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Next Generation Systems Engineering: Combining old and new

FEATURE ARTICLE

**Current Reality and Trends in Model-Based
Systems Engineering – Insights from Industry Research**



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WELCOME

Dear SyEN Reader,

Model-based systems engineering (MBSE) is stepping out of the shadows and into the mainstream—and this month's feature article by James Roche, *Current Reality and Trends in MBSE – Insights from Industry Research*, shows why. Drawing on an Aerospace & Defense PLM Action Group study that interviewed practitioners, solution providers, and integrators, Roche maps the value landscape of MBSE. He explains how rising product complexity and digital-engineering mandates are accelerating adoption, yet cultural resistance and tool interoperability are still slowing progress. You will discover which use-cases are maturing fastest, where the most significant capability gaps lie, and why successful programs balance near-term ROI with long-term strategic value. If you need hard data and candid commentary to steer your own MBSE roadmap, this deep dive delivers it.

After that strategic altitude, Syenna's "Final Thoughts" bring us back to the cockpit. In her trademark conversational style, she reminds us that simply labelling every challenge a problem can be a problem in itself. Syenna walks through four thinking disciplines—Situation Appraisal, Problem Analysis, Decision Analysis, and Potential Problem Analysis—and shows how choosing the wrong "tool" can fell the wrong "tree." Her pragmatic advice is a timely counterweight to the abstract discussions MBSE often inspires.

Of course, SyEN 147 offers much more:

- *Systems Engineering News* lists initiatives such as NIST's AI "Zero Drafts" pilot, mentions INCOSE's global chapter milestones, and lists updates to the SETDB tool database.
- *Conferences, Meetings & Webinars* lists upcoming gatherings from IISE 2025 to ISDC 2025—perfect for planning your professional calendar.
- *Systems Engineering Resources* contains a handy summary of the April edition of INCOSE's *Insight* magazine, as well as other tools to up your game.

Whether you're refining an enterprise-wide digital-thread strategy or simply looking for a better way to frame tomorrow's design review, we think you'll find insight—and a few provocative questions—inside these pages.

Enjoy the issue and keep the conversation going.

Warm regards,

Francois

Managing Editor (on behalf of the PPI SyEN Team)

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

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Tests are no substitute for requirements specifications.

Bertrand Meyer

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

Institute of Industrial and Systems Engineers Annual Conference & Expo (IISE 2025)



The [Institute of Industrial and Systems Engineers \(IISE\)](#) will hold the IISE Annual Conference and Expo 2025 in Atlanta, Georgia, USA over 31 May – 3 June.

IISE is offering three [pre-conference workshops](#) on 31 May:

- Hands-on Training: Cyber-Informed Engineering to Secure Industrial Control Systems
- Supply Chain Management Foundations
- Engineering Unleashed: Engaging Minds, Empowering Industrial and Systems Engineers.

[Keynote speakers](#) for the main conference over 1-3 June include:

- [Ajani Dunn](#), Chief Administrative Officer, Mayo Clinic in Florida
- Caroline Russell, Director for Business Development, Mayo Clinic in Florida
- [Jianjun \(Jan\) Shi](#), Georgia Institute of Technology
- [David Reid](#), Director, Production Design, Chick-fil-A

Emerging program details may be found [here](#). [Conference tracks](#) include:

- | | |
|---|---|
| • Construction | • Lean & Six Sigma |
| • Data Analytics and Information Systems | • Logistics & Supply Chain |
| • Energy Systems | • Manufacturing & Design |
| • Engineering Economy | • Modeling & Simulation |
| • Engineering Education | • Operations Research |
| • Engineering Management | • Performance Excellence |
| • Facilities Design & Planning | • Quality Control & Reliability Engineering |
| • Health Systems | • Sustainable Development |
| • Human Factors & Ergonomics | • Systems Engineering |
| • Industry Case Studies, ISE Tools and Professional Development | • Work Systems & Services. |

Conference plans have solidified concerning numerous aspects of the event:

- [Society/Division Town Hall Meetings](#)
- [IISE 2024 Volunteer Service Project](#)
- [IISE Innovation Cup Competition](#)
- [IISE / Rockwell Student Simulation Competition](#).

[Learn more](#). Register [here](#).

[Join IISE.](#)

10th International Engineering Systems Symposium: CESUN 2025



The [Council of Engineering Systems Scholars and Universities \(CESUN\)](#) was established in 2004 as a group of universities with a common interest: addressing some of the great challenges of the 21st century by advancing engineering systems as a new field of study. To support this mission, the 10th International Engineering Systems Symposium (CESUN 2025) will take place over 9-11 June in Arlington, Virginia, USA.

This in-person event will bring together researchers from multiple domains and methodological backgrounds who share a common interest in tackling complex sociotechnical systems problems.

CESUN 2025 topics will address crosscutting themes such as:

- Complex systems design, operation, and evolution
- Humans in engineering systems
- Systems in the societal context
- Technology management and policy
- AI/ML in engineering systems
- Engineering systems education
- Methodological advances in engineering systems.

[Learn more](#) and [register](#).

NAFEMS Launches Medical Devices and Life Sciences Working Group



NAFEMS, the International Association for the Engineering Modelling, Analysis and Simulation community, has established a Technical Working Group on [Medical Devices and Life Sciences](#) to bring together healthcare industry leaders, professionals, academic researchers, experts from regulatory authorities, standards-development organizations and software developers.

The primary goal of the Working Group is to promote the development, understanding, and practical application of *in silico* simulation techniques in the medical and healthcare sectors, ensuring that these tools meet the rigorous standards required for clinical and regulatory use.

The Working Group will tackle a variety of simulation-driven challenges:

- *Design of medical devices*
- *Medical device approval processes*
- *Surgical planning and training*
- *Biomedical modeling.*

Learn more and volunteer to participate [here](#).

Learn more about other NAFEMS [technical working groups](#) or [join](#) NAFEMS.

NIST Launches AI Standards “Zero Drafts” Pilot Project



The U.S. National Institute for Standards and Technology (NIST), seeking to accelerate the development of AI-related standards, has launched an [AI Standards “Zero Drafts” Pilot Project](#). NIST is currently working on scoping and proposing initial concept papers for its initial Zero Draft(s). These documents are preliminary, stakeholder-driven drafts of standards that are as thorough as possible - which will be submitted into the private sector-led standardization processes (via Standards Development Organizations – SDOs) to be developed into voluntary consensus standards.

The pilot project is driven by two simultaneous needs:

- AI standards need to be developed expeditiously
- AI standards demand a wide range of expertise and perspectives.

The proposed process begins with NIST proposing topics and soliciting stakeholder input on which topics to prioritize and how to scope them. For each topic selected by NIST based on this feedback:

- NIST will release a concept paper outlining a proposed direction for a standard
- Based on the concept paper and broad stakeholder input, NIST will propose an initial draft standard
- NIST will iterate on drafts based on further rounds of input
- The resulting document will be submitted to SDOs via established processes as a proposal for formal standardization.

The initial range of topics under consideration includes:

- Documentation about system and data characteristics for transparency among AI actors
- Methods and metrics for AI testing, evaluation, verification, and validation (TEVV)
- Maps of concepts and terminology regarding AI system designs, architectures, processes, and actors
- Technical measures for reducing risks posed by synthetic content.

NIST welcomes inputs on AI topics, topic priorities, needs, foundational ideas and standards concepts and also welcomes organizations that are willing to host “listening sessions” to gather AI-stakeholder inputs. Interested parties should contact ai-standards@nist.gov.

NIST Finalizes Guidelines on Mitigating Cyberattacks Against AI



In January 2024, NIST published voluntary guidelines on how to identify and mitigate cyberattacks against AI. The guidelines are primarily intended for those who design, develop, deploy, evaluate and govern AI systems.

The finalized guidelines, *Adversarial Machine Learning: A Taxonomy and Terminology of Attacks and Mitigations* ([NIST AI.100-2e2025](#)) are now available. Topics include:

Predictive AI Taxonomy:

- Attack Classification
- Evasion Attacks and Mitigations

Generative AI Taxonomy:

- Attack Classification
- Supply Chain Attacks and Mitigations

- Poisoning Attacks and Mitigations
- Privacy Attacks and Mitigations.
- Direct Prompting Attacks and Mitigations
- Indirect Prompt Injection Attacks and Mitigations
- Security of Agents
- Benchmarks for AML Vulnerabilities.

The 114-page report concludes with an extensive discussion of key AI cybersecurity challenges.

See more details [here](#).

INCOSE Q1 2025 Highlights



INCOSE published its Q1 2025 Members Newsletter in March. A sample of various highlights is provided below.

Leadership Notes

Ralf Hartmann, INCOSE President, and Steve Records, INCOSE Executive Director, noted the intentional, increasingly-global focus of the organization, evidenced by:

- International Workshop (IW2025) in Seville, Spain, the first IW held outside the U.S.
- International Symposium 2025 (IS2025) in Ottawa, Canada and IS2026 in Yokohama Japan
- Participation in the World Federation of Engineering Organizations (WFEO)
- Launch of a new Latin America chapter
- Leadership participation in numerous regional conferences.

The structure of the INCOSE Board of Directors is evolving, being simplified by reducing the number of named and specialized positions. By 2029 the Board will consist of President, President-Elect, Secretary, Treasurer, and nine Director-at-Large roles.

To improve engagement with the academic community, INCOSE has decoupled its Academic Council (AC) from the Corporate Advisory Board (CAB). No dues are required of AC members.

Events

The INCOSE International Workshop (IW2025) in February, which PPI attended, had a remarkable turnout of 658 attendees representing 35 countries, with 384 in-person participants in Seville and 274 virtual attendees. Three workshops took center stage:

- Digital Twins Workshop
- Energy Transition Workshop
- MBSE Workshop.

The latest members newsletter included summaries of the progress made during the IW and beyond by numerous working groups, including:

- AI WG
- Complex Adaptive Systems WG

- Configuration Management WG
- Embedding SE into Organizations WG
- Sustainability WG
- Program Management-SE Integration WG
- Human Systems Integration WG
- Requirements WG
- Resilient Systems WG.

Preparations are underway for INCOSE's 35th Annual International Symposium (IS2025) in Ottawa, Canada, in July. PPI will be an exhibitor and participant. See conference details in the Conferences section of PPI SyEN and at <https://www.ppi-int.com/resources/conferences-and-meetings/>.

Sector and Chapter Updates

INCOSE sectors and chapters continue to offer a slate of significant events and to support initiatives that improve the capabilities of their members and their societies. Examples include:

- The [Institute of Engineers, Singapore \(IES\)](#) held a World Engineering Day event at the Singapore Polytechnic with a theme of "*Towards a sustainable world: Engineering the way forward*".
- [JCOSE](#), the INCOSE Japan chapter, hosted a INCOSE Automotive Working Group (WG) in February and the JCOSE Systems Conference 2025 in March.
- [INCOSE Brasil](#) presented the INCOSE Vision 2035 at Embraer. The chapter launched an effort to translate the INCOSE Systems Engineering Handbook, 5th Edition, into Brazilian Portuguese.
- The [New England chapter](#) hosted the 6th annual [INCOSE fall workshop](#) with a theme of "*The Artificial Intelligence Landscape in Systems Engineering*". The chapter also partnered in sponsoring the [Complex Adaptive Systems Conference \(CAS 2025\)](#) in March.
- INCOSE has announced the official establishment of the [Latin America \(LatAm\) Chapter](#).
- Several chapters report significant progress in efforts to stimulate member engagement. These include Greater Philadelphia and [Hampton Roads Area \(HRA\)](#).
- [INCOSE TÜRKIYE](#) hosted two webinars in Q1, launched a member-published blog series, and a new [website](#).
- [AFIS](#), the French chapter, held its annual congress in January with the theme "*Systems engineering for a complex world*".
- The [NORSEC](#) Norway chapter continues to hold Systems Engineering Study Group (SESG) events with the University of South-Eastern Norway (USN). The SESG theme for Spring 2025 is "*Where are we on the digital journey?*". USN received the INCOSE Academic Equivalency (AcEq) recognition at IW2025.
- [GfSE](#), the German chapter, is participating in the [Nordic Systems Engineering Tour Spring 2025](#) in June.
- Planning is underway for the INCOSE UK's Annual Systems Engineering Conference ([ASEC 2025](#)) while celebrating INCOSE UK's 30th anniversary in a [video](#). Two authors in the Don't Panic! series of guides shared their motivation behind these works on the chapter [YouTube Channel](#). PPI will be exhibiting and participating in ASEC.

Additional Content

The Q1 2025 Member Newsletter also included special-topic articles:

- Harmonizing Systems, Safety & Domain Engineering: A Digital Framework for Electric

- Aviation (Shantanu Mishra)
- Generative AI for Systems Engineering: Advances, Reasoning Models, and Deployment Paradigms? (Barclay R. Brown)

[View or download](#) the full (137-page) INCOSE Q1 2025 Member Newsletter for details on these and other topics.

INCOSE and INCOSE Foundation 2024 Reports

Both [INCOSE](#) and the [INCOSE Foundation](#) have released their annual reports for 2024.



The [2024 INCOSE Annual Report](#) provides a detailed overview of the organization's activities, achievements, and progress throughout the past year. Topics addressed include:

- INCOSE Strategic Plan
- Message from the President
- 2024 INCOSE members & associates
- 2024 chapters
- INCOSE certification
- 2024 INCOSE events
- INCOSE products and publications
- 2024 highlights (themes, services, working groups, products, publications, etc.)
- INCOSE financial overview
- INCOSE Board of Directors.

Download this 36-page report [here](#).



The Foundation's [Report of Activities](#) describes its strategic efforts to work in consonance with INCOSE to enable complementary goals that promote broad, inclusive participation, enhance engagement, and address the unique needs of members across different regions and cultures. Strategic activities during 2024 include development of a Strategic Plan and collaborations with global SE projects such as:

- Support for African SE communities
- Academic expansion in Brazil
- Sustainability challenges in Colombia.

The Foundation also sought to advance the SE community through advancing education, professional development, and process innovation in several industries. This was accomplished by:

- Recognizing research excellence through two Doctoral Research awards
- Supporting student awards in the International Science and Engineering Fair (ISEF)
- Supporting the STEM initiatives of local INCOSE chapters.

Donate to the INCOSE foundation [here](#).

Modelica Association News



[Modelica](#) is a freely available, equation-based, object-oriented language for convenient and efficient modeling of complex, multi-domain cyber-physical systems described by ordinary differential, difference and algebraic equations. The [Modelica Association](#) is a non-profit organization that develops coordinated, open access standards and open source software in the area of cyber physical systems. Highlights from the Association's ([January 2025](#)) newsletter are found below.

[System Structure & Parameterization \(SSP\) 2.0](#)

The release of the SSP 2.0 standard enables industries such as automotive, aerospace, energy, and manufacturing to push the boundaries of digital engineering, virtual prototyping, and AI-driven development. Enhancements include:

- Architecture Exchange
- Advanced Co-Simulation
- Broader Component Support
- Virtual Electronic Control Units (vECUs)
- Layered Standards & Metadata
- Next-Gen Digital Twins
- AI & Machine Learning.

Read the full SSP 2.0 press release [here](#).

The Association is also beginning the development of an [SSP Traceability layered standard](#) that will address the challenges of demonstrating the credibility of simulations that are used to inform design decisions. The standard will enable design teams to build a Chain of Trust for confident simulation-based decision-making through a digital thread of simulation-based evidence linked to product requirements and performance indicators. Aspects of this standard include:

- Open, flexible & scalable credible simulations
- Flexible and standardized metadata exchange
- Model reuse and continuous improvement.

View the current [SSP traceability specification](#).

[Conferences and User Meetings](#)

The 17th OpenModelica Annual Workshop took place on 3 February 2025 in Linköping, Sweden. Conference presentations are available [here](#) and include topics such as:

- [Towards a strict, robust and scalable subset of Modelica](#)
- [Current Status and Technical Overview of OpenModelica and its Development Environment](#)
- [Future Directions of OpenModelica – Next 5 years and Next 20 years](#).

This event was immediately followed on 4-5 February by 19th international MODPROD Workshop on Model-Based Cyber-Physical Product Development. Learn more about this workshop [here](#).

Preparations are underway for the [16th International Modelica & FMI Conference](#) that will be held in

Lucerne, Switzerland on 8-10 September 2025.

[*Functional Mock-up Interface \(FMI\) News*](#)

Maintenance releases FMI 2.0.5 and FMI 3.0.2 were issued in late 2024. See release notes [here](#).

Significant progress is being made in the definition of layered standards (application-focused extensions) on top of the FMI standard, including:

- [FMI-LS-XCP](#) v1.0.0 - Universal Measurement and Calibration Protocol
- [FMI-LS-BUS](#) v1.0.0-rc.1 release candidate - network communication simulation
- [FMI-LS-STRUCT v1.0.0-alpha.1 prerelease](#) – Management of variables and parameters

See an overview of FMI layered standards [here](#).

[*Modelica Vendor News*](#)

[Orthogonal Supersystems](#) has announced the release of ODE, a web-native advanced Modelica simulation and collaborative design platform that boasts of advanced model-based application tools, enhanced user experience and a design-driven philosophy.

Session videos are available from the [SimulationX User Conference 2024](#) sponsored by [Keysight](#).

[orchideo | easySSP v1.4.1](#) has been released with support for the SSP 2.0 standard.

[XRG Simulation](#) is celebrating its 20th anniversary with continued focus on delivering premium thermal system simulations to industrial customers. See [company milestones](#).

