



Sept 2016 Newsletter

Newsletter Highlights:

- ✓ Sept 25th **USS Midway** STEM Fundraiser Event
- ✓ Nov 5th INCOSE San Diego **Mini-Conference**
- ✓ **Postcards** from the 2016 INCOSE Int. Symposium
- ✓ Our INCOSE **Heritage** (Continued)

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From the President:

Our INCOSE Heritage (Continued)

In this newsletter I will continue the series of highlighting some enduring concepts of systems engineering embodied in our INCOSE heritage. We will again recall the 1994 inaugural issue of our Systems Engineering Journal, and contributions from key early pioneers. An important principle written in that journal by Dr. Barry Boehm was the importance of integrating the systems engineering and software engineering disciplines.

The premise in his article "Integrating Software and Systems Engineering" was that software was becoming increasingly important, but systems and software engineers were not well integrated leading to major risks. It recognized that systems were becoming more dependent on software as the "glue" that integrates the system, and the "smarts" that make the system useful and competitive. Clearly this trend has continued in spades.

Historically when software was a small part of the system, hardware and systems engineers sat at the center table while software engineers waited for their specifications. When software became a major effectiveness driver it was unhealthy to keep the separation of hardware and software concerns. Both were needed concurrently to deal with hardware/software/system tradeoffs.

Systems engineering and software engineering have many similarities, but differences between hardware and software make integration phenomenology difficult. The paper called out the crucial need for integrating the disciplines and having an adequate supply of people who can deal simultaneously with software, hardware and application systems aspects.

There have been landmark initiatives and remaining influences borne from this recommendation. One large impact is the Capability Maturity Model Integration (CMMI) framework that many of you are familiar with. The CMMI is a process improvement training and appraisal program developed by industry, government, and the Software Engineering Institute (SEI) at Carnegie Mellon University. It is required by many DoD and U.S. Government contracts, especially in software development. Furthermore, it has been adopted internationally, and is used extensively in commercial industry outside the U.S. as a best practice for process improvement.

CMMI is the successor of the Software CMM to explicitly integrate traditionally separate organizational functions. Some of the provisions for integrating disciplines originated directly from Boehm's work and recommendations. Unfortunately, the original CMM stated that system requirements were not the responsibility of the software engineering group but a prerequisite for their work. Without participating in system requirements, this perpetuated the same risky behavior of hardware and systems engineers at the center table with software engineers waiting on the side for their specifications.

The CMMI improved this with a unified culture of systems and software providing software engineers a seat at the center table. It also identified the additional activities necessary for successful concurrent engineering of systems and software.

More recently, this important topic is recognized and elaborated in the Systems Engineering Body of Knowledge (SEBoK). INCOSE is a sponsor of the SEBoK, which is a primary reference guide for the field that is continuously updated. You can access this part of the SEBoK at [Systems Engineering and Software Engineering](#) and are encouraged to further explore the following subtopics regarding software engineering and systems engineering:

- [Software Engineering in the Systems Engineering Life Cycle](#)
- [The Nature of Software](#)
- [An Overview of the SWEBoK Guide](#)
- [Key Points a Systems Engineer Needs to Know about Software Engineering](#)
- [Software Engineering Features - Models, Methods, Tools, Standards, and Metrics](#)

It is now well accepted that software drives system considerations such as performance and cost. If your background is not in software development, it behooves you as a systems engineer to become better informed and be more synergistic. Conversely, if your primary experience is in software it is suggested to expand your skills for a more holistic systems engineering perspective.

In the next newsletter we continue recognizing key contributions from early INCOSE pioneers. Our local member Jeff Grady served as the first journal editor, and he will be highlighted as we overview his ideas on systems engineering dichotomies.

- Ray Madachy

Upcoming Events

Membership meetings are open to all. There is an optional buffet between 5:00 and 6:00 (\$5 for members, \$10 for non-members) at general membership meetings. Reminder emails shall be sent.

- **Sept 21st** – “Date Science for Systems Engineering”, Dr. James Short of the San Diego Supercomputer Center. This presentation shall be held on location at the Supercomputer Center at 5:30 pm (until 7:30). Dinner shall be provided (\$5 for members, \$10 for non-members). The address is UCSD San Diego Supercomputer Center, 10100 Hopkins Drive, La Jolla, CA 92093. **NOTE** – Please be on time, as the building doors lock after hours. If you will arrive after 5:30pm, please email someone at info@sdincose.org beforehand so that arrangements can be made to let you in.
- **Sept 25th** – Our 5th annual USS Midway STEM fundraiser event (see article in newsletter).
- **Oct 19th** – This event is TBD: please watch your email for announcement of the topic and the location.
- **Nov 5th** – Our annual INCOSE San Diego Chapter Mini-Tutorial (see article in newsletter).
- **Dec 14th 2016** – Join us for our **Annual Holiday Party!** Details are forthcoming and will be emailed several weeks beforehand. This party is free to all – please bring a guest and introduce them to the chapter!

