

An Introduction to Systems Approaches for SMEs



Introduction

This Guide introduces the subject of systems approaches and provides pointers to additional information for those who are interested to know more. The intended audience is Small to Medium Enterprises (SMEs) of any type, in any domain.

Systems approaches

Systems approaches treat the challenge of solving a complex problem as an integrated whole, looking at all the elements AND the interactions between them. See 2 and 3 for more information. They utilise the concepts, principles and patterns of Systems Thinking. They should not be confused with Systems Engineering see 5 and 6.

Why SMEs

It is reported that over 98% of global economic value is generated by enterprises comprised of fewer than 25 people. It is recognised that there is a need to improve on existing SME guidance for systems approaches.

Why Now

The development of this guide has been triggered by the UK Government's announcement that it encourages systems approaches for successful Net Zero Green House Gas (GHG) transformation.

Value to SMEs

Systems approaches help you to amplify your strengths (agility, productivity, ability for individuals to take on and swap between multiple roles, inherent holism....) and mitigate challenges (appreciation of context, exposure to external threats, unanticipated impact of internal and external changes....).

They instil a focus on creating the right solution, creating it well, and improving collaboration with other stakeholders.

Among other things, you can expect a greater chance of project success, improved marketing and brand reputation, a positive selling point to funders, and better-informed strategic planning.

What (1)

Successful systems approaches help to ensure that any System of Interest (SoI) continues to address the "right" problem through a balanced and "complete" solution to a validated set of stakeholder needs when things are complex, uncertain and subject to change. They also help with understanding how a change in one area might impact the wider system behaviour and how changes in the wider system might impact the SoI. Systems Thinking and Systems Approaches are increasingly being adopted in Agile frameworks such as Large Scale Scrum (LeSS) - see 6.



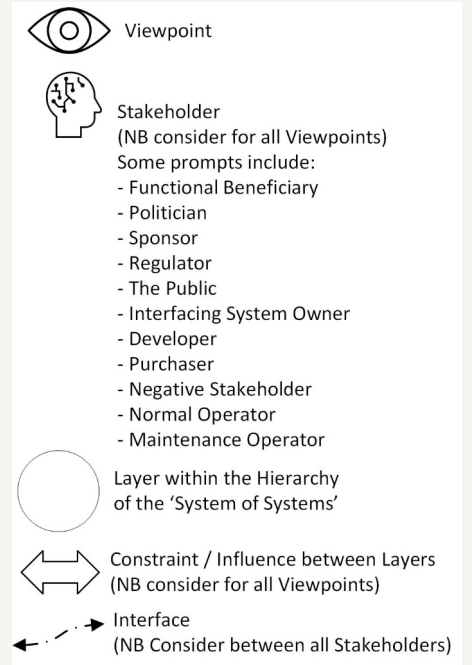
The "layers" diagram helps to show the hierarchy of different systems, but concentrates on identifying stakeholders, how they may interface with each other, and some different viewpoints onto the wider system. Enabling systems support the SoI during its life cycle; examples include factories, maintenance systems, and retirement systems. The containing system is broader still; e.g. if a tram is the SoI, it could be a city transport system.

What (2)

A systems approach is designed to examine the "whole system, whole life cycle, and whole problem (whole stakeholder community)" see 6 to ensure that the purpose of the system (or systemic intervention) is achieved sustainably without causing any negative unintended consequences.

Whole Problem. All aspects of the SoI beyond technology (e.g. PESTEL see 4). Hard and soft system aspects. The full set of stakeholder needs and interactions with other problems.

Whole System. The boundary of our SoI and how it interfaces and interacts with other systems (the context). The supporting systems needed to design, deploy and sustain the SoI. Whole Life. Consideration of an appropriate approach (e.g. Agile or "V"). Ability to respond to change (e.g. to needs or technology). Planned lifetime and continuous improvement.



