Systems Engineering and Project Management (SEPM) Joint Working Group Outputs

Value Proposition

1. Cutting the true cost

Delivering value through:
- Cutting rework costs
- Cutting delay costs
- Cutting change costs

Delivering the right solution as quickly as possible is usually the most economic way to complete a project

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2. Delivering tangible benefits

- Fit for purpose – design is fundamentally correct

So:
- Robust to changes in requirements
- Reduced slippage
- Improved morale – flaps and panics reduced
- H&S built in - cutting injuries and deaths
- Project delivers:
  - Solution that is a success
  - On plan
  - Cost-effective

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3. Less unproductive tension

- Reducing start-up delays on projects
- Clarifying roles and responsibilities
- Optimizing planning around technical design and delivery gives best return on investment
- Earliest assurance of benefits delivery
- Increased performance from PM and SE resources

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Dovetailing Processes and Disciplines Throughout the Life Cycle

Guide To Life Cycles & Life Cycle Models

Systems Engineering and Project Management (SEPM)
Joint Working Group

Guide to Life Cycles and Life Cycle Models

Summary

Andrew Gray
Ken Richardson
Kate Rooke

The authors would like t
Transformational Chan

5. Comparisons of SE and P3M Definitions

System-of-Interest Life Cycle vs a Project/Programme Life Cycle

As discussed and illustrated in Section 2, the various definitions presented in the previous section illustrate a key difference between the SE outlook and the PPM outlook. The SE outlook is concerned with the full life cycle of the system-of-interest from inception to retirement. The PPM outlook is primarily focused on the change life cycle, the change being the activities that bring the (new or updated) system-of-interest into being (although noting that the APMBOK acknowledges the product life cycle and how it relates to the product life cycle).

It is therefore important that when determining the appropriate life cycle, the system engineer and the P3 manager have a consistent understanding of the various life cycles that are being used to underpin all the work. In addition, both should ensure that language and terminology are common across the disciplines.

This is especially important when discussing Stages and Phases where the two terms may mean different things to the two communities – as discussed in *Terminology and Programme Tranches and Project Stages*. A Project Manager may be co-ordinating a Stage completion (based on the project stage objectives) whilst a System Engineer considers themselves part-way through the Development Stage (of the generic SE Life Cycle shown in Table 1).

Commonality of Descriptions

On close inspection there is a great deal of synergy and commonality between the two disciplines in the determination of the individual phases of the life cycles. Generic representations are consistent, translatable and transferrable. P3 and P3M life cycles typically contain less granularity as they are more focused on the need to underpin the control and governance aspects of the work, as opposed to helping to provide a detailed definition of the manner and means through which the development work will be undertaken.

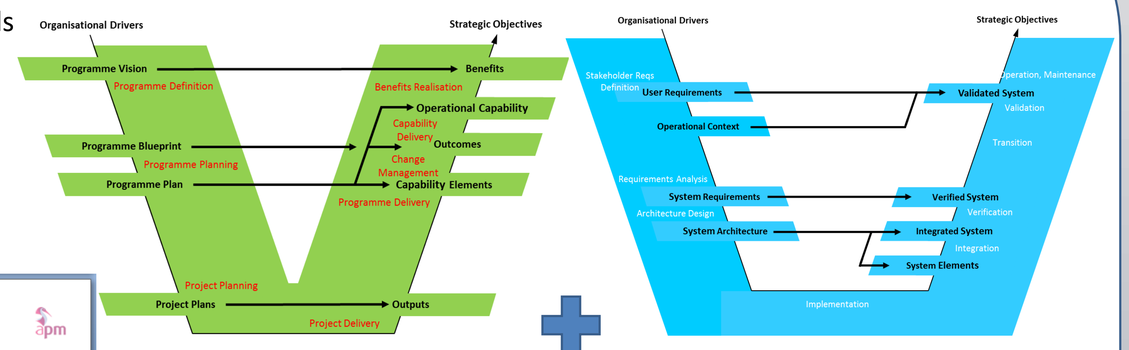
It must be therefore noted that this detailed understanding of the development work to be undertaken is intrinsically important to the P3 Manager. It will underpin the means by which projects and programmes will be structured and planned (e.g. determining the Project Approach in a PRINCE2 Product Based Planning environment). This aspect of the levels of overlap and dependency of SE and P3 processes is addressed and developed further in "**Guide to SE and P3M Processes**".

