Standing on the Shoulders of Giants

Ann Hodges, Chapter President, Sandia National Labs

When I start a systems engineering effort on a project, I start with a stakeholder analysis. As part of this activity, I seek to understand what stakeholders' wishes and needs are beyond just the product itself, to include the product development effort. From this I can determine what set of standards and practices will resonate best with their wishes and needs, and tailor accordingly. Determining the right level of rigor is key, given the consequence of failure if the product doesn't meet mission requirements and project and product characteristics that increase the likelihood of problems.

Standards are typically developed and maintained by individuals with expert breadth and depth in the subject. Standards provide an opportunity to leverage the experience and knowledge of others, rather than hoping to reinvent something at least as good. One of my Newton-quoting colleagues called this "standing on the shoulders of giants." Another source of leverage takes advantage of lessons learned – both within the organization and by researching similar situations elsewhere.

Perhaps the most rewarding opportunity for "standing on the shoulders of giants" occurs in professional society talks, where accomplished practitioners and researchers speak of their understandings in ways seldom revealed in whatever writing they may have done. The breadth of experience and knowledge available face-to-face at the

Google image, original source unknown

annual INCOSE International Symposium often poses decision conflicts on who's multi-track talk I want to hear next. In contrast, our monthly Chapter meetings feature a single speaker, with time to evaluate and digest the relevancy of that knowledge before listening to another the following month. I am proud of the quality of talks we have been able to offer, and am humbled by the wealth of SE knowledge and experience shared each month. I make a point of suggesting and participating in the selection of speakers, to get exposure to the subjects I want to hear about, as well as talks I think would be of interest to the Chapter.

Chapter tutorials offer another way to get even more depth in subjects of interest. Upcoming in November, Dr. Eric Smith, from the University of Texas, El Paso, will delve into the topic of trade studies, with details covered elsewhere in this newsletter. Earlier this year, Dr. Scott Workinger provided two excellent back to back tutorials; one an Introduction to Systems Engineering and the other on Transformational Systems Engineering; with his presentation materials archived with prior tutorial on the Chapter's web site at www.incose.org/enchantment/learning.aspx.

What speakers and topics do you want to presented at the monthly meetings? What tutorial topics would you like next year? Send me an email at alhodge@sandia.gov and we'll try to arrange that.

On a more informal level we have an upcoming opportunity to "rub shoulders with giants" at our December Chapter social event, described later in this newsletter. There we can connect personally with other SE practitioners in the region, meet the Chapter's Board of Directors, and relax a bit before the holidays. So bring your "giant self" and a guest or two, and have some fun with your fellow SE giants. I look forward to seeing you at one of our Chapter events!   ∞
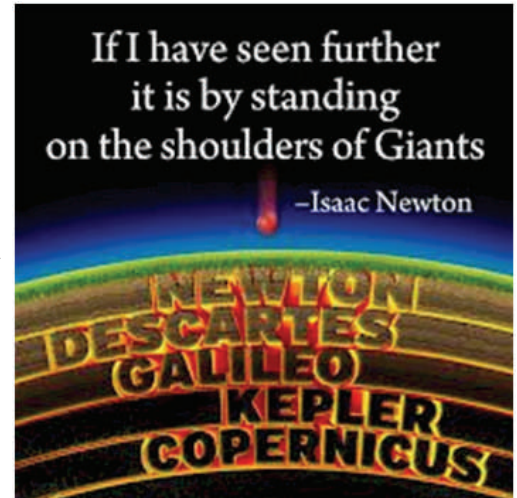
UTEP Student Chapter Initiative: Green Sustainability Projects

Aditya Akundi, Interim President – UTEP INCOSE Student Division, PhD student, Industrial & Systems Engineering Track

The main goal for the INCOSE University of Texas, El Paso (UTEP) Student Division this academic year is to actively involve systems engineering students at UTEP with increased exposure to different emerging fields of research, by inviting faculty from various departments of the college of engineering to present their research. Also, guest speakers from industries will be invited to talk on their experience and insight about real-time, industrial application of systems engineering concepts.

