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Foundations for Improved Integration - Using Systems Engineering in Programme and Project Management

www.incose.org/symp2017

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Acknowledgements

- The INCOSE UK/APM Joint Working Group (JWG) on Systems Engineering and Project/ Programme Management Integration
- APM Systems Thinking Special Interest Group (which incorporates the JWG)
- Duncan Kemp and Adrian Pyne for general advice and inputs
- Dr James Goodwin for the genesis of the categorisation of the lifecycles
- All those interviewed in support of the case studies

Today's Presentation

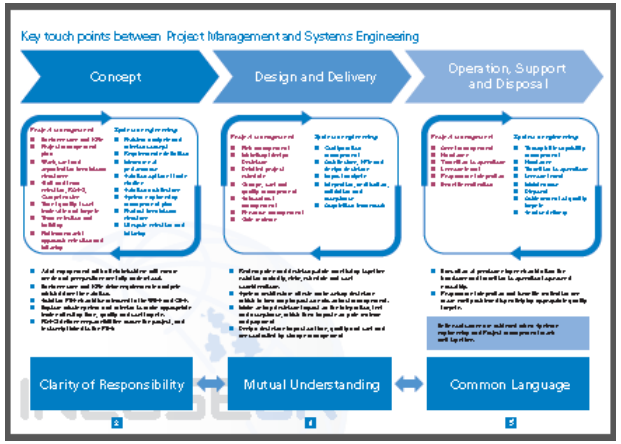
- Introduction: The Joint Working Group
- The approach
- Life cycles and Processes
- Touch points
- Tensions
- Fusion Points
- Case studies
- The Principles
- The Barriers
- Top Tips
- Conclusion

The Joint Working Group (JWG)

To develop and promote good practice and guidance dovetailing SE and PM and promote systems thinking across the wider decision-making community in the UK (and to influence developments internationally) in order to support the improved delivery of complex projects and avoid common pitfalls.

The Joint Working Group (JWG)

1. Define the benefits of increased SE and PM integration
2. Provide a focus in how to deliver these benefits
3. Communicate the benefits to a wide range of audiences



- INCOSE UK Z-guide (Z11) was presented at the INCOSE UK Annual Systems Engineering Conference (ASEC) 2013 (Cowper & McGlynn 2013)
- A one-page value proposition at ASEC 2014 (SEPM JWG 2014)
- A presentation at the APM Conference in 2015 (Cooke & Rooke 2015).
- A paper on lifecycles and processes at ASEC 2015 (Gray & Richardson 2015)

What are the benefits?	
WS 1	Compelling value proposition
How to deliver the benefits?	
WS 8	Life cycles and processes
WS 4	Roles and responsibilities
WS 6	Competency framework
WS 7	Education and training
How to promote the benefits?	
WS 2	Communication & exploitation
WS 3	Guidance material
WS 5	Case studies

Guidance materials and Communication

Information from working groups used to identify the principles for enabling integration.

Outputs needed to meet **key criteria**:

- Based on evidence collected through:
  - comparative analysis (including ws8)
  - case studies and interviews (ws5)
- Tested and refined through focused workshops and conferences;
- Communicated with a wide stakeholder group.

WS8: Lifecycles and Processes

Continuing Annual Systems Engineering Conference (ASEC) narratives:

- Life cycle model and approaches (Adcock and Farncombe, 2009) and subsequent Bristol Local Group workshop (Brain and Gibson 2011).
- ASEC 2011, SELEX/UCL survey into behaviours of PM and SE practitioners and integration of approaches (Fielding-Smith, 2011).
- One-page value proposition at ASEC 2014 (SEPM JWG 2014)
- A paper on lifecycles and processes at ASEC 2015 (Gray & Richardson 2015)

