A Few Words First

Audio Connection – Please mute phone (*6 toggle) – or your GM left-side name Phone connections may be muted during presentation. Put questions in chat box.

Upcoming Meetings (see events on Chapter home page for event registration):

- Ongoing: Chapter-Arranged on-line self-paced SEP Course, runs long as you need.
- Apr 4: Free NRAO Tour and free SEP Exam, day before the Summit.
- Apr 5-6: Socorro Systems Summit.
- Apr 10: Strategies for Complex Systems Development: Program Management and Systems Engineering – Tina Srivastava, MIT

CSEP Courses by *Certification Training International:* <u>Course details</u> (with more locations and dates) Upcoming Course Schedule (somewhat nearby): 2019 Aug 12-16 | Austin, TX Chapter SEP mentors: Ann Hodges <u>alhodge@sandia.gov</u>, Heidi Hahn <u>hahn@lanl.gov</u>

First slide, not retained in recording but retained in pdf presentation.

And Now - Introductions

Enchantment Chapter Monthly Meeting



<u>13 March 2019 – 16:45-18:00 MT</u>

Evidence-Based Approach to Implementing the New INCOSE Systems Engineering Competency Framework Don Gelosh, Director of Systems Engineering Programs, Worcester Polytechnic Institute, <u>dsgelosh@wpi.edu</u>

Abstract: The much-anticipated new INCOSE Systems Engineering Competency Framework was released in July 2018. In this presentation, Dr. Don Gelosh, Chair of the Competency Working Group, will discuss how individuals and organizations can use a practical evidence-based approach with the new framework to enhance their systems engineering expertise. The framework consists of 36 competencies across five groups: Core, Technical, Management, Professional, and Integrating. In addition to a description and explanation of why it is important, each competency includes a set of evidence-based indicators of knowledge and experience for five levels of competence: Awareness, Supervised Practitioner, Practitioner, Lead Practitioner and Expert. Dr. Gelosh will explain how individuals and organizations can use these evidence-based indicators to help identify and acquire the necessary knowledge, skills, abilities, behaviors and experiences at the appropriate levels of proficiency to enhance their own Systems Engineering effectiveness across their careers and the workforce.

Download slides today-only from GlobalMeetSeven file library or anytime from the Library at <u>www.incose.org/enchantment</u> **NOTE: This meeting will be recorded**

Today's Presentation

Things to Think About

- How can this be applied in your work environment?
- What did you hear that will influence your thinking?
- What is your take away from this presentation?

Speaker Bio



Dr. Don Gelosh is the Director of Systems Engineering Programs at Worcester Polytechnic Institute (WPI).

Don has over 43 years of systems engineering leadership experience from the US Air Force, government, industry, and academia. Before WPI, he was Deputy Director for Workforce Development for the Deputy Assistant Secretary of Defense for Systems Engineering at the Pentagon.

Previously he was lead systems engineer for communications and payload integration on NASA's Vehicle Integration and Test Team supporting the Space Shuttle, he taught Electrical and Computer Engineering at the USAF Academy, he served as Deputy Department Head for Electrical and Computer Engineering at the Air Force Institute of Technology and was Dean of Learning and Technology at the National Defense University.

Don has led the Competency Working Group of the International Council on Systems Engineering (INCOSE) to produce the new Systems Engineering Competency Framework that was awarded Product of the Year for 2018.



Evidence-Based Approach to Implementing the New INCOSE Systems Engineering Competency Framework

Don S. Gelosh, Ph.D., CSEP-Acq Director, Systems Engineering Programs Worcester Polytechnic Institute

13 March 2019

Overview

In this presentation:

- The New INCOSE Systems Engineering Competency Framework
- Evidence-Based Indicators
- The Steps to Success
- Conclusion



Systems Engineering Competency Framework

International and Diverse Collaboration:

- 7 Years
- 2 Professional Societies
- 12 Companies
- 4 Schools
- 1 Research Center
- 1 National Lab
- 5 Primary Authors
- 23 Secondary Authors/Reviewers
- 6 Countries



The complete Competency Framework can be accessed at:

https://www.incose.org/CompetencyFramework

Systems Engineering Competency Framework

Represents a world view of 5 competency groupings with 36 competencies central to the profession of Systems Engineering, including indicators of knowledge, skills, abilities and behaviors across 5 levels of proficiency.

Aligns with major ongoing INCOSE initiatives.

Supports a wide variety of usage scenarios including individual and organizational capability assessments.