Use of Vee Model to depict Programme Management

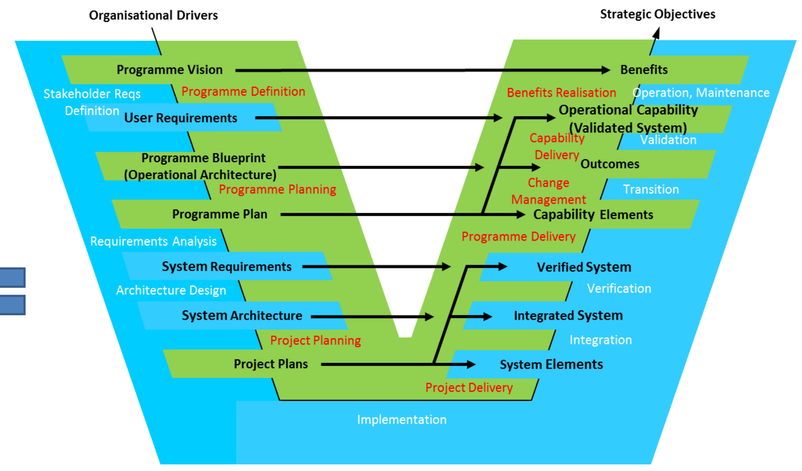
The use of SE life cycle depictions do permeate through PM literature and process guidance. For example, reference is made to waterfall, Vee and Spiral models in the Life Cycle section of the APMBOK. Another example is the depiction of the strategic context of benefits realisation within a programme depicted by MSP[®].

[®] Managing Successful Programmes, 2011, The Stationery Office, p66

WkS: Guide to Lifecycle Models: Issue 1.00D Page 26



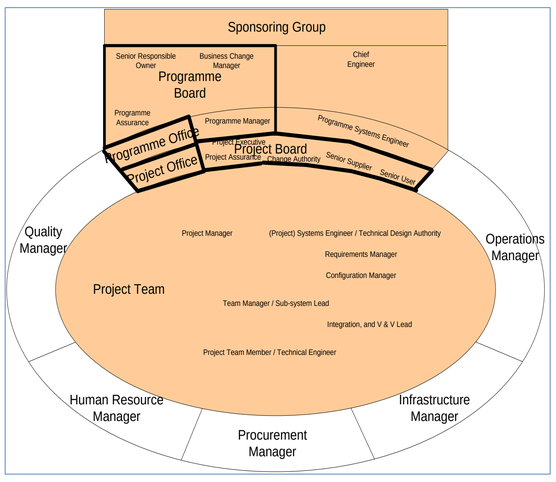
PPM Perspective + SE Perspective



Combined SEPM V-Model

"Handshakes" - Linking Roles & Responsibilities

Roles & Responsibilities RACI Analysis



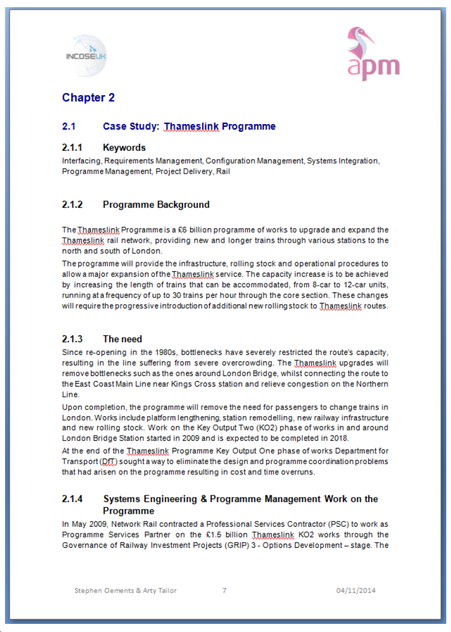
4 Roles & Responsibilities RASCI Table

This section identifies the responsibility associated with each role in terms of the programme/ project management and systems engineering products generated for the life-cycle described in section 2.