[Modelon](#) is also highlighting their 20th anniversary of support for an open standard for modeling and simulation with a [reflective article](#) and a variety of new software capabilities and published resources.

The release of [OpenModelica 1.25.0](#) incorporates support for hierarchical parameter editing in structured models, a Reload package feature, an Open Class in text view feature, and an improved compiler front end.

[Model Based Innovation LLC](#) has announced an expanded set of tool and library partnerships and a wide range of training and simulation customization services.

View details of these and other announcements in the latest [Modelica Association newsletter](#).

Dassault Systèmes and RWTH Aachen University Partnership



On 13 March, [Dassault Systèmes](#) announced a 10-year collaboration with the Institute for Machine Elements & Systems Engineering (MSE) at RWTH Aachen University in Germany. The agreement opens the door for the university's 13,000 mechanical engineering students to use Dassault Systèmes' cloud-based 3DEXPERIENCE platform as an integral part of their mechanical engineering curriculum. The 3DEXPERIENCE platform connects modeling with physical and AI-based simulation and creates traceability of system parameters in one collaborative environment.

In addition to education, the collaboration includes joint research activities of MSE and Dassault Systèmes to enhance MBSE methods and processes. New research-driven technologies will be transferred to industry by the Center for Systems Engineering (CSE), RWTH Aachen's interdisciplinary hub.

Learn more [here](#).

Updates to the Systems Engineering Tools Database (SETDB)



The Systems Engineering Tools Database (SETDB), developed by PPI in partnership with INCOSE, provides a virtual platform for engineering tool vendors to communicate their latest offerings.

Recent SETDB updates, including both new tools and updates to existing tools, include:

Vendor: [Altia Inc.](#)

- [DeepScreen](#): Converts GUI models and prototypes into deployable graphics code. User interfaces have interaction defined in graphical editors, displays consist of images, fonts and other custom components. Altia's code generator processes them into efficient codes ready to deploy on production devices.

Vendor: [Ansys Inc.](#)

- [Ansys Medini Enterprise](#): Dramatically decrease safety and security analysis efforts while accelerating time to market with state-of-the-art methods in the model-based environment of Ansys Medini Analyze.

Vendor: [AUTOSAR](#)

- [Standards](#): The AUTOSAR layered architecture is offering all the mechanisms needed for software and hardware independence. It distinguishes between three main software layers which run on a Microcontroller (μ C): application layer, runtime environment (RTE), and basic software (BSW).

Vendor: Benchmark Consulting Canada

- [IRIS Business Architect](#): A browser-based application intended for use by business executives, change managers, enterprise architects, business analysts, and agile experts to plan, adjust, and deliver optimal strategic initiatives and projects.

Vendor: Change Vision, Inc.

- [Astah SysML](#): A lightweight SysML diagramming tool which is perfect for systems engineering. Our user-friendly tool helps create a clear understanding among business analysts, engineers, developers, and quality assurance specialists with Astah SysML.
- [Astah UML](#): Astah UML will allow you to create a set of UML 2.x diagrams for your project.
- [Astah Professional](#): Helps you create UML diagrams, ER Diagram, Flowchart, and DFD and more
- to create a clear understanding of your software design among teams.

Vendor: DGB Technologies LLC

- [SAFEST](#): A probabilistic risk assessment tool based on dynamic fault trees and event trees.

Vendor: DRAKON Labs

- [DrakonHub](#): Free online diagramming software for flowcharts, mind maps, and checklists to name a few. DrakonHub will automatically create links between diagrams to create an integrated knowledge base. A cloud-based app that runs in a web browser from your phone, laptop, or desktop.

Vendor: [Galorath Incorporated](#)

- [SEERai](#): An advanced generative AI trained on four decades of proprietary data and proven methodologies. It was built specifically to provide digital engineers and cost estimation professionals with the data-driven insights needed for accurate and timely project planning and cost estimation.
- [SEER for Systems Engineering](#): SEER-SYS estimates systems engineering cost, schedule, and effort for projects of all sizes and complexities. It provides systems engineers, program managers, and cost analysts, the ability to understand and optimize the effort and schedule of systems engineering activities quickly and effectively.
- [SEER-SPACE](#): SEER-Space was built from a comprehensive collection of space missions and credible, defensible data sources along with extensive research by Galorath's team of space experts. It allows early estimation of space missions when little information is known as well as during later phases of a project.
- [SEER for Software](#): Estimating, planning, analyzing and managing complex software projects is risky business. SEER enables users to establish realistic expectations, control profitability and see, manage and mitigate risks throughout the software development and maintenance lifecycle.
- [SEER for Hardware](#): The costing process for hardware projects is time consuming, error prone, and opaque. Estimates often rely on judgment, tribal knowledge, and various levels of costing skills. The numbers are only as good as the least skilled estimator. SEER uses a trusted estimation model based on actuals.
- [SEER for IT](#): SEER, quickly understand the likely cost, schedule, effort, risk, and reliability of a project. SEER provides Parametric Cost Estimation for IT projects enabling alternative evaluations, design to cost trade studies, vendor evaluations and monitoring as well as project cost and effort.

Vendor: [IBM](#)

- [SPSS Statistics](#): A powerful statistical software platform that extracts actionable insights from your data using statistical procedures to ensure high accuracy and quality decision making. All facets of the analytics lifecycle are included, from data preparation to analysis and reporting.

- [SPSS Modeler](#): A leading visual data science and machine learning (ML) solution designed accelerate time to value by speeding up operational tasks for data scientists for data preparation and discovery, predictive analytics, model management and deployment to aide the monetization of data assets.
- [SPSS Amos](#): A structural equation modeling (SEM) software that supports multivariate analysis methods, including regression, factor analysis, correlation and analysis of variance with attitudinal and behavioral models reflecting standard multivariate statistics techniques.
- [Synergy](#): A task-based software configuration management (SCM) solution that brings together global, distributed development teams on a unified platform. The SCM repository manages all artifacts related to software development, including source code, documents, and much more.
- [ClearCase](#): Provides controlled access to software assets, including code, requirements, design documents, models, test plans and test results. It features parallel development support, automated workspace management, baselining, version management, build auditing, and flexible access.

Vendor: [Inflectra Corporation](#)

- [Rapise](#): A test automation tool intended for development teams to help test web, mobile, desktop, & APIs. Tightly integrates with SpiraTest and Microsoft Team System.

Vendor: [Intasoft Ltd.](#)

- [IntaChange](#): Change Management software for complete change control in an automated, simple to use Enterprise Change Management system. It increases product control and provides detailed information on all changes, in a simple and concise format at every lifecycle stage.
- [AllChange](#): Integrated change management, version control, release management and source code control in a single product. Problem management, change management, configuration management, SCM Software & Configuration Item and Release management templates are included.

Vendor: [iPlan Enterprise Pvt. Ltd.](#)

- [iPlan Portfolio Management](#): Provides the capability to record budgets, select metrics, define project scorecards, execute impact analysis, record goals, assumptions, constraints and targets and much more to provide a product portfolio view of the business.
- [iPlan Requirement Management](#): Creates and decomposes concepts into requirements and captures inter-requirements relationships to incorporate into projects. Maintains visibility of requirements, requirements changes and documents test cases for each stage of the lifecycle.

Vendor: ITP Aero

- [ESATAN-TMS](#): The ESATAN Thermal Modelling Suite (ESATAN-TMS) is a complete thermal modelling environment and brings under one roof the capabilities of ESARAD, ESATAN, FHTS and ThermNV.
- [CADbench](#): Provides the thermal engineer with an environment to view and modify the CAD geometry and generate the analysis model. When generating the thermal analysis model from CAD geometry it is common practice to simplify the geometry.
- [Workbench](#): An integrated environment with full pre- and post-processing capabilities, providing geometry modelling, visualization, reporting and analysis case control. It

introduces multiple ways of building the geometrical model and creating finite element or lumped parameter representation.

- [Thermal](#): The underpinning "engine" based on the lumped parameter formulation. A flexible and easy to use syntax is allowed within ESATAN-TMS input files enabling arbitrary algebraic expressions to be used to define non-constant material properties.
- [ThermNV](#): Enables the visualization, inspection and processing of thermal analysis networks, either for model validation or post-processing tasks such as heat flow inspections, limits reports and charting.
- [ThermXL](#): The integration of ThermXL within Excel allows the full functionality of the spreadsheet to be used both for the model input definition and result presentation, providing enormous flexibility in model definition and greatly easing the model documentation, presentation and reporting.
- [Fluids](#): Provide the capability to carry out the thermohydraulic analysis and simulation of a piped fluid network which may be connected to a standard ESATAN thermal model. The ability to provide a steady state and transient analysis is also available.

Vendor: [Micro Focus International plc](#)

- [Dimensions CM](#): A software change and configuration management system for Agile software development programs. It is a process-based solution that automates Agile development tasks. It supports common databases, features advanced network compression and advanced library cache technology.

Vendor: Modelon Inc

- [PyFMI](#): A package for loading and interacting with Functional Mock-Up Units (FMUs), which are compiled dynamic models compliant with the Functional Mock-Up Interface (FMI), see <https://www.fmi-standard.org/> for more information.

Vendor: PTC

- [Arena PLM](#): Arena Product Lifecycle Management software brings product information, people, and processes together into a single enterprise platform to speed product design and development. Our Cloud PLM software is easy to use anytime and anywhere.
- [Arena QMS](#): Brings quality and related product development teams together to speed commercialization efforts, simplify regulatory compliance, and drive continuous improvement. Arena QMS helps everyone work together and provides significant value for quality, operations and engineering departments.

Vendor: [Riskonnect](#)

- [Risk Management Information System](#): Gives you the data, analytics, and insight to turn risk into a strategic advantage by consolidating real-time risk data from multiple internal and external sources to identify trends, emerging risks, and opportunities.
- [Compliance Software](#): Helps you manage regulatory issues to reduce risk and protect your organization. It helps you keep close tabs on corporate and legal policies, procedures, and requirements – from one place – to defend against regulatory fines or other costly damages.

Vendor: [Sensmetry](#)

- [SysIDE Pro](#): A comprehensive SysML v2 tool suite for professionals and enterprises
- [SysIDE Editor](#): An open-source SysML v2 textual editing and analysis system. SysIDE (pronounced "seaside") provides SysML v2 language support in VS Code and can be used as

Integrated Development Environment. SysIDE was developed and is currently maintained by Sensmetry.

Vendor: [Siemens Digital Industries Software](#)

- [HEEDS](#): A design space exploration and optimization package that interfaces with all commercial computer-aided design (CAD) and computer-aided engineering (CAE) tools, eliminating the need for custom scripting. HEEDS enables automated lifecycle process workflows and design concept searching.

Vendor: [SOFTEAM](#)

- [Modelio SA](#): Supports the UML and BPMN modeling standards as specified by the Object Management Group (OMG). It provides all the standard diagrams for UML and BPMN and can exchange models using the standard XML format making it easy to model a complete business process.
- [Modelio SA SysML](#): Enables architects and system engineers to formalize functional system specifications with SysML models. SA SysML supports all SysML diagrams, from block diagrams to internal and parametric diagrams, and has many functions to author a functional, formal, and clear specifications.

Vendor: [SPEC Innovations](#)

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

Vendor: Tecolote Research

- [ACEIT Suite](#): A family of Automated Cost Estimating Integrated Tools (ACEIT) that support program managers and cost/financial analysts during all phases of a program's life-cycle.
- Session Analyzer: ACEIT application that scans your ACE session and identifies potential problems that could lead to unexpected numerical results. It makes sure that good ACE modeling practices have been implemented.
- Librarian: A powerful application that lets any user or site build and maintain their own Inflation Indices and CER Libraries. With this tool a user can build a library of inflation tables or cost methodologies and data sources/references for their program, project, or organization in ACEIT.
- Inflation Utility: An Excel Add-in program that allows you to inflate costs in an Excel spreadsheet. The inflation utility uses the same database of inflation indices that ACE uses. The utility can convert costs from a base year (constant) dollars to base year dollars in another year.
- ACEIT Admin: An administrator module for ACEIT. It allows you to determine the location of files and databases, repair files, view and edit license information and copy example files.
- [ACE Plug-Ins](#): Allow an ACE user to seamlessly incorporate data from external 3rd party applications into an ACE session. With plug-ins analysts can choose the best tool available for estimating different elements of the overall estimate.

Vendor: [Targeted Convergence Corporation](#)

- [Success Assured®](#): Teams that design complex products use Success Assured® to increase their productivity 4X and cut their time-to-market in half. How? Success Assured® enables analyses to make the key decisions based on concrete knowledge, collaboratively leveraging everybody's expertise, eliminating the guesswork.

Vendor: [VisibleThread](#)

- [VT Insights](#): An AI document analysis software intended for enterprises to support business writers and track enterprise-wide quality improvement in the use of in jargon-free, easy to understand language.
- [VT Writer](#): A secure AI writing assistant for business writers to instantly score their content and suggest improvements to improve the quality of mission-critical business writing. Used by Proposal Teams, Contracts, HR, Finance, Marketing, Operations, Senior Leadership, Quality, Engineering etc.
- [VT Docs](#): Document analysis software for proposal and contract teams to assist with the preparation and improve the clarity of contractual documents.

In addition to software tools, the SETDB also includes other resources such as standards and frameworks. This quarter's updates have yielded numerous such items:

Source: INCOSE

- [Digital Engineering Measurement Framework](#): This initial DE measurement framework proposed by our team of representative stakeholder experts is intended to help projects and enterprises establish an initial path toward a measurably effective transition and implementation of digital engineering processes, tools, methods and measures.
- [Digital Systems Engineering Process Model](#): The product consists of two parts. First part – the interactive process model – covers the first purpose. The second part – editable machine-readable process model – covers the second purpose.
- [Guide to Needs and Requirements](#): Needs and requirements form the backbone of the systems engineering information model of the System of Interest being developed. Needs and requirements definition and management addresses how the stakeholder needs and requirements are formed and managed throughout the project lifecycle.
- [Guide to Verification and Validation](#): Provides practical guidance for successful verification and validation activities across all system lifecycle activities, as well as clarifications on misunderstandings of the true nature of verification and validation as applied to the design of the product.
- [Guide to Writing Requirements](#): The INCOSE GtWR v4 is a mature product that is used extensively by INCOSE members. This latest revision represents a further evolution of the concepts communicated within the Guide based on comments and inputs received from members of the RWG and larger body of INCOSE members.
- [INCOSE Model-Based Capabilities Matrix](#): A tool to help organizations that have already decided to implement digital engineering or Model-Based capabilities assess, and then plan the development of these capabilities in a comprehensive and coherent manner.
- [Model Portfolio Management Guide](#): A model manager works in conjunction with program managers, project managers, systems engineering managers and the modelers responsible for their models to manage a collection of models throughout the modeling lifecycle.
- [Technical Measurement Guide](#): This guide provides information on implementing technical measurement on a project including Measures of Effectiveness (MOEs), Key Performance Parameters (KPPs), Measures of Performance (MOPs) and Technical Performance Measures (TPMs).
- [The Guidance to ISO/IEC/IEEE 42020 — Architecture Processes](#): This comprehensive guide provides valuable insights and best practices for applying the architecture processes defined in ISO/IEC/IEEE 42020. It covers key areas such as architecture governance, management, conceptualization, evaluation, and elaboration across enterprises, systems, and software.

Source: [The Modelica Association](#)

- [System Structure & Parameterization \(SSP\)](#): A tool independent standard to define complete systems consisting of one or more FMUs (see Functional-Mockup-Interface) including its parameterization that can be transferred between simulation tools. It is available for downloading.

Source: [SAE International](#)

- [ARP4754B](#): This SAE Aerospace Recommended Practice (ARP) provides recommendations for the development of aircraft and systems, taking into account aircraft functions and operating environment.
- [ARP4761A](#): ARP4761A and its EUROCAE counterpart, ED-135, present guidelines for performing safety assessments of civil aircraft, systems, and equipment.

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

Access the [SETDB website](#).

Upcoming PPI Live-Online™ and In-Person Systems Engineering Five-Day Courses

Click [here](#) to view the full schedule or register for upcoming courses

P006-961-1	Asia SGT 6:00 (UTC +8:00) PPI Live-Online™	23 Jun – 27 Jun 2025
P006-961-2	Oceania AEST 8:00 (UTC +10:00) PPI Live-Online™	23 Jun – 27 Jun 2025
P006-962	Eindhoven, the Netherlands CEST 8:30 (UTC +2:00) In-Person	14 Jul – 18 Jul 2025
P006-963	Las Vegas, USA PDT 8:00 (UTC -7:00) In-Person	21 Jul – 25 Jul 2025
P006-964-1	Asia SGT 6:00 (UTC +8:00) PPI Live-Online™	25 Aug – 29 Aug 2025
P006-964-2	Oceania AEST 8:00 (UTC +10:00) PPI Live-Online™	25 Aug – 29 Aug 2025
P006-965-1	Europe CEST 9:00 (UTC +2:00) PPI Live-Online™	15 Sep – 19 Sep 2025
P006-965-2	United Kingdom BST 8:00 (UTC +1:00) PPI Live-Online™	15 Sep – 19 Sep 2025
P006-965-3	South Africa SAST 9:00 (UTC +2:00) PPI Live-Online™ (Exclusive to South Africa)	15 Sep – 19 Sep 2025
P006-965-4	Türkiye TRT 10:00 (UTC +3:00) PPI Live-Online™	15 Sep – 19 Sep 2025
P006-965-5	Saudi Arabia AST 10:00 (UTC +3:00) PPI Live-Online™	15 Sep – 19 Sep 2025

CONFERENCES, MEETINGS & WEBINARS

Events of relevance to systems engineering

INCOSE LA Webinar: Integrating Software & Systems Engineering



The [INCOSE Los Angeles chapter](#) will be hosting a hybrid presentation on 10 June titled *Integrating Software & Systems Engineering: Transdisciplinary Approach to Breaking Traditional Silos*. The in-person venue will be the Aerospace Corporation in El Segundo, California, USA.

