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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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A Quotation to Open On

"The role of a trainer or consultant is to empower the customer, not to make himself indispensable." - Bertrand Meyer

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Feature Article

IceCube as a Systems Engineering Case Study

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Abstract. The South Pole is now home to IceCube, the world's largest neutrino particle telescope. IceCube is a true "Discovery Class" research instrument, with potential to fundamentally alter our understanding of the physical universe. The author had the privilege of participating on the project as the Systems Engineering Manager, and was responsible for tailoring the SE process to serve the unique needs of this ambitious academically-driven development effort. This paper shares key observations and lessons that are hopefully valuable to others in the SE community.

About IceCube

The IceCube project website contains a wealth of information about the instrument, collaboration membership, and science objectives. The following description is provided from that website [1]:

"IceCube is a particle detector at the South Pole that records the interactions of a nearly mass-less sub-atomic particle called the neutrino. IceCube searches for neutrinos from the most violent astrophysical sources: events like exploding stars, gamma ray bursts, and cataclysmic phenomena involving black holes and neutron stars. The IceCube telescope is a powerful tool to search for dark matter, and could reveal the new physical processes associated with the enigmatic origin of the highest energy

particles in nature. IceCube is the world's largest neutrino detector, encompassing a cubic kilometer of ice.

It may seem strange to use the ice, but there are several reasons why it is an excellent location. First, the ice is very clear. IceCube is buried very deep in the ice, about 2000 meters or 1.5 miles. At that depth, pressure has pushed all the bubbles out, which means it is easy for the Digital Optical Modules (DOMs) to record neutrino interactions.

Second, it is very dark in the ice. This is important because when a neutrino interacts with an atom of ice, a particle called a muon is produced. The muon radiates blue light that is detected by the DOMs. The direction and intensity of the light allows us to determine where the neutrino was coming from in the Universe.

Finally, the last great thing about the ice at the South Pole is that there is a lot of it! The IceCube neutrino detector is enormous. It uses a cubic kilometer of ice and is the largest neutrino detector in the world.

The total cost of IceCube is $271 million USD. The National Science Foundation provided around $242 million for construction, and the rest was provided by our funding partners in Germany, Sweden, and Belgium.

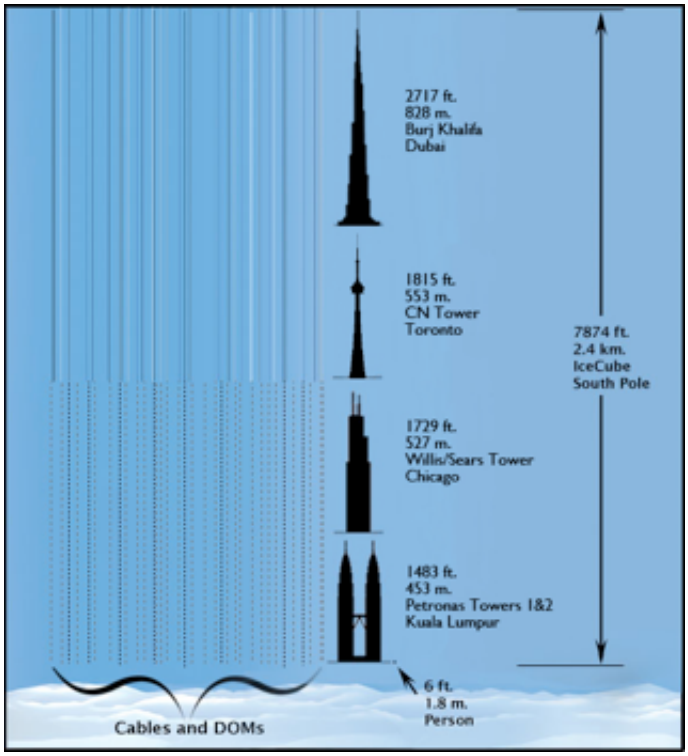

Figure 1 – IceCube in Scale [1]

Figure 1, IceCube in Scale, provides a sense of the enormity of the deep-ice portion of the instrument. In addition to over five thousand DOMs located in the ice, the project also includes a surface detector array called “IceTop”; an instrument control and data acquisition computing facility at the South Pole; data analysis resources in the Northern Hemisphere; and a variety of special test and transportation equipment.

This material is based upon work supported by the National Science Foundation under Grant Nos. OPP-9980474 (AMANDA) and OPP-0236449 (IceCube). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

The Systems Engineering Challenge

The Systems Engineering technical challenge arose from a combination of factors that included complex operational, design, and support requirements, an extreme deployment environment, and the need to attain extremely high long term reliability. While the technical challenges were daunting, the largest single factor in determining an effective tailoring strategy was finding a way to fit SE into the established academic culture of the collaboration team.

The IceCube project arose following a pilot project called the Antarctic Muon and Neutrino Detection Array (AMANDA). AMANDA proved the basic instrument design concept, demonstrated the ability to deploy sensors in deep ice, and provided the

participants with high levels of experience and confidence. Thus a group of extremely bright individuals, almost exclusively from the Physics community, formed the core of the IceCube project effort.

The transition from a successful pilot project to large scale instrument design and deployment effort was much more fundamental than one of scale alone. The “stakes” went up enormously for all participants. With success would come the possibility of incredible scientific breakthroughs and at some point perhaps even Nobel Prize award honors, but failure would embarrass both individuals and institutions throughout the collaboration. Impact extended well beyond the IceCube project, since building a reputation for successful management of large scale science expenditures is essential to research driven institutions such as the University of Wisconsin and other collaboration members.

Conditions of the much larger IceCube project funding therefore introduced formal Project Management and Systems Engineering responsibilities for the first time. On paper this inserted a new responsibility layer between the Principal Investigator and the project resources, but the working relationships established during the AMANDA effort remained dominant.

The success of AMANDA is clear evidence that PM and SE competencies were present to some extent regardless of formality or individual position titles, and the individuals involved no doubt felt that outside assistance wasn’t really needed. It is this author’s opinion that the extraordinary team carried forward from AMANDA would most likely have been “successful” on IceCube even without formal PM and SE, but that the achieved *quality* of that success would have been very different.

Systems Engineering, and to a lesser extent PM, thus entered the IceCube project as an externally imposed and largely unwelcome obligation. Position authority was theoretically strong, but virtually impossible to utilize in practice. This left informal authority as the primary means of beneficially influencing the project.

Choose Your Battles Wisely

It was immediately apparent that SE would need to operate on IceCube very differently than what I had experienced on prior aerospace and commercial projects. In particular, the SE team would need “permission” from the balance of the project to function *as Systems Engineers*, and that permission would be challenging to earn.

By its very nature SE always requires a period of upfront investment, and when successful the return on that investment takes place much later in the project life cycle. That delayed return on investment is often a difficult “sell” even in environments where remarkable benefit has previously been experienced. On IceCube the investment period was widely misinterpreted as at best unhelpful, and at worst a waste of time. Without the funding body mandate and strong support of an experienced PM, true SE would not have been possible.

We ended up viewing the overall project responsibility in three overlapping categories, each of which had its own “rules of engagement”. At one end of this range were opportunities to enrich the operating flexibility and future value of the instrument, at the other was the responsibility to identify and mitigate risks that threatened the entire project success. In between was a large area of important, but mostly routine reduction-to-practice engineering effort. Depending on the nature of the effort, we either operated openly and collegially, as a parallel and occasionally integrated resource, or as a challenging and often unwelcome change agent.

Opportunity Enrichment

Once a degree of personal and professional credibility had been established, the SE team had little difficulty working within the project to contribute new capabilities, improve operational flexibility, or enhance performance. Each of these areas was readily seen as valuable by the balance of the project. Also included in this category of effort were efficiencies in cost and schedule as well as general problem solving and technical support.

Core Design Effort

As mentioned previously, the AMANDA project resources carried across into the IceCube project. That meant that collaboration partners were able to continue engineering development and refinement with the same very talented and experienced individuals. The SE role in core design was largely one of coordination and interface management, and although significant design contributions took place the vast majority of the “credit” for core engineering goes to the collaboration members

The primary customer requirements consisted of basic physics performance, data integrity, and operational flexibility.

Physics. The IceCube collaboration includes many institutions and individual scientists, and thus represents a diverse set of research interests. These interests were consolidated into eight major categories based on similar energy level and particle types. Each of the eight categories was then evaluated to determine key requirements such as sensitivity, resolution, dynamic range, and other properties fundamental to the instrument design. Summing the most demanding aspects resulted in an instrument specification capable of meeting nearly all collaboration research interests.

Data Integrity. Extreme care was taken to ensure that all data captured by the instrument would be properly tagged, retained in both raw and compressed forms, and that systems were implemented to allow appropriate "blinding" to eliminate any potential challenge to research objectivity. Also required were provisions to collect and distribute information among collaboration researchers.

