PPI SyEN

SYSTEMS ENGINEERING NEWSJOURNAL EDITION 120 | JAN 2023

Steady Progress to Improved Capability

SMART CITIES INITIATIVE AT INCOSE IS
Six lessons from history

SYSTEMS ENGINEERING NEWS
Recent events and updates in SE

SYSTEMS ENGINEERING RESOURCES
Improve your SE effectiveness

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WELCOME

Greetings PPI SyEN Readers, thank you for picking up the first edition of the PPI Systems Engineering Newsjournal of the year. I would like to kick off this edition by wishing that this year is the best possible year for all of our readers. Let us direct our energy towards making this year the most rewarding year that we have experienced in recent years. It has been a challenging period for humanity, for commerce and business, and for the state of the earth. It is obvious to all that we are at a turning point of some kind. Regardless of what this year brings globally, may you receive many blessings in your personal and professional capacities.

This edition takes off with news including recaps and achievements of some of the most prolific systems-related organizations including an INCOSE New Zealand 2022 recap, updates from the Systems Engineering Research Centre, Smart Connected Systems Research 2022 highlights and more. We also delve into the technology trends to watch as published by the National Institute of Standards and Technology (NIST) in December 2022. It is a solid reference for directing your professional development effort to be in line with the most prominent trends in technology.

One possible way to make use of this information is to participate in a systems-related conference and to use these technologies to solve humanitarian issues such as those expressed in the United Nations Sustainable Development Goals. There really are so many exciting ways to contribute to expanding the SE body of knowledge and simultaneously contribute to addressing some of the challenges we are experiencing on this planet. Read more about this in the Conferences, Webinars and Meetings section. One exciting area of application of these technologies is within the Smart Cities domain. We are so grateful to Jon Mooney for providing this outstanding article on Smart City Systems Engineering History Lessons. It is an insightful read whether you have been tracking the Smart Cities Initiative for a while and even if you are very new to the topic.

As always, we close off the edition with resources to help you expand your practice and to enhance your SE skills. Read the resources section to learn about the new mini-courses on Systems Dynamics, learn about Engineering Trustworthy Secure Systems, the Potential of Simulation and Modeling in your Organization and much more. This month's Resource section covers not only 'hard' engineering topics but soft topics such as 'How to Effectively Communicate Innovative Ideas' too. I hope you enjoy reading this as much as we enjoyed putting this PPI SyEN 120 together! See you in February.

Regards,

René

Managing Editor, PPI SyEN

PPI Systems Engineering Newsjournal (PPI SyEN) seeks:

- To advance the practice and perceived value of systems engineering across a broad range of activities, responsibilities, and job-descriptions
- To influence the field of systems engineering from an independent perspective
- To provide information, tools, techniques, and other value to a wide spectrum of practitioners, from the experienced, to the newcomer, to the curious
- To emphasize that systems engineering exists within the context of (and should be contributory toward) larger social/enterprise systems, not just an end within itself
- To give back to the Systems Engineering community

PPI defines systems engineering as:
an approach to the engineering of systems, based on systems thinking, that aims to transform a need for a solution into an actual solution that meets imperatives and maximizes effectiveness on a whole-of-life basis, in accordance with the values of the stakeholders whom the solution is to serve. Systems engineering embraces both technical and management dimensions of problem definition and problem solving.

SYSTEMS ENGINEERING NEWS

Recent events and updates in the field of systems engineering

PDMA Launches UAE Chapter

The Product Development Management Association (PDMA) has announced the formation of chapter to support the product development and innovation community in and around the United Arab Emirates (UAE). This brings the total number of active PDMA chapters to seventeen with a truly global reach:

Africa:

- Egypt

Asia:

- Indonesia
- Pakistan
- Turkey
- UAE (website under construction)

Europe:

- Central Europe
- DACH (Germany, Austria, Switzerland)
- Netherlands

North America;

- Carolinas
- Chicago
- DMV (DC, Maryland, Virginia)
- Mexico
- Minnesota
- Pittsburgh
- St. Louis

Oceania:

- New Zealand

South America:

- Peru

PDMA chapters sponsor events that offer an excellent opportunity for local involvement, networking and exchange of ideas. SyEN readers are encouraged to learn more about PDMA chapters here and on the relevant chapter websites. You may also register as a non-member and select a chapter to follow.

Join PDMA here.

Technology Trends to Watch

Systems engineering practitioners are at their best when they combine their knowledge of existing

and emerging technologies and use that knowledge to assess the feasibility of meeting system requirements in the time frame required. PPI enshrines this idea in a systems engineering principle:

Try to ensure that the requirements are consistent with what is predicted to be possible in solutions, at the time of required supply, i.e., are feasible.

In December 2022 the U.S. National Institute of Standards and Technology (NIST) published two sets of predictions concerning emerging technologies that bear watching. These predictions stem from ongoing research performed by NIST, typically insights gained by leading researchers in their fields across multiple technology investigation and maturation projects.

Broad NIST technology predictions include:

- AI Will Become Even More Common, but Risks Remain
- Forensic Science Reviews Will Advance Criminal Justice Efforts
- Designing for Security Will Keep Everything From Your Smart TV to Your Car Safer From Cyberthreats
- Measurement Science of Indoor Air Quality Can Help Protect Us From COVID-19 and Other Respiratory Illnesses
- Spintronics Will Lead to Smaller, More Powerful Electronic Devices
- Calibrating Measurements Will Make Sure You Get What You Pay For

NIST predictions concerning Manufacturing Innovation include:

- Low-Cost Sensors Will Help Predict When Machines Need Maintenance
- Additive Manufacturing Has World-Changing Potential
- The Industrial Internet of Things Will Promote Connectivity and Supply Chain Visibility
- Talent and Technology Are Vital to Manufacturing Success

Learn more about NIST research through NIST blogs.

INCOSE New Zealand 2022 Recap

The INCOSE New Zealand (INCOSE NZ) chapter reports a busy and productive first year that featured growth in multiple dimensions. The chapter began 2022 with twenty-seven members; sixteen of whom signed the chapter's inaugural charter. By the end of 2022, membership had increased to over fifty, with numerous other individuals expressing interest.

INCOSE NZ held seven meetups covering systems engineering topics in transport, technology, defense, and more.

Two New Zealand systems engineering projects were featured in INCOSE publications - updates from Rocket Lab on Neutron development and from City Rail Link.

Five chapter members attended the Systems Engineering Test and Evaluation Conference in Canberra, Australia in September, two of whom contributed to the conference by delivering three presentations between them.

The leadership team for 2023 has been selected and includes:

- Jess Tucker as President.
- Nick Pickering as Vice President.

- John Welford as Secretary.
- Tom McKay as Treasurer.
- Dhanush Laxman as Committee Member at Large.

Learn more about the INCOSE New Zealand chapter.

Updates from SERC

The Systems Engineering Research Center (SERC) updates from December 2022 included highlights from multiple research initiatives.

Annual Research Review Explores Digital Transformation and More

SERC's 14th Annual Research Review included 19 technical sessions on cutting edge research projects that spanned four areas of expertise:

- Digital Transformation
- Enterprises and Innovation
- Models and Data
- Human Capital Development

In his presentation on Digital Transformation, Tom McDermott, SERC CTO, focused on the importance of adopting a new data-centric lifecycle model to better integrate systems engineering modernization efforts.

Regarding Enterprises and Innovation, Dr. Michael Orosz (University of Southern California) provided recommendations on improving space-based software acquisition using Agile, DevSecOps and digital engineering techniques.

In the Models and Data area, Dr. Peter Beling (Virginia Tech) presented on "Developmental Test and Evaluation and Cyberattack Resilient Systems", highlighting the risks associated with insufficient testing of cyberspace threats. Two projects were outlined to address these concerns:

- FOREST (Framework for Operational Resilience in Engineering and Systems Test)
- TREES (Testable Resilience Efficacy Elements)

Dr. Payuna Uday (Stevens Institute of Technology) addressed the emphasis of SERC's Human Capital Development research on the need for DoD-defense industry collaboration in STEM education and workforce development programs.

Read the full SERC annual review recap.

Innovating Improvements to Defense Acquisition

Concurrent with the SERC Annual Research Review, the Acquisition Innovation Research Center (AIRC) of the U.S. Department of Defense brought together practitioners and researchers to discuss issues and opportunities for improving defense acquisition outcomes. Themes included:

- The need to have a "whole systems" view connecting missions, governance, and communications.
- The shift from a program/platform-centric perspective to a mission/data-centric perspective.
- How to leverage the economic engine of commercial development to keep innovation ahead of evolving problems and threats.

Read the full article.

AIRC research presentations included:

- Assessments of the Process for Developing Capability Requirements for DoD Acquisition Programs
- Interoperable and Integrated Capabilities for Mission Effects
- Emerging AIRC Innovation Efforts
- Defense Data Grand Prix
- Thoughts on Agility Through Appropriations
- Defense Acquisitions Research Collaboration & Innovation Environment (DARCIE)
- Test and Evaluation Strategic Efforts
- Incentivizing Innovation and Culture: Systemic Factors Influencing Risk Aversion
- Factors and Decision-Making for Additive Manufacturing in Sustainment
- Cognitive Assistant for Training Cost Estimators
- Gamified Learning for Defense Acquisition
- Procurement Reform: AIRC Reports on Defense Department Bid Protests & Mandatory Debarment

View and download these AIRC research presentations here.

Learning-Enhanced Autonomous Navigation for GPS-Denied Vehicles
This research focuses on the ability for coordinated operation of autonomous (underwater, ground, aerial) vehicles in complex and unknown, e.g., GPS-denied, environments. Technologies of interest include:

- LIDAR-based mapping
- Autonomous multi-robot exploration
- Machine learning
- Graph networks

Read the full article.

Measurable Requirements for Operational Resilience
Better resilience metrics and design tools are needed to increase the resilience of defense systems. The FOREST framework, described above, is being piloted on a DoD acquisition program to provide real-world feedback on how to measure resiliency and to generate testable resilience requirements.

Read the full article.

Access the latest SERC news here.

INCOSE Q4 Highlights

The 4Q2022 edition of the INCOSE Members Newsletter included highlights from a variety of initiatives and activity reports for chapters around the world. INCOSE membership has risen to over 21,000 with the potential for even larger global impact to be realized through 65 chapters, 130 corporate partners and 52 working groups. A summary of significant activities follows below.

FuSE Initiative Paves the Way to Reach Goals of SE Vision 2035

Progress associated with the INCOSE Future of Systems Engineering initiative (FuSE) has accelerated since its start in 2018 and will be center stage at the INCOSE 2023 International Workshop (IW2023). FuSE team research was instrumental in the SE Principles document that was published in 2022. See SyEN Edition 119 (December 2022) for PPI reflections on this document.

In 2023 the FuSE initiative hopes to develop organizational relationships, workflows and value models that contribute proactively and practically to the realization of the SE Vision 2035.

Technical Leadership Institute

INCOSE's Technical Leadership Institute (TLI) continues its mission to provide opportunities for personal and professional growth and networking with peers and coaches. Started in 2015, TLI cohort #8 has 23 participants. A call for nominations for the next TLI cohort will be issued at IW2023. Learn more about TLI here.

Empowering Women Leaders in Systems Engineering (EWLSE)

In late 2022, the INCOSE EWLSE initiative published an impressive work product, "Letters to My Younger Self: How Systems Engineering Changed My Life (LTMYS)". This brainchild of Alice Squires, ELWSE founder/leader and Lisa Hoverman, former INCOSE Marketing and Communications Director, is a means to reach out to a younger generation of engineers with both the passion of their forebears and lessons learned across numerous diverse systems engineering careers. Future iterations of this e-book are planned to follow and trace the evolution of systems engineering practice. Download LTMYS.

