NiTEWORKS

Developing Strategic Systemic solutions to complex problems in the UK Defence Enterprise

Prof Mike Wilkinson, Niteworks Technical Director
Fleur Currie, Niteworks Chief Systems Engineer
Chris Jordan, Niteworks Chief Analyst

Introduction to Niteworks

Essential details of the underpinning model

Evolving role of Niteworks

"The Niteworks partnership provides practical, impartial responses to complex defence problems by combining evidence, experience and innovation from across the whole defence enterprise, including MOD, Dstl, industry and academia, in an agile and timely fashion"

- Evolving, not fixed in time
- Niteworks is an MOD and Industry partnership
- It aims to benefit all stakeholders (MOD, industry and academia)
- It incorporates a *unique* intellectual property model
- It is part of the MOD, who define the questions and provide funding
- Similar organisations exist
  - Australian DoD - http://www.rpde.org.au
  - UK Home Office - http://www.bluelightworks.com

Fully Inclusive MOD and Industry Collaboration

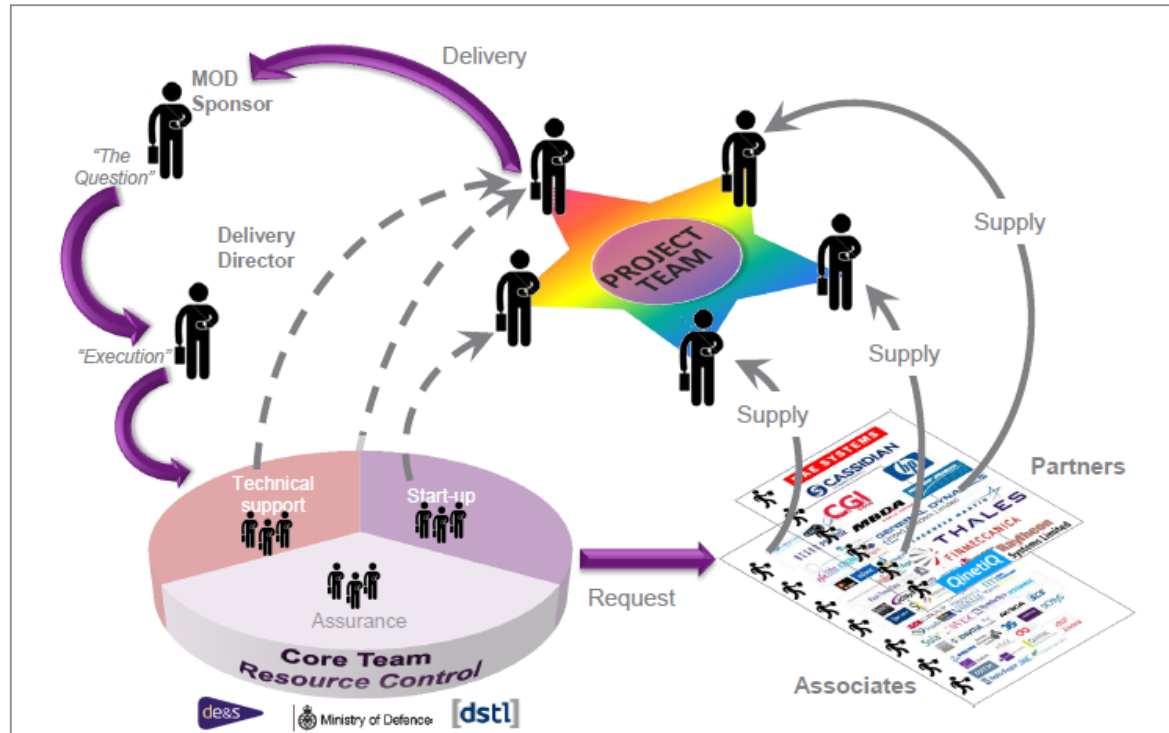
MOD unified customer

12 industry partners drawn from the major defence providers

150+ associate members comprising small & medium sized enterprises (SMEs), specialists, academia and consulting companies

Wider access via NDA as required

How does Niteworks impartial industry **engagement** work?

Best athlete rainbow teams are drawn from across the partnership. All partnership members are encouraged to engage via defined mechanisms.

Commercial and partnership model
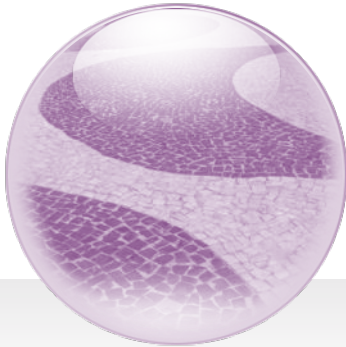
Commercial Framework

- Fully inclusive
- Shared Intellectual Property agreement
- Open and transparent processes
- Flexible and responsive contracting arrangements
- Impartiality

Breadth & Depth

- Broad Industry, MOD and Dstl engagement
- Access and reach back into MOD and Industry
- Pan-DLoD
- Knowledge sharing

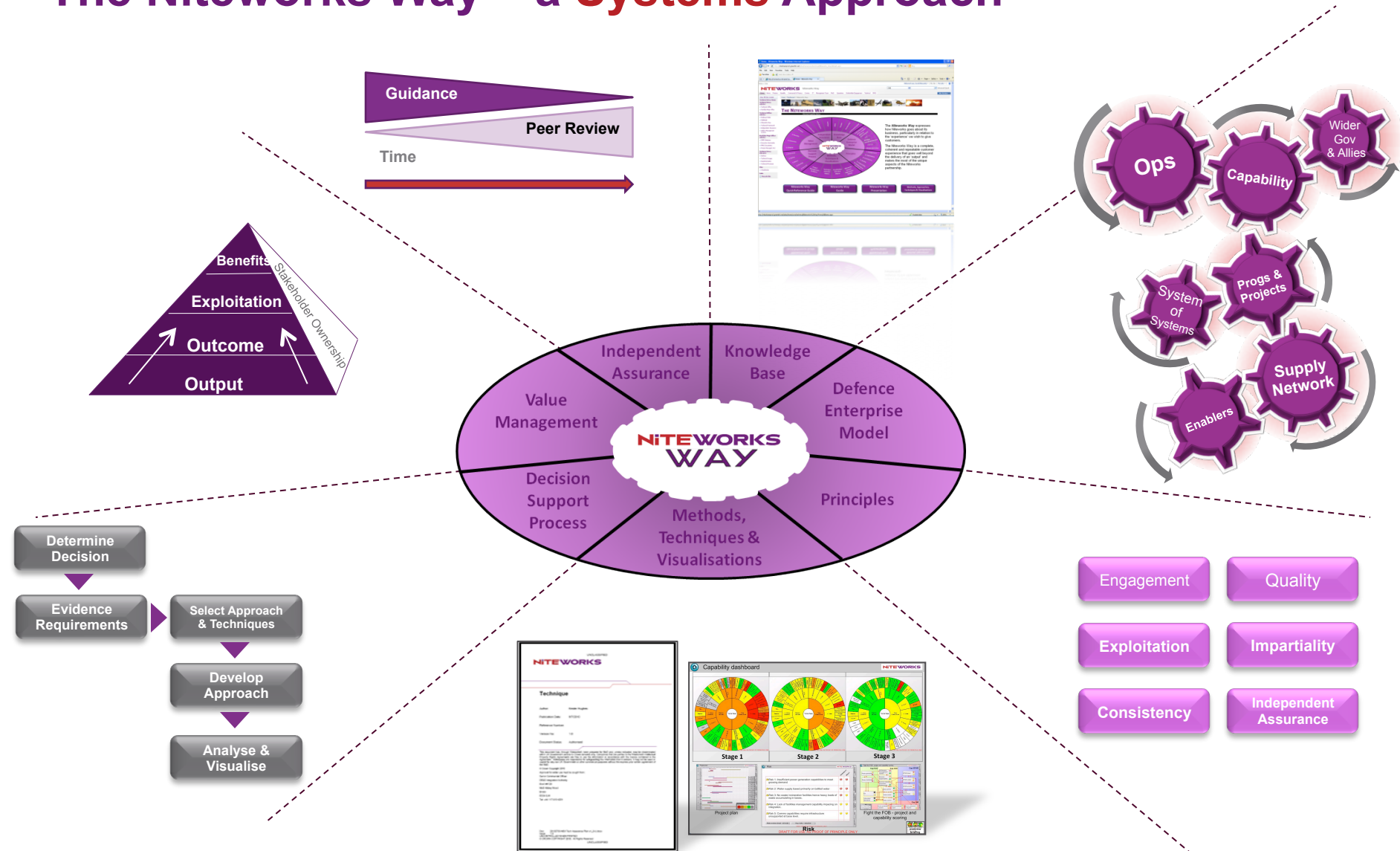## Culture

- Customer ethos
- Valuing diversity
- Joint working/shared outcomes
- Badgeless
- Exploitation focus