Operational Flexibility. Because IceCube is a true "Discovery Class" instrument, the likelihood that it will reveal interesting research opportunities outside the original eight categories is very high. Extensive provisions were made in the requirements and resulting design to allow for future upgrades and changes in operational parameters. With such flexibility comes responsibility to retain configuration control and always be able to fall-back to the last trusted version. Identifying and agreeing on these derived requirements was a significant portion of the design effort.

Like any project, IceCube had to be broken down into a manageable set of individual hardware and software configuration items. These in turn gave rise to numerous interfaces that also needed to be defined and managed. Requirements drivers were identified and examined to determine the limiting conditions, resulting requirements allocated to configuration item specifications, trade studies were conducted, and the usual validation / verification planning supported. Deploying an instrument of this scale at the South Pole also involved close coordination with a number of external groups, each of which required programmatic and technical interface consideration.

Figure 2, *IceCube Deployment at the South Pole*, shows the resources needed to deploy each one of over 80 strings of sensors in the ice. The two large tanks located in the excavated area are IceTop detectors, and the balance of visible equipment constitute the Enhanced Hot Water Drill used to produce the 2,500 meter deep holes into which the sensor strings are lowered. The short working season at the South Pole meant that deployment would require several years to complete, and the complex seasonal start-up / shut-down overhead factored heavily into technical and programmatic requirements.

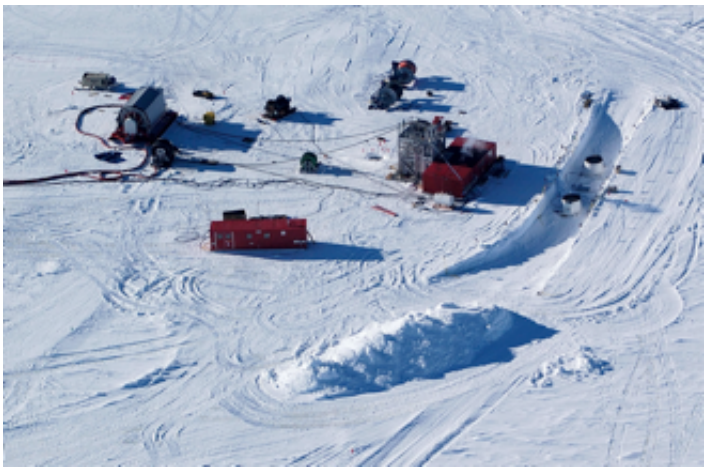

Figure 2 – IceCube Deployment at the South Pole [2]

Although a unique project application, each of these core design activities followed basic SE practices and were accomplished with surprisingly little difficulty. The level of detail and thoroughness involved in the analysis occasionally generated comments about the SE team being a little "obsessive", but in general the effort was well tolerated by the balance of the project organization and often acknowledged as quite helpful.

Risk Reduction

By far the most difficult aspect of the SE effort was fulfilling the responsibility to identify and mitigate risk. It is a fundamentally different mindset to *hope for success* than to search for risks and plan so thoroughly that *failure becomes impossible*. All of the personal and political challenges that arose for SE during the project came up as a result of differences of opinion about the severity and probability of risks.

Functional Role	Key System Elements	Accessible ?	Failure Effect	Criticality
Science Data Stream - Sensor Subsystem	In-Ice and Ice-Top DOMs, cables, connections	No	Permanent Loss of Science Data due to failed Channel(s) for the remainder of the instrument operational life.	Very High
			Permanent Loss of Science Data due to induced failure of Channel(s) for the remainder of the instrument operational life.	Very High
			Permanent Loss of Science Data from Channel(s) due to wear out, performance drift, or end of service life degradation effects in excess of user defined thresholds.	High
			Degraded Science Data from Channel(s) compared with specifications, but still deemed useful for scientific purposes such as Supernova detection and reporting.	Moderate
Science Data Stream - DOM Hub	DOM Hub, DOR Card, DOM Power Supply, Master Clock Distribution System	Yes	Permanent Loss of Science Data from unavailable channel(s) / string(s) during the interval between failure and system restoration following maintenance.	Moderate
Buffer Limited Trigger and Event Processing	Raw Data Storage, Raw Data Buffer, String Processor, Trigger, Event Buffer, Event Data Storage, Communications Buffer	Yes	Permanent Loss of Science Data from effected channel(s) / string(s) during the interval between buffer overflow and system restoration following maintenance.	Moderate
Off-Line Data Processing	All other system elements	Yes	User inconvenience prior to restoration, no loss of science data.	Low

Figure 3 – IceCube System FMEA

One of the earliest SE activities was to perform a high level failure modes and effects analysis (FMEA) for the purpose of determining risk mitigation priority. Figure 3, IceCube System FMEA, clearly communicated the importance of making sure that devices permanently deployed in deep-ice were as close to flawless as possible. Risks in data analysis or other system aspects were undesirable, of course, but the resulting impact would be relatively minor and recoverable without loss of scientific data or confidence. Problems with devices in deep-ice would be fatal, so the overwhelming majority of risk reduction effort was devoted to the Digital Optical Modules and cabling that connects them to the surface facilities.

The SE team employed rigorous “physics of failure” analysis techniques to search for all inherent or environmental sources of potential failure, then engaged in design trade studies to select recommended solutions. Extensive testing, simulation modeling, and vendor coordination was used to validate assumptions and verify that the recommendations were sound. Potential for human error during construction or handling was evaluated and mitigated through design, packaging and training.

All of these risk mitigation efforts were valuable, but none were free in terms of time or project budget. Because risk is by definition uncertain, no “proof” of probability or impact was available to defend the expenditures involved. Building understanding and consensus among decision makers was essential, yet often difficult due to differences in priority or interpretation of available data. In effect, virtually all of the goodwill “earned” in the opportunity and core design areas was “spent” to accomplish necessary but unpopular risk reduction effort.

Conclusion

The Systems Engineering *logic* is so powerful that even a largely informal role can be extremely valuable on projects such as IceCube. In this instance, as in all others the author has personally been involved in, the *potential* of SE has been limited not by process or tool set, but by the opportunity to conduct the SE effort in good faith. SE Managers, and perhaps the SE community at large, would be well served to focus on their ability to communicate and negotiate an effective SE role on projects. This is particularly true outside of the traditional aerospace environment.

Keywords: Systems Engineering; Process Tailoring; Academic Culture; Fundamentals; Case Study

References

[1] Information on http://www.icecube.wisc.edu

[2] Photo credit: IceCube Collaboration / NSF

Systems Engineering News

Feedback Requested On the Systems Engineering Body of Knowledge

The Systems Engineering Body of Knowledge (SEBoK) is now open for review at www.sebokwiki.org. This is the second release of the SEBOK, with the final release planned for September 2012. The SEBoK is now published as a Wiki. It is organized into 7 parts, 29 knowledge areas, and 115 topics. This version has 6 case studies, 6 vignettes, and 5 use cases. It contains 166 primary references, and hundreds of additional references. The glossary contains 389 terms. The SEBoK represents the efforts of over 60 authors representing six continents, and almost every corner of the SE community.

The current version benefited from over 3000 comments on Version 0.25 from 114 reviewers. With this release, the development team is opening the review process world-wide. Instructions for reviewing material are posted on each page. Over the next 3 months, feedback will be solicited through the discussion tabs on each article; review comments can be provided by simply clicking on the discussion tab at the top of any article for which one has comments, and respond to the appropriate discussion thread. Also, please see the "Note for Reviewers" link on the left hand menu for access to a survey for overall SEBoK and wiki comments that can then be returned to the BKCASE team.

The development team encourages anyone with interest and feedback to review the SEBoK. All comments will be appreciated. The development team will close this version for comments on December 15, 2011, so that it may prepare the next revision.

The SEBoK has been supported by many organizations. The development team gratefully acknowledges them. INCOSE, the IEEE Computer Society, the IEEE Systems Council, the Association for Computing Machinery, the National Defense Industrial Association, and the Systems Engineering Research Center were partner organizations in the development of the SEBoK. Primary funding was provided by the Office of the Deputy Assistant Secretary of Defense for Systems Engineering, with significant contributions in kind coming from the home organizations of the authors.

The development team is very proud of this version; however, it's recognized that it still is not fully mature. With continued assistance, the SEBoK will evolve to meet the needs of the systems engineering community.

Art Pyster, Dave Olwell, Alice Squires, Nicole Hutchison, Jim Anthony, and Stephanie Enck

For more information, contact the BKCASE team at mailto:bkcase@stevens.edu

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Senge to Address Systems Thinking at Duquesne University's Sustainable Business Symposium

Dr. Peter Senge, who has been named one of the top 20 most influential business thinkers by the *Wall Street Journal* and a top 10 management guru by *Business Week*, will keynote the fifth annual Beard Institute symposium, *Sustainable Business: Responsibilities & Results,* on Thursday, Nov. 10. The Beard Institute, the outreach center of Duquesne University's Palumbo-Donahue School of Business, will host the event at the Fairmont Hotel in Pittsburgh from 8 a.m. to 2:30 p.m.