Key Products	Programme Sponsor	Senior Responsible Owner	Business Change Manager	Senior User	Programme Manager	Chief Engineer	Engineer / Systems Engineer	Project Sponsor	Project Manager	Technical Design Authority	Requirements Manager	Configuration Manager	Systems Element Lead	V, V & V Lead
Vision Statement	A	R	C			C								
Programme Mandate	A	R	C			C								
Programme Brief	A	R	C			C								
Business Case		A	C		R		S	S	S	S				
Risk Register		A	C		R	C	S	S	S	S	S		S	S
Benefits Map		A	R		C									
Benefits Realisation Plan				A	R									
Stakeholder Requirements					S	A	C	S			R			
Stakeholder Use Cases					S	A	C	R			S			
System Boundary						A	C	R						
External ICDs						A	C	R						
Concept Documents					S	A	C	R						
Enterprise Architecture						A	C	R						
Validation Plan					S	A	C	S			S			R
Maintenance Plan					S	A	C	R						
Transition Plan					S	A	C	R						
Programme Definition Document	A	C			R									
Programme Plan		A	C		R									
Output Descriptions		A			S		R							
Projects Dossier		A	C		R									
Benefits Review Report		A	A		R									
Transition Report				S	A		R							
Realised Capability					A		R							
Validation Test Report					S	A	S							R
System Requirements						A	C	S			R			
System Use Cases						A	C	R			S			
System Architecture						A	C	R						
Verification Plan						A	C	S		S	S		S	R
System Design Specification						A	C	R		S			S	
Internal ICDs						A	C	R					S	
Integration Plan						A	C	S		S	S		S	R
Project Mandates						A		R						
Project Briefs						A		R						
Project Initiation Documents								A	R	S				
Project Plan								A	R	S				
Product Descriptions								A		R				
System Elements									A	S			S	R
Integration Test Report									A	S			S	R
Realised System									A	R				
Verification Test Report									A	S			S	R

Case Studies in Success

Case Study Report on the use of systems engineering and project management good practice



Chapter 2

2.1 Case Study: Thameslink Programme

2.1.1 Keywords

Interfacing, Requirements Management, Configuration Management, Systems Integration, Programme Management, Project Delivery, Rail

2.1.2 Programme Background

The Thameslink Programme is a £6 billion programme of works to upgrade and expand the Thameslink rail network, providing new and longer trains through various stations to the north and south of London.

The programme will provide the infrastructure, rolling stock and operational procedures to allow a major expansion of the Thameslink service. The capacity increase is to be achieved by increasing the length of trains that can be accommodated, from 8-car to 12-car units, running at a frequency of up to 30 trains per hour through the core section. These changes will require the progressive introduction of additional new rolling stock to Thameslink routes.

2.1.3 The need

Since re-opening in the 1980s, bottlenecks have severely restricted the route's capacity, resulting in the line suffering from severe overcrowding. The Thameslink upgrades will remove bottlenecks such as the ones around London Bridge, whilst connecting the route to the East Coast Main Line near Kings Cross station and relieve congestion on the Northern Line.