The Niteworks Way

Or "how we do projects around here"

The Niteworks Way – a **Systems** Approach

The Niteworks Way – a Systems Approach
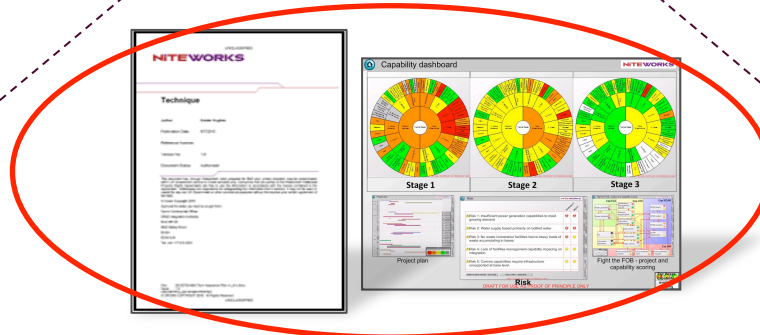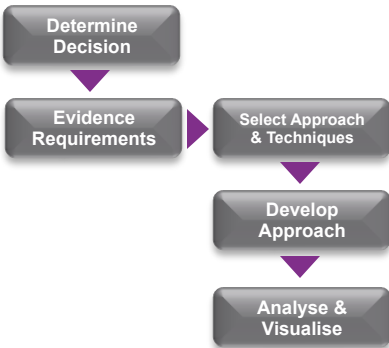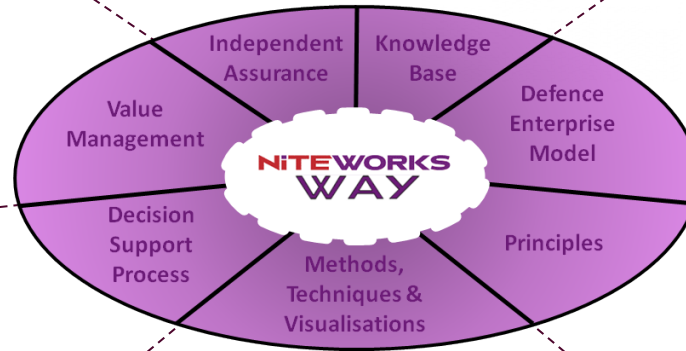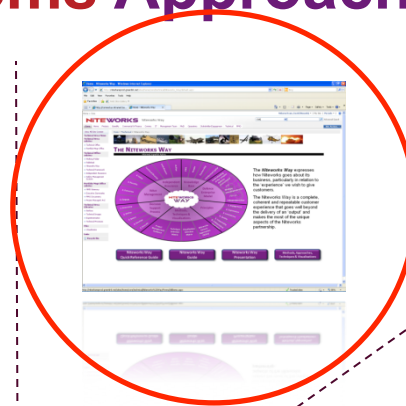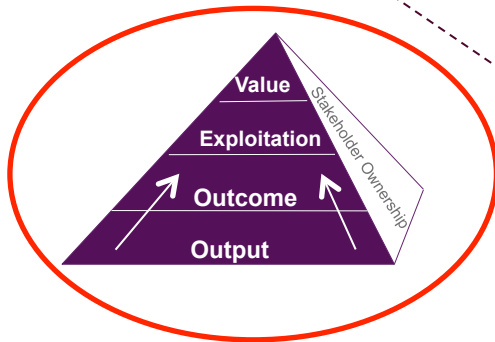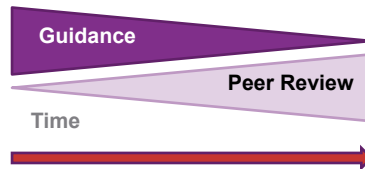
Strategic Systemic Solutions

