

PPI SyEN

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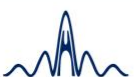


MBSE: From Principle to Practice

MECE+ THINKING
Engine for MBSE

SYSTEMS ENGINEERING RESOURCES
Improve your SE effectiveness

SYSTEMS ENGINEERING IN SOCIETY
Expanding applications of SE globally



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<https://www.ppi-int.com/syen->**WELCOME**

Welcome readers to the September 2022 edition of PPI SyEN!

Based on recent interactions with clients, I am delighted to see the footprint of systems engineering expanding to new industries, more regions, and countries, and across various levels of the hierarchy of with organizations in recent months. I really feel that SE is a key component of addressing the socioeconomic challenges in our world. Regardless of what your specific interest in SE is or whether you're trying to learn as much as possible about the world of SE (and I assume that many of you are in this position, as I am, which is why you turn to PPI SyEN each month) this September release of PPI SyEN is for you. This edition appeals to both broad application engineers as well as engineering specialists, indeed there is something for everyone in this Autumn/Spring edition of PPI SyEN.

System dynamics (SD) is a modeling technique that enables the emergent property of systems (especially socio-technical systems) to be predicted and managed. Find out about the System Dynamics Society in this edition, there are other exciting developments within INCOSE, NIST, IEE, IET, NDIA, IIBA, CSER, and more. Read more to find out what is happening within these organizations (and to find out what each of these organizations is dedicated to if you aren't familiar already with them – you know how much we engineers like acronyms! ☺)

There is a range of opportunities to showcase your talents and knowledge as well as to increase the strength of your professional network in upcoming conferences and webinars. The next six months are looking very strong from the SE professional event perspective. Can you take up the challenge to register for one of the forthcoming free or paid events highlighted in this edition?

We have a thrilling Feature Article written by John Fitch titled, 'MECE+ thinking: Engine for MBSE'. Skip to this article to read about how applying simple and concise principles can help you create more robust and useful models.

As usual, we have a range of sources including information on a multi-solving tool, a cross-disciplinary course on Climate Crisis, an MBSE job opportunity, and more.

In conclusion, Syenna has something to share about why OCDs are so important (another acronym that many of you will be familiar with - although the OCD is often confused with the CONOPS, don't be caught out in that common error). Read Syenna's final thoughts for some food for some clarity on what an OCD is and hopefully a laugh.

See you in October!

René

Managing Editor, PPI SyEN

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Views expressed in externally authored articles are not necessarily the views of PPI nor of its professional staff.

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: <i>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.</i>
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SYSTEMS ENGINEERING NEWS

Recent events and updates in the field of systems engineering

System Dynamics Society Launches Housing Special Interest Group (SIG)



With the addition of the [Housing Special Interest Group \(SIG\)](#) in April 2022, the System Dynamics Society now has 18 [Special Interest Groups \(SIGs\)](#) that focus attention on complex social problems in a variety of domains. [New SIGs may be formed](#) as member interests dictate to address different aspects of complex social systems.

The Housing SIG aims to understand the housing system, with three long-term goals in mind:

- The promotion of System Dynamics as a tool to analyze housing systems and policy.
- The development of a repository of case studies, models and other resources for practice and teaching.
- To work as a group to spread the use of system dynamics through the housing community both in practice and in academia – via for example workshops, targeting housing-related conferences and journals, and developing case studies with policy impact.

The Housing SIG has compiled nearly 300 housing-related articles, conference papers or books in the [Housing SIG Bibliography](#).

To participate in the Housing SIG, first join the System Dynamics Society [here](#). Note that the SDS now supports an annual subscription membership model with an auto-renewal option.

Contact the Housing SIG organizers at housing@systemdynamics.org.

Follow the Housing SIG on [LinkedIn](#).

Grants for Strengthening the Field of System Dynamics

The System Dynamics Society (SDS) has announced updated guidelines for its Strengthening the Field Fund (StFF). The StFF allocates funding for activities that promote the growth of the System Dynamics field. Goals of the Strengthening the Field Fund include the following:

- Increase membership of the System Dynamics Society
- Develop and maintain members' capabilities in System Dynamics
- Enable knowledge sharing and dissemination on System Dynamics topics
- Facilitate community building and collaboration among SDS members
- Support interest and enthusiasm around System Dynamics topics
- Make it easier for SDS members to learn and share experiences
- Facilitate SDS Chapter and SIG activities

Activities that are eligible for funding include:

- Development of materials enabling students and other learners to keep on improving their capabilities (videos, self-study guides, books, etc.).
- Activities that strengthen the relationship of specific Chapters or SIGs, or the SDS in general, with other related organizations, such as through joint or adjacent meetings.

- Sponsorships and awards for special competitions or challenges held by Chapters or SIGs.

The updated guidelines now permit an informal group of SDS members to apply for the StFF. Previous guidelines limited funding to projects submitted by SDS chapters and Special Interest Groups (SIGs).

The SDS currently budgets \$10,000 (USD) annually for StFF activities.

View the [StFF guidelines](#).

Access the [StFF application form](#). Applications should be submitted at least three (3) months prior to the event or activity proposed for funding.

Building the NIST AI Risk Management Framework: Workshop #3



The U.S. National Institute for Standards and Technology (NIST) is progressing with the refinement of a voluntary AI Risk Management Framework (AI RMF). NIST will be hosting

a third and final virtual workshop concerning the AI RMF on 18-19 October. The workshop series has been a part of NIST's efforts to foster an open, transparent, and collaborative process as it creates a Framework to manage risks to individuals, communities, organizations, and society associated with AI.

Leading AI experts will join the NIST team to explore the community's feedback to date and discuss next steps for the Framework. Suggested workshop participants include those from government, industry, civil society, and academia with an understanding of AI concepts and risk issues and approaches. Individuals and advocates from impacted communities are also encouraged to attend.

In preparation for workshop #3, the following material are available:

- [Workshop #1 video](#)
- [Workshop #2 video](#)
- [AI Risk Management Framework, Draft 2](#)

[Register](#) for the third AI RMF workshop.

Learn more about the AI RMF at the [NIST website](#).

NIST Contributions to Digital Engineering



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

- Networked Control Systems Group
- Smart Connected Manufacturing Systems Group
- IoT Devices and Infrastructure Group
- Smart Grid Group
- Transformational Network and Services Group

Three research initiatives dedicated to advancing the field of Digital Engineering were profiled in the [August 2022 NIST Smart Connected Systems Newsletter](#).

Modeling Language Upgrade to OMG Standards Organization

Since 2018, NIST researcher Conrad Bock has engaged with the Object Management Group (OMG) concerning refinements to the [System Modeling Language \(SysML 2\)](#). In June 2022 Bock proposed an upgrade to SysML 2 to address modeling spatial relationships within a system without committing to specific geometries or shapes for objects.

The proposed spatial modeling upgrades also integrate with time models in SysML 2, under a NIST-developed, [four-dimensional framework](#). The integrated model enables specification and simulation of non-colliding paths for objects, such as those occurring in assembly and disassembly, as well as for transportation safety, such as when autonomous vehicles negotiate street intersections.

'EasyTrust' for Digital Data Defense in Manufacturing

NIST has aided manufacturing's transition from paper-based representations – like 2D blueprints – to digital representations, such as 3D graphics, as well as their digital flow – or "digital thread" – across manufacturing processes. But this digital transition has also given rise to digital threats, which seek to maliciously change designs and corrupt files. NIST has worked with stakeholders to develop a forthcoming web-based application called "[EasyTrust](#)," which will provide easy to implement solutions for countering and mitigating threats.

Modeling Needs for Digital Thread in Manufacturing

NIST's "[Digital Thread](#)" project promotes the transmission of standardized digital information across engineering domains: design, simulation, manufacturing, inspection, business, and marketing. NIST collaborator Ben Urick, recognized expert in geometric modeling, participated in a panel on [Geometry Modeling to Support the Digital Thread](#) at the [2022 AIAA Aviation Forum](#).

In order for geometric modeling to move standardized digital data across manufacturing domains, Urick highlight the need to:

- Understand the use cases of computer-aided technologies across engineering domains.
- Ensure computer-aided technologies are generating representations that are "fit-for-purpose".
- Determine digital information needs for each engineering domain and reconcile data differences, to achieve standardization.
- Determine unique data that does not require transmission to all engineering domains.
- Define the fundamental relationship between metadata and geometric modeling.
- Map the needs for metadata and semantic product manufacturing information across engineering domains.
- Develop a formal approach to generating "digital twins" – digital representations of a physical object – for each domain's use

View previous NIST Smart Connected Systems newsletters [here](#).

New Documents in PPI's Systems Engineering Goldmine

PPI's [Systems Engineering Goldmine \(SEG\)](#), continues to grow, adding to the 4 GB of resources that have been assembled over multiple years. Here are some documents that have been updated or added to the SEG during August 2022:

Designing and Enhancing a Systems Engineering Training and Development Program

This paper discusses the process of designing and enhancing a systems engineering program. The program direction and design are driven by a competency model that focuses on behaviors of successful SEs at MITRE. (Source: The MITRE Corporation)

Independent Assessment Of Perception From External/non-NASA Systems Engineering (SE) Sources

This presentation looks at study results and overview of Independent Assessment Of Perception From External/non-NASA Systems Engineering (SE) Sources. Data collected through in-depth phone interviews from April to July 2019. (Source: Harlan Brown & Company, Inc.)

