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SYSTEMS ENGINEERING NEWSLETTER

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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.

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Quotations to Open On

These days, unless you devote an enormous amount of time to anticipating the future, you won't have any future.
-- Ron Chernow

If we knew what it was we were doing, it would not be called research, would it?
-- Albert Einstein

Feature Article

Active Knowledge Architecture: What Systems Engineering Need to Embrace

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Keywords: Active Knowledge Modelling, Architecture-driven Systems Engineering, Agile Approach, Emergent Enterprise Architecture, and Holistic Design

Abstract: This article introduces an agile approach to holistic design of products and systems. The approach is based on Active Knowledge Architecture (AKA) developed by applying Active Knowledge Modeling (AKM) methods and tools [1,2]. Architecture-driven workplaces, methods and services for Emergent Enterprise Architecture [3], supporting design and execution, have been prototyped. Collaborative systems engineering, as well as design of smart adaptive products and systems, can be realized by developing an AKA. Effective experimentation with alternative solutions and management of adaptive life-cycle services are just some of the many benefits that systems engineering can harvest.

The AKM technology has since 1997 been applied for experimenting with new ideas, approaches and methods for project and product design. An AKA will capture the core knowledge of any enterprise and product, enabling effective collaboration and communication across disciplines and project stages. AKA methods for modeling enterprise knowledge spaces and workspaces have been invented and prototyped as being a more effective means of process and knowledge management. Dynamic viewing, knowledge sharing and effective reuse are inherent AKA properties.

Introduction
Systems engineering and product design are recognizing limitations in current methods and growing challenges, such as escalating complexity and demand for effective in-use repair and maintenance. AKA-driven workspaces [2] for distributed design and collaborative engineering have been piloted. AKA-driven means that architecture models are actively used in designing, executing and managing workplaces and system solutions.
Properties of mental models, such as reflection and repetition are easily supported in an AKA, allowing users to combine the powers of mental and digital models. Simple graphic languages enable users to build work environments, where processes and dependencies are modeled as adaptive task-patterns. User workplaces, services and application models can be reconstructed and adapted at any time in the life-cycle of products and systems.

Systems Engineering Practices. There is consensus in the Systems Engineering (SE) community [3,4] about what SE is and how it should be performed. However, little is published about how SE will meet the challenges facing the designers, engineers and users of future networked enterprises. The dominant SE thinking is System of Systems (SoS). In SoS each system is designed with the same set of activity break-down structured processes. Each system has its separate data model and services. Design, engineering, integration and interoperation is a matter only for the SE processes and the integrating ICT architecture.

In SoS, humans are considered and modeled as any other stable system component. This means that the powerful methods of comparison, handling of alternatives and team reasoning, and the inherent properties of mental models are lost. These methods and properties cannot be expressed in natural language alone, nor by present SE modeling and coding methods. So work-centric context and local ways of working or acting cannot be captured and applied to manage dependencies and local events and practices. Interaction among mental and digital models is the only known way for capturing adaptive methods (task-patterns) and local working context.

The overall SE process, the SIMILAR model [3,4], has no common product design information model, and no user services to capture and balance system properties and parameters for managing dependencies. The model is an abstracted perspective of a theoretical workflow, or document and diagrammatic model flows. Comparing and managing alternatives is very resource consuming, and decisions cannot be traced.

Challenges and Needs. Most applications use computing purely to improve efficiency in processes and ways of working originating from layered sequential flows. The growth in bureaucracy and user communities applying spreadsheets and slides is evidence that little new thinking, knowledge sharing, and learning and innovation are taking place. There are many public application areas where we are not able to support or improve capabilities and services because practical experience, competence, contexts and tacit knowledge cannot be captured and shared. Examples besides industrial design and development are reconstruction of crime and incident modeling in police investigation, military missions and operations, and management of nature- and man-made crisis and disasters.

To meet these and other challenges designers, architects and users must adopt an agile approach to emergent Enterprise Architecture (eEA) and systems development, enabling them to capture and share knowledge about actors, events and situations. Architects and designers must be able to respond to growing variances, emergence and complexity in markets, customer demands, competences and capabilities. They must be able to concurrently work with alternative solutions, share knowledge and reiterate tasks.

The needs faced when participating in multiple global projects can only be mastered by an agile approach to holistic design and access to role-oriented execution and management services. Collaborative innovation and learning, role and competence transfer, capabilities replication, and dynamic networked enterprise execution and management is enabled by an AKA. The Active Knowledge Modeling approach supports tacit knowledge explication.

What is Active Knowledge Modeling?
Active Knowledge Modeling is an approach to enhance computing. The approach is best summarized as “using visual modeling rather than software coding to capture global as well as local context” [2]. Another key characteristic is that role-oriented workspaces support users in capturing and handling situations and complex dependencies.

AKM means that as users execute tasks assigned, they are provided architecture-driven tasks to capture data and practice in the architecture, thus creating local work-centric contexts to facilitate new working methods. As work progresses, new aspects are emerging as is the knowledge to be shared among users. The key innovations validated by prototypes can be summarized in the following statements:

1. Enterprise knowledge exists in multi-dimensional knowledge spaces, interlaced and interacting through properties and their parameter-structures.
2. Work-generative knowledge has these intrinsic properties; reflective views, repetitive task-patterns, recursive flows, and replicable templates.
3. Agile workplaces for performing tasks in a collaborative setting require role-specific workspaces with strong viewing and communication services.
4. Data, work-centric information, and knowledge must belong to the owners of the data, the industrial users.

5. The knowledge world is not alone object-oriented. Our mental models are role, task, view and concept driven.
6. Work-sensitive role-oriented knowledge, reflective and common models and views, are the only true enterprise integrators.

Enterprise knowledge spaces are created by disciplines and roles responsible for calculating and deciding the main properties of a product. Structures of product, organization, process and system aspects and their mutual dependencies are decided by global properties and their parameter-trees. These parameter sets decide the object structures and their relationships. Collaborative balancing should therefore be done by disciplines before parameters are decided and embodied in object-class structures.

Multi-dimensional knowledge spaces, role-oriented organizations, and the AKM methodologies and principles are further explained in our AKM book and blog [1, 2]. Two of the major concepts are defined in the following sections.

Holistic Design. Holistic design and management of situations must embrace active architecture to support collaborative learning and innovation, capturing new design and working methods and tasks. Holistic design implies working top-down, bottom-up, and middle-out, focusing on perspective views and views specific to any workspace.

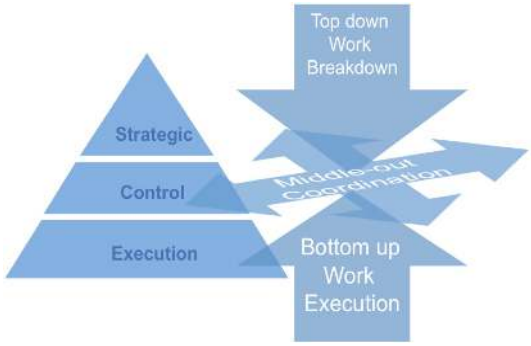

Figure 1: Holistic design: top-down, bottom-up and middle-out approaches

Holistic design is top-down decomposition of objects and tasks, bottom-up aggregation of parameter values and dependencies, and middle-out balancing of parameter values between disciplines and components. Finally, parameter values are compared with life-cycle values and values specified by customers, suppliers and the manufacturing process.

Planning, economy and quality control, and other management aspects employ methods that are mostly based on top-down decomposition, e.g. Business Process Management [6]. Practical dependencies, decision-making and work processes in general are decided by bottom–up aggregated parameter values. Engineering methods work middle-out balancing discipline specific values of alternative component configurations.

What is Active Knowledge Architecture?
Holistic design must be performed in teams with enterprise architects, methodology experts, and leading users, supported by agile architecting methods and practitioner-driven approaches. The many kinds of models are integrated in and reused from a visual, role-oriented Active Knowledge Architecture (AKA). An AKA is built by teams and emerges as leading users express knowledge of roles and their workspaces. Architects govern principles and create modeling constructs to allow as much work-centric knowledge as possible to be captured. Modeling in practical contexts, capturing both approach and execution, allows users to express work-centric knowledge that would otherwise remain tacit and even be lost. Context-rich workspace models are created using the Information, Role, Task and View (IRTV) language.

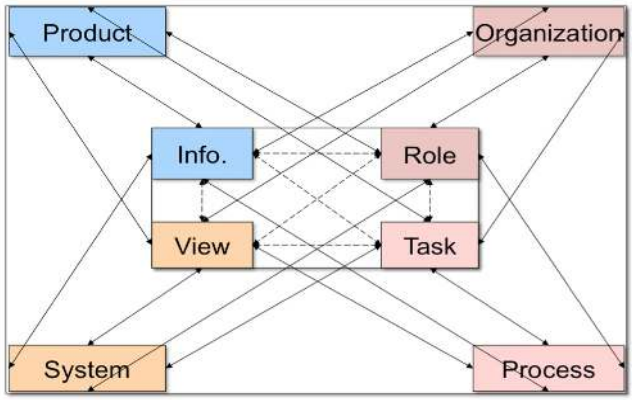

Figure 2: Enterprise knowledge spaces and workspaces are built by teams involving leading users applying the IRTV methodology giving executable models

The models are composed of contents that focus on dependencies among and between roles (R), their main tasks (T), supporting views (V) and relevant information elements (I), as illustrated in Figure 2. Models created using this approach can automatically generate workspaces for the specific roles. Users can affect the model through their workspaces to automatically update the model.

Example from Practice
Industrial pilots have been developed that verify the AKM approach and validate the user benefits. A pilot example from an oil and gas field engineering project is presented. Its focus is on the design of a selected piping system platform area and three roles involved.

