# Project Performance International

**Systems Engineering**

**Newsletter (SyEN)**

**SyEN #031 - May 2, 2011**

**Brought to you by Project Performance International**

http://www.ppi-int.com/newsletter/SyEN-031.php

**Dear Colleague,**

SyEN is an independent free newsletter containing informative reading for the technical project professional, with scores of news and other items summarizing developments in the field, including related industry, month by month. This newsletter and a newsletter archive are also available at www.ppi-int.com.

**Systems engineering can be thought of as the problem-independent, and solution/technology-independent, principles and methods related to the successful engineering of systems, to meet stakeholder requirements and maximize value delivered to stakeholders in accordance with their values.**

If you are presently receiving this newsletter from an associate, you may receive the newsletter directly in future by signing up for this free service of PPI, using the form at www.ppi-int.com. If you do not wish to receive future SE eNewsletters, please reply to the notifying e-mail with "Remove" in the subject line, from the same email address. Your removal will be confirmed, by email.

We hope that you find this newsletter to be informative and useful. Please tell us what you think. Email to: contact@ppi-int.com.

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# A Quotation to Open On

"If theory and practice do not coincide, either the theory is wrong, or the practice is wrong. Look at results to reach a conclusion."

- Robert Halligan

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# Featured Article

## Model Based Systems Engineering – A New Methodology or an Old One in a New Jacket?


| | |
|---|---|
| Robert Halligan, FIE Aust<br>Managing Director<br>Project Performance International<br>rhalligan@ppi-int.com | Alwyn Smit<br>Editor, SyEN<br>asmit@ppi-int.com |


Systems Engineering has been around for a long time and many of the concepts that formed the basis of the classic document centric systems engineering approach are just as valid today. Some of these are identified below:

### Some Key Systems Engineering Concepts

a. System levels or layers

The analytical approach to the engineering of systems starts with the top level system within its context, breaking it down into multiple lower levels or layers typically defined as system segments, subsystems, assemblies, sub-assemblies, etc.

b. The Core Systems Engineering Process

The core systems engineering process is captured by the “football diagram” (Project Performance (Australia) Pty Ltd) given below. This process is iteratively applied at all the system layers starting with the top level system. The process input is therefore not miraculously falling out of the sky to start the SE process, it is the product of SE done at the next higher system level.

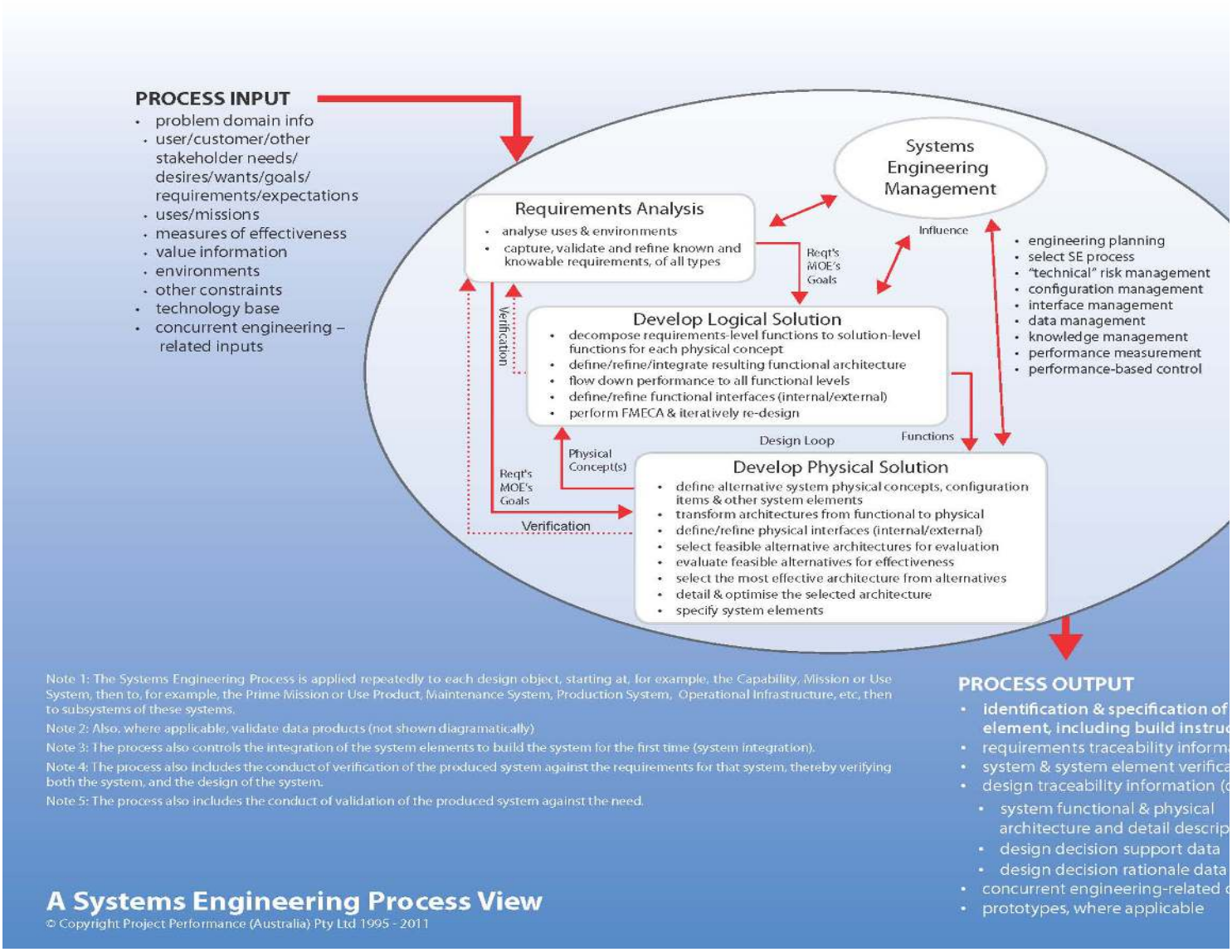



**Figure 1: A Basic Systems Engineering Process View**

a. Problem and Solution Domains

The concepts of problem and solution domains are important to understand, as working on the solution before there is a rational basis of confidence that the 5-15% of requirements that drive architecture are adequately defined, may lead to unnecessary rework. Only once the problem has been fully analysed in terms of the operational concept, context (system border and external interfaces), missions and operational scenarios (use cases); can the requirements be fully understood, can a true common understanding between all stakeholders be reached and can the solution analysis be completed to implement the high level system design in terms of behaviour, structure and associated subsystem requirements.

b. System Life Cycle, Baselines and associated Artefacts, Audits and Reviews

The full life cycle of a system typically covers everything from the initial identification of the need, through the acquisition, operational use and eventually the phase-out. Various life cycle standards and acquisition standards have their own definition for the different life cycle stages. Typical life cycle processes (often equates to life cycle stages) include Concept Definition, Design, Implementation, Integration, Verification and Validation, Transition, Operational Use and Maintenance, Phase-Out. Transitions between stages have traditionally been associated with specific artefacts, reviews, baselines and audits. This has been the basis of the document centric approach to SE for decades and quite often led to the incorrect perception that SE is about generating documentation, where the real value actually lies in the layered analyses to produce the ultimate structure and behaviour of a system that will fulfil the original need in a cost effective way at an acceptable risk.

c. Common terminology

The purpose of a system is to fulfil a particular need(s) within a given context. A system has structure (physical architecture – components connected via interfaces) and for most systems, behaviour (not just functional architecture, but also temporal behaviour). The system solution description is defined by deriving, by making design decisions, solution-level functions which are allocated to the components (creating functional and performance requirements on the components), and interfaces (giving interface requirements). Components also acquire requirements by derivation solely using the physical view, typically non-functional requirements such as mass, reliability, maintainability. These requirements flow down by design through the system layers in a traceable manner.

d. Requirements Documents (specifications)

Using the basic SE process applied in a layered approach in both the problem and solution domains, the requirements defining the problem and the requirements on system elements defining the solution are formulated. These requirements are then documented as a set in natural language, or some other language, given some guidelines in terms of language usage to ensure correct, concise and unambiguous requirements specification.

## Why MBSE?

So if all of the above has been in place for years and the basic approach to systems engineering does not really vary if you follow the document centric approach or the model based approach, why then do we need MBSE?

One of the biggest problems in a document centric approach is making sure that the mental model of the stakeholder is transferred to the system designer accurately and in turn from the system designer to the hardware / software developer. Despite our best efforts, problems arise in the use of natural language as people interpret what they read, and draw their own conclusions given their particular knowledge and background.

Management of huge amounts of technical data in a document format is also problematic. Any old-school systems engineer will remember the effort to maintain requirements traceability and keep verification cross-references updated.

