



2015 July ■ Quarter 2



Members
e-Newsletter

President's Corner

David Long, david.long@incose.org

In the systems engineering workforce study entitled “Helix – Developing Systems Engineers” conducted by the Systems Engineering Research Center longitudinal study of the systems engineering workforce, Pyster, Hutchison, and Henry identify the paradoxical mindset as one of five important characteristics of effective systems engineers. The capability to simultaneously manage big picture thinking and attention to detail, to think analytically and synthetically, to be methodical and creative is central to systems engineers and the unique value we deliver. Key to INCOSE is our own organizational ‘paradoxical mindset’- directed initiatives and organic contributions, near-term tactics and long-range thinking, and volunteerism bringing together the best of volunteers and professional staff. This paradoxical mindset helps INCOSE to think and act both globally and locally, maximizing the impact we bring and the value we deliver.



Like any organization, INCOSE maintains its portfolio of critical initiatives defined and driven at the international level. One of the largest is the 4th edition of the Systems Engineering Handbook, a revision and expansion to reflect the latest systems knowledge while remaining

aligned with the recent revision of ISO/IEC/IEEE 15288. We are pleased to launch the 4th edition (along with the corresponding revision to the Certification exam) on July 13 as we open the 2015 International Symposium (IS2015). But the launch of this latest edition is not the only product release on our radar. Two notable products are emerging from our working groups – a new “Project Manager’s Guide to Systems Engineering Measurement for Project Success” (highlighted in this newsletter) and version 2 of the highly popular “Guide for Writing Requirements” (slated for launch at the symposium). Both products, and countless others like them, were conceived of, developed, and driven by our working groups (WGs). Many of the great innovations in programs and events likewise develop at the local and regional level, notable among these the Nordic Systems Engineering Tour. This synergistic combination of “top-down” initiatives and “grass roots” efforts enable INCOSE to advance the state of the art, the state of the practice, and the state of the systems engineering community in a way that neither directed nor organic approach could achieve alone.

2015 is filled with many other projects and programs, many of which have strategic impact. The INCOSE Institute for Technical Leadership is poised to open with its first cohort of future technical leaders drawn from across application domains and around the world. Chapters, WGs, and individuals from across INCOSE are populating our new website with updated information highlighting past results, current initiatives, and future

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INCOSE Member Newsletter

Publication of the International Council on Systems Engineering

Editor Lisa Hoverman
newsletter@incose.org

Member Services INCOSE Administrative Office
info@incose.org +1 858 541-1725

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Article Submission newsletter@incose.org

Publication Schedule. The **INCOSE Member Newsletter** is published four times per year. Issue and article/advertisement submission deadlines are as follows: 3rd Qtr 2015 issue –15 Aug; 4th Qtr 2015 issue –15 Nov; 1st Qtr 2016 issue –13 Feb; 2nd Qtr 2016 issue –15 May; 3rd Qtr 2016 issue –15 Aug; 4th Qtr 2016 issue –15 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 10,000+ 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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President's Corner *(continued)*

directions. Chapter leaders and Technical Operations are involved in a treasure hunt to gather formal products, technical artifacts, recorded presentations, and briefings into a single INCOSE archive to maximize their value and enhance the value we deliver to our members. While driving forward these tactical efforts, INCOSE continues to work strategically to ensure our five-year objectives and Systems Engineering Vision 2025 serve as guides to our future rather than merely documents on the shelf. This included defining our values in 2014 (the unchanging “who” we are) along with our principles (the “how” we pursue our mission and vision) helping us to better align and execute across our widely distributed organization.

Through it all, INCOSE demonstrates a special brand of volunteerism—volunteers and staff working together to achieve our objectives and to deliver benefit to our members, individuals, and society. Our passionate volunteers define the path forward, giving selflessly of their time and energy to advance the profession. We amplify those contributions through the efforts of a limited but passionate group of professional staff who bring special skills and their own sense of energy and purpose. Whether in impactful products and publications, informative communications, engaging events, or countless other efforts, neither volunteer nor professional staff alone can deliver the critical results that we achieve together.

As we celebrate the critical role that both volunteer and staff play, we also prepare to say goodbye to a key member of the INCOSE family. Holly Witte, INCOSE’s Managing Executive since October 2008, is retiring from this role at the end of June. Holly is known to so many across INCOSE, particularly those active at the international level. Over the past three years, I have had the pleasure of working closely with Holly as she serves both as an advisor to, and an extension of the Board of Directors helping our volunteer leaders manage the day-to-day and year-to-year operations of a 10,000-member organization. Holly has made a lasting impact on INCOSE and those who have worked closely with her over the last seven years. As much as we will miss Holly and what she brings to INCOSE, we are thrilled that she is retiring from INCOSE to spend time with two of her great loves – her husband Jim and their winery A Blooming Hill Vineyard which continues to grow and prosper.

INCOSE has much to celebrate – the paradoxical mindset that characterizes us, the intellectual contributions that define our practice and profession, the passionate individuals that make great things happen, and the exciting future before us. Wherever you may be in mid-July – whether connecting with an estimated one thousand leading systems engineers at the International Symposium in Seattle, making your own systems contributions in your office, or simply relaxing with family or friends on holiday – I hope you will pause, reflect back, look forward, and celebrate INCOSE, systems engineering, and the unique value that both deliver for the benefit of humanity and the planet. ■

Note from the Editor

Lisa Hoverman, newsletter@incose.org



Welcome to the second edition of the INCOSE Members e-Newsletter. I hope this finds you gearing up for the amazing event that the International Symposium (IS2015) will be as we celebrate INCOSE's 25th! I look forward to meeting and seeing many of you in Seattle, US-WA.