MITRE Systems Engineering (SE) Competency Model, Version 1.13E

This competency model presentation was made to help MITRE staff enhance strategic capability in systems engineering. This model reflects MITRE's brand of systems engineering, which is a "government view and approach" to systems engineering. (Source: The MITRE Corporation)

NASA Procedural Requirements

The purpose of this document is to clearly articulate and establish the requirements on the implementing organization for performing, supporting, and evaluating systems engineering. Systems engineering is a logical systems approach performed by multidisciplinary teams to engineer and integrate NASA's systems to ensure NASA products meet customers' needs. Implementation of this systems approach will enhance NASA's core engineering,, management, and scientific capabilities and processes to ensure safety and mission success, increase performance, and reduce cost. This systems approach is applied to all elements of a system and all hierarchical levels of a system over the complete project life cycle. (Source: National Aeronautics and Space Administration (NASA))

NASA Risk Informed Decision Making Handbook, Version 1.0

This handbook addresses the RIDM component of RM. This is an essential part of RM since the decisions made during a program ultimately "burn-in" the risk that must be retired/mitigated during the life cycle of the program (primarily during the development portion of the life cycle) using CRM processes to track progress towards the program's goal. RIDM helps to ensure that decisions between alternatives are made with an awareness of the risks associated with each, thereby helping to prevent late design changes, which can be key drivers of risk, cost overruns, schedule delays, and cancellation. Most project cost-saving opportunities occur in the definition, planning, and early design phases of a project. (Source: National Aeronautics and Space Administration (NASA))

NASA Systems Handbook, (Rev 2)

This handbook is intended to provide general guidance and information on systems engineering that will be useful to the NASA community. It provides a generic description of Systems Engineering (SE) as it should be applied throughout NASA. A goal of the handbook is to increase awareness and consistency across the Agency and advance the practice of SE. This handbook provides perspectives relevant to NASA and data particular to NASA. (Source: National Aeronautics and Space Administration (NASA))



**SYSTEMS
ENGINEERING
GOLDMINE**

Robustness of Multiple Objective Decision Analysis Preference Functions

This is a Dissertation written by William K. Klimack, Colonel, investigating the value and utility functions in multiobjective decision analysis to examine the relationship between them in a military decision making context. New data is presented and data from an earlier study is also analyzed for this relationship. (Source: Department of The Air Force University)

The MITRE Systems Engineering Guide

This guidebook introduction provides guidance on how to navigate the pages of the SEG and benefit from doing so. It covers the practical matters - the organization, use, and roots of the SEG, what you should (and should not) expect from its articles, and how you can access and respond to the latest SEG information on MITRE's website. (Source: The MITRE Corporation)

Verification Handbook Volume I: Verification Process

The purpose of this handbook is to describe typical verification activities utilized in MSFC Programs. It is meant to be a working reference and guide to performing the verification planning, requirements, and compliance activities. This handbook is not intended to be a statement of policy, nor to recommend changes to any existing MSFC policies. (Source: National Aeronautics and Space Administration)

Work Breakdown Structures for Defense Material Items, MIL-STD-881E, 6 October 2020

This Standard presents direction for effectively preparing, understanding, and presenting a Work Breakdown Structure (WBS). It provides the framework for Department of Defense (DoD) Program Managers to define their program's WBS and to defense contractors in their application and extension of the Program and contract's WBS to report additional details associated with their agreements with Government Program Managers. (Source: U.S. Department Of Defense).

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](#).

Call for Papers: Open Journal for Systems Engineering (OJSE) – Resilience in Systems Engineering



The Institute for Electrical and Electronic Engineers (IEEE) Open Journal for Systems Engineering (OJSE) has issued its third [Call for Papers](#) for a special issue seeking original papers that address the challenges in achieving Resilience in Systems Engineering. Potential

topics include:

- Artificial intelligence for resilience
- Complexity science and resilience engineering
- Conceptual and theoretical examinations of resilience and sustainability for the analysis of socio-technical systems
- Data-driven approaches for resilience assessment and monitoring
- Design for resilience approaches
- Digital twins for reliability, risk, and resilience engineering
- Dynamic maintenance for resilience
- Human factors considerations in the context of resilience
- Integration of risk with resilience
- Resilience coordination, decision-making, and governance

- Simulation methods
- Systematic approaches for resilience assessment of complex systems considering technical, human, and organizational factors
- Uncertainty handling in resilience assessment

OJSE is an Open Access journal for which authors pay the publication costs. For 2023, publication costs are projected to be \$975 (USD) for a 10-page manuscript. See details concerning paper submission [here](#).

The deadline for manuscript submission for the Resilience in Systems Engineering special issue is 1 November 2022. Final manuscripts are due on 15 April 2023. Submit papers [here](#).

See additional details on OJSE [here](#).

INCOSE 2022 Recognition and Awards Yearbook



International Council on Systems Engineering (INCOSE) has announced the publication of the 2022 Recognition and Awards Yearbook. This Yearbook showcases INCOSE's volunteers who have gone above and beyond to further the awareness and implementation of Systems Engineering to ensure a better future for all.

The Yearbook lauds the recipients of a wide range of awards:

- INCOSE Fellows
- INCOSE Founder's Award
- INCOSE Pioneer Award
- Systems Engineering Influencer Award
- Chapter Awards
- Outstanding Service Awards
- Working Group Awards

[Download](#) the 2022 Yearbook.

System Dynamics Society Presidential Address



The President of the System Dynamics Society (SDS), Shayne Gary, shared a 25 minute address with the attendees at the 2022 International System Dynamics Conference (ISDC2022) in July. The SDS has posted the video of that address on the [SDS YouTube channel](#).

Gary's talk focused on three topics:

Update on the state of the Society:

- The Society has a strong foundation, as evidenced by success with the first hybrid conference, strong financials, quality of the Home Office team and 100+ volunteers, growing web traffic and social media engagement, and the increasing Impact Factor of the System Dynamics Review journal.

Challenges facing the Society:

- Membership growth lags aspirations
- Declining membership renewal rates since 2013

- Geographic representation of members – lacking from Asia, Latin America and Africa
- Need to increase gender diversity

Exciting opportunities:

- Connect and build relationships with other rapidly growing adjacent communities, including other simulation modeling methodologies, data science and information science.
- Capitalize on the growing appreciation that many complex problems, including most of the global challenges facing humanity, require a systems (thinking, analysis) perspective. Seize the exciting opportunity to collaborate with others on such problems and leverage strengths of system dynamics.

Gary closed with exhortations to the membership to persevere in their lifelong pursuit of system dynamics skills, increase their level of engagement in the system dynamics community, recruit colleagues to the Society, publicize the impactful work being done in the field, and partner with like-minded communities in working on important global problems.

Learn more about the SDS [here](#).

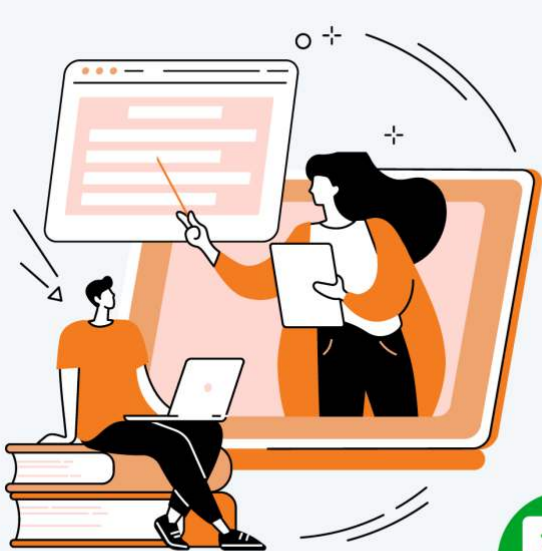


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CONFERENCES, MEETINGS & WEBINARS

System Analysis and Modelling Conference (SAM22)



The fourteenth System Analysis and Modelling Conference (SAM22) will be held in Montreal, Quebec, Canada on 24-25 October 2022. This in-person conference will be co-located with the MODELS 2022 conference at the University of Montreal. The conference theme is *The Future of Model-Driven Software and System Engineering*.

Keynote messages for SAM22 are:

- Mohammad Hamdaqa (Ecole polytechnique de Montreal) speaking on *Beyond the Clouds: A journey and lessons learned*. Advances in cloud platforms have changed the application development landscape. Cloud platforms abstract the complexity of application delivery to enable the applications' rapid development and easy management. This changes the way development teams think about and deal with the underlying resources while building and managing their applications. In this talk, I will walk you through my journey of applying the Model Driven Engineering approach to enable organizations that build cloud-native applications to exploit the cloud platform building blocks to realize what we refer to as the malleable application architectural style. The talk concludes with lessons learned and laying the ground for the future application of Model Driven Engineering in practice.
- Maged Elaasar, PhD (NASA Jet Propulsion Laboratory, California Institute of Technology) speaking on *openCAESAR: A Next Generation Platform for Systems Engineering*. Model-based systems engineering (MBSE) has had slow adoption by the industry at large. The main reason is that the cost of its adoption (complex formalisms, poor siloed tools, and lack of enterprise support) is far more than its derived value. openCAESAR is an open-source project that tries to change this paradigm. It allows defining a custom modeling stack with semantic web ontologies. Using such stack, it streamlines 6 systems engineering functions on models including authoring, federation, configuration, integration, analysis, and reporting using modern technology frameworks and DevOps approaches. In this talk, we will give an overview of openCAESAR, including its Ontological Modeling Language (OML). We will also highlight its supported functions and use cases and demonstrate its current tools. We will also discuss how the technology is being used by the Jet Propulsion Lab to modernize the systems engineering practice of space projects. We conclude by describing both work in progress and future works.

The two day program includes presentations divided into four sessions that support the conference theme:

UML Modelling

- On Abstraction in the OMG Hierarchy
- Detecting Mistakes in a Domain Model
- Interactive highlighting for digital UML class diagrams: a new feature?

Model Checking

- Model-Checking of Space Systems designed with TASTE/SDL
- Model Checking Message Delivery Times in SpaceWire Networks

CONFERENCES, MEETINGS & WEBINARS

- History-Aware Explanations: Towards Enabling Human-in-the-Loop in Self-Adaptive Systems with Temporal Models

Innovative Modelling Approaches

- Classifying Changes to Models via Changeset Metrics
- An approach to build consistent software architecture diagrams using DevOps system descriptors
- Towards Extending the Goal-Oriented Requirements Language with Emotion-Oriented Goals to Support Socio-Technical Systems

System-Level Modelling Languages

- QoS-aware Model-Based Systems Design using Systems Modeling Language
- An Approach for a Simulation-Based Analysis of Business Processes Using the Systems Modeling Language (SysML)
- Scalable ontology-based V&V process for heterogeneous systems and applications

Register to SAM 2022 using the [MODELS 2022 Registration Page](#). The registration should be for "Satellite events" (if only attending SAM 2022/other satellite events) or for "Full package" if attending the main MODELS 2022 conference as well.

Learn more about SAM22 [here](#).

Registration Open for Dassault Systèmes MBSE Cyber Experience Symposium



Registration is open for the Dassault Systèmes MBSE Cyber Experience Symposium Europe 2022 to be held in Göteborg, Sweden on 11-12 October 2022. This two-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 Architecture.