With system design data being nothing more than a collection of data elements with dedicated relations, it wasn't long before the power of the personal computer and relational database software enabled the development of dedicated tools to capture and manage the huge amount of data associated with system development. Requirements and functional allocation can now be done by setting up links between data elements. Reporting tools enable the automated generation of documents from such a database. Determining the impact of a proposed change suddenly becomes a lot easier with the electronic navigation of these links to determine the affected components and requirements. Some of the MBSE tools also allow the graphical modeling of physical and functional architectures, which results in the complete system solution being captured in the electronic database. Paper documents need not be generated unless they are needed for review or formal approval. Even reviews can be done electronically, allowing all relevant stakeholders access to the most up-to-date data.

MBSE tools have one more added advantage and that is that the data models and graphic notations used by these tools, constrain the representation of the system design to a predefined set of engineering concepts that aids common understanding. Requirements descriptions are however still usually captured in natural language, so the same set of guidelines in terms of language usage still applies.

## An Example System Description Language

MBSE requires

- A methodology
- A modelling notation
- A model database

Based on the arguments above, the methodology for MBSE should not really be different from the paper centric approach. The core SE process is still applied, first in the problem domain to fully understand the problem and then in the solution domain for each layer of the system design.

It is with the modelling notation and the modelling database where the strength of MBSE really lies. Only one definition exists for any element of the model leading to a unique representation in the database. Any number of different views into the integrated model is typically possible. For modelling languages that are sufficiently expressive to be executable, the ability to find many

errors very early, through execution, without building or coding anything is a huge advantage, specifically for complex or critical systems. The contribution to much more effective discovery of error via independently performed design review (the logical model describing the logic of how the physical design is intended to meet the requirements) and the contribution to understandability of how the design is supposed to work, by, e.g. colleagues, designers of the maintenance solution, are some more huge advantages.

The examples quoted below are from one MBSE tool. There are numerous of these tools on the market, some of them supporting the OMG Systems Modelling Language (OMG SysML™). The OMG SysML is a general-purpose graphical modelling language for specifying, analyzing, designing, and verifying complex systems that may include hardware, software, information, personnel, procedures, and facilities. In particular, the language provides graphical representations with a semantic foundation for modeling system requirements, behaviour, structure, and parametrics. (The Object Management Group)

INCOSE has a Tools Database Working Group (TDWG) that makes available information on commercial-of-the-shelf (COTS) and government-off-the-shelf (GOTS) tools of interest to systems engineers. The database can be found at:

http://www.incose.org/ProductsPubs/products/toolsdatabase.aspx.

***The Data Model***

A database typically consists of a number of different elements, each element with specific attributes. These elements are connected by a number of set relationships, each relation also having specific attributes. This leads to a defined ontology which contributes to the elimination of misunderstandings that occur due to the different mental models people create based on their own interpretation of the model. Some examples (Vitech Corporation, 2010) of these elements and relations are illustrated below.

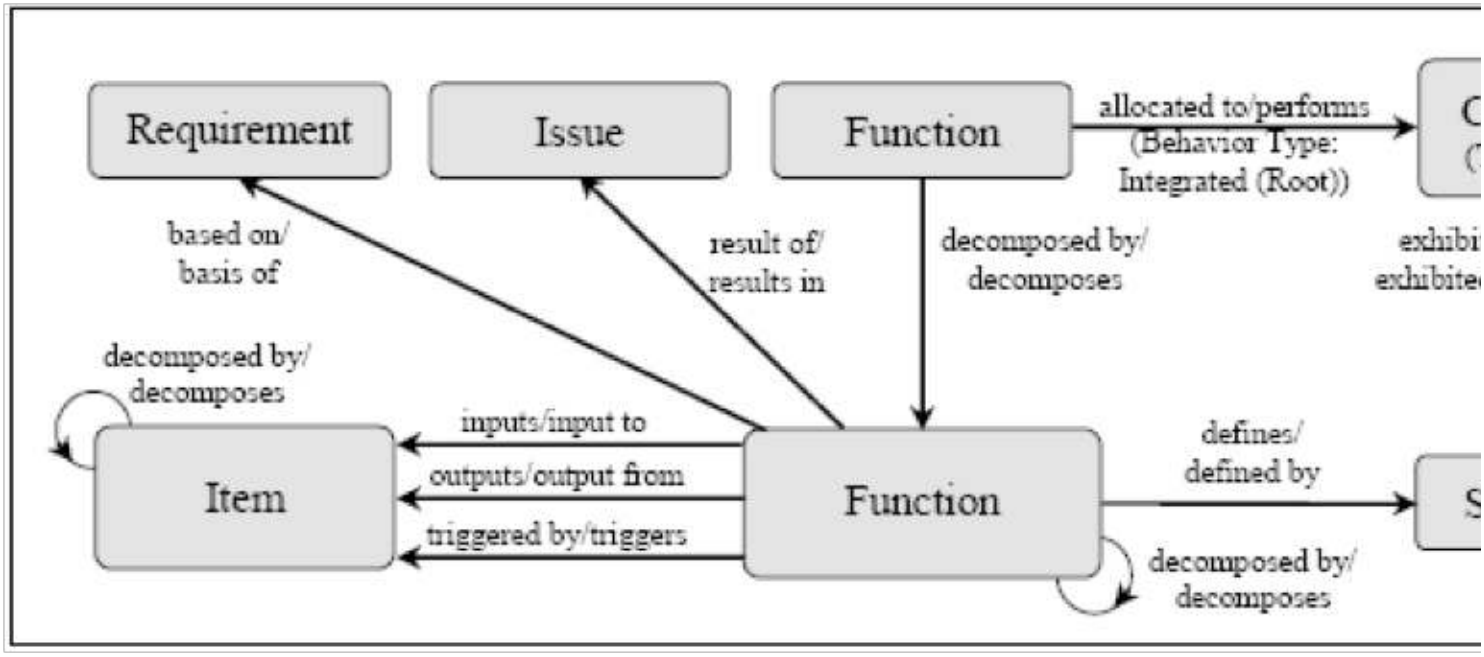



**Figure 2: Example of Relations Applicable to Functional Decomposition**

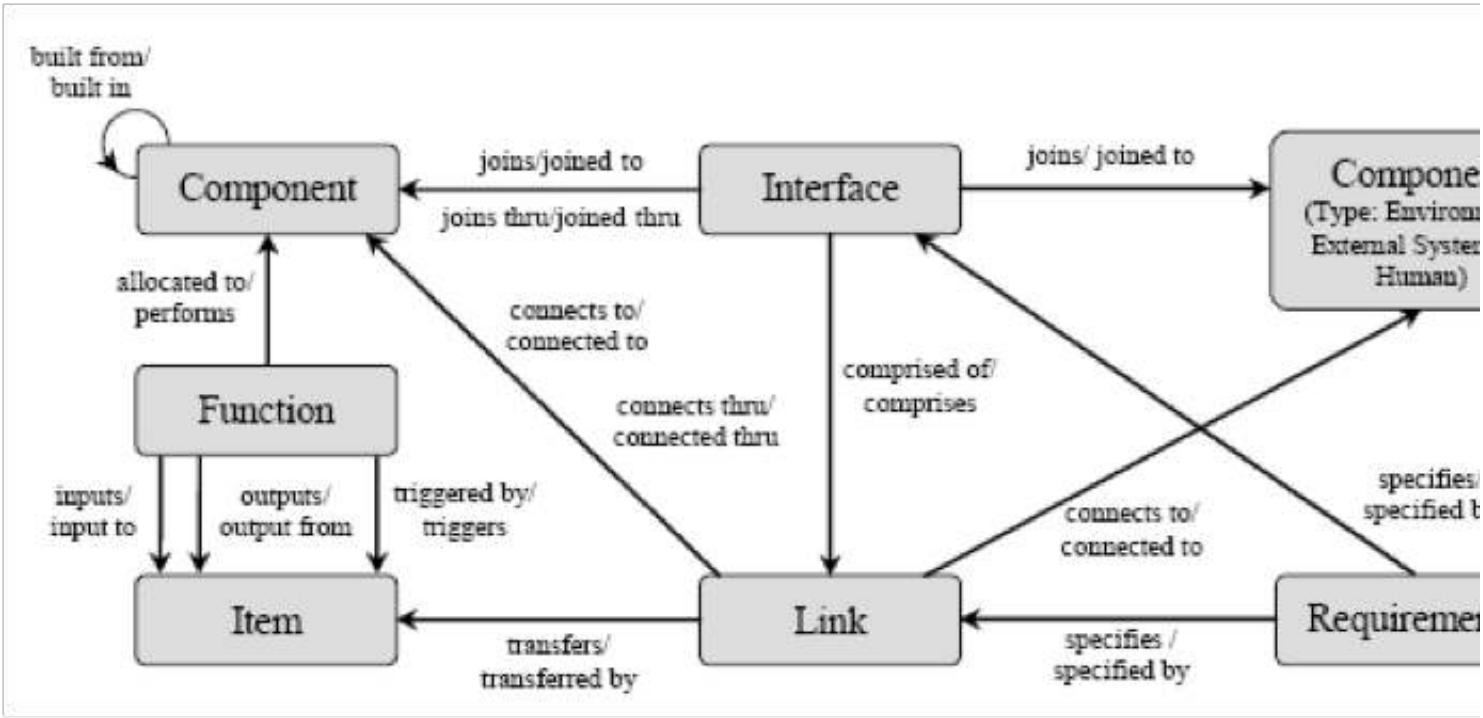



**Figure 3: Example of Relations Applicable to External Interface Definition**

***Behavioural View***

Behavioural views into the system model enable the representation of the system behaviour within its contextual environment (problem domain) as well as the design of behaviour of the system itself (solution domain), either in the form of a functional thread that follows from stimuli to the system from the context, or the integration of these threads into an integrated system behaviour. These behaviour representations quite often include data and control flow information as well. A typical example is an Extended (including data and control flow) Functional Flow Block Diagram as given below.