Abstract:

Disconnects between Systems Engineering and Software Engineering invariably compromise the reliability of complex systems. Agile methodologies, widely used in software development, often ignore traditional systems engineering modeling languages such as SysML, leading to significant gaps in requirements modeling. Compounding this problem is the fact that systems models are typically decomposed from a functional perspective, creating further dissonance between the two disciplines. Currently in the news, Boeing's Starliner spacecraft problems vividly illustrate the System/Software disconnect.

Learn more and register [here](#).

10th International Engineering Systems Symposium: CESUN 2025



The [Council of Engineering Systems Scholars and Universities \(CESUN\)](#) was established in 2004 as a group of universities with a common interest: addressing some of the great challenges of the 21st century by advancing engineering systems as a new field of study. To support this mission, the 10th International Engineering Systems Symposium (CESUN 2025) will take place on 9-11 June in Arlington, Virginia, USA.

This in-person event will bring together researchers from multiple domains and methodological backgrounds who share a common interest in tackling complex sociotechnical systems problems.

CESUN 2025 topics will address crosscutting themes such as:

- Complex systems design, operation, and evolution
- Humans in engineering systems
- Systems in the societal context
- Technology management and policy
- AI/ML in engineering systems
- Engineering systems education
- Methodological advances in engineering systems.

[Learn more](#) and [register](#).

Building Business Capability (BBC 2025) Conference



The International Institute of Business Analysis™ (IIBA®) is hosting the Building Business Capability (BBC 2025) conference in Phoenix, Arizona, USA from 9-12 June 2025. The theme of this in-person conference is *"Immerse Yourself - Engage & Excel!"*. The goal of the BBC 2025 event is to enhance participants' ability to advance People, Product, Data, and Knowledge, to build core leadership skills, to create a customer-centric organization, and to deliver digital transformation.

The four-day conference will feature 100+ sessions and 80+ speakers to serve the anticipated 1000+ delegates.

A small sample of the presentations planned for the main conference sessions on Tuesday, 10 June and Wednesday, 11 June includes:

- AI in Requirements Management: Shaping the Future
- Anatomy of a User Story: Writing Aligned User Stories
- Avoiding the solution illusion: Techniques for understanding "why"
- Case Study: Business Architecture for Quick Transformation
- How Non-Functional Requirements Can Change Lives
- Outcome is King...Or How To Rethink Modeling a Value Stream
- Prototype Like a Pro: Turning Ideas into Actionable Requirements
- Reaching Scale with Design Thinking
- You Don't Know Me: Reimagine Product Innovation & Customer Value.

A sample of the tutorials, to be delivered on Monday 9 June and Thursday 12 June, finds topics such as:

- Deriving the Highest Value through Design Thinking
- Elicitation of the "real" needs
- Engineering the Business Experience: How Processes, Rules and Requirements Can All Work Together
- Focus on "Why": The Crucial Role of Benefits in Business Analysis
- Practical Process Modeling: Hands-On Learning, 'critical models you cannot be without'
- The Core Concepts of Business Architecture
- Unlocking Transformation: A Practical Guide to AI Technologies.

Explore the full conference agenda [here](#).

[Learn more](#) about BBC 2025 and [register](#).

Subscribe to the [BBC 2025 newsletter](#) to receive discounts and conference updates.

System Dynamics Summer School 2025



The System Dynamics Society (SDS) is offering two members-only opportunities to learn system dynamics concepts and skills and gain application experience in the form of the [System Dynamics Summer School](#) that will run from 9 June (start of pre-work) through live online sessions on 7-10 July 2025.

CONFERENCES, MEETINGS & WEBINARS

Introductory Track

The Introductory Track is for individuals with no or minimal System Dynamics knowledge. The purpose is to teach the System Dynamics methodology and not specific software syntax. There will be models available in Vensim, Studio, and Stella. Free versions of modeling software that are limited in capability or limited in duration of use will be available. Introductory Track instructors include:

- Birgit Kopainsky, University of Bergen
- Rod MacDonald, James Madison University
- Oleg Pavlov, Worcester Polytechnic Institute
- Raafat Zaini, James Madison University
- Erica Rieder, University of North Carolina
- Larissa Calancie, Tufts University
- Hector Menendez, South Dakota State University.

Introductory Track Daily Schedule

Day One 7 July	Day Two 8 July	Day Three 9 July	Day Four 10 July
Modeling Steps & Problem Definition	Formal Modeling of Stocks and Flows	Nonlinear Relationships	Model Analysis
Modeling Feedback Mechanisms	Information Delays	Policy Modeling	Model Use
Conceptual Modeling with Stocks and Flows	Workshop: Accumulation, Feedback, and Information Delays	Model Validation	Workshop: Common Pitfalls and Best Practices
Workshop: Introduction to System Dynamics Modeling Software	Applications Lecture	Applications Lecture	Applications Lecture

Participants in the Introductory Summer School may attend online classes held at times that are convenient for European or American time zones. Both tracks will cover the same material. Each track will convene three times per day for 90-minute sessions.

Intermediate Track

Qualifications for the Intermediate track include a self-assessment test over the basics of system dynamics. The Intermediate track focuses on software (Studio, Vensim, and Stella). It presents more advanced modeling techniques. Free versions of System Dynamics modeling software, which are limited in capability or duration of use, will be made available.

Intermediate Track instructors include:

- Willem Auping, TU Delft
- Bob Eberlein, isee systems
- Ying Qian, University of Shanghai for Science and Technology

CONFERENCES, MEETINGS & WEBINARS

Intermediate Track Daily Schedule

Day One 7 July	Day Two 8 July	Day Three 9 July	Day Four 10 July
Steps of Modeling: Problem Description	Simulating Nonlinear Relationships	Recognizing and Avoiding Common Pitfalls	Model Improvement
Model Building: Stocks and Flows	Simulating the Flow of Information	Validation Testing: For Us & Our Client	Applications Lecture
Checking Results with Equilibrium Diagrams	Checking Results with Delays in the Flow of Information	Applications Lecture	
Diagrams to Show Feedback Loops	Applications Lecture		

Live, instructor-led online sessions of the Intermediate Summer School will be scheduled to accommodate participants from around the world, with final timing based on participant preferences once the roster is finalized.

Both courses require significant pre-work in the form of watching videos and tutorials prior to the week of synchronous class sessions.

[Learn more about](#) and [join](#) the SDS to participate in the Summer School.

See more details on the [System Dynamics Summer School](#) and register prior to 9 June 2025.

Webinar: AI-Driven Product Strategy - Transforming the Future of Product Management



As part of its Innovation in Focus webcast series, the [Product Development Management Association \(PDMA\)](#) will host a free webinar on 12 June titled “AI-Driven Product Strategy: Transforming the Future of Product Management”, presented by Keyuri Anand of Samaritan Apps.

Overview

AI is rapidly transforming product management, offering unprecedented opportunities for innovation, efficiency, and data-driven decision-making. As we look towards 2025 and beyond, several key trends are emerging that will shape the future of AI-driven product strategy. Understand how AI can be leveraged to create more innovative, user-centric products while optimizing the product development process.

Key Takeaways

- AI as a Catalyst for Enhanced Decision-Making
- Personalization at Scale
- Efficiency and Innovation in Product Development.

[Learn more](#) and register for this event.

International Workshop on Equation-Based Object-Oriented Modeling Languages and Tools (EOOLT 2025)

The logo for the EOOLT workshop, featuring the text "Equation-Based Object-Oriented Modeling Languages and Tools" in a serif font, with "Equation-Based" in blue and the rest in black, set against a light blue background with a subtle grid pattern.

The 10th International Workshop on Equation-Based Object-Oriented Modeling Languages and Tools (EOOLT 2025) will take place on 13 June in Bielefeld, Germany.

This in-person event seeks to explore the capabilities of hybrid modeling languages based on equations that support both continuous-time and event-based aspects of cyber-physical systems. Examples of such languages include Modelica, SysML, VHDL-AMS and Simulink/Simscape.

The EOOLT workshop addresses the current state of the art of equation-based object-oriented (EOO) modeling languages and explores topics that aim to overcome limits of their expressiveness, correctness, and usefulness.

View [Proceedings](#) from EOOLT 2019.

The agenda for the workshop is being finalized; check back [here](#) to learn more and register.

NAFEMS Webinar: The Impact of MBSE on Engineering Simulation



NAFEMS is hosting a free webinar on 19 June titled "*The Impact of MBSE on Engineering Simulation.*" Sponsored as part of the [ASSESS Initiative](#), this event will focus on how MBSE, combined with Engineering Simulation, is transforming the way complex systems and products are designed, analyzed, and optimized.

Scott Ragon, Principal Product Manager at Ansys, will highlight various aspects of the MBSE-Simulation integration that improve the consistency and traceability between system models, simulations and design decisions.

Learn more and register [here](#).

The Storytelling Leader Workshop



The [Waters Center for Systems Thinking](#) (WCST) is a non-profit foundation with forty years' experience in delivering systems thinking know-how to a diverse set of communities and individuals (from kindergarten students through Fortune 500 CEOs). The Center is sponsoring [The Storytelling Leader](#) workshop on 26 June 2025 in Tucson, Arizona, USA.

OVERVIEW: Are you ready to find, tell, and activate stories around your most urgent work? Join us at this full-day active learning workshop with renowned expert in narrative leadership and complex systems change, David Hutchens. Leave with highly persuasive narratives to engage people in your innovation work, align the system to action, provide context for change, and build organizational culture and identity... all while shaping your own voice of leadership influence.

CONFERENCES, MEETINGS & WEBINARS

Topics covered include:

- Part 1: Why Story – Experience how stories create powerful human connections through “neural coupling” examples
- Part 2: Find Your Stories – Consider “story taxonomies” (patterns), identify relevant stories, and use the Story Canvas to develop your story
- Part 3: Activate Your Stories – Practice telling your story to others and receive coaching.

Learn more and register [here](#).

International Society for the Systems Sciences (ISSS) 69th Annual Conference



The [69th Annual Conference](#) of the [International Society for the Systems Sciences \(ISSS\)](#) will take place from July 11 to 15, with the in-person

portion of this hybrid event to be held in Birmingham, UK. The theme for the conference is *Advancing Together - An Invitation for Systemic Collaboration*.

Plenary speakers for this event include:

- Agricultural Crisis & Systems Science (AIESS): Transition from Degenerative Agriculture to Climate Balancing Regenerative Agriculture (Dr. Amar K J R Nayak, Professor of Strategy and Chairperson of AIESS)
- Deep Systems Thinking & the Ecology of Human Experience (Christopher Chase, educator and author)
- Education and Knowledge Sharing (Dr. Clifford Whitcomb, Cornell University)
- Energy and Climate (Professor Lucian Gill)
- Harnessing Systems Science: The Key to Unifying Diverse Theories in Systems Practice (Dr. Alejandro Salado, University of Arizona)
- Policy and Governance (R. Eva King, Goshawk Consulting LLC)
- Systemic Leadership: Birmingham Leadership Institute (Dr. Juanita Bernal and Dr. Rachel Lilley)
- The Built Environment (Dr. Mark Enzer, University of Cambridge).

Register [here](#).

INCOSE-APTA Transportation Infrastructure Workshop



The INCOSE Canada chapter in collaboration with the American Public Transportation Association (APTA) is hosting the 2025 Transportation Infrastructure Workshop on 25 July in Ottawa, Canada. The workshop seeks to address challenges associated with the current surge in infrastructure investment, including:

- Complicated legacy system and new technology integrations
- Increasing infrastructure technical complexity
- Varying and ambiguous expectations and methodologies between projects and

organizations.

Workshop participants will collaborate to create a unified vision, share best practices, and learn the latest innovations - shaping the INCOSE-APTA Systems Lifecycle Engineering (SLE) Standard. The workshop will feature presentations by industry experts, interactive breakout sessions, and an overview of the stakeholder engagement standard, providing valuable insights, fostering collaboration, and ensuring participants are well-versed in best practices.

Learn more and register [here](#).

Interested parties should note the workshop's proximity in space-time to INCOSE IS 2025 and plan accordingly.

Program Details: INCOSE IS2025



The INCOSE [International Symposium 2025 \(IS2025\)](#) will take place from 26 to 31 July 2025, with the in-person portion of this hybrid event to be held at the [Rogers Centre](#) in Ottawa, Canada.

[Program details](#) for this premier annual INCOSE event have been recently released, highlighting the distinctions between the in-person and virtual participation options. [The in-person experience](#) includes 6 days of content, distributing 160+ presentations and panels across 6 tracks.

Sixteen tutorials will take place from 26 to 27 July, including:

- Beyond Traditional Engineering: Transformative Approaches for a Changing World
- Decision Making Strategies for Systems Engineers
- Developing Custom LLMs for Systems Engineering
- Enterprise SE: A New Discipline for Transforming the Enterprise
- From Legacy to Product Lines: A hands-on journey on Product Line Engineering for Multi-Level Systems
- Introduction to STAMP-based methods, STPA, and CAST
- Leading Modelling in Systems Engineering: From Modeler to Leader
- Open Source System Modeling with Python and Generative AI.

Download the full [book of abstracts](#) for presentations and tutorials.

[Learn more](#) about IS2025 and register [here](#).

Program Details: International System Dynamics Conference (ISDC 2025)



The [System Dynamics Society \(SDS\)](#) will host its annual International System Dynamics Conference (ISDC 2025) from August 3 to 7, 2025. The in-person portion of this hybrid event will take place in Boston, Massachusetts, USA. The theme of

ISDC 2025 is *Incorporating AI into Dynamic Modeling*.

CONFERENCES, MEETINGS & WEBINARS

In support of this theme, newly announced [conference speakers](#) include:

- Babak Heydari, Northeastern University (Associate Professor, specializing in AI, behavioral modeling, and systems engineering)
- Donald Martin, Jr., The Global Institute for the Learning Society (Founder, CEO)
- Jeff Trailer, California State University, Chico (Professor of Management System Dynamics)
- Megan Mahajan, Energy Innovation: Policy and Technology LLC (Senior Modeling and Analysis Manager)
- Steve Peterson, Thayer School of Engineering, Dartmouth College (Senior Lecturer)
- Tom Fiddaman, Ventana Systems (CTO).

View the [conference schedule](#).

Presentations will be organized around the following [topical threads](#):

- Business and Strategy
- Diversity
- Economics
- Environment and Resources
- Health
- Learning and Teaching
- Operations
- Methodology
- Psychology and Human Behavior
- Public Policy
- Stakeholder Engagement
- Security, Stability, and Resilience
- Transport and Mobility.

In addition to technical presentations, ISDC 2025 will incorporate a wide range of special activities:

- [Summer School](#)
- Career Fair
- [Student-Organized Colloquium](#)
- [Conference Workshops](#), including the [Modeling Assistance Workshop](#)
- [Chapter](#) and [SIG](#) Meetings
- [Systems Thinking in Action Day](#).

[Register](#) for ISDC 2025. View the [Invitation Letter](#).

[Join](#) SDS.

International Conference on Engineering Design (ICED25)



[The Design Society \(DS\)](#), established in 2000, is an interdisciplinary community of academics and industry practitioners with the goal of developing and promoting a robust, usable and scalable means of designing complex solutions that a sustainable and globalized society needs to thrive, in the 21st century.

In support of this mission, the Society hosts [numerous events](#), including the biennial International Conference on Engineering Design (ICED). [ICED25](#) will take place in Dallas, Texas, USA on 11-14 August 2025.

CONFERENCES, MEETINGS & WEBINARS

ICED25 appears to be a very hands-on experience, with much learning and collaboration taking place in [workshops](#) such as:

- Agile design for hardware
- Artificial Intelligence X Design
- Collaboration and Constraints: A role-playing game of Systems Design
- Defining and Exploring A New Research Field in Design: Extreme Design
- Design Creativity SIG meeting
- Design Theory for Transitions
- Evaluating AI Generated Solutions to Ill-structured Design Problems
- How can we define success of a shared mental model in collaborative engineering design teams
- Sketch Ideation Opportunities and Workflows with AI
- Transforming Product-Service Systems: AI-Driven, Resilient and Human-Centric Solutions.

Check back [here](#) for evolving details on the ICED25 program. [Register](#) for ICED25.

Search the [Proceedings](#) of previous ICED events.

Follow the [ICED Conference](#) on LinkedIn.

Call for Abstracts: AI4SE & SE4AI Workshop 2025



The [Systems Engineering Research Center \(SERC\)](#) will host the [AI4SE & SE4AI Research and Application Workshop 2025](#) on 17-18 September in Washington, DC, USA. The theme of this year's workshop is *Systems Engineering AI that Works: Assuring Transformative Capabilities and Enabling a Digital Transformation*.

The Call for Abstracts seeks abstracts from government, industry and academia for [paper presentations](#) and [interactive sessions](#) to explore the exciting advancements and challenges in the field of artificial intelligence (AI) and systems engineering (SE). The workshop seeks to foster discussions and insights on how systems engineering can support the development of trustworthy AI systems, and how AI tools can in turn transform the practice of systems engineering and shape the workforce.