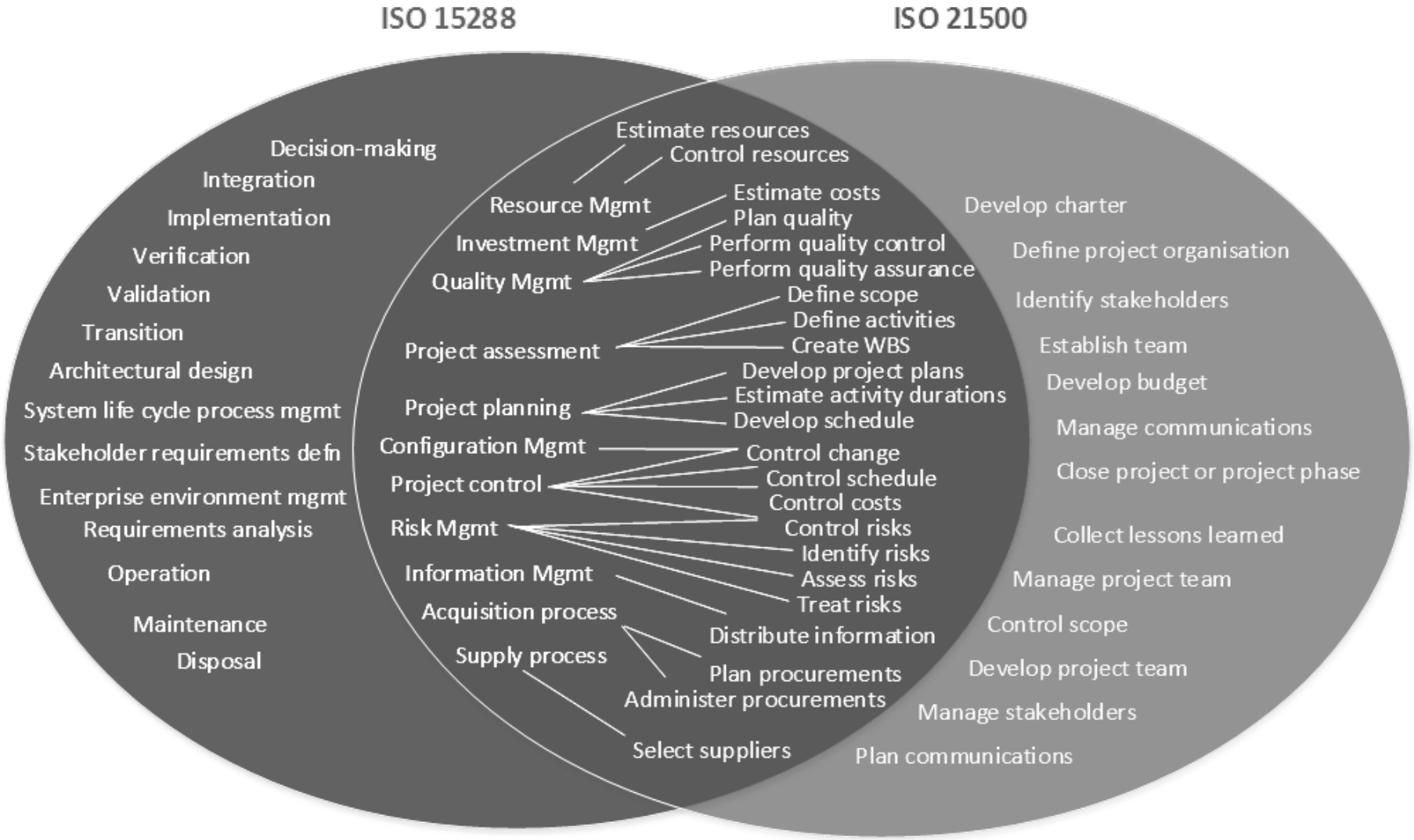
Process Comparisons:

- ISO standards ISO15288:2015 (SE) and ISO21500:2012 (PM)

Life cycle representations:

