SYSTEMS ENGINEERING NEWSLETTER

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1. QUOTATIONS TO OPEN ON

"A team (a human system) is much more than the sum of its parts."

Robert John Halligan

"When an Open Data standard is created and promoted, it's important to think why - what change is this trying to drive? What will people do with this data that they couldn't do before?"

James Baster

"The wise man makes knowledge acceptable."

Proverbs 15:2

2. FEATURE ARTICLE

2.1 What Constitutes a Systems Approach to Risk Management?

by

Dr. Gavan Lintern

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Editors' note: Although risk management has been practiced, applied, studied, and supposedly improved, the results for large-scale socio-technical systems have historically been unsatisfactory and there is no evidence or other reason to believe that we are actually making progress. Systems engineering professionals are well-advised to consider the implications of this for risk management as currently conducted within systems engineering. In an effort to further strengthen and improve risk management practice in systems engineering, Project Performance International is providing this article as a blog post, with a comment block at the bottom. This will enable systems engineering professionals to participate in conversations leveraging social media. We encourage your participation!

To further stimulate the conversation, PPI Managing Director and professional leader Robert Halligan observes that the job of the requirements engineer is to ensure as much as possible that problem definition is low risk due to defects in the problem definition; the job of the design engineer is to make solution decisions, inevitably in the presence of uncertainty (creating risk and opportunity). And yet, almost every engineer on earth has graduated with negligible education on risk and opportunity, and the basis of decision-making in their presence.

On 11 March 2011, a violent earthquake off the East coast of Japan created a tsunami that surged over the seawall of Fukushima Dai-Ichi nuclear power station, resulting in a multiple core meltdown. Over the following days, Tokyo was threatened with irradiation, raising the possibility of mass evacuation from the city and threatening the economic future of Japan (Willacy, 2013). With historical records suggesting that a tsunami of that magnitude and destructive power could be anticipated every 800 years or so, the failure to build an adequate seawall, and to protect backup systems against earthquake and flooding, seems grossly neglectful.

On 20 April 2010, an oil drilling rig, Deepwater Horizon, blew out in the Gulf of Mexico. Eleven workers perished that day and subsequently, over a period of three months, the damaged well released almost five million barrels of oil into the Gulf of Mexico. As reported by the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling (2011), diverse safety systems and backup safety systems failed at critical times. In addition, poor planning by off-rig management and poor coordination between on-rig teams contributed to the accident and exacerbated its severity.

These are just two of the many industrial accidents we have witnessed over recent decades that can be classified as major disasters. In retrospect, the vulnerabilities that contributed to these enormous losses seem trifling, even inconsequential, thereby conforming to the idea that tightly coupled systems allow the effects of some types of events to cascade through the system, expanding the magnitude of the catastrophe (Perrow, 1984).

The safety of large-scale sociotechnical systems with catastrophic potential poses a challenge. Despite many high-profile accidents and despite all that has been written on large-scale industrial systems with catastrophic potential, we can have no confidence that we have resolved the general problem. We can have no confidence that we have eliminated the vulnerabilities, as exemplified in the two accidents described above, lurking within other large-scale industrial complexes with catastrophic potential.

We need a systems approach

Many have argued for a systems approach to this problem (e.g., Leveson, 2011; Salmon, Cornelissen & Trotter, 2012). A system is a regularly interacting or interdependent group of items forming a unified whole. It is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose, and expressed in its functioning. These connections and interactions, along with a purpose, characterize a system. More formally, a system can be described as "*a set of elements or parts that is coherently organized and interconnected in a pattern or structure that produces a characteristic set of behaviors, often classified as its 'function' or 'purpose'*" (Meadows & Wright, 2009, p. 188).

System Analysis

A systems approach to risk management will necessarily identify the potential for vulnerabilities and will develop a way of eliminating them or of reducing the likelihood, they will cause trouble. Reflecting on the Meadows and Wright definition, a comprehensive risk management framework will not only identify the elements or parts that contribute to risk but also the interdependencies between them. In a large-scale, sociotechnical system, interdependencies cause problems when events in one functional area (e.g., decisions taken to optimize work) interfere with work processes in other functional areas.

Risk management is typically guided by causal analysis of single accidents, one popular method being Root Cause Analysis. There is much said in the risk management literature about the limitations of Root Cause Analysis, most specifically that it limits investigation to a single causal chain (although this criticism seemingly ignores the Ishikawa (Fishbone) method). Cause is generally viewed as deterministic; one event is necessary and sufficient to cause another. Within risk management, where events do not lead inevitably to other events, we need a concept of indirect causality. If we are taking a systems view, we need to look for *systemic* causal factors, those that exert a pervasive or ubiquitous influence throughout the system.

Salmon, et al (2012) have described three dominant methods of causal analysis that have been established as systems approaches to risk management. The Human Factors Analysis and Classification System as developed by Wiegmann and Shappell (2003), is a taxonomy-based approach that identifies unsafe acts by systems personnel and accident-inducing conditions residing in designs, equipment, supervision, maintenance, training, and procedures. Rasmussen and Svedung (2000) developed a method of accident analysis that features an AcciMap, which maps causal links between vulnerabilities across and within organizational levels of the sociotechnical system. Leveson (2011) co-opted the concept of organizational levels from Rasmussen and Svedung (2000) to develop the Systems Theoretic Accident Modelling and Processes model, which identifies and links contributory failures across and within sociotechnical system levels.

Salmon, et al (2012) undertook a comparative evaluation of these methods within the context of the Mangatepopo gorge tragedy in New Zealand, April 2008 in which six students and their teacher drowned while participating in a guided outdoors activity. Each of the three methods identified over 50 factors that contributed to the accident, with many of those factors identified by more than one of the methods and some by all. This suggests a question: could a system that functions well enough most of the time have 50 or more systemic problems? A scan of the factors identified by Salmon, et al (2012) reveals many that are not systemic, and it is not entirely clear that any are systemic.

In reviewing these ideas, I do not want to be overly critical of Salmon, et al (2012). A comprehensive review of how these methods have been implemented elsewhere would reveal that this is a general problem. Those who promote these methods talk a good systems game, but when it comes to the analysis, it remains unclear that they are fulfilling the systems promise. Indeed, being focused on causal analysis and typically used to analyze a single accident, it is unclear that these forms of accident analysis as they are typically executed are anything other than a more expansive and more structured Ishikawa Root Cause Analysis.

Systems Design

A further problem is that now, having identified a good number of contributory factors, it remains unclear what to do about them. A large number of the contributory factors identified by Salmon et al (2012) implicate personal failures at different levels within the organization; for example, inadequate supervision, inadequate training, and failure to check the weather. The way these results are presented encourages the view that this system can be repaired with better rules and procedures. However, the system that led to the Mangatepopo gorge tragedy already had a large set of rules and procedures across all levels of the sociotechnical organization, many of which were not being rigorously applied. It might seem we need a global rule; *do not ignore rules and procedures*. We can be skeptical regarding the efficacy of that approach, but there is an even more serious problem. A rule set can never account for all contextual variations. As a result, the exhortation to follow rules and procedures under all circumstances is likely to induce rule-following behavior in circumstances where the rule does not apply.

This suggests a glaring deficiency in our frameworks for risk management: a lack of any robust design strategy for responding to systemic issues

Rasmussen's Risk Management Framework

Risk management requires a framework with an analysis phase that identifies the systemic issues and a design phase that addresses them. There is, however, a puzzle within the risk management frameworks as I describe them above. One of those frameworks is attributed to Jens Rasmussen who, outside of risk management, developed a wide-ranging Cognitive Systems Engineering that focused on systemic issues (Rasmussen, 1986; Rasmussen, Pejtersen and Goodstein, 1994). Why would he be satisfied with a risk management framework that was so limited when his approach to Cognitive Systems Engineering was so much more expansive in both in its forms of analysis and its strategy for design?

The short answer to this puzzle is that Rasmussen's risk management framework as discussed in secondary sources focuses on only a subset of his ideas; his model of hierarchical organization and his development of the AcciMap. Although Rasmussen is one of the most frequently cited authors concerning risk management, many of the essential elements of his framework are ignored by those who cite him. A review of papers that refer to Rasmussen's risk management framework reveals that some of his more radical ideas are mentioned only rarely and others not at all. In Lintern (2019), I have described Rasmussen's framework in its entirety. Here I outline three of his formative ideas.

The Generic AcciMap

Within the risk management literature, AcciMaps generally (although not exclusively) represent a single accident. However, Rasmussen intended that a generic AcciMap be developed by abstracting the entries from several single-incident AcciMaps. He distinguished between tokens and types. The entries in a single-incident AcciMap are tokens, which represent context-specific vulnerabilities. The entries in a generic AcciMap are types, which represent context-independent vulnerabilities. The generic AcciMap is used not so much to identify the systemic causes of accidents but rather to identify those in the system who make decisions that can contribute to accidents. From there, Rasmussen argues for the development of an ActorMap, constructed in a style similar to an AcciMap, but identifying those decision-makers, and an InfoMap, also constructed in a style similar to an AcciMap, but showing the information links between decision makers.

Functional-Relational Modeling

Rasmussen distinguished causal reasoning from functional reasoning. Causal reasoning is the common mode of working through problems, but sometimes we are faced with a situation where we need to puzzle over what activity-independent functions we need to access to satisfy our goals and what resources are available that will support those functions. Human reasoning can switch between causal and functional modes. In order to identify the functions and resources available within a system, Rasmussen developed what is now known as Work Domain Analysis. The analytic product of this analysis is an Abstraction-Decomposition Space whereby system purpose, system priorities, system functions, technical functions, and physical resources are represented over five levels of abstraction.