Day 1 will be focused on training sessions:

- Introduction to UAF
- Intro to Model Analysis and Simulation
- System Architecture using SysML and MagicGrid V2
- Digital Engineering - MBSE with SysML in PLM 3DEXPERIENCE Platform from Architecture to Analysis and Design
- Managing Projects in TeamWork Cloud (TWC)

Day 2 will include key note addresses:

- From Product to Connected Systems Experience (Olivier Sappin, CATIA CEO)
- Future MBSE need based on the INCOSE Vision 2035 (Sven-Olaf Schulze, Unity AG)
- Quo vadis MBSE? (Dr Jörg Wirtz, Airbus)

Various technical tracks will also be conducted on Day 2.

- Client Experience
- Best Practices
- Technology
- 3D Experience

Learn more [here](#).

Register [here](#).

Registration Open for Nordic Ergonomics and Human Factors Society (NES2022) Conference



Registration is open for the Nordic Ergonomics and Human Factors Society (NES2022) Conference to be held in Uppsala, Sweden over 23-25 October 2022. The theme of this in-person conference is “Work Well - *Ergonomics in an Unpredictable World*”.

The NES2022 Conference is arranged by the Swedish Ergonomics and Human factors Society ([EHSS](#)), together with Uppsala University and endorsed by the International Ergonomics Association ([IEA](#)).

Planned keynote addresses include:

- Digitalisation and the work environment (Åsa Cajander, Uppsala University)
- Human Factors in the age of autonomous systems (Ole Andreas Alsos, Norwegian University of Science and Technology)
- Meet the world – the extended family tree of the Ergonomics and Human Factors professional (Cecilia Berlin, Chalmers University of Technology)
- Research and development for future working life (Magnus Svartengren, Uppsala University)

A diverse set of session tracks, each with multiple presentations, will be available:

- Occupational safety and health management
- Transport systems
- Physical ergonomics
- Advanced risk management tools
- Ergonomics in healthcare
- Human factors in design
- Modern digitalisation technologies
- Methods in ergonomics
- Visual ergonomics

Multiple workshops and special sessions will also be conducted:

- Using fatigue failure based exposure assessment tools to evaluate the risk of distal upper extremity MSDs
- Activity-based work environments – Perspectives on the implementation process and employee well-being
- A user-centered product development and evaluation of an equipment vest with integrated ballistic protection for the Swedish police force
- The European Work Environment Authorities
- Occupational health challenges in the Arctic
- Work well – by improving working condition after risk assessment with reliable technical methods
- Smart textiles
- Crisis information design with a human factors/ergonomics perspective

See conference details and register [here](#).

Download the [conference program](#).

IEEE International Symposium on Systems Engineering (ISSE 2022)



The IEEE will host its 8th International Symposium on Systems Engineering (ISSE 2022) on 24-26 October 2022 in Vienna, Austria. This in-person conference seeks to create an interactive forum for the advancement of the practice of systems engineering across the multiple disciplines and specialty areas associated with the engineering of complex systems.

Topics of interest include, but are not limited to:

- System Architecture and Architectural Frameworks
- Engineering Systems-of-Systems
- Product Lifecycle Management Processes and Tools for System-of Systems
- Service-Oriented Architectures
- Agile Development Methods of System-of-Systems
- Model-Based Systems Engineering
- Systems Engineering Competency, Education and Training
- "Systems Thinking" Benefits
- Societal and Political Impacts of Systems and Systems Design
- Research in Systems Engineering
- Virtual Prototyping

Lessons learned in these topics will be applied across multiple system domains including autonomous systems, energy, space/communications, medical, transportation, gaming/entertainment, sensors, disaster response, global earth observation and large-scale systems integration.

The symposium will include two special sessions with a focus on:

- Reliability, Availability, Maintainability, and Safety (RAMS) in Systems Engineering: new perspectives for research and industry
- Theoretical Foundations of System Engineering (THEFOSE)

Learn more [here](#).

See registration details [here](#).

View proceedings from prior ISSE conferences [here](#). (IEEEExplore sign-in required for paper downloads)

INCOSE New England Fall Conference (NEFWS)



The INCOSE New England chapter will be hosting its fourth annual Fall Workshop (NEFWS) on 28-29 October 2022 as a virtual event. The workshop provides a forum for the systems engineering community to network, share ideas, knowledge, and practices, and learn more about the most recent innovations, trends, experiences, and issues in all aspects of systems engineering from world-class thought leaders in the

field. The theme of this year's NEFWS addresses both Organizational Transformation and Digital Engineering. Topics of interest include:

Organizational Transformation

- Cultural & Workforce Adoption
- Digital Standards
- Digital Environments
- Digital Work Products

CONFERENCES, MEETINGS & WEBINARS

- Vendor Showcases/Training
- Systems Engineering Career
- Intellectual Property Issues for Cross-Organizational Collaboration

Digital Engineering

- Digital Twins
- Digital Data Threads
- Authoritative Single Source of Truth
- Product Lifecycle Management
- Model Integration Strategies

The 2022 Fall Workshop will also include the New England chapter's annual Student Research Poster Competition. Students (undergraduate, master's, and doctoral) may submit a virtual poster (1 page PowerPoint or equivalent slide) of their Systems Engineering research and project discoveries from school or an internship. Initial submissions are due the 3 October. Multiple awards will be available, including a \$500 grand prize.

Look for updates to the NEFWS program and registration details [here](#).

Call for Papers: Conference on Systems Engineering Research (CSER 2023)



The 20th Annual Conference on Systems Engineering Research (CSER 2023) will be held on 16-17 March 2023 at Stevens Institute, Hoboken, New Jersey, USA. CSER 2023 has issued a Call for Papers inviting researchers and practitioners to submit their work in alignment with the conference's thematic focus on a smart and sustainable world. The 2023 theme emphasizes how

the transdisciplinary systems engineering research community plays a pivotal role in creating smart systems and the transition toward a more sustainable society. Smart systems encompass those that apply artificial intelligence, machine learning, digitalization and data analytics to provide performance enhancements, automated insights and informed decisions.

CSER seeks three types of submissions:

- Full papers (maximum 10 pages) for full peer review and presentation
- Abstracts (maximum 2 pages) for poster presentation and/or lightning talk
- Proposals for workshops, discussions, and/or interactive sessions (maximum 2 pages) on special topics of interest to the CSER community

Current and prospective doctoral students are also invited to attend the Systems Engineering & Architecting Network for Research (SEANET) workshop on 15 March 2023.

Suggest research topics include:

- | | |
|--|--|
| • Advances in Model-Based Systems Engineering (MBSE) | • Industry 4.0 and Lean Manufacturing |
| • Artificial Intelligence for Systems and Software Engineering (AI4SE) | • Social Systems Engineering |
| • Big Data and Analytics | • Systems and Software Engineering for Artificial Intelligence (SE4AI) |
| • Cybersecurity and System Security Engineering | • Systems of Systems |

CONFERENCES, MEETINGS & WEBINARS

- Cyber-Physical Systems and Cyber-Physical-Social Systems
- Digital Engineering, Digital Twins
- Digital Transformation
- Human-Systems Integration
- Systems Thinking
- Trust and Autonomous Systems
- Uncertainty and Complexity Management
- Value-based and Agile Systems Engineering

These topics should address one or more application domains, including energy, environment, transportation, healthcare/medicine, new space, smart cities, infrastructure, urban resilience, sustainable development and education.

The deadline for full paper submission is **5 December 2022**. Authors will be notified of acceptance by 9 January 2023 with final papers due by 23 January 2023.

Download the CSER 2023 [Call for Papers](#).

See [conference details](#).

NDIA Systems and Mission Engineering Conference



The U.S. National Defense Industrial Association (NDIA) is hosting its 25th Annual Systems and Mission Engineering Conference in Orlando, Florida on 1-3 November 2022. This in-person conference targets the U.S. defense community including representatives from industry, government, and academia. Typical attendees include Program

Managers, Systems Engineers, Chief Scientists and Specialty Engineers/Engineering Managers.

Topics of interest will include:

- Capability Maturity Model
- Engineering and Manufacturing
- Human Systems Integration
- Integrated Program Management
- Life Cycle Support
- Mission Analysis
- Modeling Simulation
- Safety and Environmental Engineering
- Software Experts Panel
- Systems Architecture
- Systems Engineering
- Systems Engineering Effectiveness
- Systems of Systems Engineering
- Systems Security Engineering
- Test and Evaluation

Agenda details are forthcoming. Check [here](#) for new information.

Register [here](#). [Join](#) the NDIA and receive a conference discount.

INCOSE Los Angeles Webinar - Agile Systems Engineering



The INCOSE Los Angeles chapter will be hosting a free webinar on Tuesday, 11 October 2022 as part of its INCOSE-LA Speaker Meeting series. Gabriella Coe, ESEP and Northrop Grumman Fellow, will share her insights on *Agile Systems Engineering*.

Abstract: Systems engineers are story tellers, they manage and communicate the story of the system so that everyone involved in its development and operations has the same understanding of what the system is supposed to do, in what conditions, with what interactions and standards. In the Agile methodology, systems engineers play a critical role in aligning teams on Agile Release Trains (ARTs) and Solution Train to a shared technical direction and partner with those teams to develop the solutions, validate technology assumptions, evaluate implementation alternatives, and create the continuous delivery pipeline.

Register [here](#).

Slides will be available on the [LA Chapter web site](#).

Webinar: Resilience Engineering - Can Regulations Support Resilient Performance?



The Resilience Engineering Association (REA) and the Resilience Engineering Technical Committee of the International Ergonomics Association (IEA) are co-hosting a free webinar

on 28 October 2022 to address the question “*Can Regulations Support Resilient Performance?*” The webinar will consist of two talks:

The influence of regulations on resilient performance – multilevel healthcare research and cross sector learning (Sina Øyri, postdoctoral researcher at SHARE – Centre for Resilience in Healthcare, University of Stavanger, Norway)

This talk will introduce some of the knowledge gaps related to how regulation and resilience intertwine – two concepts that often are considered as counterparts. However, different regulatory approaches exist, and few studies have considered how this interface with resilience. Thus, this talk outlines how regulation could contribute to facilitate, or hamper, resilient performance, depending on the regulatory strategy. Demonstrated by a multilevel study on resilience and regulation in the Norwegian healthcare context, a particular focus will be dedicated to discussing how external regulators and inspectors may design, inspect, and enforce a regulatory regime, and thereby contribute to adaptive capacity, anticipatory capacity, and learning as key resilience elements in complex system contexts. The talk includes a list of suggested reading material, and suggestions for future research.