In academic and business circles, Senge is known for applying his organizational systems thinking to sustainability in his noted book, The *Necessary Revolution* (2008). He is the author of the widely acclaimed book, The Fifth Discipline: The Art and Practice of the Learning Organization (1990, revised edition published 2006), and serves as a senior lecturer at the Massachusetts Institute of Technology. Senge also is the founding chair of the Society for Organizational Learning, a global community of corporations, researchers and consultants and has lectured extensively throughout the world, translating the abstract ideas of systems theory into tools for better understanding of economic and organizational change.

More Information

Haines Centre Releases the Training Module Toolbox: A Unique Systems Thinking Approach to Management and Leadership Training

This toolbox is an integrated and holistic framework for leaders and managers in dealing with virtually all issues and situations within an organization. The toolbox contains 65 Systems Thinking based 1- 1 ½ hour training module tools and applications. It includes over 190 research based articles, models and assessments. It is essential for any trainer, consultant or facilitator looking to improve their entire organizational efficiency and effectiveness in our dynamic and complex global economy.

The Haines Centre is a Global Alliance of master consultants, founded in 1990 with offices in over 25 countries. They are the world leaders in Strategic Management powered by Systems Thinking. Stephen Haines has dedicated his life to understanding and researching the universal framework and guide of systems thinking, and is excited to extend his research discoveries and knowledge to the world. The Toolbox's tools and applications have 21 years of proven performance behind them at the Haines Centre to help make any company or organization thrive. These training modules allow the organization to maximize 9 strategic management topics:

1. Systems Thinking
2. Reinventing Strategic Planning
3. Enterprise-Wide Change
4. Creating the People Edge
5. Achieving Leadership Excellence
6. Becoming Customer-Focused
7. Aligning Your Delivery
8. Creating Customer Value
9. Cultural of Performance Excellence

More information

Thinking About Moving to the Cloud? There Are Trade-Offs

More and more business-oriented tools are becoming available online, including many that can be critical to running a company. This guide looks at questions business owners ask and trade-offs they have to make. The guide is relevant to use of the Cloud for systems engineering.

More Information

Human Factors and Ergonomics Society (HFES) Digital Library Now Available Online

Human Factors and Ergonomics Society (HFES) has transferred its 16,000-plus library of articles to the SAGE Journals Online (SJO) platform. Members of HFES can now access a huge resource of publications in human factors, ergonomics in design, Annual Meeting proceedings, Journal of Cognitive Engineering and Decision Making, and reviews of human factors and ergonomics, by logging in at the society's website: www.hfes.org.

Details of how to become a member of HFES are also at the website.

SysML 1.3 and 1.4: What's Happening?

The systems modeling language SysML is presently at version 1.2. This version has acknowledged issues, and unacknowledged issues. The Object Management Group (OMG) has published information on schedules for further development of SysML, giving further promise that SysML may one day meet the requirements against which SysML was intended to have been developed.

Major milestones released by the OMG in relation to SysML 1.3 and 1.4 are:

September 23, 2011	SysML 1.3 RTF (Fax Vote initiated)
September 23, 2011	2nd SysML-Modelica 1.0 FTF (Voting List Deadline)
September 23, 2011	SysML 1.4 RTF (Voting List Deadline)

September 30, 2011	SysML-Modelica FTF (FTF recommendation and report deadline)
September 30, 2011	SysML 1.3 RTF (RTF Revision Deadline)
October 23, 2011	2nd SysML-Modelica 1.0 FTF (Beta 3 specification publication)
December 2, 2011	SysML 1.3 RTF (Fax Vote completed)
December 5, 2011	2nd SysML-Modelica 1.0 FTF (FTF comment deadline)
February 20, 2012	2nd SysML-Modelica 1.0 FTF (FTF report due)
March 1, 2012	SysML 1.4 RTF (RTF Public Comment Deadline)
March 1, 2012	SysML 1.4 RTF (RTF Public Comment Deadline)
March 30, 2012	2nd SysML-Modelica 1.0 FTF (FTF recommendation and report deadline)
June 12, 2012	SysML-Modelica FTF (Veto Power)
November 5, 2012	SysML 1.4 RTF (RTF report due)
December 14, 2012	SysML 1.4 RTF (RTF Revision Deadline)

Legend:

FTF: Finalization Task Force: OMG subgroup responsible for drafting the changes that turn an Adopted Specification into an Available Specification. These changes are two-fold in nature: editorial and minor technical.

RTF: Revision Task Force (RTF): An OMG subgroup with a closed membership of individually named representatives, in existence for a specified finite length of time, responsible for maintenance of an adopted OMG specification: that is, clarification of ambiguities and correction of errors. An RTF may not extend a specification with new functionality; this requires a new RFP.

Ask Robert

Question:

When do we reach the appropriate level of decomposition in logical and physical design to enter implementation? Or to be a little bit more specific, if our system contains complex software, how deep do we drive design into the software system until we as system engineers pass work to the software engineers for software design and software production.

Answer:

The question can be separated into two parts: 1) what are the criteria for ceasing the formalization of logical design and its mapping to physical implementation (i.e. to what we construct)? and 2) who does the work, with what job titles?

I will start with the second part of the question. I'll preface my remarks by observing that a client company put 140 of their software engineers through my systems engineering 5-day course. The reasons they stated for doing so were that: they wanted their software engineers to always see the software they were engineering as a part of a bigger system; and, they wanted the same principles applied to engineering of their software as to their engineering in general.

The client company action reflects a view that I regard as a very valuable. It is a view that is clearly being embraced by many enterprises worldwide. The view is that systems engineering is best regarded as a set of principles, supporting methods, and a skill-set that has application to anything that is being engineered, regardless of who is doing it, with what job title. Applying this view to the specific scenario, regarding systems engineers passing work to software engineers, the issue is an organizational design issue, the best solution to which will be influenced by:

- the software technology skills of the systems engineers
- the logical and physical design skills of the systems engineers, as they relate to software

- the software technology skills of the software engineers (expected to be high)
- the logical and physical design skills of the software engineers, as they relate to software
- the cultures of the systems and software engineers with respect to collaboration with, and learning from, each other
- existing defined organizational boundaries and responsibilities, and the ease or otherwise of changing these.

In the ideal engineering organization, all design (solution decision making) engineers will have comparable levels of understanding of the concepts and principles of logical and physical design, irrespective of the technologies in which they are working. In addition, they will have skills in the specific forms of logic, related modeling languages, methods and supporting tools most applicable to the problems they are being asked to solve. And therefore to the technologies relevant to solving those problems. They will understand the strengths, but also the weaknesses, of the languages available to them, a critically important point, given the level of maturity of today's public domain engineering modeling languages.

To now respond directly to the second part of my restatement of the question, who does the work, with what job titles: within these principles, it doesn't much matter, as long as those doing the work have the necessary mix of knowledge and skills - technology plus design principles and process.

I will now address the first part of my restatement of the question, regarding the criteria for ceasing the formalization of logical design and its mapping to physical implementation. And the answer is totally routed in risk. When we conduct a project overall, we want it to deliver at least the value intended. Any possibility of delivering less value than intended means that there is risk. The amount of risk is the integration of the amount of lost value times the probability of that loss occurring. We generally seek low risk, i.e. delivery, on a balance of probabilities, of no more than say 2% less value than intended. Since there typically are tens of thousands of identifiable sources of risk in a complex technical project, the accumulation of risk from each of these sources should be no more than (say) 2% total risk.

Fortunately, for the typical project, a smaller number of sources, maybe ten to thirty, contributes much of the risk. Unfortunately, the accumulation of risk from tens of thousands of smaller sources within a project is also very significant. Potentially, death by 10,000+ small cuts.

This is the reality of major, complex projects.

To respond directly to the first part of my restatement of the question, regarding the criteria for ceasing the formalization of logical design and its mapping to physical implementation: we want to do so when the complexity of design is at a level at which a human being of average intelligence, possessing the necessary technology skills, is very, very unlikely to make an error of omission or an error of underlying logic in the design as a consequence of the complexity, or, alternatively, where the cost of formalization of the logic exceeds the risk-reduction benefit.

In practice, this means that substantial formalization of logic needs to be the norm in engineering, be it in software or in other technologies. It also means that we will not formalize the logic for getting a cup of coffee, or designing a nut/bolt/washer combination to retain two pieces on metal in a geometric relationship with respect to one another, or in designing a "No Left Turn" sign for use at a street corner.