One of the recurring problems within sociotechnical systems is that workers in one functional area optimize their own work processes by use of procedures that disrupt work processes in other functional areas. Areas of responsibility can be mapped onto the Abstraction-Decomposition Space, thereby revealing what sort of information workers in some functional areas need about other functional areas so that they do not inadvertently create problems beyond their boundary of visibility. In that sense, an Abstraction-Decomposition Space represents not only functions but also relations between functions and can therefore be classified as a functional–relational model.

An Ecological Information System

Rasmussen's design strategy for risk management is embedded in his call for development of an Ecological Information System. An Ecological Information System is a fully integrated and comprehensive information-action system in which information is structured in a manner that reflects the structure of the cognitive work. An Ecological Information System provides robust, accessible action modes and diverse action capabilities so that, once having assimilated the essential information for a work task, workers can act in response to it in naturally compatible ways. An Ecological Information System is Rasmussen's systemic solution to the risk management problem. In a previous article in this newsletter, my colleague, Al Motavalli and I, referred to this concept as a functional workspace and it is elsewhere referred to as an ecological interface or an ecological display.

Among other things, an Ecological Information System supports both causal and functional-relational reasoning. Its design draws in part on the generic AcciMap and in part on the Abstraction-Decomposition Space. The argument for an Ecological Information System is that given comprehensive, readily accessible, salient, and meaningful information about the state of the system, those responsible for system safety will make the right decisions. As far as I have been able to ascertain, no one publishing in risk management refers to this idea. It seems to have been lost entirely.

Conclusion

Despite many high-profile accidents, it remains unclear whether those working on risk management for large-scale sociotechnical systems are making satisfactory progress. New methods of analysis have not demonstrably reduced risk in large-scale socio-technical systems (Lintern and Kugler, 2017). There is no evidence that widespread use of Rasmussen's entire risk management framework would reduce the risk of catastrophic accidents in large-scale socio-technical systems and, indeed, no strategy of risk management has been put to that test (Lintern and Kugler, 2017). It is, however, evident that Rasmussen's risk management framework contains ideas that do not have a high profile within our current discourse on risk management. Given the catastrophic potential of many of our contemporary sociotechnical systems, and the cost, the suffering, and the professional jeopardy associated with adverse events, serious assessment of those neglected aspects of Rasmussen's risk management framework seems warranted.

References

Leveson, N.G. (2011). Engineering a Safer World: Systems Thinking Applied to Safety. MIT Press, Cambridge, MA, 2011.

Meadows, D. & Wright. (2009). Thinking in systems: A primer. Routledge.

Lintern, G. (2019). Jens Rasmussen's Risk Management Framework. Theoretical Issues in Ergonomics Science. DOI: 10.1080/1463922X.2019.1630495

Lintern, G. and Kugler, P.N. (2017). Sociotechnical System Safety: Hierarchical Control versus

Mindfulness. Systems Engineering 20 (4): 307–317. doi:10.1002/sys.21396.

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling (2011). Deep Water: The Gulf oil disaster and the future of Offshore Drilling. [Downloaded from https://www.nrt.org/sites/2/files/GPO-OILCOMMISSION.pdf, 18 May 2017].

Perrow, C. (1984). Normal accidents: Living with high risk technologies. New York: Basic Books.

Salmon, P.M., Cornelissen, M., Trotter, M.J. (2012). Systems-based accident analysis methods: a comparison of Accimap, HFACS, and STAMP. Safety Science Journal 50, 1158e1170.

Rasmussen, J. (1986). Information Processing and Human-Machine Interaction: An Approach to Cognitive Engineering. New York: North-Holland. ISBN 0-444-00987-6

Rasmussen, J., Pejtersen, A.M. and Goodstein, L.P. (1994). Cognitive Systems Engineering. New York: Wiley.

Rasmussen, J. and Svedung, I. (2000). Proactive Risk Management in a Dynamic Society. Karlstad, Sweden: Swedish Rescue Services Agency.

Wiegmann, D.A., Shappell, S.A. (2003). A Human Error Approach to Aviation Accident Analysis. The Human Factors Analysis and Classification System. Burlington, VT: Ashgate Publishing Ltd.

Willacy, M. (2013). Fukushima: Japan’s Tsunami and the inside story of the nuclear meltdown. Sydney: Macmillan.

About the Author

Gavan Lintern earned his Ph.D. in Engineering Psychology from the University of Illinois in 1978 and M.A. and B.A. degrees in experimental psychology from the University of Melbourne, Australia, in 1971 and 1969 respectively. He has worked in aviation-related human factors research at the Defense Science and Technology Organization (then known as the Aeronautical Research Laboratories), Melbourne (1971-1974), and in-flight simulation research on a US Navy program in Orlando, Florida (1978-1985). He returned to the University of Illinois in 1985 to take up a position as a faculty member at the Institute of Aviation (1985-1997). He has subsequently filled positions as head of human factors at the Defense Science and Technology Organization in Melbourne (1997-2001), senior scientist with Aptima, Inc in Boston (20012003) and chief scientist with General Dynamics Advanced Information Systems in Dayton Ohio (2003-2009). He now has an adjunct appointment at the Monash University Accident Research Centre.

Gavan's primary areas of expertise are in cognitive analysis and design of complex knowledge and information systems, instructional system development for aviation and information intensive systems, and e-Learning development of professional and technical courseware. He has high-level skills in Cognitive Work Analysis, Ecological Interface Design, Brahms human workflow modelling, and web design.

He has over 40 publications in reviewed journals and numerous symposium papers and book chapters. He is a Fellow of the Human Factors & Ergonomics Society, a recipient of the Jerome H. Ely Award, 1991, best paper in Volume 32 of Human Factors and a recipient of the George E. Briggs Dissertation Award, 1978. He has served on the Editorial Board, Human Factors (1986-2000) and still serves on the Editorial Boards of The International Journal of Aviation Psychology (since 1991) and Cognitive Engineering & Decision Making (since 2007).

Gavan retired from General Dynamics in early 2009 and now works part time as an industry consultant, otherwise filling in his time as minder of the home pets and general home roustabout. He is a member of PPI’s consulting team, is the author of PPI’s training on Cognitive Systems Engineering and Human Systems Integration, and has been the presenter of this training. He published the book, The Foundations and Pragmatics of Cognitive Work Analysis, in April 2009 and another, Joker One: A Tutorial in Cognitive Work Analysis, in August 2013.

Affiliations:

- Member and Fellow of the Human Factors & Ergonomics Society
- Member, International Council on Systems Engineering
- Editorial Board of the International Journal of Aviation Psychology
- Editorial Board of Cognitive Engineering & Decision Making

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3. ADDITIONAL ARTICLE

3.1 Summary of the INCOSE IS 2019 MSBE Lightning Round

by

René King

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Project Performance International

During the International Symposium that took place in Orlando, Florida, I had the pleasure of sitting in on the MBSE Lightning Round. The Lightning Round is always one of the most well-attended sessions at INCOSE events as MBSE is widely viewed as a means to manage increasing complexity and other systems engineering challenges including interface management and as a mechanism to achieve the dream of full digital engineering. I have summarized the main points of each of the presentations delivered by the speakers. This session was recorded and each of the presentations can be viewed on YouTube via the INCOSE channel. The link to each of the recordings can be found at the bottom of each summary.

Introduction by Mark Sampson

Author note: Mark provided a very engaging introduction to the session. He provides some technical and personal examples that provide justification for why we should care about the future of MBSE.

Summary:

- The vision of MBSE is to lead to an integrated digital thread
- The benefit is faster turnaround of information and more visibility into the consequences of changing requirements

- Many engineering defects result from improper interface management and poor communication across those interfaces, especially across disciplines. MBSE integrated throughout the lifecycle provides proactive detection of errors, especially at the intersections of domains e.g. mechanical engineering and material science.

Link to Mark's 9 min presentation on YouTube

1: Using System Architecture Models to Populate Structured Requirements by Ron Carson

Author note: If you were at the lightning round then you can never forget Shellbee and Shellis, the two fictional ladies Ron used to demonstrate the main concepts in his presentation. The story of Shellbee and Shallis was highly effective in getting the main message across to the audience. This presentation was very intriguing, I would highly recommend giving it a watch.

Summary:

- How can we ensure that we have high quality, verifiable requirements from the outset of a project?

- A good requirement has the following structure: 'the *who* shall *what*, *how well*, under *what conditions*' with the italicized terms clearly defined.

- In order to improve the requirements, we need to define the above elements.

- The INCOSE Guide to Writing Requirements provides a good start to writing sound requirements.

- The Boeing template for parsing requirements was demonstrated: The **AGENT** shall **FUNCTION** in accordance with **INTERFACE-OUTPUT** with **PERFORMANCE** [and **TIMING** upon **EVENT TRIGGER** in accordance with **INTERFACE-INPUT** while in **CONDITION].**

- This detailed structure is not entirely supported by SysML: in order to parse a requirement, an additional aspect must be added to an MBSE tool to render individual requirement elements and the resulting statement (the Boeing implementation in DOORS does this)

- In implementation, someone can only modify a requirement by modifying an element of the requirement; the structure and template cannot be changed and the requirement engineer has to ensure the resulting requirement is correct.

- Other types of requirements including design requirements, environmental requirements and suitability which have slightly different elements and which are not all instantiated in the architecture.

- *Why is this above information not used?* The emphasis in current days is on requirements management and configuration management not on requirements development.

- We currently derive requirements by changing the agent name and so the value of using architecture to drive requirements is not realized.

- We should be developing the architecture at the next lower level and then deriving and validating requirements based on this information.

- Ron illustrates an example of how to use a graphic illustration of the architecture model to populate the requirements template using CORE from Vitech, however this is still a manual transcription of the requirement from the architecture.

- In a fully automated rendering, the requirements engineer would examine the resulting text and update of the fields to ensure verifiability of the requirements and the coherence of the model which updates the analysis prior to finalization: the model is driving the requirements.

