

# MEMBERS NEWSLETTER

March 2020 - Q1



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Azad Madni Receives IEEE Aerospace and Electronic Systems Pioneer Award • Improving the Odds of Achieving  
Excellence at Startup Companies • INSIGHT Preview • Note from the Editor

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# President's Corner

Kerry Lunney

[kerry.lunney@thalesgroup.com.au](mailto:kerry.lunney@thalesgroup.com.au)



## Welcome to 2020 – A New Decade!

It is hard to believe we are now at the start of the 3<sup>rd</sup> decade of the 21<sup>st</sup> century. What may it hold for each of us? In addition to our desire for peace, the end to poverty, food for all, a healthy existence, and a sustainable world, as Systems Engineers what may be our aspirations? There is no doubt this will be different for each of us. What is certain is change – transformation in how we carry out our work, how we

communicate, what technologies will start to dominate, to name a few. And, this will all occur under a more sustainable astute and environmentally aware world.

As such, I foresee some pivotal changes within INCOSE as we adapt, grow, and influence systems engineering and related systems fields.

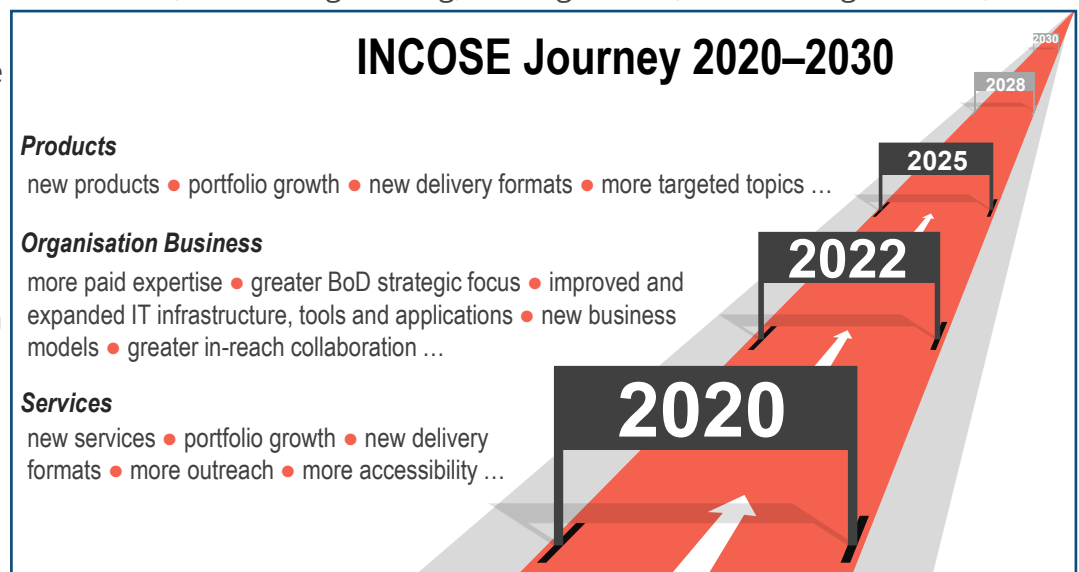
When I look back to what I was doing 10 years previously, I was on a rapid learning curve on Computer-Based Train Control (CBTC) systems for metro style, driverless train solutions. If you asked me prior to 2010 if I would work in this field as part of my systems engineering activities, the answer would have been no. However, time, technology, and circumstances dropped me into this domain. Moving forward in time, this led to my increase in international INCOSE activities, from a panel participation in 2012 to now, as your President for 2020-2021.

As such, I wonder what will I work on, or with, over the next 10 years? What will this decade of transformation mean to me? Working with enhanced Artificial Intelligence (AI) will be the norm and I am looking forward to this as a practitioner in my field. My outreach to research, tools, and products will expand. Modelling, simulation, experimentation, and virtual realities will see more use and deployment as we embrace the digital world and digital transformation becomes “a thing of the past.” How exciting will it be to use quantum computing! Turn this around and think what offering these in our solutions we develop would be like. We will probably deliver such solutions under a wider set of life cycle frameworks and relationships than what we have today.

I expect my “day in the office” will be a rarity as the remote home office takes over. Likewise, telecommunications, virtual meetings, and remote collaborations will dominate. Going to a location will only be necessary when it is critical to be on location no matter if it is for validating a solution, piloting a program, carrying out maintenance, conducting training, holding classes, undertaking research, or holding an event.

If this is what is instore for us in our world of systems and systems engineering then INCOSE will need to continue to transform over the next 10 years with pivotal changes in numerous areas.

Our Products will progress with an increased portfolio and the delivery content taking many



forms to match the pace of the outreach and in-reach required. The production of short, concise, and targeted topics will prevail. Different formats for providing the same content will include video (blogs, YouTube equivalent and other on-line formats), text, simulations, and virtual realities.

Our Services will have a greater accessibility worldwide utilizing remote on-line applications. Our events, including our flagships, the International Workshop (IW) and the International Symposium (IS), will endure but “not as we know them” today. Attending an event may include participants attending in real-time remotely, in real-time locally, and in offline/ asynchronous mode. Similar to the expansion of the Products portfolio, so will our Services portfolio increase. The last 10 years have seen our Certification Program establish and grow to an internationally recognized and valued qualification. This next decade we need to focus on Education and Training (E&T) to develop and offer E&T services through on-line formats.

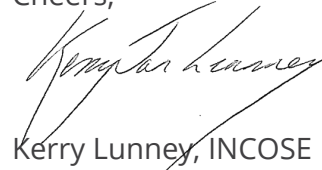
INCOSE's Organization Business will evolve to use more paid expertise for non-Systems related activities, thereby providing increased opportunities for our members to volunteer for activities they have the expertise and/or passion for. Focusing on and supporting the INCOSE infrastructure, tools, and applications is paramount to operate in a digital world. Collaboration, not isolation, is key within INCOSE for all working groups, chapters, and

other communities of interest. Employing new business models will likely better support our operations, our membership growth, our offerings, and our benefits to members. As INCOSE grows and the world changes, INCOSE's Organization Business that has served us well from conception will not likely remain as is.

Now you may ask “how is this all possible”? What can INCOSE achieve over the next few years? We continue to refine long term strategies and execute near-short term activities. You may think this is “business as usual” and partly so, however, we need to keep driving forward on transformations related to Product, Services, and Organization Business. As such I am currently working alongside the Board of Directors focusing our priorities for 2020 and into 2021 on these transformations.

Over the next 2 years I will report our progress as we start our journey in this decade. As INCOSE members – come join us – there are many areas you can participate in from a few hours to many, from a once-off participation to an on-going effort. We always welcome and appreciate your energy, expertise, and drive.

Cheers,



Kerry Lunney, INCOSE  
President 2020-2021

### ***A Message from the President***

Dear INCOSE Members,

It has been three weeks [since the last time I sent a message to our INCOSE family](#) regarding COVID-19. Since then it has become a pandemic with many countries, organisations and businesses introducing new restrictions and guidance to minimise the rapid spread of the virus. The fact is the COVID-19 will be with us for quite some time and all measures taken to date will “flatten the curve of infected numbers” but potentially extend the duration of COVID-19. We therefore need to take care of our families and friends and remain positive under these trying times.

Firstly, from the INCOSE leaders, our hearts and thoughts are with you all. We would also like to send a big thank you to all our members and their families who are able to continue to offer services to their communities, whether they are “front-line responders,” the engineer on a critical project, the local transport provider or the retailer. Your contributions are outstanding.

To all members of INCOSE we encourage you to follow the guidance provided by your authorised authorities and the World Health Organisation (WHO). As such the following restrictions now apply:

- INCOSE is prohibiting all INCOSE related meetings and external INCOSE representation

requiring air travel, whether domestic or international, without approval from the INCOSE Officers until 31 May 2020, at which time this restriction will be reviewed.

- INCOSE highly discourages any INCOSE related face-to-face meeting and the decision to hold such a meeting is at the sole discretion of the INCOSE meeting organiser.
  - We encourage you to consider alternative means of communication available such as conference calling.
  - Social distancing and good hygiene practices are to be employed where practical.
- Any external INCOSE representation in support of another organisation's face-to-face meeting is at the individual member's discretion.

In parallel to the above restrictions, we have been working hard behind the scenes to support all our INCOSE activities and members.

We have a task team evaluating different remote participation applications to be made available for all members for all INCOSE related meetings, worldwide. It is likely we may have more than one recommended application with guidance on which application is best suited for a specific virtual participation, location and volume of users.

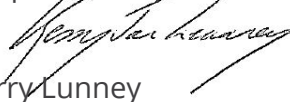
We are assisting various groups within INCOSE to restructure their programs, events and meetings to make greater use of remote participation and, where possible and practical, to reschedule events later in the year. If you need assistance, please reach out to [helpdesk@incose.org](mailto:helpdesk@incose.org).

We are keeping a close eye on the changing circumstances in Cape Town and globally with respect to the International Symposium IS 2020, July 2020. At present, the South African government has placed restrictions on travel and gatherings until further notice, which can prevent us holding IS 2020 in Cape Town. However, from further discussions these restrictions may or may not continue past May. It is unknown at this point in time. As such we are continuing to plan the event taking into consideration:

- The possibility of virtual participation for some sessions,
- A smaller scale conference with greater outreach post conference date,
- Additional hygiene services at the event,
- The possibility of delaying the event,
- Exploring options to publish finalised papers in various online proceedings.

The wellbeing of our members is our highest priority. We will continue to closely follow the recommended health and safety precautions. Likewise, we will keep you informed on a regular basis of any updates relating to COVID-19.

Keep well, keep safe.



Kerry Lunney  
INCOSE President





**30<sup>th</sup> Annual INCOSE**  
international symposium

Cape Town, South Africa  
July 18 - 23, 2020



# Mark your calendar now! July 18 - 23, 2020

## SPONSOR INCOSE IS 2020!

- 1** Unique brand of recognition and visibility for your organization
- 2** Access to the latest thinking relevant to the practice of Systems Engineering
- 3** Put a spotlight on your organization's competency in Systems Engineering
- 4** Be associated with the highest culture of professionalism and innovation
- 5** Demonstrate organizational support to INCOSE's mission
- 6** Develop sustainable business relationships



## EXHIBIT at the INCOSE IS 2020!

- Be associated with the highest culture of professionalism and innovation
- Access to the latest thinking relevant to the practice of Systems Engineering
- Put a spotlight on your organization's competency in Systems Engineering
- Develop sustainable business relationships

**16 642**  
SQ FT

**4**  
DAYS

**2**  
SOCIAL EVENTS

**11**  
BREAKS & LUNCHES

**Lots of possibilities to interact with systems engineering communities**

Visit [www.incose.org/symp2020](http://www.incose.org/symp2020) and contact us **TODAY** - The IS2020 Organizing Team

# Notes from the Board

Lisa Hoverman, [marcom@incose.org](mailto:marcom@incose.org)

The INCOSE Board of Directors (BoD) held their first quarter meeting in Torrance, CA at the INCOSE International Workshop. The focus of this BoD meeting starts with the Board holding five Strategy Sessions with current and past involved INCOSE leaders and members. The Strategy Sessions aimed at improving Events Attendance and Access, Membership Engagement, Standards Participation, Getting the Most from Our Strategic Alliances, and the Future of Systems Engineering (FuSE). Outcomes from these strategy sessions set focus and direction for INCOSE for the coming year. We inducted five new Board Members onto the INCOSE Board of Directors in the opening plenary session of the International Workshop, their pictures and titles are below. Our Q1 BoD meeting focused on strategy for 2020, including each Board Member's priorities for 2020 and on our ongoing preparations for our 30<sup>th</sup> Anniversary. Other important topics covered were details for the IS, and our special initiatives, specifically working on some of the Engineering Grand Challenges that align with the United Nation's Sustainable Development Goals.

A few other highlights of the meeting included:

- The Board reviewed the excellent work of the Product Accessibility Task Team, whose recommendations are helping to make INCOSE Products more accessible to all who wish to use them.
- Bob Kenley, chair of the nominations and elections committee reported on open positions that they are actively recruiting to fill for expiring terms in 2020. The open positions are:
  - Secretary (Term: 2 years)
  - Chief Information Officer (CIO) (Term: 3 years)
  - Director for Outreach (Term: 3 years)
  - Director for Asia-Oceania (Term: 3 years) (Only Asia-Oceania Chapter Presidents are eligible to vote on this position)
- The Board reviewed the following on-going initiatives in detail:
  - Corporate Advisory Board (CAB) Needs—International vs. Local CAB
  - Chapter Circle Awards
  - Grand Challenges
  - INCOSE Fellows Slate for 2020
  - Upcoming Events
  - Vision 2035
  - FuSE

In a subsequent remote BoD meeting, the BoD made the decision to move the Q2 BoD meeting from Singapore to Detroit due to worry over COVID-19, and to approve updates to the INCOSE Bylaws. These are posted [on the INCOSE website](#).

## 2020 INCOSE Officers and Directors



**President-Elect**  
**Marilee Wheaton**  
Systems Engineering Fellow  
at The Aerospace  
Corporation, a FFRDC



**Director for EMEA**  
**Lucio Tirone**  
Sr. Systems Engineer  
in Fincantieri S.p.A.,



**Director for Academic Matters**  
**Bob Swarz**  
Professor of Practice and  
Co-Director of the SE Program at  
Worcester Polytechnic Institute



**Director for Strategic Integration**  
**Tom McDermott**  
Dpty. Director of the  
SERC at Stevens Institute  
of Technology



**Treasurer**  
**Mike Vinarcik**  
Chief Solutions  
Architect at SAIC

**By Laws Change was Approved**  
One appointed director position shall be the Services Director. The Services Director shall be nominated by the President and approved by majority vote of the Board of Directors. The term for the position shall be 2 years.