Erika Palmer, ELWSE Americas Sector lead and LTMYS co-author) recently interviewed Cindy Mahugh-Dam, CEO of SPEC Innovations (LTYMS sponsor), to gain her insights into inspiring women in the engineering workforce and the benefits of workplace diversity. Watch this interview.

SySTEAM Initiative

2022 saw the expansion of the INCOSE Systems, Science, Technology, Engineering, Arts, and Mathematics (SySTEAM) initiative to explicitly include the arts and humanities alongside STEM and to address the significance of interdisciplinary education. Since its inception at IW2022, SySTEAM has grown into an online global community comprised of hundreds of educators, industry professionals, advocates, and students, all linked via SySTEAM's email, listserv and Discord community hub. SySTEAM's expanded vision was highlighted in SyEN Edition #113 (June 2022).

A November "end-of-year" workshop produced a preliminary report that highlights SySTEAM's findings concerning the current state of systems thinking and systems engineering education, recommendations for long-term solutions to relevant issues and short-term actions that might create value in 2023. A potential SySTEAM mini-conference in mid- or late-2023 is under consideration. There is opportunity to shape the planning for this conference by completing an interest form and joining the SySTEAM Discord server.

Learn more about SySTEAM.

INCOSE Outreach Champion Proposals

INCOSE Outreach is soliciting "Champion Proposals" from members who would like to suggest a potential collaboration that they would like to create between INCOSE and another organization or professional society. The one-page proposal should include:

- GOALS (identify)
- Describe your project in one or two paragraphs.
- Motivation
- Proposed actions you will take.
- How will you evaluate whether your action contributed to your goal or not?
- Identify milestones (with timeframes).
- Ultimate results you want to achieve.

Proposals should be submitted to Julia Taylor, Director for Outreach, on julia.taylor@incose.net.

New INCOSE Leadership Team Members

Based on the 2022 election results, four new members have joined the INCOSE Leadership Team:

- Don York (Secretary, 3 years)
- Alejandro Salado (Director for Academic Matters, 3 years)
- David A. Long (Director for Strategic Integration, 3 Years)
- Sven-Olaf Schulze (EMEA Sector II Director, 3 years)

Academic Council – Student Divisions

News from the INCOSE Academic Council includes:

- Approval and roll-out of a new policy governing Student Divisions.
- Dr. Erika Palmer (Cornell University) replaces Dr. Cecilia Haskins as an organizing member of INCOSE's Doctoral Student Network (SEANET).
- Deployment of two Discord servers dedicated to Student Divisions and SEANET.

Learn more about the INCOSE Academic Council here.

Chapter Updates

A small sample of the fourth quarter highlights from INCOSE chapters include:

- Australia (SESA): The Systems Engineering Test & Evaluation (SETE) Conference 2022 was conducted in September as an in-person conference with the theme of "Enabling Resilience through Disruption". Learn more about SESA.
- Japan (JCOSE): Conducted three JCOSE events in September (Japan Symposium 2022, Vision for a Better World, Introductory course on SE). Learn more about JCOSE.
- Singapore: In November, the Singapore chapter hosted chapter representatives from Norway and India to begin an East-West dialog aimed at improving chapter effectiveness.
- Korea (KOSSE): The Korean System Engineering Conference was held in November with the theme of "Meeting of Artificial Intelligence and Unmanned Vehicles". Learn more about KOSSE.
- New Zealand: (see separate news item in this edition)
- Brazil: Hosted the INCOSE Brazil Conference 2022 in October which highlighted the ten-year evolution of INCOSE Brazil (shared by PPI's George Sousa), while looking toward the realization of SE Vision 2035. Numerous topics were addressed across the five-day conference aimed at current challenges faced by the Brazilian engineering community.
- U.S. Western States: Hosted the Western States Regional Conference (WSRC) from 30 September – 2 October with over 130 in-person attendees learning how to "Climb Above Buzzwords".
- German (GfSE): Hosted the TdSE (Day of Systems Engineering) conference in November, celebrating the 25th anniversary of GfSE while sharing numerous educational and practical presentations. Learn more about GfSE.
- UK: Announced the publication of "Don't Panic! The Absolute Beginner's Guide to Service Systems and Services". Conducted the ASEC2022 conference in November. Conference proceedings are available in the INCOSE UK online store. Learn more about INCOSE UK.

Working Group Updates

Various working groups report their progress, including:

- Artificial Intelligence (AI) Systems Working Group: Investigating the potential of large

language models to revolutionize AI. Visit the AI Systems WG webpage.

- Information Communication Technology Working Group (ICT WG): Will participate at the International Wireless Communications Expo (IWCE) in Las Vegas, Nevada, USA in March 2023. Visit the ICT WG webpage.
- Natural Systems Working Group (NSWG): Has moved numerous prior webinars to the NSWG webpage. 2023 plans include continuation of the NSWG webinar series and delivery of natural systems tutorials. Visit the NSWG webpage.
- The Professional Development Portal (PDP): The PDP was launched as a Minimum Viable Service (MVS) in July 2022, with new capabilities being added frequently. Access the PDP.
- Social Systems Working Group (SSWG): The three-person leadership team of the SSWG (Shamsnaz Bhada, Charlotte Dunford, and Dana Polojärvi) are blazing new trails as they frame the exceedingly broad topic of Social Systems. Visit the SSWG webpage.
- INCOSE IT (Website): INCOSE IT is in the midst of a multi-year IT Community Transformation project that is overhauling the way that INCOSE members and the outside world interact with INCOSE. Learn more here.
- INCOSE Mentoring Service: INCOSE has initiated a pilot mentoring service which will run from December 2022 to May 2023. INCOSE is seeking both mentors and mentees, so please enroll here. Visit the Mentoring webpage.
- INCOSE Foundation: The Foundation is partnering with the U.S. Defense Acquisition University (DAU) to provide rotational assignments for DAU faculty members to aid such faculty in staying current on the systems engineering innovations and best practices. The Foundation is continuing its outreach effort to parts of the globe that have limited systems engineering resources. Visit the Foundation webpage.
- University Partnerships: In December 2022, C. Robert Kenley of Purdue University began serving a two-year term as the Chair of the INCOSE Fellows.

Final Respects

This edition of the INCOSE Members Newsletter included tributes to the lives and impact of three individuals who enriched the systems engineering community:

- Jerry Lake
- Dr. Barry Boehm
- Amy (Kowalski) Wang

Download the full INCOSE December 2022 Member Newsletter.

System Dynamics Society 2022 Recap

The System Dynamics Society (SDS) has highlighted its most significant efforts during 2022 in expanding the global reach and impact of System Dynamics.

System Dynamics Conference 2022

The International Systems Dynamics Conference 2022 (ISDC 2022) was the Society's first hybrid conference, with hundreds of participants meeting in-person in Frankfurt, Germany. Conference highlights are available in the conference blog, including:

- The System Dynamics Conference From the Perspective of a Multi-Method Simulations Developer
- Modeling for Improved Organizational Staff Diversity
- Is System Dynamics the Missing Subject in our Educational System?

- System Dynamics Focuses More on Sustainability Than the Sustainable Development Goals

Preparations are underway for ISDC 2023 to be held on 23-27 July 2023 in Chicago, Illinois, USA and on-line.

Seminars
During 2022, the Society hosted numerous seminars with over 1,100 attendees, including:

- Systems Thinking for Pre-College Education
- Dancing with Systems: Moves for Turbulent Times
- Working with Loops That Matter: technique and tools to analyze feedback loops
- How to Publish in the System Dynamics Review
- The Dark Side of Projects: Delays, Disruption, and Disputes
- The Food Packaging Problem: A Food System Problem Not a Packaging Problem
- New Horizons of Systems Science
- Using System Dynamics to Teach and Learn about COVID-19
- Multisolving: Working With Complexity and Interconnection
- Data and Uncertainty in System Dynamics
- Documenting the Modeling Process

To access this content, join the System Dynamics Society here.
Find more SDS learning opportunities.

Resources
Worldwide supply chain challenges have triggered a dramatic increase in Beer Game sales. To respond, the Society added Facilitation Services to our offerings and led the Beer Game with several clients.

The top-selling book for 2022 was Principles of Systems by Jay Forrester.

Shop for additional resources here.

Chapters and Special Interest Groups (SIGs)
The Society now has 20 Chapters and 18 SIGs including a new Housing SIG. Support for these organizations has been expanded including websites.

Outreach and Communications
The Society's Publications Team continues to improve its processes, reducing review times for articles and increasing the System Dynamics Review journal's impact factor to 3.040. Article downloads reached an all-time record high (10,000 in October) and the citation trend almost doubled from last last year (140 over 2 years).

The Society's University Innovation Team has begun to gather a list of university courses around the globe.

The Case Study Applications webpage has been revamped and five new case studies added during 2022, including:

- Achieving a Polio-Free World Through System Dynamics Simulation: Scenario analysis leads to 192 country resolution and $100M in funding from the Bill and Melinda Gates Foundation to target global eradication rather than an ongoing maintenance program.
- System Dynamics Helps Reduce Waiting Lines for NHS Patients: Creative solutions were needed to tackle the elective recovery backlog under limited resources. System Dynamics allowed operational and clinical staff to test the impact of major interventions, aiding leaders decide how to best allocate resources, transform services to benefit patients, and

reduce waiting times.

- Twinings Uses System Dynamics Games to Enhance HR Capability: A one-day workshop helps business executives to improve communication, collaboration, and decision-making while giving them powerful strategies and insights.
- MasterCard Halts Market Share Slide With Scenario Planning: Credit card giant leverages System Dynamics regaining 6 points of market share and revolutionizing the industry with co-branding.
- RSC Uses System Dynamics to Increase HVACR Sales Against the Tide: A forecasting model powered by System Dynamics helps RSC CEO identify main industry trends, foressee a downturn, and strengthen its position in a spectacular move.

Other media highlights:

- Youtube Channel expanded.
- Social Media following expanded to 21,400+.

Learn more about SDS.

NIST Smart Connected Systems Research 2022 Highlights

The U.S. National Institute for Standards and Technology (NIST) formed its Smart Connected Systems Division in March 2022. The Division advances measurement science, standards, and test methods to support communications networks, trustworthy Internet of Things (IoT) systems, and critical applications including smart grid, smart manufacturing, industrial control systems, automated vehicles, and smart cities and communities.

The January 2023 NIST Smart Connected System Newsletter recapped 2022 highlights of research across the Division's five groups. Abdella Battou, Division Chief, and David Wollman, Deputy Division Chief, summarized 2022 progress as:

"In 2022, the Division focused on improving, securing, and expanding the connectivity of smart systems – and always with an eye on future directions, stakeholder goals, and how smart connected systems can provide equitable and inclusive benefits."

A small sample of each group's advances, projects chosen for relevance to general systems engineering practitioners, are shared below:

IoT Devices and Infrastructure Group
Addresses the development and engineering of the Internet of Things for such applications as automated vehicles, smart cities and communities, and more.

- Simulating Complex Cyber-Physical Systems (CPS): These are massive systems that contain many communicating parts including small IoT devices, physical infrastructure, and humans. Simulation is key to determine if a complex CPS will work as intended – and the subject of Integrating Multiple HLA Federations for Effective Simulation-Based Evaluations of CPS. It offers ways to develop multiple simulation federations for testing a complex CPS. The publication focuses on modelling a manufacturing plant as a use case, which is aided by NIST's Universal CPS Environment for Federation.