- A goal for SysML and MBSE tools would be to standardize the requirement elements and derive them from the architecture data within the architecture model so that this process can be automatically generated.

- The architecture model can also simulate the architecture to validate the model and resulting requirements for logic, timing, connectivity, I/O exchanges and parametric performance related to functionality and throughput on defined interfaces depending on the capability of the architecting tool.

- The architecture behind the requirements are simulated, not the requirements themselves. Could requirements then be dispensed altogether? Probably not due to the current preference for text-based requirements.

- The architecture model enables us to check for:

    - Verifiability: are all the elements present and adequate?

    - Sufficiency (through simulation): if the requirement is implemented as stated, will it ensure the system satisfies the parent need?

    - Necessity: is the parent requirement to be satisfied without this requirement?

    - Feasibility (for performance, sizing, reliability and other parameters defined in the model): can we obtain a solution that satisfies this and all other requirements within the constraints of the program and with acceptable risk?

    - Quality: do the elements exist and can quality of the element be affirmed according to defined criteria? Significant effort and reduced risk of cost overrun is observed when requirements quality is improved.

Conclusion

We need to use the information available in the MBSE architecture model to develop and write verifiable requirements.

Link to Ron's 16 min presentation on YouTube

2: Using the Viable System Model to Focus on the Human Aspects of Problems by Bob Kenley

Author note: This presentation was conducted in a very entertaining format of a 'W-INCOSE Lightning Round Radio Show' where Bob was interviewed by a host. It is definitely a must watch if you haven't seen it yet!

Summary:

- SYS 530 is a practical systems thinking course offered at Purdue that contains techniques and currently used in non-profit organizations.

- Bob participated in a project on retiring Plutonium manufacturing plants after the cold war.

- During this project trade-studies were conducted including softer measures such as 'risk acceptability to the public' in order to devise a method of disposing of nuclear waste.

- The public had a positive response to the visibility and depth of the analysis and consideration of the risk to the community.

- At the MIT socio-technical research center, the Lean Advanced Initiative concluded that the key to process improvement is not just about Six Sigma related topics but also about defining the entire organization.

- The practical systems thinking course is mainly taken up by nurses and engineers and others comprised in the class. The nurses have more empathy in general and are thus in some ways better socio-technical engineers as a result.

- The structure of the course has a major focus on theory and completing modules before being connected with community sponsors in the practical application component of the course.

- As part of the course; the recursive Viable System Model by Stafford Beer is used to model various types of organizations including agricultural and non-profit organizations.

- The course is adapted and adjusted over time to improve the value to students.

- One of Bob's students, Ibukun Phillips, has done research on using Soft Systems Moethodology (SSM) and TRIZ (Theory of Inventive Problem Solving) concurrently.

- Activity diagrams are being used in the medical field to model medical operations in an emergency.

- There was a project with General Motors where a form of yoga was used to improve communication. This solution resulted from an problem definition analysis in the form of a Viable System Model.

- Peter Checkland uses a form of the V Model in his soft system methodology.

Conclusion

- There are soft systems which are guaranteed to impact our ability to get the hard systems deployed and operating.

- There are underlying human elements in every system that will matter whether we like it or not.

- These soft system methods are infinite in their potential uses for application

Link to Bob's 17 min presentation on YouTube

3: MBSE Enabled Digital Enterprises by Heinz Stoewer

Author note: Heinz delivered a highly relevant presentation on digital transformation and presented results from the JPL Symposium and Workshop titled, 'MBSE in transition' that took place in Pasadena on 23-25 January 2018.

Summary:

- Model-based engineering (MBE), model-based systems engineering (MBSE) and project life cycle management (PLM) are all elements of the digital transformation and are essential building blocks for digital enterprises.

- Our world is experiencing massive digital transformations towards cyber physical systems and ‘our digital environment is enabling sheer infinite opportunities’.

- Several questions were addressed at the JPL Symposium, some of the questions and answers are addressed in this presentation.

- Brynn Watson, Vice President of Lockheed Martin states that MBE and MBSE are in transition from independent tools to a ‘digital tapestry’ fitting together *as seamlessly as possible*.

- Airbus described MBSE (analytical models, verification models, architectural models etc.) as interlinking with each other and connected with more explicit discipline models including marketing, research, control and other elements. Only when all elements fit together do we arrive at a digital enterprise.

- Digital twins and virtualization are two lynchpins towards the future.

- Digital twins are virtual representation/approximations of reality – how close we are to reality is a function of development and knowledge of the data behind the model.

- What are the differences between models and digital twins? A model represents elements and/or functionalities of a system. A digital twin should eventually represent a complete system or product e.g. a power station, a heart, an aircraft (it results from intense modelling)

- Both a model and a digital twin precede reality and evolve with it

- A digital twin is at the heart of industry 4.0 (Phase 1: Product, Phase 2: Manufacturing Process, Phase 3: Operation)

- Advantages of a digital twin in combination with MBSE:

    1. One can thoroughly the system before implementation to enable trade-offs

    2. One can generate a comprehensive planning baseline for system and supplier contractors, for development and production

    3. One can create an authoritative source of truth accessible to all project participants for effective management throughout the lifecycle

    4. Customer receives digital ‘as built’ configuration.

- Visualization and virtualization are advancing on a broad front into our daily lives.

- Illustrations carry high density information with a potential of being self-explanatory and often are simpler than documents

- Many of our current MBSE diagrams represent software, not engineering culture; and virtualization will help overcome this.

The conclusions from the panel at the JSP symposium were as follows:

- MBSE and ME are moving towards the same direction but there are lots of hurdles

- MBSE and PLM need to be aligned to achieve coherent, informed and effective ‘digital engineering’, project management and decision practices

- Digital transformation faces challenges but offers the benefit of efficiency and quality gains

The following questions were asked during the panel. When do you think that, in your organization?

- MBSE will have become common place for two thirds of the SE community? Answer: about 6 years (range of answers from 5 to 10 years)

- MBSE and MBE will have matured towards seamless interaction? Answer: about 7 years (range of answers from 5 to 10 years)

- MBSE will have become the standard end-to-end SE practice from conceptual design to manufacturing and service? Answer: about 10 years (range of answers from 5 to 15 years)

- PLM and MBSE will have been aligned to allow seamless interaction? Answer: about 9 years (range of answers from 5 to 15 years)

The spread (range) results from companies with different priorities, organizations and perspectives (and are still fairly optimistic).

Conclusion

- Models, simulation, virtualization and digital twins will grow slowly together and we will see many fascinating opportunities and gains as they do, particularly with the help of AI and big data

- Standards and ontology and crucial and lag far behind which prevent faster convergence and progress. Software and IT competencies are scare and are the bottleneck in the digital

- Digital enterprises need to integrate both hard and soft disciplines where MBE, MBSE and PLM are crucial building blocks

Link to Bob's 17 min presentation on YouTube

4: Enhancing the Value by Architecture Models by James Martin

James Martin delivered a pertinent analysis of the role that architecture models play in our solution design and highlighted necessary considerations to aid engineers in the modeling process.

Summary:

- Our models can have value only to the extent that they get us closer to the truth. Will the solution that we're developing be suitable in a future that we don't even know about? (The system is to be deployed in the future).

- We want the architecture to drive the design model, the design model to drive the test models, the test models to drive the manufacturing models and so forth. Architecture models drive the many elements in the system.

- Systems are always part of a larger solution and there are elements of the larger system that are not systems at all such as elements of the natural environment.

- The solution contains the system and the enterprise contains the solution

- The system has no value on its own, the solution also has no value on its own, only when the solution is used in the enterprise context is where value gets realized

- 'All models are wrong but some are useful.' – George E.P. Box

- What is a useful model?

1. A useful model can answer important questions for key stakeholders (for all disciplines and stakeholders)

2. A useful model can provide answers that are accurate (enough), timely and insightful?

- The answers to the questions may force someone to ask different questions at a later stage.
- What sorts of questions could we ask?
  - For the system: what? How well?
  - Solution requirements: where? When? How will it be used?
  - Enterprise requirements: why? So what? Who cares?

- How well do your models help the stakeholders answer these questions?
  - Who benefits?
  - Who loses?
  - Who pays?
  - Who supplies?
- Key messages a model should convey:
  - Is the problem well understood?
  - Is the solution good enough?
  - IS the solution affordable and timely?
  - Is the risk acceptable?
- There are other questions to ask before you get to architecture related to business and mission needs, operations concept, functional capabilities then architecture (an example set of questions is disclosed in the presentation)
- SysML may be adequate for modeling the system but is it suitable for modeling the solution and the enterprise?
- Model management activities include:
  - Purpose analysis
  - Problem framing
  - Solution framing
  - Planning and organization
  - Enablers development
- Example decomposition of problem framing: what are the users and who are the uses of the model? What is the scope and context of the model? What information and data is required to be inputted and outputted to and from the model? What views and models are required at the end?
- The difference between models and views: views need to be human understandable

- We make models that we are proud of but then we are not equipped to translate the models into business speak
- It is very important to understand what decision is required to be made via the use of the model
- Systems engineering is the practice of helping people understand their problem and how the proposed design solution contributes to solving this problem

Conclusion

- Architectures have value if they can answer fundamental questions of benefit vs cost for the key stakeholders and if they can do this in a timely and cost-effective manner with a minimum effort
- Models should not be built until you know the questions to be answered and how the answers will be used by project participants and enterprise decision makers

Link to James' 20 minute presentation on YouTube

Watch the riveting MBSE Lightning Round Q&A session here

4. SYSTEMS ENGINEERING NEWS

4.1 Barry Boehm Recognized as INCOSE's 2019 Systems Pioneer

Image Source

Barry Boehm has been recognized for his work as a systems pioneer, uniquely contributing to the advancement of systems engineering through extensive research, education, and the application thereof in industry.

