Systems Engineering Competency Framework

Using the Framework:

The Systems Engineering competency framework is generic in purpose. It can, and indeed should, be tailored before use. It can be applied in the context of an organisation, a project, an individual and/or a training programme.

The Framework describes the competencies of Systems Engineering rather than the competencies of an individual Systems Engineer.

It is acknowledged that a well rounded systems engineer will need other competencies, knowledge, skills and abilities tailored to their particular role or area in which they operate.

Many organisations have tailored the framework and are actively using it to:

- Identify individual's and the organisation's competencies in Systems Engineering
- Identify learning and development opportunities
- Standardise job roles and descriptions
- Aid recruitment and direct interview questions
- Develop Systems Engineering training programmes

Evaluation:

A Guide to Competency Evaluation is also available and is designed as a companion to the Systems Engineering Competencies Framework document. It gives guidance on how to evaluate people against the competency framework.

What are the Competencies?

Systems Thinking
Systems concepts
Super-system capability issues
Enterprise and technology environment

Holistic Lifecycle view
Determine and manage stakeholder requirements
System design:
- Architectural design
- Concept generation
- Design for…
- Functional analysis
- Interface management
- Maintaining design integrity
- Modelling and simulation
- Select preferred solution
- System robustness
Integration & Verification
Validation
Transition to operation

Systems Engineering Management
Concurrent engineering
Enterprise integration
Integration of specialisms
Lifecycle process definition
Planning, monitoring and controlling

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Z6 Issue 1.0 March 2010

Z6

Issue 1.0
March 2010

INCOSEUK

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The Systems Engineering Competency Framework was developed 'to have a measurable set of competencies for Systems Engineering which will achieve national recognition and will be useful to the enterprises represented by the INCOSE UK Advisory Board'.

It provides a common language with which to describe and discuss the competencies that are required to conduct good Systems Engineering.

Does your organisation know what makes a good systems engineer?

The Competency Framework can help!

What are the Competencies based on?

The Systems Engineering Competencies developed are consistent with the following:

- International Standards Organisation ISO15288
- EIA632
- INCOSE Systems Engineering Body of Knowledge & Handbook

COMPETENCY AREA - Systems Thinking: System Concepts

Description:

The application of the fundamental concepts of systems engineering. These include understanding what a system is, its context within its environment,its boundaries and interfaces and that it has a lifecycle.

Why it matters:

Systems Thinking is a way of dealing with increasing complexity. The fundamental concepts of Systems Thinking involves understanding how actionsand decisions in one area affect another, and that the optimisation of a system within its enviroment does not necessarily come from optimising the individual system components.

EFFECTIVE INDICATORS OF KNOWLEDGE AND EXPERIENCE

AWARENESS	SUPERVISED PRACTITIONER	PRACTITIONER	EXPERT
Is aware of the need for systems concepts Aware of the importance of: ■ system lifecycle ■ hierarchy of systems ■ system context ■ interfaces ■ interactions amongst systems and their elements	Understands systems concepts Understands the system lifecycle in which they are working Understands system hierarchy and the principles of system partitioningin order to help manage complexity Understands the concept of emergent properties Can identify system boundaries andunderstands the need to define andmanage the interfaces Understands how humans and systems interact and how humanscan be elements of systems	Able to identify and manage complexity with appropriate techniques in order to reduce risk Able to predict resultant system behavior Able to define system boundaries and external interfaces Able to assess the interaction between humans and systems, and systems and systems. Able to guide supervised practitioner	Able to review and judge the suitability of systems solutions and the planned approach Has coached new practitioners in this field Has championed the introductionof novel techniques and ideas in this field which produced measurable improvements Has contributed to best practice

Figure 1 - Typical table extracted from the competency framework

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