Addressing the root causes of problems, once and for all

Strategic vs Tactical, Systemic vs Symptomatic

Strategic

Symptomatic — *Systemic*

Tactical

- Wishful Thinking
- Root Cause
- Quick and Dirty
- Sticking Plaster
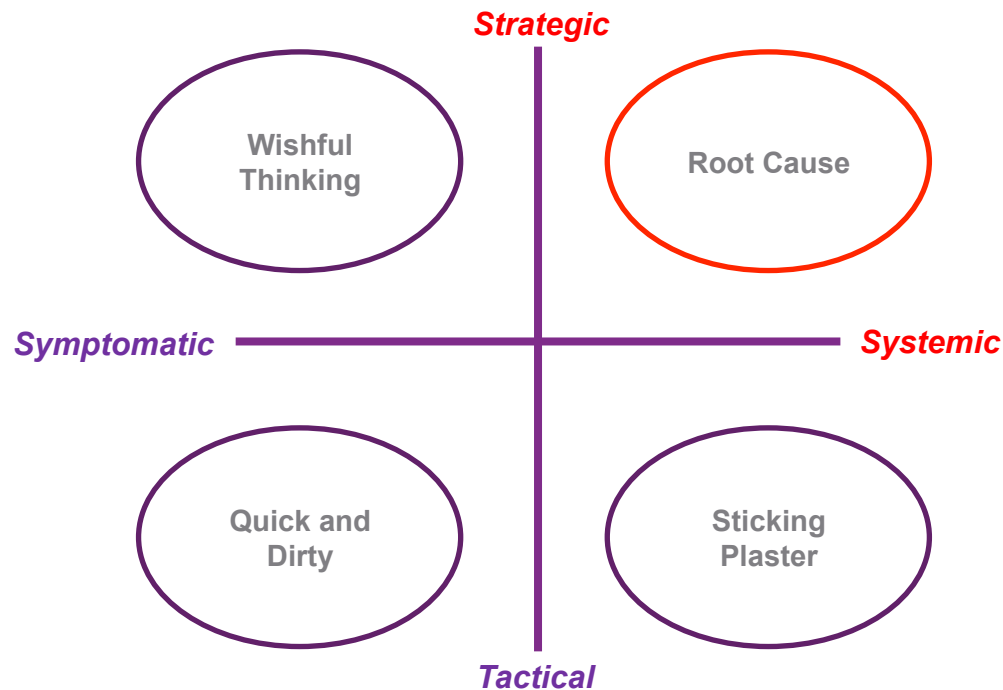
Generating a strategic systemic generic solution
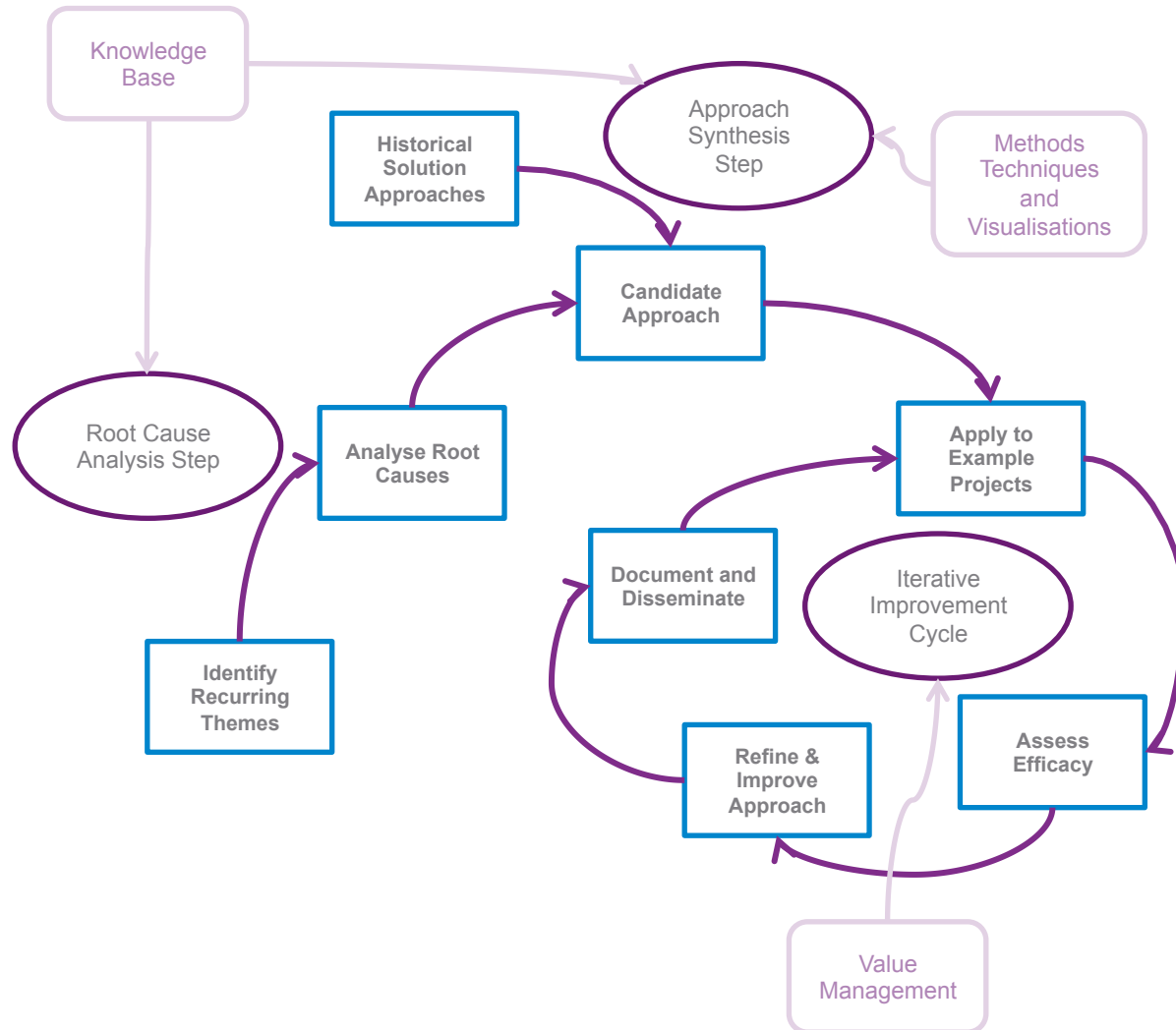
Case Studies

Continuous Capability Evolution

Traditional defence acquisition lifecycle
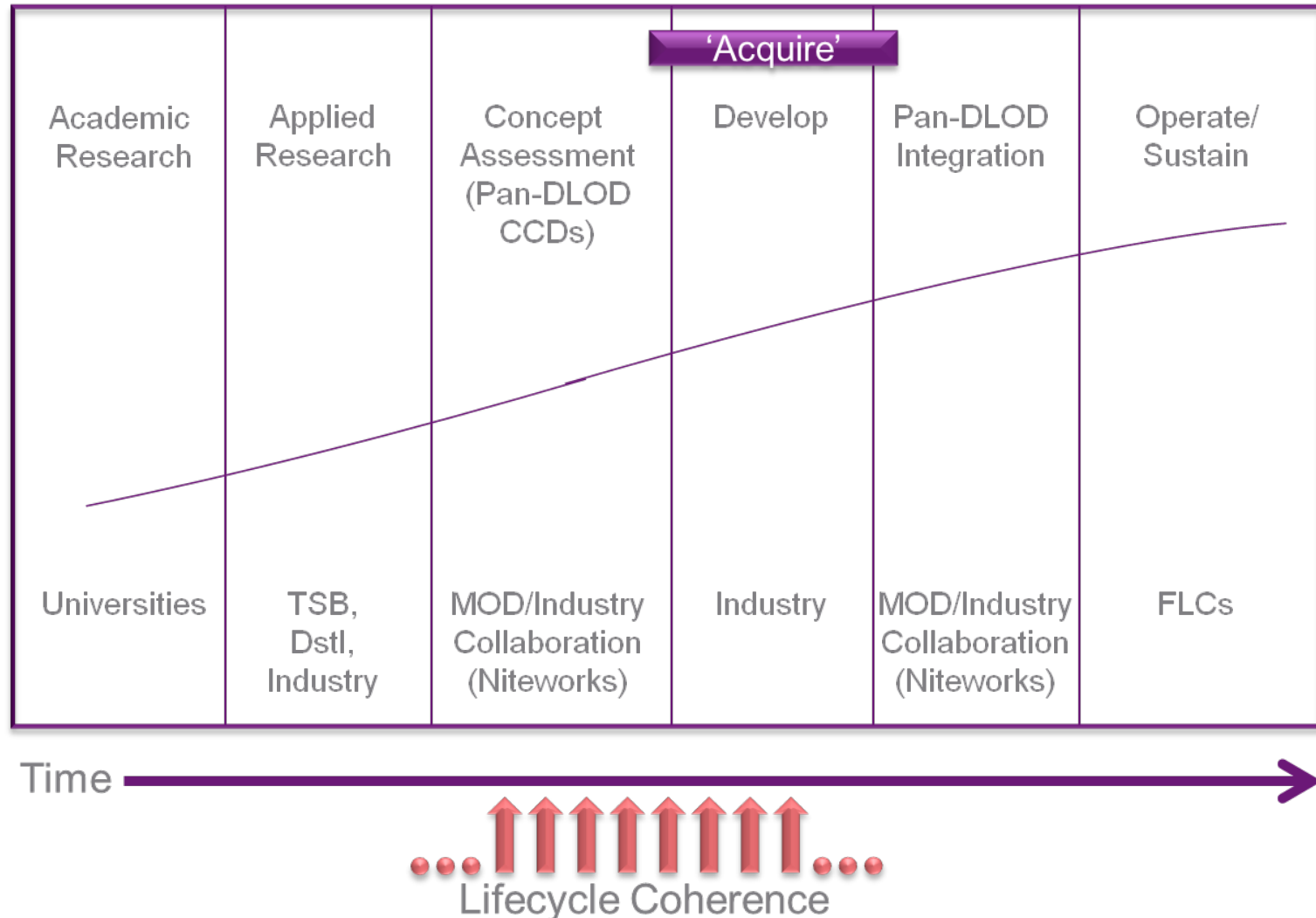
Five generic root causes

- Standard acquisition lifecycle processes are lengthy leading to *fragility to changing circumstances*
- Aligning research to support acquisition activities and the *technology exploitation* challenge
- The linear approach involves premature specification, often for contractual reasons, with consequent *susceptibility to poor requirements*
- Commercial mechanisms applied to a complex capability acquisition act as a *strait-jacket*
- Complex capabilities require integration within themselves and across the capabilities with which they operate leading to *capability coherence* challenges

Four additional root causes for 'fast-spin' domains

- Greater challenges around DLOD integration and operationalising capabilities or components of capability leading to *hybrid fast/slow spin incompatibility*

- Fast spin domains are dominated by off-the-shelf (OTS) technologies, which top-down requirements driven design do not fully accommodate, this is the *presumption of requirements design freedom*

