The Business Benefits of SE
Cost / Benefit analysis

Can you construct a cost/benefit case for SE?

These following points should make adoption of SE a 'no brainer':

- It costs much less to solve problems sooner rather than later in the project life-cycle. SE covers the entire project life-cycle and should be employed from the pre-concept phase onwards.
- Project Management (PM) and SE have the same ultimate project goals. PM defines them; SE delivers them.
- Cost to fix a problem:

	systems cost factors
requirements	1x
design	3-8x
build	7-16x
test	21-78x
operations	29-1615x

- Management has much more ability to act and influence events early in the life-cycle. This becomes much less so later on.
- 60%+ of a project's cost base is determined in the first 15% of the project. SE has particularly strong leverage in the early stages.
- SE can help any organisation involved with complex projects – not just aerospace and defence. Talk to other sectors eg: Transportation and Telecoms.
- SE brings people benefits as well. Their work becomes less chaotic and stressful and quality of work improves.

Wondering what you have to do to make SE successful in your organisation? This leaflet gives some advice.

Three Topics to think about when 'selling' SE :
- Are things going wrong on your projects?
- Are the requirements clearly defined and agreed?
- Are the acceptance criteria for those requirements agreed?

This leaflet is intended to help systems engineers asses how their organisation supports systems engineering, and to assist in communicating the benefits of appropriate systems engineering to their managers.

For further information, advice and links to helpful websites, go to:
www.incoseonline.org.uk.

Download copies of this leaflet and other systems engineering resources online at:
www.incoseonline.org.uk

For more information about the worldwide systems engineering professional community, go to:
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Enabling Systems Engineering
How to make SE successful in your organisation

Are things going wrong on your project?

Understand where, how and why your projects go wrong. The following problems all stem from non-existent or inadequate SE:

- **Unclear or confused about what the system is supposed to do?**
  ✓ SE improves the quality and management of Requirements.

- **Inadequate costing and time-scale estimation?**
  ✓ SE results in better Work Breakdown Structures and Plans.

- **Weak control of suppliers/sub-contractors?**
  ✓ SE delivers better Specifications.

- **Integration problems?**
  ✓ SE defines the System Parts and how they fit together correctly.

- **Non-existent or inadequate test and acceptance strategy?**
  ✓ SE provides Test and Acceptance Criteria linked to Requirements.

These problems erode profit margins and damage reputations. If the organisation takes SE seriously, the business benefits will follow.

Make sure the people running your organisation and your projects understand the business benefits of SE. If SE is just seen as something technical people do, it may not be taken seriously.

Organisational Factors

- Stop the organisation itself getting in the way of effective SE, and 'tune' it to make best use of SE; SE can only do so much by itself!
- Improve communication channels.
- Integrate SE with projects. SE cannot be done as a stand-alone discipline.
- Give SE the necessary authority; make the SE function ultimately responsible to the Engineering Director (or equivalent).
- Align SE-related functions within the organisation and the supply chain. Finance, Commercial, Procurement and Marketing all have a stake in SE.
- Organise your projects properly. It is a common problem to focus effort at sub-system rather than system level.

Is your organisation preventing effective Systems Engineering?

- Don't contractually bind or commit your projects too early in the life-cycle, before Requirements and Specifications have been analysed and assessed.
- Get top level management commitment to SE. Once obtained, communicate this as a leadership message to your teams.
- You do not need a whole department of System Engineers. 1 or 2 good people can make a real impact at the beginning, and provide a strong foundation for the project, involve all supplier stakeholder groups and ensure buy-in to the contracted programme.

SE Image Issues
Ensure SE is led and resourced by respected and experienced people with business sense

Do's and Don'ts for System Engineers:

Do show you understand the business world,
Do get involved with real projects,
Do be adaptive and flexible to real situations,
Do apply 'process' intelligently,
Do apply common sense in your SE,
Do show respect for technology/application experts,
Do show you can talk to multi-disciplined people,
Do show that you can pin-point and clearly define problems,
Do show you can plan ahead to avoid problems,

Don't turn SE into a high priesthood,
Don't make SE look like your personal hobby,
Don't do your SE 'over there' in the corner,
Don't become a 'process fundamentalist',
Don't hide behind 'process'.

Sometimes the name 'SE' can be a problem

'Systems Engineering' – conjures up an 'oily rag' image. If so, adopt a better term eg:
'Systems Integration' –
makes a powerful impact on management.
'Systems (or Systemic) Thinking' –
popular with some people.
'Systems Management' – careful!
This means different things to different people.

Define and Implement Effective SE Processes

- Proceed in small steps at first in 'safe areas'. Then, with experience and success under your belt, expand the scope.
- Use off-the-shelf SE processes (eg IEEE 1220, EIA 632, ISO 15288, CMMI) adapted to the projects you routinely do.
- Get an expert to help you define your processes
- Allow the processes to be tailored to each project's needs.
- SE is about the intelligent application of process.
- Don't create the impression that rigid processes can or should replace common sense.
- Identify who needs to know about the SE processes. This will go beyond technical staff.
- Put in place support for SE: guidelines, tools, training and coaching (for the SE processes, methods and tools). Don't forget areas like Configuration Management, Change Control, and Risk.
- Don't repeat mistakes routinely made on other projects. Institute 'Learning From Experience' (LFE) and feed back into SE processes.

effort / time

— project employing good SE
···· project not employing good SE
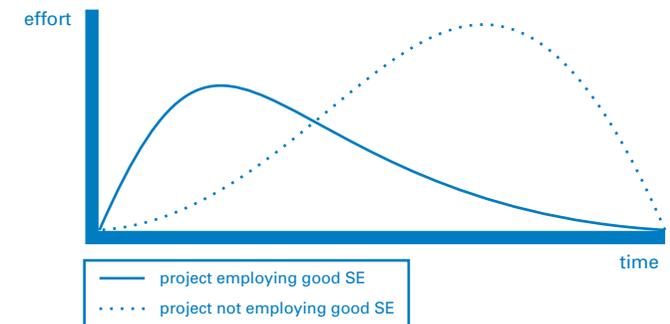
Total cost of sorting out problems is much less when done early in the project lifecycle.

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