# INCOSE Secretary Update on Membership Engagement

Kayla Marshall, INCOSE Secretary, [secretary@incose.org](mailto:secretary@incose.org)

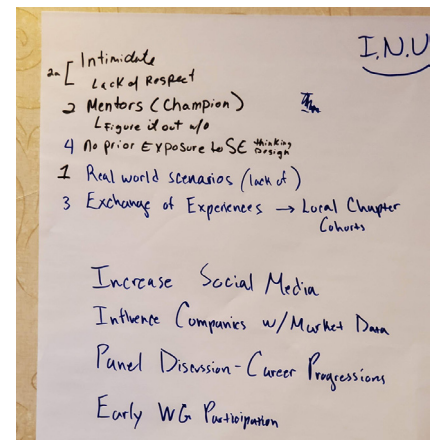
**H**ello all! During the past year the INCOSE Membership Engagement Team strongly considered improved approaches to meeting the needs of our membership. INCOSE has various membership types that seek value in Systems Engineering in many ways. Through surveys and questionnaires, strategy sessions focused on membership feedback and value, and professional research on the behavior of our members we learned a few key components to engaging our members: provide well informed initial engagement with our new members to aid their transition into active membership, provide a more tailored guided engagement to our members who are new to the discipline of Systems Engineering with a more direct network for these members to develop the systems engineering skillsets they desire, and communicate INCOSE value in the systems engineering discipline better. As a result, we formed the following membership engagement initiatives.

## Systems Engineering Early Career Professional (ECP) Network and Task Team

To prepare the current and future work force of systems engineering professionals, INCOSE must educate, nurture, and grow the early career systems engineering professional. In 2019 INCOSE kicked off the Systems Engineering Early Career Professional (ECP)

network at IS2019 in Florida. We created the ECP network to provide systems engineers new to the discipline a means to meet one another and to form a network to navigate the systems engineering discipline, INCOSE and our systems engineering interests, together, as we navigate our careers to experienced engineers. In addition, we formed the ECP task team. The task team's focus is to identify the needs of systems engineering ECPs and to develop and implement initiatives to meet those needs within INCOSE. Members of the ECPs Task Team will work along with the INCOSE Membership Engagement Team and INCOSE Board of Directors to implement these initiatives throughout the year while developing their personal leadership skills.

During the INCOSE International Workshop (IW) 2020, we organized two events to engage systems engineering ECPs attending the workshop. The first event was a networking session which provided a causal environment for the ECPs to get to know each other and build a professional network. The second event was a focused discussion on engaging ECPs to shape the future of INCOSE by identifying challenges specific to the ECP demographic and what products INCOSE needs to create to enhance the ECP experience. INCOSE Secretary, Kayla Marshall and ECP Assistant Director (AstD) Ali K. Raz divided the ECPs into three different groups and led them into a guided discussion



INCOSE IW 2020 Early Career Professional Working Session.



*Ali Raz, AstD of ECP Engagement and Don Boyer, AscD of Membership Engagement at INCOSE IW2020 ECP working session.*

and brainstorming session to identify the challenges faced by ECPs in their systems engineering career and ideas on how INCOSE can help ECPs achieve their career goals. One item highlighted by the ECPs was to create an ECP social media presence and recognize ECPs as a demographic within the systems engineering community. The Board of Directors (BoD) chartered the INCOSE ECP task team to create products and opportunities for ECPs; the

task team will be working on addressing these ideas and identified a social media lead for the group.

If you're new to the systems engineering discipline, a student, consider yourself an early career systems engineer and would like to join the ECP network or the ECP Task Team please contact the ECP AstD Ali Raz [akraz@purdue.edu](mailto:akraz@purdue.edu) or the INCOSE Secretary at [secretary@incose.org](mailto:secretary@incose.org).



## INCOSE Value Proposition Initiative

Juan P. Amenabar and Ken Harmon lead the Value Strategic Initiative (VSI). Chartered at IW 2019 as a priority of the Corporate Advisory Board (CAB), this initiative is to distill the core characteristics of a value proposition, identify the needs of the systems engineering community, and develop and maintain INCOSE value statements, *Figure 1*. The value statements and products development from this initiative will communicate and promote the value of systems engineering and INCOSE, INCOSE products, membership, and certification within and outside of INCOSE leading to improved member engagement for membership growth and retention.

### New Member Welcome Series

Associate Director of Membership Engagement, Don Boyer, revamped the new member welcome email series. As new members join, we aim to provide them a guided tailored introduction to the systems engineering discipline, INCOSE value, and ask them for continuous feedback on how to improve their experiences with INCOSE and systems engineering career development. As the introductory emails improve, these

emails will target member systems engineers' interests and supply a more direct line of engagement to an individual's needs. The emails consist of messages from INCOSE leadership including the President, President-Elect, and the Director of Technical Operations detailing INCOSE value, events, working groups of interest, and how to become an active member of the INCOSE community.

### INCOSE Membership Engagement

Volunteer to support membership engagement by being a Membership Engagement Ambassador. This is an opportunity for you as members to aid in the growth of INCOSE by sharing your experiences and engaging the systems engineering community. Become a Membership Engagement Ambassador or volunteer on as needed basis to support INCOSE and INCOSE-sponsored events or local systems engineering events in your local communities.

If you're interested in how you can volunteer to support the INCOSE BoD in Membership Engagement or for more information on these initiatives contact Kayla, the INCOSE Secretary at [secretary@incose.org](mailto:secretary@incose.org).

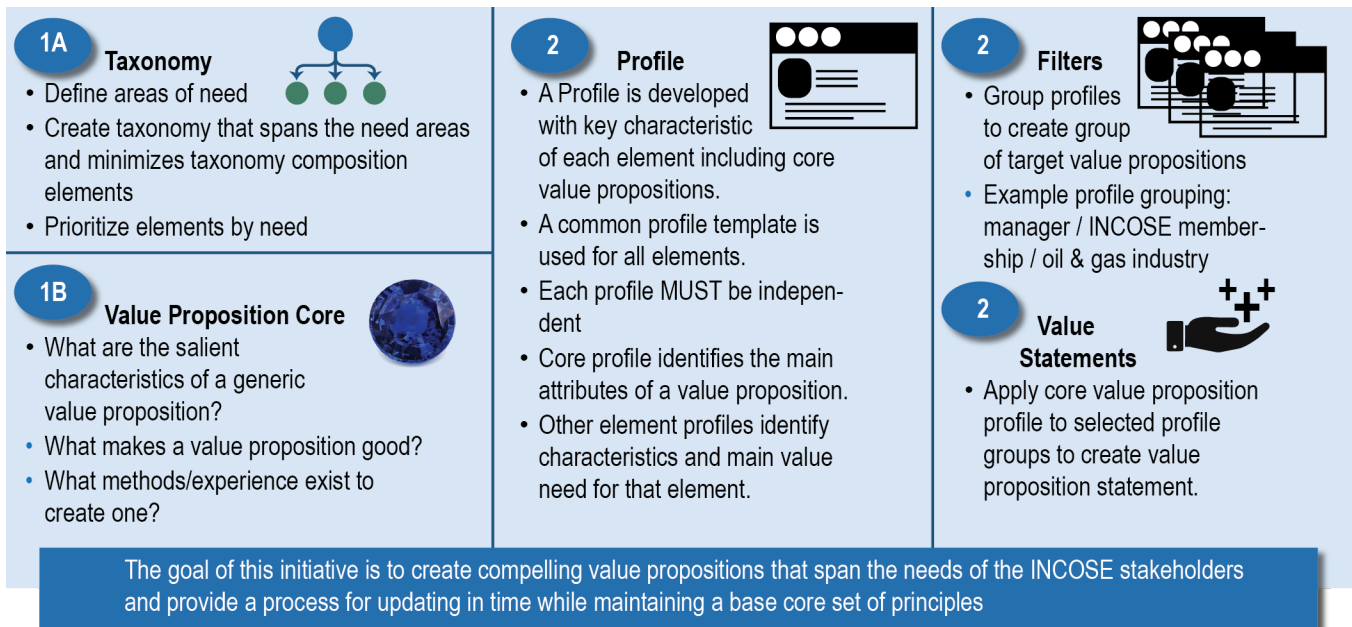


Figure 1. INCOSE Value Proposition Initiative

# Sector Updates—Americas

## *Systems Engineering Fellowship Program for Federal Workforce*

For a few years, MITRE has been developing a fellowship program for federal workforce offering an immersive, 12-month practical and academic experience to enable the next generation of government technical leaders to design and sustain systems of critical national importance. MITRE's Systems Engineering Fellowship program, designed for government employees, integrates interdisciplinary, hands-on project and research experience in Systems Engineering at MITRE, with a systems engineering degree from the University of Virginia (UVA) Accelerated Master's Degree Program.

The inaugural cohort graduated May 2019 with seven participants working on various projects. Program participants work on numerous projects across government sectors including civil systems, cybersecurity, defense and intelligence, data analytics, and model-based engineering. The sponsoring federal organization would pay tuition to University of Virginia along with employee salary and travel/relocation costs for the year.

If you are a Federal Employee and looking to accelerate your career, by solving hands-on and



agency applicable challenges, and earn your Master's Degree from UVA, please talk to your career manager and contact [SEfellows@mitre.org](mailto:SEfellows@mitre.org) to learn about the application process. The deadline to apply for the next cohort is April 15, 2020.



# Postponed



# SETE

SESA | 25TH ANNIVERSARY

SYSTEMS ENGINEERING TEST AND  
EVALUATION CONFERENCE 2020

Connect with system engineers from  
around the world at SETE 2020 in  
Brisbane, 11 – 13 May.

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Sponsorship opportunities available  
[www.sete2020.com.au](http://www.sete2020.com.au)

## ***INCOSE-LA Report, Feb 17, 2020***

The INCOSE-LA's February Speaker meeting occurred on February 11, 2020. Members met at several locations to hear Dr. J. Shelley, a professor at California State University, Long Beach (CSULB), present "A Systems Engineering Approach." The presentation detailed a thought experiment examining CSULB's Antelope Valley Engineering Programs (AVEP) through systems engineering tools and perspectives to develop insight into its education and business practices. On Saturday, February 22, 2020, the board and others met for the first Strategic Planning Meeting (SPM) of the year to discuss our plans for 2020, training new officers, and the overall operation of the chapter.

Monday January 27<sup>th</sup> the INCOSE-LA Chapter happily hosted a soiree at the Torrance Marriott where our members could network with INCOSE members attending the International Workshop. The LA Chapter is grateful to Dassault Systèmes and NoMagic for hosting the event and to INCOSE board members who were able to attend, including Marilee Wheaton, one of our own, the new INCOSE President-Elect. Congratulations Marilee.

Tuesday January 21, 2020, the chapter met at The Aerospace Corporation to induct the officers of the year. We were fortunate to have Dr. Azad Madni, INCOSE Fellow and Lifetime member, perform the induction. Following the induction of officers, the 2020 President, Dr. Mark McKelvin, opened discussions about how the chapter could improve and become more contemporaneous as it works to be the

go-to destination for systems engineering professionals and organizations in the Los Angeles Region.

December 7, 2019, INCOSE-LA Members and guests met at The Renaissance Long Beach Hotel to celebrate the holiday season. President, Dr. Mark McKelvin, recognized the board members and their contributions to a successful year of events and tutorials serving the systems engineering community of Southern California.

INCOSE-LA is actively working on conference committees for two conferences in 2020. The first one will be March 19-21 at the elegant Crowne Plaza Hotel in Redondo Beach. Systems Engineers from around the world will meet to present their research in systems engineering. This 18<sup>th</sup> CSER focuses on exploring recent trends and advances in Model-Based Systems Engineering (MBSE) and the synergy of MBSE with simulation technology and digital engineering. Learn more about it and register to attend CSER 2020 at our website: [www.cser2020.org](http://www.cser2020.org) The Western States Regional Conference 2020 will be held in Seattle on September 17-19. We are currently accepting proposals to acknowledge and celebrate successful applications of Systems Engineering in the Puget Sound area and Western USA and identify future activities of potential value. Please see our website here for more information about how to submit your proposal: [www.incose.org/wsrc2020](http://www.incose.org/wsrc2020)



*Knowledge and Camaraderie shared at the INCOSE International Workshop*

# Sector Updates—EMEA

**INCOSE UK Granted Licensed Member Status**



INCOSE UK Ltd has received approval to become a Licensed Member of the Engineering Council (having previously held Professional Affiliate status).

INCOSE UK, licensed by the Engineering Council, assess candidates for inclusion on the national register of professional engineers and technicians as Chartered Engineer (CEng), Incorporated Engineer (IEng) or Engineering Technician (EngTech).

INCOSE UK President, Kirsty Akroyd-Wallis, stated "Our volunteers, INCOSE UK Council and Secretariat have worked hard to ensure the processes and systems are in place so we can offer our members the opportunity to become professionally registered via their home institute. We have been strongly supported by the Engineering Council in this endeavour over the past 6 months and we are delighted to have been successful. It is an honour to be awarded Licensed Member status of the Engineering

Council and is a sign of how INCOSE UK has developed since its creation in 1994." Applications are accepted with immediate effect.

## **ASEC 2020**

INCOSE UK is pleased to announce the Annual Systems Engineering Conference (ASEC) 2020 will be held at Heythrop Park Resort, Oxfordshire on Tuesday 17<sup>th</sup> and 18<sup>th</sup> November 2020.

This year's conference theme is: "*The Challenges of contemporary Systems Engineering.*"

This includes exploring the following sub-themes.

- Integrating with new disciplines
- Developing new competencies
- Evolving current practices
- Exploiting emerging technologies and techniques

ASEC 2019 was a major success, welcoming numerous first-time delegates. This year we aim to develop and grow the ASEC event further by providing varied modern and unique presentations, tutorials, and research posters.

To keep up to date with the latest ASEC news and updates, follow the conference hashtag #ASEC2020UK across LinkedIn and Twitter.