Enables organizations to tailor and derive their own competency models that address their unique challenges.

*

INCOSE

Systems Engineering Competency Framework

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MITRE

WPI

Alignment to Major Initiatives



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36 Competencies Across 5 Groups



Awaren	ess
Supe	ervised Practitioner
P	ractitioner
	Lead Practitioner
	Expert
	W



The person displays knowledge of key ideas associated with the competency area and understands key issues and their implications.



The person displays an understanding of the competency area and has some limited experience.



The person displays both knowledge and practical experience of the competency area and can function without supervision on a day-to-day basis.



The person displays extensive and substantial practical knowledge and experience of the competency area and provides guidance to others including practitioners encountering unusual situations.



In addition to extensive and substantial practical experience and applied knowledge of the competency area, this individual contributes to and is recognized beyond the organizational or business boundary.

Evidence-Based Indicators

COMPETENCY AREA – Technical: Requirements Definition

Description:

To analyze the stakeholder needs and expectations to establish the requirements for a system.

Why it matters:

The requirements of a system describe the problem to be solved (its purpose, how it performs, how it is to be used, maintained and disposed of and what the expectations of the stakeholders are).

EFFECTIVE INDICATORS OF KNOWLEDGE AND EXPERIENCE

AWARENESS	SUPERVISED PRACTITIONER	PRACTITIONER	LEAD PRACTITIONER	EXPERT
Describes different types of requirements (e.g. functional, non-functional, business etc.). Explains why there is a need	Identifies all stakeholders and their sphere of influence. Assists with the elicitation of requirements from stakeholders.	Defines governing requirements elicitation and management plans, processes and appropriate tools and uses these to control and monitor	Recognized, within the enterprise, as an authority in requirements elicitation and management techniques, contributing to best practice.	Recognized, beyond the enterprise boundary, as an authority in requirements elicitation and management techniques.
for good quality requirements. Identifies major stakeholders	Describes the characteristics of good quality requirements and provides examples.	Elicits and validates	Defines and documents enterprise-level policies, procedures, guidance and best practice for requirements elicitation and	Contributes to requirements elicitation and management best practice.
and their needs. Explains why managing requirements throughout the lifecycle is important.	Describes different mechanisms used to gather requirements.	Writes good quality, consistent requirements.	management, including associated tools. Challenges appropriateness of requirements in a rational way.	Champions the introduction of novel techniques and ideas in requirements elicitation and management, producing measurable improvements.

Evidence-Based Indicators

COMPETENCY AREA – Professional: Communications

Description:

The dynamic process of transmitting or exchanging information using various principles such as verbal, speech, body-language, signals, behavior, writing, audio, video, graphics, language, etc. Communication includes all interactions between individuals, individuals and groups or between different groups.

Why it matters:

Communication plays a fundamental role in all facets of business within an organization, in order to: transfer information between individuals and groups to develop a common understanding and build and maintain relationships and other intangible benefits. Ineffective communication has been identified as the root cause of problems on projects.

EFFECTIVE INDICATORS OF KNOWLEDGE AND EXPERIENCE

AWARENESS	SUPERVISED PRACTITIONER	PRACTITIONER	LEAD PRACTITIONER	EXPERT
Explains communications in terms of the sender, the receiver, and the message and why these three parameters are central to the success of any team communication. Explains why there is a need for clear and concise communications.	Uses a governing communications plan and appropriate tools to control communications, with guidance.	Uses a governing communications plan and appropriate tools to control communications.	Recognized, within the enterprise, as an authority on the application of communications within SE, contributing to best practice.	Recognized, beyond the enterprise boundary, as an authority on the application of communications within Systems Engineering.
	Communicates effectively among peers. Develops positive relationships through effective communications, with quidance.	Communicates effectively with all stakeholders on project. Develops and maintains positive relationships through communications.	Defines and documents enterprise level governing communications management processes, tools and guidance.	Contributes to best practice in the application of communications techniques to Systems Engineering.

COMPETENCY AREA – Systems Engineering Management: Risk and Opportunity Management

PRACTITIONER

Defines governing risk and opportunity management plans, processes and appropriate tools and uses these to control and monitor risk and opportunity management activities.

Establishes a project risk and opportunity profile including context, probability, consequences, thresholds, priority and risk action and status.

Identifies, assesses, analyzes and treats risks and opportunities for likelihood and consequence in order to determine magnitude and priority for treatment.