From Wikipedia:

Barry W. Boehm (born 1935) is an American software engineer, distinguished professor of computer science, industrial and systems engineering; the TRW Professor of Software Engineering; and founding director of the Center for Systems and Software Engineering at the University of Southern California. He is known for his many contributions to the area of software engineering.

Presentation by Barry Boehm: "A View of 20th and 21st Century Software Engineering"

4.2 Booz Allen Hamilton and INCOSE Announce Newly Certified Systems Engineering Professionals

The International Council of Systems Engineering (INCOSE) announced that it has renewed a memorandum of agreement (MOA) with Booz Allen Hamilton to collaborate in the granting of the status of Certified Systems Engineering Professionals (CSEP) or Associate Systems Engineering Professionals (ASEP) to properly experienced Booz Allen systems engineers.

Garry J. Roedler, INCOSE President stated, "Booz Allen's renewed certification agreement with INCOSE will continue to support systems engineers as they expand their training and education. We are extremely happy to continue to collaborate with them and work together to embrace the best practices of systems engineering."

"Booz Allen has more than 140 INCOSE-certified systems engineers – the third highest for any organization in the United States," said Booz Allen Vice President Kevin Coggins. "INCOSE's Certification Program provides valuable training for our firm's elite engineering talent, and we're proud to bring this qualified experience to our military, government, and commercial clients."

More Information

4.3 Call for MBSE Lightning Round Submissions

27 September Deadline

by

Christine Kowalski | Aug 23, 2019

As MBSE becomes mainstream with many topics to cover, it is necessary to streamline information delivery at our annual MBSE Workshops (next one is Jan. 25-28 in Torrance CA). For the last several years, we have experimented with various methods, but the best approach/most popular is the MBSE Lightning Round (a series of TED-talk like 18-minute presentations on MBSE topics). This year we are continuing the Lightning Round, but opening it to proposals, thus this call for 18-minute MBSE lightning Round proposals.

MBSE Lightning Round presentation proposals will include stories, experiences, case studies, research, issues, etc. that will inspire MBSE for attendees and provoke further conversations. These presentations will be recorded and added to the MBSE INCOSE YouTube Channel library for reference.

Please respond with a title, abstract, contact information, and brief bio to:
mbse-submissions@incose.org by Sept. 27, 2019.

We appreciate your participation.

Troy Peterson/Mark Sampson
INCOSE MBSE Initiative Chairs

4.4 Electrical and Systems Engineers to Support NASA-Funded Research on Electric Aircraft

Article Source

Electrical and systems engineers from Rensselaer Polytechnic Institute will develop simulation models to help researchers at the University of Illinois develop an all-electric aircraft, a project that recently received a $6 million grant from NASA.

Although improvements have been made to increase flight efficiency over the past few decades, the continued dependency on hydrocarbon fuels makes aircraft operation costs volatile. It also means commercial aviation will continue to contribute a significant amount of greenhouse gas emissions across the national and international transportation industry.

In an effort to address these challenges, the team is looking toward more sustainable energy sources for aviation and the introduction of new electrically driven propulsion systems for commercial aircraft systems.

“A plane has multiple systems inside of it,” said Luigi Vanfretti, associate professor of electrical, computer, and systems engineering. “You need to have a way to understand the interaction of the systems and, in an integrated way, you need to optimize them together.”

Vanfretti’s ALSETLab, which stands for Analysis Laboratory for Synchrophasor and Electrical Energy Technology, specializes in complex modeling simulations of electrical systems. His focus on simulation models has led to multiple collaborations with other academic institutions, government organizations, and industry. The work his team does, Vanfretti said, helps researchers understand how systems work together and if new developments will be successful long before they’re physically tested.

“There’s a big need and it’s becoming greater because we are integrating things with software,” he said. “It costs too much money to develop prototypes, so of course you need to make models and simulations.”

This new electric aircraft initiative, led by Phillip Ansell, assistant professor in the Department of Aerospace Engineering at Urbana-Champaign, is called CHEETA—the Center for Cryogenic High-Efficiency Electrical Technologies for Aircraft.

Through his work with CHEETA, Vanfretti will support the development of a fully electric aircraft platform that uses cryogenic liquid hydrogen as an energy storage method.

“The hydrogen chemical energy is converted to electrical energy through a series of fuel cells, which drive the ultra-efficient electric propulsion system,” Ansell said. “The low temperature requirements of the hydrogen system also provide opportunities to use superconducting, or lossless, energy transmission and high-power motor systems.”

Ansell compared the use of superconducting materials at cryogenic temperatures to how the magnets in MRIs work.

“However,” he added, “these necessary electrical drivetrain systems do not yet exist, and the methods for integrating electrically driven propulsion technologies into an aircraft platform have not yet been effectively established. This program seeks to address this gap and make foundational contributions in technologies that will enable fully electric aircraft of the future."

In addition to Illinois and Rensselaer, the project participants include the Air Force Research Laboratory, Boeing Research and Technology, General Electric Global Research, The Ohio State University, Massachusetts Institute of Technology, the University of Arkansas, and the University of Dayton Research Institute.

4.5 The Engineering Design Show: 16th & 17th October 2019

Ericsson Exhibition Hall, Ricoh Arena, Coventry

Image Source

The Engineering Design Show is the UK's only event entirely dedicated to engineering, electronics and embedded design. The show provides the ideal environment for design engineers to benefit from direct access to the latest products, services and innovations available to the sector.

The Engineering Design Show is expected to have over 4000 attending visitors, 25 conference speakers, 220 exhibitor stands and 35 practical workshops during the course of the two days.

Register Here

4.6 Digital Transformation in Complex Systems Engineering Conference 2020

On September 21-22, 2020 the 4th Asia-Pacific Complex Systems Design & Management conference will be held in Beijing, China. The conference will be co-organized with Chinese Society of Aeronautics and Astronautics (CSAA) and in partnership with INCOSE, China Aviation Industry Corporation (AVIC), China State Shipbuilding Corporation (CSSC), Tsinghua University, 北京航空航天大学 (Beihang University) and CASC.

4.7 Call for Papers IEEE/NDIA/INCOSE Systems Security Symposium 2020

Crystal City, Virginia, USA

This symposium will address the convergence of cybersecurity, safety, and engineering with interest in the effective application of security principles, methods, and tools to complex systems such as cyber-physical systems, autonomous systems, transportation vehicles, medical devices, large IoT systems, and other systems of interest.

Topics:

- Systems Security Work Focused on Advancements in Theory, Practice, and Education
- Engineering of Safe, Secure, and Resilient Systems
- Examples of Mission/Systems Assurance and Assurance Cases
- Model Based Engineering focused on Security, Safety, Trust, Resiliency
- Affordable and Scalable Approaches to Hardware, Software, Firmware Assurance
- Novel Architecture Design and Analysis Examples or Trade-Space Studies
- Trust of Complex Systems with Emphasis on Cyber-Physical Systems
- Security considerations for machine learning / artificial intelligence
- Large-Scale DevSecOps and Agile Approaches for System Development
- System Security Design Considerations for Cloud Environments
- Verification, Validation, and Evidences for Secure System Development
- Extensions of Formal Methods to System-Level Evaluation
- Cybersecurity in Manufacturing and Supply Chains
- Case studies to include automotive, transportation, space, and others
- Cyber-Physical System Event Detection, Investigation, Forensics, and Malware Analysis
- Tailored Risk Management Approaches for Large Complex Systems
- Attack/Defense Modeling, Simulation, and Characterization
- Techniques for Cyber Risk Buy Down in Legacy Systems, Infrastructure, and Enterprises
- Policy, Ethical, Legal, Privacy, Economic, and Social Issues

Additional Information

4.8 Upcoming INCOSE Election: Please Vote!

During the period from 14 September to 6 October, INCOSE members will have the opportunity to vote for several positions, including President Elect, Treasurer, Director for Strategic Integration, and Director for Academic Matters. The only position that has more than one candidate is President Elect.

The next President-Elect of INCOSE will serve as President Elect for two years under incoming President Kerry Lunney from 2020-2022, and then serve another two years as INCOSE's President for 2022-2024.

Regular and senior members in good standing will have the opportunity to vote for these positions. Consistent with INCOSE Bylaws, neither students nor associate members may vote. Successful candidates will be installed in office at the 2020 International Workshop.

An INCOSE Webinar was held on 12 September in which the two candidates for President Elect, Marilee Wheaton and Joe Marvin, were asked a series of questions concerning their experience, qualifications, goals, priorities, and plans concerning INCOSE.

INCOSE members should have received an email on September 13th that provides instructions concerning how to vote electronically.

Biographies

Joseph W Marvin ESEP

Joe Marvin is PSG founder and president and focuses the company to combine core competencies with research initiatives in a defined technology roadmap.

Joe is a systems engineer who started his career with the United States Air Force as a Space System Research and Development Engineer. After military service he held Chief Systems Engineering and Program Manager industry roles with Lockheed Martin and SAIC on major system acquisitions in defense. He currently serves as President of Prime Solutions Group, Incorporated, a systems and software integration small business he founded in 2007. At PSG, he applies his experience with product development and delivery to market of large software development baselines to the PSG research agenda. PSG's core expertise in sensor data processing and multi-intelligence product development is augmented by innovative software tool development with Big Data technologies to support complex system modeling & simulation, and Artificial Intelligence/Machine Learning applications.

Joe has served in a number of INCOSE roles across the organization since 2007 as a member of the Central Arizona Chapter. These roles include: Chapter President, Chair of the Small Business Systems Engineering Working Group (formerly VSEWG), Tech Ops Assistant Director for Industry, Tech Ops Assistant Director for Internal Operations, Assistant to Director for Outreach and Future of Systems Engineering (FuSE) Artificial Intelligence subcommittee member.