Topics of interest include:

- SE4AI: Leveraging systems engineering principles and methodologies to develop safe, robust, and efficient AI systems, while extending them in response to the nature of AI enabled systems.
- AI4SE: Application of AI in support of systems engineering processes, by enabling enhanced decision-making, optimization, validation, and verification.

Abstracts (2-3 pages in length) are due by 9 June. All abstracts and presentations must be cleared for public release; participation is unfortunately limited to U.S. citizens.

View the [submission guidelines](#) document for more information.

Call for Speakers: Global Business Analysis Day 2025



The [International Institute of Business Analysis \(IIBA\)](#) has issued a Call for Speakers for its Global Business Analysis Day 2025. This free virtual worldwide event will take place on 14 November with 7000+ participants, based on 2024 registrations.

Download the [Call for Abstracts form](#). Submissions are sought for both 20-minute and 40-minute presentation sessions in the form of 150-250 work abstracts, plus the primary learning objectives of the session and speaker biographies.

Abstracts are due no later than 15 June 2025. Email to events@iiba.org.

PPI RESOURCES

PPI offers a multitude of resources available to all 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 resource 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 (INCOS). 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 (a substantial quarterly SE publication): <https://www.ppi-int.com/systems-engineering-newsjournal/>

You're already reading our quarterly newsjournal! However, click on the link to access the history of 100+ newsjournals containing excellent articles, news and other interesting topics summarizing developments in the field of systems engineering.

FEATURE ARTICLE

Current Reality and Trends in Model-Based Systems Engineering – Insights from Industry Research

by James Roche, CIMdata, Inc.

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Authored for PPI SyEN

Abstract

The value landscape for model-based systems engineering (MBSE) is expanding and shifting. To plan effectively, it is essential to clearly understand current state enablers and barriers, as well as future investment opportunities and drivers. These opportunities are enabled by new technologies and advanced protocols for collaboration and interoperability. The drivers include strategies and policies from government agencies, competitive pressures, and global dislocations. What is the true nature and value potential of these opportunities, and what are the business implications of these drivers? And what are the critical prerequisites to ensure success as we map our organization's journey? In this article, I will share findings from an extensive research project recently completed on behalf of the Aerospace & Defense PLM Action Group (AD PAG) to answer these questions. This collaborative effort involved CIMdata and the AD PAG partnering with six PLM solution providers. Their main objective was to understand the needs, opportunities, drivers, and constraints that would guide investments in MBSE solution development and industry implementation.

Introduction

Over the past several years, digital everything—threads, twins, engineering—has been in the spotlight, and rightly so. However, alongside these topics, perhaps slightly in the shadows, has been model-based systems engineering (MBSE). Now, MBSE is rising to greater prominence. For many of us, this seems appropriate, maybe even a bit overdue. With this prominence comes opportunities and expectations, and unfortunately, a fair amount of hype and confusion.

To invest effectively in MBSE, it is essential to have a clear understanding of the current state enablers and barriers, as well as the future investment opportunities and drivers. What is the true nature and value potential of these opportunities, and what are the business implications of these drivers?

INCOSE defines MBSE as “the formalized application of modeling to support system requirements, design, analysis, verification, and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases.” Across such an expansive landscape, what can be implemented to deliver value today? In what directions and at what pace will that value footprint expand? What are the critical prerequisites to ensure success as we map our organization's journey?

CIMdata recently completed an extensive industry research project on behalf of the Aerospace & Defense PLM Action Group (AD PAG) to answer these questions and others. For this effort, the AD PAG partnered with Ansys, PTC, Siemens Digital Industries Software, and The Reuse Company, all solution providers committed to addressing the MBSE challenges faced by industrial companies. The main objective was to understand the needs, opportunities, drivers, and constraints to guide their investments in MBSE solution development and industry implementation.

The project used two methods to gather information: interviews with MBSE thought leaders and strategists and an online survey. CIMdata conducted interviews with MBSE thought leaders from the participating PLM solution providers, their key A&D customers, the AD PAG member companies, and prominent experts from industry and academia. To broaden the information base, CIMdata reached out to other notable MBSE solution providers, including experts from system integrators who are playing a critical role in filling current gaps in the solutions. Several of these “providers of interest” agreed to be interviewed. The four providers of interest who participated in the research were Dassault Systèmes, HCLTech, IBM, and Tata Consultancy Services. Learnings from the interviews were used to develop the line of inquiry for the web-based survey.

Value Positioning

Each interview began with the question, “What is your definition of the MBSE?” The INCOSE definition figured prominently in responses from both industrial and solution provider thought leaders. Nearly all solution providers accept INCOSE’s definition of MBSE. While widely accepted within industry, some thought leaders criticized INCOSE’s definition as being too vague and overemphasizing models without proper linkage to systems engineering fundamentals.

The first positioning question in the web-based survey was:

“How would you characterize the MBSE vision and strategy within your company?”

As might be expected, MBSE is primarily viewed as an initiative within engineering, specifically in product development. What is significant and surprising is that the majority of respondents (58%) indicated that MBSE is now an integral element of their company’s digital transformation strategy and initiatives.

Survey respondents were asked to describe the changes that have elevated interest in MBSE within their company. While they cited a number of different factors, the two common themes driving increased interest in MBSE are:

1. The growing complexity of products and the value chains for their development, production, and service.
2. Customer demands for collaborative participation in product development, and companies, in response, embracing MBSE as the means to conform and sustain their competitive position.

Next, we probed deeper for insight into the impact of two recent events. We asked respondents to assess the significance of the U.S. Department of Defense's (DoD) Digital Engineering strategy to the A&D industry and how it is impacting their company's MBSE solution strategy. Results are shown in Figure 1.

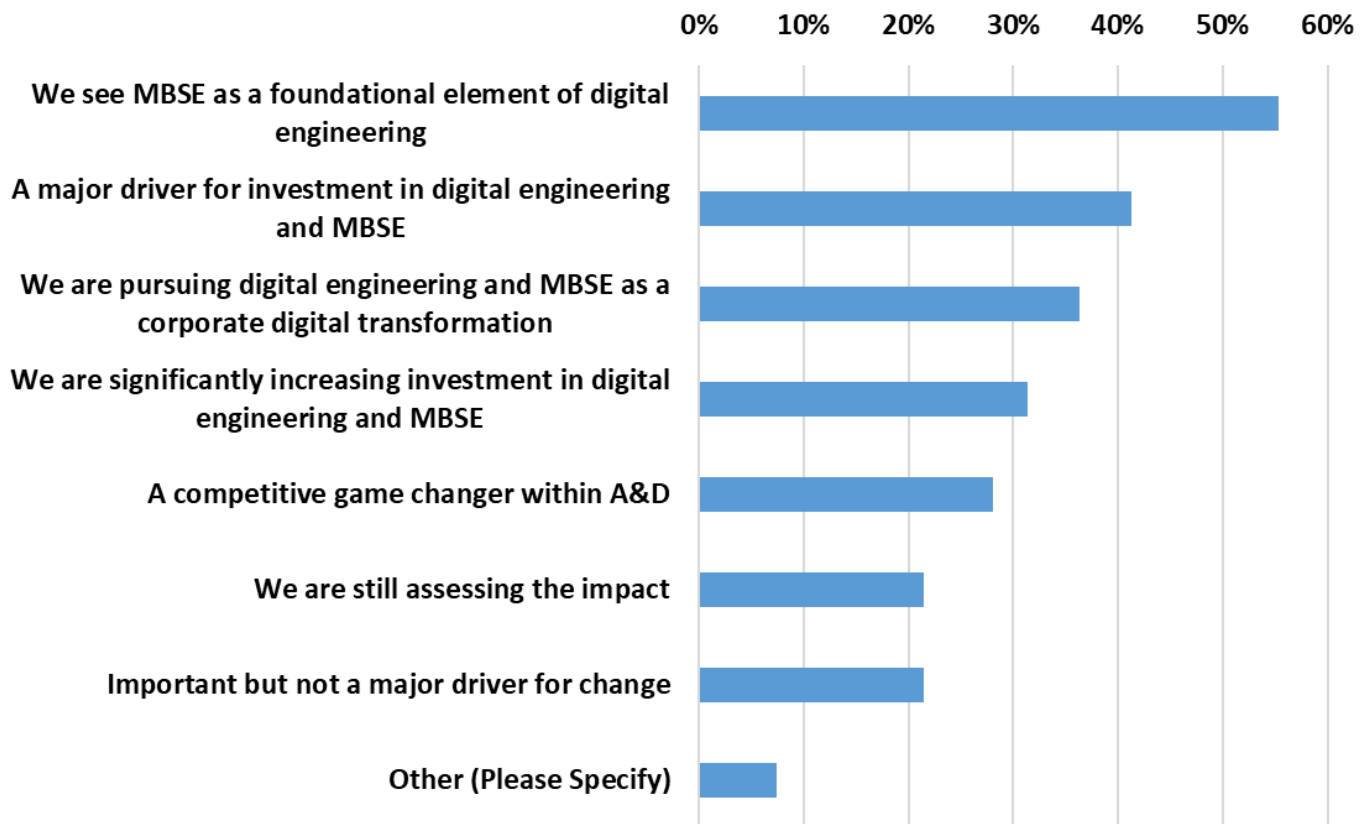


Figure 1 - Significance of the DoD's Digital Engineering Strategy to the A&D Industry and Its Impact on Respondents' Company's MBSE Solution Strategy (% of respondents)

There is little doubt that the DoD's Digital Engineering initiative, driven by the Office of the Under Secretary of Defense for Research and Engineering, has significantly increased interest in and adoption of a digital engineering approach and associated model-based processes, such as MBSE and the software tools necessary to implement MBSE. These results are even more striking considering that fewer than a quarter of respondents are active in the U.S. defense industry.

We asked a similar question regarding the emerging SysML 2.0 standard. Results are shown in Figure 2.

The responses indicate that the jury is still out on the significance and timing of the impact of the emerging SysMLv2.0 standard. While there is generally a positive perception and about a third of the respondents view the new standard as a major step forward from SysMLv.1, it is too early in the standard's lifecycle to assess its business impact on the A&D community.

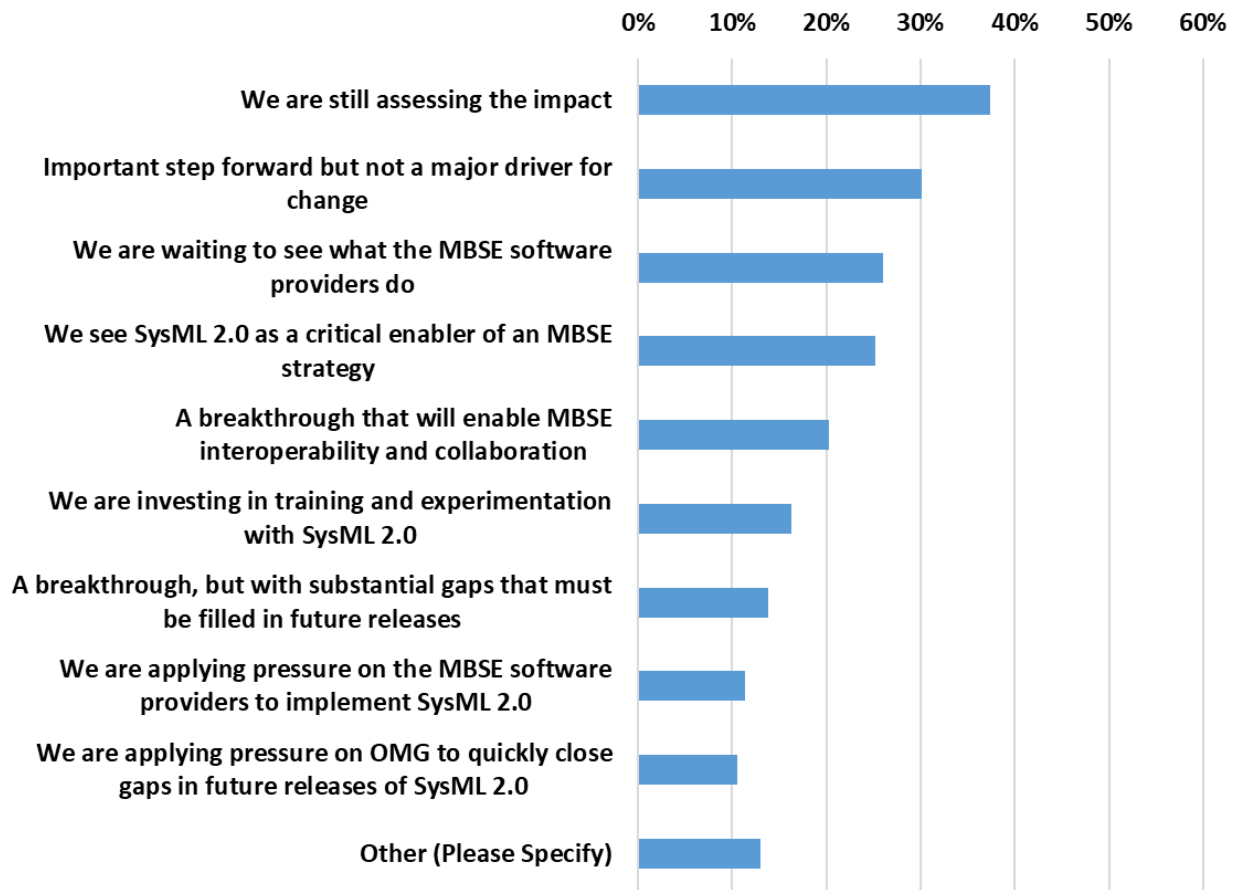


Figure 2 - Significance of the Emerging SysML 2.0 Standard to the A&D Industry and Its Impact on Respondents' Company's MBSE Solution Strategy (% of respondents)

Value Footprint Over Time

The vast majority of MBSE focus and implementation activities today are in the Conceptual Design and Development stages (i.e., the left side of the systems engineering “V”). This is not surprising, as traditional systems engineering is applied during product design and development, beginning with the capture of stakeholder requirements, defining system-level product requirements, and requirements allocation to the various engineering disciplines involved in development.

Interestingly, solution providers believe their technology and services could be applied much more broadly than industry has deployed them to date. One solution provider commented, “We have seen new MBSE use cases that are now being applied on the production system, and more recently on the support/services system. The implementation of these use cases is low in the industry, although the tools to perform them are available.”

Looking ahead, survey respondents anticipate a significant increase in the near term (one to three years) in other emerging and non-traditional systems engineering use cases, such as software design, product line engineering, and design for safety and security. Respondents predict that, in the longer term (greater than three years), use cases will emerge more prominently in other enterprise disciplines such as production and factory automation, supply chain and planning, and in-service operations. These results align with the emergence of the Internet of Things (IoT), Industrial Internet of Things (IIoT), and digital twin technologies, which can now be effectively applied in these domains.

Readiness for Success

Maturity

The discussion of maturity with industry experts was highly subjective. Those interviewed agree that MBSE within industry is generally in its early stages, and the A&D industry is the most advanced in applying MBSE. Notable comments offered by those interviewed include the following:

“MBSE is in its infancy. We all individually feel we are behind but find that everyone is roughly in the same early phase of MBSE adoption and rollout.”

“The industry, from our perspective, seems to be in transition. Practices are not yet completely adopted, nor standardized.”

“Comparing MBSE [maturity] to [the progression of] CAD from emergence in the 80s to the fully parametric CAD now, we are in the mid-90s.”

Survey respondents were asked to assess the maturity of the MBSE strategy realization within their company. Results are presented in Figure 3.

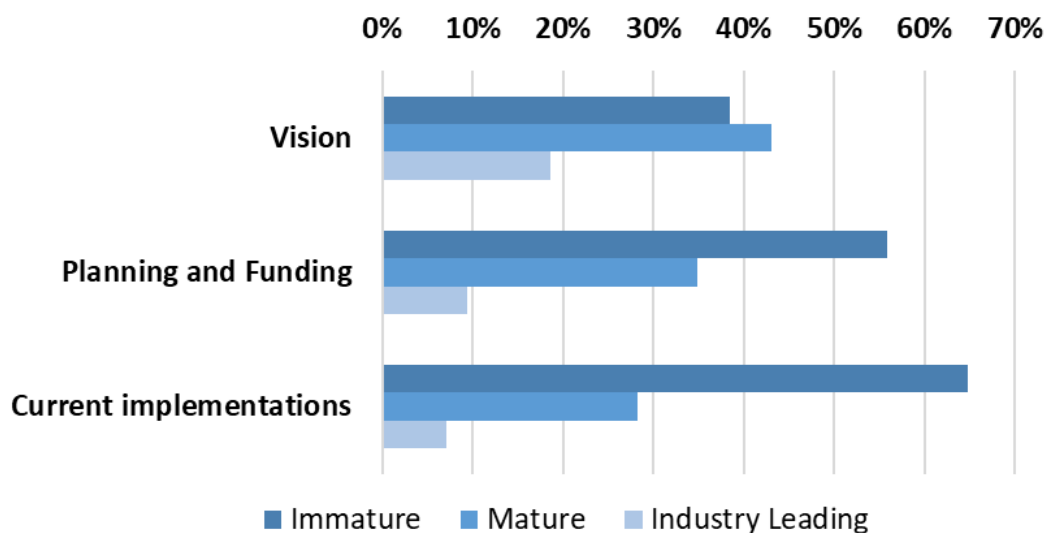


Figure 3 – Self-Assessment of MBSE Maturity within Respondents’ Company (% of respondents)

Despite the fact that MBSE has emerged as a formally recognized area of desired best practice over the past decade, especially within A&D, these results indicate that industry as a whole is still in the early stages of adoption.