Smart Connected Manufacturing Systems Group
Promotes fully integrated, collaborative manufacturing that can readily respond to changing demands and factory conditions.

- Proposed Upgrade to Systems Modeling Language: Many manufacturers specify requirements for complex systems, as well as designs and tests for them, using the Systems Modeling Language (SysML 2). NIST and the Object Management Group have continually advanced SysML 2. This past year, NIST offered major upgrades, enabling SysML 2 to model required spatial relationships – such as landing gear being inside a plane after takeoff – without committing to detailed object geometry, leaving that to alternative design exploration and evaluation. The updates were accepted in a draft specification submitted to OMG. (See NIST Researcher Proposes Modeling Language Upgrade to OMG Standards Organization).

Networked Control Systems Group

Researches and advances sensor networks and system controls for use in manufacturing, industrial environments, construction, and mission critical applications.

- Draft Guide on Operational Technology Security: This draft NIST Special Publication (SP) 800-82r3 was released for stakeholder input. It is intended to improve the security of operational technologies which detect changes in industrial, building automation, transportation, and other similar systems. The draft provides an overview of operational technologies; identifies threats to them; describes their vulnerabilities; and recommends security safeguards and countermeasures for managing risks. (See NIST Seeks Inputs on its Draft Guide on Operational Technology Security)

Smart Grid Group

The Smart Grid Group advances the interoperability, reliability, and optimization of a rapidly transforming power grid, with its increasing use of renewable energy systems, sensors, and microgrids.

- Proposed Integration of Electric Vehicle Charging Stations and Power Grid: This is addressed in the Interoperability Profile for Electric Vehicle Fleet Managed Charging. The Profile describes the needed functions and interactions between charging stations and the grid. The Profile lays out the technical requirements for their information exchanges, which are based on the smart grid communication protocol IEEE 2030.5-2018. NIST developed the Profile with the Smart Electric Power Alliance. (See NIST, SEPA Develop Interoperability Profile for Integrating Electric Vehicle Charging with Grid)

Transformational Network and Services Group

Researches quantum communications, cloud computing, wireless sensor networks, 5G, 6G, information centric networking, and their potential impacts on how we will work and live

- A Path to a Cloud Computing Federation via Standards: This path was described in an IEEE webinar and IEEE publication. The goal is a standards-based federation, with multiple clouds, allowing users to access all cloud services, but with providers still controlling what they find. The path would involve NIST and IEEE collaborating on a cloud federation standards. A public working group also might develop a federation vocabulary and concept. standards. A public working group also might develop a federation vocabulary and concept. These outputs would aid an IEEE working group's development of a standard. (See NIST, Industry Researchers Use IEEE Standard to Point a Way Ahead for Cloud Computing)

View previous NIST Smart Connected Systems newsletters here.

Tom Sawyer Software News

Tom Sawyer Software has announced release 10.1.1 of its Model-Based Engineering data visualization software. Release 10.1.1 of Model-Based Engineering adds support for 2021x and 2022x of No Magic MagicDraw, Cameo Systems Modeler, and Teamwork Cloud. This release also improves the performance of the TinkerPop integrator for large JanusGraph instances in Perspectives.

View the 10.1.1 release notes.* Current users may download Release 10.1.1

Tom Sawyer has also created an example application that uses its Perspectives software to help identify problematic chains in a supply chain. Access the Supply Chain example.*

New visitors to Tom Sawyer Software need to create an account to access these resources.

Learn more about Tom Sawyer Software products.

- Model-Based Engineering: Automatically lay out diagrams into interactive, customized visualizations
- Perspectives: Build effective visualization and analysis applications that give value to your data.
- Graph Database Browser: Instantly explore and analyze your graph database
- Business Process: Visualize work processes. Efficiently manage tasks across your organization

On 28 January, Dr. Janet Six, Senior Product Manager, is presenting two talks at the Data Day Texas conference in Austin, Texas, USA:

- Visualizing Connected Data as It Evolves Over Time
- Where Is the Graph? Best Practices for Extracting Data from Unstructured Data Sources for Effective Visualization and Analysis

View the Data Day Texas agenda. Register here.

Learn more about Tom Sawyer Software.

Intercax 2022 News Summary

The team at Intercax reports a busy and productive 2022, headlined by the release of Syndeia 3.5 with significant expansion of digital thread technology. See new features here and in SyEN Edition #117 - October 2022.

Other highlights include:

- Intercax sponsored and/or provided presentations and software demonstrations at numerous industry events and workshops during 2022. See summary here.
- Over 200 individuals registered for the live online Syndeia Training Program held in Spring & Fall. This program will continue in 2023.
- Nearly 20 informative posts were published in Intercax blog addressing a wide variety of digital engineering topics.
- The Syndeia user base has seen significant expansion in the design and manufacturing industries during 2022.
- The Intercax team is playing a leading role in developing SysML 2.0 open standard

Learn more about Intercax products and services.

Surge in SE Tools Database (SETDB) Updates

The Systems Engineering Tools Database (SETDB), developed by PPI in partnership with INCOSE, saw a surge in updates by tool vendors during late December and early January. Recent SETDB updates include:

Vendor: Absolute Software Inc.

- Absolute Visibility: A cloud-based application that enables you to see all of your devices and application, inventory all software assets, build and maintain a device inventory on your network, and provides reports on geolocation, usage and the health of all of your essential applications.
- Absolute Control: Absolute Control enables you to retain command of all your endpoints, all the time even if they are off your network using a persistent link between your Absolute Visibility Dashboard and your devices. Using the link, you can freeze lost or stolen devices wipe and remotely wipe data.
- Absolute Persistence: Absolute Persistence adds a high level of resilience to your mission-critical apps, granting them the power to heal and reinstall themselves whenever they're disabled, altered, or uninstalled.

Vendor: Agent oriented Software (AOS)

- CoJACK™: CoJACK™ is cognitive architecture used for modelling the variation in human behavior. It is used in simulation systems to underpin virtual actors.

Vendor: ALD Ltd.

- FRACAS: ALD's third generation, web based and user configurable Failure Reporting, Analysis and Corrective Action System (FRACAS) that captures information about equipment or the processes throughout its life cycle, from design, production testing, and customers support.
- Fault Tree Analysis: Up-to-date, intuitive and powerful fault tree analysis diagram interface allowing full control over the diagram: elements location, colors, styles, zooms, etc. Handy methods for diagram printing and simple copy & paste transfer to other applications and linking to ALD FMECA modules.
- Process and Design FMEA: Provides potential product Failure Modes and Effects Analysis and is fully compliant with AIAg FMEA and QS 9000. Features a full visibility failure mode, effect and cause chain, built in corrective actions and support for the decision-making process with full FMEA documentation.
- FMEA/FMECA with Testability: Perform FMEA with one click switching to FMECA mode, full sharing of reliability and maintainability data, powerful testability capability, full set of FMEA/FMECA reports and more.
- Availability Analysis RBD: Reliability Block Diagram module for availability analysis that supports all failure and repair distributions, graphical representations and event driven Monte Carlo Simulation. Multiple configuration comparison of availability.
- Safety Commander: An Integrated Safety Assessment tool for Functional Hazard Assessment (FHA) and Fault Tree Analysis (FTA) with the capability to support aircraft level fault analysis (create, calculate and analyze) of integrated fault trees of multiple systems.

Vendor: Ansys Inc.

- Ansys medini analyze: A model-based, integrated analysis tool for safety-critical electrical

and electronic (E/E) and software (SW) controlled systems. It allows for consistent application of industry guidelines, tailored to industry standards, such as ISO 26262, IEC 61508, ARP 4761, ISO 21448 or MIL-STD-882E.

Vendor: Autodesk Inc.

- Revit: Revit® Building Information Modeling (BIM) software helps architecture, engineering, and construction (AEC) teams create high-quality building and infrastructure designs in 3D with parametric accuracy and precision in a unified project environment.
- Product Design and Manufacturing Collection: Unify product design and manufacturing with integrated CAD, CAM, and CAE apps and services.
- Autocad: Power your teams' creativity with automation, collaboration, and machine-learning features of AutoCAD® software. Architects, engineers, and construction professionals use AutoCAD to design and annotate 2D geometry and 3D models with solids, surfaces, and mesh objects plus compare drawings and more.
- Inventor: Professional-grade tools for 3D mechanical design, simulation, and documentation.
- Inventor CAM: Integrated 2.5- to 5-axis CAD/CAM programming solution for Inventor.
- Inventor Nesting: True shape nesting software for Inventor to optimize yield from raw material.
- Inventor Tolerance Analysis: Tolerance stackup analysis software for evaluating the impact of dimensional variation.
- Fusion 360: Cloud-based CAD/CAM/CAE software for product design and manufacturing.
- Civil 3D: Comprehensive detailed model based design and documentation software for civil infrastructure. Enables better design decisions, product quality, design coordination and streamlines documentation.
- InfraWorks: Aggregate large volumes of data to generate contextual models, seamlessly integrate geospatial data into designs, model existing conditions representing built and natural environments. Explore conceptual designs in context, with analysis and simulation tools with compelling visual communication.
- Navisworks: Navisworks® is a review and coordination software to improve BIM project delivery. Enables you to visualize and unify design and construction data within a single federated model, Identify and resolve clash and interference problems before construction begins, saving time onsite and in rework.

Vendor: Change Vision, Inc.

- Astah SysML: Astah SysML is a lightweight SysML diagramming tool which is perfect for systems engineering.
- Astah UML: Astah UML will allow you to create a set of UML 2.x diagrams for your project.
- Astah Professional: Astah Professional helps you create UML diagrams, ER Diagram, Flowchart, and DFD and more to create a clear understanding of your software design among teams.

Vendor: CodeKick AB

- KanBanFlow: A lean project management tool intended for use by teams for implementing Kanban boards. It can be used free or by monthly subscription. Features include importing and exporting in several formats, add tasks by email and features a REST based API.

Vendor: creately

- Decision Tree Maker: Decision trees are a method of visualizing possible outcomes and

impact of a strategic decision to help determine the probable results of a decision, and calculate the costs, risks and benefits of a stream of decisions. Decision Tree Maker is a collaborative, on-line tool for making decision trees.

Vendor: Dassault Systemes

- Simulia: Part of the 3DEXPERIENCE® platform, the SIMULIA Simulation Portfolio delivers virtual, realistic simulations enabling users to visualizing their designs before committing to physical prototypes. it enables users to develop, store, manage, deploy, store and reuse standard simulation design methods.

Vendor: Decision Support Tools Ltd

- DST Lifespan Evaluator: A Life cycle cost, risk and performance evaluation of asset choices, asset replacement timing, lif extension options, obsolescence, procurement and decommissioning decisions.

Vendor: DevMads Ltd

- StoriesonBoard: On-line user story mapping software to help manage multiple Agile programs being executed in an organization. Build visual backlogs that everybody understands, slice out the releases and push user stories to your favorite issue tracker.

Vendor: Lucid Software

- Lucidchart: Lucidchart is an intelligent diagramming application that brings teams together to make better decisions by visualizing processes, systems and organizational structures. It enables process and design optimization, and the visualization of technical data using architectural diagrams and flowcharts.
- Lucidspark: A collaborative whiteboarding/brainstorming visualization tool for collecting ideas, organizing thoughts, and planning. Capture team insights with sticky notes, freehand drawing, and color-coded cursors, shapes, and lines for each collaborator to create an infinite expandable canvas of ideas.
- Lucidscale: Lucidscale is the cloud visualization solution that helps organizations see and understand their cloud environment. Works with AWS, Azure and GCP architectures. Analyze specific elements such as security groups, VPCs, Virtual Machines, Zones, and more to avoid risk and cut unnecessary costs.

