

The Integrator

INCOSE North Star Chapter



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North Star Newsletter

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Systems Engineering at its Best!

SE CURRICULUM DEVELOPMENT

SE curriculum development is often not planned at companies. Companies, when recognizing the need for Systems Engineering, often bring in one course in Systems Engineering. At least one avionics company, serious about training their employees, went all the way in the development of a course curriculum.

The company chartered a Systems Engineering Council (SEC) whose purpose was to actively develop a Systems Engineering manual and a plan for a Systems Engineering course curriculum. The knowledge used for the manual and courses was based on INCOSE knowledge as captured in the papers, tutorials, and SE Handbook. The SEC architected a cross-divisional and cross-discipline view of the curriculum.

The courses were allocated to

- 1) Government Systems Processes,
- 2) Commercial Systems Processes,
- 3) Systems Management,
- 4) Systems Analysis and Architecting, and
- 5) Product Domain.

The five categories were later reduced to three; Systems Processes, Systems Management, and Product Domain. The Systems Engineering Council chose to focus on the development of Systems Process and Methodology and Systems Management courses. The responsibility of bringing in product domain specific courses was left to the projects. The projects were better equipped to identify their own specific, technical needs.

The Commercial Systems Engineering Council recognized the need for an additional Council, one that

Chapter President's Corner

Mark Elpers, Medtronic

INCOSE North Star Chapter 2010 President

Welcome again to the North Star chapter of INCOSE! Summer is winding down and many are enjoying that last weekend at the cabin or an end-of-summer vacation. Soon the temperature will drop and we'll be preparing for winter.

I hope that those of you who attended the International Symposia came away with new perspectives, awareness and insight into the inner working of INCOSE and the systems engineering profession in general. As a follow-up to my earlier president's corner, I promised to bring back some answers to the questions facing the companies who are looking to mature their systems engineering practices. While there was not a specific tutorial or lecture on this topic, there were those in attendance who had some wisdom in this area. There seemed to be two main thrusts that were suggested as important in the beginning: solidifying the user needs, requirements and verification/validation structure and sales/culture change.

The user needs, requirements and verification challenges, while not simple, are well understood and there is plenty of help available in this area. The sales and culture change piece is a little more challenging, especially for engineers. Quantifying the value of systems engineering is one way to sell systems engineering. Eric Honour and others are working to help make a quantitative argument there. Information on culture change is best gleaned from considerable literature on this subject.

Mark Elpers - 2010 President

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focused on engineering education for more than just the Commercial Divisions. The Systems Engineering Education Council (SEEC) was formed with representation from Government, General Aviation, and Air Transport Divisions, Learning and Development, Hardware, Software, and Systems.

The Systems Engineering Education Council identified 24 instructor led and computer-based courses (Figure 1), which were prioritized in order of need decided by a SEEC member vote. Number one on the priorities was a Systems Engineering Fundamentals course. The course titles, course objectives, requirements and content were discussed, dissected, and combined by the Council before achieving the “final” twenty-four based on company business objectives. These courses were then planned for delivery as both Computer-Based-Training (to save money) and Instructor Lead Training. In some cases courses were offered in both ILT and CBT formats to accommodate refresher training.

1. Process Training
2. Requirements Capture
3. Integration, Verification & Validation
4. Early Validation of Requirements
5. Regulatory Requirements
6. System Safety Assessment Overview
7. Decision Point Process Overview
8. H/W Engineering Process Overview
9. S/W Engineering Process Overview
10. System Engineering Process
11. Concurrent Engineering Concepts
12. Management Training
13. Project Management
14. Team Building
15. Risk Management
16. Earned Value
17. Business Acquisition Program
18. Project Change Management
19. Technical and Specialty Training
20. System Engineering Fundamentals
21. Design of Experiments
22. Design to Cost
23. System Architecting
24. Analysis and Decision Methods

Figure 1: SE Courses

Measuring Effectiveness. Learner feedback is a partial measure of course presentation effectiveness. The following do not measure effectiveness, but do measure interest:

- Monitoring the length of time a learner actively spends in the course
- Monitoring the length of calendar time a learner

takes from start to finish

- Measuring how many learners completed the course compared to how many have signed up for the course

The best measures of learning effectiveness are those that would determine cost savings, schedule reduction, and quality infusion. The best measures of learning effectiveness are the very same measures that would determine the benefits of Systems Engineering principals. These measures would best be accumulated by the projects who have taken the courses and applied the knowledge learned to affect the behavior. Learning and Development charts the course usage. Figure 1 illustrates the sign-up trend.

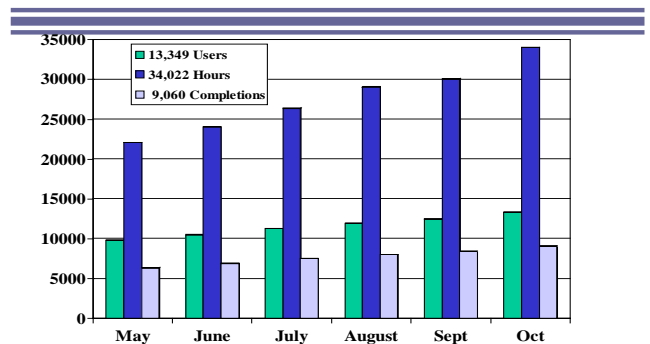


Figure 2: On-Line Learning Course Usage

This trend was reflected in the steady increase in users, hours spent on the CBT courses and completions. Note the completions are increasing at almost the same rate as the number of enrollments.

Have you considered a full curriculum at your company? Keep in mind, universities and vendors often work with training organizations to deliver the right training for your organization.

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WELCOME, NORTH STAR NEW MEMBERS!

Name	Company	Title
Jean Hudson	Medtronic, Inc.	Prin IC Des Eng
Mike Keyes		Prod Dev Physicist
Paul Leavitt	OEM	SE
Kalyani Mallela	Boston Scientific	SE
David Overbo	Boston Scientific	SW/SE Test Eng
Erik Sorensen	Lake Region Medical	Eng