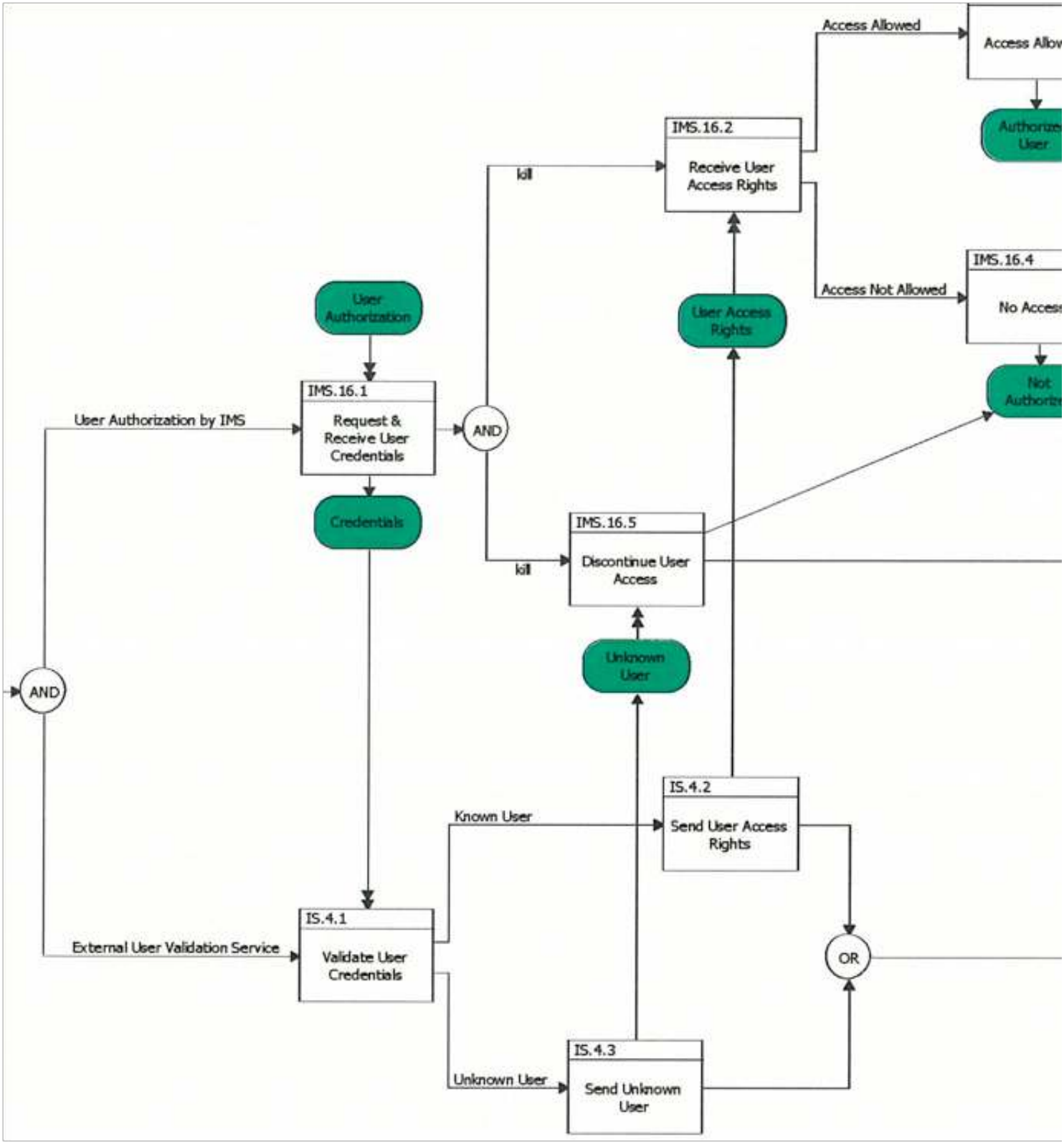
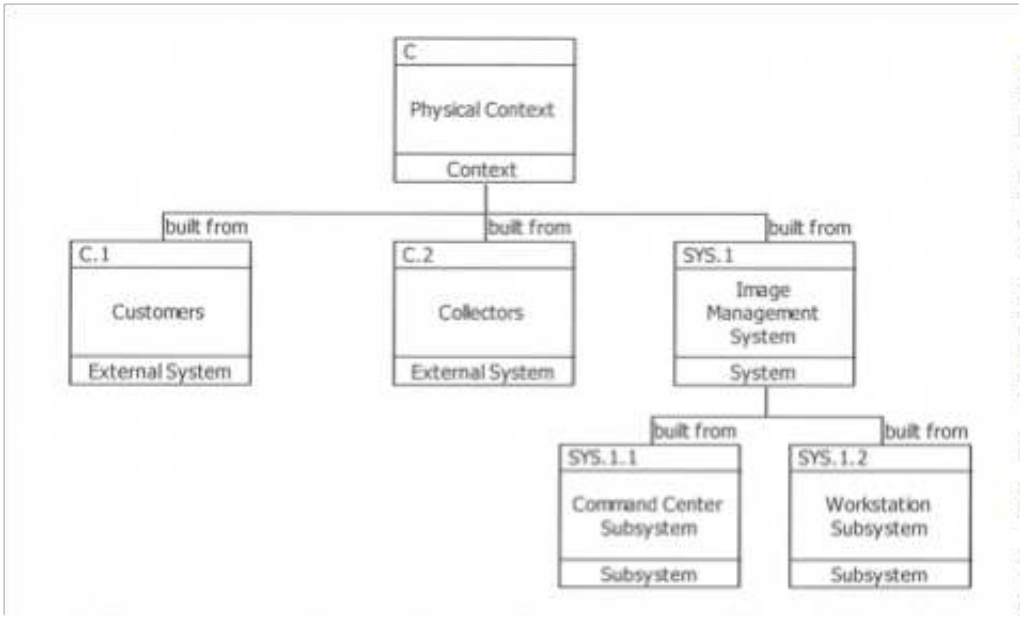



**Figure 4: Example of a Functional Flow Block Diagram with Control Flows**

### *Structural View*

Structural views into the system model enables the representation of the physical architecture of the system (components and interfaces), either in hierarchical or block diagram form. Typical examples of hierarchical and physical block diagram views are given below.



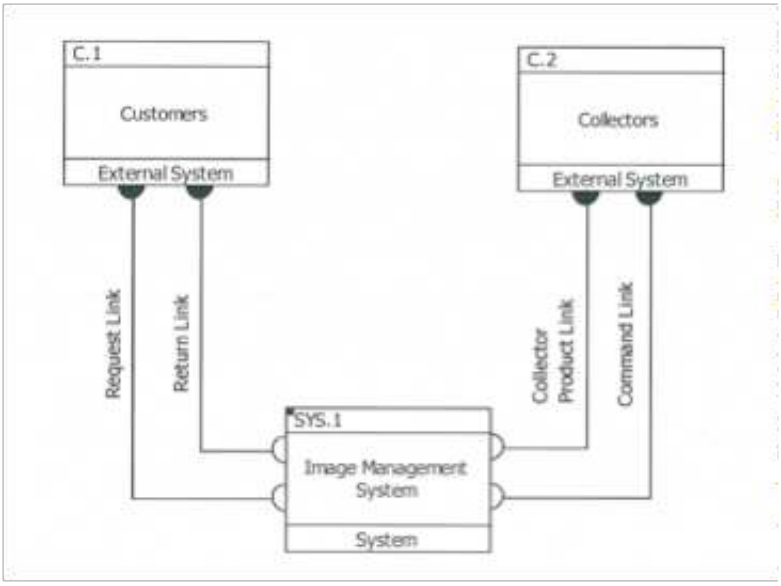




Figure 5: Example of a) Hierarchical and b) Physical Block Diagrams

## Conclusion

It is clear that MBSE tools provide a host of benefits in the capture, management and representation of system problem domain and system design data. They may enable us to spend less time on the painstaking preparation of documents that was so familiar with older document centric approaches. Instead, more time can be spent on the proper application of a sound methodology in the analysis of the problem and solution domains to deliver an integrated database containing proper traceability and multiple views into the data to represent all the aspects of the system design. Management of this data is also a lot easier and the full extent of a proposed change can be assessed in a short time. Document generation is automated and can be delayed to the last possible moment for baseline approval and communication purposes.