Currently, the UTEP Student Division, advised by Dr. Eric Smith, is active in helping students develop ideas for Green sustainable projects to be implemented at UTEP, submitting funding requests to the UTEP Green Fund Committee.

We are always looking for students who are interested in being part of the student division leadership. Elections occur each year in the early half of the Fall semester, in the presence of a quorum of students from the systems engineering program at UTEP. For more information about the student division and its activities, please contact me at sakundi@miners.utep.edu

[Editor's note: the author of this article is lead author of a paper about GRCSE at UTEP, the Graduate Reference Curriculum for Systems Engineering, a part of project BKCASE (Body of Knowledge and Curriculum to Advance Systems Engineering) governed by the Systems Engineering Research Center (SERC), INCOSE, and IEEE: Aditya Akundi, Eric Smith. 2013. A four-year experience with the graduate curriculum for Systems Engineering at UTEP and its convergence/divergence with GRCSE. ASEE Annual Conference. http://www.asee.org/public/conferences/20/papers/7004/download]   ∞

Fall Tutorial—Friday, 7 November, 9:00 am–2:00 pm
Tradeoff Studies, Techniques and Biases—Eric Smith
Workforce Training Center, 5600 Eagle Rock Ave. NE , Albuquerque, NM, Room 101

Trade Studies are broadly recognized and mandated as *the* method for simultaneously considering multiple alternatives with many criteria, and as such are recommended by several standard bodies including INCOSE and ISO/IEC 15288 Decision Management Process, and SEI's Capability Maturity Model Integration (CMMI) Decision Analysis and Resolution (DAR) process.

Tradeoff studies, which involve human numerical judgment, calibration, and data updating, are often approached with under confidence by analysts and are often distrusted by decision makers. The decision-making fields of Judgment and Decision Making, Cognitive Science and Experimental Economics have built up a large body of research on human biases and errors in considering numerical and criteria-based choices.

Relationships between experiments in these fields and the elements of tradeoff studies show that tradeoff studies are susceptible to human biases. This tutorial indicates ways to eliminate the presence, or ameliorate the effects, of mental mistakes on tradeoff studies.

You should attend this course if you:
- Are assigned to develop trade studies.
- Work on teams that integrate criteria to decide on alternatives.

Participants will receive:
- Instruction: A variety of creative and analytic tools will be introduced. Examples of pitfalls and practical challenges will be discussed in class.
- Course Notes: Each student will receive a set of course notes for reference.
- Practice: Students will have an opportunity to practice fundamental Trade Study skills in classroom exercises.

The course is aimed at:
- Engineers of all Disciplines.
- Managers.
- Leaders who need decision making skills to choose better alternatives.

By course end, attendees will be able to:
- Construct a basic trade study.
- Apply basic tradeoff skills.
- Recognize cognitive decision making errors.
- Know how to avoid common biases.
- Have an expanded awareness on avoiding mental mistakes in decision making.

Costs
- INCOSE Member $150
- Non- Member $200
- Student $0

Advance payment only, info coming in email announcement, or contact Mary Compton at mlcompt@sandia.gov

Eric Smith, Ph.D., is currently an Associate Professor at the University of Texas at El Paso (UTEP), a Research Associate of the Research Institute for Manufacturing and Engineering Systems (RIMES), a faculty member of the Industrial, Manufacturing & System Engineering (IMS) Department, and Graduate Program Director for the Systems Engineering Program.

He earned a B.S. in Physics in 1994, an M.S. in Systems Engineering in 2003, and his Ph.D. in Systems and Industrial Engineering in 2006 from the University of Arizona in Tucson, AZ. His dissertation research lay at the interface of systems engineering, cognitive science, and multi-criteria decision making. He taught for two years in The Boeing Company's Systems Engineering Graduate Program at the Missouri University of Science & Technology.