Below you will find the schedule for submission of articles for the INCOSE Newsletter as well as the general theme for each. All articles are to be submitted to newsletter@incose.org. If you have any questions on the INCOSE Newsletter regarding submission of articles, requests, or anything related, please also submit these to the same email address.

The new INCOSE Newsletter is published every quarter and seeks articles and news items of interest. To support the newsletter, articles must be submitted by the middle of the prior month. However, if you expect to share "Late Breaking News," I can hold a space. If you do plan to have late breaking news, you must notify me by the General Submission deadline if possible.

Please reach out with any questions. Thank you all for the quality submissions to date. I look forward to improving this as we continue to grow. Please do support and promote the Newsletter – it will only ever be as good as the material in it! ■

Newsletter Issue	Submission Date for General Articles	Exceptional Submission Date for Late Breaking News with advance permission	Theme
Third Qtr 2015	15 August	31 August	INCOSE International Symposium & Current News
Fourth Qtr 2015	15 November	30 November	INCOSE Year's End & Current News
First Qtr 2016	13 February	28 February	INCOSE International Workshop & Current News
Second Qtr 2016	15 May	31 May	Planning for the INCOSE International Symposium & Current News
Third Qtr 2016	15 August	31 August	INCOSE International Symposium & Current News
Fourth Qtr 2016	15 November	30 November	INCOSE Year's End & Current News

Design an Icon for Systems Engineering

Alan Harding, alan.d.harding@baesystems.com

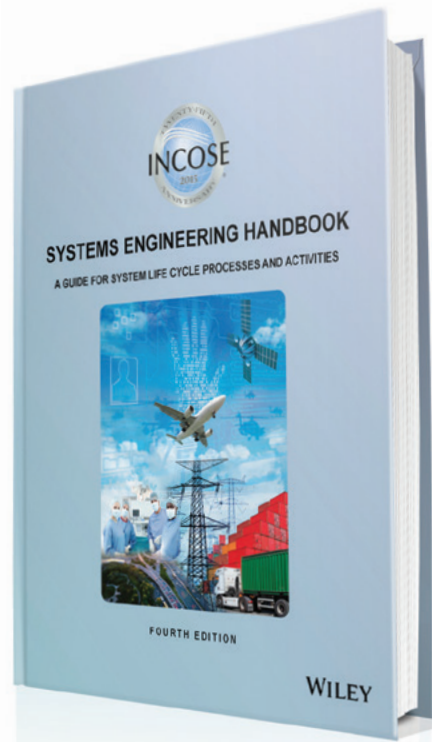
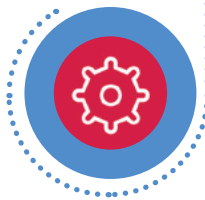
This competition is an opportunity to develop an appropriate icon that represents systems engineering. Doctors have the caduceus, Pilots have wings, but Systems Engineers have nothing! The INCOSE logo and Systems Engineering Certification logos have specific meanings and restricted use. The challenge is to design something that represents systems engineering, and that we can start to use and popularize across the community.

- **Eligibility:** All INCOSE members as of the closing date (including student members) are eligible to enter the competition, and may submit as many valid entries as they wish.
- **Guidance:** A monochrome logo is preferred (black on white), preferably square, and usable when reproduced no larger than 400 pixels wide x 400 pixels high.
- **How to enter:** entries by email, submitted to info@incose.org, with the title "SE Icon Competition." Entrants may send files in Adobe Acrobat or Microsoft Office formats. Entries remain the intellectual property of the originator, however, in submitting an entry the originator grants INCOSE rights to use the icon as it sees fit.
- **Opening date:** Monday 1st June 2015
- **Closing date:** Monday 31st August 2015
- **Judging:** Preliminary judging will take place between 1st - 11th September. Subject to sufficient entries of high enough quality, the panel will submit a ranked recommendation to the Board of Directors (BoD) who will make the final decision at their meeting in Boston in October. If there are no entries of sufficient quality, the BoD may elect not to declare a winner.
- **Preliminary Judging Panel:**
 - Chair: Jerry Fisher
 - EXCOM Representative: To Be Determined (TBD)
 - Communications Representative: Lisa Hoverman
 - Up to 2 other Representatives: TBD

Results will be announced in the Q4 Newsletter, together with social media coverage. Winner(s) will receive a small prize (\$100) and acknowledgement for the icon, which INCOSE will use and promote. ■

Pre-order the Latest INCOSE Handbook Now!

The objective of the *International Council on Systems Engineering (INCOSE) Systems Engineering Handbook* is to describe key process activities performed by systems engineers and other engineering professionals throughout the life cycle of a system. The book covers a wide range of fundamental system concepts that broaden the thinking of the systems engineering practitioner, such as system thinking, system science, life cycle management, specialty engineering, system of systems, and agile and iterative methods. This book also defines the discipline and practice of systems engineering for students and practicing professionals alike, providing an authoritative reference that is acknowledged worldwide.