Locally, Joe has served as President of the Arizona Air Force Association and President of the Maricopa Trails and Parks Foundation. He earned a MS in Engineering Science from Northrop University, in Los Angeles, CA, and BS degree in Engineering Science from Arizona State University. Joe and his wife, Sharon, live in Phoenix, AZ and have two children, Jared and Megan and two grandchildren, Charley and Leo.

Marilee J. Wheaton

Marilee J. Wheaton is a Systems Engineering Fellow at The Aerospace Corporation, a Federally Funded Research and Development Center (FFRDC) headquartered in El Segundo, California. In this role, she is responsible for providing technical leadership and building capability across the corporation to include enterprise systems engineering, systems architecting, and model-based systems engineering. Her previous assignment was as the executive director and general manager of The Aerospace Institute which coordinated all education, training, and staff development activities at the corporation. Wheaton has held several executive level technical leadership positions at Aerospace, including general manager of the Systems Engineering Division (SED) and general manager of the Computer Systems Division. As general manager of SED, she provided functional engineering leadership for space systems architecture and design, acquisition and planning, systems analysis and simulation, and mission assurance. From 1999 to 2002, Wheaton was a director with TRW Systems providing leadership for cost estimation, metrics, and quantitative management goals. She is a trained CMMI appraiser and led process improvements as a Six Sigma Black Belt. Wheaton holds a B.A. in mathematics and a B.A. in Spanish from California Lutheran University both magna cum laude. She earned an M.S. in systems engineering from the University of Southern California (USC) and is a graduate of the UCLA Anderson School Executive Program in Management. Wheaton is currently a Systems Engineering Research Center (SERC) Fellow, completing her PhD at USC in the Systems Architecting and Engineering Program. A member of INCOSE since 2002, she was selected as an INCOSE Fellow in 2009; received an INCOSE Outstanding Service Awards in 2018; and received the INCOSE Foundation Kossiakoff Award for best systems engineering research in 2018. She is one of the leaders in the Empowering Women Leaders in Systems Engineering (EWLSE) working group. Wheaton has been a member of the Corporate Advisory Board representing Aerospace from 2006 – 2009 and from 2015 to the current time. She has held leadership roles for the 2014 and 2017 Conference on Systems Engineering Research (CSER) to include the Technical Program Committee and Conference Management. Wheaton is also a Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and is an active member of the organization's technical committees on economics and systems engineering. A Fellow and Life Member of the Society of Women Engineers (SWE) and a past President of the Los Angeles Chapter, Wheaton has taken on high-profile leadership positions for SWE both locally and nationally. She is also a Senior Member of IEEE, and an active member of the IEEE Systems, Man and Cybernetics (SMC) Society. She is the recipient of several awards for her contributions to these Societies. Wheaton currently serves as a member of the Advisory Board for the California State University Northridge (CSUN) Bonita J. Campbell Endowment for Women in Science and Engineering (WISE) and on the CSUN College of Engineering and Computer Science Industrial Advisory Board. Wheaton also has served as adjunct faculty for over a decade in the Systems Architecting and Engineering Program at USC.

More Information

MIT Non-Degree Program in Architecture and Systems Engineering

by

Ralph Young

Editor

PPI SyEN

More than 600 people attended an online webinar on 17 September 2019 hosted by Bruce G. Cameron, Director of the non-degree architecture and systems engineering courses provided annually by the Massachusetts Institute of Technology (MIT) USA.

Dr. Cameron indicated that he expects continued great change over the next five years that will test how far we can extend our existing architectures. He stated that the purpose of the MIT non-degree program is to help people make decisions concerning how to proceed with continued development and delivery of products and services. Companies attending the webinar included Northrop Grumman, Honeywell, Boeing, Apple, Microsoft, and MITRE, among many others.

The Program provided by MIT consists of four courses:

- Architecture of Complex Systems and Systems Thinking (four weeks)
- Models in Engineering Function and Emergence (four weeks)
- MSBE Documentation and Analysis (four weeks)
- Quantitative Methods in SE (five weeks)

More than 6,000 people have enrolled in this Program. Some of the Course parameters are the following:

- There are no prerequisites for the courses.
- The courses are tool-agnostic (Dr. Cameron stated that there are more than 20 tools available today for MBSE).
- The courses address the *why* of MBSE in addition to the *how*.
- "Learner time" that is required by the students averages 4 to 6 hours per week. Learning is by doing. There is no final exam.
- The programs are asynchronous, that is, all content is pre-recorded, and the students can access the course materials at their convenience.
- Half of the students decide to work in teams; half don't.
- The courses are applicable to students from companies of all sizes.
- Perspectives of the students included technical, project management, services, and others.
- The courses launch and finish on specified dates.
- Pricing is $949 per course or $3,249 per Program (four courses). One can use the promo code SYSENGWEB to save 10% on the entire Program.
- There are weekly assignments.
- 90% of the students who spent more than 4-6 hours per week felt that the additional time invested was worthwhile.
- The Program is not a segway to a Master's Degree at MIT.

Dr Cameron noted that MIT's experience is that half of the students are active on weekends; the other half during the week. The modalities of the courses include Learn (watch recorded videos), Connect (have discussions with other students), Practice (complete non-graded practice problems), Assess (complete graded problems), and Apply (complete a weekly project). The courses faculty include Dr. Cameron, Ed Crawley, Adam Ross, Oliver de Weck, Warren Hoberg, Donna Rhodes, Steve Eppinger, Dov Dori, and John Hansman. Some of the more than 50 expert guest lecturers include Anna Thornton, Joe Lessard, Matthias Kreimeyer, Roy Primus, Kate Cantu, and Robert Wirthlin. The guest lecturers bring real case studies from their work environments.

The certificate schedule for the coming year is as follows:

Course 1	Sep 30 – Nov 4
Course 2	Nov 11 – Dec 16
Course 3	Jan 6 – Feb 3

Course 4	Feb 10 – Mar 9

Information

To view a recorded version of the webcast
https://event.on24.com/wcc/r/2052884/E24D20EF3F61AA604F23458F94A99705?mode=login&email=ryoungrr@aol.com

To enroll in the Program that begins on September 30, 2019 (Use coupon code **SYSENGWEB** to save 10%).
Visit this link to enroll.

Website
http://sysengonline.mit.edu

Email
xpro@mit.edu

5. FEATURED ORGANIZATIONS

5.1 Association for Computing Machinery (ACM)

Image Source

The Association for Computing Machinery is an international learned society for computing. It was founded in 1947, and is the world's largest scientific and educational computing society. The ACM is a non-profit professional membership group, with nearly 100,000 members as of 2019. Its headquarters are in New York City. ACM delivers resources that advance computing as a science and a profession. ACM provides the computing field's premier Digital Library and serves its members and the computing profession with leading-edge publications, conferences, and career resources. ACM's Special Interest Groups (SIGs) represent major areas of computing, addressing the interests of technical communities that drive innovation. SIGs offer a wealth of conferences, publications and activities focused on specific computing sub-disciplines. They enable members to share expertise, discovery and best practices.

More Information

5.2 Swiss Society of Systems Engineering (SSSE)

The **Swiss Society of Systems Engineering (SSSE)** is a non-profit organization formed in 2011 by a group of like-minded engineers, working across a broad range of industries, who share the passion of practicing, advancing and promoting Systems Engineering (SE) principles. SE is fundamentally: "doing engineering better".

SSSE is actively organizing informational lectures, seminars, and events on various SE topics ranging from "Concurrent Engineering in the Space Industry" to "a Beginner's guide to the SE Handbook" (essentially the reference book for SE, published by INCOSE). All of SSSE's events are free of charge. See the events page for more information.

The SSSE has also been recognized officially as the Chartered Swiss Chapter of **INCOSE (International Council on Systems Engineering)**.

The SSSE has strong links with the **GfSE (German Chapter of INCOSE)**. Members of both organizations have the same membership benefits. The most significant difference is that GfSE uses German and the SSSE uses English - even though the SSSE is fortunate to have many multilingual members.

SSSE collaborates with the French Chapter of INCOSE (AFIS), the Italian Chapter of INCOSE (AISE), and the Spanish Chapter of INCOSE (AEIS) to provide a South European Systems Engineering Tour each year that is provided in four venues, one in each country.

SSEE Home Page

5.3 Military Operations Research Society (MORS)

MORS has a long and distinguished history, dating back over fifty years. The First Military Operations Research Symposium (MORS), sponsored by the Office of Naval Research (ONR) - Pasadena, was held at Corona Naval Ordnance Lab, Corona, California in August of 1957. By the Eighth MORS Symposium, the event became a nationally oriented joint-service meeting. In April 1966 the Military Operations Research Society was incorporated.

MORS is proud of its heritage as it closely reflects the heritage of Operations Research in the United States. MORS recognizes those individuals who have made long-lasting and significant contributions to the Society as Fellows of the Society. They are some of the great minds in military and national security OR work.

Additional Information

6. NEWS ON SOFTWARE TOOLS SUPPORTING SYSTEMS ENGINEERING

6.1 Zuken Completes Vitech Corporation Acquisition

Zuken, a supplier of electrical and electronic design automation solutions, has completed the acquisition of Vitech Corporation following the approval of the US Department of Defense and the Committee on Foreign Investment in the United States (CFIUS).

Vitech has more than 25 years of industry experience in systems engineering methodology offering products and services directed at the Model-Based Systems Engineering (MBSE) market. The acquisition expands

Zuken's solution portfolio to include systems engineering, an area of increasing importance to product development companies.

"The acquisition of Vitech advances Zuken's strategy to become a leader in digital engineering solutions," said Jinya Katsube, Chief Operating Officer at Zuken. "Zuken is now uniquely positioned with solutions in both systems engineering and detailed design to take a leadership role in the development of electrical and electronic model-based design practices from product definition to manufacturing."