- Smaller companies are now the ones developing technology – there is a *changing locus of innovation* that is not supported by prime contracting

- Even if technology updates keep pace, users cannot master the changes, leading to *operational decoupling*

Solution principle: Continuous Change
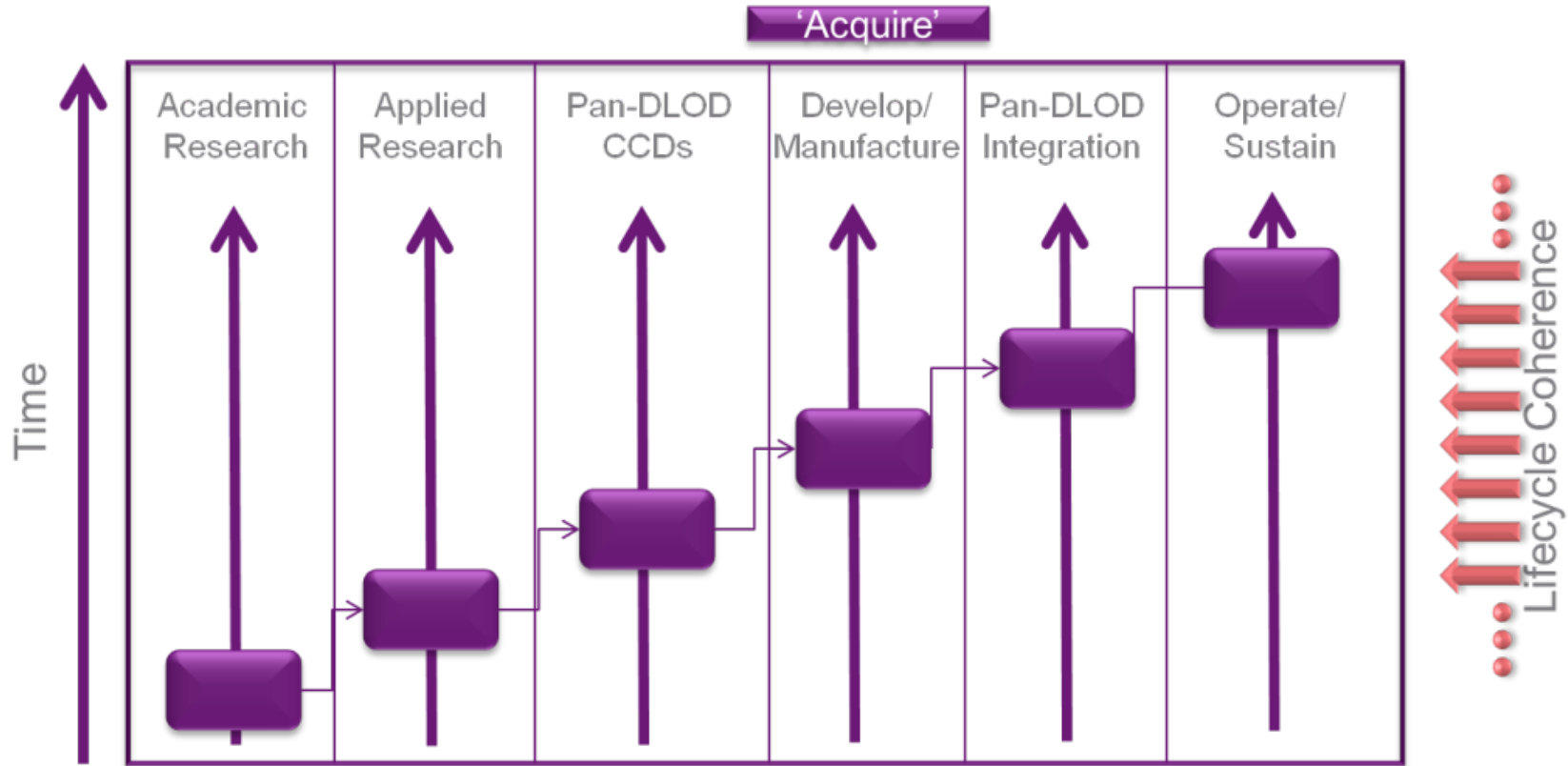
Solution principle: Use External Research and Existing OTS Capabilities
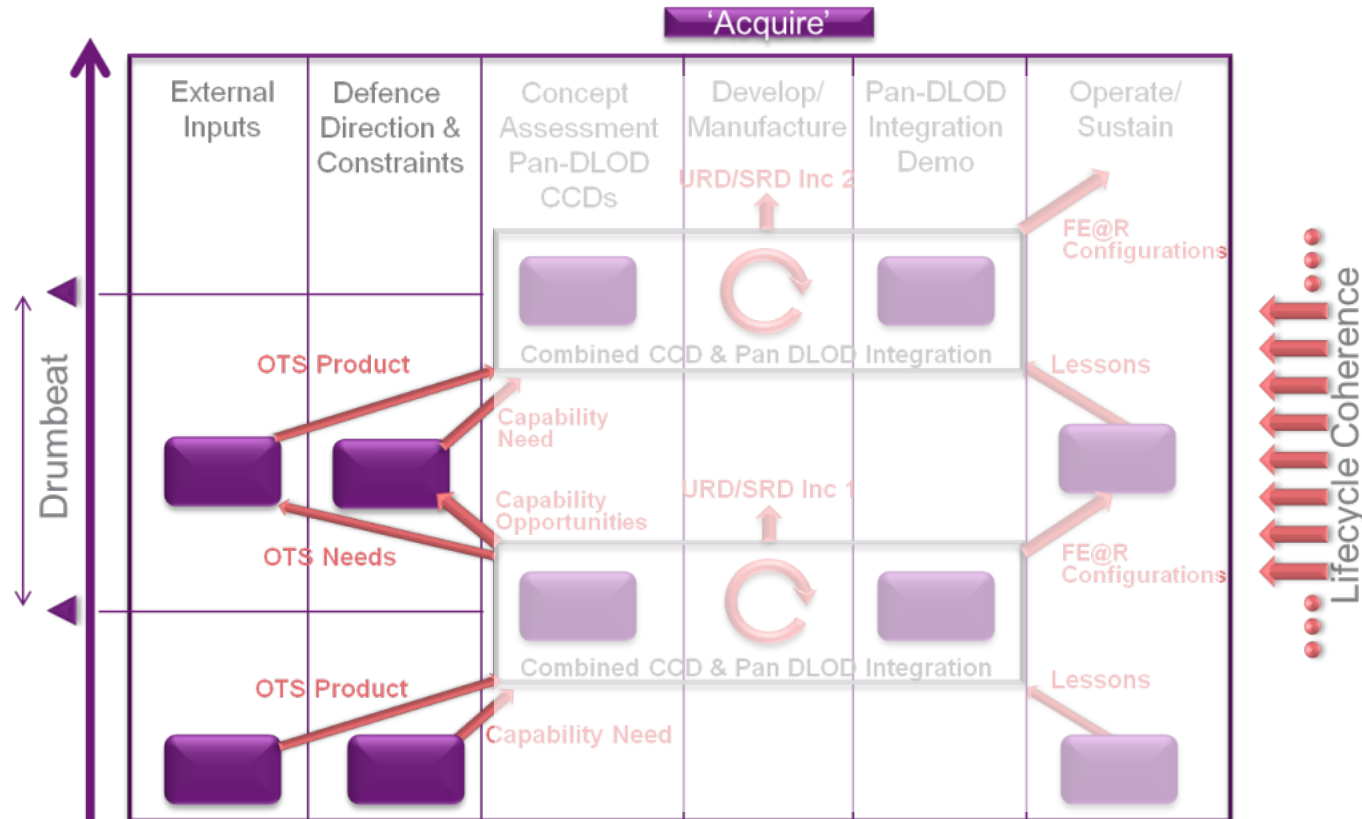
Plug and play OTS elements often conform to international standards with an implicit or explicit open modular integration architecture