Edited by David D. Walden, ESEP
and Garry J. Roedler, ESEP
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The latest edition of the *INCOSE Systems Engineering Handbook*:

- Is consistent with ISO/IEC/IEEE 15288:2015 Systems and software engineering—System life cycle processes and the Guide to the Systems Engineering Body of Knowledge (SEBoK)
- Has been updated to include the latest concepts of the INCOSE working groups
- Is the body of knowledge for the INCOSE Certification Process

This book is ideal for any engineering professional who has an interest in or needs to apply systems engineering practices. This includes the experienced systems engineer who needs a convenient reference, a product engineer or engineer in another discipline who needs to perform systems engineering, a new systems engineer, or anyone interested in learning more about systems engineering.

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INCOSE's Finances and Operations: Review of 2014

Jen Narkevicius, jennifer.narkevicius@incose.org

In compliance with INCOSE policy, this article provides a financial report of the 2014 fiscal year. In addition, the goals for the 2015 annual operating plan are presented.

Financial Results for 2014

INCOSE continues to pursue our mission to deliver the highest quality products and services to our members. Membership growth and the continued hard work of the Events Committee resulted in strong revenue in 2014, positioning us to continue growing in 2015. Sustained investments in Certification continue to facilitate the growth of the systems engineering profession. In addition, record turnout at our conferences, enduring academic outreach, sustained development of outreach and support to our chapters and sectors bolstered INCOSE revenue.

INCOSE demonstrates value through a variety products and services. Our professional magazine *INSIGHT* transitioned publishers, which will assure a broader audience and increased revenue. The magazine continues to highlight items of importance to practitioners and delivers information to facilitate the systems engineering community of practice. This value will improve the capabilities of our readers and may draw others into the INCOSE fold.

INCOSE is the leading organization for systems engineering globally, reflected in our sustained membership growth. INCOSE attracts and retains leading organizations as members of the INCOSE Corporate Advisory Board (CAB) and the Academic Council, being the flagship organization of systems engineering. We continue to build and leverage relationships with similar but different organizations that deliver complementary value including the Program Management Institute (PMI) and the Institute of Electrical and Electronics Engineers (IEEE).

INCOSE's income for 2014 was USD 1,695,000 (103% of plan), while expenses were USD 1,750,000 (95% of plan). This left us with a net deficit of USD 55,000. Although we used surplus funds from previous years, this covered the expenses of implementing our new IT structure. Our income highlights include better than expected symposium income due to increased sponsorship and increases in CAB membership. Our combined membership dues continue to provide about 77% of our

operating income. We will see income growth through our new relationship with Wiley as our audience expands within the context of their global reach. Expenses include sharing dues revenue with chapters, expenses of certification, information-technology expenses, publication expenses, marketing, technical operations support costs, administrative office costs and expenses. The INCOSE Board of Directors are rigorous and vigilant stewards of INCOSE members' money and will continue its efforts over the next few years to enable our organization not only to grow, but also to expand our income by supplying effective and valued products and services to our membership as well as to all systems engineers and associations that seek our collective value.

Financial Outlook for 2015 and beyond

The global economic picture affects INCOSE as it does all. Financial challenges will continue for the INCOSE organization as with the rest of the economic sector. As an organization, however, we continue to seek methods to improve our value to our various stakeholders while maintaining a conservative but strategic view of financial planning.

We had a good financial result from the 2014 International Symposium (IS) in Las Vegas, US-NE. The 2015 International Workshop (IW) in Los Angeles, US-CA was the largest to date and reviews of both new and experienced participants were good – clearly the IW continues as an excellent service for members. While the intent of the IW is not to be profitable, we consistently work to keep expenses suppressed through careful selection of location and vendors.

As we celebrate the 25th Anniversary of INCOSE, our growth will continue at both the individual level and in the CAB members. Our foray into external publishing is a significant move toward improving our communications infrastructure. Our goal to see the completion of the development of the INCOSE IT infrastructure has been met and it continues to be populated with the information that makes us strong and vibrant. As we move forward, our new Chief Information Officer CIO will focus on maintenance and smaller projects needed to meet member and chapter needs.

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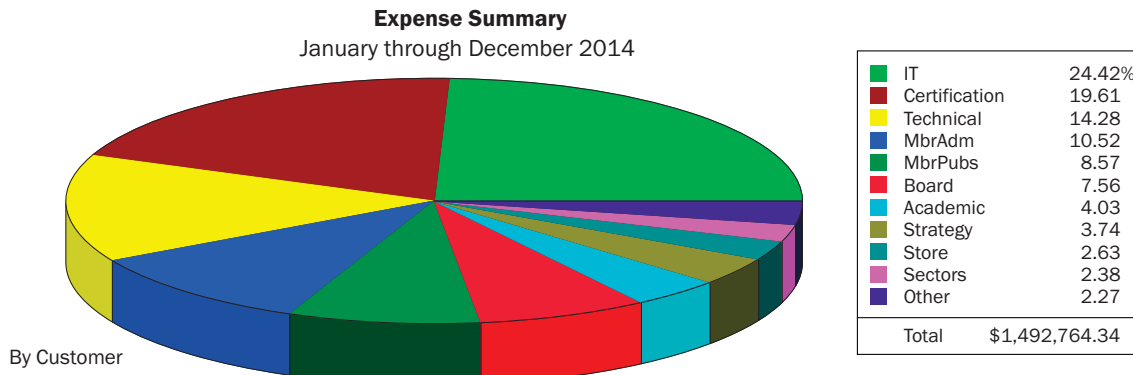
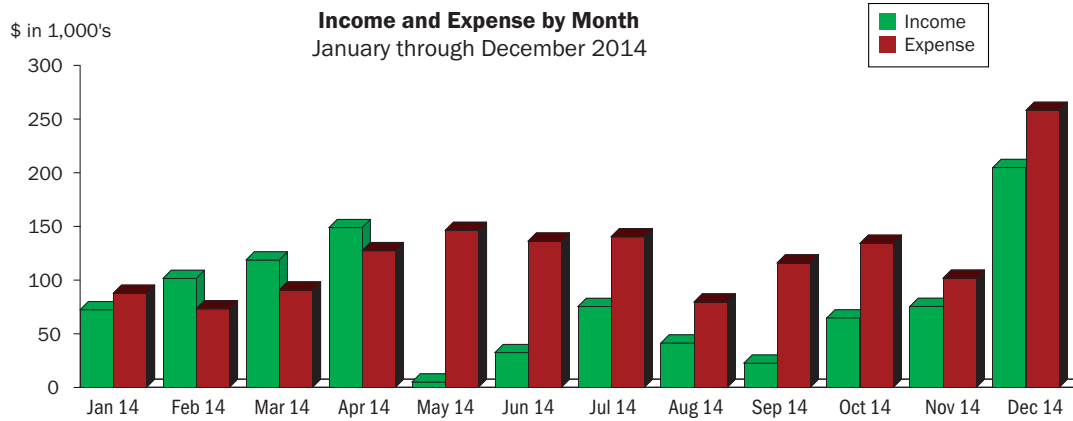


