: www.incose.org
Article Submission: newsletter@incose.net

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• Q1 2024 Newsletter: 15 February 2024
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• Q3 2024 Newsletter: 15 August 2024
• Q4 2024 Newsletter: 15 November 2024

For further information on submissions and issue themes, visit the INCOSE MarCom website: www.incose.org/marcom

Who are we?
INCOSE is a 23,000+ member organization of systems engineers and others interested in systems engineering. Its mission is to share, promote, and advance the best of systems engineering from across the globe for the benefit of humanity and the planet. INCOSE charters chapters worldwide, includes a corporate advisory board, and is led by elected officers and directors.
All views expressed in this Newsletter are the writers' own and do not reflect the views of INCOSE.

Content Manager and Copy Editor: Kelly Henseler
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A Better World Through a Systems Approach

7670 Opportunity Rd, Suite 220
San Diego, CA 92111-2222
USA

info@incose.net
www.incose.org
+1 858 541-1725

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