Vendor: Pro-Concepts LLC

- Risk Radar® Enterprise: An intuitive web application for enterprise-wide, program, and/or project Risk Management that adheres to industry standards. It enables effective management of project Cost, Schedule, Technical and Performance Risk within a common, flexible and scalable framework.

Vendor: PTC

- Arena PLM: Arena Product Lifecycle Management software brings product information, people, and processes together into a single enterprise platform to speed product design and development. Our Cloud PLM software is easy to use anytime and anywhere.
- PTC Arbortext: A structured authoring tool intended for technical authors to generate technical documentation like service manuals and parts catalogues.
- Vuforia: A comprehensive, scalable enterprise Augmented Reality (AR) platform for developing powerful step-by-step AR instructions. Our wide-ranging solution suite ensures

that we can provide the right AR technology to every customer based on their business needs.

Vendor: ScopeMaster Ltd

- ScopeMaster Requirements Analyzer: A ground-breaking requirements analysis tool that hyper-automates the analysis of software requirements or user stories.

Vendor: Scrumwise

- Scrumwise: An agile management tool intended for teams in implementing Scrum. Design your own easy-to-use Scrum boards and Kanban boards, where everything updates in real-time keeping everybody on the same page.

Vendor: Siemens Digital Industries Software

- Model Based Definition: Part of the Solid Edge Product Development Portfolio (2022) suite. Enables the production of a complete digital definition of parts and/or assemblies using a 3D model, moving users to a fully digitalized manufacturing and design environment. Annotated 3D models are easier to understand than complex drawings and drive downstream validation and manufacturing effort.

Vendor: Smartdraw Software LLC

- Smartdraw: SmartDraw helps you create over 70 different types of diagrams and charts. Diagrams and charts are visual representations of information. They are useful for documenting facts, drawing plans, and capturing ideas and enhance communication, learning, and productivity.

Vendor: Sodius Willert

- OSLC Connect for WIndchill: Part of the MagicDraw Publishers suite. The OSLC Connect for Windchill links your ALM system with the Windchill PLM systems. It enables workflow integration, requirement traceability, change management and impact analysis across the interface.

Vendor: SoHaR Incorporated

- FavoWeb: FavoWeb is a web based and user configurable Failure Reporting, Analysis and Corrective Action System (FRACAS) that captures information about equipment or the processes throughout its life cycle, from design, production testing, and customers support.

Vendor: SPEC Innovations

- Innoslate: Innoslate, the first web-based MBSE tool, was developed by SPEC Innovations to support the entire system or product lifecycle. This cloud or on-premise application simplifies system or product development while reducing time-to-market, cost, and risk.

Vendor: TechnoSolutions Corp.

- TopTeam Requirements: Comprehensive Requirements Management Tool with end-to-end Traceability, SysML and UML modelling, use case development, change management, traceability customization, trace matrix generation, custom taxonomy and advances branching and merging.
- TopTeam Analyst: TopTeam Analyst is an end-to-end solution for requirements definition and requirements management with an integrated agile process. Single source of truth with all requirements, user stories, use cases, SysML diagrams, UML diagrams, change management and traceability in one tool.

SYSTEMS ENGINEERING NEWS

Vendor: UNICOM Systems, Inc.

- UNICOM® PowerHouse® 4GL: Equips your organization with high productivity development environments for creating your data-driven business solutions faster - whether for web-based, client/server, or traditional terminal-based access.
- UNICOM® Finance: Provides streamlined consolidation and budgeting, insightful analysis and forecasting, and valuable, flexible reporting in one easy-to-use, web-deployable package.
- UNICOM® Intelligence: The UNICOM Intelligence suite of products helps survey and market researchers gain a deeper understanding of people's attitudes, preferences and opinions.
- UNICOM® Digital Transformation Toolkit (UDTT™): A development environment with design templates intended for the retail banking industry. It provides runtime infrastructure based on IBM WebSphere Application Server to deliver targeted multichannel marketing campaigns.

SyEN readers are encouraged to check out these new and updated systems engineering tool offerings.

Access the SETDB website.

Upcoming PPI Live-Online ™ Systems Engineering Five Day Courses

Click here to view the full schedule or register for an upcoming course.

P006-906-1	Asia SGT 5:00 (UTC +8:00) PPI Live-Online	06 Feb - 10 Feb 2023
P006-906-2	Oceania AEDT 8:00 (UTC +11:00) PPI Live-Online	06 Feb - 10 Feb 2023
P006-907	London, United Kingdom GMT 8:30 (UTC +0:00) In-Person	20 Feb - 24 Feb 2023
P006-908	Las Vegas, United States of America PST 8:00 (UTC -8:00) In-Person	06 Mar - 10 Mar 2023
P006-909-1	North America EDT 10:00 (UTC -4:00) PPI Live-Online	20 Mar - 24 Mar 2023
P006-909-2	South America BRT 11:00 (UTC -3:00) PPI Live-Online *(Only available in South America)*	20 Mar - 24 Mar 2023
P006-910-1	Asia SGT 5:00 (UTC +8:00) PPI Live-Online	27 Mar - 31 Mar 2023
P006-910-2	Oceania AEDT 8:00 (UTC +11:00) PPI Live-Online	27 Mar - 31 Mar 2023
P006-911-1	Europe CEST 9:00 (UTC +2:00) PPI Live-Online	27 Mar - 31 Mar 2023
P006-911-2	United Kingdom BST 8:00 (UTC +1:00) PPI Live-Online	27 Mar - 31 Mar 2023
P006-911-3	South Africa SAST 9:00 (UTC +2:00) PPI Live-Online *(Only available in South Africa)*	27 Mar - 31 Mar 2023

CONFERENCES, MEETINGS & WEBINARS

Online Forum: The Value of Digital Twins - From Concept to Reality

The Digital Twin Consortium (DTC) is a global ecosystem of users driving best practices for digital twin usage and defining requirements for new digital twin standards. On 22 February 2023 DTC is hosting a half-day online public forum titled "The Value of Digital Twins: From Concept to Reality". Presenters will include DTC leadership and leading innovators in digital twin technology and methods.

The target audience for this forum includes:

- Anyone interested in learning about digital twin technology, business advantages, and applications.
- C-level executives and sustainability professionals tasked with improving cost, consumption, and operational efficiencies in their organizations.
- IT and IoT executives and technologists.

Learn more about the online forum.
Register here.
Learn more about the Digital Twin Consortium (DTC).

Registration Open for Journey to the NIST Cybersecurity Framework (CSF) 2.0 - Workshop #2

On 15 February 2023, the U.S. National Institute for Standards and Technology (NIST) will host its second virtual public workshop on the future update to the NIST Cybersecurity Framework (CSF 2.0).

This event will address potential significant changes to the Framework as outlined in the CSF Concept Paper, as well as build on feedback from the 2022 NIST Cybersecurity Request for Information (RFI) and the first workshop that was held on 17 August 2022. NIST hopes that Workshop #2 will continue engagement with a wide and diverse community of experts; the first CSF 2.0 workshop was attended by 4,000 participants from 100 countries.

This one-day event will include updates from NIST on CSF 2.0, as well as virtual panel discussions with experts in the community. Attendees may participate in each panel topic via Slack, offering comments on each topic and suggesting questions to ask the panelists.

Recommended preparation steps for attendees include:

- Read the CSF Concept Paper (to be posted here, prior to the workshop)
- Review the RFI analysis
- Watch the Workshop #1 recording
- Learn more about the progress toward CSF 2.0

Learn more here.
Register for Workshop #2.
Subscribe to receive email alerts concerning the CSF.

Business Analysis Webinars in February

In February, the International Institute of Business Analysis (IIBA) is hosting three business analysis webinars, two members-only and one public/open access.

On 8 February, Dr. David P. Marco will present "*Data Literacy: Bias and Common Data Analysis Mistakes Master Class #4*".

Abstract: Data analysis is challenging work with various pitfalls that must be avoided. In part 4 of the Data Literacy series, Dr. David P. Marco (President, EW Solutions and Data Management U) will walk us through the 9 most common mistakes made by business analysts and the 18 types of bias that can creep into any analytics.

Become an IIBA member to access this webinar and earlier events in this series.
Register here.

On 15 February, Jaleann Matos-McClurg (IIBA Atlanta Chapter, VP of Professional Development) will present "*Elevating The Role of Business Analyst to Proxy Data Scientist*".

Abstract: The market forces of cloud computing, IoT, digital transformation, value-driven analysis and data science are brewing the perfect storm to position BA for becoming proxy data scientist in absence of skilled resources. This presentation will discuss resources for BA up-skilling and also present a blueprint of how BA role intersects data scientist role and why BA is well positioned to play a seat at the table becoming a trusted advisor of the business. Jaleann will discuss distinct skillsets for data science roles to keep in mind on your growth plans. In this session, Jaleann McClurg brings her experience in the Data Analytics space to help you understand how you can leverage your current BA skills to 'find your place at the table' in this fast-growing area of the Business Analysis world. A 2021 IIBA survey noted that BAs can make a huge difference in the success of data analytics projects by either (a) driving the analysis itself, and/or, (b) serve as a partner with business leaders and data science experts to ensure that a solid business case and outcomes are defined for the project. If you are interested in raising your abilities - and your stature within your company - in this arena, this is the presentation for you.

Become an IIBA member to access this webinar. Register here.

In addition to these two member-only webinars, IIBA is hosting a public webinar on 24 February titled "*Business Analytics Series: Introduction to Statistical Analysis in Power BI*" and presented by Dr. Mark Griffin (Director, Insight Research Services Associated).

Abstract: Statistical analysis is a vital tool for business analysts. Within this webinar we will provide a introduction to three key core techniques (regression, classification, and cluster analysis). For each technique we will discuss the purpose of the technique, a very brief mathematical foundation, the names of methods that could be applied under that technique, a brief introduction as to how perform that technique in Power BI, and an interpretation of the results coming from Power BI. The importance of these skills is discussed in the IIBA Guide to Business Data Analytics (see Techniques 3.9 Descriptive and Influential Statistics).

This webinar will be presented in 3 time zones, so register through the desired link below:

- Asia Pacific – Brisbane 14:00 (+10 UTC)
- Europe – London 09:00 (+0 UTC)
- North America – New York 15:00 (-5 UTC)

Learn more about the IIBA.

Listen to the IIBA Business Analysis Live podcast.

Registration Opens for NDIA 2023 Human Systems Conference

The U.S. National Defense Industrial Association (NDIA) is hosting its 2023 Human Systems Conference in Arlington, Virginia, USA on 1-2 March 2023. This in-person conference will take place on the campus of George Mason University with the theme of "Human Systems Design: from Research to Practice".

Conference Description:
The defense industry has seen a dramatic increase in technological advances in the areas of artificial intelligence and machine learning, wearable sensors, decision support, hybrid teaming, and more. With these advances, critical questions emerge about the role of the human in these sociotechnical systems. Understanding the fundamentals of human systems design is key to optimizing performance of new technology as well as the servicemen and servicewomen equipped with those technologies operating in real-time high-stakes decision making scenarios. As technology evolves, so do human performance dynamics. Research is required for understanding these new dynamics. So too, is an understanding of how those dynamics emerge during practical application, and their consequences. Human systems design is optimized by taking the insights from both research and practice.

