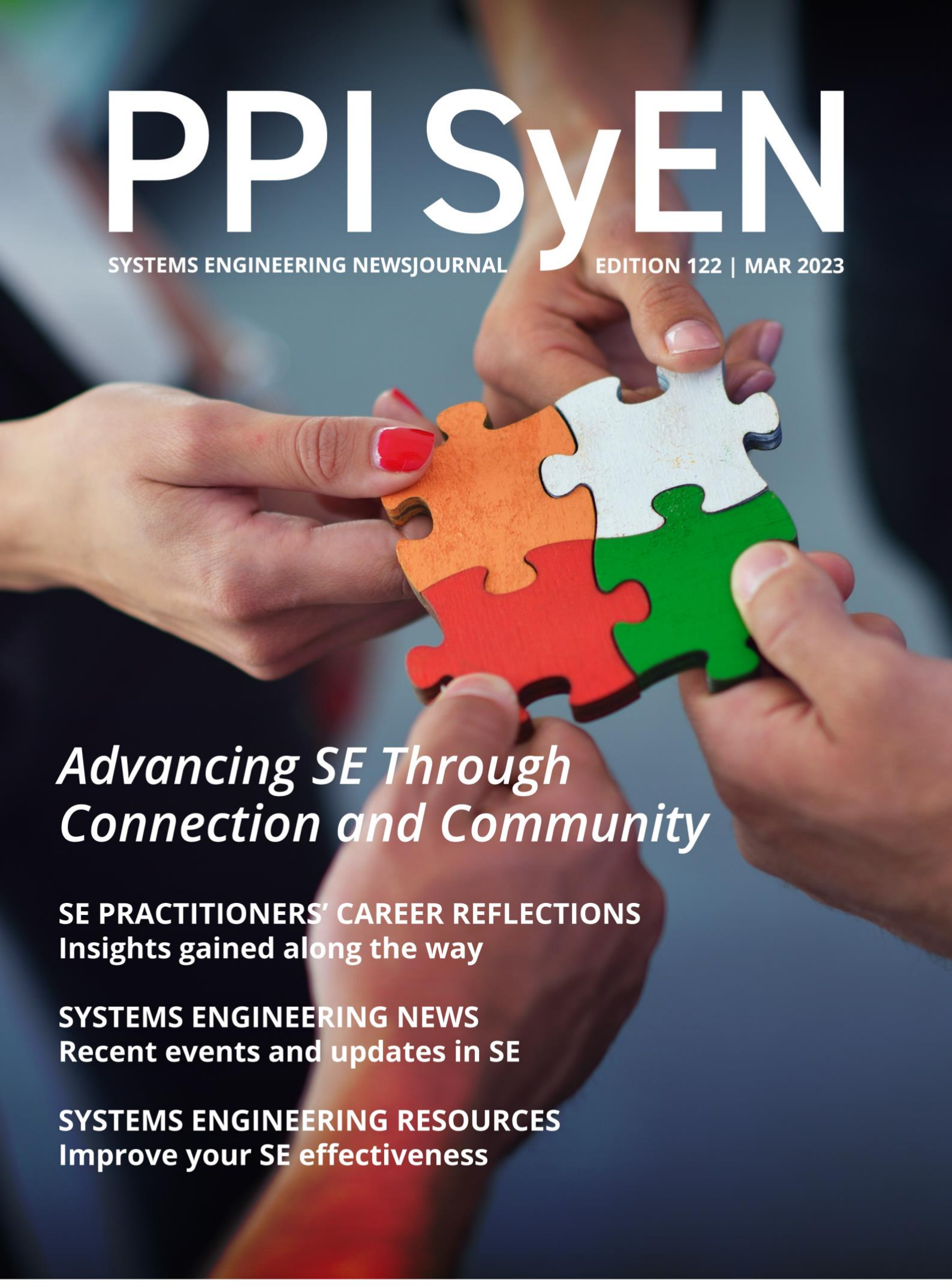
PPI SyEN

SYSTEMS ENGINEERING NEWSJOURNAL EDITION 122 | MAR 2023



Advancing SE Through Connection and Community

SE PRACTITIONERS' CAREER REFLECTIONS
Insights gained along the way

SYSTEMS ENGINEERING NEWS
Recent events and updates in SE

SYSTEMS ENGINEERING RESOURCES
Improve your SE effectiveness

A PROJECT PERFORMANCE INTERNATIONAL PUBLICATION | PPI-INT.COM

PPI SyEN

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WELCOME

Hello dear readers,

We are pleased to introduce you to PPI SyEN for March. As systems engineering evolves in an exciting direction, this 122nd edition of the PPI Systems Engineering Journal is dedicated to you, engineers and other professionals aspiring to do even better.

The theme of this edition is 'Advancing SE through community and connection'. This theme strikes a chord with me at this time, and I am sure with many of our readers. We all have strengths and substantial potential to bring to the workplace; equally, we all have professional challenges, and we have all experienced frustration or envy when we watched one of our colleagues get through a difficult task, we would otherwise find impossible or stumble through with unease.

When we can appreciate the individual strengths we bring to the table, we can have a higher appreciation for our individual skillset and look at our daily work as an opportunity to provide value and transform processes and approaches for the better of our teams. Our understanding of how important teamwork and communication are in delivering successful projects is closely related to how we learn to appreciate and respect every individual for the value they bring to the table.

In this edition, you have the chance to discover awards for thought-leaders in systems engineering and learn about upgrade your skillset via mentorship openings with INCOSE. Moreover, you can evaluate your current systems engineering proficiency and plan ahead for future development. Participating in conferences and webinars are great ways to determine areas you'd like to gain mastery in or bring attention to something that's truly meaningful to you. There are exciting in-person and virtual events that facilitate connection with kindred spirits – those of us who see value in doing the hard work up front.

In Reflections on Letters to My Younger Self, our esteemed editor, John Fitch, summarizes and synthesizes thoughts on this INCOSE publication that we hope will provoke your thinking on what led you to practice systems engineering and how being an engineer impacts your life and the lives of others.

There are several free and paid resources available to help you take your learning further. We hope that in this edition you find a piece of information that ignites you to take the next steps and advance your practice through community and connection.

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

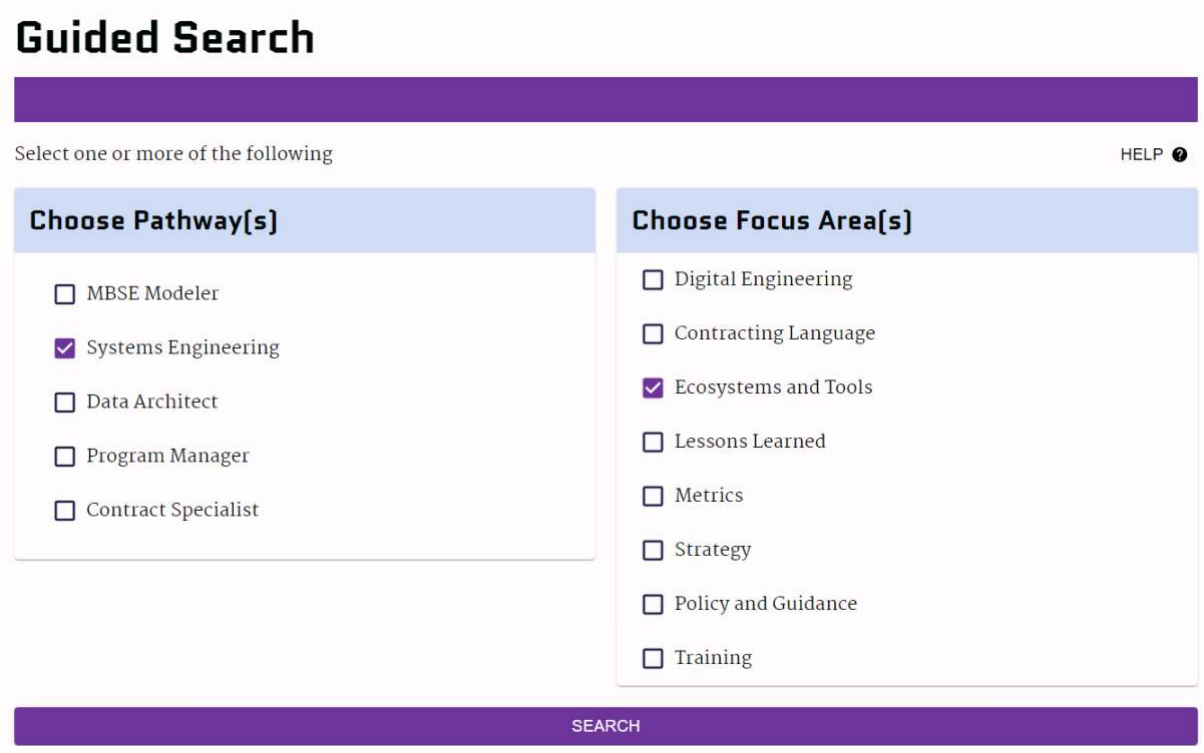
Recent events and updates in the field of systems engineering

Digital Engineering Body of Knowledge (DEBoK) is Live!

The U.S. Department of Defense (DoD) has launched the first full public version of the Digital Engineering Body of Knowledge (DEBoK). The V1.0 release is based on DoD community feedback on the BETA version that was made available in early 2022.

From the DEBoK "About" page:
"The DEBoK is intended to provide referential resources for the DoD engineering community for implementing Digital Engineering (DE) starting with Systems Engineering and expanding to specific discipline engineering domains and specialty areas. Data, Information, Knowledge, and Wisdom on Digital Engineering is stored and created in a controlled manner. Everyone working in this space contributes to the community's collective experiences and is able to quickly build their digital engineering solutions based on a common knowledge base in the DEBoK."

The DEBok is searchable based on resource popularity, keywords and the intersection (logical AND) of a structured set of "Pathways" (roles) and Focus Areas.



Search results are returned in either list or "card" view with options for additional keyword and metadata filtering to aid users in finding the most relevant topics of interest.

DEBoK also contains a glossary with definitions for over 5000 terms.

A guided tour is available to help new users navigate the DEBoK.

Explore the DEBoK here.

Dr. Azad Madni Wins National Academy of Engineering Award

The U.S. National Academy of Engineering (NAE) has announced that Dr. Azad M. Madni of the University of Southern California (USC), has been selected to receive the 2023 Bernard M. Gordon Prize for Innovation in Engineering and Technology Education. This annual award recognizes new modalities and experiments in education that develop effective engineering leaders.

Dr. Madni is being recognized for creating and disseminating a transdisciplinary systems engineering education paradigm based on entrepreneurial leadership, innovation, convergence, social awareness, and diverse thinking and backgrounds. The award notes that Dr. Madni "defined the field of transdisciplinary systems engineering and is the creator of transdisciplinary systems engineering education (TRASEE™), which fosters out-of-the-box thinking while enhancing retention and recall of concepts and facts through innovative storytelling and role-playing approaches."

Read the NAE press release.
Learn more about Dr. Azad Madni.
Investigate the NAE here.

INCOSE Natural Systems Primer Released

The INCOSE Natural Systems Working Group (NSWG) has announced the release of a new product, *Natural Systems and the Systems Engineering Process: A Primer*. This 28-page resource serves a tool for systems engineering practitioners and project managers to introduce and integrate Natural Systems thinking and approaches into their processes and products. By asking "How can Nature help me solve this problem?" engineers can leverage living and non-living systems to provide inspiration for solutions to system engineering challenges.

The Primer is intended to help readers learn:

- What natural systems are and the benefits of using them for inspiration.
- Where natural systems knowledge and tools can be used in systems engineering.
- How to use natural systems knowledge and tools.

Topics include (but are not limited to):

- What are Natural Systems?
- Using Natural Systems in Systems Engineering
- What knowledge and solutions exist in Natural Systems?
- Elevating Natural Systems knowledge in systems architecture practice
- Circular Economy
- Examples from a few thousand successful NS applications

Learn more about the Primer and its contributors here.

Download the free Natural Systems Primer.

SYSTEMS ENGINEERING NEWS

PDMA News

News highlights from the Product Development Management Association (PDMA) demonstrate the influence of PDMA among the global innovation and product development community. Here are some recent items that may be worthy of note to our SyEN readers.