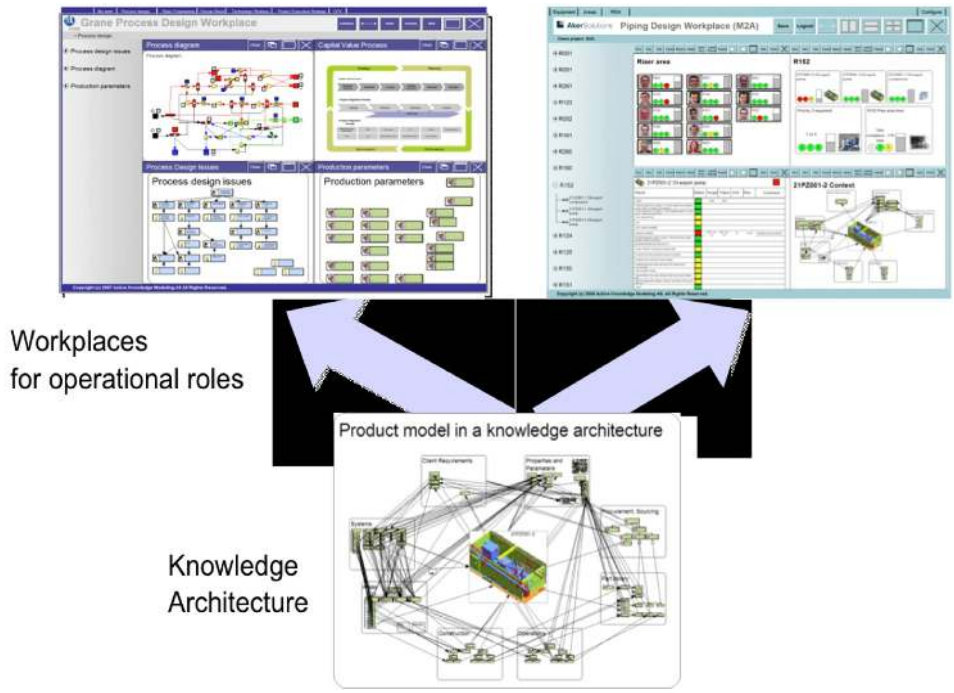

Figure 3: The crude oil piping area and eight engineering disciplines were modeled

Figure 3 shows an AKA with just the application model visible. The two workplaces generated by the AKA provide tasks for users to enhance the model and build new ones. Workplace models are composed of content specific to roles, their main tasks, supporting views and relevant information elements. The three workplaces shown in figure 4 were modeled, embedded in, and configured by tools and models embedded in the AKA.

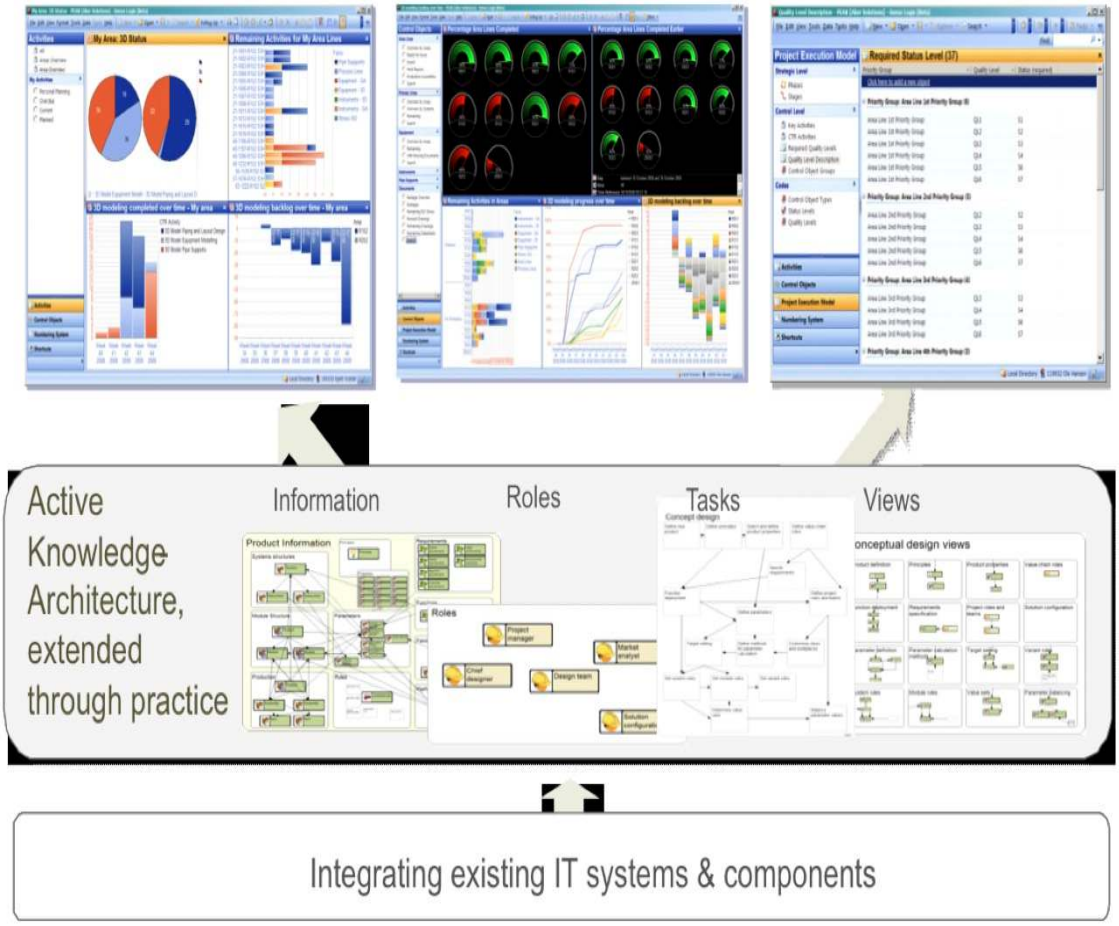

Figure 4: The model-based workplaces of the engineering project pilot, from left: - the piping engineer, the piping area manager, and the methodology manager

The objectives of improved visual collaboration and coordination to improve work planning, reporting and execution were met in a few weeks. Practitioners must collaborate to design and apply variant, modularization, and design rules. Tasks being executed and new tasks are captured in task-patterns. These may later contribute to improved processes for design, coordination, traceability, predictability and reusability. New design principles and methodologies are developed [8], including modeling principles and services for composing modeling languages to be used in life-cycle maintenance and support. Common understanding of operations and tasks, roles and responsibilities, interoperability and information exchange, and business and engineering data was achieved. Support for user and other stakeholder involvement in modeling and architecture development and management was facilitated, as was continuous learning and innovation.

AKA Benefits. The advantages of developing an AKA to capture the approach, emerging architectures, and enterprise evolution are:

- Enable model-based, AKA-driven execution,
- Support work in context, modeling knowledge spaces,
- Support role-oriented, architecture-driven workspaces,
- Capture local nuances, practices and rules, and rich context,
- Giving users control over data, information flows and viewing,
- Closing the gap between design and execution,
- Allow users to extend networking platforms to invite new users,
- Extend and integrate the method base with pragmatics,
- Integrate and provide role-specific operational views,
- Give control of IT solutions and services to practitioners,
- Implement new methods by combining mental and digital models, and
- Produce event- and situation-driven communications and views.

AKA-driven knowledge bases support holistic design and portfolio management.

Towards Agile Visual Landscapes
Agility and emergence can be achieved by model-based, architecture-driven workplaces, providing capabilities for extending and modifying the Active Knowledge Architecture (AKA), and to reflect operations across stages, roles and workspaces.

Architecture-driven Collaboration. Industrial companies and public institutions are struggling to provide effective and efficient ICT support to develop and deliver services to customers, partners and suppliers. The current approaches and supporting ICT solutions are schematic, fragmented, and non-interoperable, focusing formal methods and standardized data modeling. Local work-centric context, pragmatic methods, and tacit knowledge are lost, making conceptual design, collaborative engineering, adaptive solutions, and innovation and learning from experience hard to implement.

Role-oriented workspaces and architecture-driven workplaces must be developed by collaborative teams of designers, architects and users. Development should be based on visual modeling of core competence roles, working with architecture-driven workplaces, involving stakeholders and users. An AKA captures the enterprise core competence. This is a bottom-up approach and could be performed in parallel with a top-down approach modeling visions, stakeholder concerns, and business goals.

Continuous Innovation and Learning. In order to improve innovation, users must be able to share and manage data as knowledge. Computing systems and solutions must self-adapt to local situations, simplify evolution and change management, and provide roles with role- and task-specific views. This means creating a network of self-adapting mental and digital models, and providing powerful viewing and management of dependencies and shared views. As work evolves, digital models change, so mental models must also adapt, and that can only happen through situated at-the-workplace innovation and learning.

Enterprises are becoming increasingly dependent on global collaboration, on human ability to engage and motivate people, and on pursuing opportunistic business ventures. Knowledge sharing, competence transfer, and continuous innovation and learning must be supported in order for this to become a reality.

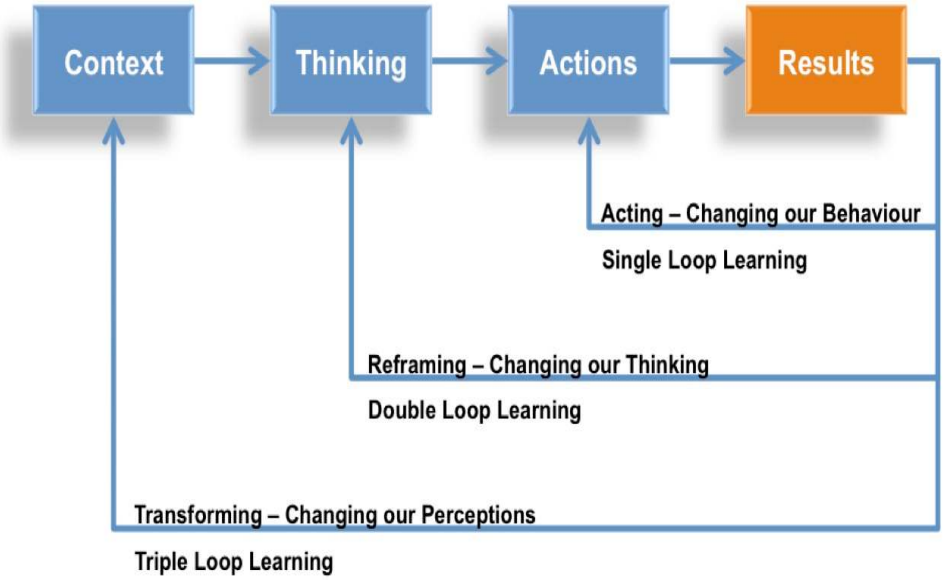

Figure 5: Rich-context digital workspaces will open new horizons for our mental models

In physical work environments humans are able to benefit from double-loop learning. Agile visual landscapes will allow designers, architects and users to engage in Open Innovation [7] and in continuous Life-cycle Learning. An AKA gives the human mind access to role-specific workspaces, where reflective views, repetitive task-patterns, and replicable methods are managed. This enhances human creativity, problem-solving capacity, and opens for triple- and even multiple-loop learning. Much more tacit knowledge can be externalized and shared. This will also make design, engineering and manufacturing processes simpler and raise the quality of products, systems and services. People assigned to roles can work with alternatives, and test and compare their capabilities before agreeing on the alternatives to produce and deliver.

Collaborative Product and Systems Design
The future will require customers and suppliers to rapidly engage in collaborative working environments, inviting partners to contribute to negotiations and results. This can be achieved by architecture-driven collaborative workspaces, and enhanced methods.

Agile approaches to emergent EA will further enable partners and suppliers and their users to align and manage business and project objectives, and enable knowledge sharing and competence transfer. Qualifying for and taking on roles, and engaging in collaboration with partners and suppliers will be performed at-the-workplace.

