



# Midwest Gateway Newsletter

## International Council on Systems Engineering

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### *President's Corner*

*Dear Midwest Gateway  
INCOSE Members*

As we near the end of March 2007, I want to thank our members for their participation in our membership meetings thus far. Dr. Dagli's talk in January on Methodologies for Understanding Systems of Systems was very well attended and we had an enthusiastic group for Ralph Lambert's February talk on Applying Systems Engineering on a FIRST Robotics Team Effort. Once again, I want to encourage our membership to feel comfortable volunteering either ideas for future meeting program subjects or to participate as a meeting program presenter.

I am working on some material for an April membership meeting on the DoD Approach to Acquiring Systems-of-Systems and we have a potential speaker on Model-Based Architectures for a May meeting. Please continue your outstanding participation.

Mason Myers,  
Chapter President  
Midwest Gateway INCOSE

### *Systems Engineering: It Can Happen Anywhere*

*By Marcos Chu, Outreach Chair*

December 26, 2006 I am sitting at a table in the second level of the American Center talking to Pastor Jim from Yuba City, CA. We were waiting for the parking lot volunteer training to start when three college students from Virginia sat down next to us. Pastor Jim and I introduced ourselves and one of the students mentioned she was studying to become a systems engineer. As an INCOSE member, the next question I inevitably ask is "Have you ever heard about INCOSE?". I was excited to hear that yes, she had not only heard about INCOSE but plans to join in the future. It was great to attend Urbana 06 ([www.urbana06.org](http://www.urbana06.org)) event at American Center where over 22,000 gathered to worship God. This opportunity came about thanks to our own INCOSE member Jon Wang. Jon is a former Boeing Systems Engineer who resigned from his job to join InterVarsity full time ([www.intervarsity.org](http://www.intervarsity.org)). InterVarsity is an organization that hosts and organizes Urbana every three years. Staff at Urbana manage and integrate hundreds of seminars, exhibits, an enormous bookstore, stage production work, video webcasting, a daily paper publication, small group leader training & facilitation, volunteer coordination to name only a few. In order for the event to be a success - everything must be focused to communicating one strong message to the students about the

(see *It Can Happen...* on page 2)

### *Getting Your Voice Heard*

*By Bob Scheurer, Past President  
Midwest Gateway INCOSE,  
INCOSE Member Board Rep.,  
Region I*

Since its inception in 1990, INCOSE has upheld the belief that its primary source of strength lies in its membership. As a result, the INCOSE Member Board's essential purpose is the "Voice of the Member" inside the otherwise formal Board of Directors. As the new representative for one of the six international regions of INCOSE (Region 1 – from Missouri to US points North and West, incl. Canada & Alaska), I want to provide you periodic insight and feedback into the inner-workings of INCOSE and hopefully point out some of the "hidden value" of your membership.

At the International Workshop held recently in Albuquerque, N.M., the Board discussed the following three elements of its mission: 1) Member Experience, 2) Vibrant Chapters, and 3) Enhanced Communication. With any sizeable organization, these areas are essential for success but usually have much room for improvement.

INCOSE works hard at the member experience by holding annual symposiums, yearly workshops, issuing publications, and offering opportunities for learning more

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## *UMR forms a Student Division of the Midwest Gateway Chapter of INCOSE*

The Student Division of the Midwest Gateway Chapter of INCOSE was formed by the mutual agreement of 10 attending students on February 7th, 2007. Officers were elected, including President John Fiore, and plans were made to immediately write a constitution in order to be a recognized student organization at the University of Missouri - Rolla.

The Division is planning two more meetings for the semester, and is inviting Brian Beyer, the MG Chapter Ambassador to the Student Division, to be a guest speaker at one of the meetings.

The Division had previously sent an informal delegation to attend a MG Chapter meeting, and may do so in the future, as it values its connection to Boeing."

We are awaiting our Division Banner, and the opportunity to take a group picture in front of it!

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## *Planning – Discovering What Needs to Be Done*

*By Bill Schoening, Past President Midwest Gateway Chapter INCOSE*

Programs sometimes have to redo work performed at the beginning because they had the wrong people or they began before the requirements were settled or they just misunderstood what needed to be done. Executives have often pointed at poor planning up front as the main culprit. How is it that we can pride ourselves on good planning processes and techniques when there is evidence that we don't plan well? Part of the answer seems to be that we are good at planning what we know and understand while we are not very good at planning things we don't yet know or don't understand very well. Planning what is currently unknown or is highly ambiguous requires the planner to explore; it is a voyage of discovery. This note looks at how to make that voyage easier and more productive.