Inhibitors

The one factor that clearly stands out to interviewees and survey respondents as the most significant inhibitor is the complexity of organizational impact and cultural resistance.

Interviewees expressed strong opinions regarding inhibitors to the formulation and execution of an MBSE strategy. This is a topic with significant divergence of views between industrial users and solution providers. While most industry interviewees (60-100%) consider interoperability, tool capability, and collaboration standards to be principal inhibitors, only a minority of solution provider interviewees (15-40%) share this view.

Industry thought leaders offered the following comments regarding inhibitors to a successful MBSE strategy.

“The term MBSE has been overloaded and confused in the industry due to the generic nature of the definition. For example, if I consider my legacy spreadsheet of calculations the “model,” then I am doing model-based system engineering. As a result, companies have struggled to measure the ROI on MBSE.”

“Engineers will not adapt if the change is difficult without managers telling them to do it. For that to happen, the benefit, i.e., ROI, must be clear.”

“Lack of interoperability between different vendors’ tools and collaboration platforms is the most significant inhibitor to executing an MBSE strategy. The appropriate mitigation is to promote the importance and then to demand interoperability.”

Critical Success Factors

When interviewees were asked about the critical factors that must be in place within a company to ensure successful formulation and execution of an MBSE strategy, industry and solution provider thought leaders were well aligned. As is common with most new methodologies and technologies, executive commitment is crucial for the successful adoption of MBSE. Companies need strong leadership from the top down to drive the transition from document-centric to model-based approaches.

Thought leaders from industry offered the following comments regarding the critical influence of middle management.

“Support from top management is a necessary-but-not-sufficient condition for the successful deployment of MBSE in an organization. However, support from middle management is crucial. They are responsible for the spreading and establishment of the corporate culture in an organization.”

“The greatest resistance comes from program managers. Their evaluation by middle management is short-term, but the payback is long-term.”

Survey respondents were asked to list the critical factors that must be in place within a company to ensure the successful formulation and execution of an MBSE strategy. Their assertion regarding the critical need for a well-defined MBSE vision and strategy that has strong and consistent commitment from executive management is not surprising. Understandably, these factors are considered the most critical prerequisites for success.

Future Investment

After investigating how MBSE is perceived and the industry’s readiness for successful investment, the research turned to characterizing future investments.

Pain Points

“Pain points” are the points of friction in the current information flow and way of working. Typically, a major focus for ongoing investment in a company’s MBSE implementation is to address and relieve “pain points.” Several top “pain points” relate to interoperability. Others relate to collaboration across disciplines and the supply chain. These are two aspects of successful digital thread implementations, which are foundational to MBSE.

Thought leaders from industry offered the following comments regarding “pain points.”

“Being a Tier 1 requires us to align with the production systems of multiple OEMs. This causes us to take an agnostic approach to PLM that requires coordination and agreement on model sharing.”

“The digital thread is really important. It is astonishing that this topic is not sufficiently emphasized in industry.”

Survey respondents were asked what “pain points” they would target for future MBSE implementations within their company. While an extensive list of “pain points” was offered with this question, the respondents’ choices tended to point to one common theme: the need to share MBSE models and data in a straightforward way within an engineering organization and between multiple enterprises who need to collaborate based on MBSE models and digital data instead of documents.

Opportunities

“Opportunities” refers to new capabilities or business areas for potential expansion of the value footprint of an MBSE implementation. Industry and solution provider interviewees provided a wide-ranging list of more than 20 opportunities in their future investment portfolios. Some opportunities discussed could, by their nature, significantly extend or alter MBSE practices. An industry thought leader offered the following comment.

“MBSE solution capabilities and processes will need to change to capitalize on new product or technical opportunities. For Tier 1 suppliers, the elements we control will not need to change much. What will change will be in response to external direction from OEMs. They may have new MBSE methods that we will need to adopt.”

Investment Rationale

Respondents were asked to characterize the balance between immediate return and strategic value in driving MBSE investment, and how that pattern is changing over time. Results are shown in Figure 4.

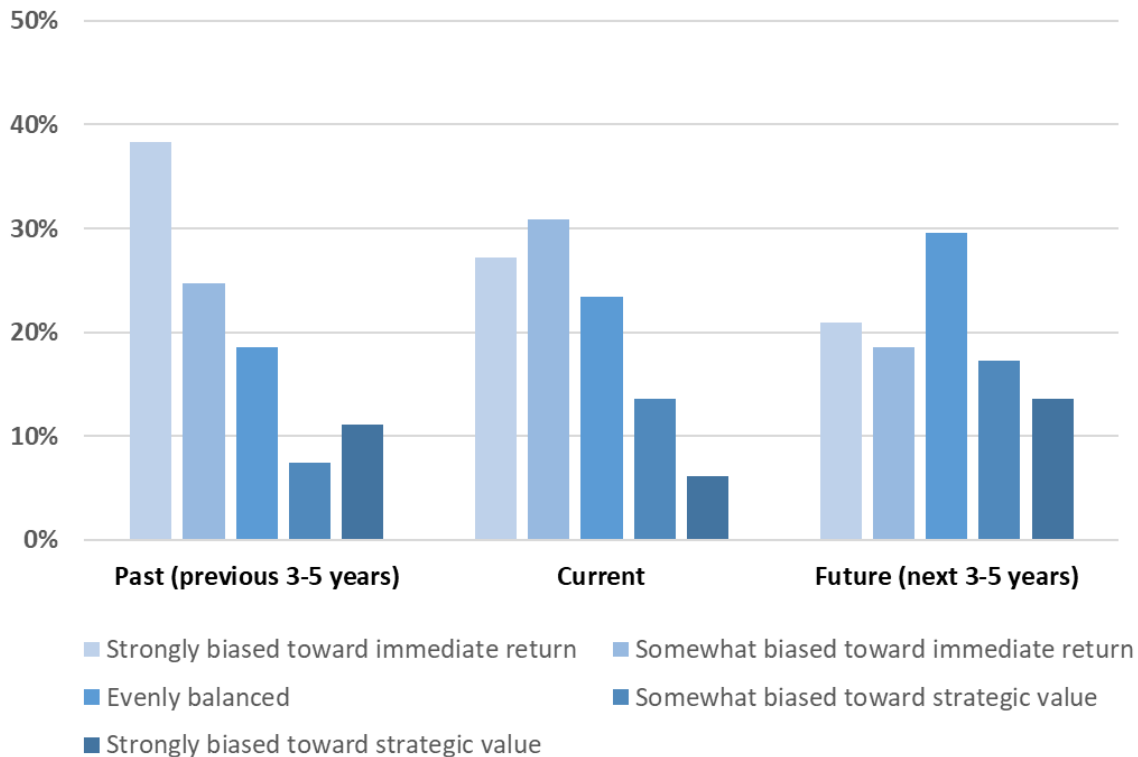


Figure 4 – The Balance Between Immediate Return and Strategic Value in Justifying MBSE Investment Decisions, and How that Pattern is Changing Over Time (% of respondents)

These responses highlight an interesting dynamic in how companies justify their investments in adopting MBSE. In the past, the ROI value justification was heavily biased towards immediate returns (one to two years) versus longer-term strategic value (three to five years). That bias has gradually shifted to a more evenly balanced approach, which is growing in acceptance. Over the next three to five years, the respondents see this trend continuing with a further shift toward the strategic value justification approach.

One industry thought leader offered the following comment.

“You can rarely demonstrate immediate return on MBSE initiatives, especially since most A&D developments are long in duration (8-10 years). You must get company leadership to understand and accept the strategic value.”

Technology Considerations

Only the industry thought leaders were questioned regarding the topics in this section. The initial discussion with interviewees aimed to assess the current capabilities of commercially available PLM solutions in meeting industry’s requirements for MBSE. The perspectives were not uniform, but the prevalent view can be summarized as follows.

“The major platform solutions are evolving into full system lifecycle suites. PLM came into life for mechanical. Then, ALM for software. Now, SysLM is a term coined to cover all perspectives of systems engineering (RFLP) through the full lifecycle for systems of interest. All the SysLM suites are conceived as monolithic platforms. As such, they are oriented to carry out all the system lifecycle activities within the platform. Consequently, these platforms provide a lot of

possibilities for importing information but do not provide any capabilities for exporting the information to other platforms.”

Capability Gaps

The next line of discussion was to solicit perspectives regarding notable gaps in capabilities offered by the solution providers. Results of this conversation are shown in Figure 5.

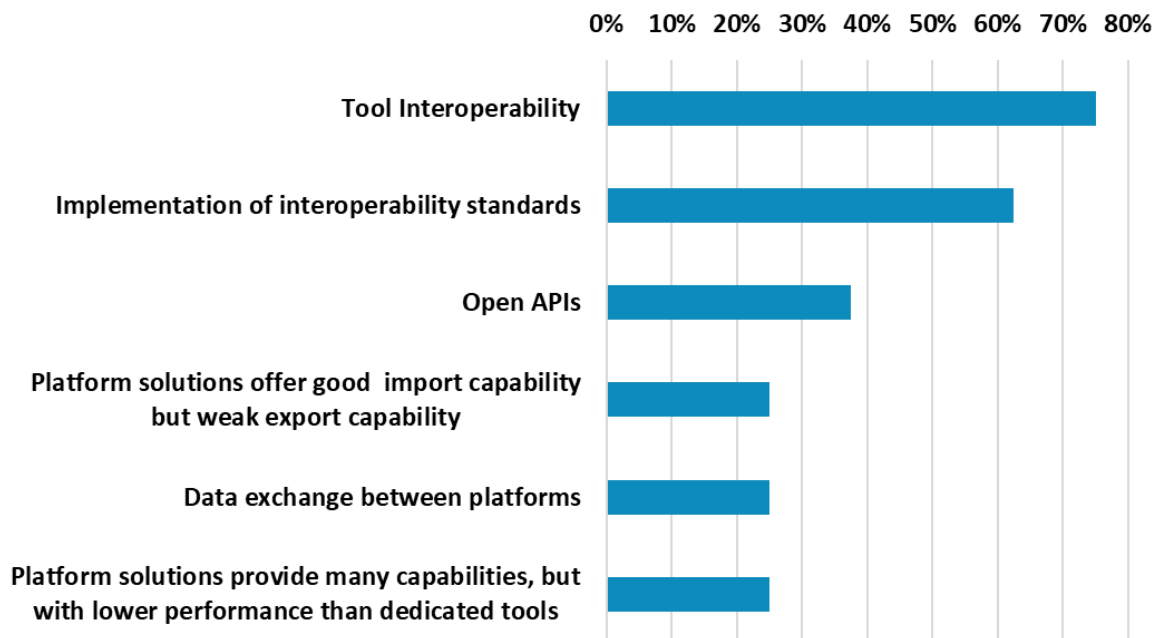


Figure 5 – Notable Gaps in Capabilities Offered by Solution Providers (% of interviewees)

Significantly, five of the top six gaps listed by the industry thought leaders are related to openness and interoperability.

Survey respondents were provided with a list of choices and asked to indicate any notable examples of gaps in capabilities offered by their chosen solution providers. This question highlights the importance of key productivity issues for MBSE practitioners related to the commercial software tools available to them today. Model and data interoperability, as well as data exchange between users via Open APIs, and the implementation of data interoperability standards are identified as key areas for improvement. Other important areas for improvement include enhancing user interfaces to improve the tool's ease of use and enabling change management and change impact analysis.

MBSE Tools in Use

Survey respondents were asked what primary tools they use to implement MBSE solutions within their companies. Results are shown in Figure 6.

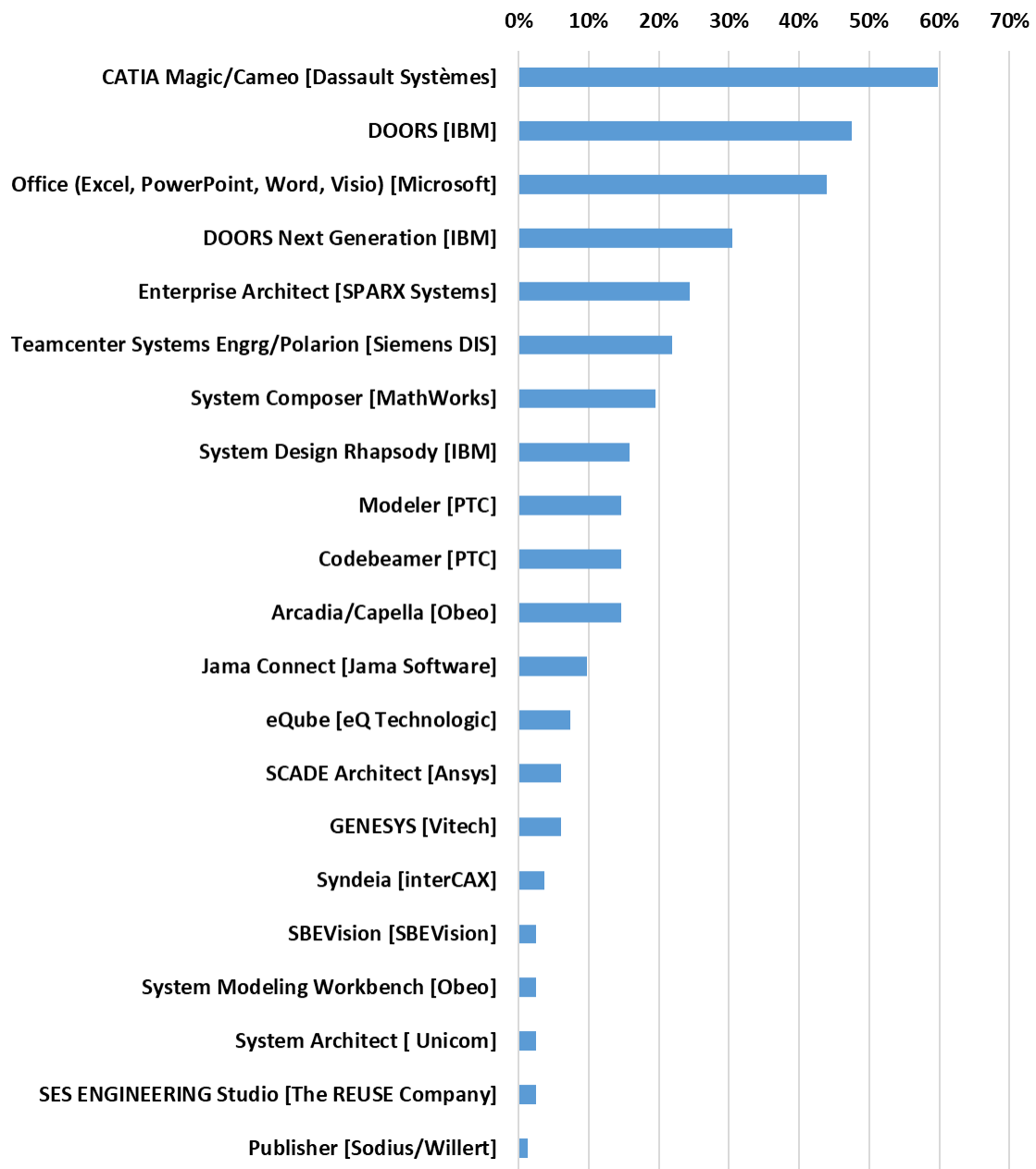


Figure 6 – Primary Tools Used to Implement MBSE Solutions (% of respondents)

The responses to this question highlight several significant points.

1. A large number of commercial software tools are used within the discipline of systems engineering, MBSE, and ALM, and the list shown is by no means comprehensive.
2. Over 40% of respondents use Microsoft Office Suite in doing systems engineering, and it is third on the list of tools used. Excel, Word, and PowerPoint are widely used throughout industry, and this is unlikely to change in the near term.

These points underly the call from industry for PLM and MBSE solution suppliers to provide solutions based on industry standards, as well as robust Application Programming Interfaces (APIs) that will enable the integration of models, data, and metadata between data authoring platforms that span the multiple systems engineering domains (i.e., mechanical, electrical/electronics, embedded

software/controls, chemical, biological, etc.) and the extended community of collaborating participants.

Strategy Alignment

Survey respondents were asked how well their perspectives and strategies for MBSE investment are aligned with those of their chosen PLM solution providers. Results are shown in Figure 7.

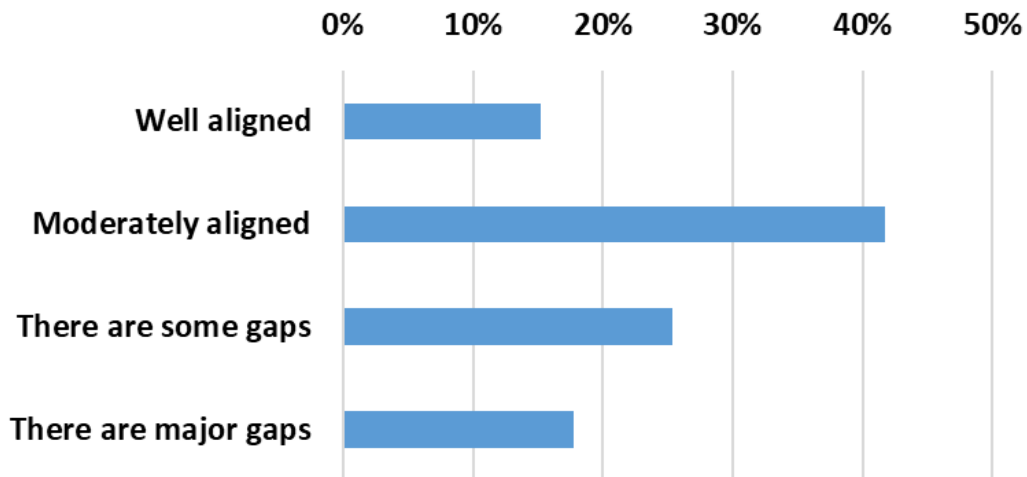


Figure 7 – Alignment of Perspectives and Strategies for MBSE Investment Between Respondents and Their MBSE Solution Providers (% of respondents))

The responses here form a bell-shaped curve skewed more toward ‘Aligned’ than ‘Having Gaps’. Some level of misalignment between the expectations of software users and the companies that build and support those tools is inevitable.