More Information

6.2 Visure Solutions Takes No.1 Spot for Requirements ALM Platform Second Year in a Row

Image Source

The Software Reviews Data Quadrant Gold Medal Awards recognize outstanding vendors in the technology marketplace as evaluated by their users. Gold Medals represent the capstone of the firm's in-depth software evaluation reports and are awarded based on a composite score that encapsulates performance in five areas of evaluation: vendor capabilities, product features, customer satisfaction, likeliness to recommend, and net emotional footprint.

Visure Solutions, Inc., a trusted specialized requirement ALM partner for companies of all sizes across safety-critical and business-critical industries, has scored the No.1 Requirements ALM Platform for two years in a row (2018 and 2019) and has been awarded the Gold Medalist Award by Info-Tech Research Group's Application Lifecycle Management (ALM) Vendor Landscape.

Visure recently introduced a new ALM Platform, the first-of-its-kind feature-rich ALM solution supports full standard compliance of safety-critical and business-critical applications.

"Customers have consistently highlighted Visure´s commitment to their success as a key aspect why they love Visure Requirements ALM," said Dr. Moustapha Tadlaoui, Visure's CEO. "We work hand-in-hand with them to improve Visure's technology by adding new capabilities that fulfill customers need, and especially helping us to develop one of the easiest and most intuitive tools in the market."

Read the Full Article Here.

7. SYSTEMS ENGINEERING PUBLICATIONS

7.1 Emerging Frontiers in Industrial and Systems Engineering: Success through Collaboration

by

Harriet B. Nembhard, Elizabeth A. Cudney, and Katherine M. Coperich

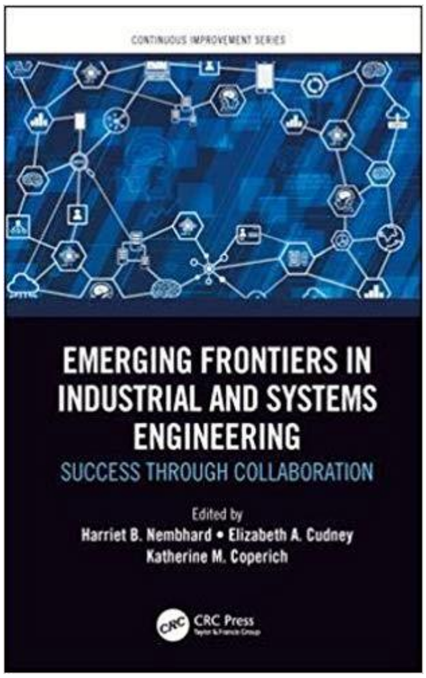

Image Source

by

Harriet B. Nembhard, Elizabeth A. Cudney, and Katherine M. Coperich

From the Amazon.com Website:

Success is driven through collaboration. The field of Industrial and Systems Engineering has evolved as a major engineering field with interdisciplinary strength drawn from effective utilization, process improvement, optimization, design, and management of complex systems. It is a broad discipline that is important to nearly every attempt to solve problems facing the needs of society and the welfare of humanity. In order to carry this forward, successful collaborations are needed between industry, government, and academia. This book brings together an international group of distinguished practitioners and academics in manufacturing, healthcare, logistics, and energy sectors to examine what enables successful collaborations.

The book is divided into two key parts: 1) partnerships, frameworks, and leadership; and 2) engineering applications and case studies. Part I highlights some of the ways partnerships emerge between those seeking to innovate and educate in industrial and systems engineering, some useful frameworks and methodologies, as well as some of the ideas and practices that undergird leadership in the profession. Part II provides case studies and applications to illustrate the power of the partnerships between academia and practice in industrial and systems engineering.

Features:

- Examines the success from multiple industries.
- Provides frameworks for building teams and avoiding pitfalls.
- Contains international perspectives of success.
- Uses collaborative approaches from industry, government, and academia.

- Includes real world case studies illustrating the enabling factors.
- Offers engineering education and student-centric takeaways.
- Formats: Kindle and Hardcover

Formats: Kindle and Hardcover

Publisher: CRC Press; 1 edition (June 24, 2019)

ISBN-10: 1138593753

ISBN-13: 978-1138593756

More Information

7.2 From Engineer to Manager: Mastering the Transition

by

B. Michael Aucoin

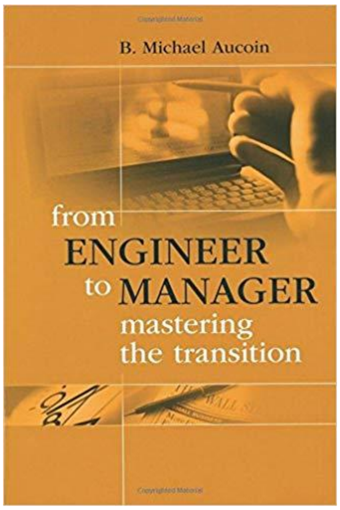

Image Source

From the Amazon.com Website:

Providing clear, expert guidance to help engineers make a smooth transition to the management team, this a newly revised and updated edition of an Artech House bestseller that belongs on every engineer's reference shelf. The author's 30-plus year perspective indicates that, while most engineers will spend the majority of their careers as managers, most are dissatisfied with the transition. Much of this frustration is the result of lack of preparation and training.

Review by Gerard H. (Gus) Gaynor 3M Director of Engineering, Retired Life Fellow, Institute of Electrical and Electronics Engineers:

From Engineer to Manager: Mastering the Transition is a must read if you are an engineer, an upward-bound engineer thinking about transitioning to a leadership position in management, a professional in any discipline pursuing a future in management, or a student. Also, an excellent review text of leadership principles for those in top leadership positions. The author, B. Michael Aucoin, addresses the transition issues, from many years of experience in research and practice. He examines the topics required to master the fundamentals, recognizing that the practice of engineering management and leadership evolves. Every day presents new challenges and opportunities which cannot be resolved by some prescribed methodology. Mastering those leadership skills builds business success and also career success. Leaders inspire and develop new leaders. Aucoin treats transitioning to leadership with a mindset that integrates the ever-important and challenging roles of: 1) building relationships both within and also outside the organization; 2) seeing the organization as a system and exploring new opportunities; 3) getting the work of the organization done effectively and efficiently; 4) communicating clearly at all levels in the organization, and especially when reaching decisions to take action; 5) using organizational and other resources judiciously to maintain the financial stability of the organization; and 6) looking beyond one's field of expertise while eliciting greatness from your teams making continuous progress in providing organizational leadership for your teams. This is your opportunity to begin the transition to take on a leadership position in management. There are no mysteries, just a clear understanding of the fundamental principles and learning from each opportunity to lead one opportunity at a time, with each new opportunity imposing new challenges and new learning.

Series: Wiley Series in Systems Engineering and Management

Format: Kindle, Hardcover

Publisher: Artech House; 2 edition (September 30, 2018)

ISBN:

ISBN-10: 1630815438

ISBN-13: 978-1630815431

More Information

7.3 Digital Engineering Magazine

From the DE Magazine Website:

DE's magazine, websites and e-newsletters have a history of bringing design engineering teams the latest technology news, products and services. We are focused on optimizing the design cycle to show our audience how technology can be used to bring better products to market faster. Engineering technologies from 3D printing, data management tools, simulation software and high-performance computing are converging to allow design engineers to create more innovative products than ever before. We will guide our audience through the multi-disciplinary engineering complexities involved in designing those products and explain how technology and engineering services can help them meet their deadlines and clients' needs.

LinkedIn

More Information

7.4 Making Space: Strategic Leadership for a Complex World

by

Dr. Wanda M. Austin

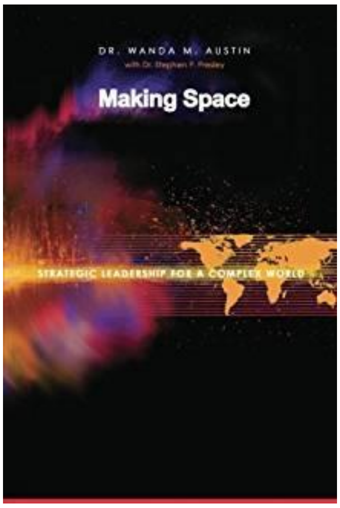

Image Source

Editor's note: Dr. Austin was a Keynote Speaker at the INCOSE 2019 International Symposium.

From the Amazon.com Website:

In Making Space: Strategic Leadership for a Complex World, Dr. Wanda M. Austin, president and CEO of The Aerospace Corporation, shares leadership lessons that she has learned during her decades-long career as an engineer and executive in the space industry. "Leadership is not a birthright; it is a skill. Leaders can come from anywhere and in any form," says Austin, noting "there was a societal assumption that an African American woman from the inner city in the 1960s could not be a leader." In this book, Austin shows how she proved that assumption wrong, relying on the encouragement and mentorship of others, while developing the work ethic, values, and skills that took her to the top position in The Aerospace Corporation, a leading architect of the nation's national security space programs. Austin, who became president and CEO of The Aerospace Corporation on January 1, 2008, is internationally recognized for her work in satellite and payload system acquisition, systems engineering, and system simulation. She serves on the President's Council of Advisors on Science and Technology, was appointed to the Defense Science Board in 2010, and was appointed to the NASA Advisory Council in 2014. Among the topics covered in her book are:

- Leading through Unexpected, Uncertain, and Intentional Change
- Stacking the Deck: The Tactics of Strategic Leadership, and
- Building Your Team

Format: Kindle and Paperback

Publisher: CreateSpace Independent Publishing Platform (July 6, 2016)

ISBN:

ISBN-10: 1534878181

ISBN-13: 978-1534878181

More Information

8. EDUCATION AND ACADEMIA

8.1 Systems Engineering at Cornell University

Ithaca New York USA

“Graduate students in Systems pursue methodologies and modeling techniques in engineering, business, and the social sciences that are relevant for planning and executing multi-disciplinary solutions to solve a variety of societal design and operational issues in today’s complex world.”