***Annual Systems Engineering Conference (ASEC) 2020  
Heythrop Park Resort, Oxfordshire on Tuesday 17<sup>th</sup> and 18<sup>th</sup> November 2020***

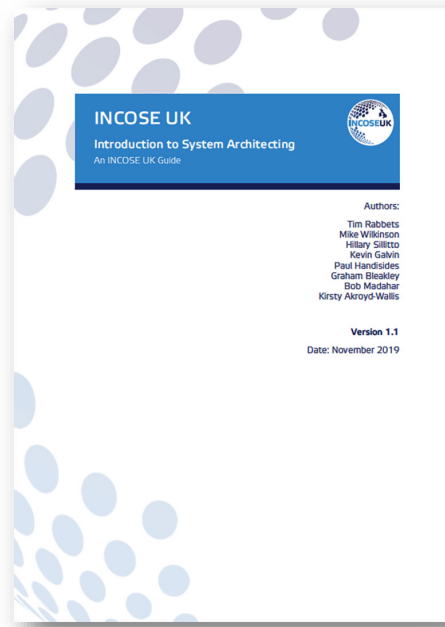
## Introduction to System Architecting.

Our run of new publications continues with our latest technical guide “Introduction to System Architecting”

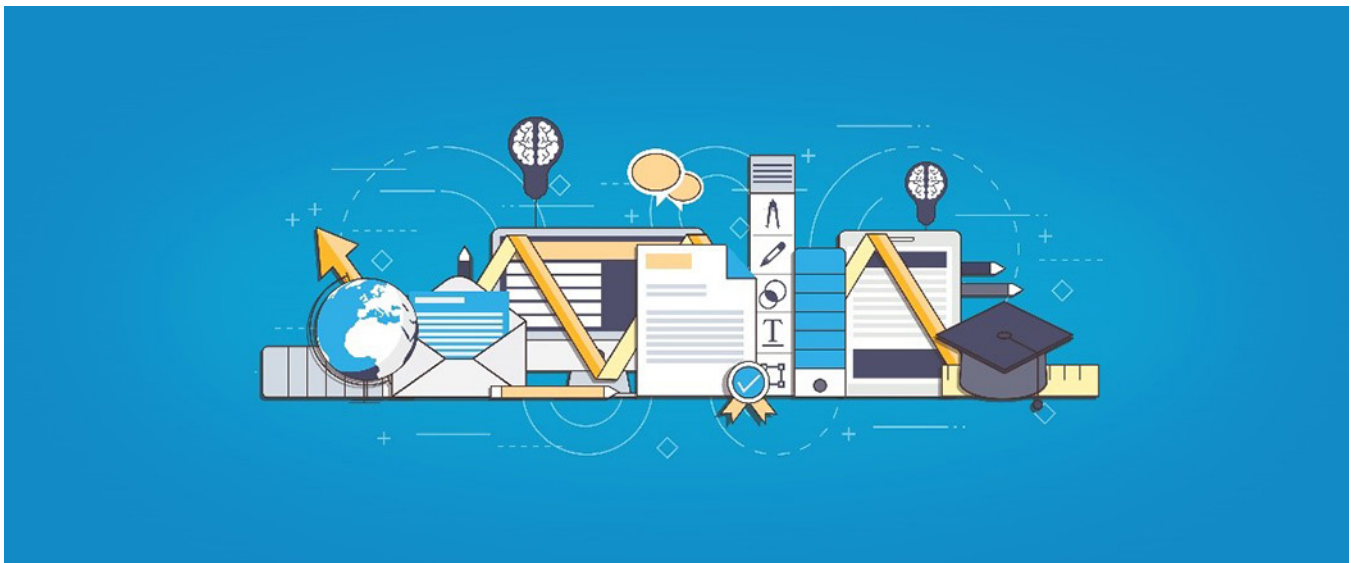
The publication covers the who, what, when, where, why and their scale, composition, form, or construction. It addresses architecture’s basic concepts and principles, benefits, and different uses. It also defines the basic architecting processes, the enabling methods and tools, and explains the role of the architects involved with them.

Written by members of the INCOSE UK Architecting Working Group, the technical guide is accessible to a varied audience and assumes no prior knowledge in the area. Suitable for non-practitioners in systems architecting to experienced professionals, the guide includes many references. It provides a springboard for further investigation and is a useful tool for those who wish to review their understanding of this important subject in systems engineering.

“Introduction to System Architecting” is available to purchase via the [INCOSE UK online store](#), a free PDF version is also available to INCOSE UK members via the online store.



The new “Don’t Panic—The Absolute Beginner’s Guide to Managing Interfaces” is still available from the [INCOSE UK Online store](#) and equips readers with some practical methods and best practice tools for improving their interface definition and management, an under explored engineering literature area.



# Sector Updates—Asia-Oceania

## INCOSE India Chapter

Mudit Mittal  
mittalmudit@johndeere.com

With INCOSE celebrating 30 years, INCOSE India Chapter is celebrating its 10-year anniversary this year. Formally chartered as South India INCOSE chapter, a group of systems engineers from various companies felt the need to collaborate and spread awareness about systems engineering.

Today we have a strong team of 14 committee members and 160 INCOSE Members across India. The chapter also has



3 active working groups—MBSE working group, PHM working group, and Architecture Working group.

We plan to celebrate our 10 years through a series of communications featuring INCOSE India Chapter committee members, founders, and well-known Systems Engineers and Thinkers in India. Since we are active in mainly three cities: Bangalore, Hyderabad, and Pune the team plans to host a celebration event in the month of May in all three cities. So, keep watching for our updates on Twitter and LinkedIn and we welcome everyone to join us to celebrate our 10<sup>th</sup> year anniversary.



## Happy 10<sup>th</sup> Anniversary

Figure 1. ASWE Breakout Sessions

Submit Your Work  
to the 4th International Complex Systems Design  
& Management Asia Conference

CALL FOR PAPERS

New & Last Submission Deadline:  
March 21, 2020

Mastering complex industrial systems is a strategic challenge. The CSD&M conference is a widely open event dedicated to academic researchers and industrial & governmental actors, interested in Model-Based Systems Engineering and Digital Transformation in Engineering. The conference language is English.

September 21-22, 2020 | Renaissance Beijing Wangfujing Hotel, Beijing, China

CONFERENCE GENERAL CHAIRS



**KROB Daniel**  
Institute Professor, Ecole Polytechnique, France  
INCOSE Fellow  
President, CESAMES



**Dr. ZHANG Xinguo**  
Distinguished Professor,  
Director of Complex Systems Engineering Research  
Center, Tsinghua University, China  
INCOSE ESEP, President of INCOSE Beijing Chapter

PROGRAM COMMITTEE

Academic members

**LI Lefei, Tsinghua University, China (Co-Chair)**

- CARDIN Michel, Imperial College, United Kingdom
- DE WECK Olivier, MIT, USA
- FENG Yanghe, National University of Defense Technology, China
- GAO Xinghai, Beihang University, China
- GUAN Ruoxi, Tsinghua University, China
- HAMMAMI Omar, ENSTA ParisTech, France
- JACKSON Peter, SUTD, Singapore
- KOO John, Hong Kong Applied Science and Technology Research Institute, China
- LV Yisheng, Chinese Academy of Sciences, China
- RAUZY Antoine, NTNU, Norway
- WANG Chen, Tsinghua University, China
- WANG Yingxun, Beihang University, China

Industrial members

**ZHANG Hongjun, China State Shipbuilding Corporation, China (Co-Chair)**

- AMBROSO Annalisa, Framatome, France
- DAURON Alain, Renault-Nissan Alliance, France & Japan
- FERROGALINI Marco, Airbus, European Union
- HOU Shudong, Huawei, China
- ONG Robert, No Magic, Thailand
- QIE Yongjun, Aviation Industry Corporation of China, China
- SCHREINEMAKERS Paul, INCOSE, European Union
- STARK Rainer, Fraunhofer Institute, Germany
- SUN Zhixiao, Aviation Industry Corporation of China, China
- WEN Yuejie, Academy of Space Technology of China
- XING Chenguang, Aviation Industry Corporation of China, China
- YEE Victor, IBM, China
- ZHANG John, Huawei, China

CONFERENCE TOPICS

Industrial domains

Aerospace, automotive, communications & e-services, defense & security, electronics & robotics, energy & environment, healthcare & welfare services, high tech, logistics & supply chain, ship & transportation, software industry, urban & public infrastructures

Scientific & technical topics

Systems fundamentals, systems architecture & engineering, model-based systems engineering, big data for industrial applications, systems manufacturing, systems modeling & simulation, system optimization, system project management, systems safety, systems serviceability, systems technology & policy

KEY INFORMATION

Important dates

- Submission deadline: Feb 21, postponed to **March 21, 2020**
- Results announcement: April 30, 2020
- Final version: May 29, 2020

How to submit

Access to submission procedure - <https://www.2020.csdm-asia.net/call-for-papers-submission-procedure/>

Publication & indexation policy

Accepted papers will be included into the CSD&M Asia 2020 conference proceedings, published by Springer Verlag and referenced & indexed in DBLP, EI Compendex, ISI Clarivate and Scopus

Organizers

Co-operators & Sponsors



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## SESA Australia

SESA President, Bill Parkins, ESEP  
[bill.parkins@bigpond.com](mailto:bill.parkins@bigpond.com)

### Silver Anniversary

2020 is SESA's 25<sup>th</sup> Anniversary. The inaugural SESA meeting took place October 1995 in Sydney, with Kerry Lunney as a primary initiator along with a few engineers possessing INCOSE International Symposium experience and keen to establish a local chapter. We are also planning celebrations coinciding with SESA events throughout 2020. Finalized details will be on the SESA website.

I would like to take the opportunity to thank the many INCOSE Australian and International members and staff who have helped to shape SESA over the last 25 years

# Happy 25<sup>th</sup> Anniversary

### 2020 Plan

The first SESA committee meeting for 2020, held February 11, finalized discussions for the 2020 Annual Operating Plan (AOP) including budget bids for 2020 activities. This year the AOP was part of a 3-year rolling plan so the strategic initiatives can prioritize importance and urgency. Future newsletters will report initiative progress.

SESA is revising the Corporate Membership provisions aiming to increase Corporate Members to provide the committee guidance

on systems engineering stakeholder community needs. David Orr (External Engagement Leader) and I have attended meetings with INCOSE EUMEA Sector leaders to understand local CAB provisions in European Chapters for the Australian context. There are 92 Associate members in Australia who, at present, have no direct SESA activity involvement. We will invite them to participate in our local activities on a cost-neutral basis.

### SETE 2020 Brisbane

<https://sete2020.com.au/>

The holiday period delayed the SETE 2020 planning and work, but we are back on track now and the program is shaping up well. Click on link—<https://sete2020.com.au/program>

In addition to refereed papers, industry presentation, and tutorials, there will be panel discussions providing the opportunity for presenting ideas and discussions on current topics of interest. We are focusing on diversity as we finalize the program, consciously seeking a balanced program attractive to all attendees.

An additional element to the program this year is a "Systems Thinking Roundtable" leveraging off the IW/IS initiative.

### IW 2020

SESA Technical Director, Jawahar Bhalla, along with several other SESA members attended January's IW in Torrance. Jawahar Bhalla said the INCOSE IW provided great insights into focus and potential areas for participation across our local SESA working groups. It also identified areas needing greater initiative,



The banner features a night view of the Brisbane skyline with the Story Bridge illuminated. On the left, a stylized logo of an atom with the text 'SETE' and 'SESA | 25TH ANNIVERSARY' below it. To the right, the word 'Postponed' is written in large white letters. Below that, the text reads 'SYSTEMS ENGINEERING TEST AND EVALUATION CONFERENCE 2020', '11 - 13 May 2020', and 'Rydges South Bank, Brisbane'. At the bottom right, there are logos for 'ENGINEERS AUSTRALIA', 'SESA', 'INCOSE', and 'EUMEA'.

such as Healthcare. Bhalla summarized the IW activities participated in:

- INCOSE IW Strategy session
- Systems Thinking Roundtable
- Opening Plenary - installation of new Board including Kerry Lunney as INCOSE President
- Systems Sciences Working Group - focus on New Definitions of systems engineering and Systems and FuSE
- Asia-Oceania Sector Directors Meetings, including:
  - Identified potential opportunity to speak at JS 2020 in Japan in March.
  - (Note: Travel support from INCOSE Asia-Oceania Sector confirmed this)
  - Publicised SETE 2020 and ASEW as well as SETE 2021 in conjunction with AOSEC and potentially the Australian Simulation Conference. Dates not yet available.
- Complexity in Natural and Social Systems
- Telecommunications Working Group, working with reps linked in from Australia, they received an Outreach award at IW
- Human Systems Integration Working Group with focus on the HSI section of the Systems Engineering Handbook
- PM-SE Integration Working Group agenda covering:
  - Project Breakdown Structure - presentation of work done with discussion
  - Strategic Technical Planning - on how to improve getting it right
  - Presentation on SE Applications Needs of Agile Best-Practice
  - Overview of PMBoK V7 by PMI
  - Note: “The Standard for Project Management” is open for public review from Feb. 14



*Telecommunications Working Group wins an Outreach award at IW*

- Complex Systems Working Group - focus on definitions and work to be done for systems engineering handbook rev 5
- Meeting with INCOSE TLI leads - SESA intends putting forward two candidates for the next cohort
- Meetings with NAFEMS (International Association for the Engineering Modelling, Analysis and Simulation Community) on the recent MoU with INCOSE and the potential for collaboration and alignment with the recent MoU between SESA and Simulation Australia (SimAust).

### National Speaker Program (NSP)

The first SESA National Speaker Program event for 2020 will be Tuesday February 25th, 2020. The speaker is Jawahar Bhalla (JB), SESA Technical Director with a presentation on Architectural Insights enabling Defence 5th Gen Distributed Mission Training (DMT)

Dates for upcoming NSP's later this year are Feb 25, May 26, Aug 25, and Nov 24.

Thanks to JB for his contributions to the 2020 SESA program. Thanks to him and the other committee members, I expect this to be a very productive year for SESA!