Our 5th USS Midway Event is September 25th!

This coming Sunday, September 25th, we will host our 5th annual STEM fundraiser event aboard the USS Midway museum.

This event showcases the students who have received our



STEM grants, and allows them to demonstrate what they have done with them. In addition, a fun night aboard the USS Midway Museum is held to get the younger students excited about STEM.

Tickets include:

- **Admission** to the USS Midway Museum
- Spaghetti and meatball **buffet** by Wild Thyme Catering
- Free **docent tours**
- Free **flight simulators**
- Local school **robotics demonstration**
- 50-50 **raffle** to support STEM
- **Networking** with engineering colleagues



- Fantastic **flight deck night view** of San Diego Harbor

Ticket prices are \$30 for adults, \$20 for those 6-17 years of age, and free for children 5 or less years of age. A family package is also available for \$100 which includes admission for 2 adults and up to 4 people between 17 and 6 years of age. The event is on Sept. 25th from 6 pm – 9pm. Please get your tickets at: <http://www.sdincose.org/5th-midway-event>.

Upcoming Tutorials in San Diego

- **December 14-15 at UCSD – Data Science.** Since we are planning a data science track for our November mini-conference, we have decided to have a workshop that is integrated into a conference that Dr. Short is organizing for this December at UCSD in San Diego.



INCOSE members will receive at least a 25% discount (exact pricing is forthcoming). Please watch for the emails from INCOSE in the following months on the exact topics to be presented.

Fall INCOSE San Diego Mini Conference on November 5th

This year’s INCOSE San Diego mini-conference will be held on Saturday, November 5th, 2016. This is a one-day, information-packed event with presentations by industry, government, independent practitioners of systems engineering, and academia (professors and students).

In addition to standalone topics, this year’s conference will include the following **group tracks**:

1. UAV Systems Engineering
2. Data Science & Big Data
3. Science of Laws
4. Agile Systems Engineering

There is still time to apply to present at the conference!

Please send your 2-5 paragraph abstract ASAP to info@sdincose.org. Additional topics considered include

- Women in Systems Engineering
- Model-Based Systems Engineering
- Systems Engineering in Medical Device Development
- Systems Engineering in the Health Care Industry
- Systems Engineering in Transportation
- Other Systems Engineering topics

Postcards from Scotland and the 26th INCOSE International Symposium

Ray Madachy was one of our lucky members who attended the 26th annual INCOSE symposium in Scotland. Below is his description of the event:

The annual INCOSE International Symposium (IS) is our premiere global event, and this year it was held July 18 - 21 in Edinburgh, Scotland. The overall IS program includes technical presentations, INCOSE business meetings, working group meetings, awards, sponsor and exhibitor booths, a host of social events and entertainment. Some of us were very fortunate to attend across the pond. It was exciting, educational, thought provoking, and great for networking with old and new colleagues.

The technical program was very impressive showcasing progress in the field and new ideas. The most prevalent topic was Model-Based Systems Engineering (MBSE) in different forms. Moving from hype several years ago it was good to see real traction being made in practice. Though it is implemented differently across companies, many are successfully integrating model types, moving away from other documents, reducing cycle time and achieving other benefits.

Our chapter received some notable awards. Hearty congratulations go to Rick Steiner who received an INCOSE Fellow Award (see accompanying picture). With this prestigious award, he joins a distinguished group of Fellows whose contributions to the art and practice of systems engineering are recognized and respected worldwide.



Rick Steiner (right)

We also received the Gold Chapter Circle Award based on our 2015 contributions and accomplishments for the entire chapter. Only a handful of chapters receive this elite award every year. I was most honored to receive the award on our behalf (see accompanying picture), but credit goes to our 2015 President Mark Halverson. Major kudos goes to Mark and everyone who volunteered and/or participated last year in the Chapter activities.



Ray Madachy accepting INCOSE San Diego's Gold Chapter Circle Award

All members are encouraged to attend the IS if possible. Anyone can participate, and one way to get there is to submit a technical paper. Next year it will be in Adelaide, Australia from July 15 – 20. We hope to see many of you there down under.

- Ray Madachy

New Members

INCOSE San Diego is pleased to announce the addition of **18 new members** to our chapter since June 2016. Please welcome the following individuals to INCOSE:

- Maryanne Domm, Northrop Grumman Corporation
- Brian Haan, Northrop Grumman Corporation
- Frank Mays, Northrop Grumman Corporation
- Carl Scavo, Johns Hopkins University
- Perry Tuey, Northrop Grumman Corporation
- Philip Usher, Northrop Grumman Corporation
- Greg Wauson, Northrop Grumman Corporation
- Brett Thompson, Georgia Institute of Technology
- Francisco Enciso, Plantronics
- Esther Escobar, Plantronics
- Marina Gurria, Plantronics
- Hiram Heredia, Plantronics
- Abel Hernandez, Plantronics
- Mario Larreta, Plantronics
- Cesar Muñoz, Plantronics
- Ruperto Navarro, Plantronics
- Rafael Olivera, Plantronics
- Silverio Perez, Plantronics

We hope to meet each of you at the many upcoming INCOSE events!

