

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

For more information visit:

<http://www.incoseonline.org.uk>

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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
Explains what the competency is and provides meaning behind the title.

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
indicates the importance of the competency and the problems that may be encountered in the absence of that competency

Why it matters:

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

EFFECTIVE INDICATORS OF KNOWLEDGE AND EXPERIENCE

Awareness
The person is able to understand the key issues and their implications. They are able to ask relevant and constructive questions on the subject. This level is aimed at enterprise roles that interface with Systems Engineering and therefore require an understanding of the Systems Engineering role within the enterprise.

AWARENESS

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

Supervised Practitioner
The person displays an understanding of the subject but requires guidance and supervision. This level defines those engineers who are "in-training" or are inexperienced in that particular competence.

SUPERVISED PRACTITIONER

- Understands systems concepts
- Understands the system lifecycle in which they are working
- Understands system hierarchy and the principles of system partitioning in order to help manage complexity
- Understands the concept of emergent properties
- Can identify system boundaries and understands the need to define and manage the interfaces
- Understands how humans and systems interact and how humans can be elements of systems

PRACTITIONER

- 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

EXPERT

- Able to review and judge the suitability of systems solutions and the planned approach
- Has coached new practitioners in this field
- Has championed the introduction of novel techniques and ideas in this field which produced measurable improvements
- Has contributed to best practice

Expert
The person displays extensive and substantial practical experience and applied knowledge of the subject.

Practitioner
The person displays detailed knowledge of the subject and is capable of providing guidance and advice to others.



Figure 1 - Typical table extracted from the competency framework