A response to a related question during an interview with one of the leading software solution providers is indicative of the challenges faced by both users and solution providers.

Question: How would you rate the ability to integrate and interoperate today? Is it getting better or worse? What can and should solution providers do to make it a non-issue?

Response: “Interoperability may never be a non-issue. Everybody needs to be willing to be part of this open community. Problems arise when a player does not subscribe to the openness philosophy. We have high hopes for SysML v2.0 as it is a major step forward for openness compared to SysMLv1.”

Survey respondents were provided with a list of choices and asked to indicate any notable examples of alignment or misalignment between their company and their chosen MBSE solution providers. Though many of the response selections are worded to imply a negative condition, the user responses are generally answered with a positive view of their MBSE software supplier. Approximately 70% indicated that their MBSE solution supplier is a good partner, and ~20% held a neutral view.

Summary Observations

MBSE is gaining traction in the A&D industry due to factors such as increasing product complexity, the growing role of software in products, and the influence of the DoD’s digital engineering strategy. Investment in MBSE is increasing and expected to continue to grow.

Current MBSE implementations are mainly concentrated in the early stages of the product lifecycle, specifically Conceptual Design and Development. However, there are plans to expand its use into later stages, including Production, Utilization, and Support, particularly as technologies like IoT, IIoT, and digital twins become more prevalent.

The top MBSE use cases currently involve Requirements Definition and Allocation, System Architecture Definition, and Design Verification and Validation.

Future implementations are expected to include non-traditional applications such as software design, product line engineering, and design for safety and security.

The industry is still in the initial phases of MBSE adoption, with maturity levels differing significantly across companies and programs.

Organizational impact and cultural resistance pose the most significant challenge to successful MBSE implementation.

Essential success factors for MBSE adoption include a well-defined vision and strategy, strong executive commitment, appropriate methodologies, development of MBSE expertise, education and training initiatives, middle management support, and robust tool integration and standardization.

A wide range of commercial and in-house software tools are used for MBSE. The research highlights a crucial need for enhanced interoperability between different tools and platforms, facilitated by open APIs and adherence to standards. Future improvements should focus on enhancing the user interface, improving change management capabilities, and developing change impact analysis tools. Justifications for MBSE investments are shifting from a focus on immediate returns to a more balanced approach that considers long-term strategic value. This change reflects the increasing recognition of MBSE's potential to drive innovation and efficiency in the A&D industry over time. There is a strong need for collaboration between companies and their solution providers to address existing gaps and advance MBSE capabilities in a way that benefits the entire industry.

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About the A&D PLM Action Group

The Aerospace & Defense PLM Action Group (www.ad-pag.com) is an association of aerospace and defense companies within CIMdata's globally recognized PLM Community Program, which functions as a **PLM advocacy group** to:

- Set the direction for the aerospace & defense industry on PLM-related topics that matter to members (including promoting, not duplicating, the work of standards bodies)
- Promote common industry PLM processes and practices
- Define requirements for common interest PLM-related capabilities
- Communicate with a unified voice to PLM solution providers
- Sponsor collaborative PLM research on prioritized industry and technology topics.

CIMdata administers Group operations, coordinates research, and manages the progression of policy formulation.

About CIMdata

CIMdata, a global strategic management consulting firm, provides services designed to maximize an enterprise's ability to design, deliver, and support innovative products and services. For more than forty years, CIMdata has provided industrial organizations, providers of digital technologies and services, and investment firms with world-class insight, expertise, and best-practice methods on a broad set of product lifecycle management (PLM) topics and the digital transformation they enable. CIMdata also offers research, subscription services, publications, and education through certificate programs and international conferences. To learn more, visit www.CIMdata.com or email info@CIMdata.com.

About the Author



James Roche is an Executive Consultant and Aerospace & Defense Practice Director at CIMdata, Inc. James joined CIMdata in 2011, bringing more than 30 years of experience in digital transformation and IT enablement of product development and manufacturing processes. He has been a strategic advisor, program manager, and solution architect for PLM programs across the Americas, Europe, and Asia. Mr. Roche's current role includes facilitation of the Aerospace & Defense PLM Action Group, an association of 12 of the Top 40 aerospace OEMs and Tier 1 suppliers.

Previously, James was PLM Practice Manager at CSC Consulting and at A.T. Kearney. During that period, he led the development and delivery of PLM offerings and consulting services for international clients in the aerospace, automotive, consumer products, high-tech, and medical devices industries. He also served as chief architect for General Motors' worldwide engineering systems and as head technical negotiator for strategic supplier contracts.

James holds a BS in Physics from Worcester Polytechnic Institute. As a postgraduate student, he studied Mechanical Engineering and Materials Engineering at Wayne State University and the University of Rochester.

SYSTEMS ENGINEERING RESOURCES

Useful artifacts to improve your SE effectiveness

INCOSE INSIGHT Practitioners Magazine: Resilience of Complex Systems



The [April 2025 edition \(Volume 28, Issue 1\)](#) of INSIGHT, INCOSE's Practitioner Magazine published by Wiley, has been released.

Electronic subscriptions to INSIGHT are available as a member benefit to INCOSE members. Hard-copy subscriptions to INSIGHT are available for purchase by INCOSE members for one membership year, and to the public.

The twelve articles in this 84-page edition address the theme of *Resilience of Complex Systems*.

[A Generic State-Machine Model of System Resilience](#)

Authors: Scott Jackson, Stephen Cook, and Timothy L. J. Ferris

System resilience means different things to different people and different things across different industries and system contexts. In this article, we present a state-based conceptual model of the variety of states that a system may experience when encountering and resolving a resilience-related situation. We contend that it has promise for framing discussion on resilience objectives of a particular system during the design process by imbuing a common understanding of the expected resilience characteristics of the system to all stakeholders. Furthermore, we advocate that during operations the model informs decisions on how best to deal with multiple resilience-related issues, such as an impending threat and an impaired system.

[An SoS Analytical Workbench Approach to Architectural Analysis and Evolution](#)

Authors: Daniel DeLaurentis, Navindran Davendralingam, Karen Marais, Cesare Guariniello, Zhemei Fang, and Payuna Uday

This article summarizes the development of a System of Systems Analytic Workbench (SoS AWB) that provides a set of computational tools to facilitate better-informed decision-making on evolving SoS architectures. The workbench motif is adopted since SoS practitioners typically generate archetypal technical queries that can be mapped to appropriate analysis methods best suited to provide outputs and insights directly relevant to posed questions. After an overview of the workbench framework, four distinct methods currently available for use are presented along with their distinctive aspects in the concept of use.

[Bringing Operational Perspectives into the Analysis of Engineered Resilient Systems](#)

Authors: Valerie B. Sitterle, Erika L. Brimhall, Dane F. Freeman, Santiago Balestrini-Robinson, Tommer R. Ender, and Simon R. Goerger

Engineered Resilient Systems (ERS) is a Department of Defense (DoD) program focusing on the effective and efficient design and development of complex engineered systems across their lifecycle. An important area of focus is the evaluation of early-stage design alternatives in terms of their modeled operational performance and characteristics. The work in this paper ties together

differentiated operational needs with requirements specification and maturation of previous analytical constructs toward a more operationally relevant viewpoint. We expand on the concept of Broad Utility as a high-level aggregated measure of robustness of fielded system capabilities with respect to operational requirements. The relation to requirements is more explicit, and systems are failing to achieve threshold requirements are penalized. The impact of this approach and how it offers a foundation from which to more fully explore sensitivity to Pre-Milestone A requirements are discussed.

[Effective and Efficient Preparation for the Unforeseeable](#)

Authors: S. W. Hinsley, M. J. Henshaw, and C. E. Siemieniuch

This paper hypothesizes that a system-of-systems (SoS) that is not fit for purpose is so because it cannot implement the correct, timely, and complete transfers of material, energy, and information (MEI) between its constituents and with its external environment that are necessary to achieve a particular result. This research addresses the problem of maintaining a SoS fit for purpose after unpredictable changes in operation, composition, or external factors by creating a method, implemented as an engineering process, and supported by an analysis technique to enhance the affordance {"Features that provide the potential for interaction by affording the ability to do something"} (Norman 1999)} of SoS constituents for MEI transfer and reveal potential undesirable transfers.

[Engineering a Cyber Resilient Product Line](#)

Authors: Patrice Williams, Paula Moss, Susan Bataller, and Suzanne Hassell

A product line consists of a managed core set of composable systems with scalable features and customizable variations. Critical mission threads may differ across the product line, but key product line architecture components support the implementing capabilities supporting a specific customer mission. The choice to adopt a product line engineering strategy allows an organization to manage its assets for efficient use across business opportunities. This article uses an illustrative product line containing two separate but related architectural solutions, which include some similar and some unique hardware assets. Developing shared hardware assets conforming to both architectural constraints facilitates asset usage across the entire product line.

[Enhancing Early Systems R&D Capabilities with Systems - Theoretic Process Analysis](#)

Author: Adam D. Williams

Systems engineering today faces a wide array of challenges, ranging from new operational environments to disruptive technological - necessitating approaches to improve research and development (R&D) efforts. Yet, emphasizing the Aristotelian argument that the "whole is greater than the sum of its parts" seems to offer a conceptual foundation creating new R&D solutions. Invoking systems theoretic concepts of emergence and hierarchy and analytic characteristics of traceability, rigor, and comprehensiveness is potentially beneficial for guiding R&D strategy and development to bridge the gap between theoretical problem spaces and engineering-based solutions. In response, this article describes systems-theoretic process analysis (STPA) as an example of one such approach to aid in early-systems R&D discussions. STPA - a 'top-down' process that abstracts real complex system operations into hierarchical control structures, functional control loops, and control actions - uses control loop logic to analyze how control actions (designed for desired system behaviors) may become violated and drive the complex system toward states of higher risk. By analyzing how needed controls are not provided (or out of sequence or stopped too soon) and unneeded controls are

provided (or engaged too long), STPA can help early-system R&D discussions by exploring how requirements and desired actions interact to either mitigate or potentially increase states of risk that can lead to unacceptable losses. This article will demonstrate STPA's benefit for early-system R&D strategy and development discussion by describing such diverse use cases as cyber security, nuclear fuel transportation, and US electric grid performance. Together, the traceability, rigor, and comprehensiveness of STPA serve as useful tools for improving R&D strategy and development discussions. Leveraging STPA as well as related systems engineering techniques can be helpful in early R&D planning and strategy development to better triangulate deeper theoretical meaning or evaluate empirical results to better inform systems engineering solutions.

[Extending Formal Modeling for Resilient Systems Design](#)

Authors: Azad M. Madni, Michael Sievers, Ayesha Madni, Edwin Ordoukhanian, and Parisa Pouya

Resilience is a much-needed characteristic in systems that are expected to operate in uncertain environments for extended periods with a high likelihood of disruptive events. Resilience approaches today employ ad hoc methods and piece-meal solutions that are difficult to verify and test, and do not scale. Furthermore, it is difficult to assess the long-term impact of such ad hoc "resilience solutions." This paper presents a flexible contract-based approach that employs a combination of formal methods for verification and testing and flexible assertions and probabilistic modelling to handle uncertainty during mission execution. A flexible contract (FC) is a hybrid modelling construct that facilitates system verification and testing while offering the requisite flexibility to cope with non-determinism. This paper illustrates the use of FCs for multi-UAV swarm control in, partially observable, dynamic environments. However, the approach is sufficiently general for use in other domains such as self-driving vehicle and adaptive power/energy grids.

[Harmonizing the Domains of Loss-Driven Systems Engineering](#)

Author: Keith D. Willett

System characteristics include what it is (structure, state), what it does (function, behavior), where it resides (environment, containing whole), what it uses (resources, energy source, raw material), what it contains (content), and why it exists (value delivery). An adversity produces a disturbance that can induce stress in a system so it may suffer some loss within one or more of these characteristics. Loss-driven systems engineering (LDSE) is an approach to address systemic loss in all forms helping ensure value delivery. LDSE domains include reliability, sustainability, survivability, risk management, resistance, resilience, agility, safety, and security which all work in harmony to avoid, withstand, and recover from loss. Traditional systems engineering treats these as separate domains with varying degrees of detail, rigor, and results. LDSE proposes consolidating these domains for a comprehensive, cohesive, and consistent approach to address system loss. This paper establishes interrelationships among the LDSE domains to harmonize role, fit, function, and impact among the domains focusing on sustaining value-delivery.

[How Infrastructure Can Become Reborn by Becoming Born Robust](#)

Author: Josh Sparber

Systems Modeling Language (SysML) is a tool for guiding engineers in designing power grid circuits sufficiently robust to withstand known electromagnetic pulses (EMPs). Careful examination of existing data shows that EMPs, and sometimes geomagnetically induced currents (GICs) that accompany EMPs are truly a powerful threat to power grid survival. Systems engineers, employing SysML can isolate power grid failure susceptibilities and areas for necessary power grid design improvements with

selected SysML packages defined as enclaves associated with risk. These enclaves can be decomposable into stereotyped components available for risk categorization, building simulation libraries, or follow-on tests. As an example, a stereotype Source, instantiated as a Photovoltaic (PV) Inverter, increasingly important in microgrid renewable energy, is linked to a high frequency alternating current (HFAC) microgrid risk enclave package. Simulation allows evaluation of SysML use cases with EMP Actors. Real world test, construction, and strategic grid readjustment can then segue quickly.

[Systematic Identification and Analysis of Hazards for Automated Systems](#)

Authors: Lina Putze, and Eckard Böde

The introduction of automation into technical systems promises many benefits, including performance increase, improved resource economy, and fewer harmful accidents. In particular, in the automotive sector, automated driving is seen as one key element in Vision Zero by eliminating common accident causes such as driving under the influence, reckless behavior, or distracted drivers. However, this is contrasted by new failure modes and hazards from the latest technologies. In this article, we address the problems of finding common sources of criticality for specific application classes and identifying and quantitatively assessing new sources of harm within particular automated driving systems.

[Systems Theory Principles and Complex Systems Engineering Concepts for Protection and Resilience in Critical Infrastructure: Lessons from the Nuclear Sector](#)

Author: Adam D. Williams

Part of the Presidential Policy Directive 21 (PPD-21) (PPD 2013) mandate includes evaluating safety, security, and safeguards (or nonproliferation) mechanisms traditionally implemented within the nuclear reactors, materials, and waste sector of critical infrastructure - including a complex, dynamic set of risks and threats within an all-hazards approach. In response, research out of Sandia National Laboratories (Sandia) explores the ability of systems theory principles (hierarchy and emergence) and complex systems engineering concepts (multidomain interdependence) to better understand and address these risks and threats. This Sandia research explores the safety, safeguards, and security risks of three different nuclear sector-related activities - spent nuclear fuel transportation, small modular reactors, and portable nuclear power reactors - to investigate the complex and dynamic risk related to the PPD-21-mandated all-hazards approach. This research showed that a systems-theoretic approach can better identify interdependencies, conflicts, gaps, and leverage points across traditional safety, security, and safeguards hazard mitigation strategies in the nuclear reactors, materials, and waste sector. As a result, mitigation strategies from applying systems theoretic principles and complex systems engineering concepts can be (1) designed to better capture interdependencies, (2) implemented to better align with real-world operational uncertainties, and (3) evaluated as a systems-level whole to better identify, characterize, and manage PPD-21's all hazards strategies.

[Versatile Test Reactor Open Digital Engineering Ecosystem](#)

Authors: Christopher Ritter, Jeren Browning, Peter Suyderhoud, Ross Hays, AnnMarie Marshall, Kevin Han, and Taylor Ashbocker

Modern design of nuclear facilities represents unique challenges: enabling the design of complex advanced concepts, supporting geographically dispersed teams, and supporting first-of-a-kind system development. Errors made early in design can introduce silent errors. These errors can cascade causing unknown risk of complex engineering programs. The Versatile Test Reactor (VTR) Program

uses digital-engineering principles for design, procurement, construction, and operation to reduce risk and improve efficiencies. Digital engineering is an integrated, model-based approach which connects proven digital tools such as building information management (BIM), project controls, and systems-engineering software tools into a cohesive environment. The VTR team hypothesizes using these principals can lead to similar risk and cost reductions and schedule efficiencies observed in other engineering industries. This research investigates the use of a digital engineering ecosystem in the design of a 300-MWt sodium-cooled fast reactor. This ecosystem was deployed to over 200 engineers and used to deliver the conceptual design of the VTR. We conclude that initial results show significant reductions in user latency (1000x at peak use), the possibility of direct finite-element-analysis (FEA) integrations to computer-aided design (CAD) tools, and nuclear reactor system design descriptions (SDDs) that we can fully link throughout design in data-driven requirements-management software. These early results led to the VTR maintaining milestone performance during the COVID-19 pandemic.