Regulation of resilience – safety management approaches that doesn't work and how to go further (Kristine Vedal Størkersen, senior researcher, SINTEF)

Key points:

- Regulation of resilience in the realm of safety management
- Pros and cons
- Why are the cons so resistant?
- Auditism: a condition that may be the opposite of resilience
- How to approach resilience in regulation?

Register [here](#). Participation is not limited to members of the REA or IEA. Learn more about the [REA](#).

Learn more about the [IEA](#).

Capella Days: First Talks Announced



OBEO and Thales, co-organizers of Capella Days 2022, have announced an initial set of talks that are representative of the content that will be shared during this free, online event scheduled for 15-17 November 2022. Capella Days provides an opportunity for knowledge sharing among members of the community of the Capella MBSE tool and Arcadia methodology:

- Creators of this innovative systems engineering solution
- Providers of Capella add-ons and services
- MBSE experts and industrial users

Initial talks will include:

- A method for quantitative evaluation of functional chains supported by a Capella add-on
- How We Use Capella for Collaborative Design in COMAC
- A global engineering process based on MBSE to master complexity

Learn more about [Capella Days 2022](#).

Access the slides and recordings for previous editions of [Capella Days \(2017-2021\)](#)

INCOSE New Zealand Webinar: The Value Proposition of Systems Engineering



On 23 August the INCOSE New Zealand chapter hosted a webinar on *The Value Proposition of Systems Engineering*. Russell McMullan, General Manager of Assurance and Integration for the City Rail Link Project in Auckland, shared his insights on how to better communicate the systems engineering value proposition.

After reviewing previous studies that made the business case for systems engineering investment, McMullan transitioned to the potential for using the [Business Model Canvas](#) and its associated [Value Proposition Canvas](#) as a alternative method to both understand and “sell” the benefits of systems engineering disciplines.

McMullan walked through his value proposition “mental journey” by mapping various systems engineering constructs to the Value Proposition Canvas elements:

- Customer Job(s)
- Pains
- Gains
- Pain Relievers
- Gain Creators
- Products and Services

This analysis identified an enduring problem (pain and gain) with the communication of systems engineering concepts to stakeholders through common artifacts, e.g., written documents, reports and presentations. These formats require stakeholders to visualize in their minds the integration of complex sets of technical information. McMullan proposed the use of system models and simulations, particularly 3D video animation as a promising combined pain reliever and gain creator for these challenges:

CONFERENCES, MEETINGS & WEBINARS

3d video animation supports the SE value proposition as a gain creator and pain reliever

Download the presentation [here](#).

Learn more about the Value Proposition Canvas [here](#).

PPI RESOURCES

PPI offers a multitude of resources available to all of our clients, associates and friends! Click on any of the links below to access these resources today.

Systems Engineering FAQ: <https://www.ppi-int.com/resources/systems-engineering-faq>
Industry-related questions answered by PPI Founder and Managing Director Robert Halligan.

Key downloads: <https://www.ppi-int.com/keydownloads/>
Free downloadable presentations, short papers, specifications and other helpful downloads related to requirements and the field of Systems Engineering.

Conferences: <https://www.ppi-int.com/resources/conferences-and-meetings/>
Keep track of systems engineering-relevant conferences and meeting dates throughout the year.

Systems Engineering Goldmine: <https://www.ppi-int.com/se-goldmine/>
A free resources with over 4GB of downloadable information relevant to the Engineering of systems and a searchable database of 7,800+ defined terms. You can expect the content of the SE Goldmine to continue to increase over time.

Systems Engineering Tools Database (requires SEG account to log in from the Systems Engineering Goldmine): <https://www.systemsengineeringtools.com/>
A resource jointly developed and operated by Project Performance International (PPI) and the International Council on Systems Engineering (INCOSE). The SETDB helps you find appropriate software tools and cloud services that support your systems engineering-related activities. As a PPI SEG account holder, you have ongoing free access to the SETDB.

PPI SyEN Newsjournal (actually a substantial monthly SE publication): <https://www.ppi-int.com/systems-engineering-newsjournal/>
You're already reading our monthly newsjournal! However click on the link to access the history of 100+ monthly newsjournals containing excellent articles, news and other interesting topics summarizing developments in the field of systems engineering.

FEATURE ARTICLE

MECE+ Thinking: Engine for MBSE

by John Fitch (PPI Presenter and Principal Consultant)

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Introduction

In the experience of this author, most systems engineering practitioners are familiar with Model-Based Systems Engineering (MBSE) in some form. Many practitioners have learned SysML or another modeling language and have experience in populating a few of the standard diagrams from within a commercial MBSE tool. However, few practitioners have had the time or inclination to think deeply about the common principles that “power” the prevailing modeling languages and tools. Fewer still have struggled through the process of:

- Defining, extending, or refining information metamodels (entity classes, attributes, and relationships).
- Updating engineering methods to support the capture of such structured knowledge.
- Mapping free-form paragraph text within source documents to a structured information metamodel, i.e., turning paragraph blobs into traceable objects/entities.
- Creating viewpoints (new diagram types) to visualize structured engineering knowledge.
- Developing software tools that guide the capture and use of structured engineering knowledge.
- Figuring out how to use software tools to detect inconsistencies in system models and to guide and confirm the resolution of such issues.
- Struggling to simplify the inherent complexity of modeling a system and the full range of thinking that creates that system.
- Completing cycles of learning from missteps and failures in all the efforts noted above.
- Detecting patterns of thought that are the common building blocks of successful MBSE practice.

This brief paper is an attempt to share one such pattern of thought that, in the opinion of the author, cuts across nearly all the tasks that we perform when engineering solutions to any problem. That pattern is *MECE+ Thinking*.

Origin and Use of MECE Pattern

The first use of the term MECE (Mutually Exclusive, Collectively Exhaustive) is attributed to Barbara Minto of the McKinsey consulting firm as part of a “Pyramid Tool” approach to aid the firm’s consultants in writing clear ideas, recommendations, and conclusions for their consulting project reports.

“The pyramid is a tool to help you find out what you think. I saw it meant there were only three logical rules to obey. The point above has to be a summary of those below because it is derived from them. You can’t derive an idea from a grouping unless the ideas in the grouping are logically the same, and in logical order.”¹

According to Tom Spencer, the MECE framework “aids clear thinking in two ways: 1) No overlap: categories of information should be grouped so that there are no overlaps, which helps to avoid double counting; and 2) No gaps: all categories of information taken together should cover all possible options, which helps to avoid overlooking information.” ²

Moving from the realm of business consulting to engineering, advocates of Axiomatic Design have applied the MECE framework to the decomposition of functional requirements (FRs). In this context, the design heuristic is restated as *CEME (min)* where the decomposition of an FR into its child FRs must be:

- Collectively Exhaustive
- Mutually Exclusive
- minimum in number

This formulation is expressed in the equation:

$$\Sigma \text{ children} = \text{parent}$$

[Brown, 2011] explains CEME (min): “If the sum of the children is less than the parent, then the decomposition is not collectively exhaustive. If the sum of the children is greater than the parent then the children are either: A) not mutually exclusive or B) something outside of the parent is included. Anything more than the minimum number of children would be indicative of a redundant design, which would be suboptimal.” ³

[Henley, 2015], also writing from the perspective of Axiomatic Design, extends the application of CEME to functional metrics (FMs) that indicate how well a functional requirement satisfies a customer need. Parent FMs should equal the mathematical sum of their children. ⁴

It is interesting to note that the terms MECE or CEME do not appear in the Fourth Edition of the INCOSE Systems Engineering Handbook or in Version 1.6 of the Guide to the Systems Engineering Body of Knowledge (SEBoK). ^{5,6}

MECE+ Thinking: Definitions and Examples

The author has used, and proposes for wider use, extensions to MECE and CEME (min) to better address the broader use cases for applying decomposition techniques to the engineering of systems.

MECE+ is a contraction of a model that consists of five principles or heuristics:

- ME = Mutually Exclusive
- CE = Collectively Exhaustive
- OD = Optimally Decomposed
- OI = Optimally Integrated
- AC = Across Classes

Optimally Decomposed (OD) is a restatement of the (*min*) element within *CEME (min)*.

Optimally Integrated and Across Classes are extensions to MECE, required because simple decomposition hierarchies are insufficient to address the richness of system structures and systems engineering knowledge. Systems (and the thinking that creates them) are networks, for which simple trees are a useful approximation.

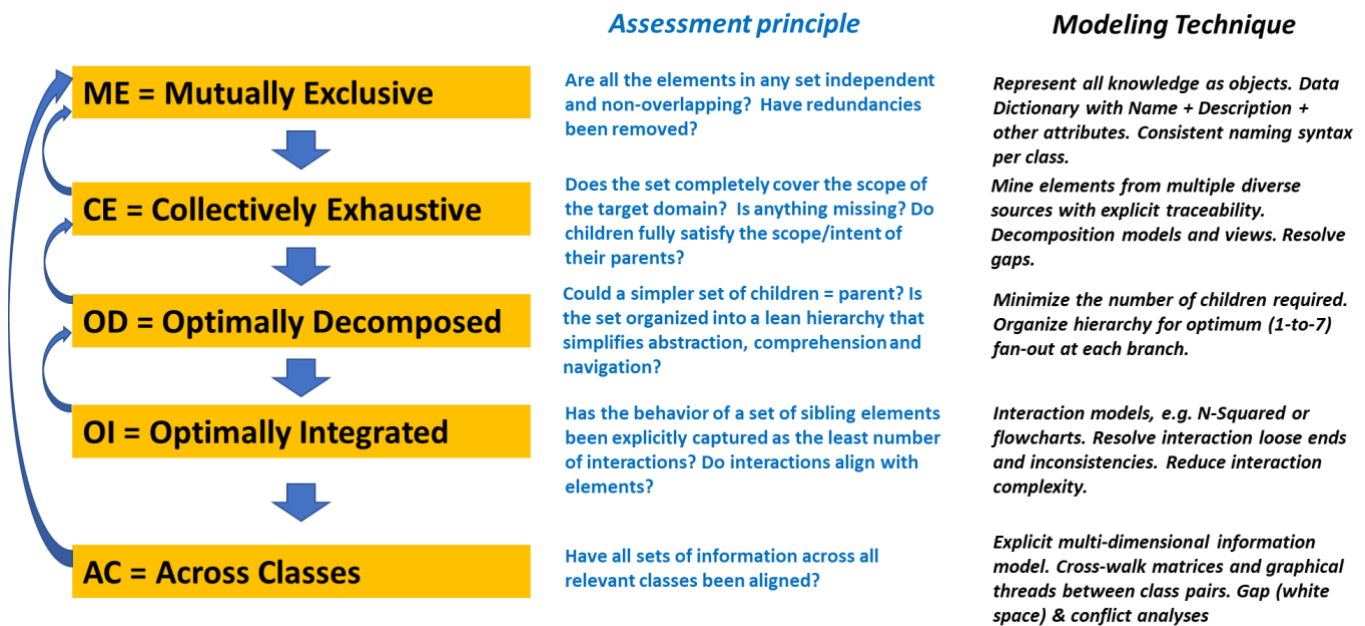


Figure 1: MECE+ Thinking Framework

The sections that follow take each principle in the MECE+ Thinking Framework and review its definition, and using examples, consider its application and potential value to the breadth of the practices known as MBSE. MECE+ Thinking may be applied to any class of system engineering knowledge that lends itself to hierarchical decomposition, i.e., representation in the form of a singly rooted tree. Such classes include, but are not limited to:

- Stakeholder needs
- Mission scenarios, use cases or user stories
- Use case steps / operational activities
- Requirements (functional, performance, lifecycle, environmental, etc.)
- System lifecycle phases
- Business processes
- Operator tasks
- Decisions
- Solution alternatives
- Risks, failure modes or threats
- Physical architectures
- Logical architectures
- Interfaces
- Item flow (energy, matter, information) between functions or across interfaces
- System states and modes
- Verification and validation events, procedures, and results
- Project work breakdown structures (deliverable-focused)
- Project schedules (phases/tasks)
- Organizational breakdown structures (resources)

The author's hypothesis is that the meaning of MECE+ and the $\Sigma \text{ children} = \text{parent}$ equation may differ subtly between the various types of decomposition structures, but that the value of this type of thinking will be demonstrable in each case. In most situations, the emergent properties of the parent will not be just a simple sum of the properties of the children. The systems principle known as emergence implies that the properties of the parent are the results of the combination of or

interactions among its children. See the *More Musings on Emergence* article in [SyEN Edition 115 – August 2022](#) for additional thoughts on this topic.

Mutually Exclusive

Any set of same-class elements, intended to elaborate or decompose a parent of the same class, must ensure that the individual elements in the set are non-overlapping or non-redundant. Mutual exclusivity is primarily a definitional challenge. Elements must be named and described in sufficient detail to detect overlaps. This evening's grocery list, texted to a busy spouse on the way home from work, might include:

- Pasta
- Linguine
- Rigatoni
- Italian sausage
- Tomato sauce
- Mozzarella cheese

Proponents of Italian cuisine would have little difficulty in detecting the potential overlap between the pasta class of food and two of its instances, linguine and rigatoni. A simple question concerning the number of types of pasta desired would resolve the ambiguity. But when applied to stakeholder needs, gathered through multiple techniques, from different sources, and written in a variety of Voice of the Customer (VoC) formats, the detection of overlaps and redundancies is much more of a challenge. Domain understanding may be essential, combined with "What do you mean by ____?" queries concerning the nouns, verbs, adjectives, and adverbs included in stakeholder need statements.

The simple practice of representing each element as a set of discrete attributes/properties (rather than free-form text in a paragraph) can assist confirming mutual exclusivity among stakeholder needs. A "Context", "Rationale", or "Lifecycle" attribute, if populated, may distinguish apparently similar needs as applicable to different situations and therefore confirm their uniqueness. Similarly, using a consistent style or syntax when naming elements within a class can help in the detection of redundancies.

However, the author has experienced numerous situations in which exclusivity could not be confirmed by definitional analysis alone. In such situations, the *Optimally Integrated* heuristic (addressed later) may need to be applied to model the dependencies or interactions between elements before overlap detection is possible.

Collectively Exhaustive

The Collectively Exhaustive heuristic is a test for completeness. Do the children fully satisfy the intent or cover the scope or explain the rationale for the parent? Are there gaps - missing children?

When performing functional decomposition, one may ask, "Do the child functions fully deliver the transformation of inputs into outputs implied by the parent function? In many situations, detection of gaps may be simple IF the analyst has domain knowledge AND the technology decision on how to accomplish the parent function selects a solution approach within the analyst's range of experience. Few engineers would have trouble spotting a gap in this list of child functions:

- Do A
- Do B

- Do D
- Do E

But when the solution approach chosen to deliver a parent function is new (to the world or to the engineer), spotting gaps in the child functions may be problematic. The Optimally Integrated heuristic may come to the rescue in such situations.

The decomposition of a physical architecture into a Bill of Material or parts list is another application of the Collectively Exhaustive principle. “Are all the elements that comprise the system identified? What’s missing?” Similar thinking applies to a Project Work Breakdown Structure – “Are all the deliverables required by the contract identified at level 2?” Such questioning must be applied recursively at every branch in the decomposition hierarchy.

Completeness is hard to assess when applied to the elaboration of high-level risks or failure modes. Decomposition of risks or failure modes requires the repetitive asking of the “What could go wrong with component X?” question with persistent use of “What else?” Failure patterns based on experience may assist in such cases.

Decision patterns provide confidence that each branch of a Decision Breakdown Structure (DBS) collectively and exhaustively elaborates its parent decision. For example, after the Use Cases to Support decision is made and four use cases are chosen as “in-scope” for the product, we can be confident based on a proven pattern that there will be a set of child decisions that elaborate the “design” of each use case:

- UC #N Value Proposition
- UC #N Flow (User Experience)
- UC #N Solution Role (Operational Concept)

See the *Introduction to Decision Patterns* article in [SyEN Edition 107 – December 2021](#) for more details on the use of decision patterns to exhaustively model the problem domain.

Optimally Decomposed

As noted above, Optimally Decomposed (OD) is a restatement of the (*min*) element within *CEME (min)*. A decomposition could be MECE, but unnecessarily complex if the number of children defined to achieve equivalence with the parent is larger than required. Increasing complexity generally correlates with increased system cost and decreased system reliability; simpler solutions are generally better, all other things being equal.

In situations where the parent groupings are somewhat flexible, e.g., organizing requirements within a specification, the meaning of Optimally Decomposed may be guided by the limitations of human comprehension (based on short term memory, as popularized in the Miller Number of “7 plus or minus 2”.^[7]

Whether one agrees with 7 as the “magic number”, experienced engineers will recognize that a deep hierarchy with a 1:2 decomposition fan-out at each node would be inefficient and difficult to navigate.

Similarly, a 1:20 decomposition fan-out would be difficult to view and grasp when scanning a tree graphic or outline. There is some optimum fan-out between these two extremes that improves human comprehension of large decomposition structures, though optimum varies by individual and perhaps by the class of information being displayed.

Optimally Integrated

Relationships are central to system thinking and therefore systems engineering. No tree structure

can fully express the reality that systems are comprised of multiple interacting elements; it's the interactions that create stakeholder value (the intent of the design process) and sometimes destroy value (when such interactions lead to unexpected and undesirable system behaviors). An automobile may consist of 10,000 parts, but a pile of such parts sitting in a garage can't deliver any of the mobility functions expected by a driver or the comfort or safety requirements demanded by vehicle occupants. How the parts are combined to form the system makes all the difference.

The Optimally Integrated heuristic focuses on the interactions among children and whether those interactions efficiently equate to the characteristics required of the parent. This is where the realm of MBSE excels; modeling element interactions is the essence of most system diagrams.

Functional analysis is an excellent example of the Optimally Integrated principle. During the system design process, each system-level function will be decomposed to the level required to allocate the sub-functions to a single subsystem. To do otherwise is to pass on an unacceptable level of ambiguity to the subsystem developers.

How a parent function is decomposed is driven by the physical solution architecture chosen to deliver that function; the functional model is a behavioral model of a physical solution concept. To clarify how the physical solution will accomplish each system level function, functional models are created that include:

- Control flow – dependencies between functions that drive sequencing (parallel, serial, iteration, looping, etc.)
- Item flow – Energy, matter, or information inputs to and outputs from functions.

Whether visualized as an Enhanced Functional Flow Block Diagram (EFFBD), a SysML Activity Diagram or Sequence Diagram, a process flowchart or a Functional N-Squared Diagram, the explicit identification of dependencies and flow interactions forces the engineer to a higher level of precision in defining the child functions. Clarifying dependencies helps ensure mutual exclusivity; two functions with sequencing dependencies are guaranteed to be unique and non-overlapping. Clarifying item flow defines the transformation (of inputs into outputs) that occurs in each function. If the inputs and outputs don't match, then either overlaps and/or gaps in the functional model exist. In all but the simplest cases, functional decomposition requires a network model to be constructed to confirm MECE coverage; a tree view is insufficient.

Even if a functional model is MECE, it may not be optimum. If there is item flow between each pair of functions, i.e., an N-Squared Diagram with no "white space" in the off-diagonal cells, the system design is highly coupled. Such coupling results in high complexity (therefore higher cost and lower reliability) and increased cost of managing change across the system lifecycle.

Across Classes

The systems engineering process creates diverse sets of system models, plus models of the thinking that transforms a problem definition into a solution design. MBSE languages and tools are based on the mapping of this knowledge to numerous classes of information. Much of the power and payoff of investments in MBSE result from the ability to create, view, navigate, and analyze the digital thread of connected thinking that evolves as engineering analyses are performed. A MECE+ model of system requirements is a great thing, but it could still miss the mark if it isn't traceable from and aligned with stakeholder needs. The Needs -> Requirements trace is an example of the Across Classes principle.

To illustrate the Across Classes principle, let's extend the meal planning example shared under the Mutually Exclusive section to the development of a weekly meal plan. Mapping the weekly meal plan (essentially the use cases that grocery shopping is intended to support) to the items on a weekly

grocery list could uncover gaps, overlaps or other inconsistencies, particularly if such mapping was also done against current inventories.

If we extend the functional analysis example and combine it with the modeling of physical architecture, we see a more potent application of the Across Classes principle. Every item (energy, matter, or information) that flows between two functions demands an interface to transfer, carry or communicate the item. If two connected functions have been allocated to different components in the system's physical architecture, then there must be a physical interface between the two components that can support this item flow. This logic implies that four classes of systems engineering knowledge (Functions, Items, Components, Interfaces) must be consistent with each other. The set of relationships among these types of knowledge may be queried and inconsistencies detected by use of a set of rules. In MBSE tools such consistency checks may be performed as automated scripts or accomplished by side-by-side comparison of graphical views, e.g., comparing an EFFBD with a schematic block diagram of the physical architecture.