An important factor is that the age old saying of “garbage in, garbage out” still holds true. Although MBSE tools may lead you in terms of the different data elements that need consideration, it does nothing to prevent you from following a flawed methodology and subsequently delivering a flawed design.

None of this is to suggest that documents are inappropriate. Documents using natural language remain a major means of communicating information between participants in the engineering process. We predict that they will continue to do so. However, document centric engineering? We see that model-centric and model-document balanced approaches are becoming the norm, for reasons we have described.

### Bibliography

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4. Vitech Corporation. (2011). *A Primer for Model Based Systems Engineering*. Retrieved April 02, 2011, from Vitech Corporation MBSE Community Forum (http://community.vitechcorp.com/home/): http://community.vitechcorp.com/home/post/A-Primer-for-Model-Based-Systems-Engineering.aspx

### About Alwyn Smit

Alwyn is a systems engineer with the Council for Scientific and Industrial Research (CSIR) in South Africa. His career of 27 years includes more than 20 years in project management and systems engineering on defence related projects. He is a long standing member of INCOSE and a Certified Systems Engineering Professional. He is also a past president of the INCOSE SA Chapter and the editor of SyEN.

### About Robert Halligan

An executive professional engineer, manager and engineering practitioner, Robert is renowned internationally for his role in the practice and improvement of technology-based projects. Robert obtained his engineering qualifications at the University of Melbourne and the Royal Melbourne Institute of Technology, now RMIT University. After early engineering, engineering management and project management roles with Telecom Australia, Department of Defence (Australia), Rockwell International and Andrew Corporation, Robert has for the last twenty-two years contributed to major systems projects worldwide as a consultant and trainer. He is also the Managing Editor of SyEN.

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# Systems Engineering News

## Upcoming Submission Deadlines and Themes for INSIGHT

INSIGHT is the newsletter of International Council on Systems Engineering. It is published four times per year (January, April, July, October). INSIGHT features status and information about INCOSE's technical work, local chapters, and committees and boards. Additionally, related events, editorials, book reviews, trends, and how-to-do articles that are pertinent to the many aspects of a systems engineer's job are also included, as space permits.

Upcoming submission deadlines and themes for INSIGHT

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## INCOSE INSIGHT - April 2011, Vol 14 - Issue 1

The April 2011 INSIGHT is ready to view or download on INCOSE Connect.

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## Lean Software and Systems Consortium and the Software Engineering Institute Announce Conference Cooperation for LSSC 2011

The Lean Software and Systems Consortium (LeanSSC) and the Carnegie Mellon University Software Engineering Institute (SEI) formally announce their technical cooperation for the upcoming Lean Software & Systems Conference 2011 (LSSC11) May 3-6, 2011, in Long Beach, CA.

More information

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## Systems Engineering Society of Australia (SESA) to Re-affiliate with INCOSE?

The Systems Engineering Society of Australia (SESA) membership will vote on 3 May 2011 whether to re-affiliate with the International Council on Systems Engineering (INCOSE), with full Chapter status, whilst retaining its status as a Technical Society of Engineers Australia.

More information

## Brasil to form INCOSE Chapter

It is expected that Brasil will formally constitute a Chapter of the International Council on Systems Engineering (INCOSE) in Brasil, at a Systems Engineering Day to be held at INPE/LIT in São José dos Campos, SP, on Monday 6 June. The program involves presentations on systems engineering from a number of sectors, including automotive, energy, defense, aerospace, and infrastructure. These presentations will be preceded by a meticulously researched presentation on the rich history of systems engineering in Brasil, and after a Chapter Formation Meeting, will be followed by a presentation by PPI Managing Director Robert Halligan on the status of systems engineering in Brasil and in the world.

# Featured Society

## The Design Society

The Design Society is an international non-governmental, non-profit making organisation whose members share a common interest in design. It strives to contribute to a broad and established understanding of all aspects of development and design, be it mechanical, civil, architectural, graphical, etc., and to promote the use of results and knowledge for the good of humanity.

The society aims to:

- create and evolve a formal body of knowledge about design;
- actively support and improve design research, practice, management and education;
- promote co-operation between those in research, practice, management and education;
- promote publications and their dissemination;
- organise international and national conferences and workshops;
- establish Branches and Special Interest Groups; and
- co-operate with other bodies with complementary areas of interest.

The society is built on the foundations laid by the WDK (Workshop Design-Konstruktion) Society - 15 International Conferences on Engineering Design (ICED conferences), 26 major publications and more than 60 workshops on a wide range of topics.

The Design Society is governed by a Board of Management, comprising five elected members of the society including the President, Vice President and Secretary. The current President is Christopher McMahon of the United Kingdom. The members of the Board of Management are elected democratically by the members of the Society at a General Meeting, which is called every two years during ICED conferences. The Board of Management is advised, guided and supported by an Advisory Board of 27 people. This Advisory Board presently has very wide geographic representation.

Special Interest Groups (SIGs) play a major role in the activities of the Design Society. Present SIGs are:

- Computational Design Synthesis
- Decision Making
- Design Creativity
- Design Education
- Design Theory
- Development of Mechatronic Products and Systems
- Eco Design
- Human Behaviour in Design (HBiD)
- Managing Structural Complexity
- Modelling and Management of Engineering Processes.

The Design Society publishes:

- periodic Newsletters
- conference proceedings
- design-related Theses

Membership of the Design Society is open to persons with recognised design qualifications and/or experience in the fields of design research, design practice, design management, and design education.

More information: http://www.designsociety.org

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# INCOSE Technical Operations

## Intelligent Enterprises Working Group

http://www.incose.org/practice/techactivities/wg/intelent/

### Charter

Explore and demonstrate the utility of systems engineering for evolving intelligent enterprises and the utility of intelligent enterprise concepts to making systems engineering intelligent.

### Leadership

Co-Chair: Americas, Steve Else, The Center for Public-Private Enterprise, Alexandria, VA, USA
Co-Chair: EMEA, Open
Co-Chair: Australasia, Susu Nousala

Contact Intelligent Enterprises Working Group (IEWG) for additional information or to join this group. The IEWG sponsors a discussion list which you are encouraged to join by contacting the IEWG

### Objectives

- Attributes that distinguish an enterprise and an intelligent enterprise.
- Attributes that distinguish systems engineering and intelligent systems engineering
- Descriptive models of IE and ISE
- Tutorials for those seeking an understanding of IE and ISE
- Stakeholder value realized as a function of the degree of intelligence.

### Knowledge Base

Intelligent Enterprises Working Group - Knowledge Base

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# Systems Engineering Software Tools News

## Whole Systems Modelling with iThink and STELLA Workshop

An introductory workshop for individuals with responsibility for improving organisational performance, or information specialists currently responsible for modelling using spreadsheets or other techniques.

17 and 18 May, 2011, Conyngham Hall, Knaresborough, North Yorkshire, UK

More information

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## Dymola 7.4 Has Been Released

Dymola, Dynamic Modeling Laboratory, is an environment for modeling and simulation of integrated and complex systems. Dymola® has multi-engineering capabilities which means that models can consist of components from many engineering domains. This allows for models of complete systems to better depict reality. Libraries in many different engineering domains are available that contain components for mechanical, electrical, control, thermal, pneumatic, hydraulic, power train,

thermodynamics, vehicle dynamics, air-conditioning, etc. The multi-engineering capabilities of Dymola allow users to model and simulate physical components that can be described by ordinary differential equations and algebraic equations..

More information

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## Atego Webinar: Keeping Control of Requirements

Atego Exerpt Synchronizer is claimed to break down traditional boundaries between partners, vendors and customers by creating an environment for smooth requirements interchange between these stakeholders. Based on the forthcoming OMG standard for Requirements Interchange Format (ReqIF), Atego Exerpt Synchronizer is designed to tackle real-world projects and is used to automate large scale requirement exchange processes.