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View this issue in the [Wiley online library](#).

System Dynamics Review and Resources



[Volume 41, Issue 1 of the System Dynamics Review \(SDR\)](#), published quarterly by Wiley on behalf of the [System Dynamics Society \(SDS\)](#), contains three open access articles that may be of interest to PPI SyEN readers:

[A systematic method to integrate co-produced causal loop diagrams based on feedback stories](#)

Authors: Jefferson K. Rajah and Birgit Kopainsky

Within participatory systems dynamics, more practitioners are compiling co-produced causal loop diagrams (CLDs) to analyze and report workshop outputs. Though not formalized, existing documented techniques have been limited to analyses of representations in single-group diagrams predicated on, at times, untraceable subjective judgements. This paper addresses the need for a systematic method to guide and justify the subjective decisions made in the integration process. We propose a multistep, three-stage process that synthesizes feedback stories from representations in diagrams (i.e. what is represented) and transcripts of the participatory process (i.e. what is said). This approach enables practitioners to report the interpretive scheme through which qualitative data are analyzed and, thus, support the subjective decisions they made during the integration process. Using a case study, we demonstrate the application of this method and its potential for narrowing the semantic distance between participants, practitioners and external audience for interpreting and analyzing an integrated diagram.

[ChatPySD: Embedding and Simulating System Dynamics Models in ChatGPT-4](#)

Author: Bo Hu

This paper presents a novel approach for seamlessly integrating system dynamics models into the ChatGPT-4 conversational AI. By transforming system dynamics models with PySD and embedding them into ChatGPT's conversational context, users can explore even complex models through natural language interactions. ChatGPT-4 is capable of running simulations based on user-provided parameters and offering explanations and analyses of the simulation results, leveraging its extensive knowledge base. Because of the constraints of ChatGPT's analytical and computational capacity, it is crucial to provide additional essential information alongside the system dynamics model and to

thoroughly verify and implement ChatGPT's responses. ChatGPT, in turn, can dynamically generate executable Python code, creating a bidirectional interface that empowers modelers to engage with ChatGPT using programming languages. This complements existing natural language and image-based interactions, enhancing the overall efficiency of communication. Successfully integrating system dynamics models with ChatGPT not only makes the models more accessible but also enhances various aspects of system dynamics, including modeling, simulation, discussion, and education. Furthermore, the inherent rigor and transparency of system dynamics models can be extended to ChatGPT conversations, thereby expanding ChatGPT's capabilities.

[Incorporating Deep Learning Into System Dynamics: Amortized Bayesian Inference for Scalable Likelihood-Free Parameter Estimation](#)

Authors: Hazhir Rahmandad, Ali Akhavan, and Mohammad S. Jalali

Estimating parameters and their credible intervals for complex system dynamics models is challenging but critical to continuous model improvement and reliable communication with an increasing fraction of audiences. The purpose of this study is to integrate Amortized Bayesian Inference (ABI) methods with system dynamics. Utilizing Neural Posterior Estimation (NPE), we train neural networks using synthetic data (pairs of ground truth parameters and outcome time series) to estimate parameters of system dynamics models. We apply this method to two example models: a simple Random Walk model and a moderately complex SEIRb model. We show that the trained neural networks can output the posterior for parameters instantly given new unseen time series data. Our analysis highlights the potential of ABI to facilitate a principled, scalable, and likelihood-free inference workflow that enhance the integration of models of complex systems with data. Accompanying code streamlines application to diverse system dynamics models.

The issue also contains an memorial to [Professor Dr. Jac Vennix](#), an influential researcher and educator in the system dynamics community.

This issue of the SDR adds members-only content including:

- [Bridging System Dynamics and Causal Epidemiology: An Opportunity for Both Fields](#)
- [The polycrisis is here, and system dynamics can help: a call to action.](#)

Learn more about the System Dynamics Review [here](#).

Beyond the Review, the SDS makes available a wide variety of resources concerning applications of system dynamics techniques to diverse problem domains. Recent recommendations include:

1. [Accelerating Sustainability Education with System Dynamics: A Community-Based Strategy](#) (webinar recording)
2. [An Exploration of Groundwater Resource Ecosystem Service Sustainability: A System Dynamics Case Study in Texas, USA](#) (journal paper)
3. [Closing Learning Gaps with Systems Thinking Education](#) (webinar recording)
4. [Creating Critical Thinking in our Students through System Dynamics Thinking](#) (video)
5. [Digital Twin for Diabetes Management Using System Dynamics Simulation - The Case of India](#) (conference paper)
6. [Integrating Dynamic Modeling into Your Courses](#) (video)

7. [SDG Architect in Action: How a Board Game Teaches Sustainable Development Strategies](#) (blog)
8. [Systems Thinking and Its Relevance to Space Leadership](#) (video)
9. [The influence of causal loop diagrams on systems thinking and information utilization in complex problem-solving](#) (journal paper)

In addition to published resources, the SDS promotes networking and collaboration among members through a global set of [Chapters](#) and [Special Interest Groups \(SIGs\)](#).

[Join](#) the SDS to gain full access to the System Dynamics Review and additional members-only content and engagement.

Business Analysis (BA) Digest Q2 2025 Edition



[Blackmetric Business Solutions](#), a UK-based training and consulting firm, publishes a quarterly [Business Analysis \(BA\) Digest](#). In keeping with its theme as *your regular round of useful BA content*, the 68-page [Q2 2025](#)

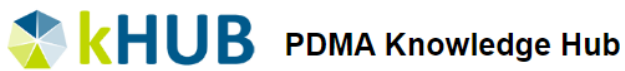
[edition](#) addresses topics such as:

- 5 Essential Techniques That BAs Can Use to Help Entrepreneurs
- BA Back Stories: Christelle Govender
- Business Analyst Role in AI Governance with Ethical AI Training Model
- ChatGPT: Is It an Ally or an Enemy?
- Empowering the BA Community: Our Commitment to Continuous Upskilling and Growth
- Hello, Hola, Cześć – Cultural Differences in Projects
- Impact Mapping: A Simple yet Effective Visual Thinking Tool for Business Analysis
- I've Started so I Won't Finish: Embracing the Incomplete
- Prototyping with Confidence: Iterations and Psychological Safety
- Secure by Design: Embedding Cybersecurity in Business Analysis Practices
- The Accidental BA
- The Humble Business Analyst - Rethinking Soft Skills
- The Power of Elicitation: Beyond Interviews and Workshops
- The Power of Organization: Maximizing Project Outcomes Through Requirements Architecture
- The Power of Personas in Cybersecurity
- The Role of a Business Analyst in Data Migration Projects
- Using Group Construct Analysis to Understand Stakeholder Worldviews in Ambiguous Situations, Part 16: Communication: It May Not Be What You Think It Is.

Typical articles are a quick read at 2-4 pages in length.

Subscribe to the BA Digest [here](#).

PDMA Resource Recommendations



The [Product Development Management Association \(PDMA\)](#) hosts a Knowledge Hub ([kHUB](#)) that offers a wide variety of product development and innovation

management resources in the form of blogs, podcasts, videos, conference presentations, feature articles, and whitepapers. Also included are research articles from the Journal of Production Innovation Management (JPIM).

Recent recommendations include:

- [Accelerating Results with Change Management](#) (chapter content)
- [Best Practices in New Product Development and Innovation: Results From PDMA's 2021 Global Survey](#) (article)
- [Creativity and the Collective Mind](#) (blog)
- [Developing a Product Innovation Strategy](#) (article)
- [Do external founder CEOs place strategic emphasis on innovation? An upper echelons perspective](#) (JPIM article)
- [From Resistance to Reinvention: Overcoming Cultural Barriers to Transform Innovation Capability](#) (article)
- [How to Implement Community-Driven Product Development \(CDPD\) Without Overhauling Your Process](#) (article)
- [Introduction to Exploratory Product Development](#) (article)
- [Nimble & Scrappy: Immersive Experiences at Blume Studios](#) (chapter content)
- [Organizational models for advancing technological innovations: A configurational approach](#) (JPIM article)
- [Overcoming the Negative Role of Nostalgia in Consumer Reactions to Automated Products](#) (JPIM article)
- [PDMA's Exclusive Radical Product Thinking](#) (webcast)
- [Purposeful NPD: Designing Your Product Strategy](#) (article)
- [Scaling Success: Managing Continuous Improvement for Duke Energy's Customer Mobile App](#) (chapter content)
- [Selecting the Right AI Solutions for Use in New Product Development](#) (article)
- [The Coming AI Tsunami in New Product Development – Are You Ready?](#) (article)
- [The Requirements Trap: Are Your Requirements Sabotaging Your Success?](#) (chapter content)
- [Unveiling coping mechanisms in marketplace discrimination: The allure of artificial intelligence recommendations](#) (JPIM article)
- [What Is AI and What Can It Do in NPD for You and Your Business?](#) (article)
- [Why Community-Driven Product Development \(CDPD\) Creates Better Products](#) (article).

Access to kHUB is free and open to the public. Full text access to JPIM research articles requires a PDMA membership or institutional access to the JPIM through the Wiley Online Library; however, kHUB publishes JPIM article abstracts and key takeaways.

Create a guest account or join PDMA [here](#).

Digital Twin Technology Showcase: DT-Enabled Microfactory



The Digital Twin Consortium (DTC) has developed a [Technology Showcase](#), i.e., a reference library that chronicles the evolution of digital twins and elaborates on use cases that demonstrate how consortium members have deployed digital twins to create new value. A new use case has been added to this library.

[Digital Twin-Enabled Microfactory for Smart Manufacturing](#)

The Problem: Factories and asset-intensive industries such as manufacturing, mining, oil and gas, and utilities, face challenges that impact their productivity, profitability, and long-term sustainability, including:

- Unplanned downtime inefficiencies in production processes
- High maintenance costs
- Lack of real-time insights
- Sub-optimal energy and resource consumption.

The Solution: A "microfactory" digital twin that integrates IoT sensors, PLCs, and an IoT Gateway to enable real-time data streaming and edge computing. It utilizes a composable architecture, AI-driven insights, and 3D visualization to optimize production processes, detect anomalies, and support predictive maintenance. Expected outcomes include improved scalability, operational efficiency, predictive maintenance and architectural flexibility.

Download the [use case](#).

The new use case complements nine previously published applications of digital twin technology:

- [Biopharmaceutical Manufacturing](#)
- [Buildings As Batteries](#)
- [Digital Twins for Public Safety](#)
- [Infectious Disease Management](#)
- [Manufacturing Quality Control Via Remote Operator](#)
- [Scope 3 Carbon Emissions Reporting](#)
- [Smart Heating Digital Twins](#)
- [Upgrading Emergency Communication Services](#)
- [Wind Farms Remote Operations Center](#).

Learn more about the [Digital Twin Consortium](#).

INCOSE Canada Event Recordings



The Canada chapter of INCOSE has been hosting a series of webinars since late 2022. The webinars are available for open-access viewing at the [chapter events page](#). Recent presentation recordings include:

[A Systems Engineering Approach to Functional Perseverance](#) (14 April 2025)

David Hetherington (System Strategy, Inc.) and Ivan Taylor (Policy Dynamics) share their insights on

how to achieve resilience in the face of malicious actors.

Security is essential for modern engineered systems. Systems engineers must ensure operational integrity despite threats. This presentation explores how System-Theoretic Process Analysis (STPA) and System Dynamics (SD) enhance security-aware engineering. We address resilience as a system property, ensuring function under adversarial conditions. Adaptive redundancy models and failure response strategies mitigate threats while maintaining capacity. The framework helps engineers quantify trade-offs, design adaptive security mechanisms, and integrate security into system functionality.

Leveraging MBSE for Advanced Technology Development and IP Management (17 March 2025)

Shahram Pourazadi, a Technology Entrepreneur and IP Specialist with a Ph.D. in Engineering Science, excels in building IP portfolios, commercialization strategies, and fostering growth. Passionate about systematic product development and model-based technology management, he has led numerous patent applications and IP strategies across various industries. Currently, as an IP Consultant at Twelvivo Consulting, he leverages Model-Based Systems Engineering (MBSE) to enhance IP and technology management for high-tech companies.

Mining on the Moon - Self Replicating Machines (10 February 2025)

This INCOSE Canada event features Prof. Alex Ellery, Canada Research Professor at Carleton University and a leading expert in space robotics. Prof. Ellery will present “Building the Future: Self-Replicating Machines and Lunar industrialization,” where he will discuss the potential of in-situ resource utilization (ISRU) and self-replicating machines for lunar industrialization. He will explain how extracting oxygen from lunar minerals and using self-replicating machines can revolutionize space exploration and enable large-scale projects like solar power satellites.

A Glimpse into the Next Generation of Modeling Tools: Introducing SysON, an Open-Source, Web-Based SysML v2 Graphical Modeling Environment (20 January 2025)

This INCOSE virtual event, hosted by the INCOSE Canada Chapter, features speaker Stephane Lacrampe, Obeo. Stéphane Lacrampe co-founded Obeo in 2005, a leading independent software vendor based in France.

After years of intensive collaboration, SysML v2 is on the brink of becoming an OMG-adopted standard. The Systems Engineering community eagerly anticipates a new generation of tools that will enable seamless, trusted collaboration in a digital engineering environment powered by this new standard. Obeo, a leading tool vendor known for supporting the open-source Capella ecosystem - one of the top three most widely used MBSE modeling tools - has been involved with the SysML v2 effort for the past five years as part of the SST team. At the end of last year, Obeo announced the launch of SysON, a new open-source project dedicated to implementing the SysML v2 graphical specification. In this presentation, we will introduce SysML v2, provide an overview of SysON’s development status and specification coverage, and showcase its capabilities through an extensive demo. We will also outline the vision and roadmap behind SysON and discuss how open-source tools like it can play a pivotal role in the upcoming digital engineering transformation.

Why Systems Engineering is a Smart Investment: Managing Complexity, Reducing Risk, Saving Money (2 December 2024)

This INCOSE virtual event, hosted by the INCOSE Canada Chapter, features speaker Ivan Taylor, president of Policy Dynamics Inc. located in Kitchener, Canada.

This presentation outlines the critical importance of Systems Engineering (SE) as a strategic investment for senior management. Systems Engineering is an interdisciplinary approach that ensures complex projects are delivered successfully by managing risk, controlling costs, and reducing the likelihood of project failure. In today's increasingly complex project environments, SE offers a structured method to identify customer needs early, manage requirements, and ensure all system components work together seamlessly throughout the lifecycle.

Research shows that organizations investing in SE can save 10-20% of their project budgets and significantly reduce the risk of delays and overruns. Without SE, the cost of fixing errors grows exponentially as projects progress, potentially reaching 250 times the initial cost if discovered late. SE provides early control over project requirements, interfaces, and integration, preventing costly late-stage surprises.

Learn more about [INCOSE Canada](#).

Tom Gilb Systems Engineering Resources - 2024 Updates

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

Here are some of Gilb's publications during 2024 with multiple ways to access most of these resources:

- [Evo: Evolutionary Value Optimization](#) (book) Also available at [Researchgate](#).
- [General Theory of Design Engineering](#) (book) Also available at [leanpub.com](#) and at [Researchgate](#).
- [Gilb's Golden Gun](#). A book which with Perplexity AI, and Tom Gilb, tries to compare Planguage with other 100 other methods, like Scrum and Lean Startup; on the basis of qualities of planning. Also available at [Researchgate](#).
- [HAPPY: Human Aspect of Planguage Pleasing You](#) (book) Also available at [Researchgate](#).
- [OPTIMA: Balancing Critical Values](#) (book) Also available at [leanpub.com](#) and [Researchgate](#).
- Plan-gineering ([free book](#)) ([paid book](#)). Describes a planning language, "Planguage", for systems engineering and management.
- [PolComm - Better Political Communication Using 'PoLanguage'](#) (booklet). An attempt to create a method for better Politician communication.
- [PPPP: Powerful Ploys for Problems, using Planguage](#) (book) Also available at [leanpub.com](#) and [Researchgate](#).
- [R.I.S.K. Robust Innovative Safe-Keeping - VALUE: Value Architecture Lifecycle Universal Efficiency](#) (book)
- [Startup: Social Startups, not Greedy Money!](#)
- [StrategyRing: Advanced Strategic Planning using Engineering](#) (book) Also available at [Researchgate](#).
- [TIA: Toolkit for Institutional Architecture](#) (Digital Book). A proposal for TIAL.org. Also available at [leanpub.com](#) and [Researchgate](#).

PPI SyEN readers are encouraged to investigate these unique resources.

Systems Thinking in Operational Technology: Navigating Complexity in the Digital Age of Transport Infrastructure



The INCOSE New Zealand chapter continues to build an impressive library of its chapter videos - addressing a diverse set of systems engineering topics. The chapter [YouTube channel](#) captures the “meet-up” videos and in some case slide presentations. The most recent addition to the library is worthy of investigation:

[Systems Thinking in Operational Technology: Navigating Complexity in the Digital Age of Transport Infrastructure](#)

Presenter: Ed Kim (SYSTRA ANZ)

Operational Technology (OT) systems are fundamental to modern transport infrastructures, managing critical operations such as signaling, power distribution, and traffic management. In the digital age, the integration of OT with Information Technology (IT) has introduced complexities that require a holistic approach to system design and management. This presentation explores the application of systems thinking within OT, highlighting the importance of understanding interdependencies and emergent behaviors in complex transport systems. We discuss best practices in designing, validating, and assuring OT systems. Attendees will gain insights into managing the complexities of contemporary transport infrastructures by applying systems thinking principles, ensuring robust, safe, and efficient operations.