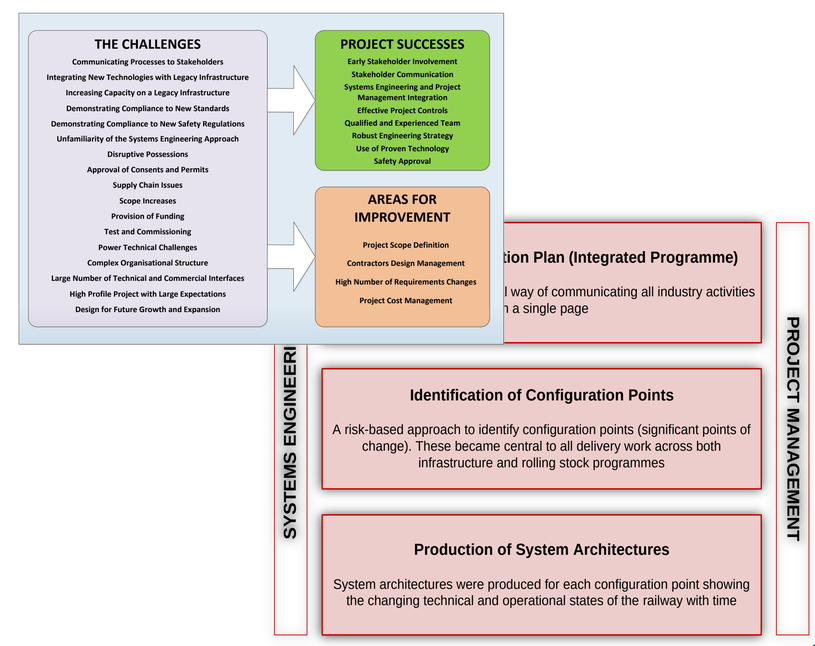
Upon completion, the programme will remove the need for passengers to change trains in London. Works include platform lengthening, station remodelling, new railway infrastructure and new rolling stock. Work on the Key Output Two (KO2) phase of works in and around London Bridge Station started in 2009 and is expected to be completed in 2018.

At the end of the Thameslink Programme Key Output One phase of works Department for Transport (DfT) sought a way to eliminate the design and programme coordination problems that had arisen on the programme resulting in cost and time overruns.

2.1.4 Systems Engineering & Programme Management Work on the Programme

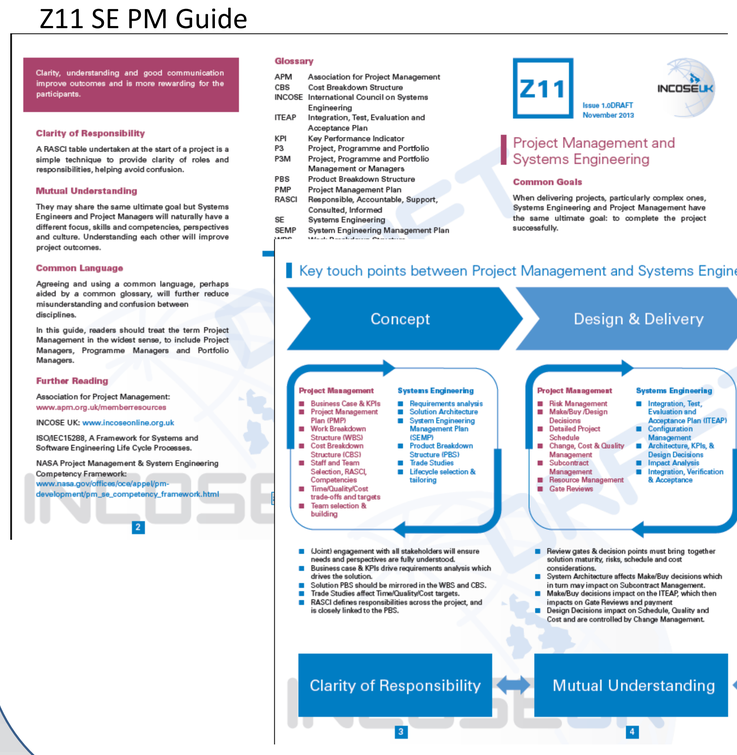
In May 2009, Network Rail contracted a Professional Services Contractor (PSC) to work as Programme Services Partner on the £1.5 billion Thameslink KO2 works through the Governance of Railway Investment Projects (GRIP) 3 - Options Development – stage. The

Stephen Clements & Arty Tailor 7 04/11/2014



Providing Guidance Material

Z11 SE PM Guide



Clarity, understanding and good communication improve outcomes and is more rewarding for the participants.

Clarity of Responsibility

A RASCI table undertaken at the start of a project is a simple technique to provide clarity of roles and responsibilities, helping avoid confusion.