April 14, 2011, 08:00AM PDT / 4:00PM BST (London)

More information

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## Intermediate and Advanced Levels in Program to Certify Practitioners of Model-Based Systems Engineering Using SysML Now Available

The OMG® announced that "Model Builder-Intermediate," and "Model Builder-Advanced," the final two examinations in the OMG Certified Systems Modeling Professional™ (OCSMP™) program, are now available. The program's sponsors IBM®, Lockheed Martin, Sparx Systems, and No Magic, Inc., and OMG certification partner UML Technology Institute Co., Ltd. (UTI), have made construction and validation of the exams possible. For more information, please visit http://www.omg.org/ocsmp.

More information

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# Systems Engineering Books, Reports, Articles and Papers

## Simulation and Modeling of Systems of Systems

Edited by: Pascal Cantot, CATOD/DMT, Arcueil, Dominique Luzeaux, DGA/UMTER, Bagneux, France
Publisher: Wiley, March 2011
ISBN-13: 9781848212343

### Product Description

Complex systems, and systems of systems engineering, is currently a major challenge for industry and governments, especially in areas such as defense, aerospace, telecommunications, and transportation. Modeling and simulation are very powerful tools that are used to counter some of the difficulty and complexity of these issues. This book explains the basic principles of modeling and simulation (M&S), how they can – and should – contribute to the engineering of complex systems and systems of systems and how to improve return on investment (ROI) while avoiding common pitfalls – covering, for example, software engineering aspects, 'battlelabs' for systems of systems (SoS) assessment, and M&S economics. It is designed in a didactic manner, and is illustrated with real world examples, lessons learned, and case studies, so that it can be understood by non-specialists such as complex systems project managers, procurement agents, or decision makers. However it will also prove very valuable for M&S experts who want to expand their knowledge of the field. While it is not designed as a textbook, it can also be a good basis for teaching the use of modeling and simulation for complex system engineering.

More information

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## Call for Papers: Special Issue on Enterprise Engineering - International Journal of Information System Modeling and Design (IJISMD)

Submission Deadline: May 15, 2011

It is the mission of the discipline of Enterprise Engineering to develop new, appropriate theories, models, methods and other artifacts for the analysis, design, implementation, and governance of enterprises by combining (relevant parts of) management and organization science, information systems science, and computer science. The ambition is to address (all) traditional topics in said disciplines from the Enterprise Engineering Paradigm. The result of the efforts should be theoretically rigorous and practically relevant.

More information

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## The Ongoing Nuclear Power Crisis in Japan

An interesting ongoing discussion in the INCOSE LinkedIn group:

“The ongoing nuclear power crisis in Japan shows very clearly, in my opinion, the very essence of System Engineering mission: it is a skill of comprehending the problem as a whole...”

More information

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## Systems of Systems Safety Lifecycle

A number of standards and recommended practices define the processes and the objectives of the safety lifecycle. The civil aerospace guidance document ARP 4761 provides a comprehensive guide of safety analysis for airborne systems. ARP 4761 suggests the following activities during a system’s lifecycle: Preliminary Hazard Analysis (PHI), Functional Hazard Assessment (FHA), Preliminary System Safety Analysis (PSSA) and System Safety Analysis (SSA)….

More information

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## Does Data Kill Leadership? Can Systems Thinking Restore Intuition?

Posted by Michael Dattilio

When I first got involved with helping organizations perform better, I mostly dealt with, and therefore learned from, engineers who saw everything as logical, step-by-step programs. Even now, many clients want a "process" for finding a better way to run their companies. There is a strong focus on the logical, rational and data-driven analysis of making business decisions. Yet, some of the engineers-as-leaders used what I call intuition to take companies in new directions……

More information

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## Decision Making in Systems Engineering and Management, 2nd Edition

Gregory S. Parnell, Patrick J. Driscoll, Dale L. Henderson
Publisher: Wiley, November 2010
ISBN-13: 978-0-470-90042-0

### Product Description

Decision Making in Systems Engineering and Management is a comprehensive textbook that provides a logical process and analytical techniques for fact-based decision making for the most challenging systems problems. Grounded in systems thinking

and based on sound systems engineering principles, the systems decisions process (SDP) leverages multiple objective decision analysis, multiple attribute value theory, and value-focused thinking to define the problem, measure stakeholder value, design creative solutions, explore the decision trade off space in the presence of uncertainty, and structure successful solution implementation. In addition to classical systems engineering problems, this approach has been successfully applied to a wide range of challenges including personnel recruiting, retention, and management; strategic policy analysis; facilities design and management; resource allocation; information assurance; security systems design; and other settings whose structure can be conceptualized as a system.

More information

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## Verification and Validation in Systems Engineering: Assessing UML/SysML Design Models


Mourad Debbabi (Author), Fawzi Hassaïne (Author), Yosr Jarraya (Author), Andrei Soeanu (Author), Luay Alawneh(Author)
Publisher: Springer; 1st Edition (November 19, 2010)
ISBN-10: 9783642152276
ISBN-13: 978-3642152276

### Product Description

Verification and validation represents an important process used for the quality assessment of engineered systems and their compliance with the requirements established at the beginning of or during the development cycle.

Debbabi and his coauthors investigate methodologies and techniques that can be employed for the automatic verification and validation of systems engineering design models expressed in standardized modeling languages. Their presentation includes a bird's eye view of the most prominent modeling languages for software and systems engineering, namely the Unified Modeling Language (UML) and the more recent Systems Modeling Language (SysML). Moreover, it elaborates on a number of quantitative and qualitative techniques that synergistically combine automatic verification techniques, program analysis, and software engineering quantitative methods applicable to design models described in these modeling languages. Each of these techniques is additionally explained using a case study highlighting the process, its results, and resulting changes in the system design. Researchers in academia and industry as well as students specializing in software and systems engineering will find here an overview of state-of-the-art validation and verification techniques. Due to their close association with the UML standard, the presented approaches are also applicable to industrial software development.

More information

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## Battle Royale - Systems Thinking Versus Six Sigma!

Posted by Michael Dattilio

"Seems like organizations only make room for one methodology to address problem solving or decision making. Usually, a new executive comes into the company or a current executive hears about a cure-all approach that saved another company and mandates its implementation.

You've been a part of this I'll bet. And we've seen it. It's going to happen again. We just don't want you to do this with systems thinking, which is why we want to connect two seemingly opposite methodologies, Six Sigma and Systems Thinking."....

More information

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## Future watch - The increasing need to interface with other domains

This interesting piece on the ISO/IEC JTC 1/SC7 Software and Systems Engineering LinkedIn space asks the question if it is not time to start thinking about standards, particularly process standards, as components in larger systems to facilitate the interfacing between application domains.

More information

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## RUSI - Enterprise Architecture and Systems Thinking: Realising Capability

Nic Plum outlines the similarities between systems-thinking and enterprise architecture and how Enterprise Architecture creates a lasting and living account of why a system is being acquired and how best to integrate it.

More information

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# Conferences and Meetings

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### 17th International Conference on Information and Software Technologies

April 27th - 29th, 2011, Kaunas, Lithuania
More information

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### Second Annual West Point Critical Infrastructure Symposium

April 29 - 30, 2011, The United States Military Academy in Newark, NJ, USA
More information

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### SETE 2011 – Systems Engineering and T&E

May 2-4, 2011, Rydges Lakeside, Canberra, Australia
More information

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### System Dynamics Society of India, Annual Conference 2011

May 5 - 6, 2011, Pune, India
More information

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### Lean Software & Systems Conference 2011 (LSSC11)

May 3-6, 2011 at the Hyatt Regency Long Beach, CA, USA
More information

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### Software & Systems Engineering Essentials

May 9-10, 2011, Frankfurt, Germany
More information

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### Enterprise Architecture Conference & Expo

May 12, 2011, The Pavilion, Ronald Reagan Building, 1300 Pennsylvania Ave. NW, Washington, DC, USA
More information

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### Risk-Based Approaches to Major Decisions (Risk '11)

May 13 - 14, 2011, Falmouth, Cornwall, United Kingdom
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### INCOSE UK Tutorial Days NEW

May 18th 2011 – Lydiard House, Swindon, UK
July 7th 2011 – Warwick Conference Centre, Warwick, UK
More information

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### International Conference on Software and Systems Process (ICSSP 2011)

(co-located with ICSE 2011)
May 21-22, 2011, Waikiki, Honolulu, Hawaii, USA
More information

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### Sixth Workshop on SHAring and Reusing architectural Knowledge (SHARK 2011)

(co-located with 33rd Int. Conf. on Software Engineering (ICSE 2011))
May 21-28, 2011, Waikiki, Honolulu, Hawaii, USA
More information

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### RSP 2011 - IEEE International Symposium on Rapid System Prototyping

May 24 – 27, 2011, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany
More information

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### SPICE 2011 - The 11th International SPICE Conference Process Improvement and Capability dEtermination