The article, *Decision Patterns – So What?* in [SyEN Edition 111 – April 2022](#) includes numerous examples that discuss the implementation and value of *Across Classes* traceability and alignment including:

- Essential information “within” each decision
- Requirements-to-decision traceability
- Decision-to-requirements derivation traceability
- Decision-to-plan traceability
- Architecture models representing alternatives
- Math/physics and lifecycle models representing alternatives

In each of these cases, the awareness of required (or at least valid) relationships across knowledge classes provides the analytical engine for detecting and resolving engineering model inconsistencies, model incompleteness, and thinking flaws.

Figure 2 illustrates a high-level conceptual view of Across Class derivation traceability. Each class of information, in this case Requirements, Decisions and Components (Solution Physical Architecture) may be thought of as a decomposition hierarchy, each refined with MECE-OD-OI thinking. Derivation traceability threads (horizontal arrows) cross-connect the data in each of the class-oriented hierarchies. The derivation trace is not one-way, i.e., decisions (through the alternative chosen for implementation) create new requirements that may affect other decisions.

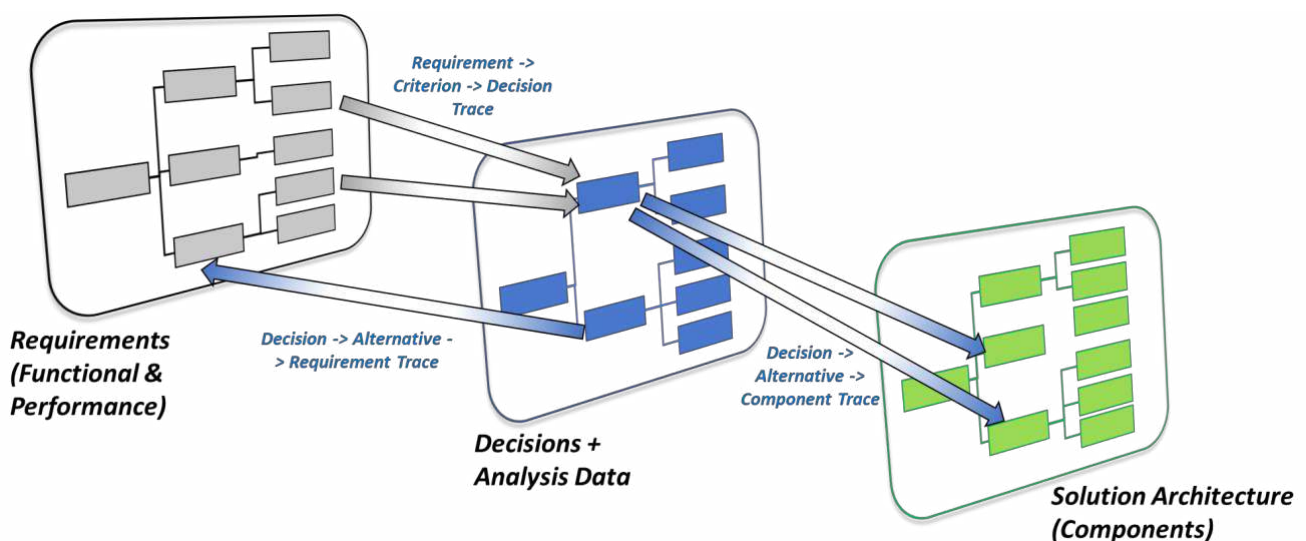


Figure 2: Across Class Derivation Traceability

Multiple high-value completeness and consistency checks are shown on this on this simplified three-class diagram.

- Requirement utilization in design decisions: Requirements should influence the solution design; the absence of a requirement -> criterion -> decision trace indicates either a requirement that may lack such influence or a partial capture of design decisions.
- Decisions create architecture: An architectural decision evaluates solution architectures comprised of components. A component that can't be traced from an explicit architecture alternative is suspect.
- Decisions create new requirements: A completed/closed decision implies commitment to implement a specific alternative. At the point of commitment, the derived requirements, i.e., the inherent consequences of the chosen alternative, become constraints on other decisions. A decision -> alternative -> requirement trace that shows no derived requirements consequences flowing from the chosen alternative is suspect.

Numerous additional potential consistency checks would be visible if the full decision analysis data model was shown. From the author's experience, a comprehensive information metamodel comprised of ~ 40 classes may yield 60 to 100 such rule-based checks and associated viewpoints for confirming model completeness and logical consistency.

Conclusions

MECE+ Thinking is applicable to a broad range of the work performed in the engineering of systems as solutions to problems. The author's hope is that this brief article and limited examples will trigger our readers to think through at least one application of MECE+ Thinking (particularly the Optimally Integrated & Across Classes principles) in their domain. SyEN will be happy to publish their examples and resulting insights in the Forum section of a future SyEN edition.

Feel free to email your insights to PPISyEN@PPI-Int.com.

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About the Author



John Fitch is a Principal Consultant and Course Presenter for 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.

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P006-895-2	Saudi Arabia UTC +3:00 (AST 8:00) PPI Live-Online	17 Oct - 21 Oct 2022
P006-896	Eindhoven, the Netherlands UTC +1:00 (CET 8:30)	31 Oct - 04 Nov 2022
P006-897-1	Asia UTC +8:00 (SGT 5:00) PPI Live-Online	07 Nov - 11 Nov 2022
P006-897-2	Oceania UTC +11:00 (AEDT 8:00) PPI Live-Online	07 Nov - 11 Nov 2022
P006-898-1	North America UTC -7:00 (MST 8:00) PPI Live-Online	14 Nov - 18 Nov 2022
P006-898-2	South America UTC -3:00 (BRT 12:00) PPI Live-Online <i>(Only available in South America)</i>	14 Nov - 18 Nov 2022
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System Dynamics: Jay Forrester Seminar Series

Jay Forrester Seminar Series

The System Dynamics Society (SDS) has transformed the [Jay Forrester Seminar Series](#) into an online, on-demand course. The original seminar series was conducted by Professor Jay Forrester, the founder of the System Dynamics field, in the fall of 1999 for his Ph.D. students at MIT Sloan School of Management. The SDS has transformed the series into a course, revising the course structure to be more suitable for evaluation-based learning. The revamped course is self-led and self-paced without guidance from an instructor. The full course consists of 11 mini-courses. Three mini-courses are available at present:

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- *World Dynamics.* A discussion based on Jay Forrester's 1971 book, *World Dynamics*, and conversations around "The World Model" and the history of *The Limits to Growth*.
- *Corporate Growth.* Forrester uses the Market Growth model to outline and explain the dynamic causes underlying behaviors in a growing company.

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- Nonlinearity
- Theory Underlying Modeling
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- Confidence in Models
- The National Model
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- Management Education
- Future of System Dynamics

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

Learn more and register for the first mini-course [here](#).

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International Institute of Business Analysis (IIBA) KnowledgeHub



The International Institute of Business Analysis (IIBA) maintains a [KnowledgeHub](#) as a repository of business analysis resources, accessible to IIBA members. The KnowledgeHub provides a method engage with IIBA standards (such as the

Business Analysis Book of Knowledge – BABOK® Guide) and community-driven content such as how-to tips, tools and templates.

The IIBA has developed an overarching framework to communicate the essence of Business Analysis. The [Business Analyst Core Concept Model™ \(BACCM™\)](#) is based on six core concepts and the relationships among them:

- Change - a controlled transformation of an organization
- Need - a problem, opportunity or constraint with potential value to a stakeholder
- Solution - a specific way of satisfying a need in a context
- Value - the importance of something to a stakeholder in a context
- Stakeholder - a group or individual with a relationship to the change or the solution
- Context - the part of the environment that encompasses the change

The entire discipline of Business Analysis may be defined in terms of these six core concepts as:

the practice of enabling *change* in an organizational *context* by defining *needs* and recommending *solutions* that deliver *value* to *stakeholders*

The BACCM™ has been in use and actively refined and extended since 2012. Recently, the IIBA has added a new interactive version of the BACCM™ to its KnowledgeHub.

Learn more about the IIBA's KnowledgeHub [here](#).

Watch the [KnowledgeHub overview video](#).

[Join the IIBA](#) to gain access to the KnowledgeHub and new interactive BACCM™.

The IIBA has over 100 chapters globally. [Find a chapter](#) near you.

FLOWER Multisolving Tool



The [Multisolving Institute](#) defines multisolving as “when one investment of time or money solves many problems at once.” Multisolving is believed to result in the following benefits:

- Aligns constituencies for greater impact
- Accomplishes more with the same budget
- Solves short term problems in ways that reduce longer term crises
- Brings people together to find win-win-wins
- Insists that equity be included in all other issues

To facilitate these objectives, particularly that of equity, the Multisolving Institute has developed and released a multisolving tool, FLOWER:

*Framework for **L**ong-term, **W**hole-system, **E**quity-based **R**eflection*

FLOWER is a tool for exploring multisolving and learning its application to real-world scenarios. Learning objectives include the ability to:

- Define multisolving
- Read and understand a FLOWER diagram
- Recognize examples of multisolving in the world
- Identify co-benefits in common multisolving policies or investments
- Identify equity impacts in common multisolving policies or investments

SYSTEMS ENGINEERING RESOURCES

In a workshop setting, participants create FLOWER diagrams for policies, actions, or investments. Each FLOWER diagram shows what co-benefits are created and explores how equitably those benefits are shared.

FLOWER organizes stakeholder benefits in seven “petals”:

- **Jobs & Livelihoods:** Provides meaningful work at a living wage and builds assets in a community.
- **Resilience:** Builds people’s capacity to survive or even thrive in the face of disruption.
- **Energy & Mobility:** Ensures access to energy, the ability to make things they need, and the ability to get around.
- **Food & Water:** Increases access to healthy food and clean water.
- **Climate Protection:** Reduces greenhouse gases emissions or boosts carbon-sequestration.
- **Biodiversity:** Preserves the variety of life that can be found on the earth
- **Health and Well-being:** Improves overall well-being and creates safe living and working conditions.

FLOWER stimulates dialogue among the potential stakeholders in a project and helps people improve projects so that they produce more benefits that are more equitably shared.