Mutual Understanding

They may share the same ultimate goal but Systems Engineers and Project Managers will naturally have a different focus, skills and competencies, perspectives and culture. Understanding each other will improve project outcomes.

Common Language

Agreeing and using a common language, perhaps aided by a common glossary, will further reduce misunderstanding and confusion between disciplines.

In this guide, readers should treat the term Project Management in the widest sense, to include Project Managers, Programme Managers and Portfolio Managers.

Further Reading

Association for Project Management:
www.apm.org.uk/memberresources

INCOSE UK: www.incoseonline.org.uk

ISO/IEC15288, A Framework for Systems and Software Engineering Life Cycle Processes.

NASA Project Management & System Engineering Competency Framework:
www.nasa.gov/offices/oce/appel/pm-development/pm_se_competency_framework.html

2

Glossary

APM	Association for Project Management
CBS	Cost Breakdown Structure
INCOSE	International Council on Systems Engineering
ITEAP	Integration, Test, Evaluation and Acceptance Plan
KPI	Key Performance Indicator
P3	Project, Programme and Portfolio
P3M	Project, Programme and Portfolio Management or Managers
PBS	Product Breakdown Structure
PMP	Project Management Plan
RASCI	Responsible, Accountable, Support, Consulted, Informed
SE	Systems Engineering
SEMP	System Engineering Management Plan

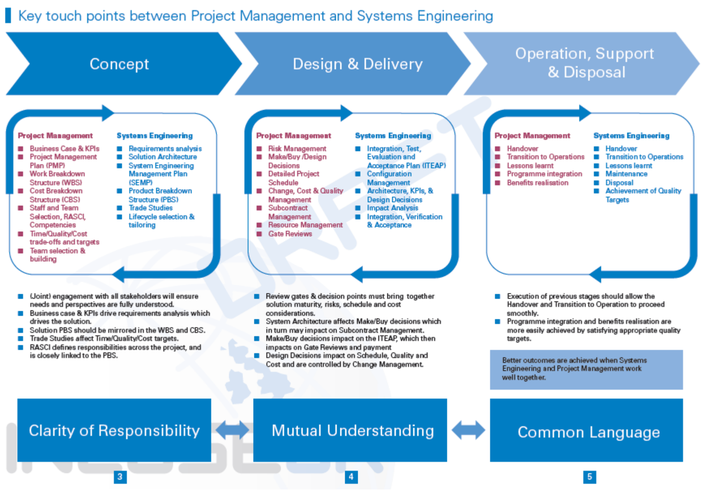
Z11 Issue 1.0DRAFT November 2013

Project Management and Systems Engineering

Common Goals

When delivering projects, particularly complex ones, Systems Engineering and Project Management have the same ultimate goal: to complete the project successfully.

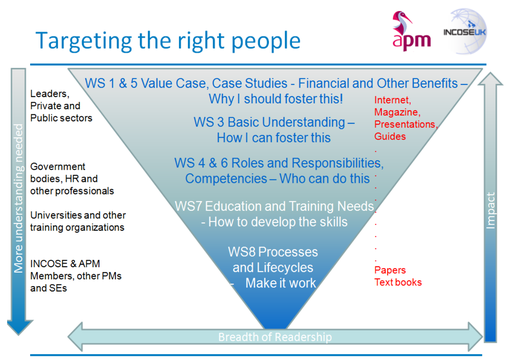
Key touch points between Project Management and Systems Engineering



Communications, Training and Education

Strategy for exploitation

Targeting the right people



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7. CPD for existing SEs and PMs

- CPD sessions for APM meetings – key concepts – video lecture - MOOCs
- Virtual communities of practice on Best Practice in integrating SE and PM – social media etc
- CPD sessions for other professional bodies (HR, Finance etc)
- Half-day courses for PMs on systems thinking and systems engineering
- Half-day courses for Systems Engineers on project management disciplines and drivers
- Deep courses (1 week?)

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7. Educating SEs and PMs

- University undergraduate courses
  - Engineering
- University post-graduate Masters courses
  - Engineering
  - Project Management
  - Specific to this subject

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