Recent INCOSE San Diego Presentations

- Andy von Stauffenberg of VStar Systems gave an enlightening presentation on UAV Cybersecurity. The presentation went over some of the types of attacks we

see now, and which we may see in the future. The slides are available [here](#) for download.

- Dr. Jo Ann Lane of the University of Southern California gave an excellent tutorial on the System of Systems (SoS) Development Lifecycle Process. She has provided her slides from the tutorial, which you can download [here](#).

NOTICE – Did you know that INCOSE San Diego is now accepting articles from members for presentation in the quarterly newsletter? This is to provide deeper understanding of specific S.E. topics. Each newsletter will present one article. To apply to have your topic in the newsletter, please submit your proposed article (one page in length or less) to both the Chapter President (madachy@gmail.com) and the VP of Administration (gbulla@yahoo.com). Thank you.

The Role of Systems Engineers in Lawmaking

By John Wood, PhD and David Shrunk, MD | September 2016

The laws of government (such as statutes, regulations, and ordinances) are the primary means by which the problem-solving goals of government are attained. Unfortunately, the traditional method of lawmaking is critically flawed. As a result, societal problems (including crime, poverty, and financial instability) remain largely unsolved, and governments thus fail to satisfy their public benefit purpose. Fortunately, a solution to this problem has been proposed: expand science to encompass laws and the lawmaking process.

All established fields of science are successful as measured by the continuous accumulation of reliable (i.e., scientific) knowledge and by continual technological advances (i.e., engineering). Lawmaking should not be an exception; however, such successes cannot be achieved without dedicated professionals consistently striving to better their field. In the case of lawmaking, these professionals are systems engineers who must consistently balance a plethora of distinct and sometimes conflicting desires from a variety of stakeholders in order to design laws and bodies of laws that operate in an effective, cost-efficient, and safe manner to collectively benefit the general public.

The present state of laws and lawmaking, which largely lacks the influence of systems engineers, suffers from two major issues. First, the traditional legislative process is not a problem-solving process. It is merely a lawmaking process that lacks the essential steps (e.g., problem definition, requirements prioritization, cost-risk-benefit analyses, etc.)

required to solve problems. Second, governments typically lack a consistent mechanism for the measurement, evaluation, and documentation of the effects of laws (both intended and unintended). As a result, governments are essentially “flying blind” in the creation and sustainment of laws. In other words, they create and enforce laws but have no reliable means to then determine the impact of those laws on the general public they are intended to serve. The results of these deficiencies are inconsistent and incidental successes in solving or mitigating societal problems combined with an ever-growing, and increasingly burdensome, body of laws.

The introduction of systems engineers and systems engineering principles to lawmaking will solve the aforementioned deficiencies. Systems engineers are trained in and adept at solving problems. They will be able seek out the root-cause of the identified issue and immerse themselves in the context of the problem. They will work with a myriad of stakeholders to understand their perspectives, needs, and desires as they design laws that best benefit the general public. Further, systems engineers are trained in and adept at identifying and understanding system interactions and emergent properties. As such, systems engineers will be capable of understanding and managing the system-level properties exhibited by a complex and dynamically interacting body of laws.

Another common skill among systems engineers is their ability to develop processes that produce consistent results. Systems engineers can apply this skill to develop a quality assurance program for laws. With knowledge gained from the scientific observation of laws, this quality program will be able to determine the degree to which laws are satisfying their intended purpose, the financial cost of the law, and additional effects of the law (whether intended or unintended). Then, the administrators of this process will be able to recommend whether laws should remain on the books, be modified to address a measured deficiency, be removed due to the fact the law is ineffective, or be retired after successfully addressing the original problem or goal. Through the execution of this program designed by systems engineers, the quantity of laws will be reduced. This reduction in laws will then allow governments to invest their finite resources on the remaining laws that are shown to be both effective and cost-efficient.

Many industries are reaping the rewards of applying systems engineering principles. These rewards include improved safety, reduced cost, and increased effectiveness. Further, these industries experience a sustained rate of advancement where each new version or iteration is able to provide better results than one it replaced. It is therefore predictable that applying systems engineering principles to lawmaking will produce similar results. While predictable, these results

would be nonetheless astounding. Just imagine governments consistently satisfying their public benefit obligations through laws that are created by engineering design methodologies and managed by an equally well-designed quality assurance program. Next, imagine you, the systems engineer, playing a critical role in that process.

To learn more about the roles systems engineers can serve in lawmaking, attend the Science of Laws track at this year's mini-conference being held on November 5th or contact the authors at: john.wood@scienceoflaws.org and david.schrunk@scienceoflaws.org.

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