Treats risks and opportunities effectively, considering alternative treatments and generating a plan of action when thresholds exceeds certain levels.

Guides supervised practitioners in Systems Engineering risk and opportunity management.

LEAD PRACTITIONER

Recognized, within the enterprise, as an authority in Systems Engineering risk and opportunity management, contributing to best practice.

Reviews and judges the tailoring of enterprise-level risk and opportunity management processes and associated work products to meet the needs of a project.

Coordinates Systems Engineering risk and opportunity management across multiple diverse projects or across a complex system, with proven success.

Establishes an enterprise risk profile including context, probability, consequences, thresholds, priority and risk action and status.

Coaches new and experienced practitioners in Systems Engineering risk and opportunity management.

All indicators:

- Start with action verbs.
- Are evidence-based.
- Show progressions from lower to higher levels of proficiency.
- Can be mapped to a combination of knowledge, skills, abilities, behaviors and experiences.
- Enable individuals to selfassess and increase their proficiency levels.

Tailoring the Framework

- The framework is structured so organizations can tailor it to develop competency models ideally suited to their unique needs and workforce.
- Using organizations can tailor the framework to derive a bespoke competency model by:
 - Adding or deleting competencies as needed;
 - Revising or only using a subset of the competencies;
 - Adding, deleting, or revising the proficiency level indicators for any of the five levels for any of the competencies;
 - Developing a bespoke set of Systems Engineering roles associated with the necessary supporting competencies;
 - Developing their own unique set of use cases for the competency models they derive from the competency framework.

Example: Steps to a Successful Career in Systems Engineering



WPI's Systems Engineering programs align with the INCOSE Competency Framework

STEP 1 – AWARENESS

- Fundamental understanding of the key concepts, impacts, and roles of Systems Engineering.
- WPI's "Essentials of Systems Engineering" training program:
 - Provides a concise overview of the critical principles, methods, and techniques, including theory-based lectures and application-based exercises and projects.

STEP 2 – PRACTITIONER

- Detailed knowledge of the theories of Systems Engineering and Systems Thinking.
- Practical experience through the application of best practices.
- Graduate Certificate in Systems Engineering:
 - Provides strong foundation enabling the development of a wide range of technical skills to lead teams and better design and implement complex systems.

The Steps to Success

STEP 3 – CERTIFIED

- Certification as a Systems Engineering Professional (SEP) is a key step upward.
- WPI offers a **SEP Boot Camp** program:
 - Prepares you for certification by INCOSE as an Associate or Certified Systems Engineering Professional.
 - Builds on your WPI Systems Engineering studies through a targeted review of coursework and the INCOSE Handbook 4th Edition to prepare you for your exam.
 - Provides personalized assistance to walk you through the application process.

STEP 4 – LEADER

- If you are a Systems Engineer, then you are expected to be a leader.
- We believe all engineers should have in-depth knowledge of Systems Engineering and Technical Leadership to be properly prepared for 21st Century realities.
- Master of Science in Systems Engineering program:
 - Provides real-world application of foundational and advanced topics that are crucial to
 effective leadership and engineering across a wide range of corporate and professional
 organizations.

STEP 5 – EXPERT

- Experts are expected to have extensive and substantial practical experience and applied knowledge of Systems Engineering so they can effectively advance the state-of-the-art.
- PhD in Systems Engineering program:
 - Provides opportunities to gain Expert-level knowledge and experience by conducting critical research with cutting-edge faculty who bring decades of practical academic and commercial expertise to solving real-world challenges.

- Develop "Guide to Competency Evaluation" (Annex E) to provide guidance on how individuals can evaluate themselves against the competency framework – work already started at IW2019
- Use the framework to develop Competency Models for various domains: SoS, SSE, Oil and Gas, Healthcare, etc.
- Continue to explore use cases for how government, industry and academic organizations can use the framework's evidence-based indicators to help identify, assess and develop the necessary knowledge, skills, abilities and behaviors at the appropriate levels in their workforce to enhance Systems Engineering effectiveness across the enterprise.

Questions?



Thank You!

For more information please contact:

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Today's Presentation

Things to Think About

- How can this be applied in your work environment?
- What did you hear that will influence your thinking?
- What is your take away from this presentation?

Please

The link for the online survey for this meeting is

- www.surveymonkey.com/r/2019_03_MeetingEval
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Look in GlobalMeet chat box for cut & paste link

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- The library page at: www.incose.org/enchantment
- Recording will be there in the library soon (maybe)