- Mark Adkins has completed his term as PDMA Board Chair, the capstone to decades of service to the PDMA. He returns to work as the head of LeanMed LLC, a leader in bringing medical device technologies to underserved regions.
- Susan Penta has been elected to serve a two-year term at the PDMA Board Chair. An award-winning entrepreneur and innovator, Penta is co-founder and managing partner at MIDIOR Consulting.
- Roger Calantone of McGill University has been chosen as PDMA's latest Crawford Fellow in recognition of outstanding contributions to the discipline of new product development and management. Calantone has over 400 journal publications and proceedings with 38 publications in the Journal of Product Innovation Management (JPIM).
- The submissions portal for the 2023 Global Student Innovation Challenge is now open; deadline for submissions is 1 June 2023.
- PDMA is seeking to expand the network of curators and editors for the PDMA kHuB. Interested parties may volunteer here.
- PDMA is co-sponsoring an All Things Innovation survey to benchmark current innovation mindsets and trends. Take the survey here.

For details on these stories, access recent editions of the PDMA Connections newsletter.
Join PDMA here.

See additional PDMA items in the Conferences+ and Resources sections of this PPI SyEN edition.

Modelica Association News

Modelica is a freely available, equation-based, object-oriented language for convenient and efficient modeling of complex, multi-domain cyber-physical systems described by ordinary differential, difference and algebraic equations. The Modelica Association is a non-profit organization that develops coordinated, open access standards and open source software in the area of cyber physical systems. Current Modelica Association standards include:

- Modelica Language
- Functional Mock-up Interface (FMI)
- System Structure and Parameterization (SSP)
- Distributed Co-Simulation Protocol (DCP)
- Functional Mock-up Interface for embedded Systems (eFMI)

All the standards are accompanied by open source software to support the use of the standard, such as the Modelica Standard Library containing about 1600 Modelica model components in many domains, other open source Modelica libraries, or the FMI compliance checker to check whether a model fulfils the requirements of the FMI standard.

The Association publishes a quarterly newsletter. Here are some the highlights from the latest release.

International Modelica Conference 2023

The International Modelica Conference 2023 will take place as a face-to-face conference on 9-11 October 2023, in Aachen, Germany. The deadline for scientific paper and industrial user presentation submissions is 26 May. See Call for Papers details.

FMI 3.0 Implementers Guide

The FMI 3.0 Implementers' Guide has been released. Developed jointly by the prostep ivip Smart Systems Engineering project and the Modelica Association Project FMI, this free resource provides recommendations and guidance to implementers of the Functional Mock-up Interface (FMI) standard version 3.0.

Modelica Building Performance Simulation Working Group

On 25 January 2023, the International Building Performance Simulation Association (IBPSA) approved the formation of the IBPSA Modelica Working Group. The IBPSA Modelica Working Group will further develop the Modelica IBPSA Library and coordinate the needs of the IBPSA community with the Modelica Association and with Modelica modeling and simulation environment developers.

OpenModelica Workshop 2023

The 15th OpenModelica Annual Workshop was held in Linköping, Sweden on 6 February 2023. Workshop chairs were Lena Buffoni and Lennart Ochel. New results and applications regarding the OpenModelica platform were presented, including:

- Status and directions of OpenModelica
- Modeling and simulation of large-scale models
- Techniques for dynamic over-constrained connectors
- Power system Var compensator model
- Translator from system dynamics to Modelica
- Library for batch chemical processing
- A bolted joint model in Modelica
- Technical overview of OpenModelica status
- Generic Bi-rate Ordinary Differential Equation (ODE) solver
- Status of the new Backend
- The new OpenModelica Instance-based API
- OpenModelica applications at VTI (Swedish Road and Traffic Institute)
- Green hydrogen and model-based applications for the energy transition.

View the conference program and the presentations here.

Modelica Vendor News

Modelica vendors highlighted numerous new capabilities:

- The Open Source Modelica Consortium announces the release of OpenModelica 1.20. Notable features include automatic installation of the Modelica Standard Library (MSL) and the introduction of a new general purpose ODE solver.
- orchideo announces the availability of easySSP v1.2 with an updated UI and new features for model editing, cloud-based simulation and process documentation.
- Wolfram announces the availability of a new aircraft library for modeling aircraft dynamics.
- Modelon has released Modelon 2023.1 with support for Functional Mock-up Unit (FMU) cross-compilation to Windows, improved diagnostics and updated libraries.

View details of these and other announcements, including numerous educational resources and blogs, in the latest Modelica Association newsletter. Subscribe to the newsletter and other Modelica

messages here.

Learn more about the Modelica Association.

INCOSE Mentoring Pilot Program Accepting Mentees

The INCOSE Mentor Matching Pilot program is underway, accepting mentees, while seeking additional mentors. The pilot program is limited to INCOSE members. The pilot program is six months long, and the commitment from mentors is 1-4 hours per month with email as the primary interaction medium.

Mentors:

- Serve as a role model.
- Serve as a sounding board.
- Provide encouragement for self-guided learning.
- Give advice (upon mentee request).
- Help mentees find people, opportunities and hard-to-find information.

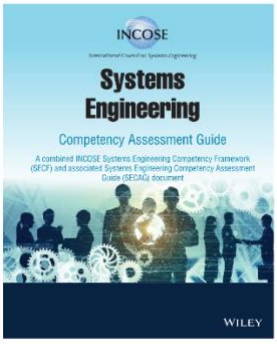
Mentees:

- Tell mentors what they want to get from the mentoring relationship.
- Formulate thoughtful questions.
- Lay out alternative courses of action with pros/cons of each.

To request matching with a mentor, log into the INCOSE website and enter your profile here. Prospective mentors should log in to INCOSE and volunteer here.

Learn more about the Mentoring Program.

Systems Engineering Competency Assessment Guide is Published



The INCOSE Competency Working Group has announced the publication of the Systems Engineering Competency Assessment Guide, published by Wiley. The Guide defines a set of 37 competency areas spanning the systems engineering discipline and provides extensive guidance on the evaluation of these competencies.

Clifford Whitcomb (Chair of the INCOSE Competency Working Group and INCOSE Fellow) has been involved with the framework and assessment guide since 2011 and is a book editor and co-author. He says "*I have researched and developed several systems engineering competency frameworks over the years. I am very impressed at how well our internationally diverse group of authors, contributors, and reviewers provided their combined expertise to create a competency assessment guide that is a unique resource for individuals and organizations to use to structure and plan the development of their systems knowledge and skills.*"

Sample topics covered in the publication include:

- Competencies described along five proficiency levels: awareness, supervised practitioner, practitioner, lead practitioner, and expert;
- Numerous relevant indicators of knowledge, skills, abilities, and professional behaviors for

each proficiency level;
- What an individual needs to know, or do, in order to be an effective Systems Engineer;
- How to leverage the book contents to develop training courses, educational curricula, position descriptions, and position performance evaluation criteria for system engineering positions.

INCOSE members receive a 25% discount when purchasing the Guide through Wiley.

New Documents Added to Systems Engineering Goldmine

PPI's Systems Engineering Goldmine (SEG) continues to expand. Documents recently added to the SEG include:

Advancing an Ontology for Systems Engineering to Allow Consistent Measurement
The purpose of this paper to advance an ontology that can support useful quantification of the desired correlations. This ontology is based on a review of current systems engineering standards, historical systems engineering activities, and data gathered on the COSYSMO and Value of Systems Engineering projects. (Source: Carnegie Mellon University Software Engineering Institute)

Application of MBSE to Oil and Gas Project / Product Management Cycle – A model-based development approach for engineering management and design
This research is based on the impacts to project development in terms of engineering and construction rework, start-up delays, start-up performance and early facility life issues that are attributable to propagation of engineering quality issues, incomplete engineering development prior to commencement of construction and other design related issues resulting in unfavourable Oil and Gas project outcomes. (Source: Massachusetts Institute of Technology)

ARIEL Design, Development, Verification and Engineering Plan
This document serves as the master guide to the proposed plans for design and development of the ARIEL Payload. The required hardware model philosophy is analysed and suggested (will be definitively defined in later issues of the document) and the impacts on the required fidelity of the delivered subsystems are examined. This document also provides the framework for the design and verification methodologies to be used by the ARIEL team throughout the project lifecycle. (Source: European Space Agency)

ASPICE 101: The Complete Guide for Automotive Development
This Ebook Guide for automotive development explains the best practices for of embedded software for vehicles such as Requirement Analysis, System Design, Architecture Design, Module Design and Coding. (Source: Jama Software)

Automotive SPICE Process Assessment Model
This Automotive SPICE Process Assessment Model contains a set of indicators to be considered when interpreting the intent of the Automotive SPICE Process Reference Model. These indicators may also be used when implementing a process improvement program following an assessment. (Source: The SPICE User Group)

Benchmarking the benefits and current maturity of digital Engineering/Model-Based SE
This material covers topics: DoD Digital Engineering Strategy, Vision, mission, and goals can be generalized to any organization and INCOSE Model-Based Enterprise Capability Matrix Benchmark for Organizational and Industry-wide DE Maturity. (Source: Systems Engineering Research Center (SERC))

Best practices for reliability assessment and verification
This technical white paper overviews the new approach to the development, production, and fielding of reliable systems. Objectives include understanding user requirements, design and redesign for reliability, producing reliable products and monitoring user reliability. (Source: ITEA Journal of Test and Evaluation)

Capability Definition Documents Guide
The purpose of this CDD Guide is to describe a process for ensuring that the scope of the project to realise or update a Capability is fully captured, properly defined and is traceable to Government direction. This process is intended to ensure that issues and requirements are not overlooked, the needs and requirements are well-understood by all parties, and the project and sustainment budgets will be sufficient to acquire and sustain the Capability being defined. If the process defined in this guide is not followed adequately, then there is increased risk that downstream problems will occur. (Source: Capability Acquisition and Sustaintainment Group)

Chapter Start-Up Guidelines
This package provides guidance, suggestions and instructions for persons interested in forming an INCOSE chapter. There are three recognized phases in the process of becoming a fully chartered chapter: pre-start-up, start-up and emerging. The following table describes a typical chapter formation process. Each phase is associated with a set of activities. A consequence of stepping through the process is an increase in the number of individual INCOSE memberships affiliated with the chapter. (Source: INCOSE – International Council of Systems Engineering)

Cost Risk Analysis 'Standards'
This analysis reviews systematic simulation-based cost risk analysis approach demonstrating how to model: CER risk (including factor relationships), Configuration (cost driver) risk, Correlation (Pearson product moment, not Spearman rank order). (Source: Tecolote Research, INC.)

Design for Reliability Handbook
This document was developed to address the appropriate mathematical and engineering practices during the materiel acquisition process for new military systems. This guide aims to address the challenges presented through the application of techniques used to understand reliability concerns at the fundamental level, develop solutions to concerns as they arise, and validate the solutions as the design matures. (Source: American National Standards Institute - Non-profit organization)

Detecting defects in software requirements specification
This research is concerned with detecting defects in software requirements specification. Motivated by both the problem of producing reliable requirements and the limitations of existing taxonomies to provide a satisfactory level of information about defects in the requirements phase, focusing on providing a better tool for requirements analysts. (Source: Alexandra Engineering Journal)

Embedded System development process reference guide
The purpose of ESPR is to be used as the reference guide for improving the current conditions of high-quality embedded software development and promoting its efficiency by defining and organizing the development processes that best suit the interests and needs of individual organizations, groups and/or projects. (Source: Information technology promotion agency (IPA) Japan inc.)

From Modularity to Emergence - A Primer on the Design and Science of Complex Systems
This Primer introduces a framework for characterising systems, focusing on characterizations that are particularly pertinent to design domains and scientific domains. The framework also defines composition and classification relationships, which form the basis for levels. Section 3 identifies three core aspects of modularity: structural encapsulation, function-structure mapping, and interfacing.

