Institute for Systems Engineering

Z1

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What is Systems Engineering?

Creating Successful Systems

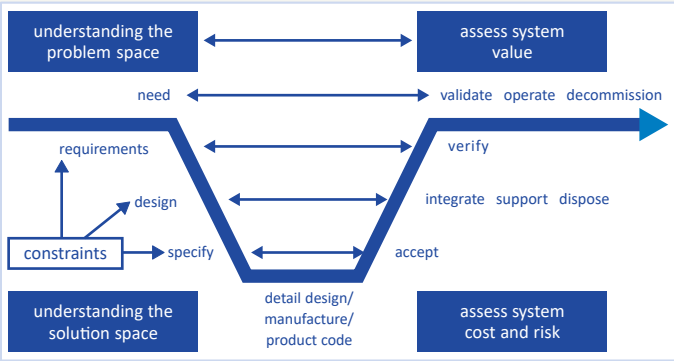
Systems Engineering is:

"Big Picture thinking, and the application of Common Sense to projects:"

"a structured and auditable approach to identifying requirements, managing interfaces and controlling risks throughout the project lifecycle."

"Build the right system; build the system right." Systems Engineering considers the whole problem, the whole system, and the whole system lifecycle from concept to disposal, "from lust to dust."

The V lifecycle model shows the logical relationship between the different Systems Engineering activities or 'processes'.



Why do Systems Engineering?

Manage Complexity. Reduce your Risk

Systems Engineering does:

Cope with complexity. The benefits of Systems Engineering include not being caught out by omissions and invalid assumptions, managing real world changing issues, and producing the most efficient, economic and robust solutions to the need being addressed.

By using the Systems Engineering approach, project costs and timescales are managed and controlled more effectively by having greater control and awareness of the project requirements, interfaces and issues and the consequences of any changes.

Systems engineers work with programme managers to achieve system and project success.
Research indicates that effective use of Systems Engineering can save 10-20% of the project budget.

It is not hard to know when System Engineering fails, because when something important goes wrong it usually makes the news fast. People get killed, buildings fall down, companies go bust, the law becomes involved.

But when System Engineering goes right, no-one notices, which is just how it should be. The computer works when you switch it on, trains run on time, your flight lands on time and no one gets mad.

6 Steps to Success

1. Understanding the Problem

Understand and write down the benefit to be achieved by the system, and how the system will be used.

Identify the key measures of operational effectiveness (MOEs), and work out how much improvement you expect from the new system. Identify the stakeholders and agree the system boundary.

Think! How will the environment change between now and when the system is ready? And how will the environment and end users respond to the new system?

2. Investigate alternative solutions

Consider, model and evaluate both novel solutions and improvements to existing ones. Work out how you will choose between the alternatives; and record your decision process and rationale in case things change later and you need to backtrack. Define a system architecture that encompasses all elements of the solution.

3. Prepare the test and support system

Prepare the test, training and support capabilities in parallel with the "operational system". Make sure they are all compatible and ready when they are needed to test, commission, deploy and use the system.

First look out from your system

4. Agree and manage the requirements

Requirements form the basis for contracts and acceptance. Starting from the desired effect of the new system, balance requirements with budget and technical feasibility. Identify and consult relevant stakeholders. Identify and manage assumptions. Assess impact of proposed changes and trade-offs. And test the system against its requirements.

5. Agree and manage the interfaces

Manage interfaces to make sure the parts of the solution combine with each other and the operational environment to create an effective whole – and to allow teams to work in parallel, confident that all the pieces they are developing will fit together and work together. Identify who is responsible for and involved in each interface.

6. Track progress against a plan

As well as the traditional Project Management measures of cost, schedule and resources, it is important to track skills, decisions and technical performance. Adapt to changes and be prepared to backtrack on decisions. Failure to agree requirements or interfaces may be symptoms of deeper problems.

Manage Complexity
Reduce your Risk

More than one in three of all projects will fail.
More than two-thirds will not achieve all their aims.
Failure is usually obvious only when the project is overdue and the budget has been spent.
But decisions and plans made earlier in the project can alter your risk, sometimes dramatically.

Don't rely on luck;
use Systems Engineering

Half of all project failures could be prevented by more effective Systems Engineering.

This leaflet collates the best of these answers into an explanation of the what and why of Systems Engineering.

Systems Engineering Integrates Technical Effort Across the Development Project:

- Functional Discipline
- Technology Domains
- Speciality Concerns

The International Council on Systems Engineering (INCOSE) defines Systems Engineering as "an interdisciplinary approach and means to enable the realisation of successful systems."

About This Z Guide

This leaflet is intended to help the "intelligent layperson" to understand what Systems Engineering is and how it could help them and their business.
For further information, advice and links to helpful websites, go to:
www.ifse.org.uk

Download copies of this leaflet and other Systems Engineering resources online at:
www.ifse.org.uk

For more information about the worldwide Systems Engineering professional community, go to:
www.incose.org

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