Question:

"We have developed a product (vehicle), and it is at the Physical Configuration Audit stage - already qualified against the specification. For reasons of mass, etc. the vehicle has had to have the foot rest removed. Due to the change in specification, does the hardware then need to be blown up and tested again to verify that it is landmine-proof?"

Answer:

The answer lies in the amount of risk versus the cost of retesting. If the cost of retesting exceeds the risk reduction benefit, the vehicle should not be retested. This assessment should be made by a person technically competent to assess the range of potential impact of the removal of the footrest. My expectation as an engineer, but not a qualified and experienced mechanical engineer who has available the design of the vehicle against which to make the assessment, is that the cost of retesting would be very high, whilst the risk arising from the change would be low. If this were the case, the vehicle should not be retested.

However, you should not rely on my expectation. The assessment should be made by an engineer who has access to the design of the vehicle and who is qualified in the relevant aspects of mechanical engineering. The assessment may take 30 seconds, but it should be done. The Hilton Hotel walkway collapse in Houston, USA, illustrates the risk of making design changes without proper evaluation.

Robert Halligan, FIE Aust

Featured Society

The Society for Modeling & Simulation International (SCS)

The Society for Modeling & Simulation International (SCS) is a non-profit member-based professional society devoted to modeling and simulation (M&S). It serves individuals and organizations in more than 150 countries around the world. SCS membership includes individuals from industry, government and academia whose interests are said to span all aspects of M&S.

The mission of SCS is to promote the use of modeling and simulation, in ever expanding application areas through education and providing a forum where the scientific basis for its foundations can be enriched through education and research.

Its vision is to be the premier society for the M&S community and the place where people who develop, teach, study and use M&S technologies get together to share ideas, build customer bases, network and together push forward the boundaries of the M&S enterprise.

SCS was established in 1952 as a nonprofit, volunteer-driven corporation called Simulation Councils, Inc. Simulation Councils, Inc. became The Society for Computer Simulation, which is the origin of the acronym SCS. SCS aims to be the premier technical society dedicated to advancing the use of modeling & simulation to solve real-world problems; devoted to the advancement of simulation and allied computer arts in all fields; and committed to facilitating communication among professionals in the field of simulation. To this end, SCS organizes meetings, sponsors and co-sponsors national and international conferences. SCS also publishes SIMULATION: Transactions of The Society for Modeling and Simulation International and the Journal of Defense Modeling and Simulation.

SCS is managed by a Board of Directors (BoD), the Executive Director and a President's Council. The president and president-elect of the Board are elected by the members of the society. The president appoints the four vice-presidents representing the four major operational areas of the society: membership, publications, conferences and education. The president also appoints a secretary and a treasurer. In addition to the elected and appointed positions, the Executive Committee includes the immediate past president and the executive director. The Board of Directors encompasses the Executive Committee and a group of Directors at Large.

SCS periodically presents special awards to distinguished Modeling & Simulation practitioners. The Awards and Recognition Committee (ARC) supports awards in the following categories: Contributions to the Profession; Service to the Society; and Lifetime Achievements (SCS's M&S Hall of Fame).

The society is headquartered in San Diego, CA, and is managed by the executive director. The current President is Mr. David Cook of the Stephen F. Austin State University, USA.

President-Elect is Mr. Jerry M. Couretas of Lockheed Martin, USA.

More information

INCOSE Technical Operations

Decision Analysis Working Group (DAWG)

Charter

1 Purpose

The purpose of the working group is to advance the state of the practices, education, and theory of Decision Analysis and its relationship to other systems engineering disciplines.

2 Goal

Expand and promote the body of knowledge of decision analysis and its benefits within the systems engineering community.

3 Scope

This technical working group will cover activities that are generically applicable to current and future Decision Analysis practices thru the product development and project life cycle for any and all domains and industries.

Leadership

Chair: Frank Salvatore

Co-Chair: TBD

Accomplishments / Products

7/2011 Kickoff meeting at INCOSE International Symposium 2011

Current Projects

9/2011-3/2012 Review and comment of the INCOSE Systems Engineering Handbook (SEH) to ensure that the current thinking on decision analysis is reflected in it.

9/2011 – 7/2012 Prepare for Decision Analysis Working Group (DAWG) Panel Discussion at IS 2012.

Contact fsalvatore@hpti.com for additional information or to join this group.

More information
(This link requires a username and password for INCOSE CONNECT)

Systems Engineering Tools News

Sparx Systems announces the release of Enterprise Architect 9.1

Creswick, Australia, September 20, 2011 – Sparx Systems, a leading vendor of modeling tools based on open standards, has today announced the release of Enterprise Architect 9.1. This latest release offers new tools and enhancements for those tasked with modeling and understanding complex systems.

The new simulation features in Enterprise Architect 9.1 allow users to understand their systems and explore alternatives without directly manipulating them. “By analyzing and exploring alternatives in a simulated environment before resources are committed, we are helping users reduce risk and save time and money,” remarked Sparx Systems COO, Tom O'Reilly. “Intelligent execution with scripted guards and effects enable powerful simulation at the click of a button.”

Through the release of Enterprise Architect 9.1, Sparx Systems has responded to its user community and the specific needs of the industry it serves. “This latest release of Enterprise Architect reinforces its strong base as a robust, flexible and easy to use tool”, commented Frank Truyen, President of Cephas Consulting Corporation. “It's exactly what the user community ordered!”

Further to this release, Enterprise Architect 9.1 has included the second beta of Sparx Systems' MDG Technology for ArcGIS, supporting the design of geodatabases in the ArcGIS 10.0 suite of tools developed by Esri Inc.

Enterprise Architect 9.1 represents a major innovation for Sparx Systems. The release of advanced simulation capabilities and geodatabase design tools continues Sparx Systems commitment to providing high-end functionality. A full list of updates and enhancements in version 9.1 can be found at: www.sparxsystems.com/ea91

More information

Vitech Corporation Releases Three Tools

On October 12th 2011, Vitech Corporation launched three new products as part of its Insight 2011 User Group event that was held just outside Washington, DC:

CORE 8.0, the latest version of its flagship product line. Described by some who have seen it as "groundbreaking" and "the biggest transformation in CORE's history", Vitech believes CORE 8.0 unlocks the power of Model Base Systems Engineering (MBSE). Combining strengths of an integrated, model-driven architecture with the usability demanded of modern software, version 8.0 redefines CORE. It delivers the user experience of a technical drawing package to complement the power of a model-driven solution, accelerating system development to think-speed. It redefines communications and analysis by delivering rich and robust representations. It lowers the barrier of entry to MBSE, aiding the engineer through automated model assistance.

GENESYSTM **1.0**, the first release of its next-generation product line. Long anticipated, GENESYS leverages Vitech's heritage in integrated, model-based approaches, taking the lessons learned from CORE and recasting them into a new product line. Built from the ground up around industry-standard technologies, an open architecture, and a scalable infrastructure, GENESYS is a flexible platform to drive complete systems designs with lower risk across the enterprise. Delivering end-to-end essential MBSE support with full traceability from requirements analysis through architecture and V&V, GENESYS enables highly connected systems engineering for the enterprise.

The 2nd edition of Vitech's MBSE Primer laying out the foundations of models, model-based systems engineering, and its layered methodology (newly named STRATATM to emphasize the strategic layers approach).

More Information

BigLever Software and General Motors to Co-Present Product Line Engineering Sessions for IBM Rational's Systems and Software Engineering Symposium Series

BigLever Software(TM), the leading provider of systems and software product line engineering framework, tools and services, announced that Dr. Charles Krueger, the company's Founder and CEO, will co-present a product line engineering (PLE) session with Bill Bolander, General Motors Technical Fellow, as part of IBM Rational's Systems and Software Symposium event to be held on October 19th at the University of Michigan. The IBM Rational Systems and Software Symposium Series features the latest innovations in product and systems development. This event will explore systems engineering best practices, with a focus on integrated product management, systems and software development, and product line engineering across the lifecycle including requirements management, architecture and design, change and configuration management, testing and quality management.

More Information

The OMG Model Interchange Working Group and Interoperability Between SysML Software Tools

Object Management Group OMG™ members in 2009 formed the Model Interchange Working Group (MIWG) to demonstrate and facilitate interoperability between modeling tools. The MIWG comprises end users, tool vendors and experts in the UML, SysML and XMI® standards.

The MIWG's approach is to create an export of the same SysML model from each participating vendor's tool and then import those models into each other's tool. The XML Metadata Interchange (XMI) format, the OMG standard for exchanging models, is used by the MIWG to transfer the model data among the participating tools. This approach has been applied across a number of test cases representing different types of models.

"Model interchange is essential to achieve integration among a broad range of systems and software design and analysis tools," said Sanford Friedenthal, from Lockheed Martin and chair of the MIWG. "End users are beginning to expect this capability in their tools, and the standards have matured to a level that this is now achievable. In addition, the vendor participants in the MIWG are working very hard to deliver this capability. They have found this interchange process to provide an efficient mechanism to enhance model interchange as indicated in their responses."