Based on these, two abstractions are introduced: function-driven encapsulation and interface compatibility. (Source: University of Cambridge)

Heuristics for Systems Engineering Cost estimation
This conference paper outlines behavioural economics, systems architecting heuristics by Rechin, categories of developing heuristics and discussion. (Source: Massachusetts Institute of Technology)

Improving processes for better services
This CMMI-SVC model provides guidance for the application of CMMI best practices by the service provider organization. Best practices in the model focus on activities for providing quality services to the customer and end users. CMMI-SVC integrates bodies of knowledge that are essential for a service provider. (Source: Software Engineering Institute)

Requirements Engineering Management Handbook
This Handbook presents a set of recommended practices on how to collect, write, validate, and organize requirements. It attempts to bring together the best ideas from several approaches, organize them into a coherent whole, and illustrate them with concrete examples that make their benefits clear. (Source: U.S. Department of Transportation Federal Aviation Administration (FAA))

Requirements Specifications - SPTR2
This document identifies the functional and administrative requirements of the RPSC SPSM IT portion of the SPTR2 project. The requirements of the system in normal and abnormal situations are elaborated. The required behavioral properties of the system are also specified. (Source: National Science Foundation)

Summary of Workshops on Integrating Systems and Software Engineering Conducted at University of Southern California on 30 October 2007
The objectives of each workshop were to: Identify the biggest issues and opportunities with respect to better integrating systems and software engineering, Identify inhibitors to progress and how to overcome them, Evaluate the ability of the Incremental Commitment Model (ICM) Principles to improve the integration of systems and software engineering, Evaluate the ability of the ICM to improve the integration of systems and software engineering and Identify what else is needed (e.g., technology/management research, education and training, regulations/specifications/standards). (Source: University of Southern California)

Training manual for Elements of Interface Definition and control
This technical manual was developed under the Office of Safety and Mission Assurance continuous training initiative. The structured information contained in this manual will enable the reader to identify and control the technical detail needed to ensure that flight system elements mate properly during assembly operations (both on the ground and in space) efficiently and effectively. (Source: NASA)

Using the Incremental Commitment Model to Integrate System Acquisition, Systems Engineering, and Software Engineering
This paper summarises trends that have caused difficulties for current systems engineering and acquisition processes, emergent requirements, rapid change, reused components, high assurance of qualities and principles underlying the ICM that better address these trends (stakeholder satisficing, incremental and evolutionary growth of system definition and stakeholder commitment). (Source: University of Southern California)

What to Expect from SySML V2?
Key SysML v2 Concepts and Innovations, Normative and informative libraries over than profiles with

stereotypes 'usage-focused Modelling Approach'. (Source: DEKonsult Advancing Digital Engineering inc.)

The SEG is a free resource, intended for use by clients, alumni and friends of Project Performance International (PPI) as well as clients, alumni and friends of subsidiary company Certification Training International (CTI). If you do not already have access to the Systems Engineering Goldmine, you may apply for free access here.

INCOSE Certification Update

Numerous CTI clients have inquired about how the SEH V5 of the INCOSE Handbook will impact INCOSE SEP Certification. This question was addressed in detail in the 160th webinar of INCOSE's series. Here is a brief summary of the key points:

- The INCOSE Systems Engineering Handbook is updated every 5-8 years to reflect the current state of the practice. This involves incorporating improved principles, processes, methods, and tools, as well as new information such as digital engineering, updated versions of the ISO/IEC/IEEE 15288 standard, and new SE challenges and visions.
- The handbook undergoes several survey, review, and update stages before its publication through Wiley (for SEHV5, this is expected to occur at the IS2023).
- The structure of the SEHV5 will change from ten chapters (1-10) to six parts (I-VI).
- The handbook will be released with a hybrid testing format, where only content common to SEHV4 and SEHV5 will be included for marks in the exam. This means that the exam will be based on overlapping learning objectives of the 4th and 5th editions and will take less time to prepare for than if taking the exam based only on either the 4th or 5th edition alone. New content will be tested via beta testing.
- The INCOSE International Workshop 2024 will introduce the rollout of the new exam, with some hybrid cases remaining where there are translations of the handbook.
- Academic equivalency transition will take place around the IS2024.
- ESEP applicants will not be affected by the handbook.
- The pattern of the question paper with one mark per minute (excluding special accommodations) and 100 marked questions per exam remains the same.

For further information on certification in the future, you may access the full webinar here:

https://www.incose.org/products-and-publications/webinars.

INCOSE Foundation Selected Focus: Foundation Member Project

The INCOSE Foundation is committed to promoting the advancement of Systems Engineering (SE) through various initiatives such as scholarships, research, and international forums. Although it is a distinct legal entity from INCOSE, the Foundation shares similar values, strategic directions, and philosophy. U.S. donors who contribute to the Foundation are eligible for a charitable deduction on their annual income tax returns, and the Foundation is working towards providing the same benefit to non-U.S. donors.

With generous contributions from the Foundation donors, the Foundation is able to recognize and honor individuals who are actively seeking solutions to intricate technical challenges throughout their educational or professional journey. This is exemplified through the INCOSE Foundation Scholarships,

which include the ISEF International Science and Engineering Fair INCOSE Award for pre-college students, the Chesapeake Chapter Award, and the Stevens Doctoral Award for Promising Research in Systems Engineering for Ph.D. candidates.

The INCOSE Foundation is currently focusing on the Foundation Member Project, which supports new members from underserved countries. You can make a donation to the Foundation by visiting the following link.

CONFERENCES, MEETINGS & WEBINARS

Prostep ivip Symposium 2023

The prostep ivip Association is an international association, in its 30th year, headquartered in Darmstadt, Germany. The association has committed itself to developing innovative approaches to solving problems and modern standards for product data management and virtual product creation.

The prostep ivip Symposium 2023 will take place in Stuttgart, Germany, on 3-4 May 2023. The theme of the symposium is "*Pioneering Digital Transformation for Sustainable Systems*". Topics addressed during this event including digital transformation, digital twins, sustainability, product development, systems engineering, and associated people/skill development needs.

Keynotes will be provided by the symposium's sponsors, Siemens and Volkswagen.

Beyond the keynotes, over forty additional presentations will be offered in multiple tracks. The range of topics covered may be seen in the sample below:

- Experts Corner - Industrial Digital Transformation for Sustainable Systems
- Software Defined Vehicles – Connecting Physical and Virtual Products
- End-to-End Digital Product Traceability
- Building Blocks for Simulation-Based Cooperation between Partners
- Analysis of SysML-based Product Development Collaborations in Cross-Company Value Creation Networks
- Graph-based Data Integration to Enhance MBSE-Centric Collaboration
- Systems Engineering – A (Never)Ending Story
- Business Model Circular Economy - An Application Case in the Furniture and Furnishing Industry
- Digitalization of Functional Safety Management
- Instant 3D for the Industrial Metaverse: Collaboration across the Entire Product Lifecycle
- Automated Test Case Generation for System Functions Through Ontology-Based Falsification

Six workshops will also be available on 4 May:

- The art of uniting people and delivering results
- From conversation to insights - Key levers for successful configuration variant management
- Fostering Standards for collaborative Systems Engineering and Digital Twins
- JT-based Data Exchange | Opportunities and hurdles for end-to-end Usage of JT
- Shaping the vision of a sustainable future smart engineering
- Creating Data Mesh Systems for PLM Infrastructures

See conference details here.
Register for prostep ivip Symposium 2023.
Learn more about prostep ivip here.

CONFERENCES, MEETINGS & WEBINARS

NAFEMS World Congress 2023 (NWC23)

NAFEMS, the International Association for the Engineering Modelling, Analysis and Simulation Community, will host the NAFEMS World Congress 2023 (NWC23) on 15-18 May 2023 in Tampa, Florida, USA. In accordance with the conference theme, *A World of Engineering Simulation*, NWC23 hopes to push simulation technology forward, creating a cross-industry, cross-technology exchange of ideas, best practice, and information.

Keynote speakers and their topics include:

- The Science and Mission of the James Webb Space Telescope (Michael Menzel, NASA)
- Mechanics Meets Biology: Modeling and Simulation Towards Skeletal Tissue Regeneration (Sara Checa, Julius Wolff Institute Berlin Institute of Health)
- The History of the Iconic Boeing 747 and the Evolution of Simulation Utilization Over its Development (Doug Backhus, Boeing Commercial Airplanes)
- Developments in Advanced, Physics-based Modelling and Simulation Techniques in the Realm of Defence and Security at Dstl (Daniel Pope, Defence Science and Technology Laboratory (Dstl))
- Digital Transformation of System Performance Development by a Flexible Digital Thread (Ernesto Mottola, Toyota Motor Europe)

NWC23 will feature 300+ presentations arranged in up to 12 concurrent tracks. The conference will deliver 15+ workshops and 11+ short training courses. See the top-level Agenda and search the Session Overview to find content of interest. Detailed abstracts are available to assist this search.

Register for NWC23.

Learn more about NAFEMS.

PDMA Events in April

Three chapters of the Product Development Management Association (PDMA) are hosting innovation and product management events in April.

On 11 April, the PDMA St. Louis (Missouri, USA) chapter will host a webinar, *User Footsteps Method,* presented by Bill Reid, a member of the PDMA Board of Directors and chairman for the PDMA Inspire Innovation Conference. Reid's 30+ years of new product development leadership form the basis for the User Footsteps method. During the webinar, attendees will will walk through a one-page tool designed to drive a thorough understanding of the user experience and to intentionally seek out these unexpected journeys that can prevent the product from being successful. The tool is based on a clear understanding of the elements of a story that involves your customer and your product or service. These elements include:

- The Protagonist (Your customer)
- Plot lines and twists
- Setting
- The conflict
- Deuteragonist and Tertiary Characters
- Antagonist
- Secondary Characters

The resulting story will explore three key aspects of a new product and its context:

- Pain points and Potholes
- Influencers and Inhibitors
- Exciters and Enablers.

This is a free event for both PDMA members and non-members alike. Learn more. Register here.

The PDMA Minnesota chapter will host a webinar on 19 April titled "*Take Your Presentation Skills to the Next Level with Strategic Storytelling*". In this talk, Bob Caporale, founder of the Strategy Generation Company, will guide attendees through the process of developing product and business presentations that lead to more captivated audiences, more successful outcomes, and a greater level of buy-in and support. Product and engineering professionals will learn how to utilize highly impactful storytelling frameworks and storyboarding techniques to re-craft their product, strategy, and gate review presentations into meaningful stories that capture audience attention and build commitment.

Participants will learn how to:

- Apply traditional storytelling tools and techniques to their product and business presentations.
- Use the "dramatic arc" to help guide their product and business stories.
- Develop storyboards to help structure their presentations and deliver their key messages with maximum impact.

This is a free event for both PDMA members and non-members alike. Learn more and register here.

On 22 April, the PDMA Carolinas chapter will host the Innovate Caroline 2023 conference with a theme of *Sustainable Innovation - Building Resilience into your Products, your Teams, your World*. This in-person event will take place in Charlotte, North Carolina, USA.

Highlights include:

- Keynote speaker Michael Arena from Amazon Web Services will "connect the dots" with his Adaptive Spaces theory, and reveal alternative organization design that leaders can adopt to overcome the limitations of a hybrid workplace.
- LeanMed CEO Mark Adkins will engage attendees with mission-driven innovation theory and practice.
- Rodney Gaddy and Emily Lancucki of One Health Alliance will share navigating change in order to achieve a sustainable future.
- University teams participating in the 2023 Student Innovation Competition will present their innovative ideas.

Learn more and register here. PDMA member and student discounts apply.

PPI SyEN readers are encouraged to take advantage of these learning opportunities from the innovation and product management community and to consider how such practices could complement systems engineering disciplines.

CONFERENCES, MEETINGS & WEBINARS

Registration Open for INCOSE EMEA WSEC

Registration is open for the INCOSE Europe, Middle-East and Africa (EMEA) Workshop and Systems Engineering Conference (WSEC). EMEA WSEC 2023 will be a hybrid event, scheduled for 24-26 April 2023, with the in-person conference to be held in Seville, Spain.

The theme for EMEA WSEC is "*Engineering a Sustainable World*," with emphasis on the role the Systems Engineering community can play in achieving the United Nations Sustainable Development Goals (UN SDGs), targeting societal challenges and focusing on highly complex/chaotic systems aligned with the INCOSE Vision 2035 for a better world.

Keynotes (see links for full biographies and abstracts) include:

- Some key messages from the 6th IPCC Synthesis Report (Gerhard Krinner)
- Systems Engineering support for Industry to meet UN SDG (Cecilia Haskins, ESEP)
- Leading for a Sustainable Future (David Long, ESEP)

In addition to the keynotes, the conference will host four invited talks and six tracks with presentations, workshops, and tutorials.

The virtual platform for this hybrid conference will provide access to recorded sessions, presentation materials and eProceedings for six weeks after the conference.

Learn more about EMEA WSEC 2023 and look for program updates here.

Register for EMEA WSEC 2023.

Program Updates for IEEE SYSCON 2023

SYSCON2023

The IEEE Systems Council facilitates interactions among communities of interest on system-level problems and applications. The Council addresses the discipline of systems engineering, including theory, technology, methodology, and applications of complex systems, system-of-systems, and integrated systems of national and global significance.