Key Principles & Tailoring

Key Principles

1. Identify your stakeholders and actively engage with them throughout the Sol life cycle;
2. Always pay sufficient attention to defining the needs, via dialogue with your stakeholders, and keep alert to changes in the needs as you progress with the solution. Try to keep the goals for your Sol in balance with the goals of the wider system;
3. Ensure your analysis of needs considers more than technological aspects – other aspects could include Political, Economic, Societal, Environmental and Legal;
4. Identify your system boundary and look out towards interfaces with other elements of the surrounding socio-technical-political system, constantly being on the lookout for changes in your external systems;
5. Collaborate with owners of each externally interfacing system and with partners to the wider system;
6. Anticipate how your Sol will interact with other systems, and how that will affect the behaviour of the wider system;
7. Plan how you will continue to check (validate) the problem definition throughout the system life cycle;
8. Follow best practice for systems approaches (see [6](#)).

Tailoring (how much and when)

- SMEs inherently (if not explicitly) follow systems approaches (typically including multi-disciplinary project management, contract management, requirements capture, risk management, and validation).
- Most of the existing guidance is aimed at large organisations, so an SME would need to tailor that in practical terms for their business, and the specifics of the current project / project organisation. Tailoring means that there should be just enough process applied at just the right time, which balances rigour with opportunity and risk, and this is the only way to really achieve the benefits.
- There are several things that need to be tailored, including policies, processes, procedures, life cycle models, development approaches, roles, and solutions (e.g. products and services).
- Agile approaches and frameworks are increasingly incorporating Systems Thinking approaches, e.g. the Scaled Agile Framework (SAFe) and Large Scale Scrum (LeSS) (see [6](#)).

How to Develop Systems Approaches

1. Develop initial awareness by browsing the information in [6](#).
2. Set up discussions with your SME team to test the appetite and agree an approach (systems approaches are whole team approaches). Use external sources of help if you think this would be valuable;
3. Develop a diagram to clarify the boundary of your Sol, and develop a list of stakeholders. Consider the “layers” diagram on [2](#) and [3](#) as one way of doing that;
4. Understand your existing systems capabilities “As-is” and associated opportunities and risks;
5. Tailor the systems approaches to define how you intend to get the benefits by exploiting the opportunities and mitigating the risks (“As-intended”);
6. Understand what priority actions you need to take to help you migrate from “As-Is” to “As-intended”;
7. Set up a straightforward way of measuring benefits from the approaches;
8. Look for and secure some quick wins;
9. Share benefits information internally and externally;
10. Migrate to the point where systems approaches are business as usual.

Note that systems approaches utilise Systems Thinking (ST) concepts, principles and patterns. Systems Engineering (SE) grew up as a separate discipline but embodies some systems approaches and systems thinking. More information on these topics can be found in [6](#), but are summarised as follows:

Systems Thinking is concerned with understanding or intervening in complex problem situations, based on the principles and concepts of the systems paradigm.

Systems Engineering is an interdisciplinary approach and means to enable the realisation of successful systems.

Organisations that can help

- The International Council on Systems Engineering (INCOSE) has advice on its website at www.incose.org
- INCOSE hosts a Small Business Systems Engineering Group Small Business Systems Engineering (www.incose.org)
- to talk to people who implement the approaches in the Energy Sector, contact the Energy Systems Catapult at <https://es.catapult.org.uk/> Examples of their relevant guidance include “Aspects of Integration” and “Systems thinking in the energy system – a primer to a complex world”
- **Commercial support and consultancy:** <https://es.catapult.org.uk/service-platforms/energy-launchpad/>

Where to get Supporting Materials

For a full list of recommended reading and contacts, please see the companion web page at <https://es.catapult.org.uk/service-platforms/energy-launchpad/>. A short list of selected references appears below:

- for information about tailoring, see the INCOSE Systems Engineering Handbook, 4th Edition, Sec on 8.1
- overview of the Systems Approach, definition of Systems Thinking, and definition of Systems Engineering at the Systems Engineering Body of Knowledge (SEBoK): www.sebokwiki.org
- ISO/IEC 29110, “Systems and software engineering – lifecycle profiles for very small enterprises (VSEs)” Publicly Available Standards (www.iso.org)
- for other guides in this series, see the IfSE Z Guides (in particular Z0, Z1, Z2, Z3, Z5, Z7) available at www.ifse.org.uk
- examples of improvement frameworks include Capability Maturity Model Integration https://en.wikipedia.org/wiki/Capability_Maturity_Model_Integration and Kotter <https://www.kotterinc.com/8-steps/>
- information on SAFe and LeSS: www.scaledagileframework.com/safe-lean-agile-principles/ and www.less.works/less/principles/systems-thinking

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