SyEN notes that the seven petals (stakeholder benefit classes) proposed in FLOWER are focused on public policy investments in socio-technical systems. The general layout of a FLOWER multisolving workshop could be applied to any type of system by starting with a different set of stakeholder benefit categories.

Learn more about the [FLOWER multisolving tool](#).

Download the FLOWER [facilitator’s packet](#).

NIST Cybersecurity Framework (CSF) 2.0 Workshop Summary Analysis and Recording



On 17 August 2022, the U.S. National Institute for Standards and Technology (NIST) hosted its first public workshop on the future update to the NIST Cybersecurity Framework (CSF 2.0). More than 3,900 virtual attendees joined from 100 different countries. Dr. Laurie Locascio (the Under Secretary of Commerce for Standards and Technology and NIST’s Director) and Director Chris Inglis (the National Cyber Director for the Executive Office of the President) provided opening remarks and shared their support for the CSF 2.0 update process. Learn more and view the recording [here](#).

This public workshop represented one of the ways that NIST has sought input from stakeholders about the current use of the Framework, as well as how the CSF can evolve to meet today’s cybersecurity challenges. NIST has prepared an eight-page summary analysis document that provides a recap of the full workshop, including:

- Panel discussion points
- Summary analysis themes
- Important reference links
- Key takeaways
- Information about next steps.

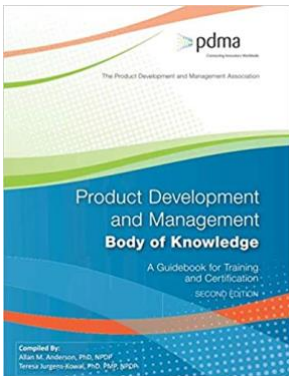
Read the [Summary Analysis](#).

View the NIST [CSF 2.0 website](#).

[Subscribe](#) to receive email alerts concerning the CSF.

Participate in a [forum](#) concerning the CSF.

PDMA Body of Knowledge Available on Amazon



The latest version of the Product Development Management Association (PDMA) Body of Knowledge (BoK) is now available on Amazon in either paperback (352 page) or electronic (Kindle) format. The book, published in July 2020, covers the fundamental principles of product innovation and product management, which can be applied to a wide range of product and service industries. It is intended to provide the basis for ongoing learning and continuous improvement, both for individuals and their organizations. The PDMA BoK is the basis for studying for PDMA's New Product Development Professional certification examination (NPDP).

View the PDMA BoK on [Amazon](#).



The Institution of Engineering & Technology

Formed in March 2006 in the United Kingdom and currently, with more than 160,000 members worldwide, [the Institute of Engineering & Technology \(IET\)](#) is one of the fastest growing science, technology, and engineering societies around the globe. The Institute was cocreated by the Institution of Electrical Engineers (IEE) and the Institution of Incorporated Engineers (IIE) and is active in 37 countries with members located in 150 countries around the world.

This rapid growth comes as no surprise when one observes the incredible output that the Institute generates; in recent years, IET has organized over 120 conferences and published more than 100 titles each year in the form of books, journals, and magazines. The IET's influence is not just in the academic or theoretical space, IET, provides professional advice to Parliament, Government, and other agencies. Browse the IET digital library [here](#).

History of the formation of the IET

Though formed in 2006, the IET cites its foundation as being in 1871 commensurate with telegraphy technology and eventuating the formation of relevant societies. Although the term 'engineer' was barely used in 1870, telegraph engineers knew about electricity which set them apart from other types of engineering. At the time, there were only two potential societies for an engineer to join: the Institution of Civil Engineers founded in 1818, and the Institution of Mechanical Engineering founded in 1847. Recognizing substantial differentiation between the knowledge space of civil engineering and electrical engineering, 'The Society of Telegraph Engineers (STE)' was formed on 17 May 1871 in London. Route to membership of 'The Society of Telegraph Engineers' reflected the dual nature of the profession: education as a Telegraph Engineer and employment in a position with responsibility for at least five years. Over the decades, STE grew by expanding its focus beyond just telegraph engineering to include electrical science.

In 1880, STE became The Society of Telegraph Engineers and Electricians after a decision in the Annual General Meeting. In 1889, a motion was put forth to change the title of the organization from The Society of Telegraph Engineers and Electricians to the Institution of Electrical Engineers (IEE) to reflect the representation of the body of electrical engineers in England. The Institution's membership

increased by 170 percent from 2,064 to 7,045 between the years 1895 and 1914. Through this substantial growth, IEE was able to purchase a lease - Savoy Place in England in 1980 (see Figure 1).

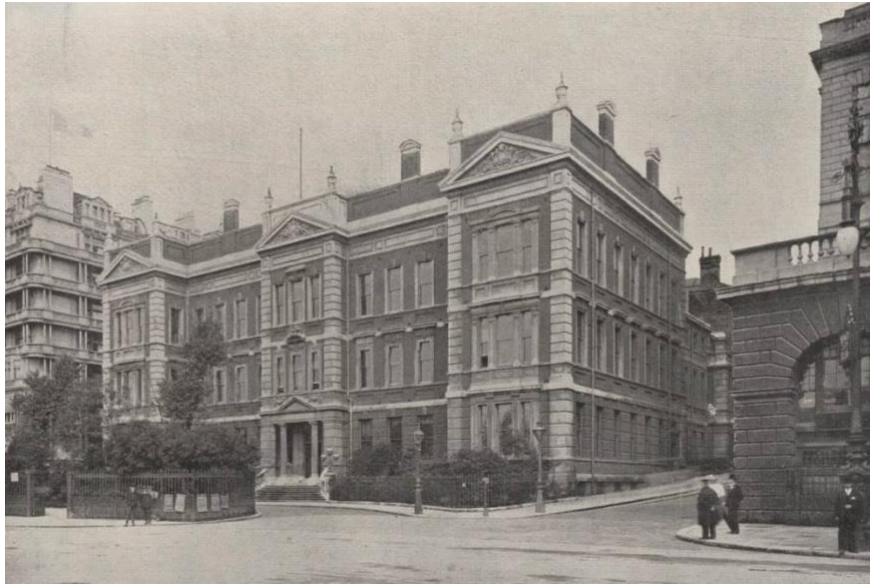


Figure 1. The first home of the IEE – Savoy Place in England

From IEE to IET

In 1921, the IEE stated in its charter the following purpose: ‘to promote the general advancement of Electrical Science and Engineering and their applications and to facilitate the exchange of information and ideas on those subjects among members...’ Within this Charter, clause 14 permitted members the right to put the initials MIEE and AMIEE after their name to indicate professional qualifications. In 1924, the IEE was granted permission to call its corporate members Chartered Electrical Engineers and its coat of arms was granted in 1948.

Today, the IET is made up of over forty preceding organizations dating back to the Society of Engineers (SoE). The family tree of the IET may be viewed on the IET website via the following [link](#).

The IET contains archives of records, membership records, correspondence, photos, minutes, films, medals, and portraits dating back to 1970. These records serve as an excellent resource of information, telling the story of the evolution of electrical engineering and technology over the last two centuries. The [IET Archives](#) also include records of the Institution of Electronic and Radio Engineers (IERE) and the Institution of Production Engineers (IProdE). IET welcomes inquiries about the collections and viewing of the archives which can be applied for [by appointment](#).

IET welcomes its new President – Bob Cryan

Bob Cryan a Chartered Engineer, a Fellow of the Royal Academy of Engineering, Fellow and current President of the Institution of Engineering and Technology is giving his President’s address at Savoy Place on 13 October 2022.

“In my President’s Address, you’ll hear how the IET and its initiatives have been central to my professional life, and from some of the people, I now work with, including actor Sir Patrick Stewart. People who, like me, believe that engineers and their pioneering work hold the keys to the future of humanity.”

Register for the talk and dinner [here](#).

SYSTEMS ENGINEERING IN SOCIETY

Expanding applications of SE across the globe

SERC STEM Research Updates



The Systems Engineering Research Center (SERC) is engaged in multi-faceted research initiatives focused on the challenge of filling the Science, Technology, Engineering and Math (STEM) talent pipeline to meet the needs of the U.S. defense community. Three such

initiatives were highlighted in a recent SERC Research Update.

STEM Education: Predictable Futures vs Incentives and Disruption - Conditions for Innovation and Leading in Workforce Development

SERC's research on the development of STEM talent is part of a broader focus on Human Capital Development. Multiple SERC research projects aim at a common objective of addressing a shortfall of STEM-capable workers in the Defense Industrial Base (DIB). Specific challenges include:

- Only 16% of U.S. high school graduates are "STEM-ready" and half of these drop out of the STEM pathway while at university.
- University STEM graduates increasingly pursue careers outside of the DIB, seeking the higher pay and freedom of career movement offered in other industries.
- The Covid-19 pandemic has worsened the demographic "cliff" of declining enrollment in higher education that will limit the capacity of the STEM talent pipeline.

However, SERC finds that innovations in delivering STEM skills such as Massive Open Online Courses (MOOC's), low cost online degrees and academic/industry partnerships are promising indicators that the challenges of the STEM talent pipeline may be successfully addressed.

Read the [full article](#).

Policy Innovations to Enhance the STEM Talent Pipeline - Understanding Economic Incentives for STEM Education Policy Innovation

To explore some of the issues affecting STEM career choices and retention, SERC initiated a two-year study focused on modeling economic incentives within the STEM education ecosystem and the impact of policy innovations on the STEM pipeline, as well as evidence-based assessments of STEM engagement on the part of students.

The study has used economic and system dynamics models better understand the causal dynamics of student education and career choices and to project the impact of various STEM investment policies.

A first-year report has been issued to summarize progress against three tasks:

- Development of four economic and behavioral models of the higher education ecosystem.
- Talent identification and recruitment to protect and promote the domestic and international STEM workforce.
- Identification of selected universities to support their preeminence in strategic areas.

Read the [full article](#). Download the [report](#).

DOD/Defense Industry Collaboration in STEM Education and Workforce Development - Defense Missions That Engage and Inspire, Recruit and Retain

SERC has undertaken a two-part study to support development of policy options that promote DoD-Defense Industry collaboration in STEM education and workforce development. The goals of this study include:

- Moving ad hoc DoD-Defense Industrial Base (DIB) relationships to partnerships that create a technical workforce to meet defense missions.
- Supporting educational opportunities for defense sector personnel.
- Increasing educational opportunities for veterans and military dependents.

The study found that despite numerous STEM outreach activities aka “a thousand points of light”, no operational construct exists to motivate the creation of DoD-DIB STEM partnerships.