He has given invited talks at the Boeing Company, on the topic of risk management, and for a Multiple University Research Initiative (MURI), on the topic of ameliorating mental mistakes in uncertain and complex environments. He has worked with Lockheed Martin Corporation's summer internship and project practicum for systems engineering students.

His current research interests include complex systems engineering, risk management, and cognitive biases.

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Papers are now being solicited for the 2015 IEEE International Systems Conference (SysCon) to be held in Vancouver, British Columbia, Canada 13-16 April, 2015. View call for papers, detailed submission instructions, and a complete list of topics.

The conference will provide a venue to exchange innovative concepts, ideas, applications, and lessons learned:
- For industry practitioners, authors are invited to submit a descriptive abstract of at least 500 words in length.
- For academic submissions, authors are invited to submit extended abstracts which should be at least four pages in length, or, alternatively, the full paper.

Abstract Deadline: 1 Nov 2014. Acceptance Notification: 15 Dec 2014.
Final Paper Deadline: 15 Feb 2015.   ∞

Bob Pierson contribution, source unknown

Recent Meetings
Jennifer Turgeon, Sandia National Labs

July 2014—The Enchantment Chapter held its first Summer Social on July 9, at the Chama River Brewing Company in Albuquerque. The event, titled "Is the Glass Half Empty or Half Foam? The Art, Science, and Engineering of Beer Production," was attended by 40 of your systems engineering colleagues and their guests.

Unfortunately the brewers were not available to meet with us and take us on a tour. Chapter President Ann Hodges stepped in, an example of flexibility and agile systems engineering, and called on the home brewers among the attendees. She facilitated a lively discussion about beer production, including the process, materials, labeling, logging, and quality control (aka taste testing).

Then it was time for our own version of quality control. Interspersed with tasting four preselected beers, attendees munched on appetizers and socialized with one another

August 2014—Dr. Seth Harvey, Senior Aerospace Engineer for Intelligent Software Solutions, discussed conjunction analysis, a process that determines when two objects in space are at risk of colliding.

In 1970 there were 2,000 objects orbiting the earth including active satellites, dead satellites, rocket bodies, and launch debris. Today there are over 23,000 objects. That number is anticipated to grow to over 100,000 objects in the next five years.

Analysis determines the Euclidean distance between two points, but complexity grows significantly as objects are added.

Seth discussed a research effort started in 2010 to understand the root of the problem and expose commonality of the challenge with similar challenges in many other domains, like molecular science and the computer gaming industry; suggesting this perspective will shed new light on many other Space Situational Analysis (SSA) problems for which analysis has never before been possible. Presentation slides are posted on the Enchantment Chapter website.

September 2014—Rick Dove, INCOSE Fellow and CEO/CTO Paradigm Shift International, presented Agile Systems & Processes 103 – Fleshing out Architecture with Design Principles, Activities, and Closure. Rick first did a quick review of Agile 101 (architecture fundamentals) and Agile 102 (requirements fundamentals).

The Agile 103 presentation then explained that agility is enabled and maintained by a fundamentally necessary and sufficient common structural architecture in systems of all kinds; from agile development processes, to the agile systems and products that are deployed. He focused on the strategy of fleshing out an agile structural architecture, reviewing fundamental design principles that drive system functional processes, and a method that brings closure to the basic design concepts. Rick provided examples drawn from agile systems and from agile engineering processes in a variety of domains.