Developing dates for major reviews, delivery dates of intermediate work products (particularly deliverables other than designs or end products), and preparing organization charts is all about planning the things we know. We have experience and know what needs to be done in the middle and latter stages of System Development and Demonstration, but earlier in the development life cycle the activities and tasks steps are much less certain or even unknown. To be more effective planners we need to augment (not replace) the techniques we use for planning.

Discovering what needs to be done is relatively straightforward once you know a couple of tricks. Since the main purpose of requirements reviews and design reviews is to make major decisions and since

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## *It Can Happen...*

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importance of living your life for God and not just yourself. This is what I like to call a "System of Systems". I have learned from this experience that system thinking and systems engineers are everywhere. This point was brought home to me when I was reading the book "Growing Healthy Asian American Churches" by Peter Cha, S. Steve Kang and Helen Lee while attending the conference. On page 90 it makes a reference to Peter Senge's book, "The Fifth Discipline", in

regards to handling conflicts in a team environment.

The last week of December at Urbana06 was a great learning opportunity for me. As a new organization practitioner I am discovering that learning is a continual process where opportunities can come from anywhere at anytime. Feel free to contact Marcos at [marcos.chu@incose.org](mailto:marcos.chu@incose.org) if you have a story of how systems engineering and thinking is part of your life that you would like to see published in a future issue of this newsletter.

*Jon Wang contributed to this article.*



*Urbana 06 at the America Center*



## Planning – Discovering...

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decisions are just answers to significant questions, it should come as no surprise that the decisions that need to be made and the questions that need to be answered are very helpful for establishing good plans, even under the most ambiguous and uncertain circumstances.

Brainstorming a list of questions or decisions is fairly easy. The next step is to organize them into some useful form. In most instances, the questions (or decisions) can be arranged chronologically with the ones that can be answered early on to the left with the ones to be delayed (usually because of dependency on the answers to earlier questions) stringing out to the right. In addition, the questions or decisions are likely to fall naturally into those that are high

level and those that are more detailed and support the higher level questions and decisions. (I like to arrange them with post-it notes on a wall.) The evolving plan centers on what needs to be done to answer the questions and make the decisions.

How do you get comfortable with this approach so you can use it on your program the next time you have to plan? I strongly suggest that you find some planning activity in your personal life and identify the questions that must be answered and the decisions that must be made. Think about planning the activities related to preparing for your next vacation. Start by making a list of questions that need to be answered:

Where are we going?

When are we leaving?

How much do we have to spend?

Do we need a visa?

Who will keep the dog? When will we drop off the dog? Who provides the dog food?

What clothes should we take?

Do we need a car?

Should we make reservations? Or just find a place to stay each night as we go along?

How much Turkish do we need to be able to speak?

Do we need traveler's checks? How accessible are ATMs?

How will we exchange money?

Many of these questions will require decisions, and you will discover more questions as you continue to explore. As a general rule, people tend to be most comfortable with making lists of questions if the problem has considerable ambiguity and uncertainty. On the other hand,

people tend to be more comfortable with lists of decisions to be made if there is less ambiguity and uncertainty. My experience suggests that you will discover a comfortable middle ground for a particular situation fairly quickly. Don't try to force all questions or all decisions. There is very little difference in the end.

Questions and decisions both lead to risks that must be handled and included in your plans. However, brainstorm the questions and decisions and begin organizing both before jumping into the risks. The questions and decisions will help you formulate the important risks.

Effective planning requires that you discover and explore what you don't know or don't understand. If you are not discovering things about what you are trying to plan, then you are probably producing a high-risk plan because there are many unrecognized questions.

Practice is the only way to get comfortable. Try it out on other simple problems such as planning the remodeling of your kitchen or bathroom. How about buying and moving to a new home or buying a new video camera? Practice lets you resolve little issues with the approach while working at your own pace without having to worry about getting it right the first time. Then, when faced with ambiguity about the way forward on the job, you will discover that you naturally start making lists of questions and decisions – and you just became a more effective planner.