The report associated with this study lays the groundwork for a transition to DoD-DIB collaborative partnerships, in an effort to scale up exceptional programs, amplify collective impacts, focus more clearly on high-priority populations, and provide a path to system-level assessments that lets both DoD and the DIB better understand the return on their investments over time.

Read the [full article](#). Download the [report](#).

The MASS Model of Community-focused Architecture

MASS. In October 2021, the 60 Minutes documentary arm of CBS News televised a story that highlighted the The Model of Architecture Serving Society (MASS) approach toward community-focused architecture. The documentary was based on interviews with three members of the non-profit [MASS Design Group](#), Michael Murphy, Christian Benimana and Alan Ricks, and their unique global experiences in designing innovative architectural solutions to meet community challenges.

The MASS design philosophy takes a holistic view of building projects; in systems engineering terms, the System of Interest is not just the building to be designed and constructed, but also the changed community that will result from the building project. MASS puts priority on three criteria:

- Beauty – building architecture should inspire.
- Local content/employment – the project should produce long-lasting economic benefits for the community by maximizing the use of local resources and creating a sustainable local supply chain.
- Natural airflow – the building should be designed to be naturally healthy with limited use of traditional energy-hungry HVAC systems.

PPI SyEN notes that, without using the language common to systems engineering practitioners, the MASS approach represents a solid understanding of many key principles that undergird proven system engineering practices:

- The need to adapt systems engineering practices to project and system context, i.e., that systems engineering is not a one-size-fits-all set of practices.
- The necessity of taking a holistic view of the system in the context of the problem domain.
- The importance of understanding the full lifecycle of the System of Interest and its interactions with other systems across that lifecycle.
- The centrality of understanding the full range of stakeholders and stakeholder needs associated with any system across its lifecycle.
- The value of gaining a deep understanding of the “problem” from the stakeholders’ perspective.

- The expression of a stakeholder value model in terms of Measures of Effectiveness (MOE's) that serve as criteria in design trade-offs.
- The avoidance of “jumping to an alternative” by using traditional solutions; optimizing stakeholder value by considering a diverse range of novel solution approaches.



MASS was inspired by the work of and direct challenges from the late Dr. Paul Farmer, co-founder of the non-profit [Partners in Health](#). Partners in Health (PIH) takes a holistic view in attempting to strengthen public health systems around the globe. In the [PIH model](#), public health systems are

built around five fundamental ingredients:

- Staff: Well-trained, qualified staff in sufficient quantity to respond to need
- Stuff: Ensuring the tools and resources needed for care delivery and administration
- Space: Safe, appropriate spaces with capacity to serve patients
- Systems: Leadership and governance, information and financing
- Social Support: Providing basic necessities and resources needed to ensure effective care.

Without making the explicit connection, the PIH model displays its grasp of the scientific and systems principle of [emergence](#) as evidenced by the quote “Removing any one item would result in a weaker health system overall”.

PPI SyEN also notes the parallelism between the MASS approach and the principles of multisolving referenced in the FLOWER Multisolving Tool article in Resources section of this edition. The MASS approach matches the definition of multisolving - “when one investment of time or money solves many problems at once” by addressing the long-term community impacts of an architectural design and construction project.

We are encouraged that the application of proven systems engineering principles, regardless of terminology or source, is producing innovative results in industries and with business models outside of the defense/aerospace domains from which many systems engineering practices emerged.

View the CBS documentary [here](#).

Common Earth: Cross-Disciplinary Course on Climate Crisis



The System Dynamics Society (SDS) is promoting a cross-disciplinary exploration of the root causes of and solutions to the climate crisis. The first module of the

Common Earth Insights online program begins on 3 October 2022.

Common Earth offers a comprehensive course to help people develop a systemic understanding of climate change, improving their ability to see interconnections and to recognize their inherent agency and resiliency, thereby forming a compassionate community of people developing holistic responses to climate change. The course gives participants the opportunity to develop their thinking and understanding alongside people equally committed to moving towards a more sustainable and compassionate planet.

Each module in the two-module course runs for eight weeks, with two two-hour sessions per week. Participants should expect a total weekly commitment of eight hours to support prework for each session. The program is fully sponsored by Common Earth, i.e., there is no cost to the participant beyond their time commitment to learn and act upon these learnings.

Module 1: Shifting Perspectives and Making Connections

This module addresses four topics:

- The Principles of Human Experience: The centrality of thought and our ability to write our own story of the future.
- Systems Thinking: Developing a holistic understanding of the world as comprised of nested systems and subsystems with dynamic behavior. Learning a scientific approach to solving problems.
- The Origin Story: Modern mathematical cosmology as a unifying story and motivation to action.
- The Climate Crisis: Exploring the adverse impacts of humans on the planet.

Module 1: Identifying Leverage Points and Harnessing Community

This module explores four new topics that build on Module 1:

- The Economy: Explore how current economic systems are creating the climate crisis.
- Thermodynamics: Gain a richer understanding of how energy systems work and our dependency on them in our daily lives. Understand the constraints that impact a move to a post carbon society.
- Biomimicry: Understand ecological solutions to problems encountered in nature over millions of years and apply those solutions in our technological world.
- Regenerative Agriculture: Learn how regenerative agriculture approaches farming with a focus on growing healthy soil, plants, and ecosystems while putting carbon in its place.

Beyond learning to think holistically about climate challenges, the goal of the Common Earth Insights course is to develop communities that take action. Learning occurs through a combination of lectures, seminars, discussions and self-study using online courses, readings and videos.

Each topic covered will relate to the question: "How can we move to the emerging caring society that puts carbon in its place?"

View the Common Earth course announcement by the [System Dynamics Society](#).

Register for Common Earth Insights - Module 1 [here](#).

Learn more about [Common Earth](#).

MBSE Postdoc Opportunity at Mälardalen University Sweden



Mälardalen University in Västerås, Sweden is offering a post-doctoral position in model-based systems engineering (MBSE). The university is collaborating with Saab Aeronautics and Volvo Construction Equipment in

the project "Mission and Capability Engineering for SoS" (MACE4SoS). The project is exploring modeling techniques to describe missions and capabilities, and tools for design space exploration (DSE). The techniques and tools will be demonstrated in case studies provided by the industrial partners.

The university is looking for a postdoc researcher to focus on model driven DSE for SoS. This work includes the necessary constituent systems of the SoS; the capabilities the constituents should offer and the conditions for doing so; deciding how constellations should be formed within the SoS for a particular mission; and dealing with SoS evolution.

See more information about the research project [here](#).

The applicant is required to have a PhD degree in Computer Science, Computer Engineering, Systems Engineering, Software Engineering, or similar. The applicant must have completed the degree no more than three years before the end of the application period.

The postdoc must have sufficient knowledge and experience of software development to construct prototypes of DSE tools of sufficient quality to be evaluated on non-trivial cases. A solid knowledge of English, both written and oral, is required.

Decisive importance is attached to personal suitability. Mälardalen University values the qualities that an even distribution of age and gender, as well as ethnic and cultural diversity, can contribute to the organization.

Desired experience:

- Model-based systems engineering
- Software and / or systems engineering
- System-of-systems engineering
- Algorithms and heuristics for planning, optimization, simulation, and / or design synthesis
- Ontology engineering

Find more information about the positions, including how to apply, [here](#).

“

In engineering, system integration is the activity of bringing together, during development of a system, the component system elements with the intention of forming a correctly functioning system.

Robert Halligan

FINAL THOUGHTS FROM SYENNA

Dear Reader,

During my recent holidays I took some photos that could be useful in describing the value of a work product that PPI calls the Operational Concept Description (OCD), defined as follows:

“a system or software-centric description of who the users of the system or software are, what are their intended uses of the system or software, how and where the system or software is intended to be used, and a representative set of scenarios of use. These scenarios, each associated with a particular intended use (mission), are chosen to represent both typical and limit conditions of use. The OCD also describes the expected external conditions during use. (PPI)”

Exhibit 1 shows the OCD for a Car Satnav System (CSS). When I showed this to the CSS project manager, she was aghast, shouting “If only you had shown me this at the start of the project, we could have cancelled the whole thing and put those resources to much better use”.



Exhibit 1 – OCD for Car Satnav System

Exhibit 2 appears in the OCD for a Hotel System. It illustrates how an OCD can be a powerful reference point for validation of requirements. It doesn't have to be a long wordy thing; a few sketches and pictures can communicate the “statement of intended use” very elegantly. To twist a well-known saying, a picture can raise a thousand questions. In this example, some obvious ones would be:

- “What is the point of a door that has to stay locked shut?”
- “Is the notice directed towards hotel staff or guests?”
- “What are the needs for key management?”
- “Under what conditions may the door be opened?”
- “Must the sign be legible in a smoke-filled corridor?”



Exhibit 2 – OCD for Hotel System

Exhibit 3 appears in the OCD for a Holiday Apartment Cooker (HAC).

The user scenario (for my user type “getting on a bit”) is as follows:

- User wishes to select cooker mode of operation
- User cannot read the cryptic icons without reading glasses (note that this photo is atypical because the symbols on holiday apartment cookers are usually badly worn)
- User spends ages trying to find reading glasses
- User finds glasses and then can’t remember why they needed to find them
- User gets hungry and then remembers
- User goes back to cooker and can now read the cryptic icons, but has no idea what they mean
- User tries to look up HAC instructions on the web, but apartment Wi-fi is inadequate
- User goes to internet café
- On-line help for HAC says “enter cooker model number – to be found on reverse of unit”
- User returns to apartment to find that the built-in unit cannot be removed in order to discover its model number
- User goes out to local restaurant



Exhibit 3 – OCD for HAC - mode selection

Exhibit 4 also appears in the OCD for the same Holiday Apartment Cooker (HAC).

The user scenario (for all user types) is as follows:

- User wishes to increase cooker temperature set-point
- User rotates knob anti-clockwise so that the "+" symbol aligns with the "deg C" symbol at top dead centre
- Cooker display shows that the set point has decreased by 5 deg C
- User nearly goes to restaurant again but first tries rotating the knob clockwise so that the "-" sign is at top dead centre
- Cooker display shows that the set point has increased by 5 deg C
- User decides never to get on an aircraft designed by these people



Exhibit 4 – OCD for HAC - temperature selection

I had no well-thought-out plan when snapping these photos, but now it is done I can postulate Syenna's first law of the OCD: "No OCD = no Users".