Presentation slides are posted on the Enchantment Chapter website.   ∞

Next Meetings
Unless noted otherwise, 4:45-6:00pm at ATA, 1300 Britt Street, SE, ABQ, and by Global Meet
Jennifer Turgeon, Sandia National Labs

Oct 8: Combating Uncertainty in the Workflow of Systems Engineering Projects
Barry Papke, Senior Systems Engineer and Project Manager, L-3 Communications
Abstract: Throughout the Systems Engineering Lifecycle events require personnel, systems, equipment, facilities and information to converge on time and at the right place in order to achieve a program objective. Unpredictability in any predecessor event can mean unpredictability for the overall project. The Last Planner is a production and planning method initially deployed in 1992 in the building construction industry as part of an effort to reduce work flow variability and improve production efficiency in the construction industry. The two key elements of the Last Planner are (1) a change in project management from a task-oriented to a work-flow oriented model and (2) processes to improve reliability of the workflow within the team or group performing the work. This paper examines the systems engineering lifecycle as a production lifecycle and explores the application of key elements of the Last Planner as a tool for system engineers to address uncertainty and unpredictability in the execution of a project.

November 12: INCOSE Systems of Systems Working Group – Current Activities and Plans
Judith Dahmann, Co-Chair INCOSE SoS Working Group, Senior Principal Systems Engineer at MITRE .
Abstract: Three years ago INCOSE created a Systems of Systems (SoS) Working Group (WG) to address the growing interest in the challenges and opportunities of applying systems engineering to SoS "a set or arrangement of systems that results when independent and useful systems are integrated into a larger system that delivers unique capabilities." This presentation will provide an overview of the objectives of the SoS WG and the set of activities the group has undertaken over the past three years to address these. Highlights include the development of a set of SoS Pain Points which characterize the challenges systems engineers face applying SE to systems of systems, monthly webinars on SoS related topics, updates to the INCOSE SE handbook to reflect current thinking in SoS SE, and an organizational survey on current SoS approaches and tools. The presentation will also provide information on current efforts and opportunities including support to development of a Getting Started in SoS SE Primer and updates to the SE Body of Knowledge (SEBoK) SoS knowledge area and the SoS Bibliography on the INCOSE SoS Connect Site. Finally, looking forward, the presentation will outline SoS WG plans for including plans for an SoS Research Roundtable at IW15, an SoS session at the IW15 MBSE workshop and an INCOSE INSIGHT Special Edition On SoS slated for October 2016 issue.

December 12: Networking Social - 6:00-9:00pm, El Pinto, 10500 4th St NW, Albuquerque, Griggs Room
No speaker, no Global Meet, but a crazy game to foster table conversation described on page 4.
Abstract: Cocktails at 6:00pm, dinner at 7:00pm. Bring a guest.   ∞

Chapter Member Heidi Hahn Teaches
LANL's Mission Assurance Support at Naval Post Graduate School

Heidi Hahn, Los Alamos National Lab

Greetings from the Enchantment Chapter's western-most outpost – the Naval Postgraduate School (NPS) in Monterey, CA! I am here for a four-month mini-sabbatical, kicking off a Los Alamos project that six Naval officers enrolled in the SE master's program will work on during the Fall and Winter quarters.

My work at Los Alamos National Laboratory (LANL) over the last few years has been focused on developing an enterprise-wide Systems Engineering Methodology for use by R&D engineers and applied scientists, as part of a larger Mission Assurance framework that encompasses SE, Project Management, and engineering quality and rigor.

Work to date has focused on publishing policies and implementation guides and developing and delivering related training. Tool support, especially with tools that help people determine "how much" SE to apply, has been negligible. This project, which is titled "Mission Assurance Support," is intended to help fill that gap.

The student design challenge is this: "Enable engineers and applied scientists who have little or no expertise in systems engineering to tailor and apply LANL's mission assurance processes (with emphasis on risk-grading, problem definition, and requirements capture and analysis) to R&D projects ranging from design of apparatus for bench experiments to demonstration of an actual system prototype in an operational environment."

Students will establish lines of inquiry that will facilitate a risk-graded approach to problem definition/requirements analysis and guide the delivery of engineered products with appropriate quality and rigor, meeting customer expectations.

