NEWSLETTER

Los Angeles Chapter of INCOSE
www.incose-la.org
Vol 2: Issue No. 3 Apr, 2004

COMING EVENTS

2nd Annual Collaboration
University of Southern California, Stevens Institute of Technology and LA Chapter of INCOSE

April 15-16, 2004

Conference Theme:

Definition of the frontiers of systems engineering research and applications in new directions to provide the robust development and management of future complex systems.

Location
Los Angeles, California
USC Campus

www.usc.edu/dept/engineering/cser

Dinner Meeting
May 11, 2004

Strategy for Implementing a Systems Engineering Process: Embedding Systemic Accountability in an Executable Model of the PMI PMBoK

Alison Boardman
Elipsis Inc.

Location
The Aerospace Corporation

Tutorial
June 5, 2004

Basic Systems Engineering Theory and Practice
Scott Jackson

Location
Radission Hotel at the LA Airport

The INCOSE Technical Vision: The Drivers

Scott Jackson

At the INCOSE International Workshop in Portland, Oregon in January a large roomful of 37 INCOSE members gathered to discuss the questions: What is the current state of the art of systems engineering (SE)? What changes have occurred over the past 10-15 years? What are new and emerging SE drivers and technologies? What will SE look like in 2010? and What will SE look like in 2020? This discussion was led by Harry Crisp and Donna Rhodes, the latter being a past president of INCOSE. Working groups were formed to discuss such topics as Systems Enterprises and Environments, that is, the practice of SE in specific application domains; standards, education and research; system development; and systems architecture. Harry and Donna will provide a report on our conclusions at the INCOSE International Symposium in Toulouse in France in June.

The groups did agree on one thing, namely, that SE is not a static discipline and it will change. Secondly, there was a remarkable degree of agreement among the groups about the forces that will cause SE to change. I will speak mainly from the point of view of my group, the Enterprises and Environment Working Group, but much of what we concluded was common to other groups.

Most of us are aware of the issues being debated within the SE world. Some of these may wind up leading to specific changes. These questions include: Will Object Oriented (OO) SE ever replace structured SE? Will model based requirements completely replace textual requirements? Can human-intensive systems be treated in the same way as hardware and software systems are treated? When is the incremental approach more appropriate and when is the spiral approach more important? Is bottom-up SE ever valid? Will systems and software engineering ever come together and form a single process? These are just a few. You can probably think of your own questions. I will try to provide just a summary of some of the points and conclusions.

Systems Engineering in the Workplace. We concluded that as of today the infrastructure for accomplishing SE in the workplace was not mature and that the integration of and the interrelations between SE, design engineering, program management, and engineering specialties was a necessity.

Global Impacts. Globalization is presenting a challenge to SE in two ways. First, more systems are being deployed globally, both military and commercial. This deployment and the associated interaction among systems is causing increased interest in and us of the system of systems (SoS) concept. Secondly, there is increasing globalization of development. The latter presents a particular challenge to SE in that the geographical dispersion of designers makes communication and cooperation difficult, essential elements in SE.

The PESTEL Impact. It is increasingly recognized that SE will have to deal with factors that are not strictly hardware and software. These factors are often called the PESTEL factors. PESTEL stands for Political, Economic, Sociological, Technological, Ecological and Legal. Although it is recognized that people are integral parts of systems, the methodology for dealing with people as components is not mature. INCOSE has a working group called the Intelligent Enterprise Working Group under Jack Ring, who recently conducted a seminar for the LA Chapter on this subject. The team also added psychological effects to the list, another difficult subject.

Challenging Systems. Systems are increasingly being asked to do more difficult technologically challenging things. The planned Mars exploration is an example. Will the existing SE process be capable of meeting that challenge? This is the question that needs to be explored. Another challenging aspect is the predictability of technology transition. New technologies are appearing at an increasing rate, and their appearance is often a surprise. Given the SE emphasis on planning, incorporating these technologies will become increasingly difficult.

System Vulnerability. Large, complex systems are increasingly vulnerable to many forces. Terrorism is the most obvious of these forces. In addition to terrorism, we have seen several large systems in the space, aircraft and energy domains succumb to their own internal frailties. Will SE provide the solution to this vulnerability? Will including the PESTEL factors make systems less vulnerable? The challenge is there, and SE must step up to the plate. The INCOSE Anti-Terrorism Working Group is addressing this challenge as we speak.