Company roles in multiple networked enterprises will vary and effective participation will increase in complexity. Future networked enterprises and their products and systems will need to be continuously designed, modeled and managed by visual collaboration.

Architecture-Driven Systems Engineering. We should focus on an agile approach for designing, executing and managing networked enterprises, defining teams that collaborate and share knowledge through experimentation with alternative solutions and views.
We believe the core enterprise design teams to be:

Conceptual Design Team - developing new design ideas, business models, solution concepts, performing conceptual and holistic product design, and expressing product and system specific new graphic artifacts and design rules.

Architecting Team - building, extending and adapting the active architectures and the integrating emergent EA, creating and adapting model-based graphic languages and application templates, and maintaining reference models.

Organization Team - defining and aligning new roles and responsibilities, workspaces and services, model-based workplaces, access rights and security, and recruiting and training personnel to take on roles.

Methodology Team - developing and adapting design methodology for networked Enterprise Design and Development (ED&D), holistic product and system design, systems engineering and collaboration and application models.

Applications Team - developing and assessing applications, models and services, and experimenting with alternative approaches, methods and solutions, and solutions for continuous learning and innovation.

Management Team - planning, performing and following up on work /tasks, situations and actions, and supporting decision-making, and the services and views required to execute tasks and maintain common performance views.

Knowledge Management Team - developing and managing project and domain knowledge bases, portfolios, product families, categories and classes, and providing services to support the building of new enterprises and emerging architectures.

These are not all the teams, but are the core teams needed to implement an agile approach to emergent EA. Agile processes and systems must be supported by agile architecting. The many individual roles and tasks of these teams should be modeled to help us develop a new approach and collaborative workspaces for designing, executing and managing networked enterprises and their emergent architecture.

Impact on Knowledge Economy. For ICT to provide networked business and enterprise platforms to make industry more competitive we need to take the benefits out of new innovations. We also need to rethink some of the concepts and components that are the foundations of present systems design and development.

Summary
Active knowledge architecture, work-centric knowledge and architecture-driven solutions will be decisive for future networked enterprises and for sustainable competitive industries.

The initiatives for developing agile approaches to emergent Enterprise Architecture [9] must invite practitioners to also support holistic design and execution of the networked enterprise. It is key user competence and data that are the main integrators of networked enterprises.

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Systems Engineering News

Guide to the Systems Engineering Body of Knowledge (SEBoK) V1.0 Released and Available Worldwide

This key deliverable of the BKCASE Project, initiated three years ago by the US DoD and SERC (Systems Engineering Research Center), is a university partnership between the Stevens Institute of Technology and the Naval Postgraduate School. The project scope is to define a Systems Engineering Body of Knowledge and use it to develop an Advanced Graduate Reference Curriculum for Systems Engineering (GRCSE, pronounced "Gracie").Seventy contributors from around the world authored the SEBoK. Several hundred reviewers provided comments.

INCOSE and IEEE are the two key sponsors of BKCASE and will jointly ensume the stewardship of SEBoK and GRCSE beginning in 2013.

More information

New and Improved IIBA Certification Exam Delivery

The International Institute of Business Analysis (IIBA) has announced that, effective January 1, 2013, it will be working with Prometric for the delivery and administration of IIBA® certification exams. Prometric is a worldwide provider of test development and delivery solutions with over 20 years of experience, and is used by organizations such as the Project Management Institute (PMI) and INCOSE.

As of January 1, 2013, Certification of Competency in Business Analysis™ (CCBA®) and Certified Business Analysis Professional™ (CBAP®) candidates will be able to take their exams online at any of Prometric’s 8000 test centers located in more than 160 countries.

INCOSE MBSE Workshop 2013

INCOSE has invited engineering professionals to join the Model-based Systems Engineering (MBSE) Workshop on Saturday and Sunday, January 26-27, 2013 as part of the INCOSE International Workshop (IW) in Jacksonville, Florida, USA. This 2 day workshop provides an opportunity to learn about the latest MBSE activities, and to network with others involved in MBSE. The theme continues to emphasize the role of systems modeling in a multi-disciplinary engineering environment. The Workshop includes a combination of in-depth presentations, and facilitated break-out sessions. The presentations focus on systems modeling applications and the integration with hardware and software design modeling and engineering analysis models. The breakout sessions focus on high-interest and high-value topical areas including system of systems modeling, systems modeling and requirements flow down, model management, as well as usability considerations associated with MBSE. MBSE continues to be a major trend towards the advancement of the practice of systems engineering.

Additional information on the INCOSE MBSE Initiative can be found at the MBSE Wiki: http://www.omgwiki.org/MBSE/doku.php?id=start

Registration for the MBSE Workshop will be available when the INCOSE IW 2013 online registration is open at: http://www.incose.org/newsevents/events/details.aspx?id=167

More information

Systems Engineering Certification Program (SE-ZERT®)

A systems engineering certification program (SE-ZERT®) was successfully launched in Germany by the INCOSE chapter, GfSE, earlier this year. Shortly after the launch, the first certified system engineers were prepared for the exam Certified Systems Engineer "Level C" (CSE-C) and certified by

TÜV Rheinland.

More information (in German)

SESA Forms Energy Transition Working Group

The Systems Engineering Society of Australia, which is the Australian Chapter of INCOSE, has formed an Energy Transition Working Group to define, using a systems engineering approach, a transition plan for transition by 2030 from coal-based electricity generation in Australia. The Working Group will also participate with the INCOSE Energy and Power Working Group; see http://www.incose.org/practice/techactivities/wg/pande/. Convener of the SESA Energy Transition Working Group is Mike O'Keefe.

More Information

INCOSE Systems Engineering Journal Editor-in-Chief Search

The Board of Directors of the International Council on Systems Engineering (INCOSE) is soliciting nominations for Editor-in-Chief of the journal Systems Engineering. Published quarterly by Wiley Blackwell on behalf of INCOSE (www.incose.org), the journal is currently in its fifteenth volume. This position is a four-year, renewable term beginning January 1, 2013.

Systems Engineering is a primary source of multidisciplinary information for the systems engineering and management of products and services, and processes of all types.

The journal emphasizes strategic and program management of these, and the information and knowledge base for knowledge principles, knowledge practices, and knowledge perspectives for the engineering of systems..

Further information about the journal can be obtained from the journal home page: http://eu.wiley.com/WileyCDA/WileyTitle/productCd-SYS.html

Nominations should include (1) a resume of individual qualifications demonstrating experience that includes systems engineering research execution and publication, (2) the names of three individuals who can provide a reference, and (3) a brief (less than 300 words) position statement outlining a vision for the journal.

Self-nominations are encouraged. Nominations will be accepted until October 31, 2012.

More information

ACM SIGSIM M&S Knowledge Repository (MSKR)

The ACM Special Interest Group on SImulation and Modeling (ACM SIGSIM) is launching a new website; the vision is to make the website a key resource for all things modeling and simulation.

The initiative includes:

- Development of an action plan;
- Development (already underway) of professionally-made content which will provide an overview of M&S and its application areas; and
- Development of a video sourcing strategy; and
- Development of short education/learning videos (less than five minutes in duration) that are more technical than the overview and cover topics ranging from "Gaussian distribution" and "Petri nets" to "Agent-Based M&S".

If you are interested in contributing expertise to the video development effort first contact the Associate Editors of the SIGSIM M&S Knowledge Repository - Saikou Y. Diallo (sdiallo (at) odu.edu) or Navonil Mustafee (navonil.mustafee (at) gmail.com) – with the topic/list of topics for which you would be interested in creating videos.

If you are an M&S consultant or are involved in marketing/development of M&S software and you are interested in developing the short videos, contact either the Editor-in-Chief of the SIGSIM M&S Knowledge Repository Osman Balci (balci (at) vt.edu) or contact Chairman, ACM SIGSIM Paul Fishwick (fishwick (at) cise.ufl.edu).

More information

Featured Society

International Society of Automation (ISA)

The International Society of Automation (ISA) was founded in 1945. It is a global, member-based nonprofit organization that aims to set the standard for automation by helping over 30,000 worldwide members and other professionals solve difficult technical problems, while enhancing their leadership and personal career capabilities. Based in Research Triangle Park, North Carolina, ISA develops standards; certifies industry professionals; provides education and training; publishes books and technical articles; and hosts conferences and exhibitions for automation professionals. ISA is the founding sponsor of the Automation Federation (www.automationfederation.org).

Mission and Vision

The mission of the ISA is to become the standard for automation globally by certifying industry professionals; providing education and training; publishing books and technical articles; hosting conferences and exhibitions for automation professionals; and developing standards for industry.

The vision of the ISA is to work in partnership with members, customers, and subject-matter experts to disseminate the highest quality, unbiased automation information worldwide.

Activities of the ISA
Automation Standards - ISA has published more than 150 standards, recommended practices, and technical reports through the efforts of a network of industry experts. ISA member can view ISA standards online, free of charge, for your personal use.

Free Web Seminars - ISA members receive unlimited, free access to a library of over 40 online pre-recorded web seminars covering relevant topics.

Technical Library - Members have access to unlimited downloads of ISA's library of more than 2,500 technical papers published at ISA conferences and symposia.

InTech Magazine - Members receive a free, qualified subscription to InTech magazine for automation professionals, and a free subscription to Automation Weekly newsletter.

Technical Divisions - ISA operates Technical Divisions, each a network of automation professionals who share technical interests. Members get two free memberships, one for the Automation and Technology Department and one from the Industries and Sciences Department. Technical Divisions are:

- Aerospace Industries Division;
- Chemical and Petroleum Industries Division;
- Construction and Design Division;
- Food and Pharmaceutical Industries Division;
- Mining and Metals Industries Division;
- Power Industry Division;
- Pulp and Paper Industry Division;
- Water and Wastewater Industries Division;
- Analysis Division;
- Automatic Control Systems Division;
- Computer Technology Division;
- Management Division;
- Process Measurement and Control Division;
- Robotics and Expert Systems Division;
- Safety Division;
- Telemetry and Communication Division; and
- Test Measurement Division.

ISA Transactions - Members receive free online access to current and past articles covering the latest advances in the science and engineering of measurement and automation.

Leadership Development - ISA provides to members a free online Leadership Development Certificate Program.

Certification and Licensure - ISA operates a professional certification programs. ISA offers the Certified Automation Professional® (CAP®) and Certified Control Systems Technician® (CCST) programs, and supports the development of the Control Systems Engineer (CSE) licensure program.

Mentoring Program - ISA provides a vehicle for connecting online with, and learning from, experienced professionals and practitioners.