Participating tools are:

Tool	Vendor/Organization
Metadata Manager	Adaptive
Artisan® Studio	Atego
RSx	IBM
IBM	

IBM Rhapsody	IBM/Sodius
Validator	NIST
MagicDraw	NoMagic
Modelio	SOFTEAM
Enterprise Architect	Sparx Systems

The MIWG is continuing to produce test cases on an incremental basis to provide extensive coverage of areas of interoperability for UML, SysML and UPDM. Any organization that wishes to participate in the MIWG is encouraged to join OMG. For more information on OMG membership, please contact Ken Berk, Vice President, Business Development at mailto:ken.berk@omg.org or +1-781-444-0404

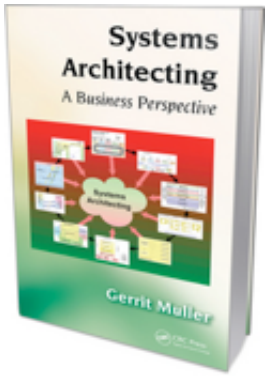
Note: XMI, UML are registered trademarks, and OMG, Object Management Group, SysML, BPMN, Unified Modeling Language are trademarks of Object Management Group. All other trademarks are the property of their respective owners.

More Information

Systems Engineering Books, Reports, Articles and Papers

Systems Architecting: A Business Perspective

by Gerrit Muller



Published by: CRC Press

ISBN: 9781439847626 Publication Date: September 01, 2011 Number of Pages: 254 Binding(s): Hardback

Order book at Amazon.com

Instructor's Manual

The Instructor's Manual is available via CRC Press

Abstract: Derived from industry-training classes that the author teaches at the Embedded Systems Institute at Eindhoven, the Netherlands and at Buskerud University College at Kongsberg in Norway, *Systems Architecting: A Business Perspective* is a practical, scenario-driven guide that places the processes of systems architecting in a broader context by juxtaposing the relationship of the systems architect with enterprise and management. It fills an important gap, providing systems architects insight into the business processes, and especially into the processes to which they actively contribute. The book uses a simple reference model to enable understanding of the inside of a system in relation to its context. It covers the impact of tool selection

and brings balance to the application of the intellectual tools versus computer-aided tools. Stressing the importance of a clear strategy, the author discusses methods and techniques that facilitate the architect's contribution to the strategy process. They also give insight into the needs and complications of harvesting synergy, insight that will help establish an effective synergy-harvesting strategy. The book also explores the often difficult relationship between managers and systems architects.

More Information

Managing Event Information: Modeling, Retrieval, and Applications

By Amarnath Gupta and Ramesh Jain

Published by Morgan & Claypool as part of the Publisher's

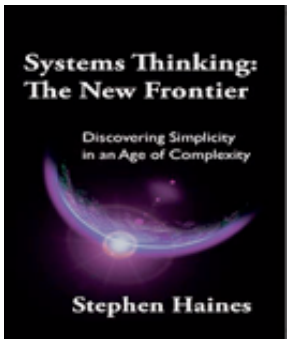
Synthesis Lectures on Data Management Series

The book addresses the exponential increase in data generation, thanks to the proliferation of citizen reporting, smart mobile devices, and social media. A significant portion of this data, called "event information" by the authors, is comprised of multimedia data, through which users share their experiences with a wider audience. The book, edited by M. Tamer Özsu, is available online free of charge to members of institutions that have licensed access to the Synthesis Digital Library of Engineering and Computer Science. The use of this book as a course text is encouraged and its text may be downloaded without restriction at licensing institutions or after a one-time fee of $25.00 at non-licensing schools. Please visit http://www.morganclaypool.com/page/licensed for more information.

More information

Systems Thinking: The New Frontier

by Stephen Haines



Steve Haines' new book *Systems Thinking: the New Frontier* is a simple primer with less than 100 pages of uniquely valuable information that has been missing in literature until now. In addition there is a 47 page index for those who want to learn beyond the simple primer. It teaches the ABC's of Strategic Thinking in just 10 minutes, and is an application that can be used universally in everything that you do for the rest of your life. It simplifies complexity to its essence. The book explores the analogy of the inner frontiers of the mind; on HOW to think better, not just on WHAT to think about. Using simple tools and applications based on Steve's extensive 25 years of research on Systems Thinking, it explains how the world has gotten so complex today, and how to see to the real meaning to any issue in your life or at work. This process allows you to think, plan and act differently to achieve superior results.

More Information

Conferences and Meetings

KSE 2011 - 3rd International Conference on Knowledge & Systems Engineering
October 14 – 16, 2011, Hanoi University, Hanoi, Vietnam
More information

MODELS 2011 - ACM/IEEE 14th International Conference on Model Driven Engineering Languages and Systems
October 16-21, 2011, Wellington, New Zealand
More information

APCOSE 2011 - Fifth Annual Asia-Pacific Systems Engineering Conference
October 19-21, 2011, Seoul, Korea
More information

The Program Management Lean Enablers Working Session
PMI® Global Congress 2011—North America
22 October 2011 from 7:30 a.m. – 12:30 p.m.
Register in advance

Workshop: Integrating Program Management and Systems Engineering
PMI Global Congress 2011—North America
24 October 2011 from 9:30 – 10:45 a.m.
Register

2011 MIT SDM Conference on Systems Thinking for Contemporary Challenges
October 24-25, 2011, Massachusetts Institute of Technology, Wong Auditorium, Cambridge, MA, USA
More information

Massachusetts Institute of Technology Annual Conference on Systems Thinking for Contemporary Challenges
October 24-25, 2011, Massachusetts Institute of Technology, Boston, USA
More information

2nd Iranian Conference on Reliability Engineering
October 24-26, 2011, Tehran, Iran
More information

NDIA 14th Annual Systems Engineering Conference
October 24 - 27 2011, Hyatt Regency Mission Bay, San Diego, California, USA
More information

SSEE 2011 - Society for Sustainability and Environmental Engineering 2011 International Conference
October 24-26, 2011, Brisbane Convention & Exhibition Centre, Brisbane, Australia
More information

ICFEM 2011 - 13th International Conference on Formal Engineering Methods
October 25 - 28, 2011, Durham, United Kingdom
More information

CEBM 2011 - 2011 International Conference on Engineering and Business Management (CEBM2011)
Oct 28 - 30, 2011, Shanghai, China
More information

The *First* Business Architecture Summit at BBC 2011 - The Benefits of Linking Enterprise Business Models with IT Infrastructure – Beyond the Basics
Oct 30 – Nov 3, 2011, Fort Lauderdale, Florida, USA
More information

IIBA 2011 Conference
Oct 30 - Nov 3, 2011, Fort Lauderdale, Florida, USA
More information

21st Annual Systems Thinking in Action® Conference
October 31-November 2, 2011, Westin Seattle Hotel, Seattle, WA, USA
More information

ER 2011, 30th International Conference on Conceptual Modeling
October 31 - November 3, 2011, Brussels, Belgium
More information

Whole Systems Modelling with iThink and STELLA Workshops
November 2-3, Brunel University, Uxbridge, UK
More information

PoEM 2011 - The 4th IFIP WG8.1 Working Conference on the Practice of Enterprise Modelling
November 2-3, 2011, Oslo, Norway
More information

5th Annual INCOSE Great Lakes Regional Conference in Systems Engineering: Leveraging Adaptability to Tame Uncertainty
November 4-6, 2011, Dearborn, MI, USA
More information

XVIII SIMPEP - Brazilian Production Engineering Symposium
November 7, 2011, City of Bauru, Brazil
More information

Managing Industrial Engineering
November 7, 2011, Chicago, USA
More information

The 23rd IFIP International Conference on Testing Software and Systems (ICTSS'11)
November 7 - 9, 2011, Paris, France
More information

11th SafeTRANS Industrial Day NEW
November 8, 2011, Hamburg, Germany (Airbus Company – Kreetslag 10)
More information

Whole Systems Modelling with iThink and STELLA Workshops
November 8-9, Conyngham Hall, Knaresborough, North Yorkshire, UK
More information

INCOSE UK Annual Systems Engineering Conference (ASEC) 2011
November 9 - 10, 2011, Scarman Training and Conference Centre, Warwick Conferences, University of Warwick, UK
More information

TdSE2011 Systems Engineering Konferenz NEW
November 9 - 11, 2011, Hamburg, Germany
More information

13th IEEE International High Assurance Systems Engineering Symposium
November 10-12, 2011, Boca Raton Marriott Hotel, 5150 Town Center Circle, Boca Raton, Florida, USA
More information

11th Annual CMMI® Technology Conference and User Group

November 14 - 17, 2011, Hyatt Regency Denver Tech Center, Denver CO, USA
More information