Other recent topics include:

- [One drop at a time – implementing an SE approach in the water industry](#)
- [An Introduction to Human Systems Integration](#)
- [Systematically Pulverised EARS.](#)

Learn more about the [INCOSE New Zealand chapter](#).

Integrating User-Centric Design in Business Analysis

Requirements Engineering Magazine

The Magazine for RE Professionals from IREB

The [Requirements Engineering \(RE\) Magazine](#) is published by the [International Requirements Engineering Board \(IREB\)](#) multiple times per year. Articles are welcome from Business

Analysis and Requirements Engineering professionals, regardless of IREB membership status. Publication is free of charge for the authors.

In the March 2025 edition, Natasha Shahun, Senior IT Business Analyst, authored an article titled *“Integrating User-Centric Design in Business Analysis - Strategies for Enhanced Digital User Experience”*.

Overview:

Discover how user-centric design (UCD) can transform business analysis to create more intuitive, efficient, and user-friendly solutions. This article delves into the practical application of UCD principles through the development of “FinTrack”, a hypothetical financial management tool, showcasing how aligning features with real user needs enhances digital experiences. Key strategies like user journey mapping, persona creation, and iterative usability testing ensure continuous improvement. Whether

you're addressing complex financial systems or everyday applications, learn how UCD can boost user satisfaction, engagement, and business outcomes, while overcoming challenges in implementation.

Topics addressed include:

- Concept and Principles of User-Centric Design
- Benefits and Challenges of UCD
- Who benefits most from a UCD approach?
- Practical applications of UCD in business analysis.

Read the full article [here](#).

View the other 100+ [RE Magazine articles](#).

[Sign up](#) to be notified about new issues of the Requirements Engineering Magazine.

See [the guidelines](#) for contributing to the RE Magazine as an author.

Scaling Agile for Hardware: The Right Framework for Your Organization



Through IEEE Spectrum, MAHD Framework LLC has published a free whitepaper titled *"Scaling Agile for Hardware: The Right Framework for Your Organization"*.

The whitepaper notes that adopting Agile in hardware organizations presents unique challenges - expensive changes, complex dependencies and regulatory constraints are just some of the constraints that make traditional Agile frameworks ineffective. While software-driven methods like Scrum or SAFe attempt to scale Agile, they frequently fall short in hardware environments.

This whitepaper compares four leading frameworks—MAHD (Modified Agile for Hardware Development), SAFe (Scaled Agile Framework), Nexus, and LeSS and highlights why software-centric approaches often fail. The comparison supports the belief that MAHD provides a tailored, hardware-centric solution for the development of physical solutions and hardware-based systems. Topics addressed include:

- Clarity on Agile fit for hardware.
- Framework comparisons
- Practical implementation guidance
- Improved speed & predictability.

Download the whitepaper from [IEEE Spectrum](#).

Systems Engineering Research Center (SERC) Updates



The [April 2025 update](#) from the Systems Engineering Research Center (SERC) highlights this organization's research-driven contributions to systems engineering practices. Project updates from SERC's partner agency, the Acquisition Innovation Research Center

(AIRC), are also published in this edition.

Though focused on U.S. defense stakeholders, much of this research has broader application across global and non-defense domains.

Research projects highlighted in this update include:

- [Cognitive Assistant for Training Cost Estimators: Phase III](#)
- [Digital Data Management and Analytic Pilots](#)
- [Facilitating Usage of New Tech in Defense Systems: Issues and a Way Forward](#)
- [Improving Acquisition Decision Making through Data Modeling](#)
- [Innovative, Data-Enabled Acquisition Strategy \(IDEAS\): Concepts for Driving the Digital Transformation of Defense Acquisition](#)
- [Systemic Factors Influencing Risk Aversion: Piloting the Innovation Alliance Program.](#)

Access the latest SERC news [here](#).

Follow [SERC on LinkedIn](#).

Book - Model-Based Product Line Engineering (MBPLE)



[Wiley](#) has published a new book, [Model-Based Product Line Engineering \(MBPLE\): The Feature-Based Path to Product Lines Success](#), a collaboration between authors Marco Forlingieri, Tim Weilkiens and Hugo Guillermo Chalé-Gongora.

This 336-page foundational book on MBPLE examines how PLE can benefit from a model-based and model-centric approach. The book combines both management and engineering aspects to deliver comprehensive coverage of the subject, including the real-life challenges and implementations of MBPLE and associated barriers to adoption.

Topics include:

- MBPLE motivation
- MBPLE foundations
- Implementation using SysML v2
- MBPLE adoption.

ISBN: 978-1-394-20468-7. Available from Wiley in E-Book and print formats.

Download the [product flyer](#).

IIBA Resources



The [International Institute of Business Analysis \(IIBA\)](#) is a non-profit professional association that helps business analysts develop their skills and further their careers by providing access to relevant content. IIBA publishes a variety of open access and members-only resources that are published in numerous media formats.

[Analyst Catalyst Blog](#)

SYSTEMS ENGINEERING RESOURCES

This open access blog features posts that address different aspects of the business analysis discipline. Recent topics include:

- [Analysis Everywhere: Partner Stories - SoftServe](#)
- [From Project Manager to Process Lead: How I Used the KnowledgeHub to Improve My Process Analysis](#)
- [Navigating Sustainability, Security, and Silos](#)
- [No One Asked for This Startup — But Business Analysis Made It Work](#)
- [Transforming Healthcare Through Business Analysis.](#)

[*Business Analysis Live! Podcasts*](#)

IIBA's podcast library is also open to non-members. Recent titles include:

- [Decide Like a Skydiver](#)
- [How to Ask Good Questions](#)
- [Soft Skills for Success Requirements Elaboration.](#)

[*IIBA's Digital Online Library*](#)

The Library is a members-only repository that currently holds over 11,000 online titles that span the full range of business analysis processes. Systems engineering practitioners may find some of the following recently recommended titles of interest:

- Innovating From Within: Intrapreneurship and Innovation Within the Organization
- Key Performance Indicators: The Complete Guide to KPIs for Business Success
- Leading Transformational Change: Working with Uncertainty and Navigational Principles
- Machine Learning for Managers
- MIT Sloan Management Review Article on Building a Data-Driven Culture: Four Key Elements
- Projects: Methods: Outcomes: The New PMO Model for True Project and Change Success
- Shareholders, Strategy and Value Creation: The Case of the IT Sector
- Strategy in the Age of Disruption: A Handbook to Anticipate Change and Make Smart Decisions (Audio book)
- The ChatGPT Revolution: Get Curious, Get Productive and Get Creative with AI
- The Friction Project: How Smart Leaders Make the Right Things Easier and the Wrong Things Harder.

[*IIBA Member Articles*](#)

The Association publishes articles from its members and generally restricts their access to other members. Recently published articles include:

- [A Successful Journey Down Use Case Paths](#)
- [Connecting the Dots: Applying Systems Thinking for Holistic Business Analysis](#)
- [How Business Analysis Fits with Agile Environments](#)
- [How to Launch a Successful Solution Based on the Value Proposition Canvas](#)
- [How to Measure the Performance of Business Analysis Professionals.](#)

[*IIBA Bookstore*](#)

The bookstore offers a diverse range of business analysis content; often discounted for members.

[Join IIBA](#) to access members-only resources and discounts.

SPEC Innovations Community Blog: New Resources



[SPEC Innovations](#), a leading provider of systems engineering services and the [Innoslate](#) and [Sopatra](#) software solutions, maintains a [community blog](#) that provides a diverse range of useful information for systems engineering practitioners (beyond their immediate customers). Recent posts include:

- [A Digital Engineering Case Study for Aerospace Webinar](#)
- [Advanced MBSE: Techniques, Tools, and Best Practices for Experts](#)
- [Ensuring Compliance Through Requirements Management](#)
- [How to Get Your Organization to Adopt MBSE](#)
- [MBSE for Beginners: A Step-by-Step Introduction](#)
- [MBSE Trends: The Future of Model-Based Systems Engineering](#)
- [Modern SysML Diagrams: Systems Engineers Move Past Ancient Scrolls](#)
- [The Need for Personalized Views to Accelerate Digital Model Adoption](#)
- [What Is Systems Engineering?](#)
- [Why Every Engineering Team Needs an MBSE Tool.](#)

Interested parties may sign up for a monthly newsletter with links to new resources.

ISO 26262 Functional Safety Standard



In recognition of the [achievement of ISO 26262 Functional Safety Process Certification](#) by the [Perforce Application Lifecycle Management \(ALM\) software](#), the [Perforce blog](#) has published an compact summary of the ISO 26262 standard including its scope, purpose, content and guidance in the standard's application to automotive safety.

ISO 26262, titled "Road vehicles — functional safety", is a functional safety standard used in the automotive industry; compliance with this standard is critical for automotive product development.

The blog post addresses the following topics:

- What Is ISO 26262 Functional Safety?
- The 10 Parts of ISO 26262
- What Is ASIL (Automotive Safety Integrity Level)?
- How to Determine ASILs and ASIL Levels (Automotive Safety Integrity Levels)?
- Guide to ASIL Levels Compliance + ISO 26262
- Ensure ISO 26262 + ASIL Functional Safety for ASIL Levels with Perforce.

Read the full [Perforce ISO 26262 article](#).

Download the Perforce [Managing ISO 26262 Software Compliance white paper](#).

Given that ISO 26262 is derived from the "umbrella" standard [IEC 61508](#), "Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems", the functional safety principles and practices summarized in this article may have broad application to domains beyond

transportation vehicles.

SEREA: Systems Engineering Reference Enterprise Architecture



The [Object Management Group \(OMG\)](#) hosts a [YouTube channel](#) that contains a wide range of useful videos associated with the OMG's immense portfolio of standards.

A recent edition to this library is the 25-minute video titled [The Systems Engineering Reference Enterprise Architecture \(SEREA\) Modeled in UAFML/Based on ISO15288](#).

Presenter: Hugo Ormo, NTT DATA Deutschland SE, Senior Managing Technical Consultant

Abstract: Join us for an insightful presentation on the Systems Engineering Reference Enterprise Architecture (SEREA), designed to support enterprises in adopting the Unified Architecture Framework (UAF). SEREA is an architecture description modeled in UAFML and based on ISO15288, providing a template for an operational model for any enterprise that develops, uses, maintains, or retires systems.

This presentation will explore how SEREA facilitates the adoption of UAF, resulting in a standardized enterprise architecture description that enhances internal and external communication. We will discuss the benefits of tracing operations from the vision and drivers through operational and resource architectures down to the specification of enabling and supporting systems.

Additionally, we will highlight the combined use of SysML to trace this chain of effects further down through the architecture description of enabling and supporting systems until the specification of their components. This comprehensive approach provides AI-agents with structured data to understand the enterprise and the systems it uses and produces, setting a comprehensive context to support the operations of the enterprise.

Notably, SEREA is being developed within a working group of the [Gesellschaft für Systems Engineering \(GfSE\)](#), fostering collaboration and knowledge sharing among experts

INCOSE Product Releases

INCOSE publishes a rich set of technical work products in a typical year and makes these resources available through channels such as the [INCOSE Online Store](#) and through Wiley.

Two noteworthy recent publications are summarized below.

[Guidance to ISO/IEC/IEEE 42020 — Architecture Processes](#) ([INCOSE Online Store](#))

This document provides comprehensive guidance on applying the architecture processes defined in ISO/IEC/IEEE 42020. It offers detailed insights, case studies, and best practices for implementing architecture governance, management, conceptualization, evaluation, and elaboration across various entities, including enterprises, systems, and software. Designed to enhance the effective application of architecture methodologies, this guide serves as a valuable resource for organizations aiming to optimize their architecture processes throughout the entity's lifecycle.

[INCOSE Systems Engineering Competency Framework - 2nd Edition](#) ([INCOSE Online Store](#))

A comprehensive standard defining 37 critical competency areas across five domains essential for Systems Engineering excellence. This framework provides detailed indicators across five proficiency levels from Awareness to Expert, enabling organizations to assess skills, create job descriptions, develop career paths, and target training investments. Designed for flexible tailoring to specific organizational needs, it serves as the definitive global reference for building world-class systems engineering capabilities in individuals and organizations.

Smart City OpenCommons



In 2014, the U.S. National Institute for Standards and Technology (NIST), formed the [Global City Teams Challenge \(GCTC\)](#) which has evolved into collaborative platform for cities, communities, industry, academic, and government stakeholders to jointly develop and deploy emerging technologies for smart cities and communities. NIST is transitioning GCTC activities to private sector partners, including the non-profit, [OpenCommons](#).

Content

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The OpenCommons information portal serves as a library/archive for smart cities documents, frameworks, and guidebooks. Members of the GCTC have worked with NIST and collectively published a series of [frameworks and blueprints](#) for smart cities and communities, and this information will be available through the OpenCommons online resource.

To date, hundreds of resources have been posted to the site by a diverse set of global contributors. Resources may be accessed from multiple perspectives as shown in the Content outline.

Knowledge Base resources are organized by topics:

- Agriculture
- Buildings
- Cybersecurity and Privacy
- Data
- Public Safety
- Smart Buildings
- Transportation
- Utility
- Wellbeing

Systems engineering practitioners are encouraged to search this knowledge portal for emerging Smart City/Community insights and to contribute their relevant expertise.

FINAL THOUGHTS FROM SYENNA

Perspectives on Problems

Syenna has learned, through painful experience, that the term **Problem** can be a problem. Like many words, **Problem** is 'overloaded', i.e., it may be used in different contexts with a very wide range of meanings. And because every problem begs a solution, this begets a secondary problem that is of primary importance – picking the right kind of thinking tools (questions to ask, data to gather, steps to achieve resolution) to attack the **Problem** at hand.

I can't see the forest for the trees

When thrown into a new pressure-filled situation with many moving parts, it's easy to feel overwhelmed by the apparent complexity of our new environment. Too many people, too many systems, too many connections, too many anything's muddle the mind. It's easy to fall prey to the temptation to DO something, i.e., attack and cut down the first tree that we see. Most action films follow this script with the hero or heroine beset by rapidly emerging and evolving threats, each sequentially overcome by preposterously improbable actions guided only by the protagonist's adrenalin-fueled superior instincts.

The likelihood of success rapidly approaches zero when taking a string of actions that are each just a coin toss. The antidote to such failures is to begin with *Situation Appraisal (SA)*, a thinking skill that separates concerns/issues (trees in this metaphor) and prioritizes these concerns so that they may be attacked with the appropriate thinking process. SA increases the chance of "situation success" by focusing brains and other resources on the most significant concerns. SA defers action on the first issue that pops up, preventing us also from "diving into detail", being absorbed in the first or most interesting, but unimportant tree while losing sight of the rest of the forest.

SA solves the "I'm overwhelmed by complexity and don't know where to begin" **Problem**.

Grab my favorite tool (oops!)

Experience (backed by a list of sources too long to cite in detail except [1]) shows that concerns naturally fall into three types, each of which needs, by their very nature, to be addressed with a different pattern of thinking. Realizing that issues call for different types of thinking tools reduces the risk that we will grab our personal favorite tool and seek to use it where it will be fruitless or even destructive.

When something has gone wrong and I don't know why with any confidence, it's perfectly appropriate to say, "I have a **Problem**", i.e., a deviation between actual and expected behavior for which I need to know root cause before I can take effective action. In this case, *Problem Analysis*, aka *Root Cause Analysis (RCA)* should be invoked to discover and confirm root cause so that we don't use trial and error in making "fixes" and risk breaking even more things.

When I need to choose a course of action to satisfy a set of stakeholders in accomplishing something difficult, it's also fine to say, "I have a **Problem**", i.e., to make a difficult decision. *Decision Analysis* is the correct thinking tool to use in such situations where the outcome is commitment to the best-fit alternative, all things considered.

FINAL THOUGHTS

You may have developed a project plan or system design by making multiple decisions and still say “I have a **Problem**”, if you are uncomfortable with the number of ways that your plan or design might fail. It's time to pull your *Potential Problem Analysis (PPA)* aka *Risk Management* tool from your thinking toolbox and begin to identify specific things that might go wrong and how to mitigate these possible failures.

Of course, we are human, so even using the appropriate systematic thinking technique on each issue doesn't guarantee success. Skills need to be grown and honed.

Perceptive readers of PPI SyEN will likely discern that the four thinking patterns may be employed in series: SA -> PA -> DA -> PPA when something has gone wrong, and we need to identify why, choose a fix, and protect the implementation of that fix from Murphy's Law.

If so, you may also have an *Eureka!* moment when you realize that PA, DA, and PPA all leverage science, our understanding of cause-and-effect, but do so with different time perspectives. PA stands in the present and looks backwards to explain current behavior. DA also stands in the present but looks forward and uses our knowledge of causality to predict the outcomes of various alternatives. PPA builds an explicit cause-effect model of the future by focusing on possible failures and how and where to best interrupt the cause-effect failure chain to protect a plan or design.

So, while doing the day-to-day tasks of engineering a solution to a complex challenge don't lose sight of which type of **Problem** you are tackling on any given day.

Regards,
Syenna

Reference:

[1] Kepner, C. and Tregoe, B. 1997. *The New Rational Manager: An Updated Edition for a New World*, Kepner-Tregoe, Inc., Princeton, NJ (US)

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I find that the harder I work, the more luck I seem to have.

Thomas Jefferson