*Knowledge and Camaraderie shared at the INCOSE International Workshop*

# Highlighting 30 Working Groups for the INCOSE 30<sup>th</sup>!

Lisa Hoverman, [marcom@incose.org](mailto:marcom@incose.org)

This year at the INCOSE International Workshop (IW), the premier conference to contribute meaningfully to the state of the art in systems engineering, 47 Working Groups (WGs) spanning topics from Artificial/Augmented Intelligence to Configuration Management to Digital Engineering to Empowering Women Leaders in Systems Engineering to Model-Based Systems Engineering, to Natural Systems, to Smart Cities, to Social Systems, to Telecommunications and more gathered in Torrance, CA to work on the big and complex challenges facing our planet.

The working groups self-organize and self-report out at the end of the workshop. Most working groups are open sessions so new members can attend, learn about the work, and engage at the level that is right for them.

The work that the group does at the IW and reports out on from their time spent working together at the IW is available on the INCOSE website [here](#). If you are a new member, or a member looking to get involved in a working group, this is a wonderful place to start learning about what INCOSE is up to, and where you might want to contribute!

As part of our 30<sup>th</sup> year celebration, we are going to highlight 7–8 working groups each Newsletter in 2020 to showcase their work, provide insight to what we do technically in INCOSE and how we contribute back in a big way to the larger Systems Engineering Community! In this issue, we are highlighting 8 working groups, that we hope you enjoy learning about and will potentially join!

## WG1—Agile Systems and Systems Engineering

**Chair:** Rick Dove, [dove@parshift.com](mailto:dove@parshift.com)

**Co-Chairs:** Ron Lyells, [rllyells@aol.com](mailto:rllyells@aol.com) and  
Larri Rosser, [Larri\\_Rosser@raytheon.com](mailto:Larri_Rosser@raytheon.com)

**Members:** About 15 active members with 204 in the total WG community

### **Purpose/Mission**

Provide a body of fundamental knowledge which enables systems engineering and engineered systems to operate in environments of caprice, uncertainty, risk, variability, and evolution (CURVE).

### **Goals**

- Necessary and sufficient fundamental concepts for any system or process to be agile.
- Publication of a relevant body of knowledge.
- Contributions to the INCOSE Systems Engineering Handbook.
- Generic agile systems engineering life cycle model fundamentals.

- Informative examples of employed agile-system concepts.
- Socialization of work efforts with papers, tutorials, INSIGHT articles, and Webinars.

### **Scope**

Show how agile architectural concepts and principles are or might be applied. Examples will avoid prescriptive interpretation and disclosure of organization-specific competitive-advantage differentiation.

### **IW Outcomes**

Reviewed past projects and WG Overview for new people and reviewed six work-in-progress project updates, two opportunities, and four project proposals.

### **Planned Activities**

- Collaboration with [National Defense Industrial Association](#) (NDIA) on Implementing Continuous Iterative Development.
- Collaboration on FuSE Agility topic with FuSE collaboration community.

- Collaboration with INCOSE Corporate Advisory Board (CAB) on Agile Transformation Needs.
- Possible collaboration with Social Systems WG.

### **Planned Work Products**

- International Symposium (IS) 2020 (IS20) Presentation Only on Continuous Integration Platform.
- IS20 Paper final completion if accepted.
- Paper on Continuous Integration Platform for submission to TBD.
- Completion of Agile Systems Engineering Life Cycle Model INCOSE Product.
- FuSE Agile Topic papers TBD.

- Project charter and start for Agile Early Stage Innovative Research & Development Systems Engineering.
- Project charter and start for Systems Engineering Engagement Metrics on Agile Projects.
- Startup on agile systems engineering material for the Systems Engineering Body of Knowledge (SEBoK).

### **Why Join the Agile Systems and Systems Engineering WG?**

- Who wants to be Waterfall?
- Led by a dynamic INCOSE Fellow
- Timely topic relevant to every system
- Fun small active group

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## **WG2—Automotive**

**Co-Chairs:** Gary Rushton, [gary.rushton@gm.com](mailto:gary.rushton@gm.com)

Alain Dauron, [alain.dauron@renault.com](mailto:alain.dauron@renault.com)

**Members:** 100+

### **Purpose/Mission**

To promote the application and advance the practice of systems engineering in the automotive industry, encompassing OEMs, suppliers and service providers in the private, commercial, and industrial vehicle sectors.

### **Goals**

- To broaden and improve the application of systems engineering to the vehicle development process.
- To build a common, shared systems engineering expertise and body of knowledge for their application by actors across the automotive industry.

### **Scope**

- To provide value-added services to our members.
- To grow the number of members.
- To support INCOSE’s strategy to establish collaborations and partnerships with professional organizations (SAE).

### **2020 Focus Areas**

- Publish Automotive Systems Engineering Vision 2025
- Automotive Vision Document Executive Summary
- Systems Engineering Handbook Automotive Application Section Updates
- Model-Based Systems Engineering—vehicle to system to subsystem to component model sharing
- INCOSE/SAE Collaboration— SAE WCX Support
- Cross Working Group collaboration (AWG, Transportation, Infrastructure, SoS, Smart Cities)
- Identify themes for Capstone Projects to engage students and share systems engineering practices from Automotive

### **Planned Work past IW**

#### **Planned Activities**

- Work with Transportation and Infrastructure Working Groups to develop a template for updates to SE Handbook.
- Collaborate with Smart Cities Initiative to share automotive related information.

### Planned Work Products

- Automotive Systems Engineering Vision 2025
- Automotive Vision Document Executive Summary
- Systems Engineering Handbook Automotive Application Section Updates

### Why Join the Automotive WG?

- Have a stellar technical product about to launch
- Because #selfdrivingcars
- Great cross-organization and cross-WG collaborations

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## WG3—Healthcare

**Chair:** Chris Unger,  
[Christopher.Unger@med.ge.com](mailto:Christopher.Unger@med.ge.com)

**Co-Chair:** Bob Malins,  
[rjmalins@eaglesummittech.com](mailto:rjmalins@eaglesummittech.com)

**Members:** 150

### Purpose/Mission

To improve Healthcare delivery, medical devices and services development, and Healthcare SE education by bringing together systems engineers and systems thinkers to identify, develop, and tailor best practices for the Healthcare industry.

- Articulate the value of systems engineering to Healthcare through simple examples and easily deployed guidelines, and
- Provide a forum for developing and sharing best practices and meeting world class experts in healthcare systems engineering.

### Goals

- Enable improved Healthcare outcomes by increasing systems engineering and systems thinking capabilities
- Increase the use of systems engineering practices in the Healthcare industry
- Publish impactful information on systems engineering in the Healthcare industry
- Serve as the clearinghouse of Healthcare needs and systems engineering best practices
- Accelerate the transformation of Healthcare systems engineering to a model-based discipline

### Scope

- Manufacturers of devices and providers of services (Clinical and Research use only devices, in-vitro, and in-vivo products, pharmaceuticals, and biologics)

- All points-of-care through the entire Healthcare delivery life cycle
- Academic Medical Centers (AMCs)
- Regulatory agencies
- Healthcare insurance providers
- Healthcare advocacy groups

### IW Outcomes

There were no specific accomplishments planned for IW other than outreach to INCOSE membership in general and to other working groups addressing healthcare relevant topics. The working group focuses on continuing the outreach for our premier event: ***the annual Systems Engineering in Healthcare Conference, now in its sixth year, to be held April 28-30, 2020 in Minneapolis, MN*** (<https://www.incose.org/hwg-conference/>)

### Planned Work past IW

#### Planned Activities

Execute the 6th Annual Systems Engineering in Healthcare Conference (HWGSEC 2020) on April 28-30, in Minneapolis, MN. The Healthcare Working Group and the INCOSE Northstar Chapter jointly sponsor this conference. The theme for the conference is Advancing the Practice of Systems Engineering in the Healthcare Industry. The intended audience is Systems Engineers, product developers and testers and leaders of organizations developing complex healthcare products and services, from large Healthcare IT systems to medical devices to healthcare delivery organizations.

#### Planned Work Products

Publish the proceedings of the Systems Engineering in Healthcare Conference through the working group and through INCOSE TechOps.

### Why Join the Healthcare WG?

- Awesome, impactful annual conference
- Because healthcare needs systems engineering
- Strong, active, relevant WG

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## WG4—Product Lines

**Co-Chairs:** Rowland Darbin,  
[Rowland.Darbin@gd-ms.com](mailto:Rowland.Darbin@gd-ms.com)

Hugo Guillermo CHALÉ, [hugoguillermo.chalegongora@thalesgroup.com](mailto:hugoguillermo.chalegongora@thalesgroup.com)

**Members:** 197

### Purpose/Mission

- To promote product line engineering (PLE) and related systems engineering best practices.
- To coordinate activities around Product Line Engineering at INCOSE central level and share results and work products amongst the different sectors, chapters, and local working groups.
- Launched collection of PLE community needs to feed our work products roadmap
- Review of the yearly cycle for work products publication
- Clarified list of contributors to the Systems Engineering Handbook V5, SEBoK & Wiki
- Call for articles for the *INSIGHT* issue on PLE—end 2020 / early 2021
- Initiated contacts with Configuration Management, Architecture & Knowledge Management WGs

### Goals

- To share experience, good practices, and traps to avoid.
- To acquire Know-How, comparing state-of-art.
- To help setup and evolve Product Lines in the Enterprises.
- To grow the membership of the PLE WG.
- To provide a professional service to our members through outstanding administration.
- First, an open workshop to advocate for Product Line Engineering within the community and to solicit community needs for adoption and education of Product Line Engineering.
- Second, an internal workshop to establish the work product prioritization and support work product development.

### Scope

- All types of systems, markets, and organizations
- All the systems engineering processes (needs, requirements, architecture, integration, and tests)
- All maturity levels of PLE, from opportunistic to completely integrated and anticipated strategies
- Published papers to address community needs for PLE
- *INSIGHT* issue on PLE in context.

### IW Outcomes

- Promotion of the “Feature-based Product Line Engineering” Primer
- Engaging WG
- PLE increases systems efficiencies throughout the lifecycle
- Largest outreach meeting held—over 20 people, around one third newcomers

### Planned Activities

PLE planned two workshops:

- First, an open workshop to advocate for Product Line Engineering within the community and to solicit community needs for adoption and education of Product Line Engineering.
- Second, an internal workshop to establish the work product prioritization and support work product development.

### Planned Work Products

- Updates to the PLE Wikipedia page
- PLE Updates to ISO PLE Standard
- PLE Updates to Systems Engineering Handbook
- PLE Updates to SEBoK
- Published papers to address community needs for PLE
- *INSIGHT* issue on PLE in context.

### Why Join the PLE WG?

- Product of the Year Award!
- PLE increases systems efficiencies throughout the lifecycle
- Engaging WG

## WG5—Requirements Working Group

**Chair:** Tami Katz, [tami.katz@sncorp.com](mailto:tami.katz@sncorp.com)

**Co-Chairs:** Lou Wheatcraft, [wheatland.consulting@gmail.com](mailto:wheatland.consulting@gmail.com)

Mike Ryan, [M.Ryan@adfa.edu.au](mailto:M.Ryan@adfa.edu.au)

Rick Zinni, [rzinni@gmail.com](mailto:rzinni@gmail.com)

Kevin Orr, [txorrhome@gmail.com](mailto:txorrhome@gmail.com)

**Members:** 561

### Purpose/Mission

Advance the state of the practices, education and theory of requirements engineering and its relationship to other systems engineering functions.

### Goals

Expand and promote the body of knowledge of requirements engineering and its benefits within the systems engineering community.

### Scope

Activities relating to requirements engineering best practices.

### IW Outcomes

Requirement WG (RWG) Accomplishments at IS2020 include:

- Generated strategy for RWG products for 2020. New product to be worked on *Needs and Requirements Life-Cycle Manual*; Generated plan for completing the *Guide to Developing and Managing Requirements* and the *Guide to Verification and Validation (V&V)*; Established roles and responsibilities for existing and new RWG products; the new *Needs and Requirements Life-Cycle Manual* is led by Lou Wheatcraft, *Guide to Developing and Managing Requirements* is led by Kevin Orr, and *Guide to V&V* is led by Raymond Wolfgang
- Coordinated with INCOSE SE Handbook editors to plan forward on SE Handbook updates and RWG contributions
- Coordinated with IVV WG for *Guide to V&V* and *Needs and Requirements Life-Cycle Manual* content with respect to verification and validation

- Held discussions on *Integrated Data as a Foundation of Systems Engineering*, including review of various approaches that could be developed to achieve the vision of the RWG white paper
- Pascal Paper held an overview of approach for modeling requirements and design functions to address early requirement and design verification (simulation). Pascal made a request to RWG to provide feedback on the proposed Requirements on Modeling requirement Method and then to benchmark alternative methods to PMM targeting the same modelling goals, will be coordinating an opportunity for RWG input.
- John Nallon held an SETDB Requirement Tool Outbrief and Discussion, along with request for RWG forward actions on tool survey maintenance, inputs to tool, and vetting of tool vendor submissions
- JD Baker held a discussion regarding the OMG request for information regarding the relationship between business requirements and system requirements in the context of the OMG; the RWG membership is encouraged to provide input to the RFI
- Jim Marsh provided a demonstration of IBM's Requirements Quality Assistant, with request for data to help IBM continue to develop the tool.
- Held active discussions on requirement challenges, and opportunities for future web meetings for the RWG team.