Solution principle: Coalesce CCD and Integration Activities
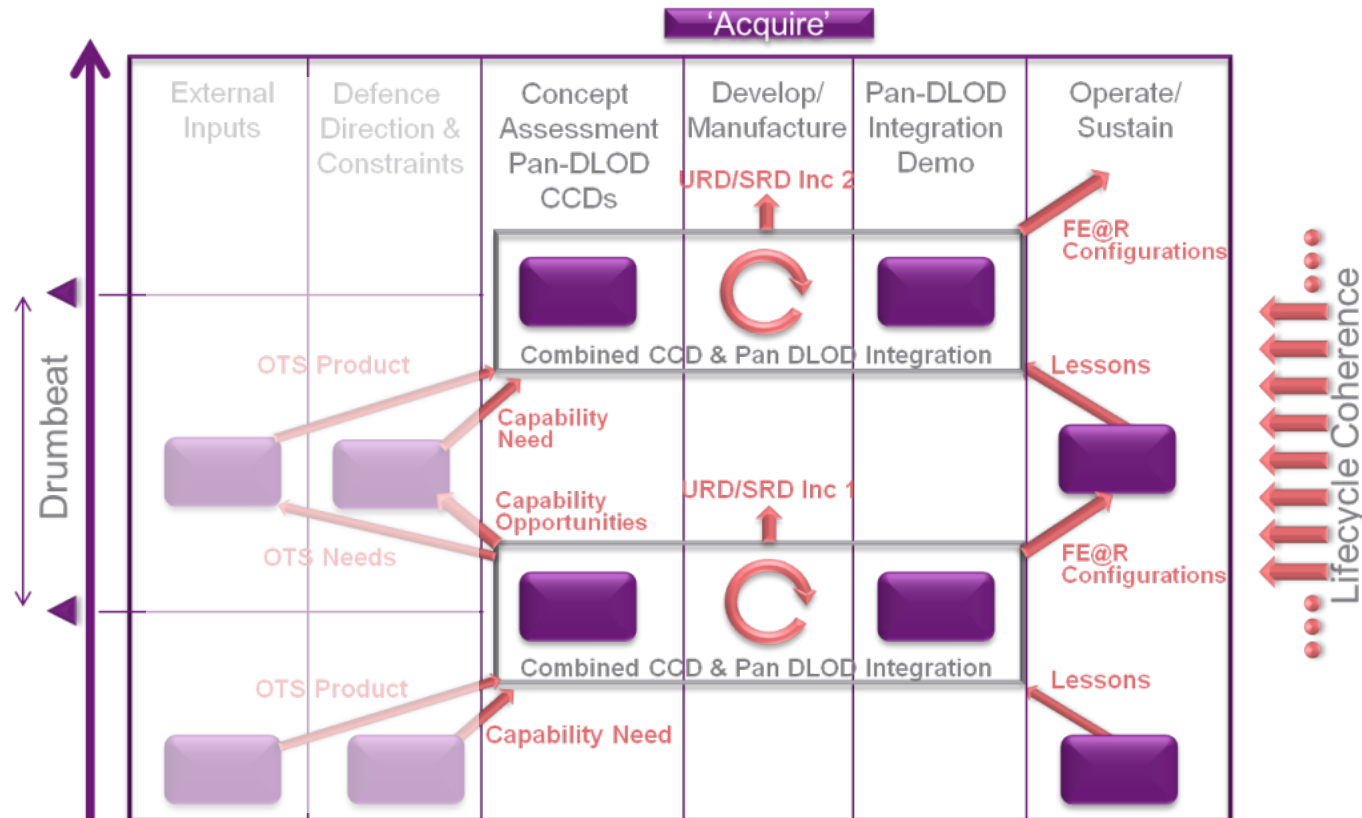
Solution principle: Adopt explicit structure to support innovation
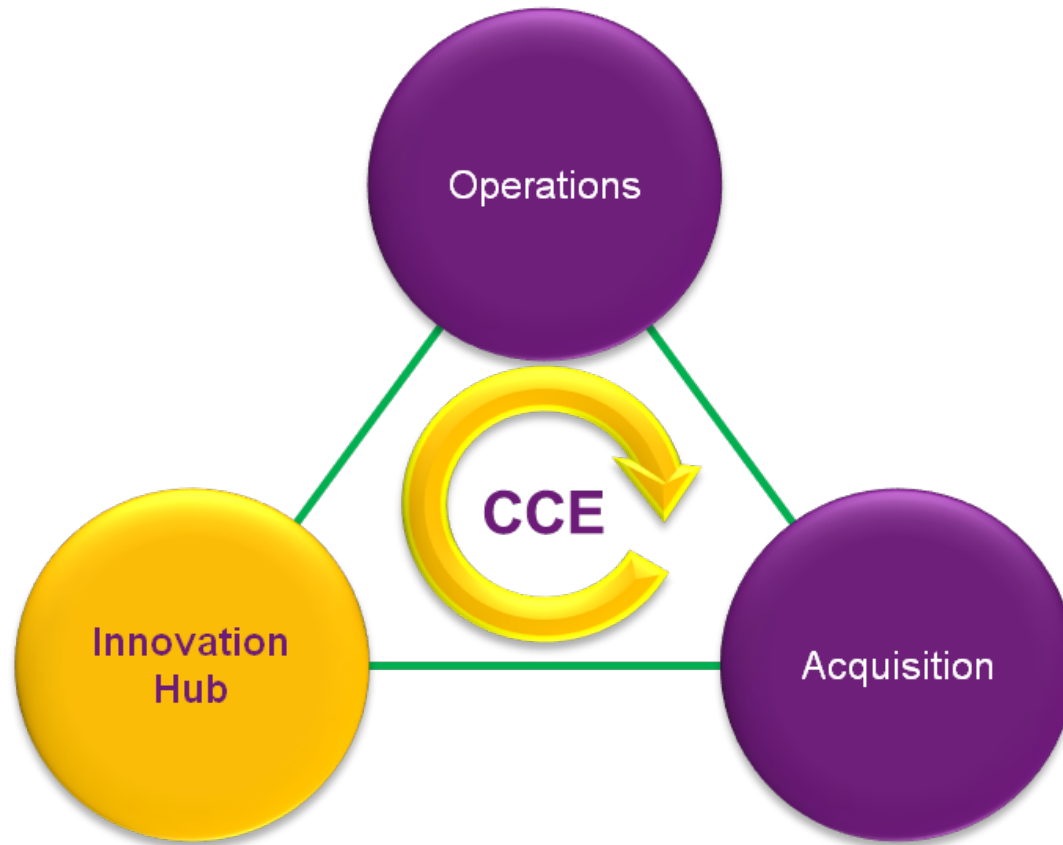
CCE - Summary

- A practical approach to the evolution of capability through small scale, low risk, increments

- Particularly well suited to acquisition of capabilities that are primarily composed of 'fast-spin' OTS technologies

- Key benefits of the approach
  - Radical compression of acquisition timescales
  - Exploitation of technologies at their optimum maturity point
  - Ability to incorporate operational lessons with minimal delay

Case Studies

Holistic Complex System Interventions

Holistic Approach to Complex Systems

▶ **Issue:** current methods fall short when employed in support of complex systems analysis leading to inappropriate conclusions.

"…contemporary operations are likely to be more complex and adversaries could be more difficult to identify. … we live in a world of wicked problems, which are so complex that they defy process driven, management or scientific approaches. This does not mean that they are unsolvable, but the approach must be open-minded, agile, flexible and adaptable to work through the complexities."