This conference is one way by which the Human Systems community seeks to advance the field and optimize warfighters' capabilities through education, consultation, research, and collaboration.

Conference tracks
Although the final agenda is forthcoming, topics to be addressed fall into four tracks:

- Human Systems Advocacy & Metrics (HAS&M): HSI metrics and associated requirements that influence the system development cycle, and methods and metrics to manage and track HSM to support total "human + system" performance, as well as characterize its impact on life-cycle cost and mission success.
- Personalized Assessment, Education and Training (PAE&T): Current challenges and ongoing or future research efforts in areas like the science of learning, affective computing, content authoring tools, natural language dialogue, adaptive and interactive scenario-based training; persistent, affordable, integrated training; and leadership development. Training methods and technologies in terms of reduced cost and increased training complexity or in terms of using new technologies as a force multiplier.
- Protection, Sustainment and Warfighter Performance (PS&WP): Current challenges and ongoing or future efforts in areas such as research metrics for quantifying Warfighter physical performance in operational environments, the interaction of physical and cognitive stressors on Warfighter effectiveness, or mitigation of physical performance decrements through advanced systems and techniques that enhance resiliency.
- Systems Interface and Cognitive Processing (SI&CP): Current challenges and ongoing or future research efforts in areas including natural human-machine interaction and teaming, cognitive and neurological models, integration of artificial intelligence and human cognitive models, or trust in automation. Approaches that emphasize verification and validation (V&V) of resultant technologies against standards or requirements.

Learn more about the conference and agenda here.

Register here. Join NDIA to receive a conference discount.

CONFERENCES, MEETINGS & WEBINARS

Registration Opens for CSER 2023

Registration is open for the 20th annual Conference on Systems Engineering Research (CSER) that will take place at Stevens Institute of Technology (Hoboken, New Jersey, USA) on 16-17 March 2023.

The theme for CSER 2023 is "*Systems Engineering Toward a Smart and Sustainable World*," emphasizing how the transdisciplinary systems engineering research community can play a pivotal role in creating smart systems and the transition toward a more sustainable society.

In conjunction with CSER 2023, INCOSE will host the Systems Engineering and Architecting Doctoral Student Network (SEANET) 2023 Workshop on 15 March. The purpose of SEANET is to advance systems engineering research by providing a collegial support network, research resources, and contacts that will enable the completion of doctoral dissertations related to systems engineering. The INCOSE SEANET invites current and soon-to-be doctoral students to participate in this one-day workshop. Students will also have the option to exhibit a research poster. All SEANET participants must register through the CSER site to be included in the workshops.

Learn more about CSER 2023. Register here.

Call for Papers: Energy & Mobility Technology, Systems, and Value Chain Conference & Expo

The Society for Automotive Engineers (SAE International), NASA and INCOSE are partnering to launch a new four-day event in 2023, the Energy & Mobility Technology, Systems, and Value Chain Conference & Expo. This conference will take place in Cleveland, Ohio, USA on 12-15 September 2023.

The conference will gather professionals from global energy and mobility technical and business communities (including energy and infrastructure, aviation and space, autonomous control, automotive and commercial vehicles) to facilitate information sharing, technology transfer, conversations on key questions, cross-industry collaboration, and synergistic approaches. These experts will support the advancement of energy and mobility sectors with modern technologies and configurations today and facilitate their successful future convergence.

The conference co-chairs have issued a Call for Papers and Presentations inviting engineers, engineering/project/program managers, academics, researchers, scientists, executives, and other high-tech professionals, as well as business planners and strategy executives to participate in the Energy & Mobility program by publishing a technical or business-oriented paper, presenting at the conference, or both.
Topics of interest include:

- Energy (Electrical, Microgrid, Storage, Sustainable Fuels, Hydrogen)
- Mobility (Aviation, Automotive, Commercial Vehicles, Charging)
- Space Systems & Technology, Power & Propulsion, Tech Transfer
- Transportation Electrification, Infrastructure & Resilience
- Autonomy & Advanced Control
- Drones & Airborne Systems
- Systems Integration, Security, Model-based SE
- Business Value Chain / Supply Chain

Important deadlines:

- Abstracts due: 21 February
- Review-ready manuscripts due: 4 April
- Revised manuscripts due: 6 June
- Final content due: 5 July

Submit abstracts here.
Learn more about the Energy & Mobility conference here.

Registration and Keynotes for IISE Annual Conference and Expo

The Institute of Industrial and Systems Engineers (IISE) has opened early registration for the IISE Annual Conference and Expo 2023 to be held in-person in New Orleans, Louisiana, USA on 20-23 May. Significant cost savings through early registration is available through 31 March.

The conference seeks to integrate research and applications of industrial and systems engineering in single event. Tracks include, but are not limited to:

Construction Engineering and Management
Data Analytics and Information Systems (DAIS)
Energy Systems
Engineering Economy
Engineering Education
Engineering Management
Facilities Design & Planning
Health Systems
Human Factors and Ergonomics
IAB/Young Professionals
Lean & Six Sigma
Logistics & Supply Chain
Manufacturing & Design
Modeling & Simulation
Operations Research
Quality Control & Reliability Engineering (QCRE)
Sustainable Development
Systems Engineering
Work Systems & Services

Reflecting diverse, global viewpoints, the scheduled keynote speakers for the conference include:

- Ricardo (Rick) J. Echevarria: Vice President and General Manager of Security Sales, Intel Corp.
- Cassandra Sotos: Entrepreneur, Co-Owner and CEO, AmpRx, Violinist and Recording Artist
- Jionghua (Judy) Jin: Professor, Department of Industrial and Operations Engineering and Director, Manufacturing Program, University of Michigan

Learn more. Register here. Join IISE.

Call for Papers: International Conference on Industrial Engineering, Systems Engineering, and Engineering Management (ISEM 2023)

The Southern African Institute for Industrial Engineering (SAIIE) and INCOSE are hosting the International Conference on Industrial Engineering, Systems Engineering, and Engineering Management (ISEM 2023) in October 2023. This conference will take place at a TBD location in South Africa's Western Cape.

Using a puzzle metaphor, the conference sponsors "*encourage academia and industry, the puzzlers and puzzled - everyone who is enthusiastic about sharing and learning - to contribute to the conference with a full paper or presentation only track*."

Abstracts on the full paper track will require the submission of an abstract that will, if accepted, be followed by the submission of a full paper subject to a peer-review process. Papers that pass the peer review process will be published in the conference proceedings.

Abstracts on the presentation-only track will require only the submission of an abstract.

Important deadlines:

- Abstracts (150 word limit) for full paper submission track: 24 February
- Full paper deadline: 12 June
- Final camera-ready papers: 21 August
- Abstracts for presentation-only track: 14 August

Submit abstracts via EasyChair. Download the Call for Papers.

For more information, email: conference@saiie.co.za

Webinar: Digital Twin Supported Trustworthiness of Complex Systems in Dynamic Environments

On 11 January 2023 the Digital Twin Consortium (DTC) hosted a webinar titled "*Digital Twin Supported Trustworthiness of Complex Systems - Dynamic Environments*". Presenters for the webinar were Dr. Detlev Richter, Vice President, and Michael Pfeifer, Smart Safety Lead Architect of TÜV SÜD.

Webinar Summary:

Digital twins are an essential part of digital transformation, which promises cleaner, smarter, and more efficient technology solutions across industries. However, in order to satisfy all stakeholders - technical, business, and regulatory - digital twins need to operate securely and safely with an understandable and interoperable model for maintaining security and safety assurance.

The Digital Twin Consortium Capabilities and Technology Working Group recently published a white paper to address these concerns: Assuring Trustworthiness in Dynamic Systems Using Digital Twins and Trust Vectors. This webinar brought together authors of that paper who introduced the digital twin concept with communication and trust vectors as the foundation for system-of-system trustworthiness and applied the principles of the whitepaper to smart manufacturing – with a focus on adding business value through reliable and resilient operations including:

- the role of the trust vector and the corresponding maturity model for each dimension.
- digital twin and symbolic AI (agents) to overcome fundamental problems of complex systems like incompleteness and ambiguity

The presenters also gave an overview of the DTC trustworthiness working group goals, including data security based on zero trust and qualification of virtual models to ensure safety and security.

View the webinar video.
Download the presentation.

Learn more about the Digital Twin Consortium here.
View DTC membership information.

FEATURE ARTICLE

Smart City Systems Engineering History Lessons

by Jon W. Mooney, PE

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The week of July 15-20, 2023, INCOSE's International Symposium will be in Honolulu; the city which upon completion of its HILANS networking project in 1986 was described in newspapers as the world's first smart city. During the symposium, members of the Smart Cities Initiative (SCI) will lead discussions on the application of systems engineering in smart city planning and operations. Specifically, these round tables will focus on what each of the smart city stakeholders expect from the systems engineer, and subsequently what tools and techniques INCOSE's SCI group should develop to help the systems engineer fulfill those expectations. Since this type of operational analysis requires a broader-than-normal viewpoint, one in which the systems engineer is actually part of the system of interest, case studies taken from history are useful to demonstrate the dynamics of a smart city project. Those of you who would like to join the discussions can get a jump start with the following six lessons from history.

History Lesson #1: There is no universally accepted definition of "smart city." What does each stakeholder think a smart city is and what do they think it can do?

In 1943, Hermann Hesse published The Glass Bead Game, which I think could be called the first smart city systems engineering novel [1]. The book describes a future dystopia where the system modelers isolate themselves from daily interaction with the real world, while they rely upon it as their sole source of income. The future's systems engineers spend their lives competing with one another to model the intricate connections in the outside world. Their glass bead models become increasingly detailed and all-encompassing representations of the world, but their lack of experience in the practical motivations and operation of outside society, coupled with outside society's view of the model makers as an unnecessary drain on capital, prevents the two sides from working as a progressive team. It's not an easy novel to read, but it holds a useful warning for systems engineers not to turn into Utopian idealists of our own models while ignoring the practical exigencies of the project.