They will use Design Thinking in their development (see Stanford website at: http://dschool.stanford.edu/use-our-methods/), starting with interviews of LANL stakeholders, including users, managers, and the Associate Directors who are the advocates of the Mission Assurance framework, to develop point of view statements that need to be satisfied by the final product.

We have no idea what the result will look like, but I'm sure that it will be creative! Look for progress reports in future chapter newsletters.

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Four of the six NPS students working on the LANL project, left to right LT Patrick Stone, LT Joe Stark, LT Shannon Buckley, Dr. Nancy Roberts (instructor for Design Thinking course; not involved with the project), me (in the doorway), and LT Ross Eldred. Project team members not pictured are LT Jordan White, LT Bob Smith, and Dr. Cliff Whitcomb (co-advisor on the project and SE Department Chair).

2015 Command & Control Research & Technology Symposium
with Track on Agile C2 Security—Abstracts due 28 November

June 16-19, 2015, Annapolis, MD. See call for papers at www.dodccrp-test.org/20thiccrtshome. Abstract due 28-Nov-2014, paper draft due 6-Feb-2015, final paper due 24-Apr-2015. The theme for the 20th International Command and Control Research and Technology Symposium is "C2, Cyber, and Trust."

See **Topic 11: Agile C2 Security**—This topic addresses the design, development and operation of composable, reconfigurable, and resilient security systems in C2 cyberspace. Chapter president-elect, Rick Dove, is track chair: dove@parshift.com. ∞

December 12 Social

Mary Compton, Sandia National Labs

This year's INCOSE Holiday Social will again be held at El Pinto Restaurant on 4th Street in Albuquerque's North Valley on December 12, 2014. Cocktail hour begins at 6:00 PM, followed by dinner, El Pinto's New Mexican Holiday Buffet, at 7:00 PM. A variation of the party game Apples to Apples will begin around 7:30 PM. Cost will be $25/person; INCOSE members will receive one drink ticket good for one house Margarita, wine, or beer. Additional details, including the menu and how to RSVP, will be sent in future emails from the Chapter.

Apples to Apples is a party game originally published by Out of the Box Publishing, and now published by Mattel. The object of the game is to win the most rounds by playing a "red apple" card (which generally features a noun) from one's hand to best "match" that round's communal "green apple" card (which contains an adjective) as chosen by that round's judging player. For a more complete description of the game visit: http://en.wikipedia.org/wiki/Apples_to_Apples.

For our INCOSE party version, the judgeship will rotate from table to table. Each table will get a set of "thing" cards that names familiar things e.g., "green chile," "SpacePort NM," "mariachis," "Susana Martinez," "RailRunner," and "the Roundhouse," etc. and topic cards that play (vaguely) off systems engineering themes like "well engineered," "reliable," "high power," "high risk," or "agile." Each table will choose which card to play for each round and the table that currently holds the judgeship will rule on the answers. ∞

On Discovering a Generic Agile SE Life Cycle Model

Rick Dove, Paradigm Shift International

This article condenses a Technical Project Plan submitted to INCOSE in September by the Agile Systems & Systems Engineering Working Group, to "discover" invariant fundamentals of a generic Agile SE Life Cycle Model (ASELCM). Participants and workshop sites in the US and UK will be sought starting late this year.

The Problem and Need

Organizations seeking agile SE approaches have many practices to choose from, little guidance on what must be considered to mix and match enticing elements from different practices; and no guidance on what is fundamentally necessary to have a process that is agile in more than name only.

A basic need is perceived to employ effective agile SE practices when the SE environment is uncertain, unpredictable, and/or evolving. Agile and lean software development project-management practices, principally exemplified as Scrum and Kanban approaches, provide enticing models not generally accepted or applicable for projects that include hardware development.

The Incremental Commitment Spiral Model (ICSM) (Boehm 2014) provides a broader and more fundamental-principle based model that can accommodate agile SE conceptually, but is not focused exclusively and fundamentally on the breadth and application of necessary and sufficient agile SE principles and practices, nor on guidance for mitigating the compromising reality forces at play in agile SE.