Joint Doctrine Publication JDP 2-00 Understanding and Intelligence Support to Operations

Create a controlled world where the interventions have large and significant impact

Design to establish cause and effect

Constrain to reduce uncertainty

Hypothesis-Deduction approach

Expect large differences

Control behaviour
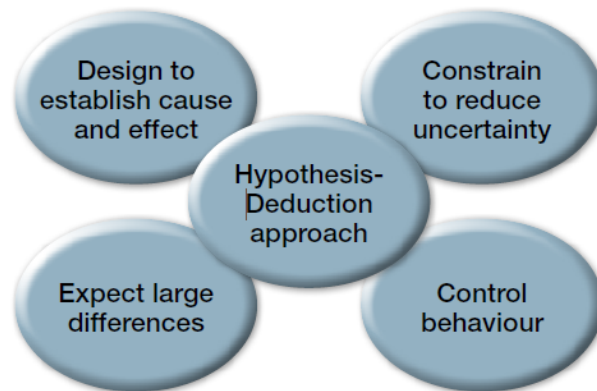
Explore in a complex world how small interventions can deliver benefits

Explore to understand

Accept uncertainy

Iterate

Be innovative

Evaluate
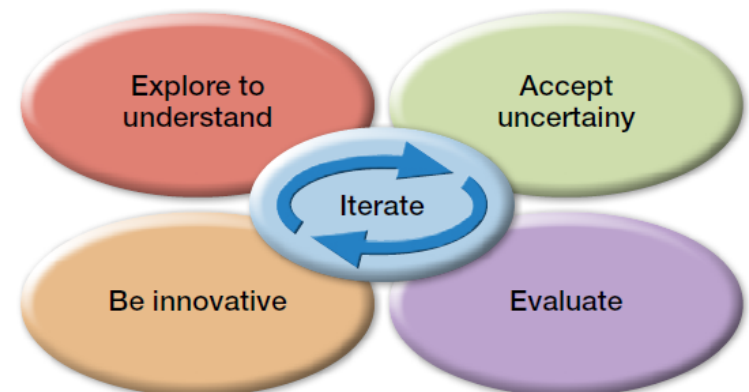
Explore to understand - accepting uncertainty

▼ Strategic Context – UK and overseas
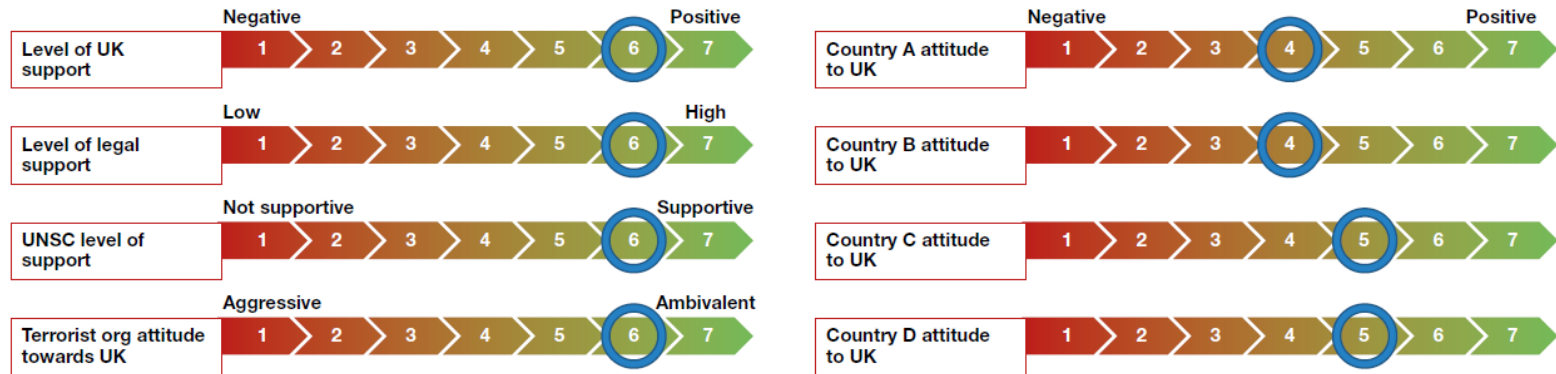
▼ Operational Environment – Factors: Political, Military, Social, Information Infrastructure, Physical Environment, Time Pressure (PMESII-PT)
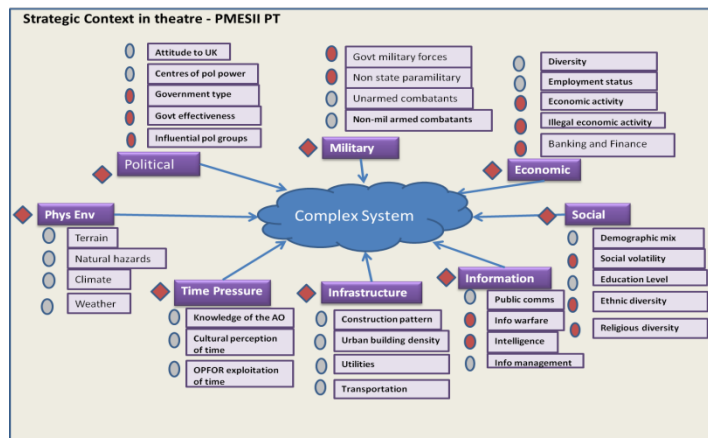
A number of factors that highlight risk

Evaluate the Baseline -Innovate – Evaluate - Iterate
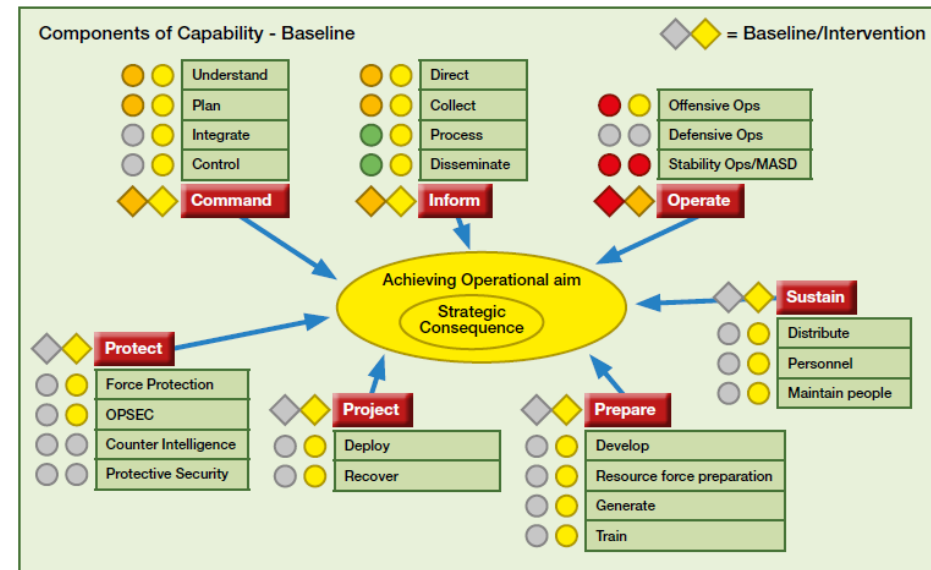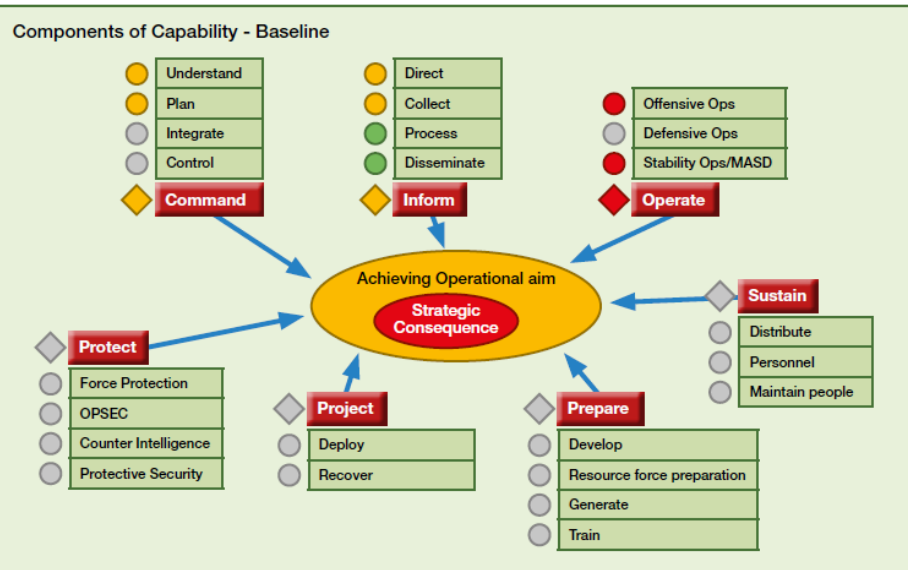
Baseline – do nothing