New Zealand Defence Industry Association Forum
15-16 November, 2011, New Zealand
More information

Brazilian Society of Dynamic Systems (SBDS) Annual Conference
16-18 November, 2011, Brasilia, Brazil
Website: www.sdsbrasil.org (under construction)

7th Symposium on Perspectives and Technology Planning
November 24 – 25 2011, Berlin, Germany
More information

ICSSEA 2011 - 23rd International Conference Software & Systems Engineering and Their Applications
November 29- December 1st 2011, Paris, France
More information

10th Anniversary & Annual Infrastructure and Regional Resilience 2011 Conference
November 29 December 1, 2011, Gaylord National Hotel & Convention Center in Washington, DC, USA
More information

3rd International Conference on Software & Systems Engineering and Their Applications
November 29 – December 1, 2011, Paris, France
More information

2011 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)
December 6-9, 2011, Singapore
More information

Haifa Verification Conference 2011 (HVC 2011)
December 6-8, 2011, Haifa, Israel
More information

3rd International Congress on Engineering Education
December 7-8, 2011, Kuala Lumpur, Malaysia
More information

Complex Systems Design & Management 2011
December 7-9, 2011, Cité Internationale Universitaire, Paris, France
More information

2nd IEEE International Conference on Networked Embedded Systems for Enterprise Applications - NESEA 2011
December 8th – 9, 2011, Fremantle, Perth, Australia
More information

The 8th Saudi Engineering Conference
December 10, 2011, Buraydah, Saudi Arabia
More information

9th International Conference on Integrated Formal Methods (iFM 2012)
December 10, 2011, Buraydah, Saudi Arabia
More information

6th International Conference on Design Principles & Practices
January 20 - 22, 2012, Los Angeles, CA, USA
More information

INCOSE International Workshop (IW) 2012
January 21 - 24, 2012, Jacksonville, FL, USA
More information

Eighth Asia-Pacific Conference on Conceptual Modelling (APCCM 2012)
January 30 - February 02, 2012, RMIT, Melbourne, Australia
More information

ESSoS12 - International Symposium on Engineering Secure Software and Systems
February 16 - 17, 2012, Eindhoven, The Netherlands
More information

16th GfSE Workshop 2012 

February 17, 2012, Hannover, Germany
More information

IEEE CogSIMA 2012 – 2nd International Conference on Cognitive Methods in Situation Awareness and Decision Support
March 6 – 8, 2012, New Orleans, LA, USA
More information

16th International GI/ITG Conference on Measurement, Modelling and Evaluation of Computing Systems and Dependability and Fault-Tolerance (MMB & DFT 2012)
March 19 - 21, 2012, Kaiserslautern, Germany
More information

CSER 2012 – Conference on Systems Engineering Research
March 19-22, 2012, St Louis, Missouri, USA
More information

The 9th ENTERPRISE ENGINEERING Track at ACM-SAC 2012
The 27th ACM Symposium on Applied Computing 25-29 March 2012, Riva del Garda, Trento, Italy
More information

Fifth Edition of the Requirements Engineering Track (RE-Track'12)
Part of the 27th ACM Symposium on Applied Computing (SAC 2012)
March 25-29, 2012, University of Trento, Trento, Italy
More information

2nd International Workshop on Model-driven Approaches for Simulation Engineering
Part of the Symposium on Theory of Modeling and Simulation, (SCS SpringSim 2012)
26-29 March, 2012, Orlando, FL, USA
More information

Symposium On Theory of Modeling and Simulation, TMS'12
Part of the 2012 SpringSim - Spring Simulation Multi-Conference
26-29 March, 2012, Orlando, FL, USA
More information

2012 SpringSim - Spring Simulation Multi-Conference
26-30 March, 2012, Orlando, FL, USA
More Information

Applied Ergonomics Conference 2012
March 26-29, 2012, Gaylord Opryland Resort and Convention Center, Nashville, TN, USA
More information

The 31st International Conference on Modelling, Identification and Control
April 2 - 4, 2012, Phuket, Thailand
More information

SETE APCOSE 2012
April 30 – May 2, 2012, Brisbane Convention and Exhibition Centre, Brisbane, QLD, Australia
More information

1st Annual Systems Engineering in the Washington Metropolitan Area Conference (SEDC 2012)
May 14 - 16, 2012, George Mason Inn and Conference Center, Washington, USA
More information

IIE Annual Conference and Expo 2012
May 19-23, 2012, Hilton Bonnet Creek, Orlando, FL, USA
More information

12th International Design Conference Design 2012
21 - 25 May, 2012, Dubrovnik, Croatia
More information

Engineering Leadership Conference (ELC 2012)
30 May - 2 June, 2012, Adelaide, Australia
More information

iFM2012 ABZ 2012 - Abstract State Machines
June 18-22, 2012 , CNR Research Area of Pisa, Italy
More information

PETRI NETS 2012 - 33rd International Conference on the Application and Theory of Petri Nets and Concurrency
June 25–29, 2012, Hamburg, Germany
More information

8th European Conference on Modelling Foundations and Applications NEW
July 2–5, 2012, Technical University of Denmark, Denmark
More information

INCOSE International Symposium (IS) 2012
July 9–12, 2012, Rome, Italy
IS2012 Call for Papers: Deadline for draft papers, and proposals for panels and tutorials for IS2012 is November 8th, 2011.
More information

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

Education and Academia

WPI's *new* Online Master of Science in Systems Engineering is a ten course (30-credit hour) degree, emphasizing systems and management with a strong technology focus. The program itself is highly flexible. Additionally, all courses delivered are said to be of the same caliber as the campus offerings and are taught by WPI faculty. A preview of potential courses can be viewed by visiting the following link: http://cpe.wpi.edu/onlinesyseng.html. The program is delivered 100% online, in an asynchronous delivery, allowing access and flexibility 24/7. The planned start date is January 2012, pending the requisite number of participants. The deadline to register is **October 20, 2011**.

Want to Learn More? A Complimentary Webinar is available on Friday, October 14, 2011, 12 p.m. EST. This interactive webinar will discuss WPI's admissions procedures, prerequisites, and tuition costs, along with providing an opportunity for you to ask any questions you may have.

Questions: If you have any questions contact Peter Huie, Senior Business Development Manager, at phuie@wpi.edu or USA 508.831.4917 or Stephanie Pals Papia, Client Relations Manager, at sppapis@wpi.edu or USA 508.831.4905.

New PhD. Program in Systems Engineering at UL Lafayette USA

The College of Engineering at the University of Louisiana at Lafayette USA will begin offering a new doctoral program next spring. All five engineering departments at UL Lafayette – chemical, civil, electrical, mechanical, and petroleum – will participate in this degree offering. The curriculum will involve two components: a systems engineering core and an engineering concentration core. This will allow students to maintain their discipline specialty by selecting a technical concentration while gaining expertise in systems engineering. Unique aspects of the program include mandatory leadership training and possible commercialization of research discoveries.

More Information

Simon Fraser University's Mechatronics Systems Engineering (MSE) Program Produces its First Graduates

At Simon Fraser University (USA) 24 students celebrated their undergraduate degrees at fall convocation on October 6, 2011. The MSE program combines studies in mechanical, electronics, software and computer engineering. "The integration of these three engineering fields is beneficial in a rapidly growing high tech world and marketplace that demands more efficient and simpler ways of doing things," says program associate director Farid Golnaraghi.

More Information

University of Virginia's Department of Systems and Information Engineering has an Open Rank Tenure Track Search for a Faculty Member in Health Care Systems Engineering

The Department of Systems and Information Engineering (SIE) at the University of Virginia (USA) invites applications for a tenure-track faculty position at any level (assistant, associate, or full professor). They are seeking a scholar whose interests complement those of the faculty and who has a proven track record in health care systems engineering. All areas of SIE specialization will be considered: human factors, computational statistics and simulation, risk and decision analysis, optimization and control, and system integration. Candidates must possess an earned doctorate in Systems Engineering or a related discipline, with a demonstrated record of academic scholarship as appropriate to the candidate's rank and commitment to teaching excellence.

The ideal candidate has a broad perspective on the application of systems engineering to health care, with interest in research collaborations with the medical community that could range from basic to applied research. Candidates should be engaged in ongoing funded research that demonstrates both individual research capabilities and the collaboration with members of the medical and engineering research communities. In addition to developing an externally funded research program, duties include teaching at the undergraduate and graduate levels and service to the department, university, and professional organizations.

The Department's high NRC PhD program ranking, existing collaborative relationships with the School of Medicine, peer relationship with the Department of Bioengineering, and the School of Engineering and Applied Science's (SEAS) strategic

commitment to medical innovation and translational research, create an unusual opportunity for significant contributions to a growing area of opportunity. The Department currently consists of 18 full-time faculty members. Its ABET-accredited undergraduate program currently admits approximately 100 undergraduate majors per class year (the largest undergraduate program in SEAS). A total of 88 graduate students are currently enrolled within its on-grounds PhD, MS, and MEng degree programs.