Objectives

- Discover generic principle-based life-cycle stages, processes, and activities that can be intuitively embraced and applied, rather than compromised by situational reality factors, to achieve both engineering and management necessary needs for dealing effectively with uncertain, unpredictable, and evolving SE environments.
- Cover four or five types of SE projects: discovery (verifying requirements and solution feasibility), programmatic (Systems and SoS from proven components), approach (e.g., ICSM methodology and product line architecture), quick reaction (rapid development and fielding), and evolving (continuous change of system operational viability and opportunity, rapid sequential generations).
- Recognize that multiple life cycle stages may be occurring simultaneously, particularly after initial deployment. Unlike a waterfall life cycle model, which puts emphasis on conditions for exiting a stage and moving to the next stage in sequence, an ASELCM will put emphasis on entry conditions necessary to trigger a decision to begin process activities within a life cycle stage.

Strategies

- The ASELCM project will be guided by ISO/IEC TR 24748-1:2010 and recognize six primary continuous and potentially simultaneous stages of process activity: Research, Concept, Development, Production, Utilization, and Support. A seventh terminal stage, Retirement, may also be considered if anything unique to agile SE is discovered during the project. Guidance will also be taken from ISO/IEC 15288 to specifically analyze the 18 Project and Technical Processes.
- Workshop hosts will provide discussion and presentation of one mature experience with an agile SE project for analysis, and a discussion/presentation of one SE approach in need of more agility to fuel a synthesis exercise based on accumulated discovery learning.
- Traveling Participants (names TBD) will likely include a sizable number of open-call volunteers limited to 10 per workshop, with each participant required to attend a minimum of 3 workshops.
- With a structured analysis approach, analyze experience from employed agile SE practices in both defense and commercial SE projects that involve combined aspects of software and hardware, and perhaps wetware (management, engineering, operator, maintainer) development. Note that management includes both supplier and acquirer project management aspects.
  - Discover and justify (with "why" reasoning) common necessary and sufficient SE needs and reality factors independent of what agile SE practice may be entrenched, favored, under consideration, or subsequently adopted.
  - Discover and justify (with "why" reasoning) principle-based stages, processes, and activities that satisfy the ASELCM-project objectives.
- With a structured synthesis approach, apply discovery and provide benefit to workshop hosts and participants with an application of accumulated learning to a relevant host opportunity or problem.
- Initial workshop structure, analysis tools, and synthesis tools will be guided by a prior discovery-workshop series conducted in the '90s that discovered fundamental architecture and design principles necessary and sufficient for agile systems (processes included). Analysis will include Response Situation Analysis tools and the Agile Architecture Pattern tool (Dove 2014). Synthesis tools will include the analysis tools and the accumulated discovery learning.
- Outcome for host sites: a deep understanding of necessary and sufficient fundamental principles and justifications for agile SE life cycle model processes and activities applicable to any type of Agile SE process for any type of project. An analysis of an existing host agile SE process relative to a host-experienced agile process. A synthesis of project-independent analyzed learnings applied to an insufficiently agile process situation in need of some organized thought. An insightful understanding and competency developed among at least a few host participants for subsequent internal leadership.

Inquire about hosting and participation to rick.dove@parshift.com

References

Boehm, Barry. et al. 2014. *The Incremental Commitment Spiral Model: Principles and Practices for Successful Systems and Software*. Addison-Wesley.