Charts and minutes are at the RWG IW2020 Connect page: <https://connect.incose.org/WorkingGroups/Requirements/RWGIW2020/SitePages/Home.aspx>

### Planned Activities

RWG Planned activities for 2020 include:

- Monthly RWG web meetings for special topics
- Development of two Guides and one Manual in 2020
- Support INCOSE Systems Engineering Handbook updates

- Support Systems Engineering Tools Database (SETB) rollout and maintenance efforts

### Planned Work Products

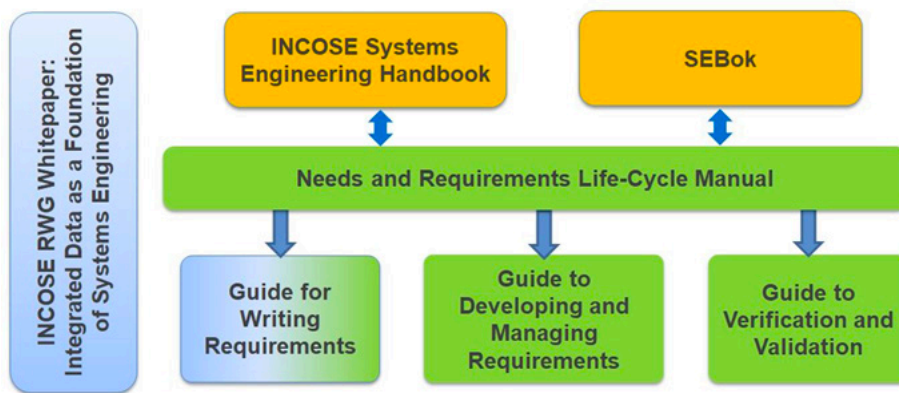
RWG is working on two new guides and one manual in 2020, as well as planning the updates for an existing guide to occur in 2021:

- *Needs and Requirements Life-Cycle Manual*—Lou Wheatcraft, Product Lead (new, TPP pending)
- *Guide to Developing and Managing Requirements*—Kevin Orr, Product Lead (new, TPP approved in 2019)

- *Guide to Verification and Validation*—Raymond Wolfgang, Product Lead (new, TPP approved in 2019)
- *Guide to Writing Requirements*—Mike Ryan, Product Lead (revision planned 2021)

### Why Join the RWG?

- They submitted a stellar write up for this Newsletter and they make graphics!!
- They have many Product of the Year Awards!!!
- They WORK and PRODUCE!
- They are huge!



### The Requirement Working Group (RWG) Sessions at IW 2020

Tami Katz  
[tami.katz@sncorp.com](mailto:tami.katz@sncorp.com)  
 Lou Wheatcraft

A special thanks goes out to all who attended the Requirements Working Group (RWG) sessions at the 2020 INCOSE International Workshop (IW 2020) along with those who volunteered to give a presentation and lead a discussion on their topic. We had four days of very informative discussions.

The INCOSE RWG has over 560 members, and almost 80 attended the four days of the IW. During the sessions, we held active discussions on our new products and presentations of various topics by our members. Some accomplishment highlights for the RWG include:

- Generated a strategy for developing new RWG products for 2020.
- Determined a new product to work, led by Lou Wheatcraft, called the *Needs and Requirements Life Cycle Management Manual*.



Chair Tami Katz and co-chair Lou Wheatcraft

- Generated plan for completing the *Guide to Developing and Managing Requirements*, led by Kevin Orr.
- Generated plan for completing the *Guide to Verification and Validation*, led by Raymond Wolfgang.



- Coordinated with the Integration, Verification, and Validation (IVV) Working Group (led by Jim Armstrong) collaborating content development for the new RWG products with respect to verification and validation.
- Coordinated with INCOSE Systems Engineering Handbook editors for the coming updates and the RWG contributions
- Lou Wheatcraft reviewed the *Integrated Data as a Foundation of Systems Engineering* RWG paper, including discussing various approaches to develop to achieve the RWG white paper's vision
- Pascal Paper discussed approaching modeling requirements and design functions to address early requirement and design verification (simulation). Pascal requested RWG review the proposed Requirements on Modeling requirement Method and then benchmark alternative methods to PMM targeting the same modeling goals, will coordinate an opportunity for RWG input.
- John Nallon held an SETDB Requirement Tool demonstration and discussion, along with request for RWG forward actions on tool survey maintenance, inputs to tool, and vetting tool vendor submissions.
- JD Baker held a discussion regarding the OMG request for information regarding the business requirements and system requirements' relationship in OMG context; encouraging the RWG membership to provide input to the RFI
- Jim Marsh demonstrated IBM's Requirements Quality Assistant, with request for data to help IBM continue to develop the tool.
- Tami Katz addressed how Commercial Off the Shelf (COTS) assemblies could meet system requirements.
- The members held active discussions on requirement challenges and opportunities for future web meeting topics to continue exchanging ideas among the RWG team.

All IW 2020 RWG presentations and associated materials are available on the RWG Connect website: <https://connect.incose.org/WorkingGroups/Requirements/Pages/Home.aspx>. Once there, click the "RWG sessions at IW2020" link on the left to see what we accomplished. You can then select "Documents" to download any presentations and background materials. IW 2020 was an exciting kick off to a new year.

We have our first web meeting February 27, to debrief RWG on the IW events, and will have others on various topics each following month. Anyone can join the RWG (under the member profile, join Committee, please select "Requirements" and you will join the group). Thank you all for your interest, involvement, and support.



Members engaged in discussions at IW

## WG6—Smart Cities Working Initiative Group



**Chair:** Jennifer Russell,  
[JLRussell@GarverUSA.com](mailto:JLRussell@GarverUSA.com)

**Co-Chair:** Marcel van de Ven,  
[mtfmvandeven@gmail.com](mailto:mtfmvandeven@gmail.com)

**Members:** 10 active and growing fast, join the movement soon!

### **Purpose/Mission**

The Smart City concept comprises Smart Infrastructure, Smart Transportation, Smart Energy, Smart Healthcare, and Smart Technology, and more. The systems engineering knowledge, experience, and skillset of INCOSE members is strategically positioned to support our global communities as they embark on supporting the multi-faceted Smart Cities CATS\*.

By leveraging systems engineering, this initiative will support communities' Smart Cities:

- **Concepts**
- **Applications**
- **Technology**
- **Services**
- **CATS**

### **Goals**

Leverage INCOSE knowledge and skills to create a model that illustrates the resources and opportunities of Smart Cities thereby enabling:

- Interconnectivity
- Reuse
- Consistency

### **Scope**

This Initiative will support municipalities and public agencies in adopting Smart Cities technologies by applying systems engineering principles and tools.

- support municipalities and public agencies

- holistic perspective / logical extensible open framework / enable integration
- specific application of system of systems approach to using systems engineering
- design, development, and operations can be clearly, completely, and concisely developed
- well-defined application that can be tailored

### **IW Outcomes**

- Select specific products and actions to be successful over the next year.
- Review model
- Identify teams for portions of model or deliverables

### **Planned Activities**

Working Group engagement across INCOSE

### **Potential Actions**

- INCOSE's participation in external events: workshops, conferences, plenaries
- Emphasize INCOSE persons' presentations, panel participation, etc.
- Conduct separate paper and panel track at INCOSE symposiums
- Prepare articles and white papers that are published in external (outside of INCOSE) journals.

### **Planned Work Products**

- Architecture template for Smart Cities, possibly MBSE model
- Context model
- Stakeholder model
- Stakeholder Management Plan
- Tailored Systems Engineering Management Plan (SEMP) for Smart Cities (gathers and helps drive all 30 of the processes specified in ISO/IEC 15288)
- Demonstrated interface template for Smart Cities CATS (N2 diagram)
- Smart Cities Concept of Operations Template
- Supporting public communication tools

- Definition of why it's important to use a systems approach to Smart City CATS, tailored for various audiences in the public sector (elected officials, planners, designers)
- Hand-out on considerations for future integration Smart Cities step one.
- Executive Sales Kit Package
- Brief Presentations aimed at C-Suite, Mayors, Legislators, Executives to assist them in the

understanding of the importance of a holistic view of all the new integrations that are likely to occur

### **Why Join the Smart Cities WG?**

- The future is now.
- They have CATS!
- They are new and they need you.

## **WG7—Social Systems Working Group (SocWG)**

**Chair:** Erika Palmer, [erika.palmer@ruralis.no](mailto:erika.palmer@ruralis.no)

**Co-Chair:** Randy Anway,  
[randy@new-tapestry.com](mailto:randy@new-tapestry.com)

**Members:** 68

### **Purpose/Mission**

Evaluate evolving changes to systems engineering processes and practices and develop measures to integrate social and sociotechnical systems understanding at theoretical, applicable, and technical levels, in collaboration through outreach initiatives with the social sciences and interested stakeholder groups.

### **Goals**

- Regularly assess relationships between systems engineering and social sciences
- Identify and support communities of practice at the intersections
- Share common challenges, best practices and productive approaches
- Enhance understanding of interactions between systems engineering and social systems, and respective drivers of change
- Develop work products for and monitor changes in systems engineering processes and practices
- Grow in participation

### **Scope**

SocWG seeks to:

- Normalize the linkage of social science and systems engineering

- Apply sociological principles in the integration of teams and communities that are engineering systems
- Improve integration of systems engineering with the social scientific evaluation of social and socio-technical systems

### **IW Outcomes**

- Explored topics/themes that the SocWG could cover
- Recruited SocWG members
- Networked individuals working with social systems
- Engaged with other WGs for collaboration opportunities

### **Planned Activities**

- Developing material reflective of this emerging area
- Collaboration: outreach and inreach
- Developmental activities: roundtables, panels, conference participation
- Enhance visibility: Increased awareness in systems engineering community
- Developing shared understandings through INCOSE platforms

### **Planned Work Products**

- Socio-Technical Systems Student Competition
- Systems Engineering—Journal Paper
- Submission in for IS2020
- Papers for IS2021
- Presentation track submissions for IS2020

- SEBoK WIKI
- Website

### Why Join the SocWG?

- Socio-Technical Systems can benefit from INCOSE and systems engineering.

- Support INOCSE and systems engineering at a unique intersection!
- Be a voice in an evolving field.

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## WG8—Training WG

**Chair:** Gabriela Coe, [gabriela.coe@ngc.com](mailto:gabriela.coe@ngc.com)

**Co-Chair:** John Clark, [john.clark@incose.org](mailto:john.clark@incose.org)

**Members:** 10

### Purpose/Mission

Provide systems engineering training to INCOSE members and others if needed. This Training WG will provide that opportunity and will support the mission, vision, and goals of INCOSE.

### Goals

- Determine our members' needs
- Develop or solicit training modules
- Solicit training volunteer instructors
- Provide training as a benefit to INCOSE members
- Coordinate training throughout INCOSE to expand training opportunities

### Scope

This Training WG will address systems engineering training as it relates to systems engineering throughout the system life cycle. Systems engineering training will be a free volunteer effort provided as a benefit to all members. This training will exclude actual US DoD projects because of ITAR regulations, copyrighted material unless authorized in writing by the author, and labor financial compensation. Other training within scope includes, but is not limited to, WG leadership.

### IW Outcomes

- Systems engineering training modules
- WG Leadership modules
- Training (via presentations, tutorials, videos, and webinars)

### Planned Activities

- Meeting semi-annually at the IW and IS of the entire WG team

- Telecon quarterly
- Webinar monthly

### Planned Work Products

- Systems engineering training modules
- WG Leadership modules
- Training (via presentations, tutorials, videos, and webinars)

### Why Join the Training WG?

- Great volunteer opportunity
- Develop great resources to aid others

### Systems Engineering Handbook V4.0 Tutorial Slides Now an INCOSE Technical Product

Gabriela Coe, [gabriela.coe@incose.org](mailto:gabriela.coe@incose.org) and John Clark, [john.clark@incose.org](mailto:john.clark@incose.org)

The INCOSE Hampton Roads Area Chapter's Systems Engineering Handbook V4.0 Tutorial slides, approved by Dr David Endler, Technical Operations Director, and his Impactful Products Committee, on January 8, 2020, are an INCOSE Central Technical Product. The slides are available by clicking [here](#) and scrolling down to Systems Engineering Handbook V4.0 Tutorial; Tutorial ID: 01\_October 2015; Tutorial Session: 00\_Shared Documents; and then downloading All Slides in Marcom Format, JOC 191212. The prior Systems Engineering Handbook V4.0 Tutorial, including its online seminar recordings, is available for download by accessing Tutorial Sessions 01 through 34. There are other Tutorials available for download, and their webinar recordings, include: Human Systems Engineering; Systems Engineering Fundamentals; Systems Engineering Handbook V3.2.2; Leadership Skills; Systems Engineering Technical Processes; and Systems Engineering Principles. Questions? Contact [gabriela.coe@incose.org](mailto:gabriela.coe@incose.org) or [john.clark@incose.org](mailto:john.clark@incose.org).