Utopianism, which is the pursuit of a perfect state, is both unrealistic and idealistic, but it has been responsible for launching city, urban planning, and social change efforts in the past. The U.S. Public Broadcasting System (PBS) has an interesting episode of "Ten that changed America" showing how town founders and planners have shaped towns, each with an underlying ideal in mind. Those ideals range from arranging homes and businesses around an orderly grid of streets, building a company town with housing for all workers, providing people with more green space, building homes on a

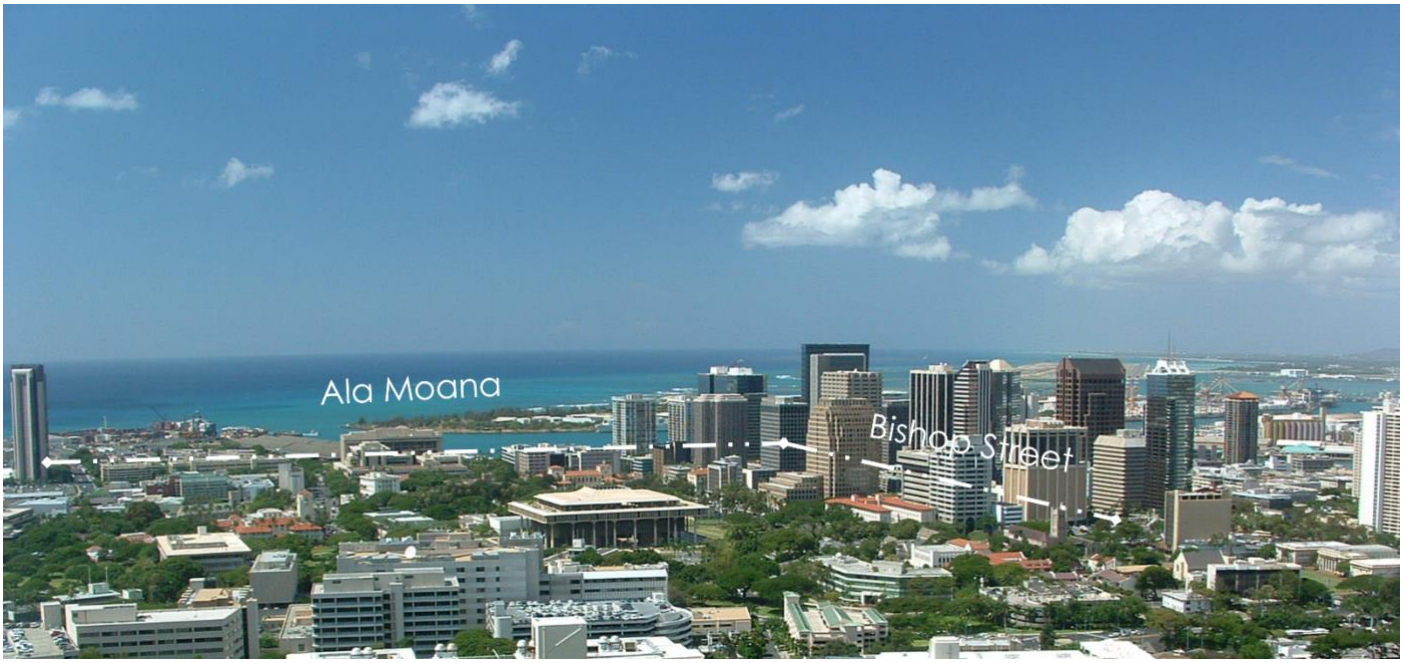
Henry Ford-type production line, tearing down old neighborhoods to build new ones, and designing the city using Jane Jacob's template for achieving diversity. The pursuit of these Utopian states has led to some educational experiments in urban planning with which the systems engineer should be familiar.

Today's ideal state is the pursuit of the smart city. When reviewing the world's current smart city models listed in History Lesson #6, notice there is no one definition of what constitutes a smart city. Most definitions include a city, distributed sensors, and centralized data processing, but the models diverge from there. By simply changing who owns the sensors and information, and who can act on that information, the character of the city can change drastically.

History Lesson #2: The smart city is promoted as the solution to serve the world's rising urban population; however, the main economic driver for smart cities to-date has been the huge economic leverage of their high-speed, long-distance communication networks. Is the smart city model consistent with the economics model?

When asking that question, it's helpful to look back at some defining events. The origins event for the "smart" movement was the deregulation of the telephone industry and the breakup of AT&T, which occurred from 1981 to 1983. This breakup removed the legal restrictions which had previously prevented architects from including telecommunication and data infrastructure as an integral part of building design. Up until this time, all telecommunication wiring and switching was owned by, and had to be installed, modified, or removed by the telephone company. Now construction drawings could include a Technology set. At that time, entrepreneur, Frank Thomas, envisioned pre-wired "smart buildings" as office buildings where small and medium sized companies could save operating costs by sharing mainframe computers, and both internal and external telecommunication services. United Technologies bought Thomas' business plan in 1983 and added building automation to the smart building mix. The first smart buildings of this type (for example City Place I in Hartford, Connecticut, and Trammell Crow Tower in Dallas, Texas) were designed and built from 1983 to 1985. Businesses were attracted by state-of-the-art telecommunications, which at that time included low-cost long distance telephone service, word processing, data transmission, electronic mail, and teleconference rooms. But it seems that building automation personified the building for its users as being smart. The same can be said for our present-day relationships with our smart, voice-activated assistants. Newspapers described the new smart buildings as anticipating our arrival to work each morning, summoning the elevators to the lobby, and turning on the air conditioning in our offices in preparation for our day. As we entered our offices, the smart building changed the security systems to daytime status and turned on the lights.

Next, Wang Laboratories engineer, William Hill imagined binding together core services in Honolulu's city center, linking smart buildings, sensors, traffic lights and other diverse electronics. [2] During the 1980's, Wang Laboratories was successfully marketing a network called WangNet that allowed the various electronic devices in a single office building to communicate with one another without regard to each device's manufacturer or operating system. Hill's vision was to run a dedicated metropolitan area network through the city to connect the individual WangNets along the route. Wang Laboratories and GTE Hawaiian Telephone partnered on the project, named HILANS, for Hawaii Local Area Network Service. HILANS broadband coax cable ran a length of 2 miles from the Hawaiian Telephone building on the north end of Bishop Street, down through the Bishop Street business corridor, and then eastward on Ala Moana to Keowee Street serving about 22 buildings along the way.



Honolulu 1986 – First Smart City

Photo taken by VideoFrog CC BY-SA, Modified here by cropping and annotation

Because real estate costs were much lower near the eastern terminus of HILANS than in the heart of the business district on Bishop, Hawaiian Telephone took advantage of this real estate savings by immediately moving its 411 Information Operators out of its headquarters building on Bishop Street and into a facility 2 miles away on Ala Moana Blvd.

This feasibility project pushed the limits, which at that time were only 2 GHz bandwidth and 2.2-mile distance for copper broadband coax. But even in this world's first small city project, the huge economic leverage on real estate costs that high-speed, long-distance communication provided, is seen to be the main economic driver for the project.

History Lesson #3: Instead of creating more efficient ways to move, interact and serve a growing downtown workforce, the economic leveraging of quick telecommunications has reduced the need to have a large downtown presence. Are the goals and acceptable solutions of the smart city model self-consistent?

After Honolulu, cities throughout the world announced initiatives to create smart cities and teleports to attract international businesses. Teleports were those cities with network cables which ran to large satellite dish farms to connect with geosynchronous satellites. Innovations in the last 35 years; satellite dish farms, fiber optic cables, packet networking, Ethernet, RF digital data streaming, cell networks, smart phones, satellite networks, and quantum internet have been primarily focused on providing the economic leverages associated with faster communication speed and remote working distances.

Telecommunications speed has been the primary economic driver for the improvements in the digital infrastructure used by smart cities. High-speed, long-distance communications has made remote work a profitable business model, which effectively blurs the smart city's boundaries.

Instead of creating more efficient ways to move, interact, and serve a growing downtown workforce, the economic leveraging of quick telecommunications has reduced the need to even have a large downtown workforce. The quick adoption of Work-from-home has demonstrated how far this could go. I asked the world's first smart city engineer, William Hill, what the future smart city might look like. He pointed to the Mauna Kea observatories as a model for the next generation of smart city. Here, astronomers from all over the globe remotely connect to the mountaintop observatories to direct the

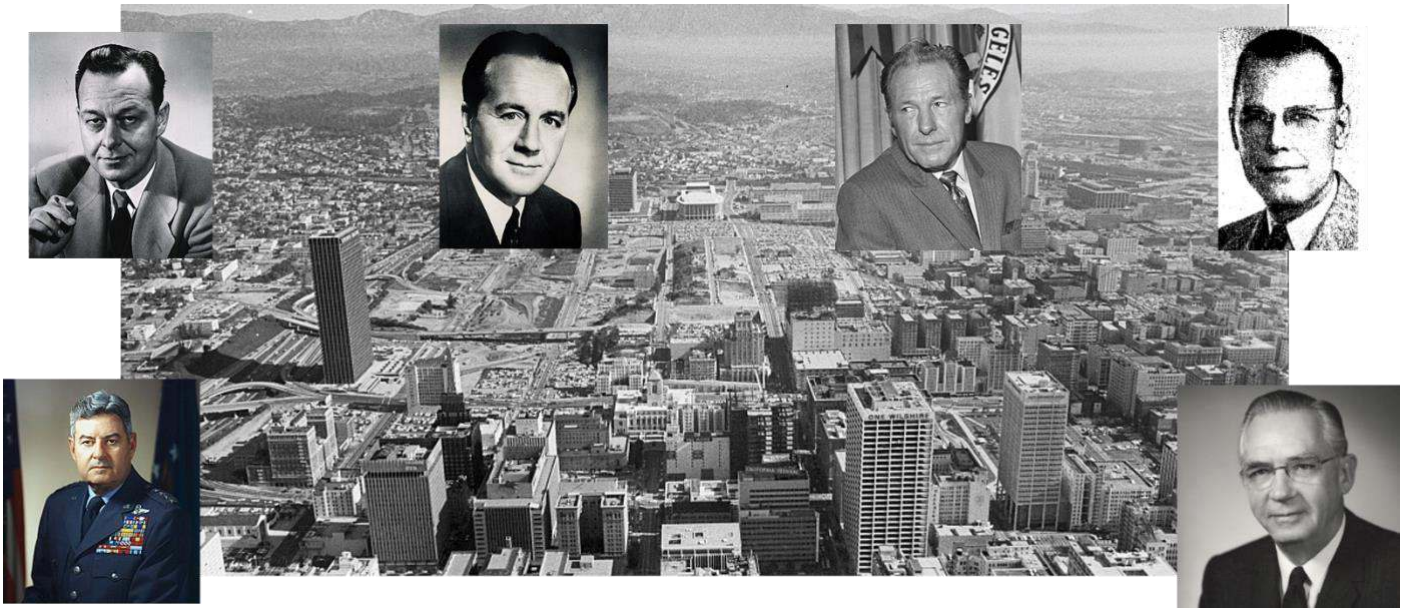
telescopes and carry out their work, while those miniature smart city complexes are manned only by a very small maintenance and support crew.

Mauna Kea Observatories – The Future of Smart Cities?

Photo by CucombreLibre CC BY-ND

History Lesson #4: Systems engineering solutions continually question the status quo, but they also require continuity in funding to achieve long term changes. Is there broad inter-agency, executive, legislative and bipartisan support and financial commitment for the smart city effort?

Although the application of systems engineering to City planning and administration seems like a new idea, it was first performed by Douglas Aircraft engineer, Dr. Edward Erath, for the City of Los Angeles in 1967. Between 1967 and 1973, Dr Erath's non-profit systems engineering company successfully developed solutions for LA's police department communications, crime data processing, city sanitation, management planning, and job development issues. [3, 6]



Los Angeles 1967 – First Systems-Engineered City

On the company board were some powerful names including General Curtis LeMay and University of Southern California president Dr. Norman Topping. President of Firestone Tire & Rubber, Leonard Firestone, was also on the board, along with Los Angeles mayor Sam Yorty. LA council member L E Timberlake and president of the powerful Merchants and Manufacturers Association, Chad McClellan rounded out the influential board. Although it was a technical success and had a powerful board, the company's investors had very close political ties to the city's mayor. As that mayor's popularity began to fall, and after he was defeated in 1973, company funding and all opportunities to work with the city simply disappeared. The company closed down shortly after. Unfortunately for us SE historians, Dr Erath's extensive files covering his civil systems engineering projects were lost during a clean-up at the university where they were housed.

History Lesson #5: Systems engineers are generally eager to solve the connectivity, control, interdisciplinary design, big picture viewpoint, and organic behavior engineering problems posed by the smart city project. But does the systems engineering model capture the underlying purpose of the project?