If you are reviewing plans, you can reinforce the value of questions and decisions as key elements of good plans by asking how the plans address answering questions and making decisions. A planner who doesn't know or may not even realize that plans should address questions and decisions probably has a faulty plan.

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## Six Sigma: The Missing Link

By Jon Wang

Systems Engineering is an interdisciplinary approach to ensuring the quality of the overall product. Ask any Systems Engineer when the best time to start the Systems Engineering effort on your project is and they will kindly answer that if you haven't started yet, then buddy you better get moving. Ideally, the majority of Systems Engineering takes place in the beginning of a project – helping define the customer's requirements, obtain a high level design, plan your timeline, and identify the work breakdown structure for project teams.

In reality though – how many projects do you know of where the SE process was either started too late, been considered unnecessary & too much effort, or was kept separate from detailed design and testing. Because of these reasons and others, there are currently (and always will exist) a number of projects where the Systems Engineering effort has been neglected resulting in missed targets, operational deficiencies, and a general lack of focus by generally everyone.

How do we improve upon already existing processes and methodologies that are of sub-par quality? Enter Six Sigma, the link between Systems Engineering and continued quality on projects. Six Sigma is a disciplined methodology and toolkit designed to be implemented on existing processes to help them get back on target (even if in some cases it requires redefining what those targets are). The name Six Sigma comes from statistics, representing a quality level of 3 defects per million opportunities or 99.9997% on target – point being, the goal of Six Sigma is to reduce process variation and stay on target.

The basic Six Sigma process follows the DMAIC process: Define, Measure, Analyze, Improve and Control. In Define your team works together to identify the process, inputs/outputs & primary purposes (CTQs – Critical To Quality). In SE language, the define process identifies the scope, interfaces and functionality of the process in question. Indeed there are many parallels between Six Sigma & the Systems Engineering Process. The Measure phase has the team identifying a way to measure the quality (performance metrics). In Analyze, teams assess the current performance of the project (testing), and identify the root causes of the variation (systems analysis). Improve has the team designing, picking (trade studies) and implementing (synthesis) fixes to the process. Finally, in the Control phase, systems are established to continually check the quality of the process according to the previously defined measures (requirements analysis).

Six Sigma, like SE, is based around the concept of Systems Thinking (integrating what you do into the larger picture). It is essentially a smaller, more compact version of Systems Engineering dedicated to improving processes and workflow. Additionally, a large part of Six Sigma outside of the DMAIC model focuses on Culture Evolution or leading people through change. Good Six Sigma strategies revolve around support foundations, project pacing, sustaining a shared vision, change barrier identification and more. Six Sigma's process measures also require that the project drill down to the bottom-line (cost-savings per improvement).

Six Sigma has been credited with re-inventing and saving many companies billions of dollars since its invention by Bill Smith of Motorola in 1984.

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about Systems Engineering via the resources on its web site: <http://www.incose.org>. While vibrant chapters are the heart of INCOSE, we often find many challenges in maintaining strong support at the local level.

Our Midwest Gateway Chapter is fortunate to have local interest and support in the St. Louis area which allows for many insightful programs throughout the year. (See <http://www.incose.org/mdwest> for most recent program presentations). Of course, it takes everyone in our chapter to make it a success so please contact Mason Myers, our 2007 Chapter President [mason.k.myers-jr@boeing.com](mailto:mason.k.myers-jr@boeing.com) or Marcos Chu, our 2007 Outreach Chair and President-Elect [marcos.d.chu@boeing.com](mailto:marcos.d.chu@boeing.com), for all the opportunities available.

One INCOSE goal which you are likely to hear a great deal about is the Systems Engineering Certification program. This is a move to elevate the stature of systems engineers and systems engineering to a level which is uniformly recognized around the world. It is believed that a common credential will allow others to recognize systems engineers who have demonstrated a minimum level of competency and have the experience to earn the badge of CSEP (Certified Systems Engineering Professional). If you are interested in learning more about this credential, please see the requirements at: <http://www.incose.org/educationcareers/certification/>

If you have any specific ideas as to how to make INCOSE better at any level (international, national, or local), please pass them along to me [robert.p.scheurer@boeing.com](mailto:robert.p.scheurer@boeing.com) and I'll see that they get the needed attention.