# INCOSE Standards Development

Richard Martin, [tinwisle@bloomington.in.us](mailto:tinwisle@bloomington.in.us)

## ***INCOSE Standards Development Department wants you!***

INCOSE participates with ISO, IEC, IEEE, SAE and OMG to develop and revise International Standards impacting systems engineering practice and practitioners. We need volunteers to provide content input, review, and comment for proposed International Standards. Currently, project liaisons with review and comment opportunities include:

If you are interested in participating in any of these projects, please contact Richard Martin, Deputy Assistant Director, Standards Development Department, [tinwisle@bloomington.in.us](mailto:tinwisle@bloomington.in.us). In addition, a revision project for ISO/IEC/IEEE 15288 will begin this coming summer to be headed by our own Garry Roedler and David Endler. More information on this project in a later edition of the Newsletter.

| Title of standard   | INCOSE Point of Contact | Development Stage                  |
|---|-------------------------|------------------------------------|
| ISO/IEC 26580<br>Software and systems engineering — Methods and tools for the feature-based approach to software and systems product line engineering | Krueger & Clements      | DIS Comment resolution in progress |
| ISO/IEC/IEEE 16085 Systems and software engineering—Life cycle processes—Risk management  | Heiniger                | DIS comments close 06/08/2020      |
| ISO/IEC 24773-3<br>Software and systems engineering—Certification of software and systems engineering professionals—Part 3: Systems Engineering       | Forsberg                | CD comments close 03/30/2020       |
| ISO/IEC 27100 Information technology—Cybersecurity—Overview and concepts  | Kepchar                 | CD comments open 06/01/2020        |
| ISO/IEC/IEEE 42010 Software, systems and enterprise—Architecture description  | Garnier & Kumar         | CD comments open 03/15/2020        |
| ISO/IEC 24641<br>Systems and Software engineering—Methods and tools for model-based systems and software engineering                                  | Abhaya & Gauthier       | CD comments close 05/15/2020       |
| OMG System Modeling Language SysML v2 Release 2019-12   | Freidenthal             | Until April                        |
| OMG Unified Architecture Framework (UAF) Version 1.2  | Hause                   | Open                               |

# EWLSE Updates

Alice Squires, [ewlse@incose.org](mailto:ewlse@incose.org)

We welcomed over 50 attendees to our Empowering Women Leaders in Systems Engineering (EWLSE) working, outreach, and networking sessions at the INCOSE International Workshop (IW) 2020. As an opening to our working session, Erika Palmer and Maja Farstad (see separate article) led an icebreaker exercise “Working Together to Identify Gender Issues in Systems Engineering.” This preceded presentations from several INCOSE Insight “Diversity in Systems Engineering” (see [Figure 1](#)) authors. First, Alan Harding and Andy Pickard summarized their “Towards a more Diverse INCOSE” article which covers gender balance across INCOSE leadership, events, awards and compares INCOSE to IEEE and IET in certain aspects. Bottom line findings included INCOSE’s gender balance in membership, certification, and INCOSE IW and IS attendance, and a need to achieve balance in other areas such as Pioneer and Fellow awards and technical operations leadership. INCOSE commissioned a task team to pursue recommendations presented by the authors to lead the way in building a diverse membership to advance and promote systems engineering. Next, Omar El-Haloush and David Flanigan summarized their “INCOSE Practitioners Challenge 2019: Clean Water and Sanitation in the Ganges River Basin” article. The exercise included identifying a layer of problems or considerations from the household to the local community to the systems of systems including the Ganges watershed, politics, and religion. Themes from the IS 2019 conference inspiring the team included building communities, biomimicry, subjective frameworks and integral theory, influencing without authority, and system of systems. The team applied standard systems engineering approaches considering socio-technical systems and human system interactions. Courtney Wright concluded the article summaries with her “Globalizing the Certification of Systems Engineers” article which focused on the use of paper exams, automated certificates, and academic equivalency agreements with universities to support international testing, distribution of certificates, and expanding



Figure 1. INCOSE Insight “Diversity in Systems Engineering” with Wiley open access through March 2020.

equivalency for the certification exam beyond the English speaking requirement.

We also had a guest visit from Patrick Godfrey from the INCOSE Technical Leadership Institute. Patrick shared insightful and heartfelt stories about how he developed a transdisciplinary respect for diversity, from coaching his younger sisters (and their friends) in Math and physics to learning about Fourier transforms and quantum physics from his wife and on-the-job experiences. He continues to support women and men in engineering and architecting with recent classes from Chongqing, China involving a majority of women (55% and 57%). For those interested in applying to the INCOSE Technical Leadership Institute, please contact [David.long@vitechcorp.com](mailto:David.long@vitechcorp.com); this year’s deadline for applicants is March 31st.

Next, we held our outreach session where Marilyn Pineda and Alice Squires facilitated

training “Negotiating and Influencing” using real-life case scenarios from their personal experience (see separate article). We ended the day with a networking session where INCOSE leaders and EWLSE members met and mingled while discussing the session outcomes, the benefits of participating in the INCOSE Technical Leadership Institute, and establishing a ‘Diversity’ cross cutting category for INCOSE IS papers, presentations, and tutorials, among other topics.

All files presented or related to the INCOSE IW 2020 EWLSE sessions are accessible for a limited time at this url: <https://www.dropbox.com/sh/3vd4cq0xwkb3byk/AAC6rXIVV-R-8v17-ydsZt7Ba?dl=0>.

### Working Together to Identify Gender Issues in Systems Engineering

Erika Palmer, [erika.palmer@ruralis.no](mailto:erika.palmer@ruralis.no)  
 Maja Farstad, [maja.farstad@ruralis.no](mailto:maja.farstad@ruralis.no)

To open the EWLSE working session, Erika Palmer and Maja Farstad led an icebreaker exercise “Working Together to Identify Gender Issues in Systems Engineering.” They gave a brief introduction to their paper: “It’s Not Just Counting the Women: Gender Diversity and Systems Engineering” (accepted to the INCOSE IS 2020 for presentation) to conceptually outline gender issue basics in systems engineering practice. Before starting the exercise portion, they also showed a video from the non-profit organization Plan International, on society’s unintended negative consequences of women being excluded from design considerations. Several examples of products with inherit

gender issues included a world where a woman is 47% more likely to be seriously injured in a car wreck (especially when petite male crash test dummies are used to model women) and yet emergency systems are 70% better at understanding a male voice, where women are excluded from medical testing due to the complications of female hormones, and female security personnel are not adequately protected by body armor vests designed for male chest sizes.

Erika and Maja then had everyone break into four groups, where each group drew a life cycle of a product and discussed and identified gender issues in each of the life cycle stages. One group, as reported by Molly Kovaka, addressed climbing safety harnesses. Focusing on the utility application of a safety harness, Molly reported her group (comprised of two men and two women) determined, owing to differences in physiology, systems designed for men who were typically heavier, taller, and had a different center of mass than women, would influence how a user would experience an arrested fall, and also the harnesses’ impact comfort and usability. These factors are illustrated in Figure 2. Another group, as reported on by Nickolas Guertin, addressed a sled design (a big wheeled wagon) where his Girl’s BSA troop was participating in a scouting event for boys and girls, and needed to push and pull the sled over hilly terrain on a course, and stop at “towns” to demonstrate their scouting skills. As a result of this exercise, Nickolas took input back from his INCOSE team to his troop and they designed durable and lightweight equipment to complete their

#### Use Context: Utility Tower

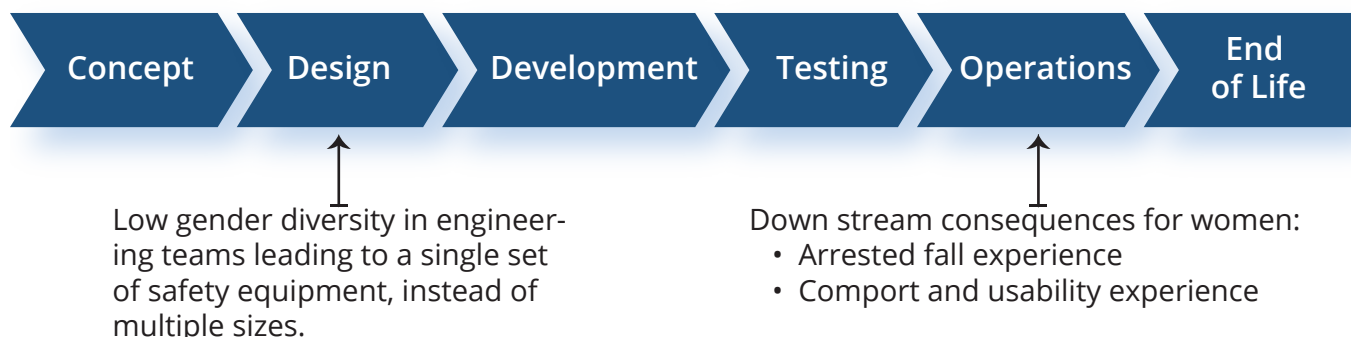


Figure 2: Group One’s Product Example: Climbing Safety Harnesses

tasks and performed well in the competition. Another design in the session included a mobile phone. There were lively discussions throughout the exercise about identifying gender issues, focusing on product design. At the end of the exercise, each group presented one key discussion point. Takeaways from the participants included the need for participants championing women, to considering allowing women to take the lead as part of their advocacy, and the power of teamwork in identifying these key product design issues for all users.

### ***Negotiation and Influencing—with Real-Life Case Scenarios***

Marilyn Pineda, [marilyn.pineda@incose.org](mailto:marilyn.pineda@incose.org)  
Alice Squires, [ewlse@incose.org](mailto:ewlse@incose.org)

Based on requests from INCOSE membership, the EWLSE outreach session volunteered to provide training on “Negotiation and Influencing” with real-life case scenarios. First, attendees shared a memorable negotiation experience. Negative outcomes had these characteristics:

- Taking too long to make a decision (especially when it comes to cyber security)
- The other party feigning agreement and then doing nothing
- Making a person feel less worthy to get one’s way
- Being expected to be quiet and compliant or otherwise viewed negatively
- Being passive and allowing the situation to dictate the outcome
- Focusing on the conflict

Positive outcomes were supported by the following:

- Getting over the hurdle of ‘whose fault is it’
- Standing ground (not being intimidated or made to feel unworthy)
- Showing how the outcome benefits the other parties involved
- Focusing on the shared goal to support diversity and inclusiveness

- Putting safety first
- Bringing in an outside perspective
- Persistence, not giving up when thrown a curve ball

Next the participants divided into four groups and each group went through a real-life case scenario. The case scenarios involved an openly hostile interviewer, a hiring situation involving a candidate unlike anyone else in the department, a new female engineering manager shown the way to her new...cubicle instead of office, and troubleshooting a problem not on my board! The groups were assigned to respond with the major conflict, what needed to be negotiated, who was involved, what were some common goals, how might agreement be achieved, and last but not least, how does the confident leader react in these situations? Overall recommendations were dependent on the case scenarios but generally focused on realizing when you are in a negotiation, agreeing on the shared common ground first and then negotiating, using “power with” (power from others), being proactive (not passive), mirroring (repeating what the other person said) while also refuting false statements, assuming the other party’s positive interpretations and intentions, providing a reason for your proposal first and then making the proposal, and finding and receiving input from a neutral third party. Overall the training was well received. Please send requests for future training to [ewlse@incose.org](mailto:ewlse@incose.org).

### ***Ready to be a Systems Engineering Mentor or Mentee?***

Looking for a systems engineering mentor or ready to be a systems engineering mentee or both? Please sign up here:

<https://bit.ly/2G6TJPL>





# Azad Madni Receives IEEE Aerospace and Electronic Systems Pioneer Award

Lisa Hoverman, [marcom@incose.org](mailto:marcom@incose.org)

INCOSE congratulates INCOSE Member and Fellow (2005), Dr. Azad M. Madni, and an INCOSE Pioneer and Founders Award Recipient for his achievement as the 2019 IEEE Aerospace and Electronic Systems Pioneer Award recipient. This is the highest award given by this society.

*"The Pioneer Award has been given annually since 1949 to an individual or team for "contributions significant to bringing into being systems that are still in existence today." These systems fall within the specific areas of interest to the society, that is, electronic or aerospace systems. The contributions for which the award is bestowed are to have been made at least twenty (20) years prior to the year of the award, to ensure proper historical perspective. It is not a condition that any awardees should have been sole or original inventor or developer, "significant contribution" of a specific nature is the key criterion."*

Azad is a Professor of Astronautical Engineering and Executive Director of USC's Systems Architecting and Engineering Program in the Viterbi School of Engineering. He is the founder and CEO of Intelligent Systems Technology, Inc., a high-tech R&D company specializing in model-based engineering and intelligent decision aiding technologies for aerospace. He is also a Life Fellow of IEEE, SDPS, IETE, and Fellow of AIAA and AAAS. He is the recipient of several prestigious international awards from seven professional societies—INCOSE, IEEE, AIAA, ASEE, ASME, IISE and SDPS. He received his B.S., M.S., and Ph.D. degrees in Engineering from UCLA. He is a graduate of the Executive Institute at Stanford University.

His research is cross-disciplinary and use-inspired, and currently focused on adaptive cyber-physical-human systems, distributed autonomy, intelligent systems, Model Based Systems Engineering, and engineered resilient systems. His research sponsors span many US government agencies and top industry companies over the last forty-plus years.

His research has had a major impact on defense readiness, and aerospace industry competitiveness. In 2016, Boeing honored him during its centennial anniversary with a Lifetime Achievement Award and a Visionary Systems Engineering Leadership Award for his impact on Boeing, the aerospace industry, and the nation's competitiveness.

He is credited with more than 200 refereed publications in archival journals and international conference proceedings; approximately 130 sponsored research reports, 14 book chapters, 5 books (2 authored, 3 edited), and more than 100 invited talks (keynotes, plenaries, lectures) at aerospace and defense systems conferences.

Since 2009, he has been a professor and Executive Director of the Systems Architecting and Engineering (SAE) Program at the University of Southern California. Under his leadership, the program has risen to become an internationally top-rated, systems engineering graduate program. In 2013, he developed and received approval for the SAE Ph.D. degree program as a specialization within Astronautical Engineering Department. He is the founder and Director of the Distributed Autonomy and Intelligent Systems Laboratory in the Viterbi School of Engineering at USC. He is the co-founder and chair of IEEE SMC Society's award-winning Model Based Systems Engineering Technical Committee. He has also served as General Chair and Program Chair of the Conference on Systems Engineering Research (CSER) multiple times since 2008.

He founded Intelligent Systems Technology Inc. in 1994 to conduct and commercialize government-sponsored research in concurrent engineering and intelligent decision aiding and training systems for the aerospace and defense industries. He grew the company 1588% in the first five years. Under his leadership the company made the Deloitte and Touche, Los Angeles Fast 50 and the D&T Technology 500 nationwide for several consecutive years. In

1999, he received the SBA's National Small Business Innovation Research (SBIR) Tibbetts Award for California for his pioneering innovations on DARPA-, Navy-, and Air Force-sponsored research and their successful transition to government and industry.

He was featured on TV and radio business shows and in *InformationWeek* for his ability to leverage federal funding to start and grow phenomenally successful technology companies. He was profiled in *California CEO* and has contributed to *Zone*, a magazine featuring emerging technologies in Southern California. He has been a featured speaker at the Caltech/MIT Enterprise Forum, Larta, and Japan External Trade Organization.

He is the author of *Transdisciplinary Systems Engineering: Exploiting Convergence in a Hyper-Connected World* (foreword by Norm Augustine), Springer 2017. He is the co-author of *Tradeoff Decisions in System Design*, Springer, 2016. He is the Co-Editor-in-Chief of two systems engineering research volumes.