Email Lists - ISA provides open forums for discussions on automation topics

Conferences, Exhibitions, and Symposia

ISA Standards Committees

ISA operates more than a hundred standards committees. Of these, the following are most closely connected to systems engineering:

- ISA50.6, System and Network Management;
- ISATAG65A, System Aspects;
- ISA67.16WG1, EMI/RFI Design Requirements;
- ISA67.16WG4, Digital System Design Guide;
- ISA98, Personnel Certification Standards Committee;
- ISA101, Human-Machine Interface; and
- ISA106, Procedural Automation for Continuous Process Operations.

Governance

The ISA is governed via a comprehensive structure of Boards, Committees, Divisions, Departments and Sections, illustrated in the figure below. The Society has a professional staff of over 50.

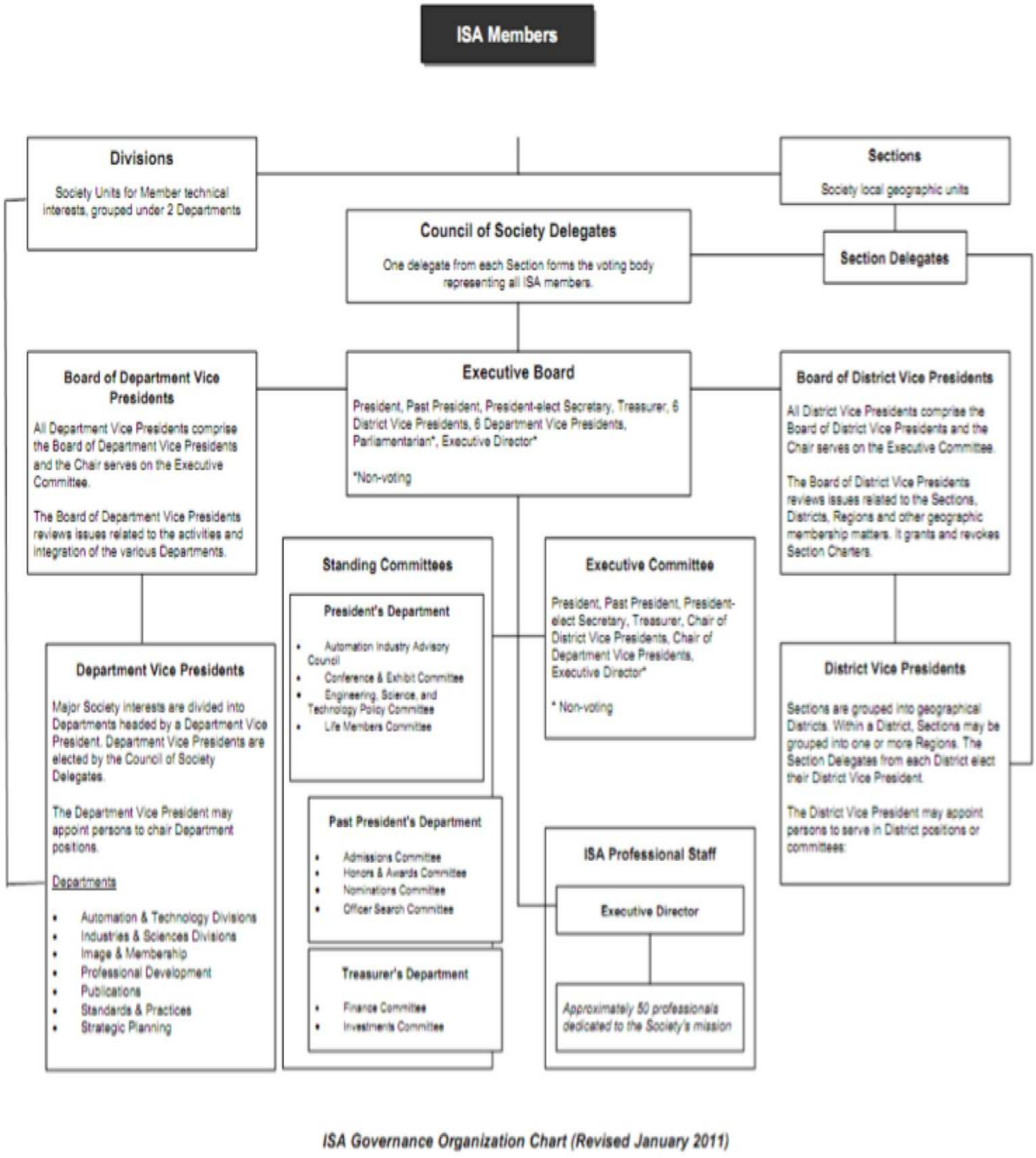


Figure 1: ISA Organization

More information

INCOSE Technical Operations

INCOSE Agile Systems and Systems Engineering Working Group

Purpose

The purpose of this working group is to identify and develop a body of knowledge that will inform systems engineering and related processes which require agile system capability. Agile systems of interest to this working group include both systems engineering processes and systems-engineered systems.

This working group views agility as a sustainable system capability, enabled and constrained fundamentally by system architecture. This architecture delivers agile capability as reconfiguration, augmentation, and evolution of system functionality, after deployment, enabling the system to respond to new and immediate situational requirements effectively. Effectiveness of response is measured in response time, response cost, response quality, and response scope sufficient to sustain the system's functional intent.

Need

The need to understand sustainably agile system design and project management concepts exists on multiple INCOSE-relevant fronts:

- Agile Systems-Engineering development processes have become of interest to the corporate advisory board (CAB) companies, and they are asking that INCOSE develop appropriate guidance.
- Defense organizations have an interest in how agile system concepts might inform agile acquisition processes.
- Quick Reaction Capability (QRC) has been a defense acquisition need for some time and would benefit from an agile response capability by suppliers, yet generally QRC is achieved today by the employment of costly and error-prone overtime work and the increased risk of relaxing formal systems engineering processes.
- Both commercial and governmental organizations are finding that the pace of technology and growing user expectations are reducing the effective life time of deployed systems.

Confusion exists in the relevance of agile software development processes to more general systems development processes, and in the relationship of lean concepts to agile concepts. This confusion needs clarifying perspective.

- A large body of experience and a variety of beneficial process approaches now exists in the area of Agile Software Development (ASD). In the growing interest for more general agile system project management processes these ASD processes appear to many to be a model for more general systems engineering development, but they are tailored to the specifics of the software development environment, and exist in a variety of different approaches more akin to brand-specific practice – such as Scrum and XP to name only two.
- In a very general interpretation, Lean values efficiency of operation and achieves this mainly through process principles; Agile values effective response ability and achieves this mainly through architectural principles. To be sure, both are concerned with operational effectiveness. Since the two have a different means for achieving different ends they are not necessarily in one-or-the-other conflict – but can be. When efficiency dominates the requirements, a lean Concept of Operations (ConOps) should dominate; taking additional value from Agile if and only if Lean requirements (as required by stakeholders) are not adversely compromised, and stakeholder requirements recognize some value from Agility. Vice versa, when an Agile ConOps is called for by stakeholder requirements, the design focus goes to architecture; streamlining process with Lean principles if and only if dominating Agile requirements are not adversely compromised. A useful set of requirements will make the nature of Lean vs. Agile design trade-off clear, when trade-off is unavoidable. In general, an Agile design should be as efficient as possible, and a Lean design should be as Agile as possible; but focus and values are found in the requirements.

More information

INCOSE Model-Based Concept Working Group

Purpose

The purpose of this working group is to advance the body of knowledge and practice of systems engineering (SE) through the development and application of model-based systems engineering (MBSE) methodologies to the exploratory research and concept stages of systems engineering.

Scope

Activities cover current and future model-based concept engineering theory, practice and education. The working group's focus is on the Exploratory Research and Concept Stages of the generic life-cycle defined by INCOSE. However, the working group will also consider how model-based concept engineering influences and is influenced by other life-cycle stages.

Model-based concept engineering definition

Model-based concept engineering (MBCE) is the application of MBSE to the exploratory research and concept stages of the generic life-cycle defined by INCOSE and more specifically to the following activities:

- Identify stakeholders' needs;
- Explore ideas and technologies;
- Refine stakeholders' needs;
- Explore feasible concepts; and
- Propose viable solutions.

More information

Systems Engineering Tools News

Rommana 12.2 Released

Rommana, an integrated lifecycle management methodology and tool, has been released in version 12.2. Rommana 12.2 consists of the following components: Requirement Management, Test Management, Project Management, Use Case Management, Issue Management, Release and Iteration Management, Document Management, Collaboration Management, and Change Management.

The tool maintains integration between these components to eliminate common causes of project failures.

More information

inteGREAT 8 Launched

inteGREAT 8 is a requirements lifecycle management platform that leverages the capabilities of Visual Studio Team Foundation Server 2012 as its application server. inteGREAT 8 delivers a set of functionality for requirements development that aims to ensure that requirements are developed right the first time.

More information

Innoslate

Innoslate™ is a cloud-based web application developed by SPEC Innovations. This is an application made specifically for systems engineers, and is stated to provide the first systems engineering tool on the cloud that supports the full lifecycle from requirements definition and management to operations and support.

Innoslate is said to take the next step in software as a service implementation of new and classic systems engineering principles and practices to address today's and future systems of system level problems.

SPEC Innovations states that Innoslate provides a secure, transparent, and automatically upgraded environment to reduce IT costs and enhance collaboration on small and large problems. Innoslate is the first tool to implement the new lifecycle modeling language (LML). This language was developed to simplify the elements, relationships, attributes and diagrams used in systems engineering and project management.

More information

Systems Engineering Books, Reports, Articles and Papers

Measuring Security in Requirements Engineering

by S. Besrour and I Ghani

Abstract. "The aim of this paper is to measure the security and related verification method in requirements engineering (RE). There are a few existing approaches to measure RE performance like IEEE Software Requirements Specification (SRS) and Security Quality Requirements Engineering (SQUARE). However, these existing approaches have some limitations such as lack of flexibility and require long implementation period. In order to address these issues, this paper intends to propose a new set of tools. First is the Effective Security Check List (ESCL), which is a check list with security questions that should be considered for measuring security. Secondly, the Traceability Matrix (TM), which is a two dimensional matrix to measure security during RE. Thirdly, Requirement Engineering Assessment Document (READ), which is a tool containing all statistical information about security performance during RE. The combination of presented approaches had been implemented in a case study. The outcome results are encouraging and illustrated integrated outcomes within existing RE model. The security level had also been properly measured."

More Information

Special Issue of the Journal of Visual Languages and Computing (JVLC)

Overview

Diagrams are an integral part of many visual languages, and include graphs, UML diagrams, Euler diagrams, and a whole range of others. For diagrams to be an effective and efficient means of communication, visualization often has to be produced, either automatically or by hand, from data sets that include little or no geometric information. The resulting layout has significant impact on the ability of users to accurately interpret the information contained in the diagrams. Sometimes multiple diagrams are required to solve problems and layout algorithms may need to take into account diagrams that have already been drawn.