Dove, Rick and Ralph LaBarge. 2014. Agile Systems Engineering Part 1 and Part 2. INCOSE IS14, Las Vegas, NV, 30Jun-3Jul.   ∞

Resources

From TED: Susan Savage-Rumbaugh reveals "The gentle genius of bonobos." Her bonobo apes understand spoken English, interact, and have learned to execute tasks once believed limited to humans - such as starting and controlling a fire. They aren't trained in classic human-animal fashion. Like human children, the apes learn by watching. "Why should I have to know how I teach Kanzi language? I just act normal around him, and he learns it." Video at:
www.ted.com/talks/
susan_savage_rumbaugh_on_apes_that_write

From TED: Richard Preston with a unique video showing "The Mysterious Lives of Giant Trees." Preston takes you inside the redwood canopy as one of the only humans to have climbed Hyperion, a nearly 380-foot redwood tree that is the tallest living thing on Earth. www.ted.com/talks/richard_preston_on_the_giant_trees

From TED: Avi Reichental with "What's next in 3D printing", the best (and short) 3D printing coverage I've ever seen. www.ted.com/talks/
avi_reichental_what_s_next_in_3d_printing

Watch this: Richard Feynman's legendary course presented at Cornell in 1964: The Character of Physical Law. Seven videos at: www.openculture.com/2012/08/the_character_of_physical_law_richard_feynmans_legendary_lecture_series_at_cornell_1964.html

Watch this: Dean Leffingwell. a voice of wisdom, presents his "Agile Portfolio Management in the Scaled Agile Framework" at:
www.youtube.com/watch?v=_y7ildmS54U.

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New Chapter Members
Mary Compton, Sandia National Labs

Enchantment Chapter now has 103 active members and student members. We would like to welcome the following new INCOSE members to Enchantment Chapter:

Lora Bonano	Sandia National Laboratories
Meeshell R. Duran-Rimi	Booz Allen Hamilton
Brian Miller	Sandia National Laboratories
Krisan K. Smith	Sandia National Laboratories
Loren J. Updegraff	Sandia National Laboratories
Eva T. Wallace	Sandia National Laboratories

The Enchantment sponsored Student Chapter of the University of Texas at El Paso currently has 8 active members and no new members

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Connect to Your Community of Practice

Chapter meetings with a focus on systems engineering are held monthly on the second Wednesday, except in December. The December meeting is an annual social event, with mingling, dinner, and a speaker chosen for enjoyment by systems engineers and guests alike.

Monthly meetings feature speakers from out-of-town as well as local subject matter experts on topics of relevance.

On occasion special facility tours are arranged, sometimes as the monthly meeting, and other times on a separate schedule.

Chapter meetings begin at 4:45 pm. After chapter news, announcements and introductions, the presentation and discussion generally lasts until 6:00 pm, carried on GlobalMeet for anybody to access who can't attend in person.

Tutorials with coverage on topics of interest are arranged approximately twice a year. Delivered by experts in the field, tutorials range from 1/2 day to day+ durations, and generally involve a tuition.

Mix with people who have the same professional interests as you do, but with a diversity of perspective beyond daily workmates. It comes in handy when you need help or answers to questions outside your accumulated experience, need a connection at another organization, or simply want some mind stretching thought.

Meeting announcements, event notices, and GlobalMeet links routinely go to all INCOSE members within the Chapter's geographic territory; as well as to names on a special *information* list open to one and all. Sign up for the *information* list with a request to the Chapter secretary listed below.

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Chapter Board

Ann Hodges	President	505-844-6284	alhodge@sandia.gov
Rick Dove	President Elect	575-586-1536	dove@parshift.com
Ricardo Pineda	Past President		
Mary Compton	Treasurer	505-845-9268	mlcompt@sandia.gov
Jeni Turgeon	Secretary	505-553-4554	jturgeo@sandia.gov
Regina Griego	Director	505-844-7238	griegor@sandia.gov
Mike Gruer	Director	505-828-5656	mike.gruer@honeywell.com
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Bob Pierson	Director	505-767-1210	pierson@aptec.com
Eric Smith	Director	915-747-5205	esmith2@UTEP.edu
Tom Tenorio	Director	575-322-4123	tenoriot@gmail.com