A partial list of his international awards includes:

- 2019 IEEE Aerospace and Electronic Systems Society's Pioneer Award
- 2019 AIAA/ASEE Leland Atwood Award (for excellence in aerospace research & education)
- 2019 INCOSE Founders Award (for increasing global stature of the council)
- 2019 Society of Modeling and Simulation International's Presidential Award for advancing the field
- 2019 ASME CIE Leadership Award (for advancing the use of computers in engineering practice)
- 2018 INCOSE Outstanding Service Award
- 2017 IEEE SMC Systems Science and Engineering Award for leading MBSE Technical Committee
- 2016 INCOSE Award for pioneering advances in Transdisciplinary Systems Engineering
- 2014 INCOSE Lifetime Achievement Award (for fundamental contributions to SE)

- 2013 IISE Prize for Innovation in Curriculum Development
- 2011 INCOSE Pioneer Award for Seminal Contributions to System Science, Engineering and Society
- 2008 President's Award from Society of Design and Process Science
- 2006 C.V. Ramamoorthy Distinguished Scholar Award from Society of Design and Process Science
- 2000 Distinguished CEO of Computerworld's Top 100 Emerging Companies to Watch
- 5 Technology Utilization Awards from Rockwell International on the Space Shuttle Program
- Listed in Marquis Who's Who in Science and Engineering, Who's Who in Industry and Finance, and Who's Who in America.

Azad will receive the prestigious award at the 2020 IEEE International Radar Conference in Washington, DC at the end of April. We celebrate our INCOSE Fellow, Azad, and wish him the absolute best as he continues to make tremendous contributions to our field.



**Dr. Azad M. Madni**

INCOSE congratulates INCOSE Member and Fellow (2005), Dr. Azad M. Madni, and an INCOSE Pioneer and Founders Award Recipient for his achievement as the 2019 IEEE Aerospace and Electronic Systems Pioneer Award recipient. This is the highest award given by this society. Azad is a Professor of Astronautical Engineering and Executive Director of USC's Systems Architecting and Engineering Program in the Viterbi School of Engineering. He is the founder and CEO of Intelligent Systems Technology, Inc., a high-tech R&D company specializing in model-based engineering and intelligent decision aiding technologies for aerospace.

**IEEE Aerospace and Electronic Systems Pioneer Award**

"The Pioneer Award has been given annually since 1949 to an individual or team for "contributions significant to bringing into being systems that are still in existence today."



# Improving the Odds of Achieving Excellence at Startup Companies?

Barry Fowler

It is commonly recognized half of startup companies fail within the first five years. The cause is probably as unique as each company. However, achieving excellence in performance, in each case, would surely help to overcome common obstacles and improve the odds of startup success.

I am proposing trajectory of success can be achieved by recognizing two example obstacles and applying a methodology to do better. The means is the application of, appropriately tailored and scaled for company size, principles of the discipline of systems engineering. It is also notable Project Management (PM), and other engineering disciplines, are knowledge areas of systems engineering.

## Obstacles to Achieving Excellence

### Over Reliance on Self

Tech startups surely involve a lot of “doing it yourself” to achieve success. Like the adage says, “If you want something done right, do it yourself.” But what individual can identify a good way to minimize risk, or maximize opportunity, for a given engineering project not done before?

A strong work ethic is a must. But strong work ethic is not a guarantee of success. Startups involve doing unfamiliar tasks, impossible to predict during planning, yet they must yield an interim professional work product. Hard work, even by the smartest individuals, is not guaranteed to achieve a professional outcome.

A healthy ego could also help but, it is said, “ego defends itself.” That could make it easy to mistakenly elevate influential personal opinion above a respectable level of risk. A salient example is the rise and failure of the Theranos startup company. The personal effects of ego were more influential than professional discipline to the detriment of stakeholders.

*“Systems Engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on holistically and concurrently understanding stakeholder needs; exploring opportunities; documenting requirements; and synthesizing, verifying, validating, and evolving solutions while considering the complete problem, from system concept exploration through system disposal.”*

*The Guide to the Systems Engineering Body of Knowledge (SEBoK)*

### System Complexity

The present-day innovator can face substantial complexity in academia, industry, and the markets for the products they develop. Some devices, like in transportation, must communicate and share data with other external system interfaces. Hence the complexities can yield a “system of systems” requiring understanding, simulation, and validation for performance and regulatory compliance with requirements over the product life cycle.

This was not unlike the situation at Bell Labs in the 1930’s and beyond. Their staff included many recognized experts in communication to include Claude Shannon who developed one of the most fundamental communication theorems -- the Nyquist-Shannon Sampling Theorem.

However, that team lacked the skills to efficiently develop products becoming more complex and required to interface with external systems. Development of communication systems, multiple technologies and devices working together as a whole, had become such a complex effort achieving the overall required performance taxed the abilities of the engineers.

### The Solution is Systems Engineering

Systems Engineering is an engineering discipline offering professional resources, and product development processes, that could serve as enablers for a startup company. Those enablers would also prompt the engineer to shift their perspective, away from opinion, towards Systems Thinking and a methodical development process.

The activity begins with tailoring a mature systems engineering process and planning the tasks ahead with stakeholder input. The tasks begin with discovering

the real issues and problems to be resolved and identifying the ones offering the greatest opportunity or the greatest risk of failure.

Another overview of systems engineering is on the Wikipedia web page.

### How Can Systems Engineering Help Mitigate These Obstacles?

The first way is to look for wisdom from respected experts in the historical record.

*"If I have seen further than others, it has been by standing on the shoulders of giants." -- Sir Isaac Newton, Albert Einstein*

Surely, their intellects and egos must have also been as healthy as any tech startup engineer's. Yet both recognized they had an obligation to understand what the experts before them had accomplished. Thus, Newton and Einstein first sought to stand "... on the shoulders of giants" by exercising their day's equivalent of due diligence before proceeding further and achieving excellence.

A second way is recognizing the methods and techniques of systems engineering have been designed to mitigate system complexity. From the narrative above, the engineers at Bell Labs needed a methodical, consistent way to identify system components to change to get the overall system performance they needed.

Their solution included showing the impact of sub-component requirements on system level requirements. Their development effort was also implemented in phases, with each one resulting in a better definition of the end product and maturity of product prototypes.

This was the birth of the profession known today as systems engineering which has since matured as an approach to systems development and been recognized as an engineering discipline.

### Development of Systems Engineering in Industry and the Public Domain

Many large corporations have since developed their own unique "recipe" for product development, whether they have called it

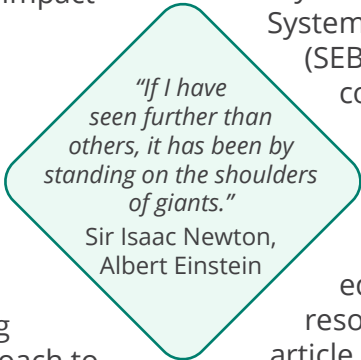
systems engineering or something else, but protected it as proprietary information because their efforts have not been without substantial investment of resources. Their motivation was better, faster, and cheaper product development for competitive reasons.

Today's innovative companies are often small and lack such resources. Their pool of expertise must largely consist of experts in the technology they are developing. And, as with any small pool of talent, it may not span the disciplines good systems engineering practices would otherwise involve.

Thus, it is fortunate systems engineering methods have begun to be formally documented in the public domain to support industry and academia. That is a reason representatives from a number of U.S. corporations and organizations founded the National Council on Systems Engineering (NCOSE) in 1990. It became the International Council on Systems Engineering (INCOSE) in 1995 as a result of growth. It is notable INCOSE membership today, nearly 17,000 from 70 countries, includes representation from prestigious universities, technical arms of the military, and engineering companies. It is also notable the INCOSE SYSTEMS ENGINEERING HANDBOOK is free to INCOSE members.

One venue to learn about systems engineering, freely available in the public domain, is the Systems Engineering Body of Knowledge (SEBoK). And not unlike it, possibly complementary, are various other BoKs other professional societies are developing. A partial list is included below.

A second venue is formal educational resources. Those resources are beyond the scope of this article, however, INCOSE has developed a recommended curriculum, described in the Graduate Reference Curriculum for Systems Engineering (GRCSE®). Materials from formal courses are also available, for example, via the MIT OpenCourseWare venue. Various universities have also embedded systems engineering into their curriculum. A listing is on the website for the Systems Engineering and Research Center (SERC).



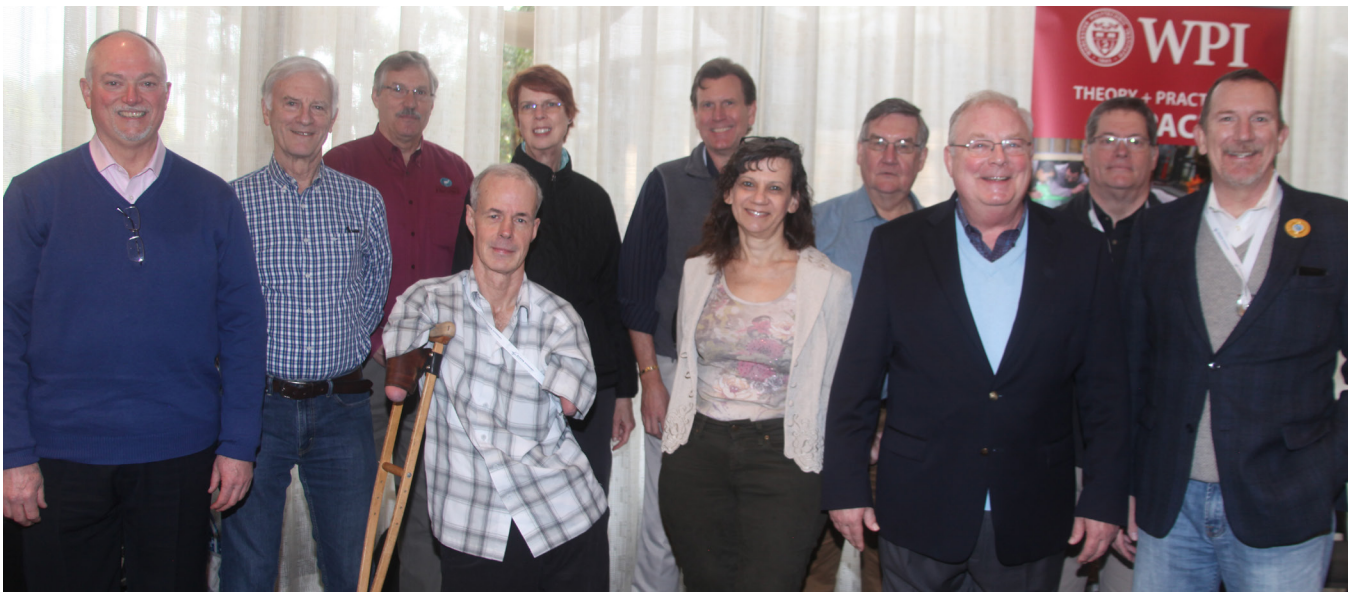
Using resources like these, proceeding in accordance with systems engineering principles, is one means of achieving success and excellence at startup companies; systems engineering principles provide a critical solution to mitigate the 50% failure rate within the first five years.

### Reputable Systems Engineering Guides in the Public Domain

- MITRE Systems Engineering Guide
- NASA Systems Engineering Handbook—referenced by: Olivier de Weck. 16.842 Fundamentals of Systems Engineering. Fall 2015. Massachusetts Institute of Technology: MIT OpenCourseWare, <https://ocw.mit.edu>. License: Creative Commons BY-NC-SA.

### Body of Knowledge Guides for Professional Disciplines related to Systems Engineering

- Professional Engineering Body of Knowledge
- Industrial Engineering Body of Knowledge (IEBOK)
- Software Engineering Body of Knowledge (SWEBOK)
- Civil Engineering Body of Knowledge
- Project Management Body of Knowledge (PMBOK Guide). Acknowledged as the globally authoritative guide of good practices in the profession of Project Management (PM).



*Knowledge and Camaraderie shared at the INCOSE International Workshop*

# Team Strength Through Diversity

Sandra Levy, Systems Engineer, [sandra.levy@medtronic.com](mailto:sandra.levy@medtronic.com)



## Sandra Levy, French-Israeli Woman, System Engineer

Sandra Levy is a systems engineer currently working for Medtronic in Jerusalem. She was born in France in 1990 and graduated from the French engineering school "L'Ecole des Mines" in 2013 with a master's degree in engineering specializing in medical devices. She moved to Israel after graduation to work for a medical equipment startup company for a couple years and subsequently moved back to France to work for Qualcomm, also for 2 years.

In 2017, Sandra and her husband chose to return to Israel as immigrants where they currently reside. She has worked at Medtronic for the past two and a half years, where she has found great success working with and leading multicultural and multilingual teams of individuals from around the world. Below, Sandra shares her perspective and insights about her experience.

**Medtronic**

In any multi-disciplinary project, the systems engineer is always at the heart of technical discussions and often represents the team and their ideas to others. As such, I believe that teams made of individuals with varied backgrounds, be they cultural, religious, educational or nationalistic, and led by a team leader who is open-minded are great assets to any company.

Medtronic's core values of Connect/Collaborate/Innovate have made me proud of being a member of their team. On a recent project, which involved the rapid development of a Proof of Concept (POC), my team consisted of 8 men and 8 women, including 2 religious Jews, 1 Muslim, 2 Russians, 2 Canadians, 1 American and 2 French people. This diversity, coupled with each member's openness, curiosity, adaptability and varied skill set allowed us to deliver the finished POC within a very tight schedule. Rather than dividing us, our diversity quickly proved to be a great strength, allowing each of us to rely on the other's perspective and point of view.

I believe that meeting and working with people who have different backgrounds and belief

systems than ourselves can open our mind and allow us to work more effectively towards a greater good.

In Israel, we work with people from all over the world and from very diverse cultural environments, but everyone is respected and valued based on their skills. As a woman and a systems engineer, I bring a strong sense of communication; as a new immigrant, I also share the best my country of origin has to offer.