The use of the phrase 'systems engineering' generates both positive and negative responses from stakeholders, depending on its context. Systems engineering applied to solve complex engineering projects is viewed as state-of-the-art while systems engineering applied to social systems can stir very negative connotations. 'Systems engineering' is generally understood to include connectivity, control, interdisciplinary design, big picture viewpoints, organic behavior, and optimization engineering tasks according to an underlying purpose. While the first five of these ideas are engineering tasks, the underlying purpose of a system depends on whom the system is being designed for, their primary aims, and the approach used in the design and implementation of the system.

Toronto's Quayside project demonstrates the need for open and general agreement on the underlying purpose and extent of the smart city project among the stakeholders. [7] When the announcement was made in the fall of 2017 of Toronto's partnership with Google's Sidewalk Labs to develop the Quayside port into a smart city, the New York Times was already reporting on privacy concerns. Even though Sidewalk Labs worked with several advisory boards, proposed third party data repositories, and conducted a series of public lectures and engagement forums, opposition to the project grew. By the end of 2018, the digital strategy advisory panel warned that the project was moving too fast, and by February 2019, a petition was begun to halt the project. Sidewalk Labs withdrew from the project in 2020, due to economic uncertainties connected with the pandemic. In 2021, Toronto launched a new Quayside design competition, replacing its focus on smart technologies with less controversial calls for community development, inclusivity features and infrastructure resilience.

History Lesson #6: Systems engineering methods are generally one of four types, each with its own unique strengths and limitations. Have the limitations of the smart city method been determined?

Since we can either produce steppingstones or stumbling blocks depending on our talent, resources, and tools, we need to at least be familiar with our tools. As defined by Robert Boguslaw, systems design approaches can be divided into four categories: Formalist, Heuristic, Operating Unit, or Ad Hoc. Existing smart city models follow one or more of these approaches, each having its own unique strengths and limitations. [4]

Formalist

The Formalist approach includes 1) linear programming models, 2) game theory models, 3) rigorously rational models, 4) ritual models, and 5) recondite models. What are their limitations? Linear models are typically too simplistic to be useful in accurately predicting socioeconomic systems. Game theory

is generally limited to single play decisions, and not easily applied when trying to determine complex courses of action. Rigorously rational models are limited by the accuracy of their rigid, underlying assumptions. Ritual models are analogies that are purposefully selected to favor a preconceived conclusion and to disfavor opposing views. Recondite models are those that do not understand nor include all relevant parameters and therefore base their conclusions on incomplete information.

The smart city model adopted by INCOSE's Smart Cities Initiative group can be classified as a rigorously rational model. It is a Plan Do Check Act type system which assumes that all system relevant elements of the city are observable, controllable, predictable and are included within the model. Given the obvious limitations of these assumptions, it is still useful as a common reference point for city leaders and systems engineers to study the operations of the city.

Heuristic

The Heuristic approach produces systems with a degree of artificial intelligence; typically including a set of rules for perfecting the system's response to sets of inputs, and system states. The heuristic system may also include programming that allows it to learn from experience, improving future response. The basic limitation with the heuristic approach in designing social systems is in trying to give the system a human set of values with which it can decide the goodness or badness of a ruled response.

Several of the world's existing smart city models are Heuristic in design.

Although it's not a smart city model but rather a sustainability template, I include the Natural Step framework here as a good example of a very simple, almost universally applicable, Heuristic system, which has only 4 guiding rules for making decisions. [5] For the past 30 years, it has been used successfully around the globe to nudge cities, towns, and businesses towards sustainable practices.

The United States Army Engineer Research and Development Center (ERDC) uses its Virtual Testbed for Installation Mission Effectiveness (VTIME) model with the goal of enabling real-time situational awareness for strategic and tactical decision-making.

Heuristic, "big data" models include France's Renne Metropole which uses Dassault System's 3DExperienCity platform to combine various data streams into a digital model of the city.

Almost 2 decades ago, IBM Watson Research Center began partnering with selected small cities to beta test their "Smarter Planet" series of big data solutions. These beta cities continue to be working prototypes available for close study of working smart solutions.

Operating Unit

The Operating Unit approach is the use of optimal control theory to design a social system. However, instead of people being included as "man-in-the-loop" as is typically done, they are instead modeled as observable and controllable system components. Depending on the level of observation and control needed, this may simply require human resource management and behavioral economics elements. If total observation and control is needed, then dystopias result, such as those described by B.F. Skinner in Walden Two and George Orwell in 1984. Individuals are continually monitored, and their free will is controlled with behavioral modification techniques or brute force to serve a central control plan.

The American Civil Liberties Union (ACLU) obviously had the avoidance of the Operating Unit approach in mind when they developed the Community Control Over Police Surveillance (CCOPS) Guiding Principles. [8] These principles are being used by communities throughout the United States to develop anti-surveillance legislation. No matter what modeling method is used, projects and stakeholders should check that they comply with local CCOPS laws.

Ad Hoc

The Ad Hoc approach continually compares the present state of a social system to that of an idealized concept. Comparison with an idealized concept can be useful in planning for changes but it should be understood that the ideal state may never be realistically obtainable. Control responses of the system to approach the ideal state should be rational but should also be scrutinized and tempered with realistic and compassionate human oversight.

Several existing smart city models take this approach.

Deloitte's Smart city Framework and Maturity Model was introduced in 2015. The purpose of the Deloitte model is to provide a standard model template from which a figure of merit for the city can be calculated. The figure of merit is designed to determine how prepared the city is to benefit from future technologies while avoiding the associated challenges.

The International Electrotechnical Committee (IEC) recently released its Smart Cities Reference Architecture (SCRA) as the proposed International Standard architectural description of smart cities. An underlying purpose appears to be the efficient creation of smart cities of any size.

Various private networks of service providers such as the Smart Cities Council have developed their own models of the ideal smart city which they use to benchmark their clients.

The United States Department of Homeland Security (DHS) and Open Geospatial Consortium (OGC) have developed the Smart City Interoperability Reference Architecture. This is a set of standard deployment guides, reusable design patterns and other resources for cities to plan, acquire and implement secure smart city information technology systems and networks.

Limitations of Models

A primary danger when using systems engineering models in the design and administration of social systems like smart cities is their misinterpretation by stakeholders. Since the real city is complex, the understanding of its operation is extremely limited, for the systems engineer and the other stakeholders. Since the model has no concept of its limitations, it will continue to supply "expert" guidance according to its programming. If decision makers rely heavily on the model, without knowing the extent and level of its limitations, then the model will in-effect be a recondite and ritual model. The resulting decisions will be made without an understanding of possible unintended effects. The recondite model is selectively blind; and is also biased according to who programmed the model and for what purpose.

Systems engineering methods and models require a systems engineer to both construct and interpret them for the other stakeholders.

Next Steps

In preparation for the upcoming INCOSE IS 2023 (July 15-20, 2023) smart city round tables, a quick study of smart city systems engineering projects of the past is useful in demonstrating the dynamics of the overall smart city project. Each stakeholder has different motivations which the SE must consider when trying to coordinate and optimize the system. The IS 2023 round tables will expand on these stories to help determine each stakeholder's expectations of the systems engineer, and the tools needed by the SE to fulfill those expectations.

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About the Author

Jon Mooney started his career as an aerospace engineer working on spaceflight and defense industry programs. His work includes design and analysis of systems for SkyLab, Space Shuttle, Patriot missile and anti-submarine sonar systems. Working within the built environment sector starting in 1993, Jon has served as the acoustics/vibration consultant on nearly 1000 projects throughout the world.

Jon is an active member of the Institute of Noise Control Engineers (INCE), Acoustical Society of America (ASA), International Council on Systems Engineering (INCOSE), and American Institute of Aeronautics and Astronautics (AIAA). He serves as architectural acoustics editor for both the Noise Control Engineering Journal and Walls & Ceilings magazine. He also frequently writes book reviews for several publications.

Jon's current passion is to grow systems engineering concepts within the built environment sector.

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Science is about knowing; engineering is about doing.

Henry Petroski

SYSTEMS ENGINEERING RESOURCES

Useful artifacts to improve your SE effectiveness

System Dynamics: New Mini-Courses on the Jay Forrester Seminar Series

The System Dynamics Society (SDS) has transformed the Jay Forrester Seminar Series into an online, on-demand course. The original seminar series was conducted by Professor Jay Forrester, the founder of the System Dynamics field, in the fall of 1999 for his Ph.D. students at MIT Sloan School of Management. The SDS has transformed the series into a course, revising the course structure to be self-led and self-paced without guidance from an instructor. The full course consists of 11 mini-courses. An original set of three mini-courses were released in March 2022:

- *What is System Dynamics? (free)*
- *World Dynamics*
- *Corporate Growth*

Three additional mini-courses were released in December 2022.

- *Group Model Building: Professor George Richardson discusses the purpose of Group Model Building, System Dynamics model building stages, and various group roles in the process. (free)*
- *Nonlinearity: Forrester uses the Superposition Theorem to explain the mathematical difference between linearity and nonlinearity and ground future discussion about the limited applicability of linear equations in System Dynamics.*
- *Theory Underlying Modeling: Forrester categorizes the various System Dynamics concepts into four general types of System Dynamics theories or principles - Structural, Methodological, Behavioral, and Principles of Good Modeling.*

Additional courses in development include:

- Confidence in Models
- The National Model
- Ethics in Modeling
- Management Education
- Future of System Dynamics

Mini-courses are free for SDS members and $25 for non-members. The *What is System Dynamics* and *Group Model Building* courses are free for everyone.

The mini-courses are delivered via the Thinkific platform and include videos, transcripts, readings, quizzes and discussion features. All the required reading materials are included with the course. Upon course completion, a certificate of completion will be granted to participants who pass all the quizzes and discussions with a 100% score. Access expires after 6 months.

Learn more and register for mini-courses here.

Join the Society and gain free access to the Jay Forrester Seminar Series.

NIST: Engineering Trustworthy Secure Systems

In November 2022, the U.S. National Institute of Standards and Technology (NIST) published its first revision of "*Engineering Trustworthy Secure Systems*". This publication, NIST SP 800-160v1r1, supersedes the March 2018 release. According to co-author Mark Winstead (per 24 December INCOSE Yammer feed):

Ron Ross, Michael McEvilley, and I revised (including some major rewrites) to drive it to be even more about systems engineering than the original. Early on, we discovered we were on a path very parallel to the security in the Future of Systems Engineering efforts of INCOSE. Gave us some great opportunities to quote some of that work.

Abstract:
This publication describes a basis for establishing principles, concepts, activities, and tasks for engineering trustworthy secure systems. Such principles, concepts, activities, and tasks can be effectively applied within *systems engineering* efforts to foster a common mindset to deliver security for any system, regardless of the system's purpose, type, scope, size, complexity, or the stage of its system life cycle. The intent of this publication is to *advance systems engineering* in developing trustworthy systems for contested operational environments (generally referred to as systems security engineering) and to serve as a basis for developing educational and training programs, professional certifications, and other assessment criteria.

Changes highlighted in this revision include:

- Provides a renewed focus on the design principles and concepts for engineering trustworthy secure systems, distributing the content across several redesigned initial chapters.
- Relocates the detailed system life cycle processes and security considerations to separate appendices for ease of use.
- Streamlines the design principles for trustworthy secure systems by eliminating two previous design principle categories.
- Includes a new introduction to the system life cycle processes and describes key relationships among those processes.
- Clarifies key *systems engineering* and systems security engineering terminology.
- Simplifies the structure of the system life cycle processes, activities, tasks, and references.
- Provides additional references to international standards and technical guidance to better support the security aspects of the *systems engineering* process.