The program is being finalized for the 17th Annual IEEE International Systems Conference (SYSCON2023) that will take place on 17-20 April 2023 in Vancouver, British Columbia, Canada.

Dinesh Verma of the Systems Engineering Research Center (SERC) will provide the keynote address on *Transitioning from DE Strategy and Research into Implementation: Enablers and Challenges*.

SYSCON2023 will feature three tutorials on the topics of autonomous systems, MBSE and modeling and simulation:

- Structured Assurance Cases for Autonomous Systems (Simon Diemert, Jeffrey Joyce, Ehsan Ghahremani - Critical Systems Labs Inc.)
- Arcadia and Capella Discovery (Stephane Lacrampe - ObeoSoft Canada Inc)
- Complex Simulation Trustworthiness: What are Your Simulation Needs? (Henri Sohier - IRT SystemX)

Learn more about SYSCON2023.
Check for final program updates (tracks, presentations, and panels) here.

Register for SYSCON2023.

PDMA 2023 Inspire Innovation Conference - Call for Presenters

The Product Development & Management Association (PDMA) has issued a Call for Presenters to the PDMA 2023 Inspire Innovation Conference to be held on 16-19 September 2023 in New Orleans, Louisiana, USA.

The Call for Presenters is seeking speakers to deliver engaging and interactive content for three types of conference sessions:

- 45 Minute Interactive Presentation
- 45 Minute Case Study
- 90 Minute Mini-Workshop

Content is sought in all areas of the PDMA Body of Knowledge (BoK):

- Product Management
- Strategy
- Portfolio Management
- Product Innovation Process
- Product Design and Development Tools
- Customer Discovery and Market Research in Product Innovation
- Culture, Teams, and Leadership
- Product Innovation Management

To align with the academic focus areas of this year's Journal of Product Innovation Management (JPIM) Research Forum (held concurrently with Inspire Innovation 2023), sessions are sought that show practical application of innovation techniques such as:

- Design and Innovation
- Digital Innovation
- Individuals, Teams, and Organization of Innovation
- Innovation Strategy and Entrepreneurship
- Open Science, Open Innovation, and Innovation Ecosystems
- Responsible and Social Innovation
- User Innovation, Adoption and Diffusion

Presentation proposals are due by 12 April using the online submission form. Acceptance letters will be sent by 19 May.

Selected conference speakers may be asked to provide an article for the PDMA Knowledge Hub (kHUB) or to record a session to be shared on the PDMA website.

The 2023 JPIM Annual Research Forum Call for Papers seeks various types of conference submissions (e.g. competitive papers, developmental papers and special session proposals) from scholars from all disciplines who share a common interest in new in new product development and innovation management research.

Submissions are due by 15 May 2023. Acceptance/rejection decisions will be made by 16 July. Submissions should be made through EasyChair.

Call for Papers: Symposium on Automated Technology for Verification and Analysis (ATVA 2023)

The 21st International Symposium on Automated Technology for Verification and Analysis (ATVA 2023) will take place in Singapore on 24-27 October 2023. ATVA 2023 is dedicated to the promotion of research on theoretical and practical aspects of automated analysis, verification and synthesis by providing a forum for interaction between international research communities and industry in the field.

The Call for Papers for ATVA 2023 seeks both regular research papers (16 pages, excluding references) and tool papers (6 pages, excluding references). Suggested topics include:

- Formalisms for modeling hardware, software and embedded systems
- Specification and verification of finite-state, infinite-state and parameterized system
- Program analysis and software verification
- Analysis and verification of hardware circuits, systems-on-chip and embedded systems
- Analysis of real-time, hybrid, priced, weighted and probabilistic systems
- Deductive, algorithmic, compositional, and abstraction/refinement techniques for analysis and verification
- Analytical techniques for safety, security, and dependability
- Testing and runtime analysis based on verification technology
- Analysis and verification of parallel and concurrent systems
- Analysis and verification of deep learning systems
- Analysis and verification of blockchain based systems
- Verification in industrial practice
- Synthesis for hardware and software systems
- Applications and case studies
- Automated tool support

The conference proceedings will be published in the Springer Lecture Notes in Computer Science (LNCS) series, therefore all submissions must be in LNCS format.

Submit content through EasyChair.

Important dates include:

- Abstract submission: 27 April
- Paper submission: 4 May
- Author notification: 30 June

Check for program updates and learn more about ATVA 2023 here.

MBSE Cyber Experience Symposium NAM 2023

Registration is open for the Dassault Systèmes MBSE Cyber Experience Symposium North America (NAM 2023) to be held in Allen, Texas, USA on 22-25 May 2023. This four-day CATIA/No Magic user conference will provide attendees with the opportunity to engage with experts in MBSE, Product Lifecycle Management (PLM), Product Line Engineering (PLE), Systems Engineering and Enterprise/Business Architecture.

The conference is designed for MBSE practitioners and explorers, with opportunities to:

- Increase MBSE awareness – stay current with latest technologies and innovations.
- Improve MBSE practices with hands-on training.
- Engage with thought leaders behind MBSE cornerstones like SysML.
- Learn directly from developers what is new and upcoming in products and solutions.

Learn more here.
Register here.

ITEA Test Instrumentation Workshop (TIW)

The International Test and Evaluation Association (ITEA) is a professional body that aims to further the exchange of technical information in the field of test and evaluation. ITEA will host the Test Instrumentation Workshop (TIW) on 22-25 May 2023 in Las Vegas, Nevada, USA. In accordance with the conference theme, *Instrumentation in a Constrained Environment*, TIW2023 will emphasize the need to be alert and aware of all technological developments that may have an impact on test and evaluation operations.

Plenary speakers for the Workshop include:

- Dr. Eileen A. Bjorkman (SES) - Executive Director, Air Force Test Center (AFTC)
- Ms. Vernita Harris (SES) - Director, Electromagnetic Spectrum Enterprise Policy & Programs, Department of Defense Chief Information Officer
- Stephen Jensen - Director, R&E, NASA Armstrong Research Center
- Hans Miller - MITRE
- Rick Quade (SES) - Deputy for Test and Evaluation, Assistant Secretary of the Navy and acting CHENG
- George Rumford (SES) - Director, Test Resource Management Center
- Bradley Thomason - Director, Threat Systems Management Office (TSMO)

The technical program will address topics including:

- Artificial Intelligence and Machine Learning
- Cybersecurity
- Digital Engineering (Digital Image Correlation, Digital Twins, etc.)
- Electronic Warfare
- GPS Denied
- Hypersonics
- Range Safety and Use of Autonomous Flight Termination
- Spectrum Limitations

Ten pre-workshop tutorials will be offered during the first day and a half of the workshop.

Learn more about the Workshop. Register here.

Join ITEA.

Registration Open for MBSE Summit 2023

Registration is open for the MBSE Summit 2023 to be held in Traunkirchen, Austria on 5-6 June 2023.

Organized by LieberLieber and Johannes Kepler University (JKU) Linz, this conference offers attendees the opportunity to hear from experts in MBSE research, development and practice.

Three keynote talks are featured:

- Ed Seidewitz: Building a major modeling language standard - Reflections on how we got to SysML v2 and where we are going
- Dr. Judith Michael: Modeling - the Swiss Army Knife of Engineering Methods. Insights into the German Cluster of Excellence Internet of Production, the RWTH Center for Systems Engineering and international collaborations.
- Dr. Tobias Gawron-Deutsch: Feature-based development – Applied MBSE in the context of overall vehicle development

Learn more here.
Register here.

Registration Open for 10th Resilience Engineering Symposium

RESILIENCE ENGINEERING 10
26-30 JUNE 2023, SOPHIA ANTIPOLIS FRANCE

Registration is open for the 10th Resilience Engineering Symposium, to be held in Sophia Antipolis, France on 26-30 June 2023. Co-organized by MINES Paris Centre of Risks and Crises and the Resilience Engineering Association (REA), the Symposium theme is "Resilience at frontiers, frontiers of resilience".

Resilience Engineering is a trans-disciplinary perspective that focuses on developing on theories and practices that enable the continuity of operations and societal activities to deliver essential services in the face of ever-growing dynamics and uncertainty. It addresses complexity, non-linearity, inter-dependencies, emergence, formal and informal social structures, threats, and opportunities.

Learn more, look for program updates, and register here.
Join the Resilience Engineering Association here.

Read more about Resilience Engineering in the Resources section of this edition of SyEN.

Keynotes Announced for System of Systems (SoSE) Conference

IEEE System, Man, and Cybernetics Society (SMC) will host the 18th International Conference on System of Systems Engineering (SoSE) in Lille, France on 14-16 June 2023. The theme for this hybrid conference is *AI and Autonomous Robotics in System of Systems* with a focus on the impact of AI on engineering fields such as control, computing, communication, information technology and in applications such manufacturing, defense, national security, aerospace, aeronautics, energy, environment, healthcare, and transportation.

In accordance with this ambitious theme, keynote speakers and topics have been published for SoSE 2023:

Prof. Kamal Youcef-Toumi (MIT)
Title: Automation & Computing Technologies
Smart interconnected systems and environments are becoming crucial. Appropriate information is

collected, processed, and used for operating and managing assets in an integrated intelligent way. This includes monitoring, diagnosing, predicting, and controlling technologies with confidence. For achieving and maintaining a high-performance system's operation, appropriate methods and a combination of control and system intelligence are vital. Systems and applications of primary focus are those with high speed and real-time requirements. Such methods and tools make modeling, design, control, and management of complex, highly integrated systems more efficient and effective. The presentation first emphasizes the importance of computing and its impact on different sectors. Then, it covers methods for robotics and automation applications. Additional examples include digital technologies specific to policymakers and addressing socio-technical challenges.

Prof. Mike Bourne (Cranfield University)
Title: A management view on systems thinking and systems of systems
Over the last 200 years, advances in performance measurement and management has enabled the development of new organizational forms. Mike will trace the early developments in this field through to the current day. As the world has become more VUCA, this has created serious complications for performance measurement and management. Interactions between different management systems and processes makes managing enterprises increasingly difficult and linear approaches have become inappropriate despite their continuing widespread use. Mike will discuss this current challenge in management along with some soft system and system of systems approaches that are emerging.

Dr. Dominique LUZEAUX (French Ministry of Defense)
Title: Agility and integration issues in system-of-systems
Abstract: One of the challenges of dealing with systems of systems in a VUCA world characterized by volatility, uncertainty, complexity and ambiguity, is to include some agility in the project management process. We will discuss how agile engineering can be applied to SoS engineering and we will show how some frameworks like SAFE can be used. However, although agile methods can be applied in a relatively straightforward manner to some development activities, this raises major integration issues. We will present some directions in order to tackle these issues.

Dr. Nader IMANI (Worlddidac Association, Festo Didactic SE)
Title: Skills and Competencies for Smart Manufacturing in the Post 4th Industrial Revolution
The factory of the future is networked and extremely agile using mass customization to individualize each product to customers individual needs. The "Industry 4.0" is yet used to describe trends of developments in the world of advanced production, using internet of things, processing data and creating intelligence from components to production facilities. Such technological developments will bring flexibility of production, while achieving cost effectiveness of products' customization. But for the manufacturing industry this is about much more than just technological developments. People, their qualifications and their continuing education are also critical success factors in the factory of the future. Across all its activities surrounding Industry 4.0, Festo focuses on the benefits of the users of automation technology to range higher productivity, developing digital skills and competencies in the forthcoming of manufacturing.

Mr. Kinya ICHIMURA (Mitsui E&S Machinery Co.)
Title: Systems of the Container Terminal Automation
The world first automated container terminal (CT) has established in port of Rotterdam in 1993, and today, around 70 terminals are in operation worldwide. Mitsui E&S (former Mitsui Engineering & Shipbuilding) has begun to develop the automation technologies since 1970s, and has been delivered automated cranes as well as Terminal Operation System (TOS). These contains Automated Overhead Bridge Cranes and Automated Guided Vehicles for Singapore and Automated Rail Mounted Cranes for on-dock rail terminal in port Los Angeles, USA. Also, recently Automated Rubber Tired Gantry Cranes

and equipment control system that collaborate with TOS have been delivered for Japanese CT. The integration between automated container handling equipment (cranes, AGVs and the other machines) and equipment control software so called the middleware is one of the key technologies for automated CT development. Because of providing both hardware and software, Mitsui E&S is able to design the whole systems of automated CT. Although the industry have been focused on the automation for the newly construction terminal so called Green-field, in recent years a conversion from the existing manual operated terminal to automated terminal become more important. This conversion so called Brown-field, has a lot of limitation. To solve the subjects for Brown-field automation, we need solutions not only technologies but also operational rules. Of cause, the safety is always top priority, and safety related technologies is also very important in automated CT. The present keynote addresses about the history and current situation, layouts, key technologies, subjects in regard to the automated CTs.