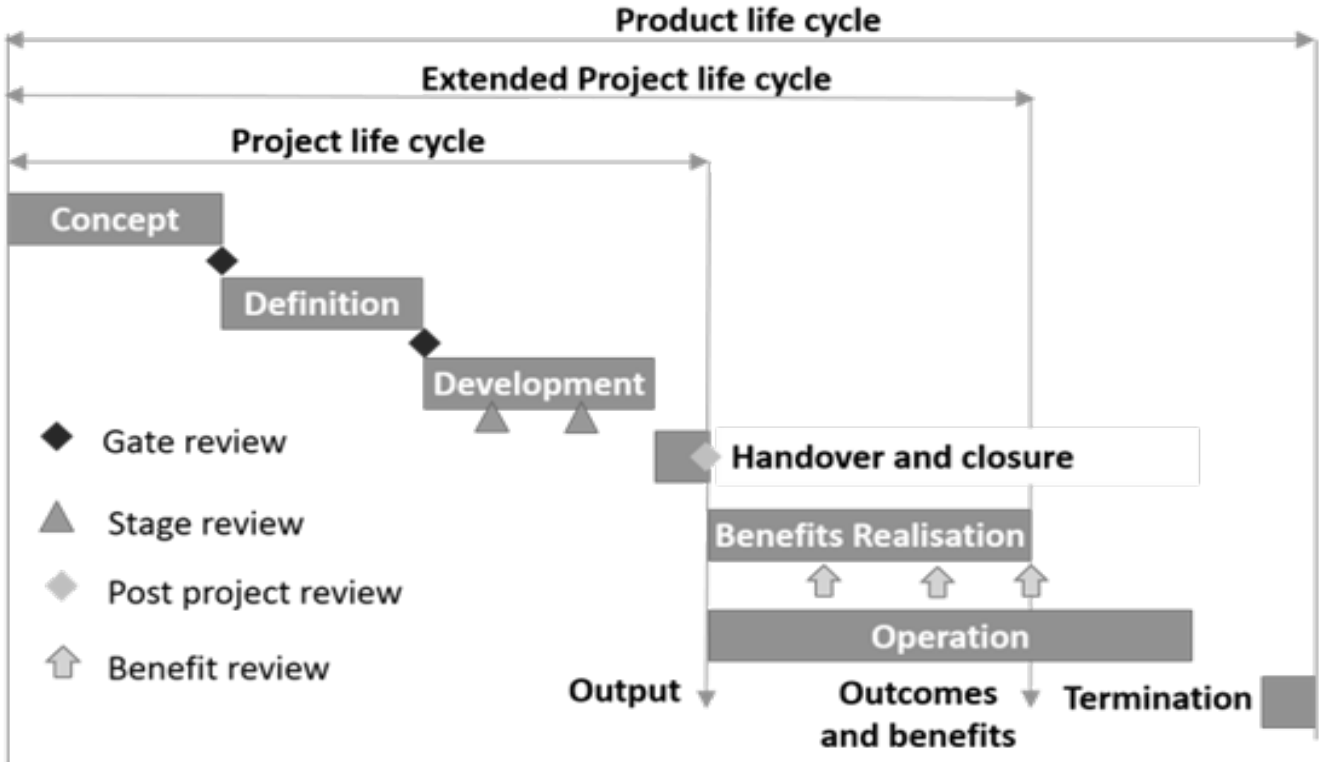
- INCOSE SE Handbook, APM Bok, PMBOK ® and sector specific examples
- Information drawn from Axelos Best Management Practice suite (MoP®, MSP®, PRINCE2®)

WS8: Process Comparison



WS8: SE vs PM terminology

- Need to develop and use common language
- Recognise and understand differences
- Example: ‘Lifecycle’