Download Engineering Trustworthy Secure Systems

NAFEMS: Unlocking the Potential of Simulation and Modelling in your Organization

NAFEMS, the International Association for the Engineering Modelling, Analysis and Simulation community, has made available an informative webinar titled "*Unlocking the Potential of Simulation and Modelling in your Organization*" that was originally delivered in September 2022. Presenter, Andy Richardson, is a Chartered Engineer and Fellow of the Institution of Mechanical Engineers. Richardson is founder and Director of PHRONESIM, providing Engineering Simulation Strategy Solutions and helping businesses maximize the effectiveness, efficiency and robustness of their modelling and simulation capabilities.

Abstract:
Modelling & Simulation is a critical function in today's businesses, enabling the development and delivery of products, capabilities, and services. Whether you are creating the latest planes, trains, automobiles, wind turbines, nuclear reactors, or medical devices, Modelling & Simulation (M&S) will be at the heart of the process, providing critical capability in research, development, design, manufacturing, delivery, and servicing of products.

Indeed, the teams of engineers and analysts diligently and expertly using simulation to refine and optimize designs are the unsung heroes of their organizations.

To get the most out of your modelling and simulation, your organization needs to understand its goals, assess its current position, and implement a strategy that addresses all the elements of its Modelling and Simulation capability to fully unlock the undoubted potential.

Read the NAFEMS blog post on this topic. Subscribe to the NAFEMS blog here.

View the hour-long webinar here.
Sign up for the full NAFEMS e-learning course on this topic with upcoming sessions on 7 February or 14 February.

Course: How to Effectively Communicate Innovative Ideas

The NAFEMS modeling, simulation and analysis community is hosting a four-session e-learning course on 13-16 February titled "*How to Effectively Communicate Innovative Ideas*".

The course offers guidance on what you need to get to the point and help people make decisions even when dealing with complex topics. The course is designed to answer questions such as:

- How do I make sure management understand my results?
- How can I present technical information to non-technical colleagues?
- How do I make my conference presentation stand-out?

The course is comprised of four two-hour sessions:

- So What?: Why should they care? We need to work on making sure this is valuable for your audience.
- Your Point of View: What is your point of view? How can we put this into context and help our audience have the right perception?
- Sense of Urgency & Proof Points: We need to prove to them that it is for real. Some proof is better than others. Let's decide what is the best proof for your situation.
- Bring it All Together: What's the recommended order of the Ingredients of Persuasion? What if you have multiple topics?

Attendees may participate in live sessions with the option to view recordings at their convenience.

Learn more and register here.

INCOSE Systems Exchange Cafés
By Bruce Lerner, INCOSE member since 1997

The INCOSE Systems Exchange Cafés were initiated in June 2020 to offer a bi-weekly opportunity for people interested in topics related to our adjacent Systems Engineering to 'stop by' and suggest

a topic, contribute to a discussion, or just listen in. The Cafés typically do address Systems specific topics, but organization and development processes have been discussed. The Cafés are open to everyone which provides some insight to systems engineering for students and professionals outside of the INCOSE community. There are three Cafés allowing for individuals around the world to access a morning, evening or late-night session with meeting time based in Japan at 9 am (Fir), US Pacific at 11 am (Maple) or UK at 8 am (Oak).

I'm Bruce Lerner and currently host the Fir Tree Café. I inherited the slot in 2021 from an original host after offering myself up as a guest host. Interacting with other system engineers from around the world and across large and small projects and companies is both eye-opening and invigorating. I continually find examples of our need to tailor the use of systems engineering processes to the project, company and personalities involved.

The Café hosts typically come prepared with a topic previously suggested by participants but depending on the attendees this topic can be replaced or superseded as the conversation suggests. Examples of our past topics:

- How do we communicate across disciplines? Etiquette in communicating in cross-functional teams?
- How can systems experience be passed on to successor projects?
- Systems Engineer or Systems Engineering?
- Moving from SE Concept to SE execution
- How are the formal Systems Engineering principles that are described in the SEBoK being applied in your work?
- How do we pick what to focus on in SE?

As we return from our solstice break the Cafés will be setting proposed topics for the upcoming season so participants can preview the initial topic for a session, and we will be sending reminders (which can be opted-out).

The Cafés are open to both INCOSE members and non-members and you can register at Systems Exchange Cafés and also interact with both members and non-members on linkedin.com:

- Oak Café LinkedIn Group
- Maple Café LinkedIn Group
- Fir Café LinkedIn Group

Please drop by, participate, help out, or just listen.

Videos for UAF Tool Vendor Roadshow

On 7 December 2022, the Fourth Quarter Technical Committee Meeting of the Object Management Group (OMG) included a Unified Architecture Framework (UAF) Tool Vendor Roadshow. OMG has posted recordings of vendor software overviews and demonstrations for UAF-enabled tools including:

Dassault Systèmes - SoS Architect
This webinar provides a review of the enterprise architecture capabilities in the Dassault Systèmes', CATIA Magic, System of Systems Architect (also known as Cameo Enterprise Architecture (CEA)): the implementation of the UAF v1.2 standard in the modeling environment, including a demonstration of the new concepts and views / viewpoints in the latest version, and collaboration support for multiple

user access and model management using DataHub.

Intercax Syndeia

In this webinar, Intercax introduces Syndeia, the digital thread platform for model-based engineering, and then illustrates how it can be used to integrate system-of-systems architecture represented as UAF models with digital engineering artifacts in multiple enterprise domains (e.g., requirements and acquisition management, hardware design and manufacturing, software development and deployment, project and program management, and cybersecurity). The demonstration covers multiple facets of digital threads with UAF models, such as traceability queries, analytics, visualization, reporting, APIs, data science, and enterprise automation. See how digital threads can provide a significantly higher RoI for your UAF-based architecture models.

Sparx Enterprise Architect

This webinar provides a walkthrough on how the Sparx platform supports enterprise architecture and systems engineering initiatives using the OMG Systems Modeling Language (SysML) and the Unified Architecture Framework (UAF). The speakers demonstrate how Sparx Enterprise Architect is used to create UAF compliant models and various types of architecture views, while Sparx Pro Cloud Server is demonstrated to show how data from other providers such as Jama, Polarion, and Jira, can be integrated into UAF models. Lastly, Sparx Prolaborate is demonstrated to show how the web portal is used to provide a modern collaboration platform for executive and decision-making stakeholders to interact with architecture models and BI/analytic views, perform online impact analysis, and manage architecture and design reviews.

UNICOM System Architect

In this webinar, the presenter addresses how to gain value from an architecture built with UAF in UNICOM's System Architect – capturing sources of record, auto-visualizing UAF views, asking the architecture questions by building reports on the fly, and communicating the architecture to a wide audience via web publishing and personalized dashboards.

View all demonstration videos on BrightTALK.
Learn more about UAF. Join the UAF LinkedIn Group.
Learn more about OMG.

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Regard the engineering system as having the same criticality as that of the system being engineered.

Robert Halligan

FINAL THOUGHTS FROM SYENNA

Hi readers,

I hope you enjoyed a relaxing festive break regardless of whether you celebrate Christmas or the western New Year. If you are anything like me, the onslaught of emails awaiting my arrival at the start of the year was enough to send me back to 2022. Now that things have settled down a bit, I thought it would be good to focus my energy on principles and approaches to help me work smarter and not harder in 2023. Here are the five principles that I plan to follow as I embark on trying to make progress in the midst of chaos in my inbox and my to-do list.

1. Done is better than perfect

   How many times do we spend hours procrastinating and dreading a task instead of just getting on with the first rough draft? Sometimes we place so much pressure on ourselves to produce a perfect final version the first time when the best thing we can do is get the first draft out of the way as soon as possible. This is a strategy used by many authors to get on with writing the book, sometimes writing the first draft of that proposal or important email in a stream-of-consciousness setting and then reviewing the piece two to three times is the best way to tackle what may seem like an impossible task. In this way seeking progress over perfectionism is the key to tackling those gargantuan tasks.

2. Pareto Principle

   We all seem to have never-ending to-do lists and who does not enjoy the feeling of clearing off things on that list however how many of those tasks are actually contributing to value to your workday? What is THE most important thing that you can focus on at this time? What if we allocated our time so that we spend 80% dedicated to the 20% of things on our to-do list that are yielding 80% of the value. It is less about the actual numbers in proportioning time versus value and more about taking on the mind-set of trying to figure out at any point in time what may contribute to bringing about the most value. A good way to assess this is by understanding what is urgent versus what is important and what is neither urgent nor important etc, see figure 1 illustrating the Eisenhower Matrix.

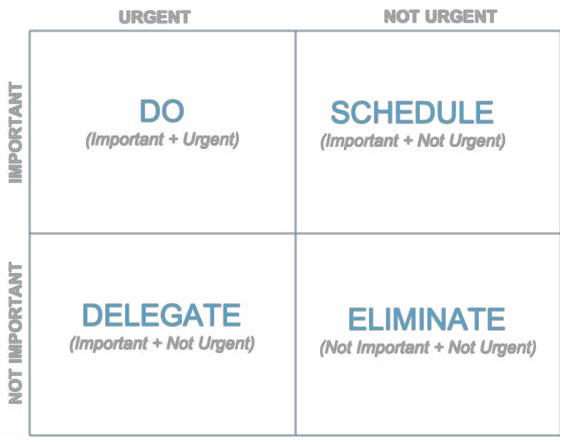

Figure 1. The Eisenhower Matrix (urgent versus important) from Productfolio.com

3. The myth of multi-tasking

   One of the biggest threats to productivity is the myth that humans are capable of focusing their attention on multiple things at one time. Even though we can simultaneously walk and talk, we are not capable of focusing on doing two things at once therefore we ought to move away from the philosophy of taking up more and more and ought to focus on doing less. Do few things properly rather than many things poorly. Multitasking is a sure way to do many things poorly. Doing few things well will bring about higher effectiveness and a higher quality output enabling us to achieve our goals a lot quicker. It is easy to understand this but not easy to put into practice. Ask yourself, what is the one thing you can get done today that will propel you to getting the next thing done tomorrow?

4. Do as Einstein would do: spend most of the effort in planning/strategizing and less of the effort in doing

   We know the famous saying by Albert Einstei, 'If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and five minutes thinking about solutions.' Although not all tasks require significant strategizing we can greatly increase our effectiveness if we break up what is to be done into smaller chunks and think out a plan for achieving the most important items on our to-do list before mindlessly jumping into a task. This may seem in opposition to principle 1, 'done is better than perfect,' however they actually go hand in hand. If we spend time planning what we will do before throwing ourselves into it, it elevates the quality of the first rough draft reducing the effort required to review and revise the first draft to bring the work product up to a respectable standard.

5. Parkinson's Law

   Have you ever noticed that if you put aside an hour to get something done, you'll get it mostly done in that hour? In the same vein, if you give yourself a month to do something, somehow the task stretches to be done in that month? Parkinson's Law was observed by Cyril Northcote Parkinson in 1955 and states that 'work expands to fill the time allotted for its completion.' This is where time-blocking can be so effective. At the start of each day, dedicate the time to planning for a task, executing and reviewing the work product and observe how you manage to achieve so much more simply by setting a boundary to the amount of time you give to a task. There are excellent resources out there regarding time-blocking but essentially all you need is a calendar or diary and a clear idea of what the most important tasks are that you need to tackle and you can maximise your working time to work smarter not harder.

   If you put the above five principles in action at least most of the time, you will notice a significant increase in your productivity and the value that you bring to the team and to your organization. Apply these principles to your professional work days or to your daily habits and make 2023 your best year yet.

   Email ppisyen@ppi-int.com if you would like another five principles to help you with your productivity.

   Regards,

   Syenna