Figure 1. INCOSE Expense Summary by Customer, 2014

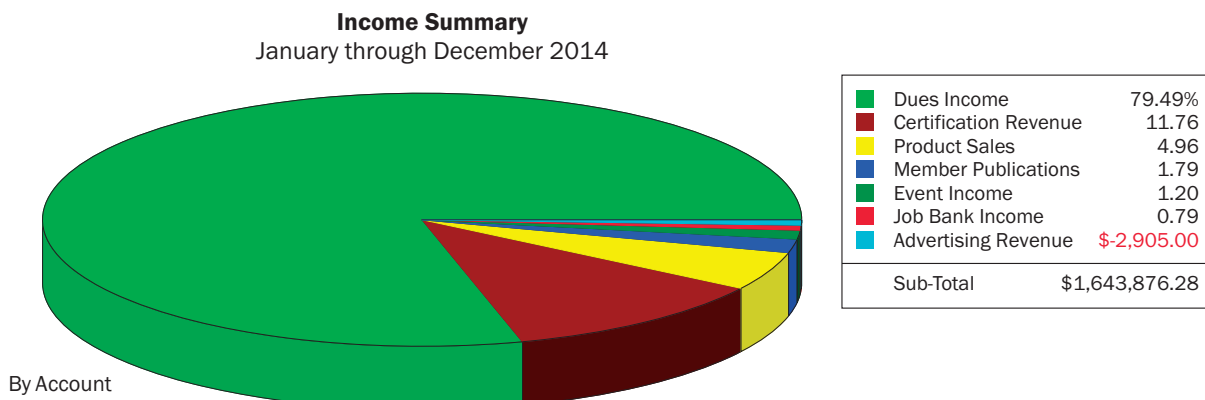
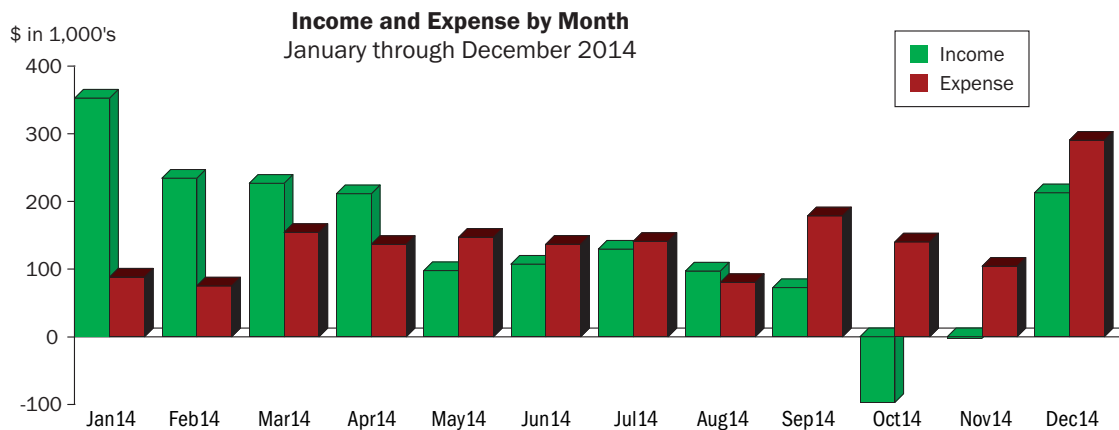


Figure 2. INCOSE Income Summary by Account, 2014

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We continue to make investments in our certification program, working to make the certification program profitable. With strong project leadership and an updated *Systems Engineering Handbook*, as well as continued focus on marketing and improving the application process, certification is set to grow.

INCOSE's continuing challenge is to maintain the balance between providing interesting technical projects and services to members in our structure as a volunteer organization. As our membership continues to grow and our geographic footprint continues to expand, we see a variety of opportunities in both traditional and nontraditional domains. Our goal is steadfast — realize our mission and work together to provide systems engineering solutions to customers' challenges. ■

From the Technical Director

Paul Schreinemakers, technical-director@incose.org

I hope that many of you are getting ready to attend the 2015 International Symposium in Seattle. From July 13 -16, you will experience an excellent technical program and many networking opportunities to meet old and new friends.