Moreover, information visualization can be substantially influenced by aesthetic qualities, design decisions and the use of visual elements. In order to fully realize the benefits of diagrams for information communication, research on diagram representation and layout needs to be informed by

aesthetics, cognitive and perceptual principles.

The purpose of this special issue is to bring together original contributions on both diagram layout and diagram aesthetics into a single collection, which will be a highly useful resource for researchers working in this area.

The publishers will consider submissions that focus on any type of diagram and whose primary contribution is on layout and/or aesthetics.

Submissions

The publishers solicit papers consisting of original research contributions. Submitted papers that extend previously published conference papers should be submitted with a cover note to the editors explaining the contribution beyond the earlier version. It is expected that substantial new material be included in the submission to the special issue.

Submissions can be submitted using EasyChair: https://www.easychair.org/conferences/?conf=dial2014

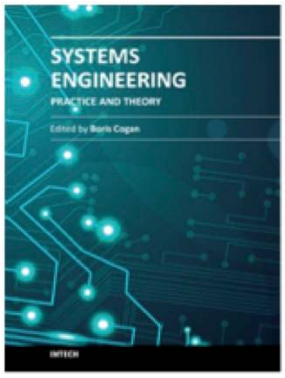
All papers will be subject to full peer review in line with standard JVLC practice.

Important Dates

Abstract submission: February 14, 2013.
Paper submission: February 28, 2013.
Publication date (tentative): August, 2014.

Systems Engineering - Practice and Theory

Edited by Boris Cogan



ISBN: 9789535103226
Format: Hardcover
Publication Date: 16 March 2012

Book Description (from InTech web site):
The book "Systems Engineering: Practice and Theory" is a collection of articles written by developers and researches from all around the globe. Mostly they present methodologies for separate Systems Engineering processes; others consider issues of adjacent knowledge areas and sub-areas that significantly contribute to systems development, operation, and maintenance. Case studies include aircraft, spacecraft, and space systems development, post-analysis of data collected during operation of large systems etc. Important issues related to "bottlenecks" of Systems Engineering, such as complexity, reliability, and safety of different kinds of systems, creation, operation and maintenance of services, system-human communication, and management tasks done during system projects are addressed in the collection. This book is for people who are interested in the modern state of the systems engineering knowledge area and for systems engineers involved in different activities of the area. Some articles may be a valuable source for university lecturers and students; most of the case studies can be directly used in Systems Engineering courses as illustrative materials.

More information

Reliability Engineering

by K. C. Kapur

ISBN: 978111814067
Format: Hardcover
Publication Date: June 2013

Book Description (from the Wiley web site):

This book presents an integrated approach for the design, engineering and management of the reliability activities throughout the life cycle of a product which includes concept, research and development, design, manufacturing, assembly, sales and service. The coverage explains how to integrate reliability methods and techniques in the Six Sigma Process and Design for Six Sigma. It also discusses relationships between warranty and reliability, as well as legal and liability issues. This is a useful guide to effectively distribute key reliability practices throughout an organization.

More information

Systems Engineering Cost Estimation with COSYSMO

by R. Valerdi

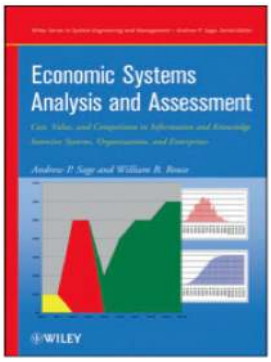
ISBN: 9780470195499
Format: Hardcover
Publication Date: September 2012

Book Description (from the Amazon web site):
This book introduces the only systems engineering parametric cost model available, an industry-calibrated model known as the Constructive Systems Engineering Cost Model (COSYSMO). Lack of such a model in the past has caused systems engineering costs to be bundled with other program management costs. Its use will allow for sufficiently quantifiable justification for properly assigning systems engineering costs.

More information

Economic Systems Analysis and Assessment: Intensive Systems, Organizations and Enterprises

by A. P. Sage and W. B. Rouse



ISBN: 9780470137956
Format: Hardcover
Publication Date: April 2011

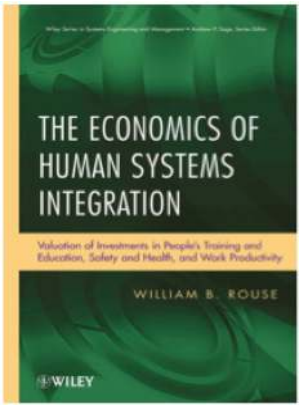
Book Description (from the Wiley web site):
This volume fills the need for a textbook on the fundamentals of economic systems analysis and assessment, illustrating their vital role in systems engineering and systems management. The book is comprised of five major parts: microeconomics, program management economics, cost estimation, strategic investments in an uncertain world and contemporary perspectives.

Also discussed in this book are normative or welfare economics and behavioral economics; COCOMO I and II and COSYSMO as examples of a cost model; and options-based valuation models and valuation of information technology intensive enterprises.

More information

The Economics of Human Systems Integration: Valuation of Investments in People's Training and Education, Safety and Health, and Work Productivity

by W. B. Rouse



ISBN: 9780470486764
Format: Hardcover
Publication Date: August 2010

Book Description (from the Wiley web site):
Human Systems Integration (HSI) is a new and fundamental integrating discipline designed to help move business and engineering cultures toward more human-centered systems. Integrating consideration of human abilities, limitations, and preferences into engineering systems yields important cost and performance benefits that otherwise would not have been accomplished. In order for this new discipline to be effective, however, a cultural change—starting with organizational leadership—is often necessary.

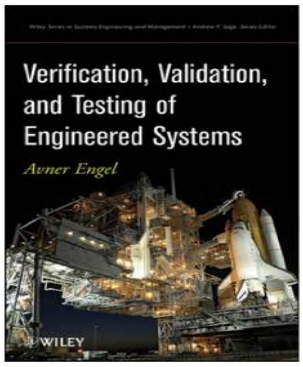
The book explains the difficulties underlying valuation of investments in people's training and education, safety and health, and work productivity. It provides an overview of how the field of economics addresses these difficulties, focusing on human issues associated with design, development, production, operations, maintenance, and sustainment of complex systems.

The set of thought leaders recruited as contributors to this volume collectively provides a compelling set of data and principles for assessing the economic value of investing in people, not just in general but in specific investment situations.

More information

Verification, Validation, and Testing of Engineered Systems

by A. Engel



ISBN: 9780470527511
Format: Hardcover
Publication Date: July 2010

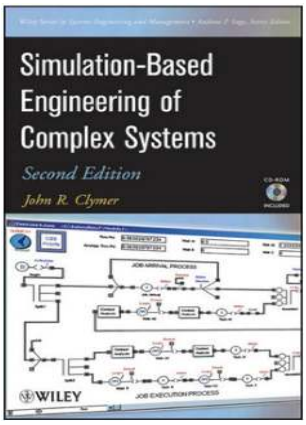
Book Description (from the Wiley web site):
Systems' Verification, Validation and Testing (VVT) are carried out throughout systems' lifetimes. Notably, quality-cost expended on performing VVT activities and correcting system defects consumes about half of the overall engineering cost.

This book provides a comprehensive compendium of VVT activities and corresponding VVT methods for implementation throughout the entire lifecycle of an engineered system. In addition, the book strives to alleviate the fundamental testing conundrum, namely: What should be tested? How should one test? When should one test? And, when should one stop testing? In other words, how should one select a VVT strategy and how can it be optimized?

More information

Simulation-Based Engineering of Complex Systems

by J. R. Clymer



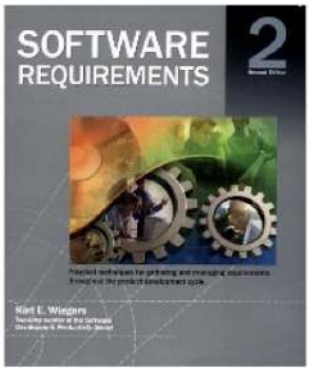
ISBN: 9780470401293
Format: Hardcover
Publication Date: April 2009

Book Description (from the Wiley web site):
This book covers the basic principles of complex systems through the use of hands-on experimentation using an icon-based simulation tool. Utilizing the accompanying software tool ExtendSim, which works with the OpEMCSS library, readers are invited to engage in simulation-based experiments that demonstrate the principles of complex systems with an emphasis on design, analysis, and evaluation. A number of real-world examples are included to demonstrate how to model complex systems across a range of engineering, business, societal, economic, and scientific disciplines.

More information

Software Requirements 2

by K. Wiegers



ISBN: 9780735618794
Format: Paperback
Publication Date: March 2003

Book Description (from the Amazon web site):
Without formal, verifiable software requirements—and an effective system for managing them—the programs that developers think they've agreed to build often will not be the same products their customers are expecting. In the second edition, requirements engineering authority Karl Wieger amplifies the best practices presented in his original award-winning text now a mainstay for anyone participating in the software development process.

This book presents effective techniques for managing the requirements engineering process all the way through the development cycle—including dozens of techniques to facilitate that all-important communication between users, developers, and management. This updated edition features new case examples, anecdotes culled from the author's extensive consulting career, and specific next steps for putting the book's process-improvement principles into practice.

More information

The Return on Investment from Better Requirements

by K. Wiegers

This article at blog.jamasoftware.com looks at return on investment from better requirements.

“Managers often ask what return on investment (ROI) they can expect from the money they spend on training, process improvement, and tools for requirements engineering. can’t give them a nice, tidy answer. As with so many questions in software, the correct answer is, “It depends.” In this article I discuss some of the factors that contribute to determining what ROI an organization can expect from better requirements.

If you want to determine the ROI from any activity, you need to track both what you invested in the activity and the benefits—reduced costs, accelerated schedules, increased sales, whatever—you enjoyed as a result. Unfortunately, few software organizations collect this sort of data. It’s not hard to track the money and time your organization spends developing improved requirements. Measuring the payback is trickier.

Following are some of the actions you might take to improve your requirements processes and hence the product requirements themselves. Track what you spend on these activities to determine your investment.”

More information

A Ten Point Guide for Streamlining Product Development with Systems Engineering

by J. Brown

Tech-Clarity research shows that manufacturers have grown the amount of software in their products, the importance of product software, and the level of innovation driven by software over the last five years. Products that combine mechanical, electrical, and software are compelling, but they add tremendous product development complexity leading to quality issues, poor productivity, and delayed time to market. Tech-Clarity offers the following ten tips to help companies overcome these challenges by streamlining product development using systems engineering best practices:

- Start with requirements;
- Take time for conceptual design;
- Optimize the architecture;
- Reuse at all levels of design;
- Simulate the system;
- Manage change;
- True transparency;
- Track and trace it all;
- Validate and verify with the V; and
- Manage configurations continuously.