Mr. Alan Harding (Past President INCOSE)
Title: BAE Systems Global Engineering Fellow
Alan will discuss the insights into systems of systems that he has gained both through his joint leadership of the INCOSE SoSWG since its inception in 2012, and in a career at BAE Systems stretching back to the mid-1980's where he has been involved across multiple domains including air, land, sea and cyber. He will use the INCOSE SoS Pain Points and the ISO/IEC/IEE 20141 SoS Taxonomy to signpost his practical learning over this period.

Look for program updates and learn more about SoSE 2023.

Program Updates: 2023 International System Dynamics Conference

The 2023 International System Dynamics Conference (ISDC2023), scheduled for 23-27 July 2023 in Chicago, Illinois, USA (and also online), continues to build a diverse lineup of renowned plenary speakers to address the theme of *Adapting in the Face of Change.*

Conference speakers and their topics include:

Asmeret Naugle Bier (Sandia National Laboratories)
Dynamics of Disinformation
Disinformation affects beliefs, opinions, and actions, and is facilitated by the internet and social media, making it difficult to counteract. This talk will discuss using System Dynamics to understand and solve problems related to disinformation and influence campaigns.

Enzo Bivona (University of Palermo)
Dynamic Interplay of Environment, Capability, and Performance
Firms need to leverage learning processes and align short/long-term strategies to mitigate the negative impact of increased environmental dynamism on their capabilities and performance. This presentation offers a framework for decision-making and arranging deliberate organizational learning processes.

Bobby Milstein (ReThink Health and Rippel Foundation)
Towards a Healthier Future: Best Practices for Being Good Stewards of Systems
An insider's view on the role of System Dynamics in informing and inspiring changemakers to rethink their roles as interdependent stewards of systems that impact population well-being. Firsthand observations within two premier health organizations, the Centers for Disease Control and Prevention and ReThink Health.

Douglas McKelvie and Eric Wolstenholme (Symmetric Scenarios)
Using System Dynamics to Explore Solutions for Health and Social Care Integration in the UK
Drawing from their book, The Dynamics of Care, Eric and Douglas will share insights and models illustrating how practitioners and individuals can cope with the challenges of a health system that fails to adapt to changing population needs.

David Bruce Matchar (Duke-NUS Medical School)
Systems Modeling to Support National Healthcare System Change
Singapore's healthcare system is undergoing change due to the aging population's stress on acute care. A System Dynamics model was created to evaluate the impact of this change. The model shows that expanding services solely based on demand is not sustainable and success depends on appealing to new care options.

Juliette N. Rooney-Varga (University of Massachusetts Lowell)
Can Simulated Climate Action Motivate Real-World Decision-Making?
Find out how more than 1,500 leaders gained climate change knowledge by interacting with a System Dynamics model.
Ihi Heke, Paora Te Hurihanganui, and Hemi Taitin (Atua Matua Systems Dynamics)
Indigenous Contributions to Systems Science
Discover how the Māori people have used a form of systems science for over 1400 years, to understand the importance of macro-level environmental systems, improving health, education, and sustainability.

Mike Severson (Idaho National Laboratory)
Supply Chain Analysis for Constrained Resources in Global Electrification
Find out how the study reveals potential inadequacies in the production of projected electric vehicle volumes with a current understanding of raw material resources.

Mohammad Jalali and Erin Stringfellow (Harvard University)
Topic: TBD

Learn more about ISDC2023 here.
Register for ISD2023.

INCOSE Los Angeles Online Events in April

The INCOSE Los Angeles chapter will be hosting two hybrid events delivered by Casy Medina, CSEP (Studio SE, Ltd.) On 4 April, as part of the INCOSE-LA Speaker Meeting series, Medina will present a free talk on *Unleashing the Power of MBSE - Syntax or Semantics? How an imbalance of either results in poor communication*.

Abstract: This presentation will discuss the use of MBSE/Digital Engineering models as communication tools. We will explore various roles of models and discuss the balance of semantics and syntax that results in good understanding of the information contained in our models and enables good decision-making. We will discuss how to approach MBSE to add value and to encourage adoption.

Register here.

On 15 April (a Saturday), Medina will deliver a workshop on *Advanced MBSE: Exploring Simulation*. There is a fee for this full day event.

Abstract: Exploring Advanced Topics in Modeling and Simulation in SysML. This hands-on, interactive

workshop will employ Dassault's Catia Magic Cyber Systems Engineer and Catia Magic Model Analyst (formerly known as Cameo) to build an executable model that demonstrates the power of simulation in describing a system of interest.

Register here.

Upcoming PPI Live-Online ™ Systems Engineering Five Day Courses

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

P006-914-1	Europe CEST 9:00 (UTC +2:00) PPI Live-Online	08 May - 12 May 2023
P006-914-2	United Kingdom BST 8:00 (UTC +1:00) PPI Live-Online	08 May - 12 May 2023
P006-914-3	South Africa SAST 9:00 (UTC +2:00) PPI Live-Online *(Only available in South Africa)*	08 May - 12 May 2023
P006-914-4	Turkey TRT 10:00 (UTC +3:00) PPI Live-Online	08 May - 12 May 2023
P006-914-5	Saudi Arabia AST 10:00 (UTC +3:00) PPI Live-Online	08 May - 12 May 2023
P006-915-1	North America EDT 8:00 (UTC -4:00) PPI Live-Online	15 May - 19 May 2023
P006-915-2	South America BRT 11:00 (UTC -3:00) PPI Live-Online *(Only available in South America)*	15 May - 19 May 2023
P006-916	Eindhoven, the Netherlands CEST 8:30 (UTC +2:00) In-Person	12 Jun - 16 Jun 2023
P006-917	Las Vegas, United States of America PDT 8:00 (UTC -7:00) In-Person	19 Jun - 23 Jun 2023
P006-918-1	Asia SGT 6:00 (UTC +8:00) PPI Live-Online	26 Jun - 30 Jun 2023
P006-918-2	Oceania AEST 8:00 (UTC +10:00) PPI Live-Online	26 Jun - 30 Jun 2023
P006-920	London, United Kingdom BST 8:30 (UTC +1:00) In-Person	31 Jul - 04 Aug 2023
P006-921-1	North America MDT 8:00 (UTC -6:00) PPI Live-Online	31 Jul - 04 Aug 2023
P006-921-2	South America BRT 11:00 (UTC -3:00) PPI Live-Online *(Only available in South America)*	31 Jul - 04 Aug 2023
P006-922	Las Vegas, United States of America PDT 8:00 (UTC -7:00) In-Person	07 Aug - 11 Aug 2023
P006-923-1	Asia SGT 6:00 (UTC +8:00) PPI Live-Online	14 Aug - 18 Aug 2023

FEATURE ARTICLE

Reflections on Letters to My Younger Self

by John Fitch (PPI Presenter and Principal Consultant)

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Introduction

In 2022, INCOSE published a free e-book titled Letters to My Younger Self - How Systems Engineering Changed My Life (hereinafter LTMYS). This book is a "compendium of letters from around the world written from system engineers in the field to their younger selves, to give a glimpse into the life they have lived and the insights they have gained along the way."

Twenty-five systems engineering practitioners from around the globe shared their stories, highlighting key events, decisions, individuals, personal traits, and learnings that shaped their careers. At 92 pages, LTMYS can be a quick read, but is perhaps better digested at a slower pace to allow personal reflection, comparing and contrasting their stories with your personal story.

My process of reflection combined the personal "resonates with me" approach with a bit of quantitative analysis and pattern-based structured thinking. First, I looked for common themes by filtering the document based on keywords (plain old string text searches), building on the most frequency "hits" by comparing side-by-side-by-side the "answers" given by the practitioners to derive common themes, beliefs or practices among the authors.

Second, I mapped some of the responses to a Life Design decision pattern that I developed circa 2000 to see which decisions were deemed most influential in the lives of the authors. We can't help it – ask anyone to share their life story and their beliefs, priorities and perspectives (all of which imply decisions) will be revealed, but incompletely and open to misinterpretation. Having a decision pattern (that works across numerous human beings) reduces the risk of misinterpretation and increases the chances of discerning useful principles that may be applied in our own lives as we face similar choices.

Evident themes

Before diving in, our readers should note that nothing about this analysis can be stated with extreme confidence. The sample consisting of 25 authors was certainly not randomly chosen from among the global systems engineering community. Though picked for diversity, they generally represent the best of the best, chosen because they have been recognized as influential contributors to the systems engineering discipline. It's also likely that the process of developing LTMYS content guided the themes that were addressed. Nevertheless, the preponderance of evidence from their life stories suggests that certain personal traits and mindsets are strong contributors to success in the engineering of systems.

Learn/grow/adapt

With over 150 combined uses, the terms *learn*, *grow*, *adapt* and their variants stood out as the

essential ingredient of a successful systems engineering practitioner. A sample of quotes (author's name in parentheses) include:

- You will *learn* that success is measured by more than correct calculations, design excellence, patents, or inventions of new technology. … As you move through these endeavors, remember to appreciate those beautiful moments, *learn* continuously, be confident and do not shy away from being vulnerable or uncomfortable. (Aguilar)
- Observe the system and *learn* to sense the system's rhythms and, as Donella Meadows says, "dance with it." To *learn* systems and to learn to dance with them, you will have to be patient and listen. But first, *learn* to listen. … Study and learn to love the social sciences, they swamp the engineering disciplines in many socio-technical system dynamics. (Donaldson)
- You will *learn* about things that will surprise you and do tasks that may not make sense to you right now. … Soon you will *learn* if you want to progress in your career, you will have to be able to take on project management and programme management roles. … You will need to *learn* to let go of some things but develop a keen sense of when to step in and grip things before they start to go awry. … *Learn* from other disciplines, they often bring complementary perspectives, but try not to lose sight of why taking a systems approach is so important. (Gibson)
- Reflect on your optimistic approach to any situation from the past, appreciate your agility, *adaptability* and acknowledge your yearning to *learn* and *grow* yourself, it is nothing but positive. (Gupta)
- Use every opportunity to *learn* new things throughout your career. … Contrary to popular belief, struggles and failures do not mean that you are not "cut out" to be an engineer; it is a normal human experience as you *learn* and *grow* in your expertise. Do not let your self-doubt creep in during times of struggle; *learn* and *grow* from it. (Haskins)
- Take time to *learn* from the hard, and that you do not want easy in this aspect of your life. After you obtain your PhD, though you will not know it yet, you follow the advice you will later *learn* from the best systems engineers, who are those who are passionate about what they do and lead a diversified lifestyle, engaging in wider pursuits such as scuba diving, sailing, fox hunting, pilot, becoming business owners and leader – try to *learn* to respect yourself for these and cherish the lessons they each deliver. (Hoverman)
- Keep it simple. The earliest lessons are the hardest for you to remember and seem trivial, but those same lessons are also the hardest and most important for newcomers to *learn*. (Iliff)
- There are so many things to *learn* and they all contribute to a diverse kaleidoscope of inter-connected ideas to draw our creativity from. … Never think you have reached the end as the path goes on forever bringing interesting things to *learn* and cherish. (Landry)
- Take time to *learn* carefully from them. They will lead you into the study of the beautiful complex systems world. (Li)
- The son of an engineer, you have always loved math and science. More than that, you love to *learn* – something you already recognize about yourself. That *learning* journey will never end. … Your university studies will be about engineering and shaping the way you think. More than that, your studies will help you understand and refine the way you *learn*. (Long)
- These hidden disruptive gems can change your life; so *adapt*, adopt, and *learn*. (Lunney)
- The final fascinating aspect of my journey as a Systems Engineer has been the need to *learn* about and understand the many fields of engineering – electrical, mechanical, software, environmental, civil/structural, hydraulic, etc., along with other fields of science, economics, and so forth. To be clear, I did not have to *learn* or understand to the depths of detail that

specialists in these individual fields have, but certainly enough to make the best design decisions and judgments to ensure an optimal solution is reached. (McCowan)