Air Strike Intervention

▼ Air Strike Intervention achieves improved command, inform and operate but introduces other risks

▼ Delivers better operational aim and strategic consequence

Summary

◥ A multi-method approach for complex systems.
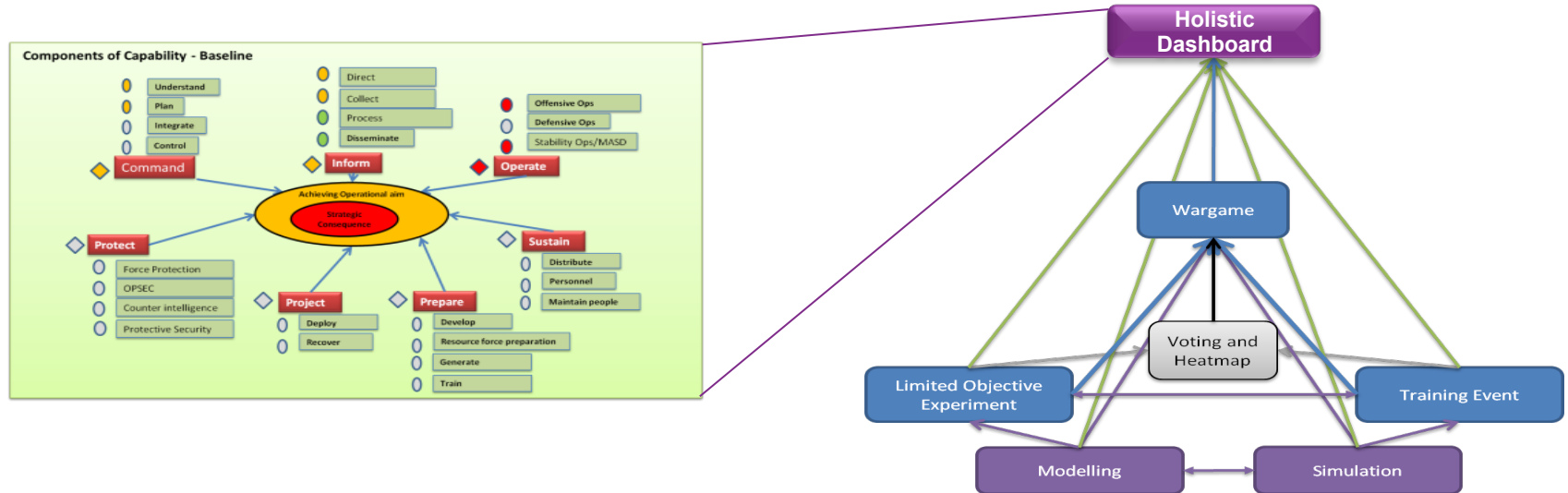
◥ Approach influencing experimentation in Niteworks and wider MOD

◥ Used to examine options for Surveillance and Reconnaissance

◥ Applied to NATO Operations Assessment

Case Studies

Architecting Styles

History of frustration with architecture

- Poor value proposition
- Architecture for its own sake
- Products not owned or valued
- Poor understanding of architectural outputs
- Focus on modelling rather than architecting
- Limited grasp of architectural concepts and use

Framework of architecting approach elements

Context

Area of Concern
- Multiple or Single
- Function or Organisation Focus
- Inwards or X – Domain
- Established or Emerging
- Defined by Breadth, Depth & EPOCH
- Different Stakeholder Concern

Purpose
- Understanding
- Coherency
- Consistency
- Efficiencies
- Rationalisation
- Robustness
- Justification
- Innovation
- Integration
- Control
- Reuse

Level of Change
- Enterprise
- Portfolio
- Programme
- Project
- Task
- Service
- Sys of Sys
- System
- Component

Enablers
- Frameworks (inc metamodel)
- People (eg architects)
- Tools (Development)
- Repository management
- Publishing Environment (static vs dynamic)
- Partitioning

Value / Scope / Control / Delivery / Delivery / Control / Scope / Value

Methods
- One Off, Phased or Iterative
- Standard or customised eg Top-down, Bottom up, Replication or Reference
- Dedicated or Complementary
- Alignment with other frameworks eg P3M3
- Principles

Governance
- External vs Peer
- Defined by: Discipline, Transparency, Independence, Accountability, Responsibility, Fairness
- Maturity Assessment
- Level of Governance

Outputs & Outcomes
- Outcomes reflect purpose
- Enduring or one-off
- Typical Outputs
  - Reports
  - Model
  - Diagrams
  - Service
- Focus on business Benefits

Reference Model
- Reflects Area of Concern
- Basis for reuse and coherency
- Includes: Patterns, Reference Model eg TRMs, standards etc
- Defined by Foundation, Common, Industry, Organisation.
- Federation

Approach

Architecting Styles

Authoritative
Corporate policy and standards

Coordinative
Co-ord of change activities

Directive
Design solution for single purpose

Supportive
Investigation to support single decision

Change Focus

Change Focus

Portfolio

Programme

Project

Task

Enterprise

System of System

System

P3M Focus

Problem Focus

Engineering Focus

Case Studies

Capability Coherence

Capability – the ability to achieve a desired effect in a specific operating environment

Capability element – a component of capability that when brought together with other components creates a capability

Capability coherence – completeness, consistency and congruence between capabilities and between capability elements

More efficient use of resources

Greater operational flexibility

Clear links between programmes, projects and strategic objectives

Reduced whole-life costs

Greater ability to operate with Allies

Enhanced ability to undertake portfolio & programme BOI

Multiple world views

Behaviours & ways of working

RA2

Ownership

?

Framework of capability coherence elements

Context

Area of Concern
- Direct
- Develop
- Deliver
- Generate
- Operate

Purpose
- To ensure internal and external coherence of capabilities across the Defence Portfolio

Level of Change
- Defence
- Command TLB
- Programme
- Project

Enablers
- Processes (& operating models)
- Organisation (& governance)
- Technology (& tools of the trade)
- Information
- Ways of Working (& enablers)

Value
Scope
Control
Delivery
Delivery
Control
Scope
Value

Methods
- GCM
- CMPG
- SOSA
- JSP 906
- P3M

Governance
- CCSG
- MCB
- Command Boards
- PDGs and CMGs
- Domain Authorities
- SOSA QA

Outputs & Outcomes
- Ability to compose capabilities
- Ability to manage gaps and overlaps
- Ability to manage dependencies
- Ability to manage risks
- Ability to control costs

Reference Model
- Defence taxonomy
- Capability/Service catalogues
- Reference frameworks
- Domain architectures
- Architecture Information Standard

Approach

Capability – the ability to achieve a desired effect in a specific operating environment

Capability element – a component of capability that when brought together with other components creates a capability

Capability coherence – completeness, consistency and congruence between capabilities and between capability elements