30 May - 1 June 2011, Dublin, Ireland
More information

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### Systems Thinking Techniques to Develop Complex Thinking Skills in K12 Education NEW

June 3-4, 2011, Systems Thinking in Schools Institute, McMenamins Edgefield, 2126 SW Halsey St., Troutdale, Oregon, 97060
More information

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### 1st Brasil Systems Engineering Day NEW

June 6, 2011, INPE/LIT, Av. Dos Astronautas, Da Granja, São José dos Campos 1758-Jd, Brasil
Contact Geilson Loureiro or George W. L. Sousa for more information

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### Seventh European Conference on Modelling Foundations and Applications

6-9th of June, 2011, University of Birmingham, Birmingham, UK
More information

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### TTCN 3 - 10th Testing & Test Control Notation User Conference

June 7-9, 2011, Bled, Slovenia
More information

### 4th Symposium on Resilience Engineering

June 8-10, 2011, Sophia Antipolis, France
More information

### 2011 U.S. Army Corps of Engineers Infrastructure Systems Conference NEW

June 13, 2011, Hyatt Regency Hotel, Atlanta, Georgia, USA
More information

### Security and Privacy Requirements Engineering (SPREE) Workshop

June 15-16, 2011, Carnegie Mellon University, Pittsburgh, PA, USA
More information

### ONTOSE 2011 - 5th International Workshop on Ontology, Models, Conceptualization and Epistemology in Social, Artificial and Natural Systems

June 20, 2011, University of East London - Docklands Campus, London, UK
More information

### BPMDS'11 Working Conference

In conjunction with CAISE 2011
June 20-21 in London, United Kingdom
More information

### International Workshop on Conceptualization of Modelling Methods (CMM) NEW

To be held in conjunction with 23rd International Conference on Advanced Information Systems Engineering (CAiSE 2011)
June 20-24, 2011, London UK
More Information

### FM 2011: 17th International Symposium on Formal Methods

June 20 - 24, 2011, Lero, Limerick, Ireland
More information

### The 32nd International Conference on Application and Theory of Petri Nets and Concurrency (PETRI NETS 2011)

11th International Conference on Application of Concurrency to System Design (ACSD 2011)
June 20-24, 2011 Kanazawa Cultural Hall, Kanazawa, Japan
More information

### INCOSE 21st International Symposium

June 20-23, 2011 Denver, CO, USA
More information

### Swiss Requirements Day

June 22, 2011, Kongresshaus, Zurich
More information

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### INES 2011 - 15th IEEE International Conference on Intelligent Engineering Systems 2011

June 23-25, 2011, Poprad, High Tatras, Slovakia
More information

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### New England Complex Systems Institute (NECSI) Eighth International Conference on Complex Systems NEW

June 26 – July 1, 2011, Boston, MA, USA
More information

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### CoMetS'11 - 2nd International Track on Collaborative Modeling & Simulation

20th IEEE International Conference on Collaboration Technologies and Infrastructures
June 27 - June 29, 2011, Paris (France)
More information

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### Introduction to Dynamic Modeling NEW

June 27-29, 2011, Antlers Hilton, Colorado Springs, CO, USA
More information

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### 18th Annual EuroSPI 2011 Conference - European Systems and Software Process Improvement and Innovation & SPI Manifesto Implementation 2011 NEW

June 27.-29. 2011, Roskilde University, Roskilde (Copenhagen), Denmark
More information

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### SoSE 2011 - 2011 6th International Conference on System of Systems Engineering (SoSE)

Jun 27 - 30, 2011, Albuquerque, New Mexico, U.S.A
More information

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### FMICS 2011 - 16th International Workshop on Formal Methods for Industrial Critical Systems NEW

August 29-30, 2011, Trento, Italy
More information

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### ICMT2011 - International Conference on Model Transformation Theory and Practice of Model Transformations

Co-located with TOOLS Europe 2011
June 27 - July 1, 2011 - Zurich, Switzerland
More information

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### 15th International Conference on System Design Languages

July 5th - 7th, 2011, Toulouse, France
More information

### 55th Meeting of the International Society for the Systems Sciences, joining with KSS2011 International Symposium for Knowledge and Systems Sciences NEW

July 17-22, 2011, Hull University Business School, Hull, UK
More information

### 2nd International Workshop on The Web and Requirements Engineering (WeRE'11) NEW

July 20-21, 2011, Paphos, Cyprus
More information

### International System Dynamics Conference

July 24 – 28, 2011, Washington, DC, USA
More information

### 46th Annual International Logistics Conference and Exhibition (SOLE 2011)

August 2011
More information

### ISSEC 2011 - 3rd Annual Improving Systems and Software Engineering Conference

August 2-5, 2011, Novotel Sydney Brighton Beach, NSW, Australia
More information

### ISSC 2011 - 29th International System Safety Conference

Aug 8, 2011 - Aug 12, 2011, Las Vegas, Nevada, USA

### 21st International Conference on Systems Engineering (ICSEng 2011) NEW

August 16 - 18, 2011, Las Vegas, NV USA
More information

### IHMSC 2011 - International Conference on Intelligent Human-Machine Systems and Cybernetics

Aug 26, 2011 - Aug 27, 2011, Hangzhou, China
More information

### TEAR 2011 : Trends in Enterprise Architecture Research (TEAR) Workshop

August 29, 2011, Helisinki, Finland
More information

### 19th IEEE International Requirements Engineering Conference

August 29 – September 2, 2011, Trento, Italy
More information

### 19th International Conference on Case Based Reasoning

12-15 September 2011, Greenwich, London, UK
More information

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### AVOCS 2011 - 11th International Workshop on Automated Verification of Critical Systems NEW

September 12th - 15th, 2011, Newcastle University, Newcastle upon Tyne, UK
More information

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### 3rd Annual NASA Independent Verification and Validation Workshop NEW

September 13 - 15, 2011, West Virginia University Erickson Alumni Center
More information

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### International Conference on Industrial Engineering, Systems Engineering and Engineering Management for Sustainable Global Development (Joint with INCOSE SA Annual Conference)

September 21-23, 2011, Spier Hotel and Conference Centre, Western Cape, South Africa
More information

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### SBMF 2011 - 14th Brazilian Symposium on Formal Methods NEW

September 26-30, 2011, Sao Paulo, Brazil
More information

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### Second Annual IIBA Conference

October 2011, More details TBA
More information

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### XXXIX Brazilian Congress on Engineering Education - COBENGE 2011 NEW

October 03-06, 2011, Himmelblau Hotel, Blumenau, Santa Catarina, Brazil
More information

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### SASO 2011 - Fifth IEEE International Conference on Self-Adaptive and Self-Organizing Systems

October 3-7, 2011, Ann Arbor, Michigan, USA
More information

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### IEEE SRDS 2011 - 30th International Symposium on Reliable Distributed Systems NEW

October 4-7, 2011, Madrid, Spain
More information

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### AGTIVE 2011 - International Symposium on Applications of Graph Transformation with Industrial Relevance

October 4-7, 2011, Budapest, Hungary
More information

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### 9th International Symposium on Automated Technology for Verification and Analysis NEW

October 11-14, 2011, Taipei, Taiwan
More information

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### ACM/IEEE 14th International Conference on Model Driven Engineering Languages and Systems

October 16-21, 2011, Wellington, New Zealand
More information

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### APCOSE 2011 - Fifth Annual Asia-Pacific Systems Engineering Conference

October 19-21, 2011, Seoul, Korea
More information

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### NDIA 14th Annual Systems Engineering Conference

October 24 - 27 2011, Hyatt Regency Mission Bay, San Diego, California, USA
More information

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### SSEE 2011 - Society for Sustainability and Environmental Engineering 2011 International Conference

October 24-26, 2011, Brisbane Convention & Exhibition Centre, Brisbane, Australia
More information

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### ICFEM 2011 - 13th International Conference on Formal Engineering Methods

October 25 - 28, 2011, Durham, United Kingdom
More information

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### CEBM 2011 - 2011 International Conference on Engineering and Business Management (CEBM2011)

Oct 28 - 30, 2011, Shanghai, China
More information

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### IIBA 2011 Conference

Oct 30 – Nov 3, 2011, Fort Lauderdale, Florida, USA
More information

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### 21st Annual Systems Thinking in Action® Conference

October 31-November 2, 2011, Westin Seattle Hotel, Seattle, WA, USA
More information

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### ER 2011, 30th International Conference on Conceptual Modeling NEW

October 31 - November 3, 2011, Brussels, Belgium
More information

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### PoEM 2011 - The 4th IFIP WG8.1 Working Conference on the Practice of Enterprise Modelling

NEW

November 2-3, 2011, Oslo, Norway
More information

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### Brazilian Society of Dynamic Systems (SBDS) Annual Conference NEW

16-18 November, 2011, Brasilia, Brazil
Website: www.sdsbrasil.org (under construction)

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### ICSSEA 2011 - 23rd International Conference Software & Systems Engineering and Their Applications NEW

November 29- December 1st 2011, Paris, France
More information

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### Complex Systems Design & Management 2011

December 7-9, 2011, Cité Internationale Universitaire, Paris, France
More information

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# Education & Academia

## XXXIX Brazilian Congress on Engineering Education - COBENGE 2011

The most important forum for discussion of engineering education in Brazil is the Brazilian Congress on Engineering Education – COBENGE, an annual event held by the Brazilian Association of Engineering Education (ABENG) without interruption since its founding in 1973.