WS8: Scenarios, Approaches and Models

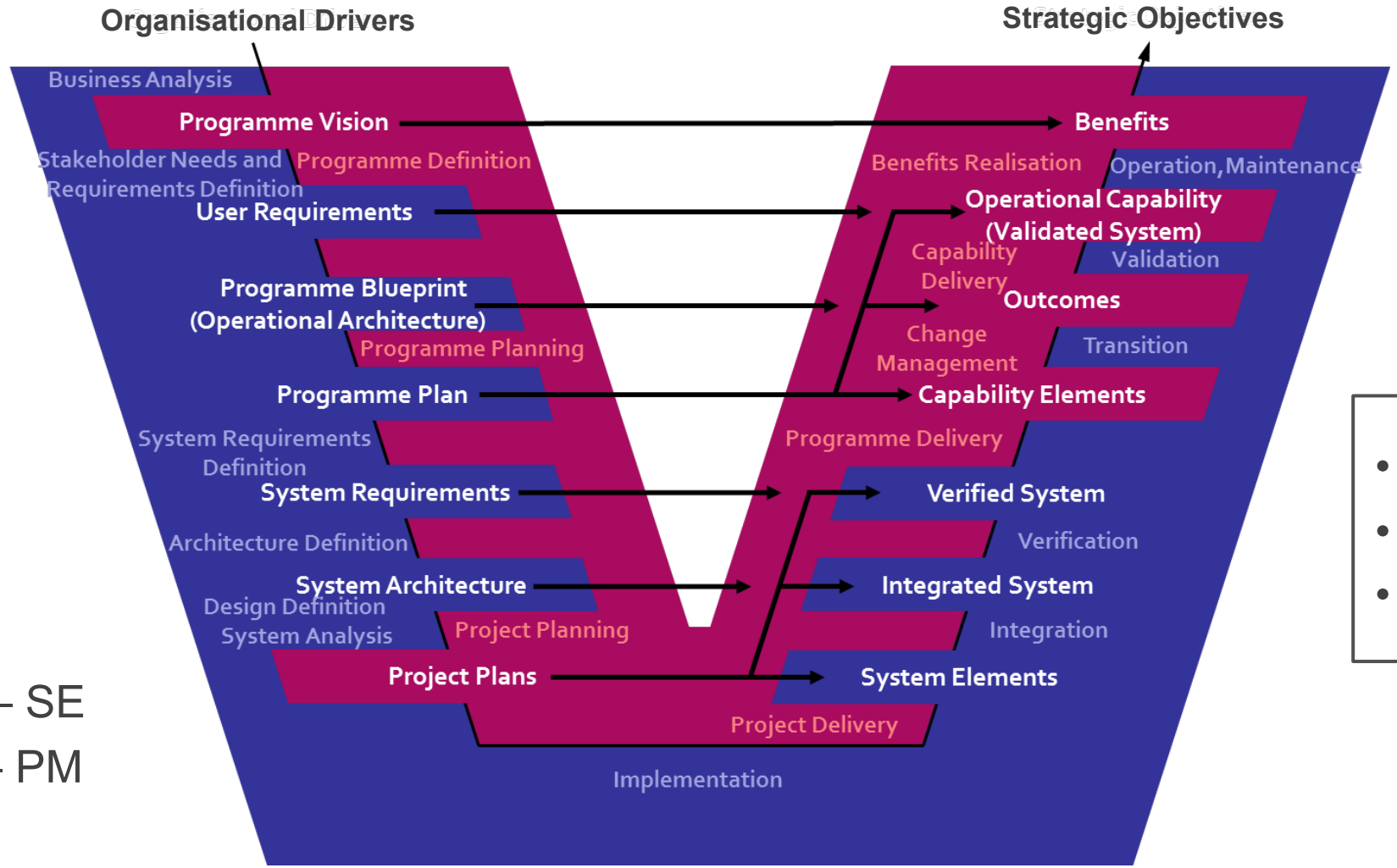
Life Cycle Scenarios
New product/facility/software design, development and introduction
Transformational change
Capability or service acquisition
Life Cycle Approaches
Base
Experimental
Incremental
Evolutionary
Life Cycle Models
Management
Development

Context of the high-level strategies to achieve specific goals.
Shaped by the business environment.

Representations of interactions between discrete life cycle models.
May be used for different scenarios and/or combine different models.

Framework of processes and activities within each lifecycle phase, how they interact, outputs generated and associated roles.