New volunteers are filling three Assistant Director positions. Troy Peterson is our new Assistant Director for Transformation of Systems Engineering to a Model Based Discipline. Charles Dickerson is the Assistant Director for Knowledge and finally yet importantly, Ray Jorgenson is the new Assistant Director for Technology Communications. Both Mike Celentano and I are looking forward to work with them on our Technical Operations team.

With the new IT infrastructure launched and our new INCOSE website online, all the Technical Operations Working Groups are starting to add up-to-date content to the Working Group (WG) webpages on the INCOSE public website. Please go to these webpages and see what the WGs are currently working on.

I'm looking forward to meet you all at the symposium in Seattle, where we celebrate our 25th anniversary. ■

Call for Aid for Global Learning Environment Experience (GLEE)!

Jack Ring, jring7@gmail.com

INCOSE Fellow Jack Ring is acting *pro bono* as architect of a project team/process who will create the GLEE tablet-based learning environment that will encourage and facilitate kids co-learning regarding reading, writing, and numeracy, and he needs your help!

The pilot project will serve 7 to 10 year-old learners in sub-Saharan Africa in an 18-month trial comparing the GLEE tablet-based learning environment to four 'competing' tablet-based alternatives.

For more information, please visit <http://starshineplanet.com> and <https://www.indiegogo.com/projects/starshine-gee-xprize-team-for-global-learning>.

Please note that although monetary contributions will certainly be appreciated Jack is not asking for money. Instead, he requests information and help in formulating a ConOps regarding a profile of kids in the target population and concepts of a) how they may use GLEE and b) the effects it should have on them, and therefore c) the capabilities GLEE must have.

Jack is accepting information and ideas for GLEE through December. Please contact Jack at jring7@gmail.com or at the GLEE topic at <https://www.linkedin.com/groups?gid=7499834>. ■

The 26th International Conference on Software and Systems Engineering Applications

Cecilia Haskins, chaskins25@yahoo.com

The 26th International Conference on Software and Systems Engineering Applications, (ICSSEA), sponsored by INCOSE and AFIS (French Association for Systems Engineering), occurred in Paris, 27-29 May 2015. ICSSEA brings together forward thinking leaders, industry practitioners, and students in a confluence of shared knowledge, research, and open inquiry for three days of intense presentations, tutorials, workshops, and demonstrations.

This year three INCOSE leaders provided the inaugural lectures to open the event: Dominique Luzeaux spoke on Engineering and Architecting of Large-scale Complex Systems; Asmus Pandikow on Managing Our Future Challenges – Despite Our Limitations; and, Cecilia Haskins on MBSE – a Historical Perspective – Promises, Pitfalls and Progress.

Dominique helped us recognize that often geopolitical and organizational issues can overshadow the technical challenges. Asmus reinforced this, and focused our attention on the importance of ‘awareness’ and increasing our potential for cooperation through effective communication. Finally, Cecilia emphasized the role that each of us must play if model-based systems engineering



ICSSEA Guest Speakers: Left to right Dominique Luzeaux, Jean-Claude Rault, Asmus Pandikow, Cecilia Haskins, and Joseph DeRosa; Jean-Claude, who organized the 26th ICSSEA is flanked by his invited guest speakers. Photo by Terje Fossnes.

(MBSE) is to achieve the benefits promised by the vision. The pre-lunch speaker, Joseph DeRosa, shared one of his favorite systems engineering patterns called “Plan to Replan.” In all, the conference hosted 10 sessions of highly relevant topics to researchers and practitioners in software and systems engineering. For more details, see www.icssea.org. ■

Empowering Women as Leaders in Systems Engineering (EWLSE) Inaugural Meeting

Alice F. Squires, alice.squires@wsu.edu

INCOSE’s Empowering Women as Leaders in Systems Engineering (EWLSE) invites you to attend their inaugural meeting at INCOSE International Symposium 2015, with the time and location to be announced on the INCOSE IS conference website. The newly forming group is dedicated to enabling women to be successful as leaders in systems engineering around the world. Membership is open to all who are interested in advocating for women as leaders in systems engineering.

Initial areas that the group is addressing include:

1) participation and retention of women in both systems engineering university programs; 2) the selection of careers in systems engineering; 3) research findings related to the value of women as leaders, decision-makers, historical figures, and current role models in the larger

context of the benefits of a diverse workforce; 3) the collection, dissemination, and celebration of success stories of women as leaders in systems engineering; and 4) other enablers for achieving our vision of success including seamless collaboration and joint workshops with other professional societies, engagement of future systems engineers (K16 and beyond), incorporation and dissemination of systems engineering principles and practices at other society events, and the formal publication of related research findings and success stories.

Attendees will have the opportunity to select and participate in those areas that they have a passion and interest in pursuing and supporting. Directions on how to join the group through the INCOSE website will be provided. We look forward to seeing you there! ■

INCOSE Awards Prizes at INTEL International Science and Engineering Fair (ISEF)

Gerard H. Fisher, gerard.h.fisher@comcast.net

Annually, the INCOSE Fellows lead a team of INCOSE members in judging at the ISEF competition, held this year in Pittsburgh, PA. This is the world finals for all high school science and engineering fairs. This year, over 1,700 finalists, from 78 countries, participated. The INCOSE team included INCOSE Fellows Bill Mackey and Jerry Fisher, as well as INCOSE members John Walker, Judy Walker, Julie Walker, Mark Ragland, Nancy Roseberry, and Gina Guillaume-Joseph. INCOSE provides an annual award of \$1,500 and an invitation to the INCOSE Symposium to the project that most exemplifies the systems engineering process and practices. Over \$5 million in prizes are awarded each year.