- The fourth insight I would like to offer is that there is so much to *learn* that it pays to be very selective about what you choose to *learn* next. *Learning* something which you might need to know someday is very ineffective, because research has shown that if we don't put new knowledge into practice very soon after we acquire it, we do not retain it. The best source of guidance on what to *learn* next comes from insightful mentors who have deep insight into both your own interests, strengths and weaknesses, and the profession and industry in which you work. (McKinney)
- My association with INCOSE enriched my life immensely. It provided the opportunity to experience, listen and *learn*. (Oosthuizen)
- Focus on *learning* how things around you work and how to communicate what you *learn*. Once you *learn* what it means to think in systems, you will realize that you are already doing it. (Palmer)
- You will find mentors in your early working career to help you develop your technical and interpersonal communications skills – *grow* these relationships and *learn* from these mentors. … Your early work activities will be guided by experienced engineers, and you will apply yourself to perform engineering tasks in projects, as you do, listen, watch, and *learn* best practices that you can use for the future to produce and lead others to develop superior systems. … Take time to *learn* from the experience of working with other companies, cultures, and personality types. … The basis you have in systems engineering is strong, but you are always *learning*. Take the time with each customer to *learn*. … You will *learn* that conceptual solutions require the creation of views of the system based on an understanding of stakeholder needs and constraints. (Parkins)
- One point of view is challenges are what makes a systems engineer *learn*, and a positive approach to each challenge invariably leads to the possible solutions. However, challenges are at the core of any engineer's career, and after each challenge, the systems engineer needs to emerge smarter and wiser. (Raman)
- *Learn* how to network. … A good systems engineer needs to deeply understand both the customer and stakeholder environments. The best way to do that is to embed yourself in those environments. For instance, if you need to develop a system associated with astronomy, become an amateur astronomer and volunteer to help professionals with observations. That will not make you an astronomer, but you will rapidly *learn* the terminology and the basic concepts dominating astronomy. … If you do not capture the attention of an audience in the first few seconds of a presentation, you will never capture it. Few have that skill inherently, but it is fairly easy to *learn*. Join Toastmasters to *learn* how to make a presentation, especially unprepared presentations. *Learn* to be comfortable in front of an audience, and it will help you for the rest of your life. (Sparrius)
- When you challenge yourself to take on projects that you are not sure you can successfully complete, it is true that you open yourself up to failure. It is also true that you open yourself up to *learn* new things and see the world in a new light. … You will soon *learn* that systems engineering focuses on how the actions taken today in the design of the system will determine the impact of the system far into the future. … Your systems view is contagious and will provide a framework and mindset to help others *learn*. (Squires)
- If I could do it differently, my earnest recommendation for your first job is you get your feet into one engineering discipline in some depth, *learn* what it takes to realize a project or system and then "*grow* horizontally" into neighboring disciplines before you aspire to become a systems engineer. (Stoewer)

Accomplished systems engineering practitioners value continuous lifelong learning above all else. They are humble and willing to learn from anyone, anywhere and at any time. They learn through both success and failure. They particularly soak up knowledge when faced with new and unexpected situations and they seek challenging projects that stretch them and force them to learn. They don't have to learn everything exhaustively but exercise good judgment concerning the depth of knowledge needed across multiple disciplines. They treasure their learnings and share them freely with others, hoping to leave a legacy and deepen their learning through teaching. Learning is understood as more than an in-born trait; success comes also with learning how to learn.

systems thinking

With 37 matches, *systems thinking* stood out another common phrase shared across 15 authors. Some quotes:

- You will find a natural resonance when you are introduced to the concept of *systems thinking* and embrace the principles and practices of systems engineering. (Aguilar)
- You have a strong desire to have a holistic view about the earth and the external influences of the universe. Others have similar holistic beginnings into the foray of *systems thinking*, although rarely would geography be the path! (Arnold)
- Children often possess what we call *systems thinking*, which is a broad view of how pieces fit into a system. … Formal training in *systems thinking* felt like coming home to a very natural way of perceiving the world. (Davidz)
- William (Willy) Donaldson came to *systems thinking* early, as his father gave him all the early systems texts from von Bertalanffy, Churchman, Checkland, Ackoff, and others. (Donaldson)
- Developing *systems thinking* as a "habit of mind" builds upon a knack for approaching situations from various viewpoints. … Your engineering skills still matter, but now it is your *systems thinking* skills that need to take centre stage. (Gibson)
- You have the ability to identify value in interactions and interconnectedness. Your thinking ability is attributed as *systems thinking* in engineering. … Note that *systems thinking* has been influenced by your *growing* up years and your priorities, life experiences have helped you acquire this skill. It is not natural for everyone to get big picture thinking. (Gupta)
- Her career included over 30 years as a practicing systems engineer and over 20 years educating the next generation of engineers on the importance of *systems thinking*. (Haskins)
- During one of your most diverse and changing time periods you will meet your first bona fide systems engineer. This individual's *systems thinking* permeated everything they did, from carefully, thoughtfully answering questions to delivering careful systems reviews on projects you work together. (Hoverman)
- What you don't realize now, and you will not for many years, is that you are a natural *systems thinker*. With more research and practical experience in as you will age, you transition into the exploration of some other interesting and challenging problems, such as how to understand and design a System-of-Systems, how to integrate design thinking into the process of systems engineering, especially for service systems, and most interestingly, how to identify *systems thinking* concepts from the Chinese culture. (Li)
- The second insight I would like to offer is the value that *systems thinking* has to offer. Many times, early in my career I "solved" a problem, only to discover that my solution caused other problems later on. Taking time to understand the big picture, and how different people, products, systems, and environmental factors relate and interact can make a huge difference. (McKinney)

- This letter to you, younger me, reflects on our life journey and how discovering the *systems thinking* philosophy and systems engineering discipline enables our search for sanity within a troubled society. … I found that systems engineering applies a holistic, life cycle-based approach founded on *Systems Thinking*, Systems Science, and Systems Theory, and is enabled by certain fundamentals, technology, processes, and tools. (Oosthuizen)
- Your big ideas to make the world a better place, and the structures that are needed to make it work, are the beginnings of your *systems thinking* journey. *Systems thinking* will help you bring order to chaos in your sometimes crazy everyday life – systems will help give you a safe harbor. (Palmer)
- You will have the opportunity to interact with other disciplines and broaden your knowledge with study leading to qualifications in project and financial management – cherish these, as they will work to influence and enhance your *systems thinking*. (Parkins)
- And *systems thinking* gives you the foundation for appreciating the key nuggets of various disciplines that matter for the system of interest. … To reiterate, *systems thinking* and "big picture" perspective are the distinguishing value-added factors the systems engineer possesses. (Raman)
- Federica Robinson-Bryant is a systems engineering professor that integrates *systems thinking* across her roles as a parent, a professor, and an engineer. … The notion of *systems thinking*, a concept characterized as holistic, interrelated, integrative, dynamic and transdisciplinary, is how we think. … I recommend that you keep this in mind: the *systems thinking* and systems engineering mindset is not yet "normal". Your unique frame will add layers onto problems and issues that will likely result in a better outcome in the long-run but will also face resistance and opposition in the interim. (Robinson-Bryant)

The authors clearly believe that systems thinking (broadly defined) abilities are differentiators among engineers and a key to their success. This capability is attributed to a mix of genetics and learning opportunities, i.e., nature and nurture.

explore/experiment

The urge to *explore* new ideas and *experiment* in order to learn new things was a pervasively recommended trait with 29 occurrences across 12 authors:

- For example, at one point you were working an *experimental* campaign to study shockwaves when a major roadblock was encountered. The *experiment* required a thin material that would separate liquid from gas. The team struggled to find something that would work, and many alternatives were tried without success. … Until, in off hours, you had a bit of an Ah-Ha moment in the kitchen. (Aguilar)
- It is a great thing that wherever you go you will be adaptable to new things, open to *experiment* and will carry memories and feel joy reminiscing. (Gupta)
- Trying out P/PM is an opportunity to *explore* not only a career broadening option, but also an excellent chance to discover for yourself how fundamental, and thus broadly valuable, the principles that drive systems engineering really are. (Iliff)
- You need to *explore*, measure, and evaluate to chart the path ahead and recording mistakes is an important lesson in continuously improving. (Landry)
- What you don't realize now, and you will not for many years, is that you are a natural systems thinker. With more research and practical experience in as you will age, you transition into the *exploration* of some other interesting and challenging problems (Li)
- Understanding the system mindset you bring (a mindset that I believe anyone can develop), and the human dimension (something you should begin to *explore* as soon as you can) will

equip you for fascinating opportunities. … Never be afraid to choose your path and recognize that life itself is a system. Treat it as a complex problem. Form a hypothesis, *experiment*, gather data, and learn as you move forward. (Long)

- The journey is fascinating for several reasons, of which the most notable ones are that it involves engineering and I am yet to identify the destination. This journey is like *exploring* a new country – there are so many paths to take and things to see and do along the way. (McCowan)
- The first insight I would like to offer you is the importance of doing *experiments*. I discovered that if I did something deliberately as an *experiment*, with the aim of learning from the outcome of the *experiment*, I never failed. Oh, I did fail to reach goals I set from time to time, but each time my activity was not a failure, because I was able to learn from it. Framing it as an *experiment*, I explicitly acknowledged that I did not know for sure how to make my efforts successful, so I was alert for symptoms indicating that my approach needed to change as I proceeded. (McKinney)
- My association with INCOSE … inspired me and provided the wherewithal to *explore* the labyrinth in pursuit of a solution to the 'uneasiness' conundrum. (Oosthuizen)
- After finding and *exploring* many interesting paths, Erika Palmer is now a systems engineer, specializing in social and sociotechnical systems. (Palmer)
- As I navigated the collegiate space and learned a little more, I changed my major a few times before coming to engineering. *Exploration* among the engineering disciplines offered at the school revealed a catalog description that read like déjà vu, as I thought I was reading my biography or psychoanalysis results. (Robinson-Bryant)
- Today scientific *exploration* and the commercial "New Space" developments continue to inspire me every day. (Stoewer)

Exploration and experimentation are highly regarded in two contexts. First, as an indicator of unending curiosity that fuels growth in understanding the behavior of natural and engineered systems – the scientific foundation that undergirds systems thinking. Second, as the recognition that your career and therefore life legacy isn't fixed and outside your control, rather is a direct result of your willingness to conceive and try many different paths toward the future.

Complementing the explorative and experimental mindset is the character trait of opportunistic optimism. Successful systems engineers don't see their path through career and life as linear or a bullseye to hit or miss, rather hop from one opportunity (aka challenge) to the next as their capabilities and networks grow. This perspective is seen in several statements:

- Innovation is often the result of making new connections, and the fact that your life experiences are different from many in the field provides the *opportunity* for you to make connections that others cannot. (Aguilar)
- While we talk about solutions, let us take a moment to talk about real hardware. Take every *opportunity* to see the current solution, and ideally crawl all over it. Whilst seeing the current solution can bias your thinking, it also gives you an unparalleled *opportunity* to understand the problem space from the users' perspective. (Gibson)
- It is not often that one gets to choose one's assignments, so when I had the *opportunity*, I took it. (Hahn)
- Use every *opportunity* to learn new things throughout your career. (Haskins)
- She completed her masters and other post-graduate studies, spring-boarding to the next *opportunity* in engineering that surfaced, often with little warning. … My entry into systems engineering was more by accident starting with an unexpected *opportunity* arising from a ride in an elevator with a senior colleague who saw potential in me. … if you get the

opportunity to work in systems-related fields, make the most of it. You will have *opportunities* to work on projects large and small, complex and not so complex. (Lunney)
- When you encounter a challenge, leverage the same as an *opportunity* to further engage your capabilities and expand beyond what you thought was ever possible. (Raman)
- When the *opportunity* arose to enter the early space business it was the perfect challenge which, as a young engineering graduate, I embraced with enthusiasm and dedication. (Stoewer)

The authors perceive life and career as a network of opportunities to be navigated and enjoyed, with no certain outcome. Seizing today's opportunity is the path toward a better future, rather than the formulation of precise, long-range plans.