More information

Conferences and Meetings

Human Factors and Ergonomics Society HFES 2012 Annual Meeting
October 22 - 26, 2012, Boston, MA, USA
More information

The World Congress on Engineering and Computer Science 2012
October 24 - 26, 2012, San Francisco, USA
More information

The 14th IEEE International Symposium on High Assurance Systems Engineering (HASE 2012)
October 25 - 27, 2012, Omaha, NE, USA
More information

8º Congresso Brasileiro de Sistemas
October 25 - 26, 2012, campus da PUC Minas em Poços de Caldas, MG, Brasil
More information

The 19th International Conference on Industrial Engineering and Engineering Management
October 27 - 29, 2012, ChangSha, China

More information

Building Business Capabilities (BBC) 2012
October 28 - November 2, 2012, Fort Lauderdale, FL, USA
More information

International Conference on Complex Systems (ICCS'12)
November 5 - 6, 2012, Agadir, Morocco
More information

Physics-Based Modeling In Design & Development for U.S. Defense Conference
November 5 - 8, 2012, Denver, CO, USA
More information

12th Annual CMMI Technology Conference and User Group
November 5 – 8, 2012, Denver, USA
More information

INCOSE UK Annual Systems Engineering Conference 2012
November 7 - 8, 2012, London, UK
More information

Systems Engineering Day 2012 (TdSE 2012)
November 7 - 9, 2012, Paderborn, Heinz Nixdorf Museums Forum, Germany.
More information

14th International Conference on Formal Engineering Methods (ICFEM 2012)
November 12 - 16, 2012, Kyoto Research Park, Kyoto, Japan
More information

IBM Systems and Software Engineering Symposium NEW
November 13, 2012, Dearborn, MI, USA
More information

Complex Adaptive Systems Conference
November 14 – 16, 2012, Washington D.C., Dulles, USA
More information

24th IFIP Int. Conference on Testing Software and Systems NEW
November 19 - 21, 2012, Aalborg, Denmark
More information

PapersModel Based Systems Engineering 2012 Symposium
November 27 – 28, 2012, Edinburgh, South Australia

International Joint Conferences on Computer, Information, and Systems Sciences, and Engineering (CISSE 12) NEW
December 7 - 9, 2012, Bridgeport, CT, USA
More information

3rd International Conference on Complex Systems Design & Management (CSD&M 2012)
December 12 - 14, 2012, Cité Internationale Universitaire, Paris (France)
More information

Operations Research Society of New Zealand (ORSNZ) Conference Includes a Systems stream: 'Systems Thinking, Systems Modelling and Systems Practice'
December, 10 - 11, 2012, Wellington, New Zealand
More information

MESM'2012 The 13th annual International Middle Eastern Simulation and Modelling Conference
December 10 - 12, 2012, Muscat, Oman
More information

IEEE 2012 International Conference on Industrial Engineering and Engineering Management
December 10 - 13, 2012, Hong Kong
More information

System-of-Systems Workshop: An NIE Experience NEW
January 22 - 25, 2013, El Paso, TX, USA
More information

Seventh International Workshop on Variability Modelling of Software-Intensive Systems (VaMoS) NEW
January 23 - 25, 2013, Pisa, Italy
More information

INCOSE International Workshop IW2013
January 26 - 29, 2013, Jacksonville, Florida USA

More information

Conference Digital Enterprise Design & Management (DED&M 2013)
February 11 - 12, 2013, Paris, France
More information

International Conference on Model-Driven Engineering and Software Development - MODELSWARD 2013 NEW
February 19 - 21, 2013, Barcelona, Spain
More information

29th Annual Test and Evaluation Conference and Displays NEW
February 25 - 28, 2013, Charlotte, NC, USA
More information

International Symposium on Engineering Secure Software and Systems (ESSoS)
February 27 – March 3, 2013, Paris, France
More information

Integrated-EA Conference
March 4 - 6 2013, London, United Kingdom
More information

INCOSE IL 2013
March 5 – 6, 2013, Daniel Hotel Herzlia
More information

ASTEC 2013, Asian Simulation Technology Conference
March 7 - 9, 2013, Shanghai, China
More information

2013 INCOSE LA Mini-Conference
March 16, 2013, Los Angeles, CA, USA
More Information

The Requirements Engineering Track - 6th Edition at The 28th Annual ACM Symposium on Applied Computing (SAC 2013)
March 18 - 22, 2013, Coimbra, Portugal
More information

11th Annual Conference on Systems Engineering Research (CSER 2013)
March 19 – 22, 2013, Atlanta, Georgia, USA
More information

EMO 2013 - the 7th International Conference on Evolutionary Multi-Criterion Optimization
March 19 - 22, 2013, Sheffield, UK
More information

Spring Simulation Multi-Conference (SpringSim'13)
April 7 - 10, 2013, San Diego, CA, USA
More information

3rd International Workshop on Model-driven Approaches for Simulation Engineering
part of the Symposium on Theory of Modeling and Simulation (SCS SpringSim 2013)
April 7 - 10, 2013, San Diego, CA, USA
Call for Papers closes November 1, 2012
More information

YoungOR 18new
April 9 – 11, 2013, University of Exeter, Exeter, Unoted Kingdom
More information

International Conference on Manufacturing Systems Engineering (ICMSE 2013)
April 14 - 15, 2013, Venice, Italy
More information

ECEC'2013, 20th European Concurrent Engineering Conference
April 15 - 17, 2013, Lincoln, United Kingdom
More information

SysCon 2013
April 15 - 18, 2013, Orlando, FL, USA
More information

SETE 2013
April 29 – May 1, 2013, Canberra, ACT, Australia
More information

Test Instrumentation Workshop: T&E on a Sustainment Budget NEW
May 14 - 17, 2013, Las Vegas, NV, USA
More information

ISC'2013, 11th Annual Industrial Simulation Conference
May 22 - 24, 2013, Ghent, Belgium

KIM2013 Knowledge and Information Management Conference
June 4 - 5, 2013, Meriden, United Kingdom
More information

13th International Conference on Process Improvement and Capability dEtermination (SPICE)
June 4 – 6, 2013, University of Bremen, Germany
More information

10th International Conference on integrated Formal Methods (iFM 2013) NEW
June 10 - 14, 2013, Turku, Finland
More information

26th International Congress of Condition Monitoring and Diagnostic Engineering Management (COMADEM 2013) NEW
June 11 - 13, 2013, Helsinki, Finland
More information

81st MORS (Military Operations Research Society) Symposium
June 17 - 20, 2013, United States Military Academy in West Point, NY, USA
More information

The Tenth International Conference on Condition Monitoring (CM 2013) NEW
June 18 – 20, 2013, Krakow, Poland
More information

Swiss Requirements Day 2013
June 19, 2013, Zürich, Switzerland

ASEE 120th Annual Conference & Exposition
June 23 - 26, 2013, Atlanta, Georgia, USA
More information

12th International Symposium of the Analytic Hierarchy Process/Analytic Network Process (ISAHP 2013)
June 23 – 26, 2013, Kuala Lumpur, Malaysia
More information

IS 2013 – Philadelphia
June 24 – 27, 2013, Philadelphia, Pennyslvania USA
More information

ISSS 2013: The 57th World Conference of the International Society for the Systems Sciences
July 14 – 19, 2013, Hai Phong City, Viet Nam
More information

15th International Conference on Human-Computer Interaction 2013 (HCI International 2013)
July 21 – 26, 2013, Las Vegas, Nevada, USA
Incorporating:
10th International Conference on Engineering Psychology and Cognitive Ergonomics
7th International Conference on Universal Access in Human-Computer Interaction
5th International Conference on Virtual, Augmented and Mixed Reality
5th International Conference on Cross-Cultural Design
5th International Conference on Online Communities and Social Computing
7th International Conference on Augmented Cognition
4th International Conference on Digital Human Modeling and applications in Health, Safety, Ergonomics and Risk Management
2nd International Conference on Design, User Experience and Usability
1st International Conference on Distributed, Ambient and Pervasive Interactions
1st International Conference on Human Aspects of Information Security, Privacy and Trust
More information

The Sixteenth SDL FORUM - SDL2013
Date and location to be determined, 2013
More information

ASME 2013 International Design Engineering Technical Conference and Computers and Information in Engineering Conference (IDETC/CIE2013)
August 4 - 7, 2013, location TBA, USA
More information

OR55 Annual Conference of the OR Society
September 3 - 5, 2013, Exeter University, Exeter, United Kingdom
More information

International Conference on Operations Research
September 3 - 6, 2013, Rotterdam, The Netherlands
More information

APCOSE 2013
September 9 - 11, 2013, Keio University in Japan
More information

SIMEX'2013
September 10 - 13, 2013, Brussels, Belgium
More information

30th Annual International Test and Evaluation Symposium NEW
September 16 - 20, 2013, Denver, CO, USA
More information

27th European Simulation and Modelling Conference - ESM'2013
October 2013, Lancaster, UK
More information

ASTEC 2014
March 2014, Digipen Institute of Technology, Singapore

ISC'2014
June 11 - 13, 2014, Skövde, Sweden
More information

19th World Congress of the International Federation of Automatic Control (IFAC 2014)
August 24 - 29, 2014, Cape Town, South Africa
More information

SIMEX'2014
September 2014, Brussels, Belgium

INCOSE Europe, Middle East & Africa (EMEA) Sector: 1st EMEA Systems Engineering Conference 2014 (formerly EuSEC)
October 2014, Cape Town, South Africa

ASTEC'2015, Asian Simulation Technology Conference
March 2015, Japan

ISC'2015 13th Annual Industrial Simulation Conference
June 2015, St.Petersburg, Russia

SIMEX'2015
September 2015, Brussels, Belgium

ISC'2016 14th Annual Industrial Simulation Conference NEW
June 2016, Bucharest, Romania

Education and Academia

The Institute for Systems Research, University of Maryland, USA

The University of Maryland, USA Institute for Systems Research (ISR) is home to cross-disciplinary research and education programs in systems engineering and sciences. It is committed to developing basic solution methodologies and tools for systems problems in a variety of application domains.

ISR is a permanent, interdisciplinary research unit within the A. James Clark School of Engineering at the University of Maryland. ISR is home to about 100 faculty and other researchers. Its basic research has resulted in new algorithms and sophisticated models for decision making and control (the sense-decide-actuate lifecycle), communications, and computing needed to model and design engineering systems that are highly automated, autonomous and distributed. New approaches to the planning and multi-objective optimization-based design of engineering systems also have been developed.