Demands on Systems. The team noted many demands on systems that, to put it mildly, put a stress on the SE process. Following are a few:

- Systems must be more user-friendly and require less training
- Systems must be deployed faster
- Systems require more automation and less intervention by humans
- Systems must be smaller (miniaturized)
- Systems must be disposable and environmentally friendly
- Systems must be modular
- Systems must be capable of using off-the-shelf components

Given the fact that traditional SE is seen as an "incremental" process, these demands will challenge the process.

SE Process Requirements. So how will SE have to change to meet these challenges? Here are a few ways the team identified:

- The new SE will have to be more rigorous. This rigor is particularly important in requirements management, risk management, verification and validation.
- The new SE will be fully integrated with program management, technology management, design engineering and detailed disciplined.
- The new SE will have a reduced process time without reducing rigor.
- The new SE will have a significantly increased scope to include such factors as psychology and sociology of personal interactions, decision making, and global effects. The increased scope will include increased emphasis on operations in addition to the traditional emphasis on development. The new SE will be capable of being practiced in the R&D environment.
- The new SE will have an increased emphasis on decision making methodologies.

What did some of the other teams conclude? Here are some samples:

- The ***Standards Focus Team*** concluded that, in addition to the other products, INCOSE will take the lead in providing standards for SE.
- The ***Education and Research Focus Team*** saw systems engineering becoming a true interdisciplinary study with strong technical foundations.
- The ***Architecture Focus Team*** saw the SE discipline expanding far beyond the current focus into more enterprise architectures.
- The ***System Development Focus team*** saw the development of distributed semantic models for specific technical domains with models for organizations, elements of society (industries, health care, economics and world trade).
- The ***Systems Management Focus Team*** saw the development of management process models used to optimize project life cycle, acquisition and support strategies and allow dynamic re-planning in real time.

Summary: The above is only a sample of the one-day brainstorming in Portland. It is by no way complete. There is a lot of work left to be done. You may have your own thoughts on how SE should change. As part of INCOSE, you will have that opportunity.

CONFERENCE ON SYSTEMS ENGINEERING RESEARCH (CSER)

Second Annual USC/Stevens-Tech Collaboration
Co-Sponsored by Los Angeles Chapter of INCOSE
Supported by NDIA, IEEE Aerospace and Electronic Systems Society

April 15,16, 2004
USC Campus, Los Angeles, CA

Example - Plenary Speakers

Max Nikias (USC Dean of Engineering), George Korfiatis (Stevens Institute Dean of Engineering)

Joseph Bordogna (Deputy Director NSF):
SE directions at National Science Foundations

Alex Levis, (AF Chief Scientist)
SE research at the AF Research Labs

Andrew Sage,(GMU):
Viewpoints from the Systems Engineering EIC

Barry Boehm (USC):
the crucial SE/ Software intersection

Eberhardt Rechtin (USC),
on systems architecting perspectives

George Friedman (USC):
Towards a Grand Unified Theory of SE

Thaddeus Sandford, (VP Engineering,
The Boeing Company Integrated Defense Systems)

Mark Wilson, (Director of the AF Center for Systems Engineering)
Robert Rassa,
(Raytheon and NDIA)
more...
http://usc.edu/dept/engineering/cser

Dinner Meeting
Tuesday, May 11, 2004

Location
The Aerospace Corporation

Time
Networking 5:30 pm
Speaker 6:30 pm

Cost
Members Free
Guests $10.00

Strategy for Implementing a Systems Engineering Process: Embedding Systemic Accountability in an Executable Model of the PMI PMBoK
Alison Boardman
Elipsis Inc.

ABSTRACT: The need to system engineer a good idea for a product, in order to realize that product in the market place, is taken for granted. The need to have a plan to do this is also recognized. However, the need to apply the same systems engineering discipline to the realization of the plan as to the product is not a commonly held view. The Project Management Institute (PMI) Project Management Body of Knowledge (PMBoK) provides a well-structured and commendably systemic description of the processes for project governance.

This presentation will include a summary of work being performed by Elipsis Inc., in collaboration with PMI, to develop structured process models representing a subset of the PMBoK. The resultant discussion is intended to enable an INCOSE/PMI assessment of interest in developing a complete PMBoK process model set that could be used as a template design for process-based project plans.

