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**Selling SE value & Utilizing
Capability Design
*to establish or enhance
organizational SE capability***

Presentation to INCOSE Singapore Chapter
August 2016

Outline

- Selling SE value – as establish/enhance SE capability
 - Organizational capability building
 - Expanding to domains outside traditional aerospace/defense
- Utilizing a Capability Design approach
 - Enterprise level capability - applying SE this level
 - Implementation examples
- Discussion & Exchange



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Excerpted material from paper, *Selling SE by Searching for the Sweet Spot*,
Richard Beasley and Anne O'Neil, presented Edinburgh INCOSE IS2016

SELLING SE VALUE – APPROACH TO DEVELOPING SE ORGANIZATIONAL CAPABILITY

Overall proposition

- Systems Engineering (SE) has the potential to be a ubiquitous discipline, adding value to many domains
- SE can appear rigid, process heavy with a strange language and a significant investment burden, preventing the realisation of value
- We suggest there is a “sweet spot” for SE application – balancing the SE response appropriate to problem and SE capability level in the organisation

Organizational guidance needed – to establish appropriate capability to realise the value of Systems Engineering

Specifics of problem

1. Systems Engineering is a team sport

- Solo practitioners cannot deliver benefits of SE alone

2. Organizational “brown field” challenge

- A SE advocate implementing SE needs to blend in with, leverage existing established responsibilities and culture

3. SE reputation for adding overhead, not value

- Poses barrier to obtaining resource support from PMs, cultivating executive sponsors

4. Terminology barrier

- “It’s difficult to sell something if you do not use language intelligible to prospective customers”

Elliot, O’Neil, Roberts, Schmid and Shannon, 2011,
Syst.Engin., 15, 203-212

Specifics of problem – cont'd

5. Over-emphasizing process versus delivered value

- Can make process replacement for Systems Thinking, rather than enabler/ context for the powerful approach

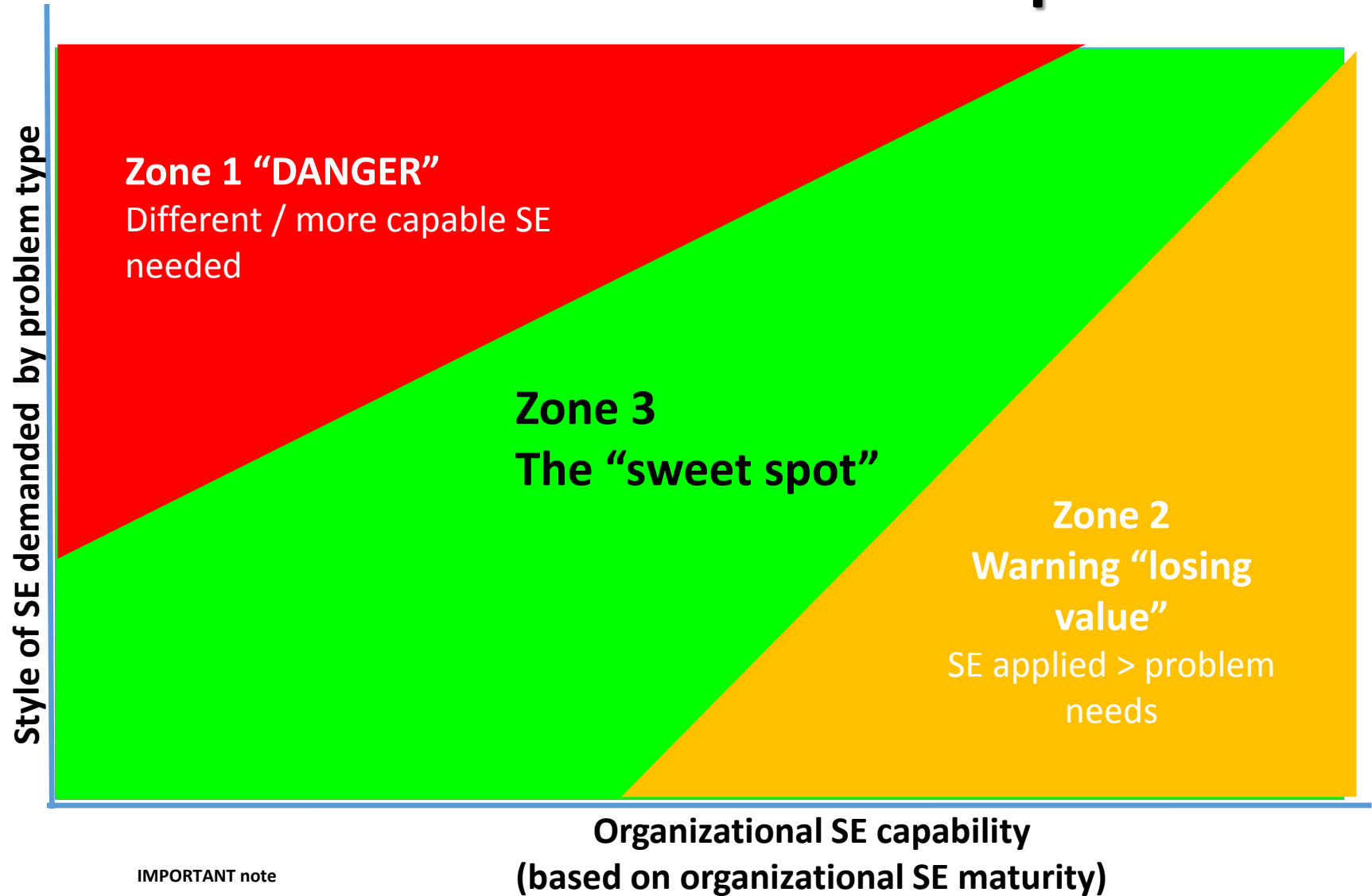
6. Inappropriate dependency on tools / methods