In a multi-disciplinary project, synergy of varied talents and competencies is essential. Every team member's skill set must complement every other; none can be missing and none can be excluded.

In my position as systems engineer, I strive for harmony within my team. This means listening to every argument, weighing every option on its merit and embracing and promoting diversity in such a way as to encourage innovative solutions.

Diversity of thought, of background, of culture and belief can lift everyone to surpass themselves and bring any project to a successful end.

Fridley, Minn.-based Medtronic doubled the number of shifts in manufacturing ventilators at its Galway, Ireland manufacturing facility. *"Medtronic recognizes the demand for ventilators in this environment has far outstripped supply. No single company will be able to fill the current demands of global healthcare systems. ...Medtronic is committed to getting more ventilators into the market and to the right locations in the world to help doctors and patients dealing with COVID-19."*

Bob White, executive VP and president, [news release](#)

## Second Workshop on the application of Artificial Intelligence for Systems Engineering Call for Presentations/Papers

<http://www.kr.inf.uc3m.es/ai4se>

INCOSE – AEIS - Carlos III University of Madrid  
Madrid (Leganés), Spain, October 13-14, 2020

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The [Knowledge Reuse Group](#), [INCOSE](#) and [AEIS](#) invite submissions to [AI4SE workshop](#), which will take place at Carlos III University of Madrid within the “Artificial Intelligence in Systems Engineering Week”.

[Artificial Intelligence](#) (AI), sometimes called machine intelligence, is intelligence “demonstrated” by machines, in contrast to the natural intelligence displayed by humans and animals. Computer science defines AI research as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chances of successfully achieving its goals. Colloquially, the term "artificial intelligence" is used to describe machines that mimic certain "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".

[Systems Engineering](#) (SE) is an interdisciplinary field of engineering development and engineering management that focuses on how to design and manage complex systems throughout their life cycle. Activities such as requirements engineering, reliability management, logistics, coordination of different teams, testing and evaluation, maintainability and many other disciplines necessary for the successful development, design, implementation, and ultimate decommission of systems, become more difficult when dealing with large or complex projects.

### -----KEYNOTE SPEAKERS-----

Lucio Tirone, INCOSE-EMEA.

(Obs, Keynote Speakers can be changed)

### -----TOPICS OF INTEREST-----

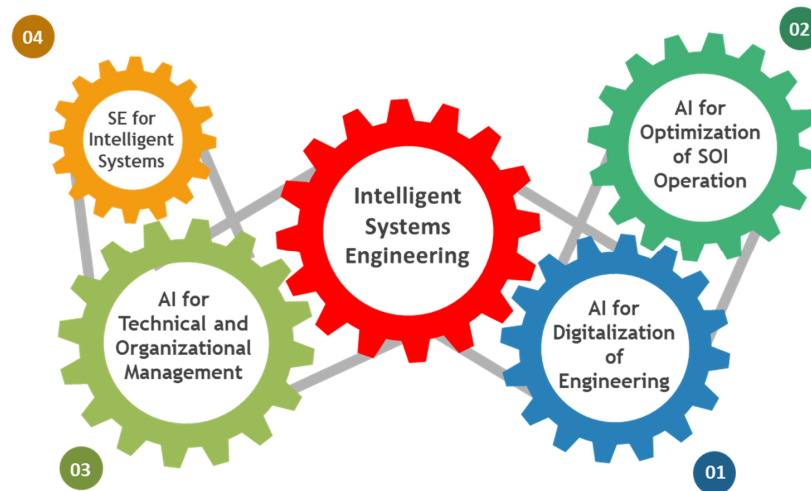
Many of the challenges described in the previous definitions are human intensive, and could demand highly developed skills in learning, reasoning, decision making and problem solving. Therefore, Artificial Intelligence and all of its interleaved variants (machine learning, knowledge engineering, artificial reasoning, ontologies, optimization methods, etc.) are more and more relevant to systems engineering.

On the other hand, emergent Intelligent Systems like autonomous vehicles in all their facets (cars, trains, submarines, aircrafts, ships, etc.) are revolutionizing our perception of services. These systems are offering divergent ways of operations, where machines learn from their own operation and, theoretically, they improve its quality of service. Not deterministic systems propose giant challenges like how the certification should take place considering they will operate differently along its service life. How to V&V them, or even how to configure them in the case of potential accidents, ethical aspects etc.

Our purpose in this AI4SE workshop is to focus on the following application areas:

- AI for digitalization of Engineering
- AI for optimization of System of Interest (SOI) Operation and Maintenance
- AI for Technical and Organizational Management
- Systems Engineering for Intelligent Systems (non-deterministic)

The Artificial Intelligence for Systems Engineering Workshop, AI4SE is designed to be the meeting point for the industry and academia to share promising on-going or relevant past experiences where AI is applied to design and improve Systems Engineering processes, methods or tools, with a clear focus on practical applications. The organizing committee invites submissions of results from industrial projects, scientific works and demonstration activities on how models and technologies, from AI, cover the following (but not restricted to) topics:



### 01. Digitalization of Engineering

- Smart Authoring
  - Computer assisted guidance for requirements development
  - Automatic generation of requirements, models, test cases, manuals
- Engineering Support Systems
  - Automatic Quality Judgement for requirements, models, components, the SOI, etc.
  - Automatic reasoning for trade-off analysis and decision management
  - Decision Support Systems for specification and modeling
  - Computer guided design methods (Designs Reuse)
  - Automatization of digital twin construction
  - Deep Learning for optimization and control
  - Smart safety analysis
- Engineering knowledge discovery
  - Automatic identification and/or suggestion of traceability links
  - Automatic patterns identification
  - Automatic generation of Product Lines from legacy information
  - Commonality/Variability discovery



## O2. Optimization of SOI Operation and Maintenance

- Operational optimization
  - Optimization of System Governance
- Predictive maintenance of systems
- Smart configuration of the SOI
  - Self-organization of systems
- Human-machine smart interaction (virtual assistants, chat boxes, etc.)

## O3. Technical and Organizational Management

- Decision Management Process
- Management Support Systems (Automatic Reasoning)
- Trade-off analysis
- Knowledge Management & Reuse
  - Relevant Knowledge discovery
  - Automatic generation of repositories

## O4. Systems Engineering for Intelligent Systems

- V&V in Autonomous / Intelligent Systems
- Automatic V&V generation techniques

## O5. Ethics for Intelligent Systems

- Trustworthy autonomous systems
- Explainable decision systems
- Accountability analysis in intelligent decision systems

## -----SUBMISSION INFORMATION AND PAPER PUBLICATION-----

Submissions will be accepted in two different formats, always written in English:

- Regular papers (10-12 pages)
- Presentation-only papers

Authors of accepted submissions will be notified and required to submit the final camera-ready version either as a Presentation-only or as a Regular paper.

Submissions for Regular papers must follow Springer LNCS format. Proceedings containing accepted papers will be published as a book with ISBN.

Presentation-only papers are format-free. Accepted Presentation-only papers will be allowed a slot for presentation at the Workshop and will be given the chance to be included in the Proceedings with a reformatting.

Submissions must be original and not published elsewhere. Each submission will be peer-reviewed by at least two members of the Program Committee. Acceptance will be based on the paper's significance, technical quality, clarity, relevance, and originality. All accepted papers must be orally presented at the workshop by one of the authors and at least one author of each accepted paper must register for the workshop.

All papers should be submitted in PDF format through the AI4SE EasyChair submission page <https://easychair.org/conferences/?conf=ai4se2020>.

-----IMPORTANT DATES-----

Submission deadline: June 1<sup>st</sup>, 2020

Notification of paper acceptance: July 31<sup>st</sup>, 2020

Camera ready papers deadline: August 31<sup>st</sup>, 2020

Workshop dates: October 13-14, 2020

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*Knowledge and Camaraderie shared at the INCOSE International Workshop*

# INSIGHT Preview

William Miller Editor-in-Chief, [insight@incose.org](mailto:insight@incose.org)  
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**I**NSIGHT's mission is to provide informative articles on advancing the state of the practice of systems engineering. The intent is to accelerate the dissemination of knowledge to close the gap between the state of practice and the state of research as captured in *Systems Engineering*, the Journal of INCOSE, also published by Wiley. INCOSE thanks corporate advisory board (CAB) member Lockheed Martin for sponsoring *INSIGHT* in 2020 and welcomes additional sponsors, who may contact the INCOSE director for marketing and communications at [marcom@incose.org](mailto:marcom@incose.org).

The March 2020 issue of *INSIGHT* addresses *augmented intelligence (AI) for systems engineering (AI4SE) and systems engineering for augmented intelligence (SE4AI)*. SE4AI addresses the transformation we need in methods, procedures, and tools (MPTs) to engineer systems with embedded AI to be fit for purpose and doing no (unintended) harm. AI4SE addresses challenges that have to be overcome to leverage AI in the practice of systems engineering much as a lever or pulley provides mechanical advantage to perform work in Newtonian mechanics.

Tenets of systems engineering from control systems engineering are that engineered systems be observable, controllable (to assure system stability with tolerable errors), and identifiable (Möller 2016). AI is in the forefront of technology advances with widely publicized innovations in image identification, diagnostics, and autonomy; AI applications gone awry are newsworthy in both the popular and scientific/engineering media.

AI methods can be broadly classed as rule-based and neural-network based. Rule-based methods are mature with decades of experience in application and are well-understood. In contrast, much is unknown of the contextually driven behavioral characteristics of neural network-based AI, referred to as machine learning and deep learning. Neural network performance is critically dependent on the datasets used to train the algorithms and whose actions currently cannot be guaranteed to be *fit for*

*purpose* to meet the attributes of elegance that systems accomplish their intended purposes, be resilient to effects in real-world operation, while minimizing unintended actions, side effects, and consequences (Griffin 2010).

The articles represent ongoing research in the Systems Engineering Research Center (SERC), a university-affiliated research center (UARC) of the US Department of Defense, in addressing the AI4SE and SE4AI challenges as stated in their research roadmap for AI and autonomy (SERC 2019). The SERC ([www.sercuarc.org](http://www.sercuarc.org)), operated by Stevens Institute of Technology with the University of Southern California (USC) as principal collaborator, leverages the research and expertise of faculty and researchers from 22 collaborator universities throughout the US. The *INSIGHT* editorial staff and SERC theme editors Dinesh Verma, Tom McDermott, and Kara Pepe thank the authors for their contributions. The lead article by Tom McDermott, Dan DeLaurentis, Peter Beling, Mark Blackburn, and Mary Bone overviews the AI and autonomy research roadmap and maps the subsequent articles to the parts of the roadmap.

The SERC articles are within the scope of the systems community initiative on the future of systems engineering (FuSE) that has AI4SE and SE4AI as an initial project. The May 2019 *INSIGHT* addressed other FuSE projects on systems engineering principles and foundations for systems engineering (F4SE). *INSIGHT* intends to report on FuSE related topics on an ongoing basis.

## References

Griffin, M. D. 2010. "How do we fix system engineering?" 61st International Astronautical Congress. Prague, CZ; 27 September – 1 October.

Möller, D. P. F. 2016. *Guide to Computing Fundamentals in Cyber-Physical Systems: Concepts, Design Methods, and Applications*. Springer, CH.

Systems Engineering Research Center. 2019. "Research Roadmaps 2019-2020." [https://sercuarc.org/wp-content/uploads/2020/01/ROADMAPS\\_2.3.pdf](https://sercuarc.org/wp-content/uploads/2020/01/ROADMAPS_2.3.pdf).

# Note From the Editor

Lisa Hoverman, [newsletter@incose.org](mailto:newsletter@incose.org)



**H**appy 2020! It's INCOSE's 30th Anniversary Year and we are celebrating big with some highlights of the amazing work INCOSE contributed to and continues to deliver in the discipline of Systems Engineering. With the world facing a pandemic, we need systems engineering, and its practitioners serving at the very front lines, to help people navigate and solve this complex problem.

We hope you fully enjoy this first issue of the Newsletter, with a lot of highlights of INCOSE, our recent International Workshop (IW) and the impactful work we are doing together. We are many—more than 18000 systems people strong, spanning more than 70 chapters, 35 countries, working in over 50 working groups on the state of the art products, standards, and research that will continue to improve and keep systems engineering relevant and of increasing relevance and value to our world.

The Newsletter continues to grow to inform our readership on all things INCOSE, both current, upcoming, and historical. There are some interesting previews on the many upcoming and exciting 2020 happenings, including the way we are monitoring the COVID-19 situation closely, while continuing our work virtually, and in small groups face to face where safe.

We have upcoming powerful chapter meetings, working group sessions, and other initiatives of INCOSE reported on in this Newsletter.

Important to this Newsletter are some great articles from practitioners—practitioners tackling both the real and grand challenges of our times that apply to the Future of Systems Engineering.

Please keep sharing your publications with us as we continuously work to improve. I hope that you see some of your suggestions and contributions in this issue. As always, we welcome feedback and contributions at [newsletter@incose.org](mailto:newsletter@incose.org).

We look forward to seeing you participating, networking at, and presenting at, one of the many terrific upcoming INCOSE events. I end with a sincere note of appreciation to all who contributed to this Newsletter. As a leader of INCOSE I encourage you to keep calm and carry one because we need our systems engineers and thinkers, now more than ever. Stay healthy and I hope to see you on an upcoming INCOSE virtual event.

## INCOSE Member Newsletter

### Publication of the International Council on Systems Engineering

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**Publication Schedule.** The INCOSE Member e-Newsletter is published four times per year. Issue and article/advertisement submission deadlines are as follows:

- Q1 Newsletter, General Content (GC): 13 Feb, Late
- Breaking News (LBN): 25 Mar
- Q2 Newsletter, GC: 15 May, LBN: 25 May
- Q3 Newsletter, GC: 15 Aug., LBN: 25 Aug
- Q4 Newsletter, GC: 15Nov; LBN: 25 Nov.

For further information on submissions and issue themes, visit the INCOSE website as listed above.

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**Who are we?** INCOSE is a 18,000+ 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.

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