The team in advance to pre-select potential systems engineering projects reviewed abstracts in the following categories:

- Biomedical and Health Sciences
- Embedded Systems
- Engineering Mechanics
- Energy: Physical
- Environmental Engineering
- Physics and Astronomy
- Robotics & Intelligent Machines
- Systems Software

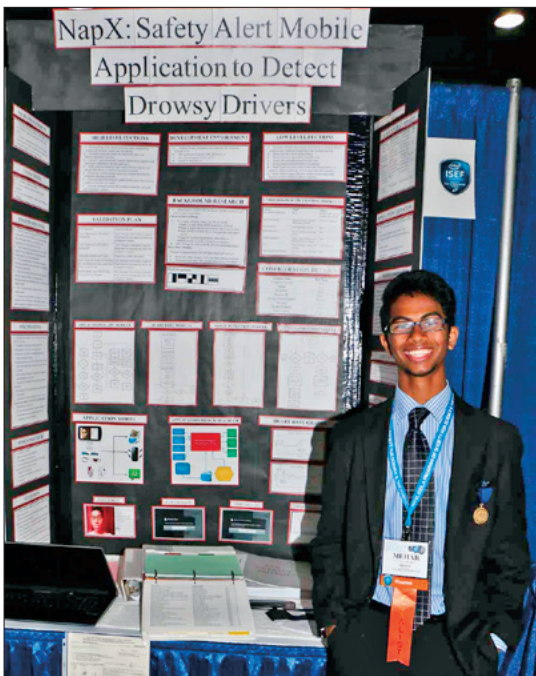


Figure 1. INCOSE ISEF Winner Mehar Nallamalli

Seventy-four projects were personally visited and scored by the entire eight-person team. From those projects, all INCOSE judges interviewed the students for the final 16 projects.

The winning project was NapX: Safety Alert Mobile Application to Detect Drowsy Drivers, by Mehar Nallamalli, a junior at Capital High School, in Olympia, Washington (see Figure 1). This project uses the GPS, accelerometer, and camera of a smart phone to detect a drowsy driver. It proactively warns the user when symptoms of drowsiness or cardiac abnormalities are observed. He has collected over 8,000 face and eye images to assess drowsiness. In addition, he had the system being tested by 31 individuals. He clearly identified a need, performed analysis, developed and iterated his design, and thoroughly tested the system.

In addition to the INCOSE monetary prize, nine Honorable Mention awards were given to the following:

Name	Hometown	Project Title
Nilay Mehta	Irvine, CA	Using Electromyographic Technology and Voice Control to Create a Cost-Effective Prosthetic Arm
Burzin Balsara	Plano, TX	EyeMove: Using Electrooculography to Provide Mobility for the Disabled
Aditya Bhople	Nagpur, India	Autoreader: A Wearable Assistant for the Visually Impaired
Maya Varma	Cupertino, CA	A Wireless Smartphone-Based System for Diagnosis of Pulmonary Illnesses
Wilfred Mason	Laval, Canada	H.E.R.O. – A Novel Geographical Data-Bases Haptic Environment Response Operator for the Visually Impaired
Alex Tacescu	Fresno, CA	Project Maverick: An Omni-Directional Robotic Mobility System
Puneeth Meruva	Ft. Wayne, IN	Autonomous Motion Planning for Hyper-Redundant Modular Robotic Systems Using State Estimation, Obstacle Avoidance, and Intelligence Locomotion Algorithms
Mihir Garimella	Pittsburgh, PA	Biologically-Inspired Flying Sensor Platform for Autonomous Emergency Response
Ava Lakmazahen	Alexandria, VA	Brain-Actuated Robotics: Controlling and Programming a Humanoid Using Electroencephalography

Additional information can be found at:

<https://www.societyforscience.org/>.

Academic News

Thomas F. Gannon, tgannon@wpi.edu

INCOSE Academic Forum on Systems Education for All Engineers | May 18–19, 2015

The INCOSE Academic Forum sponsored by INCOSE, Academic Council, the Systems Engineering Research Center (SERC), and the American Society for Engineering Education (ASEE) was hosted by the Systems Engineering and Leadership Institute (SELI) at Worcester Polytechnic Institute (WPI) on May 18–19. Rick Adcock, INCOSE Associate Director for Education served as the General Chairman of the Forum.

The Forum engaged 40 leaders in engineering education from academe, industry, and government to consider how to make substantive progress to expand the role of systems knowledge in the education of all engineers.

The Forum approached this topic in three ways:

- How can we better describe the value of systems knowledge in engineering education, for students, employers, and educators?

- What is the best way to build on existing successes to create useful materials, products, and recommendations to help deliver this value?
- What is the systems engineering knowledge-base needed to support these outputs?