October 03-06, 2011, Himmelblau Hotel, Blumenau, Santa Catarina, Brazil

More information

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## Open Academic Position at ENSTA Paristech (Paris, France)

The department of Electronic and Computer Science of ENSTA ParisTech is seeking candidates for one faculty position (associate professor) in System Safety and Reliability.

More information

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## 2011 ESMD Space Grant Systems Engineering Paper Competition

NASA Exploration Systems Mission Directorate (ESMD) Space Grant Project invited U.S. College and University teams to submit a paper on a project related to one of the ESMD areas; Grounds Operations, Lunar and Planetary Surface Systems, Spacecraft, ,or Propulsion, using a systems engineering approach. These are the design, engineering, and research areas that are critical to the future of space exploration. The purpose of the ESMD Systems Engineering Paper Competition is to train and develop the highly skilled scientific, engineering, and technical workforce of the future needed to implement the U.S. Space Exploration Policy.

More information

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## Johns Hopkins Systems Institute

In April of 2011, a major new research initiative, the Johns Hopkins Systems Institute, was launched at Johns Hopkins University (JHU). This interdisciplinary research facility, based in JHU's Whiting School of Engineering, will include faculty from across the university.

The Systems Institute will take a multidisciplinary approach to re-engineering entire systems of national importance, including medicine, health care delivery, network-enabled systems, information security, national infrastructure, and education. In addition to engineering faculty, the institute will tap into the expertise of researchers from the university's three health professions schools, Medicine, Public Health, and Nursing; from the schools of Arts and Sciences, Business and Education; and from JHU's Applied Physics Laboratory, already one of the nation's leading centers of systems engineering.

More information

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# Some Systems Engineering-Relevant Websites

http://www.asysti.org
The Applied Systems Thinking (ASysT) Institute is a collaborative endeavor of Analytic Services Inc. The mission of ASysT is to advance the application of systems thinking principles in the fields of national security, homeland security, intelligence, energy, environment, education, and healthcare.

http://www.cognitivesystemsdesign.net
A cognitive system is a thinking (or intelligent) information system. However, the enhanced intelligence is not generated by the activity of intelligent technological functions as many in the discipline of Artificial Intelligence will want to claim, but emerges from the coordinated collaboration of distributed human agents via their interactions with each other and with functionally heterogeneous technological artifacts.

http://www.reqif.de/
RIF/ReqIF is a standard for normalizing system specifications and requirements. Originally, ReqIF was devised to facilitate exchange of requirements between different software tools. In June 2010, the Mantis Task Force voted to adopt the Requirements Interchange Format (ReqIF) as an OMG standard. The OMG is an international standards organisation that is, among other things, responsible for UML, SysML, BPMN and CORBA standards. Following on from this, the Architectural Board also voted for the adoption of ReqIF as an OMG standard. ReqIF is now on the way to becoming an international standard.

http://www.sysmlforum.com/
The SysML Forum is a web community dedicated to the Systems Modeling Language (SysML), a general-purpose visual modeling language for systems engineering applications. SysML is a dialect (Profile) of the UML (Unified Modeling Language) that is customized for systems engineering applications.

http://www.sysmlforum.com/faq/relation-between-MBSE-and-other-acronyms.html
This webpage looks at the relationship between Model-Based Systems Engineering (MBSE) and other Model-Driven/Model-Based acronym expressions (MDD, MDSE, MDE, MDA, MBE).

http://www.omgsysml.org/
An Object Management Group website dedicated to OMG SysML, the version of SysML that the OMG has adopted and standardized for tool vendors.

http://www.omgwiki.org/MBSE/doku.php
A wiki dedicated to Model-based Systems Engineering (MBSE) topics, including SysML modeling. The MBSE Wiki purports to support the INCOSE MBSE initiative and the OMG Systems Engineering Domain Special Interest Group.

http://www.uml-sysml.org/sysml
An informational website in French dedicated to both UML and SysML modeling.

http://www.sysmltools.com/
A website dedicated to SysML tool information, reviews, and news.

http://jbconsultinginternational.com/TechnologyReadinessLevel.aspx
A brief history of *Technology Readiness Levels* (TRL) is provided, along with links to various TRL Calculators.

http://cost.jsc.nasa.gov/resources.html
This webpage provides or identifies a number of cost estimating resources, in the categories of Books, Government Reports, Periodicals, References, Software, and Technical Reports. The listing of software applications supporting cost estimation is particularly comprehensive.

http://cosysmo.mit.edu/
The purpose of the COSYSMO (Constructive Systems Engineering Cost Model) model is to estimate the Systems Engineering effort for large-scale systems (both software and hardware). This website is the home of COSYSMO, with extensive resources and relevant information.

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# Standards and Guides

## ISO TC 159 – Ergonomics

The ISO TC 176 website lists all the relevant information on this Technical Committee, including the following list of working groups:

| Subcommittee/Working Group | Title |
|---|---|
| TC 176/CAG | Chairman Advisory Group<br>The convener can be reached through the secretariat |
| TC 176/TF 1 | Strategic planning<br>The convener can be reached through the secretariat |
| TC 176/CAG 2 | SPTF: Strategic Planning Task Force<br>The convener can be reached through the secretariat |
| TC 176/TF 2 | Portfolio management<br>The convener can be reached through the secretariat |
| TC 176/TG | Portfolio Management<br>The convener can be reached through the secretariat |
| TC 176/SC 1 | Concepts and terminology |
| TC 176/SC 2 | Quality systems |
| TC 176/SC 3 | Supporting technologies |

The ISO TC 176 Business Plan describes:

- The business environment of the ISO/TC
- he benefits expected from the work of the ISO/TC.
- Representation and participation in the ISO/TC
- Objectives of the ISO/TC and strategies for their achievement
- Factors affecting completion and implementation of the ISO/TC work programme
- Structure, current projects and publications of the ISO/TC

The work programme for each of the working groups of ISO/TC 176 is set out on the ISO website in terms of the standard or project, the Standards Development Process Stage code and the International Classification for Standards (ICS) reference.

The meeting calendar is also provided on the website.

More information

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# Some Definitions to Close On

## Technology Readiness Level (TRLs)

**Technology Readiness Level:** TRLs are a set of management metrics that enable the assessment of the maturity of a particular technology and the consistent comparison of maturity between different types of technology - all in the context of a specific system, application and operational environment.
Source: European Space Agency

**Technology Readiness Level:** Technology Readiness Level (TRL) is a measure used by some United States government agencies and many of the world's major companies (and agencies) to assess the maturity of evolving technologies (materials, components, devices, etc.) prior to incorporating that technology into a system or subsystem.
Source: en.wikipedia.org/wiki/Technology_readiness_level

**Technology Readiness Level:** One level on a scale of one to nine, e.g., “TRL 3,” signifying technology readiness pioneered by the National Aeronautics and Space Administration (NASA), adapted by the Air Force Research Laboratory (AFRL), and adopted by the Department of Defense as a method of estimating technology maturity during the acquisition process. The lower the level of the technology at the time it is included in a product development program, the higher the risk that it will cause problems in subsequent product development.
Source: U.S. Defence Acquisition University (DAU) Defense Acquisition Guidebook and DoD Technology Readiness Assessment Deskbook

**The European Space Agency (ESA) defines nine levels as:**

- TRL 1. Basic principles observed and reported
- TRL 2. Technology concept and/or application formulated
- TRL 3. Analytical & experimental critical function and/or characteristic proof-of-concept
- TRL 4. Component and/or breadboard validation in laboratory environment
- TRL 5. Component and/or breadboard validation in relevant environment
- TRL 6. System/subsystem model or prototype demonstration in a relevant environment (ground or space)
- TRL 7. System prototype demonstration in a space environment
- TRL 8. Actual system completed and "Flight qualified" through test and demonstration (ground or space)
- TRL 9. Actual system "Flight proven" through successful mission operations

**The Y-12 National Security Complex (Y-12), a United States Department of Energy (DOE) facility, defines nine levels as:**

TRL 1. Scientific research begins translation to applied R&D - Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology’s basic properties.

TRL 2. Invention begins - Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.