Because large-scale science requires systems engineering and, conversely, systems engineering and implementation of modern real-world systems doesn't occur without good systems science, ISR develops both basic solution methodologies and tools for systems problems in a variety of different areas. ISR's current main research areas are:

- Communication systems and networks;
- Control systems and methodologies;
- Neuroscience and biology-based technology;

- Micro and nano devices and systems;
- Robotics;
- Design, operations and supply chain management;
- Systems engineering methodologies; and
- Computing, speech, artificial intelligence and data mining.

More information

SDM Pulse: Newsletter of the MIT System Design and Management Program

The USA Massachusetts Institute of Technology (MIT) Master's program in engineering design & management publishes a quarterly newsletter, Pulse, downloadable from http://sdm.mit.edu/pulse.

Jointly offered by MIT's School of Engineering and the MIT Sloan School of Management, the System Design and Management (SDM) master's program in engineering and management educates mid-career professionals to lead effectively and creatively by using systems thinking to solve large-scale, complex challenges in product design, development, and innovation. SDM aims to provide a global mindset; a systems thinking perspective that integrates management, technology, and social sciences; and ways to lead across organizational and cultural boundaries to address rapidly accelerating complexity and change in today's global markets.

The curriculum of MIT's System Design and Management Program encompasses leadership development and critical, creative, and integrative thinking as well as an appreciation of diversity and an understanding of how to foster positive change within organizations, society at large, and — most importantly — within oneself.

More information

MIT Engineering Systems Division (ESD)

The USA Massachusetts Institute of Technology Engineering Systems Division (ESD) aims to solve complex engineering systems problems by integrating approaches based on engineering, management, and social sciences—using new framing and modeling methodologies. ESD seeks to facilitate the beneficial application of engineering systems principles and properties by expanding the set of problems addressed by engineers, and to position its graduates as leaders in tackling society's challenges. ESD initiates research focused on science and technology issues of national and international importance. As a vital part of engineering systems education, ESD partners with industry and governments.

Related research initiatives, programs and centers include:

- Lean Advancement Initiative;
- Program on Emerging Technologies (PoET);
- Systems Engineering Advancement Research Initiative;
- Center for Latin-American Logistics Innovation (Colombia);
- MIT Portugal Program;
- MIT-Zaragoza International Logistics Program (Spain);
- AgeLab;
- Center for Biomedical Innovation (CBI);
- Center for Engineering Systems Fundamentals;
- MIT Center for Transportation & Logistics;
- Complex Systems Research Laboratory;
- Humans and Automation Lab (HAL); and
- MIT Sociotechnical Systems Research Center (SSRC).

More information

Johns Hopkins University Applied Physics Laboratory Alexander Kossiakoff Scholarship

INCOSE Foundation and the USA Johns Hopkins University Applied Physics Laboratory seek applicants for their 2012 Scholarship Award and Paid Internship. The Johns Hopkins University/Applied Physics Laboratory Alexander Kossiakoff Scholarship, in partnership with the INCOSE Foundation, carries an award of $5,000, a plaque and recognition at the annual INCOSE International Workshop. The awardee is also offered an optional paid summer internship at JHU/APL working on relevant systems engineering problems. The award was initiated in 2009 and was presented to an individual at the USA Naval Air Systems Command within the USA Department of the Defense, Missouri University of Science and Technology (2010),

and George Mason University (2012), among others.

Questions can be submitted to Dr. William Ewald, Chief Executive Officer of the INCOSE Foundation, at: wewald (at) jhu.com

The complete application package must be received by 30 November 2012. Electronic applications should be submitted to Ms. Holly Witte, INCOSE Foundation Managing Director at holly.witte (at) incose.org.

More information

Stevens Institute of Technology, USA - Director of Systems Engineering Position

The Director of Systems Programs is a significant leadership role within the School of Systems and Enterprises. It involves the responsibility for leading one of the largest and most impactful systems engineering graduate programs in the world. In this regard, this faculty position involves:

- Ensuring an integrated vision and strategy for the academic programs and offerings in systems, software and security engineering within the School of Systems and Enterprises;
- Working with the Faculty, Associate Dean for Research, and Operations Director to achieve success in meeting the School's educational and research objectives;
- Creating and nurturing impactful and strategic partnerships with sponsors, senior leaders, and peers in industry, government, and academia;
- Collaborating with key leaders from other schools within Stevens to develop and expand the collaborative research and educational initiatives across the Institute; and,
- Ensuring sound financial management of the School's programs and continuous improvement and growth in all aspects of the school's mission.

More information

ENSTA, ParisTech – Associate Professor

The Department of Computer Science and System Engineering of ENSTA ParisTech is seeking candidates for one faculty position (Associate Professor) in Computer Science.

The research activity of the applicant should be in adequacy with the research themes developed in the team Safety and Dependability of Systems, headed by Michel Mauny.

The research activity is focused on the formal verification of embedded systems, taking into account heterogeneity of their components like the study of software/hardware interactions or software/physical environment interactions. The applicants must have a PhD degree in Computer Science and they must have some knowledge of but not limited ito abstract interpretation, model checking, test generation, type systems, system modeling.

More details are given in the document at:
http://www.ensta-paristech.fr/~chapoutot/profil_surete_en_2012.pdf

The application form can be downloaded at:
http://uei.ensta-paristech.fr/assets/divers/form_candid.rtf

United States Naval Academy – Tenure-Track Assistant Professor – Systems Engineering

The Naval Academy's Weapons and Systems Engineering Department (http://www.usna.edu/WSE/) invites applications for a tenure-track faculty position.

The Systems Engineering major seeks candidates that can contribute to a broad field of study, including dynamics and control, mechatronics, robotics and embedded computers. The successful candidate is expected to teach and, eventually, develop course material in one or more of these areas, to advise student projects and to maintain a research program and a technical publication record. Additional technical expertise and/or previous technical research in areas of bioengineering, human machine interface, engineering management and military technology is highly desirable.

Applications in the form of cover letters and CVs, including professional experience relevant to the position, should be submitted by 1 January, 2013 and sent to Rich A. O'Brien (riobrien (at) usna.edu)

More information

Some Systems Engineering-Relevant Websites

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http://www.jamasoftware.com/resources/karl-wiegers.php

Jama Software is partnering with Karl Wiegers to develop a series of articles and whitepapers that explore effective requirements management strategies. The page contains downloadable requirements management Whitepapers by Karl Wiegers, including:

- The Business Value of Requirements Management;
- Getting the Most from a Requirements Management Tool;
- Writing High Quality Requirements; and
- Ambiguous Terms to Avoid.

http://www.youtube.com/watch?v=jOrE66l9fyw&feature=relmfu

The video at this URL, based on ideas of Donella Meadows (Thinking in Systems: A Primer | 2008, Chelsea Green Publishing), describes different types of interventions that are possible in a system, and their potential leverage.

http://ocw.mit.edu/courses/engineering-systems-division/

This webpage lists MIT Engineering Systems Division courses available online for free.

http://www.jhuapl.edu/ott/Technologies/Copyright/SysML.asp#

This page from the John Hopkins University, Applied Physics Laboratory, provides downloadable material for courses and tutorials in Model-Based Systems Engineering using Object Management Group Systems Modeling Language (OMG SysML™) and Object-Oriented Systems Engineering Method (OOSEM)

http://www.itu.int/en/Pages/default.aspx

This is the home page of the International Telecommunication Union (Union internationale des télécommunications, in French), previously the International Telegraph Union. The ITU is a specialized agency of the United Nations which is responsible for information and communication technologies. ITU coordinates the shared global use of the radio spectrum, promotes international cooperation in assigning satellite orbits, works to improve telecommunication infrastructure in the developing world and establishes worldwide standards. This last area is quite relevant to systems engineering, with significant collaboration between the ITU and ISO/IEC JTC1 SC7 on systems and software engineering taking place. The ITU also collaborates with the Object Management Group, the home of UML and SysML.

http://www.itu.int/ITU-T/studygroups/

ITU standardization work is carried out by the technical Study Groups (SGs) in which representatives of the ITU-T membership develop Recommendations (standards) for the various fields of international telecommunications.

The SGs drive their work primarily in the form of study Questions. Each of these addresses technical studies in a particular area of telecommunication standardization. Each SG has a SG Chairman and a number of vice-chairmen appointed by the World Telecommunication Standardization Assembly (WTSA).

This webpage lists the ITU SGs and the area(s) of study of each, with links to questions under study.

Standards and Guides

International Electrotechnical Commission (IEC) 61508: Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems

International Electrotechnical Commission (IEC) 61508 defines appropriate means for achieving functional safety in the systems it covers. The standard is presently in Edition 2.0. IEC 61508 applies to safety-related systems when one or more of such systems incorporate electrical and/or electronic and/or programmable electronic (E/E/PE) devices. It covers possible hazards caused by failure of the safety functions to be performed by the E/E/PE safety-related systems, as distinct from hazards arising from the E/E/PE equipment itself (for example, electric shock). The standard is generically based and is applicable to all E/E/PE safety-related systems irrespective of the application.

More information

ISO 26262: Road Vehicles - Functional Safety

ISO 26262 is a functional safety standard, titled "Road Vehicles -- Functional Safety". The first edition was published on 11 November 2011 and is intended to be applied to electrical and/or electronic systems installed in "series production passenger cars" with a maximum gross weight of 3500 kg. The standard aims to address possible hazards caused by the malfunctioning behaviour of electronic and electrical systems. Like its parent standard IEC 61508, ISO 26262 is risk based safety standard.

More information

CENELEC EN 50126:1999 Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS)

CENELEC is the European Committee for Electrotechnical Standardization and is responsible for standardization in the electrotechnical engineering field. CENELEC EN 50126:1999 Railway Applications - The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) -- Part 1: Basic requirements and generic process was published in 1999. Part 2 is a guide.

A number of documents can be considered as "key" documents in a safety management system based on EN 50126 are:

- The system definition defines the system on block diagram level.
- The safety plan describes "who does what and when".
- The hazard log contains all known hazards and their history.
- The risk analysis document contains the risk analysis performed for each hazard.
- The safety requirements document contains the safety requirements of the system.
- The safety case document proves the system is safe.

The EN 50126 family of standards is being redeveloped, per the figure below.