BIOGRAPHY: Alison Boardman attained her Bachelors degree in Applied Physics in 1987 and gained her formative experience working for Marconi Underwater Systems in Hampshire. A variety of experiences led to a keen interest in helping others to understand the product lifecycle in terms of systems engineering and project management processes. Since 1991 Alison has combined research and consultancy contracts to develop and apply techniques for people-centered business process analysis, modeling, and improvement. She completed her PhD from this work in 1997. Alison's training and consulting assignments include services to Pall Europe, BAe Airbus, various Marconi businesses, DERA, National Air Traffic Services, the RAF, and the Bank Relationship Consultancy. Alison is the Managing Director of Elipsis Inc., which makes the process-modeling software PET (Process Envisioning Tool) and companion tools that can be seen on www.elipsis.com. Elipsis has recently moved their center of operations from Southhampton, UK, to Tampa, Florida.

RESERVATIONS: You must RSVP to attend, NO EXCEPTIONS. RSVP via the INCOSE-LA website (www.incose-la.org) or to Paul Su (paul.k.su@aero.org, 310-336-2602) by May 7 if you are a US citizen, or by May 4 if you are NOT a US citizen.

ADDITIONAL INFORMATION: Additional details can be found at the INCOSE-LA website (www.incose-la.org).

Tutorial
Saturday - June 5, 2004
Location - Radisson Hotel at Los Angeles Airport

Basic Systems Engineering Theory and Practice
Scott Jackson -The Boeing Company

This tutorial goes beyond the basic introductory systems engineering courses to examine the basic axioms, that is, the self-evident truths, that are the basis for systems engineering practice. Scott has collected these axioms from various texts and his own personal experience to structure his review of basic systems engineering.

He then shows how these axioms translate into industrial practice with an emphasis on aircraft design and modification, which is his specialty. Topics covered include: the concept of the system, system architecture, the systems engineering process, system functions, requirements development and management, system synthesis, verification and validation, decision analysis, interface management, risk analysis and management, affordability, technical performance measures, and systems engineering management.

The theme is that basic systems engineering is based on the premise that systems can be characterized as hierarchical structures that are developed simultaneously as the system progresses through both the layers of this hierarchy and the phases of development. This progression can also be characterized as evolutionary as requirements develop from unverifiable stakeholder needs to detailed component requirements.

He shows how functional analysis fits into the systems engineering process as both the basis for the synthesis of the design architecture and also the foundation of performance requirements. He shows how project management fits into systems engineering by mapping the product hierarchy into both the organizational hierarchy and the planning process. Scott also emphasizes the broader view of the system, that is, the system that also includes humans.

Modern systems engineering addresses what are known as enabling systems, that is, those systems that perform development, support, production, testing, training, deployment, and disposal.

Scott also emphasizes the importance of risk management. Risk, it is said, is to a systems engineer as failures are to a reliability engineer. Although cost is often considered a “programmatic” subject, Scott considers cost to be just as important a design driver as technical requirements. He also discusses the trends in systems engineering to show where the discipline may be going in the future. In short, Scott considers systems engineering to be a dynamic and evolving discipline. It may stimulate you to be the catalyst for the future of systems engineering.

This tutorial is intended both for the new systems engineer who is looking for insight into the process and also for the experienced systems engineer who is interested in examining the basis for the discipline.

Scott Jackson is an Associate Technical Fellow in Systems Engineering at Boeing in Long Beach, California. He also teaches in the master’s program in Systems Engineering at the University of Southern California (USC). His book Systems Engineering for Commercial Aircraft was published by Ashgate Publishing Limited in the UK (1997). He has been an INCOSE member since 1993 holding the position of chair of the Systems Engineering Applications Technical Committee (SEATC). He is also a member of the INCOSE Joint Air Transportation Working Group (JATWG).

INCOSE News

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The International Council on Systems Engineering (INCOSE) is an organization formed for the purpose of advancing the art and science of systems engineering in various areas of the public and private sectors. The Los Angeles Chapter meets several times per year for dinner meetings, and additionally sponsors tutorials and other activities of interest to those in the systems engineering field or related fields. L. A. Chapter Officers are as follows:

2004 Officers and Board

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