One missing trait is also notable in their stories; none recommend the practice of second-guessing their decisions or being stuck and unable to progress due to analysis paralysis. They have learned to efficiently gather sufficient information to make a decision, balance competing values and priorities, consider (but not be paralyzed by) risks, then commit to a course of action.

team/community/network/engagement/interaction/we/us

A final theme was apparent in the frequent use of *team*, *community*, *network*, or *engagement*, *interaction,* and *relationship* among many parties, appearing in almost every life story. Many examples of the benefits of such connectedness were shared, including:

- Activities such as requirements elicitation, validation, project management and test activities use systems thinking and/or engineering skills dependent on the context and mix of other *team* member skills. (Arnold)
- There is an interdisciplinary field called systems engineering which focuses on how to design and manage complex systems from the beginning to the end of their life. It involves understanding the big picture and working with diverse *teams* to integrate technical details and accomplish the system purpose. … A robust professional *network* is invaluable. (Davidz)
- You will need to take on a tough balance between facing outwards to the customer and other stakeholders, facing inwards towards the *team*, and facing upwards towards the business. … As with many things, becoming good at project management comes with practice and experience, and it is almost inevitable there will be times where you end up smoothing things over with a disappointed customer whilst striving to get your *team* performing and your project back on track. … Who knows, if you become good at *engaging* with stakeholders, develop a flair for visualising the end-to-end task, and learn how to estimate technical effort, maybe you will find yourself involved in sales and business development. … Over time, a record of strong delivery on tasks you were a part of, quite possibly taking on more responsibility each time, may have the beneficial effect of making you into a sought after figure in the customer *community*. It is a bit of a cliché, but people buy from people. … Do all of this passably well and you might find yourself in charge of things: small *teams*, big *teams*, small projects, big projects, departments, maybe even businesses. (Gibson)
- All these seemingly impossible accomplishments are possible because of a great support *network* cheering for you every step of the way. Take the time to build and nurture a *community* that will support, encourage, and inspire you, and together you will create a bigger positive impact than you can ever dream of or imagine. … (Haskins)
- You will thrive in the throes of large consortia proposals (chaos) leading the *team* to a

common story about a solution (ahem, system) with strong win themes, and a story for a clear and compelling solution. (Hoverman)

- Teach, mentor, develop *teams*, present professional papers; doing anything that requires you to share what you have learned with others offers this benefit. (Iliff)
- On the importance of *teamwork*. … Resist the urge to do it alone in a futile attempt to reap the reward for yourself. Remember you only have two arms and one brain. A much better way is to combine forces with others for optimum impact. I have also experienced the power of small and dedicated *teams* succeeding where big *teams* were unable to. … Building your *network* and trust is essential and communication is a major tool to achieve this. (Landry)
- *Engaging* with the appropriate professional body is key to any professional's journey. … INCOSE is a group of like-minded people seeking to advance the practice and the discipline to "create a better world through a systems approach." That *network* and the opportunities it creates will shape your life in ways that you cannot predict. (Long)
- Do not hesitate to work as part of a global *team* if you get the opportunity. … Make the most of "unexpected career moments." For me this included working with a seasoned engineer from the Apollo space program and leading multidisciplinary *teams* located worldwide. … I take pride in working with *teams*. Tackling a problem is so much easier when it is carried out by "*us*" not "me." It also makes it fun. I specialise in being a generalist, so my performance often measures on the *team's* performance. Therefore, contribute to the best of your ability. You cannot succeed in the world of systems without *teams*, showing positive *team* dynamics, diversity, and inclusion. (Lunney)
- Paramount though, is the opportunity to *interact* with like-minded systems engineers from all over the globe. … It struck me like a bolt from the blue that I had stumbled upon an obvious yet extremely fundamental truth, ME + YOU = *WE*. Simple at face value, but immensely impactful, I had stumbled upon my E=mc2, which I dubbed the MEWE© principle! It postulates that ME *interacts* with, and therefore impacts on, every other MEWE sphere of influence. An important characteristic is that ME impact has the potential to proliferate exponentially via social *networking*. Conversely of course, *WE* impact ME. … Respect starts at home, with ME. It is called self-respect, without which it is impossible to respectfully *interact* with *WE*. (Oosthuizen)
- You will find your natural sporting ability will provide an avenue for meeting friends and becoming a *team* player (early systems thinking), which will be an important attribute for your future career. … You will have the opportunity to *interact* with other disciplines and broaden your knowledge with study leading to qualifications in project and financial management. … This lesson attracts your focus to the definition phase of projects and working with business development *teams*. As you work in this area, *engagement* with stakeholders in the development of conceptual solutions and planning for the execution of projects will be an area you will find that you excel in. … You help to introduce the systems engineering life cycle planning phase, a standards-based systems engineering process to ensure all aspects of the system lifecycle are addressed by an integrated project *team* including technical, operational, management, and support specialists. … You come to realize that your work in setting up *teams*, career development of *team* members, and communicating with a diverse range of disciplines and competency levels, is personally and professionally satisfying and stimulating. … The personal *relationships* established at the IS will help you greatly contribute to the *community* of interest in systems engineering in your local *community*. (Parkins)
- A systems engineer will *interact* with experts across multiple disciplines outside of the area

of systems engineer's expertise. … And despite all this unique differentiation you will have as a systems engineer, your ability to present it as a picture of *team* effort will mark your success. (Raman)

- Each *engagement* presents opportunities to establish and build *relationships*, learn and share intellectual prowess, and find fulfillment in the work tackled. … The systems engineering field and its *community network* is rich and robust. Its multidisciplinary and transdisciplinary nature instigates *interactions* with all kinds of people, places and things. (Robinson-Bryant)
- Attend seminars and tutorials. Learn how to *network*. (Sparrius)
- You will find that you can apply your approach not only to teaching systems engineering but also leading and managing organizations, projects, and *teams* – all systems in their own right. You will be able to demonstrate system effectiveness through a lens of organizational effectiveness, project success, and high-performance *teams*. (Squires)
- One of your most admired early superiors, Ludwig Boelkow, a founding father of Airbus, told us when assembling our young space project *team*: "I know you do not have any space experience and you will make mistakes, but please do not make the same mistake twice." … You were still the youngest of your steadily growing project *teams*, but so what? … Key ingredients (of career success) are: … *Team* management and communication skills. … You continuously receive challenges to (functionally) lead and support *teams* for everyone's success. (Stoewer)

Effective systems engineering practitioners are often extremely capable individuals who might be tempted to "go it alone" among lesser mortals. The authors generally reject this mindset and replace it with a strong belief that working collaboratively will yield far better results for all involved. The team, network or community is a source of knowledge, wisdom, encouragement and opportunity.

It's not surprising that people with systems thinking skills will recognize the teams and networks that they work among as systems in their own right and apply a systems mindset to improving the effectiveness of these social systems.

The decisions

What decisions were most influential in the lives of the authors? Using a Life Design decision pattern that I developed circa 2000, the decisions most frequently highlighted in the authors' stories generally fell into two branches of this pattern:

My Identity

- My Identity: Who am I?' What stands out in my talents, beliefs and personality? How do I view myself?
- Core Beliefs and Values: What are the core beliefs and values that will guide and govern my life?
- Personal Learning Style: What is my approach toward learning and personal growth?
- Response to Failure: How will I deal with failure in my life?
- Response to Success: How will I deal with success in my life?
- Talents/Skills to Develop: What are the primary talents (natural abilities) and skills (learned abilities) that I will seek to grow and use in pursuing my life vision?
- Differentiation Strategy: How will I distinguish my capability (at this talent/skill) from others? How will I be unique?
- Growth Plan: What methods will I use to grow this skill or talent?
- Good Habits to Promote: What good habits and positive behaviors will I promote and weave into my character?

A few of the authors formulated a general life vision early in their educational or work experience (do good, make a difference, be at the leading edge of some domain, etc.), but most discovered, uncovered or refined that vision by doing – by exploration and experimentation.

My Vocation

- Life Vocation: What is my life calling? What am I here to do?
- Higher Education - My Major: What forms of higher education will you seek to enable your life vision, vocation, career, and service? What level of degree? What major?
- Work Philosophy: Why do I work? What is my philosophy or guiding principle toward work?
- Work Habits: What positive work habits will I attempt to develop?
- Career: What career field (type of work) should I pursue?
- Industry: In what industry will I pursue my career?
- Employer: What company or organization should I work for? What employment status - full-time employee, part-time employee, intern, contractor?
- Job Title - Position – Role: What job title or position will I seek with this employer? What role will I play?
- Work Location: Where will I work for this employer? What type of work will I perform in each location?
- Find Next Job Strategy: What strategy will I use to find (or create) my next job?
- Service Opportunities: What volunteer service opportunities should I pursue?

It's beyond the scope of this article to map the details (specific alternatives chosen) of the authors' life stories and reflections to the specific decisions, but SyEN readers are encouraged to do so for at least one individual and then use this decision pattern to revisit the trajectory of their own life journey. SyEN will be happy to publish your analysis if you send it to ppisyen@ppi-int.com.

Final Reflections

The global systems engineering community should thank INCOSE and the authors of LTMYS for their willingness to share their life stories for the benefit of the next generation of engineering professionals.

Readers of this article are encouraged to check out the *Designing Your Life* book review in the Resources section of this edition; the proactive, experimental, continuously learning/growing mindset of the systems engineering professionals in LTYMS complements the life design process described in Burnett and Evans' best-selling book.

About the Author

John Fitch is a Principal Consultant and Course Presenter with Project Performance International. John brings over four decades of systems engineering, engineering management, consulting, and training experience to the PPI team. In 2012, John was certified by INCOSE as an Expert Systems Engineering Professional (ESEP).

Within the field of systems engineering, John's career has focused on decision management, requirements management, risk management, systems design & architecture, product/technology road-mapping and innovation. In addition to defense/aerospace, John has guided initiatives in domains such as communications systems, software, energy, nanotechnology, medical devices, manufacturing systems, knowledge management and business process improvement.

SYSTEMS ENGINEERING RESOURCES

Useful artifacts to improve your SE effectiveness

Resilience Engineering Association Newsletter

Issue #14 (March 2023) of the Resilience Engineering Association (REA) Newsletter uses the topic of aviation to deliver a broad introduction into the discipline of Resilience Engineering. Fourteen brief articles in this 43-page edition cover the topics and insights below:

Title	Key Quote or Insight
Can We Continue to Climb the Mountain in Ballerina Shoes? - Understanding Normalization of Adaptation in Aviation	…training…is dominated by compliance and achieving standards often based on arbitrary measures…normalisation of adaptation is invisibly patching up the system and making it work.
Are Black Swan Events Trainable?	To enter the world of the Black Swan, we need to understand two elements: hidden interdependencies and brittleness.
Are We Learning All We Need for Resilient Performance?	To many organizations, this process of establishing and maintaining common ground looks like slack in the system
Two Views on Procedures	The adherence view' is the language of compliance and non-compliance; 'The adaptive view' language is characterised by description, understanding and explanation.
A Multi-Domain View of System Management	Complexity is, like gravity, a foundational property of the world and ignoring both generate similar results. – Professor Dave Snowden …our systems are significantly more fragile when airlines make changes to the operation without a complexity-safe theory of change backed by contextualised data learning.
Risk is Not as Simple as You Might Think	Normalization of risk is a common aspect of long-term human interaction with risk, regardless of any calculation of risk.
From Assessing to Enabling	"…a checklist approach wouldn't suffice… humans are attuned to storytelling instinctually…
Organizational Learning Through Systems Theory	Building in…resilience requires first recognizing when assumptions are not matching reality.
On the Logical Interdependency in Infrastructures: An Institutional Perspective	Interdependency is defined as "a bidirectional relationship between two infrastructures through which the state of each infrastructure influences or is correlated to the state of the other" (Rinaldi et al., 2001)
Resilient Organizational Learning Through Action Research	"…learning is an investment, and organisational knowledge – and indeed resilience – are qualities with a limited shelf life, and are in need of continuous fostering.

SYSTEMS ENGINEERING RESOURCES

Developing Resilience in Commercial Aviation Pilots via Training Data-Driven Insights	The principal means for training for resilience include simulation, case studies and even role-playing exercises that are designed to mimic the real-world scenarios helping flight crews to develop the ability to adapt to unexpected events, maintain focus and composure under pressure and work effectively as a team.
Four Steps Towards Implementing Resilient Learning Systems in Aviation	Of the four cornerstones of resilience, anticipate, monitor, learn, and respond, the behavior most commonly observed was learning.
Learning What Goes Well and Why at American Airlines	to understand how the system is working, good or bad, it must be looked at it as a whole, studying both success and failure.
Resilience and Psychological Safety: The Language of Learning	Through mastery, we can improvise.