"At Cornell, Systems Engineering is about the real world—the complicated and messy real world. Yes, you learn the methodologies for design and analysis. You also learn the unwritten rules. That everything connects to everything. That every choice has a ripple effect. That every decision has a price—and you have to trade off until the price is right.”

H. Oliver Gao - Associate Professor of Civil and Environmental Engineering

The Systems Engineering Program was developed in response to pleas from industry for engineers who not only had depth in a particular undergraduate discipline but who could also rise above disciplinary boundaries and take leadership from a systems perspective.

Master of Engineering in Systems Engineering (Online Study)

As more and more engineers pursue master's level education, the demand for master's programs is increasing and will rise dramatically in the coming years. Many of those prospective master's degree students are engineers who already have professional jobs, and who want to pursue a professional master's program without leaving their employment. For these mature students, part-time study, often based on distance learning, is a necessity.

More Information

Systems Ph.D.

Each Ph.D. student must select a committee chair (thesis advisor). The committee chair will aid the graduate student in selecting a Special Committee, which shall consist of a minimum of three faculty members and which will directly supervise the graduate study and research of a student. The committee chair, who is also usually the thesis advisor, represents the major field of Systems. The other faculty members represent two minor fields. Students in Systems are strongly advised to develop interdisciplinary skills and thus are discouraged from having both of their minors fields in areas closely related to their undergraduate training or major advisors primary field. The special committee must be formed before the end of the third semester but the advisor and the student should begin thinking about this at the beginning of their graduate study.

More Information

8.2 MSc in Engineering Systems and Management (ESM)

Khalifa University of Science and Technology, Abu Dhabi

Image Source

The degree of Master of Science in Engineering Systems and Management (M.Sc. in ESM) is awarded for successfully completing the requirements of a program of study, which includes taught courses as well as a written thesis. The thesis is an independent investigation of specialized areas within the general field of Engineering Systems and associated disciplines. The M.Sc. in ESM is an interdisciplinary program that brings together experts in engineering, design, economics, management and policy to teach and undertake research into large-scale complex systems, and contribute to the process of discovery and knowledge creation through the conduct of original research. The mission of the Master of Science in Engineering Systems and Management Program at KUST is to create corporate and government leaders that can effectively deal with global energy and sustainability challenges that involve large scale systems. The M.Sc. in ESM graduates are trained in strategy, industrial operations, operations research, and systems thinking. As such, they will be ideally positioned to take leadership positions in the private or public sector and guide research and implementation of advanced technologies, and optimize the operations and design of complex systems. Research may be undertaken in several topics corresponding to the areas of focus identified by the University.

More Information

9. SOME SYSTEMS ENGINEERING-RELEVANT WEBSITES

Eng-Tips.com

Eng-Tips.com is a work and technical support forum for engineering professionals. It features white papers, job listings, and forums on a variety of engineering subjects that might be useful for students.

https://www.eng-tips.com/

Engineer Girl

Engineer Girl is a resource for women in engineering. It is one part career guide, one part celebration of women in engineering. It provides information about the various streams of engineering, profiles women in engineering roles, gives job prospect information and links to other engineering websites.

https://www.engineergirl.org/

Loughborough University (Leicestershire UK) Systems - Net

Systems-NET aims to add significant value to the systems research base by forming a sustainable network of high profile world-class excellence where systems efforts can be consolidated and advanced.

Systems-NET is coordinating the following events in UK:

- Annual Systems Research Grand Challenges Workshops - These will be cross-sector workshops to identify the key research grand challenges for the systems engineering community.
- Networking events – These are either sector specific, or cross-sector community building networking meetings which will take place at key UK Centers of excellence – Bristol, Loughborough, Strathclyde, Southampton, UCL, York, etc.
- Systems Knowledge base - Online knowledge base repository with links to Case Studies, Books and Journals, Body of Knowledge, Conferences, Expertise, Organizations and Societies in the UK.
- Case studies - Publicly available case study material demonstrating the value of systems engineering plus especially commissioned case studies prepared with the support of Systems-NET.
- Seminar Program **–** A program of on-line seminars or Webinars is now available under the Seminar Program page of this site.
- Consultation **-** Continuous collaboration, networking and dissemination with the stakeholder community in its widest sense.

https://www.lboro.ac.uk/research/systems-net/knowledgebase/booksandjournals/

10. STANDARDS AND GUIDES

10.1 Application of Systems Engineering Standards

Article concerning the SEBoK v. 2.0, released 1 June 2019

Source: https://www.sebokwiki.org/wiki/Application_of_Systems_Engineering_Standards

There are many systems engineering standards that have evolved over time, as indicated in Relevant Standards. Some pitfalls and good practices in utilizing standards are also identified in the article on relevant standards. In this article, several additional factors related to the utilization of the standards in systems engineering (SE) are presented.

Standards and their Utilization

A standard is an agreed upon, repeatable way of doing something. It is a published document that contains a technical specification or other precise criteria designed to be used consistently as a rule, guideline, or definition. Standards help to make life simpler and to increase the reliability and the effectiveness of many goods and services we use. Standards are created by bringing together the experience and expertise of all interested parties, such as the producers, sellers, buyers, users, and regulators of a particular material, product, process, or service.

Standards are designed for voluntary use and do not impose any regulations. However, laws and regulations may address certain standards and may make compliance with them compulsory.

Further, organizations and their enterprises may choose to use standards as a means of providing uniformity in their operations and/or the products and services that they produce. The standard becomes a part of the corporate culture. In this regard, it is interesting to note that the ISO/IEC/15288 15288 (2015) standard has provided such guidance and has provided a strong framework for systems engineers as well as systems engineering and business management, as forecast earlier by Arnold and Lawson (2004).

ISO directives state the following:

A standard does not in itself impose any obligation upon anyone to follow it. However, such an obligation may be imposed, for example, by legislation or by a contract. In order to be able to claim compliance with a standard, the user (of the standard) needs to be able to identify the requirements he is obliged to satisfy. The user needs also to be able to distinguish these requirements from other provisions where a certain freedom of choice is possible. Clear rules for the use of verbal forms (including modal auxiliaries) are therefore essential.

Requirements, Recommendations, and Permissions

In order to provide specificity, standards employ verb forms that convey requirements, recommendations, and permissions. For example, the ISO directives specify the following verb usages:

- The word *shall* indicates requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted.
- The word *should* indicates that among several possibilities, one is recommended as particularly suitable without mentioning or excluding others, or that a certain course of action is preferred, but not necessarily required, or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.
- The word *may* indicates a course of action permissible within the limits of the standard.

The directive also indicates that standards should avoid the use of *will, must,* and other imperatives.

Certification, Conformance, and Compliance

In the context of the management system standards (ISO 9001:2000 and ISO 9001:2008 or ISO 14001:2004), *certification* refers to the issuing of written assurance (the certificate) by an independent external body that it has audited a management system and verified that it conforms to the requirements specified in the standard.

Typically, other more specific systems engineering standards are not the subject of certification. They are self-imposed in order to improve uniformity of organization and enterprise operations or to improve the quality of products and services. Alternatively, they may be dictated by legislation, policy, or as part of a formal agreement between an **acquirer** and a **supplier**.

Conformance testing, or type testing, is testing to determine whether a product or system meets some specified standard that has been developed for efficiency or interoperability. To aid in this, many test procedures and test setups have been developed either by the standard's maintainers or by external organizations, such as the Underwriters Laboratory (UL), specifically for testing conformity to standards.

Conformance testing is often performed by external organizations, which is sometimes the standards body itself, to give greater guarantees of compliance. Products tested in such a manner are then advertised as being certified by that external organization as complying with the standard. Service providers, equipment manufacturers, and equipment suppliers rely on this data to ensure quality of service (QoS) through this conformance process.

Tailoring of Standards

Since the SE standards provide guidelines, they are most often tailored to fit the needs of organizations and their enterprises in their operations and/or for the products and services that they provide, as well as to provide agreement in a contract. Tailoring is a process described in an annex to the ISO/IEC/IEEE 15288 (2015) standard.

The ISO/IEC/IEEE 15288 (2015) addresses the issues of conformance, compliance, and tailoring as follows:

- Full conformance, or a claim of full conformance first declares the set of processes for which conformance is claimed. Full conformance is achieved by demonstrating that all of the requirements of the declared set of processes have been satisfied using the outcomes as evidence.

- Tailored conformance is an international standard that used as a basis for establishing a set of processes that do not qualify for full conformance; the clauses of this international standard are selected or modified in accordance with the tailoring process.

- The tailored text, for which tailored conformance is claimed, is declared. Tailored conformance is achieved by demonstrating that requirements for the processes, as tailored, have been satisfied using the outcomes as evidence.

- When the standard is used to help develop an agreement between an acquirer and a supplier, clauses of the standard can be selected for incorporation in the agreement with or without modification. In this case, it is more appropriate for the acquirer and supplier to claim compliance with the agreement than conformance with the standard.

- Any organization (e.g., a national organization, industrial association, or company) imposing the standard as a condition of trade should specify and make public the minimum set of required processes, activities, and tasks, which constitute a supplier's conformance with the standard.

Primary Reference

Roedler, G. 2010. "*An Overview of ISO/IEC/IEEE 15288, System Life Cycle Processes*." Proceedings of the 4th Asian Pacific Council on Systems Engineering (APCOSE) Conference, 4-6 October 2010, Keelung, Taiwan.

Other References

Arnold, S., and H. Lawson. 2004. "Viewing systems from a business management perspective." *Systems Engineering*, 7 (3): 229.