A final report and recommendations will be provided to INCOSE, the SERC, and ASEE on how they should work together to expand their engagement with academic and professional communities to promote the integration of appropriate systems knowledge into the education of all engineers. If you are interested in participating in future related activities or would like more information, please contact:

Thomas F. Gannon, Professor of Practice
Worcester Polytechnic Institute
INCOSE Assistant Director for Academic
Communications
tgannon@wpi.edu

California Polytechnic Institute, Pomona, Student Systems Engineering Conference | David Mason, david.mason.se@gmail.com

On April 11, 2015, Cal Poly, Pomona hosted the kick-off for the INCOSE Student Systems Engineering Conference (SSEC). Fourteen undergraduate students from a variety of educational disciplines including industrial and manufacturing engineering, as well as aerospace engineering, dedicated their Saturday to the SSEC sponsored by the INCOSE-LA chapter. The conference had two objectives. 1) Provide an overview of systems engineering; 2) Connect students with practicing systems engineering professionals to start work on real world projects that have potential for becoming senior projects completed later under the tutelage of the sponsors. The overview for the program was delivered in the morning by INCOSE's Assistant Director for the Student Division, Dave Mason.

A hypothetical baggage delivery system for a regional airport provided the vehicle for discussing basic systems engineering tools. The discussion placed emphasis on

tools supporting the portions of the V model starting with product requirements through system architecture. Dave served as 'the customer' as the students broke out into groups, each including one of the systems engineering professionals present, to work on the associated classroom exercise. Everyone seemed to approach the task in a spirit of fun while simultaneously learning from the experience. The most commonly overheard statement during the morning was variations of, "You're rushing to solution. What are the requirements for?" It is amusing to observe how, as systems engineering professionals, we never seem to outgrow this urge to hurry up and start building something.

The afternoon focused on the four sponsored projects. Each sponsor presented an overview of his or her project. Next, the students received assignments to one of the presented projects to work on requirements definition through system architecture. The working session

> CONTINUED ON PAGE 12

Project Manager's Guide to Systems Engineering Measurement for Project Success

Mike Celentano, mike.celentano@roche.com

The INCOSE Measurement Working Group (MWG) is proud to introduce their recently released technical product, a “Project Manager’s Guide to Systems Engineering Measurement for Project Success.” The target audience for the guide is program/project managers and technical systems engineering leads wanting to use systems engineering technical measures to guide their programs to success.

The writing style of the guide is casual to engage the reader in digesting the technical measurement concepts presented. For those readers desiring to go deeper, the MWG provides references to authoritative sources.

The guide has an introduction and then begins with a brief overview of systems engineering measurement. The authors provide a “quick-start” guide to help project managers select measures that are most appropriate for their project using a question and answer format, such as development or sustainment, agile or waterfall? The following section provides an extensive discussion of technical debt, how it arises, and how to identify, manage, and avoid it using different measures. Ten specific measures are provided in the next section, each with a single-page summary describing what and why to measure, how to make decisions based on the data, and cautions for application. Finally, a fictitious case study demonstrates the application of many measures in a project. The short case study demonstrates use and interpretation of various systems engineering measures with corrective actions.

The guide has 6 overall chapters:

- Chapter 1: Introduction
- Chapter 2: Measurement in Systems Engineering
- Chapter 3: Quick Start Guide
- Chapter 4: A Look at Technical Debt
- Chapter 5: Project Technical Measures throughout the Lifecycle
- Chapter 6: Case Study

How is this Different from Other Guides?

The current work is not comprehensive from a systems engineering perspective, it seeks to identify high-leverage measures of value to project managers who might not otherwise ever consider systems engineering measures. The focus of the guide is to Identify and manage Technical Debt. Technical Debt is the promise to complete a technical shortcoming in the future while declaring it “complete enough” today.

What is the Technical Debt Trap?

Similar to personal debt, the program is explicitly, or more commonly, implicitly deferring a technical challenge or risk to the future because you don’t want, or cannot spend the time and/or money, to successfully solve a technical challenge before declaring the task complete.

How is Technical Debt Incurred?

Fundamentally, there are 3 ways in which Technical Debt is incurred:

1. Omission: Tasks unaccounted for within schedule and/or budget;
2. Wishful Thinking: Tasks declared completed but not really complete; and
3. Undetected Rework: Tasks believed complete but which are incorrect.

How to Avoid and Measure Technical Debt!

To avoid Technical Debt, you will need to apply three methods:

1. Account for unscheduled tasks
2. Establish measures to provide early warning
3. Provide CAM training for taking schedule earned value credit

People on the Move

Congratulations to James Mason, PhD, who successfully defended his thesis entitled “*Social Enterprise Systems Engineering: A Development Intervention Paradigm*” at Stevens Institute of Technology to earn the degree Doctor of Philosophy in Socio-Technical Systems in May 2015. ■

INCOSE Spotlight on Holly Witte

Interviewed by Sandy Young, info@incose.org

Author Note: In each newsletter, we customarily profile one of our diverse members. However, this profile is on INCOSE's beloved managing executive, Holly Witte, who is retiring.

How would you describe your role with INCOSE?

Part cheerleader, part strategist, part herder of cats. Coming from a different background altogether, I could see how the organization worked from the outside, and I understood its great value to members and the collective power of its resources. My role was to help direct it into a structure where all the moving parts were, at least, aware of all the others and, better yet, able to produce important and valuable work together.



Holly Witte
* Photo sourced from <http://www.nwnight.com/nwnn/?p=3528>

What are the highlights of working with INCOSE members?

Having the chance to meet people doing extraordinary things in their day jobs and work with them across a meeting table, over a meal or a glass of wine, certainly broadened my perspective on how the world works and who makes it go.