WS8: SEPM Vee model



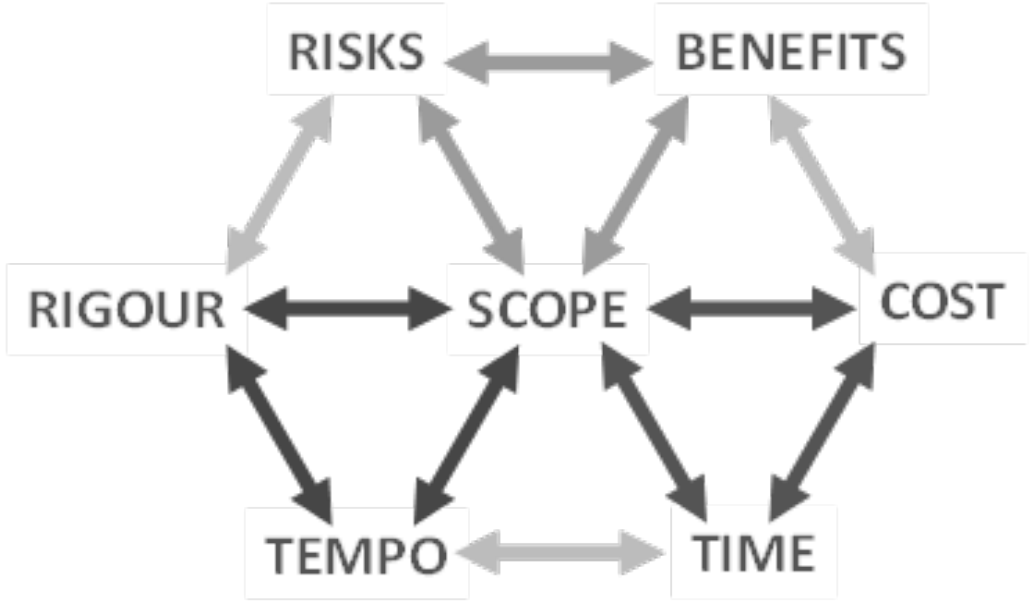
- Touch points
- Tension points
- Fusion points

Outer V – SE

Inner V – PM

WS8: Tensions

Tension fields – inherent in a project environment



SE/PM Tensions:

- Perspective differences
- Preconceptions
- Mis-communications
- Terminology clashes
- Over-elaboration (in requirement setting and project planning)
- Overlaps or Gaps in responsibilities
- Failure to articulate the respective value of SE and PM processes
- Lack of mutual understanding and respect

Fielding-Smith, 2011

WS8: Fusion Points (1)

Governance/Program level:

- Using SE to improve the governance of complex projects.
- Adopting a system of systems approach to programme definition and management.
- Identifying and managing project to project interdependencies.

Planning:

- Employing SE techniques in project product-based planning.
- Managing change across the supply chain-based product delivery system.
- Integrating review gates throughout project delivery phases.

WS8: Fusion Points (2)

Process:

- Applying soft systems methods to stakeholder management
- Requirements definitions in contract management.
- Utilising architectural modelling in defining programmes and projects.
- Transition definition and management.
- Verification and validation in benefits management.

WS5 Case Studies: Thameslink

- A ‘One team’ approach
  - Integrated team set up from day one.
  - Platform for programme and design integration.
- An integrated plan
  - Integrated plan and a tool called ‘Roadmap’.
  - Facilitated management of risks, assumptions and issues.
- Integrated governance
  - Systems Integration Authority (SIA) to provide direction and setting decision-making. boundaries, identifying strategic issues and programme level configuration control.

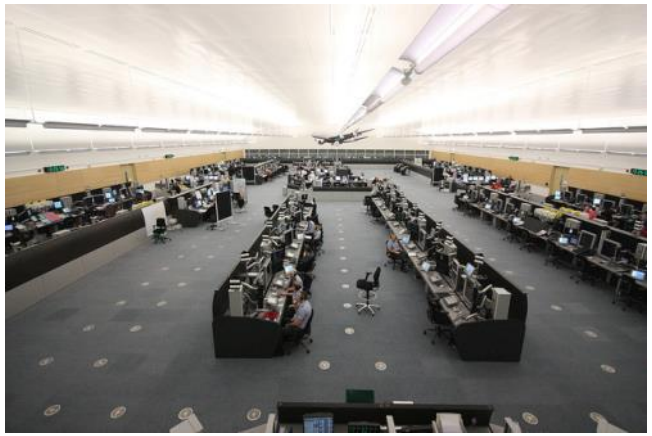
For further details see http://www.thameslinkprogramme.co.uk/about-us