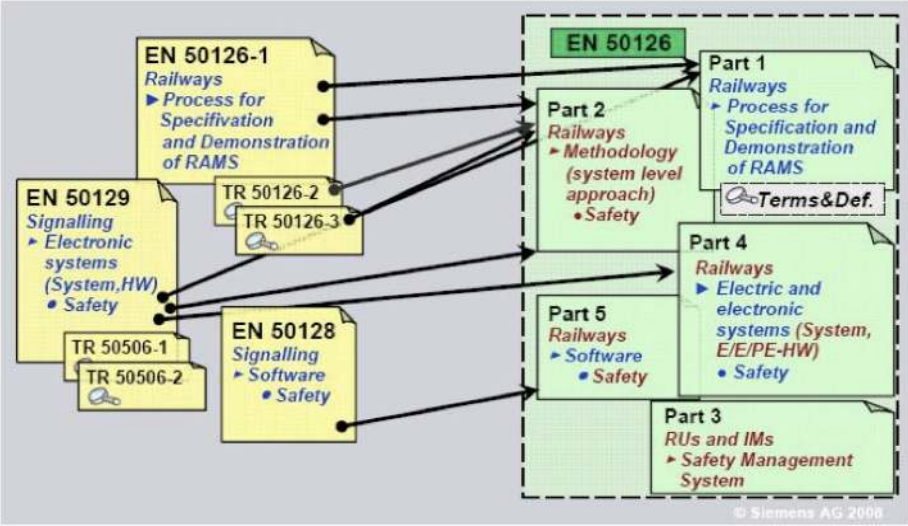

Figure 1: CENELEC EN5012X-Suite

More information

CENELEC EN 50128:2011 Railway Applications: Communication, Signaling and Processing Systems - Software for Railway Control and Protection Systems

This European Standard, published in June 2011, specifies the process and technical requirements for the development of software for programmable electronic systems for use in railway control and protection applications. It is aimed at use in any area where there are safety implications. These systems can be implemented using dedicated microprocessors, programmable logic controllers, multiprocessor distributed systems, larger scale central processor systems or other architectures.

This European Standard is applicable exclusively to software and the interaction between software and the system of which it is part.

More information

CENELEC EN 50129:2003 Railway Applications: Communication, Signaling and Processing Systems - Safety Related Electronic Systems for Signaling

This standard published on 1 February 2003 and incorporating corrigendum in May 2010, applies to the specification, design, construction, installation, acceptance, operation, maintenance and modification/extension phases of complete signaling systems. It also applies to individual sub-systems and equipment within the complete system.

More information

Defence Standard 00-56 Safety Management Requirements for Defence Systems

Defense standard (DEF STAN) 00-56 Safety Management Requirements for Defence Systems captures the requirements and guidance of the United Kingdom Ministry of Defence regarding the procurement, analysis, development and operation of safety-critical systems. The standard is presently at Issue 4, released in June 2007.

More information

Status of Some ITU Study Group 17 Standards (OSI-Related)

The status of Recommendations of Study Group 17 (SG17) of the Telecommunication Standardization Bureau (TSB) of the International Telecommunication Union (ITU) is as stated below. SG 17 is the Lead study group on languages and description techniques. An example is the formal language Abstract Syntax Notation One (ASN.1), an important component for protocol specification or systems design. ASN.1 is an important part of today's networks. ASN.1 is used, for example, in the signaling system (SS7) for most telephone calls, package tracking, credit card verification and digital certificates, and in many of the most used software programs. Today's work is progressing towards the development of unified modeling language profiles (UML) for ITU-T languages.

This work of SG17 in relation to Open Systems Interconnection (OSI) is to be carried out in collaboration with the ISO/IEC JTC 1.

The following shows some of the approved list of recommendations unless otherwise stated (recommendation number and title):

- E.115 (2010) Cor.1, Corrigendum 1 to ITU-T E.115 (2010);
- X.500, Information technology - Open Systems Interconnection - The Directory: Overview of concepts, models and services;
- X.501, Information technology - Open Systems Interconnection - The Directory: Models;
- X.501 (2008) Cor.3, Information technology - Open Systems Interconnection -The Directory - Models - Technical Corrigendum 3;
- X.509, Information technology - Open Systems Interconnection - The Directory: Public-key and attribute certificate frameworks;
- X.509 (2008) Cor.3, Information technology - Open Systems Interconnection - The Directory - Public-key and attribute certificate frameworks - Technical Corrigendum 3;
- X.511, Information technology - Open Systems Interconnection - The Directory: Abstract service definition;
- X.511 (2008) Cor.3, Information technology - Open Systems Interconnection - The Directory - Abstract service definition- Technical Corrigendum 3;
- X.518, Information technology - Open Systems Interconnection - The Directory: Procedures for distributed operations;
- X.518 (2008) Cor.2, Information technology - Open Systems Interconnection - The Directory - Procedures for distributed operations- Technical Corrigendum 2;
- X.519, Information technology - Open Systems Interconnection - The Directory: Protocols;
- X.520, Information technology - Open Systems Interconnection - The Directory - Selected attribute types;
- X.520 (2008) Cor.3, Information technology - Open Systems Interconnection -The Directory - Selected attribute types- Technical Corrigendum 3;
- X.521, Information technology - Open Systems Interconnection - The Directory: Selected object classes;
- X.525, Information technology - Open Systems Interconnection - The Directory: Replication;
- X.667; Information technology - Procedures for the operation of Object Identifier Registration Authorities: Generation of Universally Unique identifier (UUIDS) and their use in object identifiers, Not approved - Last Call Judgment;
- X.1164, Use of service providers' user authentication infrastructure to implement public key infrastructure for peer-to-peer networks;
- X.1196, Framework for the downloadable service and content protection system in the mobile Internet Protocol Television (IPTV) environment;
- X.1313, Security requirements for wireless sensor network routing;
- Z.104 (2011) Amd.1, Data and action language in SDL-2010 Annex C - Language binding;
- Z.109 (2012) Amd.1, Unified modeling language (UML) profile for SDL-2010: Amendment 1: Appendix 1 - Concrete syntax, Not approved – Status C; and
- Z.151, User Requirements Notation (URN) – Language definition.

More information

SDL-News: Progress on Z.109 (2012) Amd.1

Specification and Description Language (SDL) is a specification language targeted at the unambiguous specification and description of the behavior of reactive and distributed systems. It is defined by the ITU-T (Recommendations Z.100 to Z.106). Originally focused on telecommunication systems, its

current areas of application include process control and real-time applications in general. SDL-2000 has had maintenance updates since 1999 and is accompanied by a UML-Profile: ITU-T Recommendation Z.109 (06/07), SDL-2000 combined with UML.

In relation to Question 13/17 – Formal languages and telecommunication software, at the last ITU-T SG17 meeting consent was given for Example Syntax text for Z.109 Amd. 1 to be submitted. The text should be ready to submit to the Alternative Approval Process (AAP), an ITU-T fast-track approval procedure for technical standards, by the end of October 2012.

More information

Definition to Close On

Functional Safety

According to the International Electrotechnical Commission:

Safety is freedom from unacceptable risk of physical injury or of damage to the health of people, either directly or indirectly as a result of damage to property or to the environment.

Functional safety is the part of the overall safety that depends on a system or equipment operating correctly in response to its inputs.

Functional safety is the detection of a potentially dangerous condition resulting in the activation of a protective or corrective device or mechanism to prevent hazardous events arising or providing mitigation to reduce the fight consequence of the hazardous event.

Examples:

Functional safety relies on active systems. The following are two examples of functional safety:

- The detection of smoke by sensors and the ensuing intelligent activation of a fire suppression system; or,
- The activation of a level switch in a tank containing a flammable liquid, when a potentially dangerous level has been reached, which causes a valve to be closed to prevent further liquid entering the tank and thereby preventing the liquid in the tank from overflowing.

Safety achieved by measures that rely on passive systems is not functional safety:

- A fire resistant door or insulation to withstand high temperatures are measures that are passive in nature and can protect against the same hazards as are controlled by functional safety concepts but are not instances of functional safety.

Source: http://www.iec.ch/functionalsafety/explained/

PPI News (see www.ppi-int.com)

PPI Exhibiting at Land Warfare Conference 2012, Melbourne

PPI is proudly exhibiting at the Land Warfare Conference 2012 over 29 October - 2 November 2012 in Melbourne, Australia. To our friends attending, feel free to stop by and visit out booth!

PPI at NZDIA

PPI recently exhibited at the New Zealand Defence Industry Association Forum 2012 (NZDIA) in Wellington, New Zealand. The conference typically attracted local delegates but some came from as far as United Kingdom and Scandinavia. The event showcased the latest developments and opportunities within the New Zealand Defence Forces in one of the world's most inviting small cities.

PPI at NDIA 2012

PPI exhibited last week at the NDIA Systems Engineering Conference in sunny San Diego, California. The well supported event included tracks in Affordability, Agile Systems Engineering, Architecture, Early Systems Engineering, Education and Training, Engineering Management, Enterprise Health Management, Engineering Resilient Systems, ESOH, Human Systems Integration, Modelling and Simulation/Architecture, Net-Centric Operations, Program Management, Software, Statistical Test Optimization, System Security Engineering, Systems Engineering Effectiveness, System of Systems, Technology Maturity as well as Test and Evaluation. This conference will be hosted next year in Arlington, VA on Americas East Coast.

PPI's Expedition to South America April 2013

PPI has confirmed it's participation with the Australian Government trade mission to Chile, Colombia and Brazil in April 2013. The trade mission coincides with the LAAD 2013 event to take place in Rio de Janeiro. For more information about PPI's involvement with Team Australia or the trade mission please contact jfreeman (at) ppi-int.com.

PPI Events (see www.ppi-int.com)

Systems Engineering Public 5-Day Courses

Upcoming Locations Include:

- Amsterdam, The Netherlands
- Adelaide, Australia
- Brisbane, Australia
- Rio de Janeiro, Brazil
- Munich, Germany

Requirements Analysis and Specification Writing Public Courses

Upcoming Locations Include:

- Melbourne, Australia
- Stellenbosch, South Africa
- Las Vegas, USA
- Amsterdam, The Netherlands

Software Developmet Principles and Practices Public 5-Day Courses

Upcoming Locations Include:

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

OCD/CONOPS Public Courses

Upcoming Locations Include:

- Brasilia, Brazil
- Pretoria, South Africa
- Las Vegas, USA

Cognitive Systems Engineering Courses

Upcoming Locations Include:

- Adelaide, Australia
- Las Vegas, USA

CSEP Preparation Course (Presented by PPI subsidiary Certification Training International)

Upcoming Locations Include:

- Las Vegas, USA
- Austin, USA
- Munich, Germany

PPI Upcoming Participation in Professional Conferences

PPI will be participating in the following upcoming events. We look forward to chatting with you there.

- Land Warfare Conference 2012 | Exhibiting | Melbourne, Australia (22 - 26 October, 2012)
- MilCIS 2012 Conference | Participating | Canberra, Australia (6 - 8 November, 2012)
- 19th Asia Pacific Software Engineering Conference (APSEC) | Participating | Hong Kong (4 - 7 December, 2012)
- CSD&M 2012 Conference | Participating | Paris, France (12 - 14 December, 2012)
- IDEX 2013 | Exhibiting | United Arab Emirates (17 - 21 February, 2013)
- Latin American Defence & Security International Exhibition (LAAD) | Exhibiting | Rio de Janerio, Brazil (9 - 12 April, 2013)

Kind regards from the SyEN team:
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