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STUDENT SYSTEMS ENGINEERING CONFERENCE (continued from page 10)

finished with the students presenting their results focusing on the project needs statement, tools used from the tutorial, tools used from the Cal Poly curriculum, requirements, and options. The projects covered a wide range of domains. They included designing a volunteer genealogical library of the future (sponsored by Richard Emerson), Helium3 mining on the moon (Edward Ruth), moving very large objects (Susan Ruth), and standing up and managing a First Robotics team (Tim Wright).

The day finished up with an informal meet-and-greet between the students and volunteers. Comments exchanged

Are there any similarities between owning a winery and systems engineering?

Many. Everything is a system unto itself and part of a system. That bottle of wine I pour from for guests in our A Blooming Hill Vineyard & Winery Tasting Room (and the price we charge for it) is one end result of days of endless pruning for the current vintage, while setting up the cordon system for the next; planning the fertilizing/irrigation schedule; harvesting, fermenting and barreling the wine; ordering the bottles, labels, corks and foils; and making sure there are enough hands to do the work. Every part of the system has to be considered, and coddled, for the whole to work.

What do you think the future holds for INCOSE?

INCOSE is a great incubator. I am sure its prominence in the world will increase many fold.

What will you miss most about the organization?

That's easy ... the people.

Want to know more about Holly Witte? Be sure to check out the full interview with Holly on the new website (www.incose.org), where Holly shares insights on working behind-the-scenes for INCOSE, her "retirement" plans and a keynote speaker she was prepared to dislike.... ■

during this time included: "Ask good questions and listen to what is not said as well as what is said." "Your perspective on systems engineering changes based your role and product." "As a freshman, Wow! I didn't realize there was so much to this." "I'm glad my students get to hear what I'm teaching them in class from people who are in the real world." Finally, "As a senior, it was an affirming day. I realized that I'm prepared for what's out there."

Preview the upcoming symposia at incose.org/symp2016 and incose.org/symp2017. ■

25@25 – Glenn Ong

Interviewed by Sandy Young, info@incose.org

“25@25” is INCOSE’s new series of short profiles of INCOSE members—people who have helped make INCOSE what it is today and what it will be in the future. This is the second to appear in the newsletter in the series that will appear throughout the year to honor our 25th Anniversary.



Glenn Ong
(Self Photo)

Name: Glenn Ong
Title: Systems Engineer
Organization: Downer Infrastructure Rail
Place of Birth: Sydney, AU – New South Wales
Current Residence: Sydney, AU – New South Wales
Domain: Infrastructure
Years in systems engineering: 5 months (professionally);
 2.5 years (including The University of New South Wales
 Solar Racing Team – Sunswift)
Year joined INCOSE: 2015

How did you first hear about INCOSE? Why did you decide to join the organization?

As the systems engineer for The University of New South Wales (UNSW) Solar Racing Team – Sunswift, I gave an

INCOSE/SESA Transportation Working Group seminar with Sam Paterson about our application of systems engineering in building a solar electric vehicle. I joined INCOSE once I started my employment at Downer in order to be further exposed to the industry.

How does your freelance photography work relate to your systems engineering work?

I find that systems engineering suits my personality quite well, and therefore, I do apply some principles across different aspects of my life. My photography work also has requirements, ranging from customer requirements down to my own functional requirements that I demand for my gear. My purchases and acceptance of jobs considers what my capabilities are and whether I can actually meet the demand. I have a very systematic approach to my images and gear maintenance and am always in a “ready state” as my gear is always charged and memory cards cleared.

In 25 years, where do you see yourself?

I hope to move onto a role in systems engineering within the aerospace industry, specifically defence or commercial aviation. ■

INSIGHT Editor-in-Chief

William Miller, insight@incose.org

This July in the 25th year of INCOSE marks the second issue of *INSIGHT* in cooperation with John Wiley & Sons publisher as a magazine for systems engineering practitioners. *INSIGHT*’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 the art as captured in *Systems Engineering*, the Journal of INCOSE, also published by Wiley.

The focus of the forthcoming July issue of *INSIGHT* is Model-Based Systems Engineering (MBSE), taking stock and providing an outlook since the December 2009

INSIGHT (Vol. 12 issue 4) Special Feature to Model-Based Systems Engineering: The New Paradigm. Articles received to date from theme editor Joachim Fuchs and authors address the following topics:

1. Theme editorial on taking stock and outlook,
2. Current modeling trends in systems engineering,
3. Evolving SysML and the system modeling environment to support MBSE,
4. Academia as the educator in the world of MBSE,
5. MBSE implementation across diverse domains,
6. MBSE is on a good path, however further effort is required for a sufficient support of systems engineering activities through models,

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INSIGHT EDITOR-IN-CHIEF (continued)

7. MBSE in rail transportation – product families and product lines,
8. Modular Applications Functions (MAF) – a Westinghouse MBSE tool
9. PolarSys: a new collaborative ecosystem for open source solutions for systems engineering driven by major industry players,
10. Integration of Model-Based Systems Engineering artifacts using open services for lifecycle collaboration, and
11. Untangling the digital thread: the challenge and promise of model-based engineering in defense acquisition.

We are also pleased to introduce our first *oped* column on MBSE in perspective.

The July issue will also include an article by Rick Dove, theme editor for the July 2016 *INSIGHT* on Agile Security titled Needed: practitioner attention to systems engineering delivery of sustainable value. ■