WS5 Case Studies: East London Line Project

- Common and clear communication
  - ‘Engineering Strategy’ provided structured approach to stakeholder engagement and approval processes.
  - Intranet based Process Management System and well structured logical document hierarchy.
- Collaborative environment
  - PM team proactive in removing barriers to good SE processes.
- A ‘One team’ approach
  - Systems integration approach adopted from the start through an Integrated Project Team (IPT)

For further details see https://tfl.gov.uk/modes/london-overground/

WS5 Case Studies: Air Traffic Control Centres at Prestwick



- Benefits of SEPM
  - SEPM teams worked together on early capture of all stakeholder needs.
  - Enabled effective planning and approvals process, and a fully integrated solution.
- Recognition of tensions
  - Joint SEPM communications plan including staff migration.
- A 'One team' approach
  - SEPM worked in unison though application of SE and PM techniques in an integrated team.

For further details see http://www.nats.aero/about-us/what-we-do/our-control-centres/

WS5 Case Studies: Heathrow Airport Terminal 5

- Defining a collaborative environment
  - The‘T5 Agreement’ – where the client would bear the risk on T5 - encouraged collaborative behaviour.
  - BAA prepared, developed and refined a novel approach called ‘Continuous Improvement of Project Process’ (CIPP) based on a set of replicable processes, integrated project teams and framework agreements.

For further details see
http://www.britishairways.com/en-gb/information/airport-information/london-heathrow-airport/heathrow-t5

Principles (1)

1. **Common Goal.** The need for both disciplines to be striving towards solving the same solution and ensuring they are addressing the right problem.
2. **Scope.** Defining the scope from the outset of a project can prevent confusion and tension. It is also why it is so difficult to recover projects when a systems engineer is parachuted in late.
3. **Clarity of Responsibility.** Ensuring all members of the team are clear on their responsibilities and their timelines for delivery when defining the scope.
4. **Common Clear Communication.** This principle refers to both internal and external communication. At times, System Engineers and Project Managers can communicate with external stakeholders in ways that can seem diametrically opposed.

Principles (2)

5. **Mutual Respect and Recognition.** Good working relationships start with understanding the value that the other discipline brings to the project.
6. **Recognise and Manage Tensions.** Healthy tension between Systems Engineering and Project Management disciplines can drive a great outcome for a project. These tensions need to be recognised and managed to drive performance.
7. **Establish Collaborative Behaviours**. Planning upfront is important. All projects will face emergent issues, however, and resolving these in a collaborative manner across disciplines will ensure the optimum solution.

Barriers

- Documentation
- Use of language
- Perceived value of the disciplines
- Different understanding of risk, planning and estimating methods
- Organisational silo mentality
- Decision making authority

Top Tips

Promote the value of integration and systems thinking	Be clear on the benefits of each discipline
	Clearly articulate the benefits of integration
	Continue to develop discipline competency
	Establish a community to run internal induction and training sessions
Create a collaborative environment of healthy challenge	Clarify language
	Clarify roles, responsibilities and behaviours
	Recognise tensions at the outset and manage throughout the project
Develop an integrated plan	Agree the sequence of deliverables
	Tailor the design of the delivery system as well as the product
	Establish integrated governance (programme & technical)
Integrate early and manage through the project life cycle	Establish an SEPM “one team” approach from the outset
	Adapt the relationship throughout the life cycle

Conclusion

- Recognise the value of integrated working and different perspectives
  - SE underpins the solution planning-development-delivery lifecycle.
  - PM helps establish the business context.
  - Common goals and activities exist…
  - …but each project needs to be assessed individually
  - Top Tips and Principles will help.

Future Work

- The work of the JWG embraces many other aspects of SE/PM integration
- Further information and guidance will be published to help deliver greater value from the benefits of integrated working:
  - Awareness
  - Understanding
  - Tools and Techniques
- If you are interested then please join the working group. Information on the Systems Thinking SIG can be found at http://www.apm.org.uk/community/systems-thinking-sig

Thank you

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