Screening of applicants will begin as early as 1 November 2012 and will continue until the position is filled. The expected start date is 20 August 2012. To apply please submit a cover letter, research and educational plans, curriculum vitae, and names and contact information for at least three references. Please address questions to the search committee chair, Professor Stephen Patek

(SIEHealthCareSearch@virginia.edu). See http://web.sys.virginia.edu/ for more information.

The 3rd TUM Spring School on Systems Engineering (TUMS3E) to be held in Munich, Germany, 26 - 30 March 2012

The “TUM Spring School on Systems Engineering” is going to take place in spring 2012 for the third time. It will be held in cooperation with the Stevens Institute of Technology. The spring school refers to PhD students of all disciplines whose working areas are related to any aspects of systems engineering. Overseas students are encouraged to apply. The aim of the four day course is to encourage international scientific exchange on important literature, definitions, and actual and future topics. The PhD students should be enabled to gain an insight into industrial implementation and application of systems engineering.

Besides general talks on Systems Engineering, the participants of the course will present their own topics. There will be intense discussions with invited guests from academia and industry who will present current requirements and challenges in their companies.

More Information

Some Systems Engineering-Relevant Websites

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http://www.sei.cmu.edu/reports/95mm003.pdf

Systems Engineering Capability Maturity Model (SE-CMM). Although dated, this is one of the best products ever produced by the Software Engineering Institute (SEI). It provides a useful and effective framework for an SE environment.

www.qaiworldwide.org

This site is for the Quality Assurance Institute. QAI is a global workforce development and consulting organization addressing the education and 'Operational Excellence' needs of information technology, information technology enabled organizations, and knowledge intensive organizations. The QAI Global Institute is the workforce development division of QAI and focuses on creating robust education, services and training products addressing competency development, assessments and professional certifications.

sunset.usc.edu/research/WINWIN/index.html

This site will take you to the Center for Software Engineering (CSE) at the University of Southern California. Industry guru Dr. Barry Boehm will treat you to useful and effective models and techniques including the Spiral Model, Theory W (win-win), COCOMO™, and other available tools including CodeCount and UML/Analyzer.

www.gilb.com

Tom and Kai Gilb have provided major contributions to the systems engineering community. Visit this site to gain insight and appreciation. Tom has advocated evolutionary development (EVO), inspections, and other valuable techniques.

www.malotaux.nl/

Niels Malotaux is a thoughtful advisor in making improvements in systems engineering as demonstrated in his article on Lean Systems Engineering in SyEN’s August 2011 issue. Niels serves the project community as a Project Coach.

www.rspa.com

For 30 years, R.S. Pressman & Associates, Inc. has provided services and products that help companies improve their engineering practices. This site has become one of the primary sources for non-commercial engineering information available on the Web.

Standards and Guides

INCOSE Participation in Standards Activities

Kenneth M. Zemrowski, CSEP-Acq
INCOSE Assistant Director for Standards

The International Council on Systems Engineering (INCOSE), although not itself a standards issuing body, is an active participant in the development of standards which are intended to contribute to the successful engineering of systems. INCOSE's present range of participation is understood to be:

- ISO/IEC JTC1 SC7 SWG5 – SC7 Architecture and Harmonization is addressing system integration issues and is preparing recommendations.

- ISO/IEC JTC1 SC7 WG7 – 24748 (Guide for Life Cycle Management). INCOSE has provided the editors for several parts, which include:

- ISO/IEC TR 24748-1:2010 – Guide for Life Cycle Management (freely available at http://standards.iso.org/ittf/PubliclyAvailableStandards/index.html)
- ISO/IEC TR 24748-2:2011 – Guide for Application of 15288
- ISO/IEC TR 24748-3:2011 – Guide for Application of 12207
- ISO/IEC TR 24748-4 – Application and management of the SE Process (in development)
- ISO/IEC 24748-5 –Part 5: Software development technical management (New Work Item Proposal)

- ISO/IEC JTC1 SC7 WG7 has completed publication of the following two standards and has established a study group to recommend potential changes for further harmonization between:

- ISO/IEC 15288:2008 – System Life Cycle Processes
- ISO/IEC 12207:2008 – Software Life Cycle Processes

- ISO/IEC SC7 WG04 – SE Tools and tool environment. This represents effort from the INCOSE Tools Working Group. The effort is expanding into software and systems product lines, which includes:

- ISO/IEC 26550 –Reference Model for Software and Systems Product Lines – Final Committee Draft (FCD)
- ISO/IEC 26551 – Tools and Methods of Requirement Engineering and Management for Product Lines – FCD
- ISO/ IEC 26555 –Tools and Methods of Technical Management of Product Lines – FCD
- ISO SC7 WG20 - Certification. This effort includes developing initial SE criteria in 2011, preparation for preparing a standard for SE Certification, with an initial effort towards ISO/IEC 29154 – Software Engineering – Certification of Software Engineering Professionals – Guidelines and Examples. The INCOSE SE Handbook has been adopted as ISO/IEC Technical Report (TR) 16337:2011 – Systems Engineering Handbook.

- ISO SC7 WG24 – Life Cycles for Very Small Enterprises, is intended to addressed issues related to establish processes to implement any development approach or methodology including, e.g., agile, evolutionary, incremental, test driven development, etc. based on the organization or project needs of a VSE. Additional information is available at http://profs.etsmtl.ca/claporte/English/VSE/index.html.

- ISO/IEC SC7 WG42 - Architecture. This effort includes participation in redevelopment of IEEE 1471: 2000 (Recommended Practice for Architectural Description of Software-intensive Systems and ISO/IEC 42010: 2007 (Systems and software engineering — Recommended practice for architectural description of software-intensive systems), to become a jointly issued standard: ISO/IEC/IEEE 42010, Systems and software engineering — Architecture description.

- With Object Management Group (OMG). INCOSE provides support for modeling standards including SysML, UPDM, SysML/AP233 mapping and other model-based systems engineering. INCOSE provides the chair of the OMG systems engineering domain special interest group (SE DSIG).

- ISO TC184 SC5 WG1 - Enterprise Architecture. This effort includes architecture modeling standards and Object Process

Methodology.

- With National Defense Industries Association (NDIA), concerning systems engineering effectiveness.

An update on the status of ISO/IEC JTC1 SC7 standards relevant to systems engineering was published in SyEN#33, see http://www.ppi-int.com/newsletter/SyEN-033.php#standards.

Object Management Group (OMG) Specifications Under Development

Specifications which have been approved by the OMG membership are available to everyone, but only OMG members have access to specifications under development. We list here OMG requests for technology submissions most relevant to systems engineering which are open to both members and the general public for comment or response. The actual request documents are available at the OMG website.

Open Requests for Comments:

Interface Definition Language (IDL), Version 3.5 RFC (document mars/2011-09-08)

Open Requests for Proposals:

Case Management Process Modeling (CMPM) (document bmi/2009-09-23)

This RFP solicits proposals for a meta-model extension to BPMN 2.0 (Business Process Modeling and Notation) to support modeling of case management processes. In case management, each execution of a process involves a particular situation, a case, and a desired outcome for that case. Each case involves a particular subject (a person, a legal action, an insurance claim, etc.) and the actions performed related to that subject to achieve the desired result. The determination of actions to take in each case involves the exercise of human judgment and decision-making. Activities don't occur in a predefined sequence. A case management process will produce a case file that is a record of the history and current state of the case and may consist of multiple documents or records from relevant sources that become case file parts. Case management processes include knowledge encoded as rules that provides guidance, prompts, constraints and planning support for the human decision-maker. The encoded knowledge as well as the human decision-maker rely on the case file and observations to consider relevant facts and track associated actions. Automation of case management processes will:

- Enhance the ability for business people to learn from case histories and make timely changes to a case management process model to evolve the process to be more prescriptive and repeatable
- Provide the means to ensure that appropriate records are maintained—a case file—for the history of the case and actions taken
- Provide for more timely initiation of appropriate action when relevant circumstances of a case change
- Provide for the application of regulations and policies at appropriate points in these ad hoc processes.

·Provide for the exchange of business process models that include case management constructs. A number of vendor products have addressed this need in proprietary ways. To the extent proprietary case management constructs are incorporated into BPMN process models, the models cannot be exchanged between tools, users are faced with multiple graphical representations and users will be restricted in their choice of modeling tools as well as runtime business process engines. This RFP is intended to resolve these interoperability concerns.