ISO. 2008. *Quality management systems -- Requirements.* Geneva, Switzerland: International Organization for Standardization. ISO 9001:2008.

ISO. 2004. *Environmental management systems -- Requirements with guidance for use.* Geneva, Switzerland: International Organization for Standardization. ISO 14001:2004

ISO/IEC/IEEE. 2015. *Systems and Software Engineering -- System Life Cycle Processes*. Geneva, Switzerland: International Organization for Standardization / International Electrotechnical Commissions / Institute of Electrical and Electronics Engineers. ISO/IEC/IEEE 15288:2015.

Roedler, G. 2010. "An Overview of ISO/IEC/IEEE 15288, System Life Cycle Processes. Asian Pacific Council on Systems Engineering." Asia-Pacific Council on Systems Engineering (APCOSE) Conference, Keelung, Taiwan.

Roedler, G. 2011. "Towards Integrated Systems and Software Engineering Standards." National Defense Industrial Association (NDIA) Conference, San Diego, CA, USA.

11. SOME DEFINITIONS TO CLOSE ON

Editor's note:

The source for the following definitions is https://www.digitalengineering247.com/glossary/big-data. See the description of *Digital Engineering Magazine* in the SE Publications section of this issue.

11.1 Digital Engineering

Digital engineering is the art of creating, capturing and integrating data using a digital skillset. From drawings to simulations and 3D models, engineers are increasingly using advanced technologies to capture data and create design in a digitized environment.

11.2 Big Data

A catchall term to describe data sets large enough to be analyzed via computer algorithms in order to discover patterns or trends that can be used to enhance human decision-making or automatically cause an automated action to take place. Big data can be structured (data in fixed fields of a database) or unstructured (everything else).

11.3 Cloud Computing

Cloud computing is the delivery of computing services, like servers, storage, databases, networking and software, over the Internet or the "cloud."

11.4 Digital Thread

Digital thread refers to the sharing of product lifecycle data up and down the extended supply chain via a communication framework that allows various stakeholders to access data relevant to their responsibilities on demand.

11.5 Multidisciplinary Design Optimization

The concurrent use of methods from different fields of engineering to solve design problems.

11.6 Quantum Computing

Unlike traditional binary computing that uses bits in either a 0 or 1 state, quantum computing uses quantum bits, which can be in super positions (states can be added together to form a valid state). Quantum computers theoretically would be able to efficiently solve problems that are not practically feasible on current, binary-based computers.

12. CONFERENCES AND MEETINGS

For more information on systems engineering related conferences and meetings, please go to our website.

Featured events for this edition:

12.1 The featured event: Australian Systems Engineering Workshop (ASEW19)

The Systems Engineering Society of Australia (SESA) is proud to host the Australian Systems Engineering Workshop (ASEW) in Melbourne from 28th to 29th October 2019.

If you are involved in the delivery of new capability or the provision of critical infrastructure services or even at the forefront of the Sustainability Era then the ASEW will contribute significantly to your journey. Whether you are a seasoned practitioner of Systems Engineering or have recently become introduced to the methodology these two days will add direct value to the challenges you face every day. Through various modes of workshop engagement this event provides access to Peers and technical specialists across numerous industries to breakdown and explore present day and real world issues. As a minimum you will walk away with a deeper understanding of many of the complex or complicated engineering topics being faced by our nation but more than likely you will gain a different perspective or alternative approach that will stimulate change and promote a new way of solving YOUR current problems. This is the power of Systems Thinking within the collective experience of our national Systems Engineering cohort.

The 2018 ASEW was held in Adelaide and saw the continuation of the multi-stream approach to ensure topics and themes of relevance to all participants. This was a very successful event and saw a record number of attendees participating and actively contributing to the facilitated workshops. The industries represented included Transport, Healthcare, Telecommunications, Energy and Space. In addition to the workshops and initiatives discussed at ASEW18, SESA members participate in a number of International Working Groups (through INCOSE) which are used to catalyse the development of technical product and inform the Systems Engineering Body of Knowledge. Some of these working groups include:

- Complex Systems
- System-of-Systems
- Requirements
- Project Management – Systems Engineering Integration
- Model-based Conceptual Design
- Engineering Process Standards

More Information

12.2 INCOSE EMEA Workshop 2019

10 & 11 October 2019 – Utrecht, the Netherlands

On 10 and 11 October, the INCOSE EMEA Workshop 2019 will take place in Utrecht, the Netherlands. EMEA is the INCOSE Sector including the European, Middle-Eastern and African regions.

The workshop is an excellent opportunity for systems engineers at all levels and from all backgrounds to engage in working sessions and to contribute with their knowledge and experience to bring the systems engineering discipline forward.

There will be opportunities to work on different systems engineering topics in five parallel sessions of two hours each. A total of twenty sessions are available. The workshop is intended to have highly interactive and daring sessions. The full program is available on the website.
It promises to be two inspiring days with 20 highly interactive workshop sessions on the following topics:

- Automotive,
- Architecture
- PM-SE Integration
- Simulation
- SME & SE
- Future of Systems Engineering

- Human System Integration
- Competency, Reliability Engineering
- Product Line Engineering and System Thinking
- Competency, Configuration Management
- System of Systems
- Young INCOSE
- Knowledge Based Engineering
- System Integration in Rail
- MBSE
- Oil & Gas.

More Information

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13. PPI AND CTI NEWS

13.1 Certification Training International (CTI) Launches Monthly Newsletter

September marks the launch of CTI's monthly newsletter highlighting news related to INCOSE's Systems Engineering Professional (SEP) certification process and exams, upcoming CTI courses and practical information for all SE-related certifications. If you would like to receive the latest newsletter, please subscribe here.

13.2 PPI and CTI Visits Mongolia

PPI's Managing Director, Robert Halligan, and CTI's Managing Director, René King, recently ventured to Ulaanbaataar in Mongolia to visit our friends at Tailored Unified Systems Solutions (TUSS). Some members of the PPI team had the pleasure of meeting some members of the TUSS team at the INCOSE IS in Orlando, Florida. During the IS that took place in July 2019, PPI and TUSS acknowledged possible opportunities for collaboration and exploration of systems engineering concepts with PPI's strong application of SE in technical fields and TUSS' fervent dedication to applying SE to social environments. TUSS specializes in social systems engineering and applies curated algorithms to diagnose the health of organizations in addition to providing holistic support to organizations, enabling them to reach their business goals in a rapid and effective manner. PPI and TUSS worked side-by-side in delivering presentations to relevant engineering professionals and students to promote the application of systems engineering in all engineering and organizational practice. The trip was a wonderful professional experience but even more so, it was an enjoyable personal journey. What a blessing it was to be surrounded by such beautiful land and such welcoming people. Take it from us, Ulaantbaataar is a city to be reckoned with and we expect that it will become one of most connected and rapidly developing cities in the world in the very near future! We would love to return to this amazing place soon. Thank you to our friends at TUSS for being such generous hosts. Until next time, cobbers[1]!

14. PPI AND CTI EVENTS

On-site systems engineering training is delivered worldwide throughout the year. Below is an overview of public courses. For a full public training course schedule, please visit https://www.ppi-int.com/course-schedule/

Systems Engineering 5-Day Courses

Upcoming locations include:

- Berlin, Germany (P006-790)

  14 Oct – 18 Oct 2019

Requirements Analysis and Specification Writing 5-Day Courses

Upcoming locations include:

- Amsterdam, the Netherlands (P007-485)

  21 Oct – 25 Oct 2019

Systems Engineering Management 5-Day Courses

Upcoming locations include:

- San Francisco, California, USA (P1135-166)

  26 Dec – 06 Dec 2019

Systems Engineering Overview 3-Day Courses

Upcoming locations include:

- Chantilly, Virginia, United States of America (P884-15)

  09 Dec – 11 Dec 2019

Requirements, OCD and CONOPS in Military Capability Development 5-Day Courses

Upcoming locations include:

[1] Cobbers is an Australian colloquialism for friends

- Melbourne, Australia (P958-62)

  17 Feb – 21 Feb 2020

Engineering Successful Infrastructure Systems (ESIS5D)

Upcoming locations include:

- Las Vegas, Nevada, United States of America (P2005-3)

  02 Dec – 06 Dec 2019

Architectural Design 5-Day Course

Upcoming locations include:

- London, United Kingdom (P1768-23)

  11 Nov – 15 Nov 2019

CSEP Preparation 5-Day Courses (Presented by Certification Training International, a PPI company)

Upcoming locations include:

- Chantilly, Virginia, USA (C002-88)

  18 Nov – 22 Nov 2019

Medical Device Risk Management 3-Day Course

Upcoming locations include:

- San Francisco, California, United States of America (P1848-4)

  18 Nov – 20 Nov 2019

Other training courses available **on-site** only include:

- Project Risk and Opportunity Management 3-Day
- Managing Technical Projects 2-Day
- Integrated Product Teams 2-Day
- Software Engineering 5-Day

15. UPCOMING PPI PARTICIPATION IN PROFESSIONAL CONFERENCES

PPI will be participating in the following upcoming events. We support the events that we are sponsoring and look forward to meeting old friends and making new friends at the events at which we will be exhibiting.

Asia Oceania Systems Engineering Conference 2019

(Exhibiting)

Date: 17 – 18 October, 2019

Location: Bangalore, India

Australian Systems Engineering Workshop (ASEW19)

(Sponsoring)

Date: 28 – 29 October 2019

Location: Melbourne, Australia

INCOSE UK Annual Systems Engineering Conference 2019

(Exhibiting)

Date: 19 – 20 November, 2019

Location: Cleveland, Ohio, USA

The INCOSE International Symposium 2020

(Exhibiting)

Date: 18 – 23 July, 2020

Location: Cape Town, South Africa

Kind regards from the PPI SyEN team:

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