Resilience engineering brings a unique perspective that is new to many systems engineering practitioners. SyEN readers are encouraged to dive into this topic and let the key principles of resilience engineering challenge your thinking. Many of the ideas addressed herein parallel the System Safety principles and methods shared by Dr. Nancy Leveson at the INCOSE International Workshop (IW2023) - the subject of a feature article in last month's (Edition 121, February 2023) SyEN Newsjournal.

Access Issue #14 of the REA newsletter.
Learn more abou the REA here.

New and Recommended PDMA KHub Resources

kHUB PDMA Knowledge Hub

The Product Development Management Association (PDMA) shares an ever-growing repository of innovation and product development resources in the PDMA Knowledge Hub (kHUB). New or recently recommended hHUB content includes:

- A Fresh Look at R&D Decisions: Learning from the Best
- Aligning Product Portfolios with Strategic Plans
- Applied Marketing Science - Blog
- Ermergn - Blog
- Find Pearls and Drive More Innovation in Your Portfolio
- Four Steps to Product Management Excellence for B2B Companies
- From Product to the C-Suite
- How Can Platforms Decrease Their Dependence on Traditional Indirect Network Effects? Innovating Using Platform Envelopment – JPIM article
- How Effective Is Your Product Strategy at Delivering on Business Goals?
- Steve Jobs: A Product Developer's Perspective

Access to the Journal of Product Innovation Management (JPIM) content may be obtained by a PDMA membership or through a Wiley subscription.

Access to kHUB is free and open to the public. Create a guest account or join PDMA here.

System Dynamics Review Open Access Articles

The System Dynamics Review, published quarterly by the System Dynamics Society (SDS), often provides open access to non-members of a select set of journal articles. Two recent open access articles included:

Sublime reason: when Isaac Asimov met Jay Forrester
Author: Leonard A Malczynski and David C Lane

Abstract: This article describes an encounter between servomechanism innovator, digital computing pioneer and creator of system dynamics, Jay Forrester, and Isaac Asimov, renowned author of science fiction (including "The Foundation Trilogy" and its fictional discipline of psychohistory) and works of popular science. Their lengthy exchange took place at a workshop in 1975 and four descriptions of it are extant. What emerges in passing is a possible link between Asimov's thinking and Forrester's work on "World Dynamics". Most notable, however, is that the encounter saw the two exchanging ideas on how to think about the future, how to bring about a desirable future, and quite what that desirable future should look like. The two had fundamental differences on key points. The paper explores the unusual interaction, drawing out the points of disagreement and agreement in the views of the two and how they applied these to thinking about the future.

Observations from a system dynamics modeling field school in Mali
Author: Laura Schmitt Olabisi and Amadou Sidibé

Abstract: System dynamics models are powerful tools, but it can take months to learn modeling at an advanced level. Gaining even advanced beginner systems modeling skills may be useful for many researchers and may require less time. We tested this premise through a 1-week field course in Bamako, Mali. The course included an introduction to systems thinking and modeling, a field trip to involve local stakeholders in defining a modeling problem, and 3 days of constructing a system dynamics model for simulation. After the workshop, participants expressed satisfaction with the systems thinking tools they had acquired and saw the power of system dynamics modeling for addressing complex problems. The largest barriers to their continued use of system dynamics tools were other commitments, and the lack of a designated time and context to practice their skills further. We conclude that system dynamics modeling can be taught to an advanced beginner level (with some students reaching competence) in 1 week - but participants should be organized to continue their learning beyond the workshop.

The latest edition of the Review (Volume 39, Issue 1 – January-March 2023) includes two additional articles that are available to members only:

Sociotechnical interdependencies and tipping-point dynamics in data-intensive services
Author: Navid Ghaffarzadegan, Sarah Mostafavi, and Hyunjung Kim

Abstract: Service science theories do not fully explain failure cases in data-intensive services – high-technology services that utilize large volumes of data and provide customized information for users. In these service systems, the technological and social elements are highly interconnected: firms cannot maintain databases and analytic capabilities if they lack market penetration, which itself is influenced by performance of analytic capabilities and databases; a positive feedback loop. Informed by a case study, we develop a simulation model, postulate that market adoption is highly sensitive to

the launch conditions, specifically with respect to the initial states of the system and offer a dynamic theory in which highly nonlinear relationships among the initial states of the system drive outcomes of the market adoption of data-intensive services. We argue that a tipping point exists at which small technological differences in the launch period differentiates between market success and failure. Furthermore, our analysis points to a strong self-fulfilling mechanism whereby initial positive customer perception can increase the service's likelihood of success by indirectly influencing technological improvement. In contrast to the conventional belief, having a large number of initial adopters may negatively influence market adoption in the long run. A major source of the patterns observed is the high level of interdependencies between social and technological elements of data-intensive services.

Dynamic supply chains with endogenous dispositions
Author: James Paine

Abstract: The movement of goods through a supply chain depends on both the physical flow of goods and on the economic decisions of each entity along the chain, including price discovery and inventory disposition decisions. This paper presents a methodological contribution to the system dynamics and supply chain research communities by developing a novel framework for supply chain models by combining three classic modeling methods: co-flow differential equation structures, spot price discovery, and multinomial logistic choice modeling. The relative economic values of possible dispositions of goods, including outright disposal, are considered. For work-in-progress, development is considered in terms of the economic value that an additional unit of time will bring to the finished good, and the interplay of these considerations drive goods through, or out of, supply chains. Incorporating these mechanisms can produce materially different behavior modes and can be applied to multiple levels of aggregation within a production process.

Learn more about the System Dynamics Review here.
Join the SDS to gain full access to the System Dynamics Review.

Valuable Resources from Tom Gilb

Tom Gilb has been a consultant, methods innovator, thought leader and prolific author across a diverse set of fields for over 60 years. In addition to numerous for-purchase items and training, he makes available a wide range of free systems engineering resources on his website.

Here are some of Gilb's recent publications and how to access them:

- *Stakeholder Engineering.* Ebook by Tom Gilb. Leanpub.com/StakeholderEngineering. 27 July 2021.
- *Datocracy and a detailed architecture of a possible political future.* Ebook by Tom Gilb. Leanpub.com/Datocracy. 26 July 2021
- *SimPlan: Simple Planning Language.* Dropbox. August/Sept. 2021. https://www.dropbox.com/sh/3h6iwlz29vi3tvm/AACuH_ufpP9IZF9NrnmA0s31a?dl=0
- *SUCCESS: Super Secrets & Strategies for Efficient Value Delivery in Projects, Programs, and Plans*, Book Folder, tinyurl.com/SUCCESSGilb. October 2021.
- *Musk´s Methods*, Booklet. A collection of insights into Musk's Methods, which parallel Planguage/Evo. With Gilb's interpretation of Musk's Intent. https://www.dropbox.com/sh/ufzvgduznhx68bs/AAAmsR_Hbdeg_hliOfD3QpQSa?dl=0. In process. 2021-2022.
- *GilbThink, An attempt to understand my thinking about problems.* Paper.

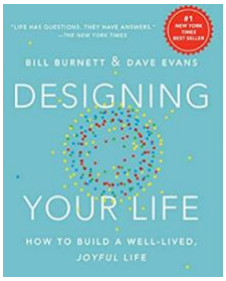
https://tinyurl.com/GilbThink. June 2021.

- *Value Impact Estimation: VIE.* https://tinyurl.com/VIEbooklet. Feb. 2022.
- *Decision-eering*. Booklet. March 2022. https://tinyurl.com/Decision-eering
- *SIMPLE: Super Ideas & Methods & Principles, Logic & Engineering.* https://tinyurl.com/SIMPLEGilb. Work in progress. Fall of 2022

PPI SyEN readers are encouraged to investigate these unique resources.

Book Review: Designing Your Life

By John Fitch



While perusing the website of the Product Development Management Association (PDMA) and putting together content for this month's edition of SyEN, I came across a book review that piqued my interest. In the book, *Designing Your Life: How to Build a Well-Lived Joyful Life*, Stanford University professors Bill Burnett and Dave Evans share their 10+ years of experience in teaching the principles of Design Thinking as applied to life, based on refinement of these concepts and feedback from 1000+ students.

If you are unfamiliar with Design Thinking, please review the article in SyEN Edition #104 (September, 2021), pages 18-28. In it, PPI's proven principles for systems engineering are compared and contrasted with corresponding beliefs that are emphasized in the diverse Design Thinking community.

The subject matter of *Designing Your Life* resonated with prior work that I had done in 2000-2008 while developing and promoting a Life Design decision pattern (see Figure 1) and prototyping software to make this pattern available to a larger audience.

Figure 1 - Life Decision Pattern and software, circa 2008

I had previously read of Burnett and Evan's work at Stanford's Hasso Plattner Institute of Design (aka d.school) and was happy to see that these two thought leaders had put their insights into a format more suitable for mass consumption (as a New York Time #1 best seller!). I ordered the book immediately and devoured its 230 pages in a day and half, all the while noting both how their precepts and process aligned or differed with the way that I've taught a few thousand professionals to take control of creating their future by proactively managing their decisions. I confess that I did not

complete the numerous hands-on exercises recommended to work through my from-scratch life design but noted how these exercises compared with my own decision-centric design processes and similar techniques that are familiar to systems engineering practitioners.

The strengths of this book, *Designing Your Life,* are many. Burnett and Evans have further simplified Design Thinking principles and processes. Four key tenets of Design Thinking are emphasized:

- Curiosity (invite exploration; get good at being lucky)
- Bias to action (prototype to learn)
- Reframing (the problem to get unstuck)
- Radical collaboration (build a team to help you)

The authors use the stories of their students to make these principles tangible and avoid complex process jargon in explaining the steps of life design. The use of examples was particularly valuable when teaching the concept of reframing. Nearly every chapter includes the illustration of one or more "dysfunctional beliefs" (that lead to stymied progress in life design and created fruitless and discouraging effort) and recommended a "reframed" belief as its replacement. Examples of these dichotomies included:

Dysfunctional Belief	Reframe as
If you are successful, you will be happy.	True happiness comes from designing a life that works for you.
I should know where I am going!	I won't always know where I am going – but I can always know whether I'm going in the right direction.
Work is not supposed to be enjoyable; that's why they call it work.	Enjoyment is a guide to finding the right work for you.
I have to find the one right idea.	I need a lot of ideas so that I can explore any number of possibilities for my future.
It's my life. I have to design it myself.	You live and design your life in collaboration with others.

The reframed principles are the "science" that powers life design, analogous to repeatable reactions in chemistry or physics that create the value in our physical products.

Burnett and Evans recommend an initial assessment that evaluates an individual's current state in the areas of Health, Work, Play and Love. Systems engineers will recognize these parameters as measures of performance.

The authors emphasize that each individual should develop and maintain a succinct statement of their "Lifeview" and "Workview", regularly check that these two statements are aligned (coherent) and use them as wayfinding tools when facing numerous life decisions. Lifeview and Workview mirror and summarize several decisions that I have framed within the Life Design decision pattern:

Lifeview Decisions	Workview Decisions
Belief System – World View	Life Vocation
Sources of Knowledge/Truth	Higher Education Strategy
Core Beliefs and Values	Work Philosophy
Personal Learning Style	Work Habits
Talents/Skills to Develop	Career
	Find (Create) Next Job Strategy
	Service Opportunities

The authors place repeated emphasis on prototyping to learn. Great lives are built incrementally, with multiple opportunities to pivot, not designed by exhaustive up-front analysis.

SyEN encourages our readers to check out *Designing Your Life.*

Read the PDMA book review here.

Purchase *Designing Your Life* here.

FINAL THOUGHTS FROM SYENNA

30 + 1 Ponies

We are fortunate to live near a large public park, within which wild ponies roam. One day we happened to be there when the warden had finished rounding up all the ponies before moving them to winter quarters. I noticed that there was a large cluster of animals, with one loner standing some way off. The warden told us that there were thirty in the large group. "What about the one over there?" I enquired. "Oh, that's Strike; he just likes to be different from all the others", we were told.

The very next day I was teaching about the life cycle processes in the INCOSE Systems Engineering Handbook. There are thirty life cycle processes plus a tailoring process, so my aide-memoire has always been that there are "30 + 1" processes. I'm happy to discuss whether or not "tailoring" should be regarded as a life cycle process.

How strange that there were 30 + 1 ponies, and that the loner should be called "Strike", given that one of the options for tailoring is to strike things out.

Regards,

Syenna

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Design as a verb is the act of making solution decisions, as a noun is the product of making solution decisions.

Robert Halligan