Common Variability Language (CVL) RFP with AB changes (document ad/2009-12-03)

The objective of this RFP is to enable the specification of the variability in product line models in order to support seamless product line modeling across the whole product line engineering process. This CVL RFP requests a specification language including a metamodel, semantics and concrete syntax for variability specification. Variability specifications shall relate to a base product line model that describes the whole product line and shall comprise: a variability model with the following elements: a model of possible choices and relationships between those choices and the base model resolution models which resolve variability (by a set of choices) and thus define specific product models. CVL shall support base models in languages that are defined by means of MOF-compliant metamodels, including UML and Domain Specific Languages.

Decision Model and Notation RFP (document bmi/2011-03-04)

This RFP solicits proposals for a standard Decision Model notation and metamodel and associated interchange format. Decision Models are developed to define how businesses make decisions, usually as a part of a business process model (covered by the OMG BPMN standard in Business Process Management Solutions).

Information Management Metamodel (IMM) RFP (document ab/2005-12-02)

This RFP solicits proposals for a standard metamodel to address the needs of Information Management. This includes the scope of the existing Common Warehouse Metamodel (CWM) standard but is extended to cover the following areas:

- MOF2 Metamodel for Information Management (IMM)
- UML2 Profile for Relational Data Modeling, with a mapping to the IMM metamodel and SQL DDL
- UML2 Profile for Logical (Entity Relationship) Data Modeling, with a mapping to the IMM metamodel
- UML2 Profile for XML Data Modeling, with a mapping to the IMM metamodel and XML Schema
- UML2 Profile for Record Modeling, with a mapping to the IMM metamodel and COBOL Copybooks
- A standardized 'Information Engineering' data modeling notation with a mapping to the IMM metamodel

MDA Tool Component RFP (document ad/2006-06-09)

This Request for Proposal (RFP) is one of a series of RFPs related to the development of the MDA Tool Component (MDATC) specification. The objective of this RFP is to provide a standard specification to define and package the material used to customize a tooling environment, in order to apply MDA to a specific domain or context. This packaging unit is called "MDA Tool Component". In support of this objective, the RFP solicits proposals for a specification of the definition and packaging aspects of MDA Tool Components

Management of Regulation and Compliance (MRC) (document bmi/2009-09-24)

Most businesses have to comply with regulation. This requires more than simply applying regulations "as they come". People in those business have to decide what their enterprises need to do in order to comply. They need software tools to support them in: 1. Interpreting what regulations mean to their enterprise; 2. Assessing the impact of the regulations on the enterprise's policies and operations; 3. Deciding how to react (and documenting why), and distributing policies and guidance for compliance; 4. Demonstrating that compliance policies are being followed across the enterprise and that they are effective. The objective of this RFP is a specification from which such tools could be developed. The RFP solicits proposals for the following:

- A metamodel of interpreted regulation and compliance actions, with a supporting vocabulary.
- A specification for interchange of model instances, i.e. for interpretations and compliance actions for instances of regulation

UML Profile for BPMN Processes RFP (document ab/2010-06-01)

Architects supporting defense and business communities using a UML-based tool chain would like to use BPMN for modeling processes within that chain. This requires using UML diagrams and BPMN process diagrams seamlessly together, along with an interchange format that can convey the combined usage, within UML tools. To enable users to visualize UML models with BPMN process notation, this RFP solicits proposals for the following: To define a UML profile for BPMN that 1) uses the semantics defined in BPMN 2; 2) provides a mapping between BPMN semantics and the profiled UML semantics; and 3) defines XSLT transforms between the UML XMI for the profile and the BPMN 2 XSD, and vice versa, as well as QVT transforms between the UML and BPMN 2 metamodels. The profile must be a UML-based abstract syntax for BPMN process notation as it is defined in BPMN 2. The transforms are between the profiled UML metamodel and the BPMN metamodel. The RFP is not asking for changes to BPMN (notation, metamodel, or semantics). The scope of this profile covers elements and relationships in the BPMN that cover Process Modeling and Process Execution conformance types, including the Descriptive, Analytic, and Common Executable conformance sub-classes. Other BPMN conformance types are out of scope for this RFP.

UML Specification Simplification RFP (document ad/2009-12-10)

The purpose of this RFP is to provide a viable foundation upon which the OMG can address existing known UML issues and any that might be discovered. This RFP is intentionally constrained to establish this basis rather than attempt to address the broader

issues identified in the RFI submissions using the current specification, or to create the required foundation and address significant UML reorganization and refactoring at the same time.

Value Delivery Metamodel (VDM) RFP (document bmi/2009-03-09)

This RFP solicits proposals for a metamodel specification for modeling customer value delivery, based on the concept of a value chain. A value chain, as originally defined by Porter, “disaggregates a firm into its strategically relevant activities in order to understand the behavior of costs and the existing and potential sources of differentiation”. According to Porter, a Value Chain is composed of a set of Value Activities, “the physical and technologically distinct activities that a firm performs”, and Margin, “the difference between total value and the collective cost of performing the value activities” (see reference 1). A primary value chain represents a chain of activities that contribute directly to delivery of end-customer value. Other value chains exist within the enterprise (support services) to produce value for internal customers. There are typically are multiple value chains for different products or lines of business. Consequently, each value chain is a use-case of enterprise capabilities required to produce a desired customer value. A value delivery model will include multiple value chains that may include participants in an extended enterprise and represent the sharing of capabilities across multiple value chains. The Value Delivery Metamodel shall

- Provide support for high level abstractions that meet the needs of top management for strategic planning, including aggregation of cost, quality and timeliness measures for product or line of business value chains.
- Provide support for analysis of value chain activities to understand the detailed costs, quality and timeliness in the context of customer value delivery and to associate market differentiators with the capabilities that achieve those differentiators.
- Establish the linkages between value delivery activities and organizations unit (s) identifying the various roles those organizations play in relationship to those activities.
- Support identification of business capabilities that may be consolidated as shared services or engaged as alternative sources.
- Enable exchange of value delivery models between different modeling tools.
- Establish a linkage between comparative differentiators and appropriate elements within the Business Motivation Model (BMM)
- Establish a linkage between competitive strategies and appropriate elements within the Business Motivation Model Value chain modeling is essential for understanding and managing a SOA because services are engaged in multiple business contexts, and their impact on these different contexts must be considered in the design of the service and its performance characteristics. The availability of a standard value delivery metamodel will advance the state of the art in business modeling, supporting more effective planning and analysis of enterprise operations. A standard model will enable tool vendors to develop more sophisticated modeling and analysis techniques and will enable users to migrate to the tools that best address their needs. This RFP does not require a normative notation or form of expression for value delivery models since the specifics of value delivery views may evolve, and product differentiation will promote the development of innovative views in different modeling tools.

A Definition to Close on

Design for Six Sigma

Design for Six Sigma (DFSS): is a separate and emerging business-process management methodology related to traditional Six Sigma. While the tools and order used in Six Sigma require a process to be in place and functioning, DFSS has the objective of determining the needs of customers and the business, and driving those needs into the product solution so created. DFSS is relevant to the complex system/product synthesis phase, especially in the context of unprecedented system development. It is process generation in contrast with process improvement.

Source: http://encyclopedia.thefreedictionary.com

Design for Six Sigma (DFSS): A methodology for designing business processes based on the needs of the business and the customer, using techniques and approaches developed for the Six Sigma process improvement system. Design for Six Sigma uses a process generation approach consisting of Defining, Measuring, Analyzing, Designing, and Verifying (DMADV).

Source: http://www.businessdictionary.com

PPI News

PPI's Newly Announced Public Course Delivery

PPI is excited to anounce the delivery of our Requirements Analysis & Specification Writing 5-Day Course & Workshop in Fremantle, Western Australia.

The beautiful maritime community is approximately 23kms (14 miles) from Perth, the capital city of Western Australia. This is our first course to be held here and the venue for the course will be the Mussel Bar, located directly over the water in Fremantle's famous fishing boat harbor.

Click here for more information on the course

Click here for more information about Fremantle, WA

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

Systems Engineering Public 5-Day Courses

Upcoming Locations Include:

- London, UK
- Stellenbosch, South Africa
- Las Vegas, USA
- São José dos Campos, Brazil
- Singapore

Requirements Analysis and Specification Writing Public Courses

Upcoming Locations Include:

- Fremantle, Western Australia
- Melbourne, Australia
- Amsterdam, The Netherlands

Software Engineering Public 5-Day Courses

Upcoming Locations Include:

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

OCD/CONOPS Public Courses

Upcoming Locations Include:

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

Cognitive Systems Engineering Courses

Upcoming Locations Include:

- Adelaide, Australia

- Las Vegas, USA

PPI Upcoming Participation in Professional Conferences

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

- NZDIA 2011 | Exhibiting | Wellington, New Zealand (15 - 16 November)
- I/ITSEC 2011 | Exhibiting as part of the Team Australia booth | Orlando, FL USA (28 Nov - 1 Dec)
- INCOSE IS 2012 | Exhibiting | Rome, Italy (9 - 12 July)

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