TRL 3. Active R&D is initiated - Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.

TRL 4. Basic technological components are integrated - Basic technological components are integrated to establish that the pieces will work together.

TRL 5. Fidelity of breadboard technology improves significantly - The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include “high fidelity” laboratory integration of components.

TRL 6. Model/prototype is tested in relevant environment - Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology’s demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.

TRL 7. Prototype near or at planned operational system - Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment.

TRL 8. Technology is proven to work - Actual technology completed and qualified through test and demonstration.

TRL 9. Actual application of technology is in its final form - Technology proven through successful operations.

**The United States Department of Defense defines nine levels as:**

1. Basic principles observed and reported
   Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Example might include paper studies of a technology's basic properties.

2. Technology concept and/or application formulated
   Invention begins. Once basic principles are observed, practical applications can be invented. The application is speculative and there is no proof or detailed analysis to support the assumption. Examples are still limited to paper studies.

3. Analytical and experimental critical function and/or characteristic proof of concept
   Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.

4. Component and/or breadboard validation in laboratory environment
   Basic technological components are integrated to establish that the pieces will work together. This is "low fidelity" compared to the eventual system. Examples include integration of 'ad hoc' hardware in a laboratory.

5. Component and/or breadboard validation in relevant environment
   Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so that the technology can be tested in a simulated environment. Examples include 'high fidelity' laboratory integration of components.

6. System/subsystem model or prototype demonstration in a relevant environment
   Representative model or prototype system, which is well beyond the breadboard tested for TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment or in simulated operational environment.

7. System prototype demonstration in an operational environment
   Prototype near or at planned operational system. Represents a major step up from TRL 6, requiring the demonstration of an actual system prototype in an operational environment, such as in an aircraft, vehicle or space. Examples include testing the prototype in a test bed aircraft.

8. Actual system completed and 'flight qualified' through test and demonstration
   Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.

9. Actual system 'flight proven' through successful mission operations
   Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. In almost all cases, this is the end of the last "bug fixing" aspects of true system development. Examples include using the system under operational mission conditions.

**The United States National Aeronautics and Space Agency (NASA) defines nine levels as:**

1. Basic principles observed and reported
   This is the lowest "level" of technology maturation. At this level, scientific research begins to be translated into applied research and development.

2. Technology concept and/or application formulated
   Once basic physical principles are observed, then at the next level of maturation, practical applications of those characteristics can be 'invented' or identified. At this level, the application is still speculative: there is not experimental proof or detailed analysis to support the conjecture.

3. Analytical and experimental critical function and/or characteristic proof of concept
   At this step in the maturation process, active research and development (R&D) is initiated. This must include both

analytical studies to set the technology into an appropriate context and laboratory-based studies to physically validate that the analytical predictions are correct. These studies and experiments should constitute "proof-of-concept" validation of the applications/concepts formulated at TRL 2.

4. Component and/or breadboard validation in laboratory environment
   Following successful "proof-of-concept" work, basic technological elements must be integrated to establish that the "pieces" will work together to achieve concept-enabling levels of performance for a component and/or breadboard. This validation must be devised to support the concept that was formulated earlier, and should also be consistent with the requirements of potential system applications. The validation is "low-fidelity" compared to the eventual system: it could be composed of ad hoc discrete components in a laboratory.

5. Component and/or breadboard validation in relevant environment
   At this level, the fidelity of the component and/or breadboard being tested has to increase significantly. The basic technological elements must be integrated with reasonably realistic supporting elements so that the total applications (component-level, sub-system level, or system-level) can be tested in a 'simulated' or somewhat realistic environment.

6. System/subsystem model or prototype demonstration in a relevant environment (ground or space)
   A major step in the level of fidelity of the technology demonstration follows the completion of TRL 5. At TRL 6, a representative model or prototype system or system - which would go well beyond ad hoc, 'patch-cord' or discrete component level breadboarding - would be tested in a relevant environment. At this level, if the only 'relevant environment' is the environment of space, then the model/prototype must be demonstrated in space.

7. System prototype demonstration in a space environment
   TRL 7 is a significant step beyond TRL 6, requiring an actual system prototype demonstration in a space environment. The prototype should be near or at the scale of the planned operational system and the demonstration must take place in space.

8. Actual system completed and 'flight qualified' through test and demonstration (ground or space)
   In almost all cases, this level is the end of true 'system development' for most technology elements. This might include integration of new technology into an existing system.

9. Actual system 'flight proven' through successful mission operations
   In almost all cases, the end of last 'bug fixing' aspects of true 'system development'. This might include integration of new technology into an existing system. This TRL does not include planned product improvement of ongoing or reusable systems.

A reference: “Technology Readiness Levels Handbook for Space Applications”, European Space Agency, TEC-SHS/5551/MG/ap, 6 September, 2008

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# Project Performance International News

## Nakhchyvan Autonomous Republic – Where’s That?

Constitutionally, Nakhchyvan is an Autonomous Republc on the territory of Azerbaijan. It is located in the southwest end of the Lower Caucasus. Bordered by Armenia (246km), Iran (204km) and Turkey (11km), Nakhchyvan was separated from the mainland of Azerbaijan in 1918. Since 1991, the Republic has been in blockade by Armenia. Initially without border crossings to any of its three neighbours, accessible only by air, and largely without electricity and gas supply, the people of Nakhchyvan suffered enormously. These terrible circumstances began to improve in the late 90s, with the opening of a border crossing with Iran. More recently, a border crossing with Turkey has become the major trade route for export of production by Nakhchyvan.

PPI Managing Director Robert Halligan visited Nakhchyvan in April this year, on his way to a systems engineering training assignment in Ankara, Turkey.

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## Defined Terms in SEG Hit 6000

PPI's free Systems Engineering Goldmine (SEG) provides, in addition to thousands of downloadable documents, a searchable database of definitions. The number of defined terms in March hit 6,400, and is continuing to grow almost daily. Access to the SEG is free to PPI clients and, conditionally, to others in the project community.

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## Robert Halligan to Speak in Brasil

PPI Managing Director Robert Halligan will speak at the inaugural Systems Engineering Day in Brasil on 6 June, 2011, on the subject "An Assessment of the Status of Systems Engineering in Brasil and in the World". Robert's Portuguese is not that great, so the presentation will be mostly in English.

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# Project Performance International Events

### Systems Engineering 5-Day Course

Upcoming locations include:

- Melbourne, Australia
- Pretoria, South Africa
- Las Vegas, USA

View 2011 Systems Engineering Course Schedule

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### Requirements Analysis and Specification Writing 5-Day Course

Upcoming locations include:

- Adelaide, Australia
- Sydney, Australia
- Stellenbosch, South Africa
- Las Vegas, USA

View 2011 RA&SW Course Schedule

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### OCD & CONOPS in Capability Development 5-Day Course

Upcoming locations include:

- Canberra, Australia
- Brasilia, Brazil

View 2011 OCD/CONOPS Course Schedule

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### Software Development Principles & Processes 5-Day Course

Upcoming locations include:

- Amsterdam, The Netherlands
- Stellenbosch, South Africa
- Sydney, Australia

View 2011 Software Development Principles & Processes Course Schedule

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### Cognitive Systems Engineering 5-Day Course

Upcoming locations include:

- Singapore
- Adelaide, Australia
- Stellenbosch, South Africa
- Las Vegas, USA

View 2010/2011 Cognitive Systems Engineering Course Schedule

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### Requirements Engineering 5-Day Course

Upcoming locations include:

- Adelaide, Australia
- Sydney, Australia
- Stellenbosch, South Africa
- Las Vegas, USA

View 2011 Requirements Engineering Course Schedule

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### Introduction to Software Development Principles & Processes 2-Day Seminar

View 2011 Introduction to Software Development Principles & Processes Seminar Schedule

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### Introduction to Cognitive Systems Engineering

Upcoming locations include:

- Singapore
- Canberra, Australia
- Stellenbosch, South Africa
- Las Vegas, USA

View 2011 Introduction to Cognitive Systems Engineering Seminar Schedule

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### Introduction to Requirements Analysis 1-Day Seminar

Upcoming locations include:

- Brisbane, Australia
- Adelaide, Australia
- Melbourne, Australia

View 2011 Introduction to Requirements Analysis Seminar Schedule

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### Preparing Great Requirements Specifications 1-Day Seminar

Upcoming locations include:

- Melbourne, Australia
- Adelaide, Australia
- Canberra, Australia

View 2011 Preparing Great Requirements Specifications Seminar Schedule

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### PPI Upcoming Participation in Professional Conferences

- SETE 2011 (Exhibiting)
- SSTC 2011 (Exhibiting)
- INCOSE IS 11 (Exhibiting)

- Defence & Industry 2011 (Exhibiting)

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Kind regards from the SyEN team:
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