More efficient use of resources

Clear links between programmes, projects and strategic objectives

Enhanced ability to undertake portfolio & programme BOI

Greater operational flexibility

Reduced whole-life costs

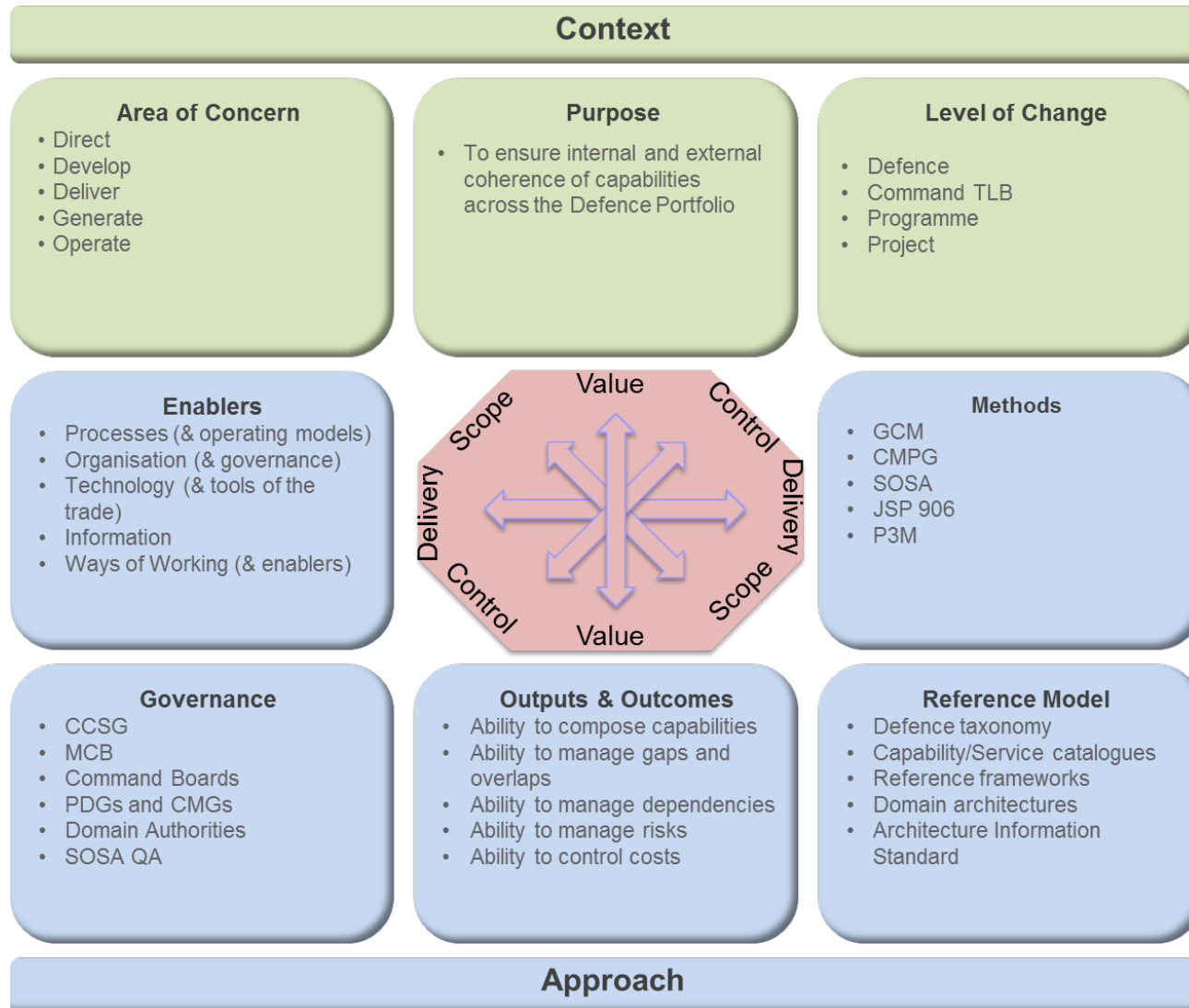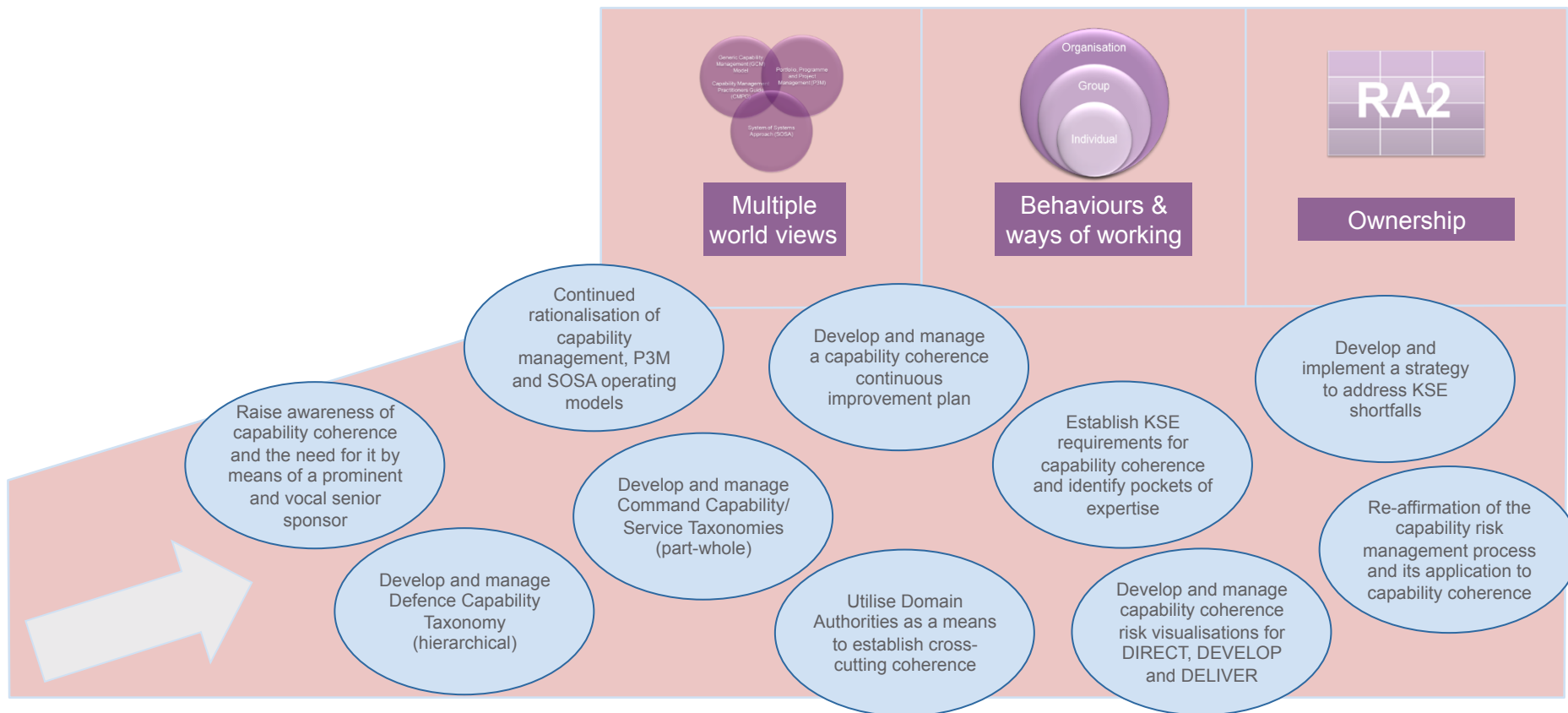Greater ability to operate with Allies

Multiple world views

Behaviours & ways of working

RA2

Ownership

Continued rationalisation of capability management, P3M and SOSA operating models

Develop and manage a capability coherence continuous improvement plan

Develop and implement a strategy to address KSE shortfalls

Raise awareness of capability coherence and the need for it by means of a prominent and vocal senior sponsor

Establish KSE requirements for capability coherence and identify pockets of expertise

Develop and manage Command Capability/ Service Taxonomies (part-whole)

Re-affirmation of the capability risk management process and its application to capability coherence

Develop and manage Defence Capability Taxonomy (hierarchical)

Utilise Domain Authorities as a means to establish cross-cutting coherence

Develop and manage capability coherence risk visualisations for DIRECT, DEVELOP and DELIVER

Thank you – Any questions?