- Avoid “pursuit for perfection”

7. Danger of creating another silo

- Do not perform SE for sake of “doing SE”

What is the “sweet spot”?



IMPORTANT note

- The axes are not linear; it's a conceptual model
- Y axis is not simply “tailoring” – it's the “style” of SE required



“Sweet spot” key takeaways

- Size of organisation must not be excuse for not adopting the SE approach and principles the situation demands
- Don't jump to a standard approach or methodology solution!

Systems Engineer the appropriate SE approach to situation

Anecdotes / lessons learned from implementation journey -- Establishing SE capability at MTA NYCT

- **Created sense of Need**
 - **Understanding and communicating the need: capital project delivery issues**
 - **Then developed business case**
 - Leveraged benchmarking data from industry peers



Network Rail
UK Rail

Dutch Rail
ProRail

UNDERGROUND
London Underground

Land Transport Authority
Singapore Government
Integrity • Service • Excellence

BART
ba

RATP
Paris Metro



Charting the implementation journey for MTA NYCT

Incremental, non-linear journey...

....flexibly aligned to agency, executive needs

- Didn't start at the beginning of lifecycle process
- Tailored activities, SE application to need – where would demonstrate value



Observing the problem space at MTA NYCT: Generating organizational buy-in and awareness

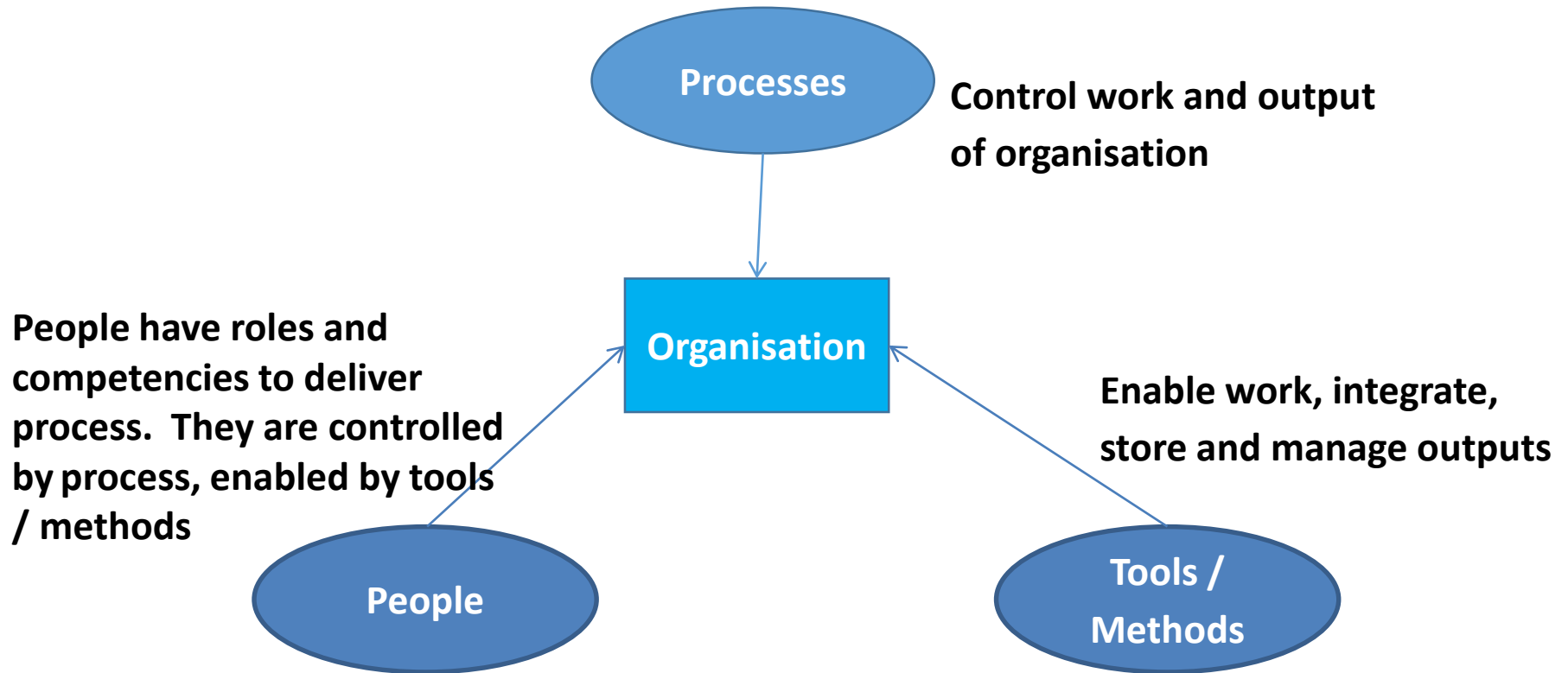
- Grew awareness for “systems issues”
- Allies generated, momentum and interest in other SE activities – to improve requirements definition, improve engagement with Operations stakeholders

At each incremental step to introduce further SE activities, emphasis remained on delivering value!



Organizational maturity:

How to organize & How implement

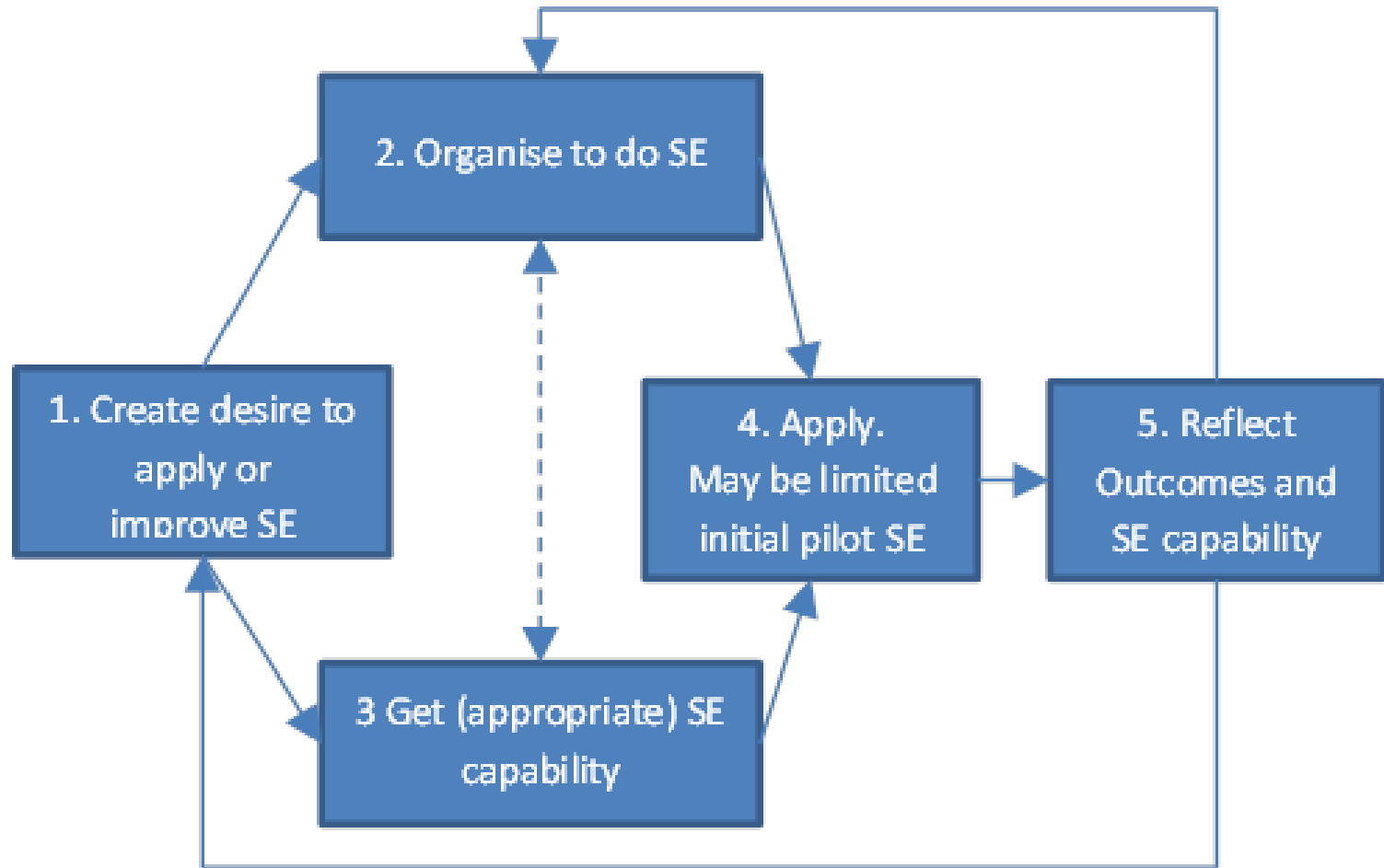


Organizational maturity to exploit SE

Key issues for integrated SE capability

- SE as “glue” role
- SE **IS** a discipline
- Scope expands beyond Engineering to Executives, Operations and Project Management
- SE must make its business case

Recognize it's a journey, and plan the route



SE must be seen as a capability

Recognize it's a journey, plan the route

Roles of SE Champion and Advocate

- Roles that define the Journey
- Core team guiding “Organizing to do SE”

Champion

- Accepts and pulls for SE application as business benefit

Advocate

- Responsible for planning the journey
- Ties SE capability needed to their understanding of 1) organization, 2) domain situation

Along journey approach must vary from “Prophet, to Pragmatist, to Perfectionist”

Kemp and Elphick, 2012

Conclusions for Making SE truly universally applicable

- Create the desire for SE
- Sustain desire: cultivate Advocates & Champions
- Watch your language
- More than tools & process, it's *Systems Thinking!*
- SE seen as distinct discipline that is **additive** to the other engineering disciplines (as it integrates)
- Tailor SE to specific needs of problem AND to existing capability of organization

Recommended: INCOSE produce “Guidance for Development of Organizational SE Capability”



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UTILIZING A CAPABILITY DESIGN APPROACH



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Dealing with enterprise-level systems

Traditional project level SE \neq enterprise level SE

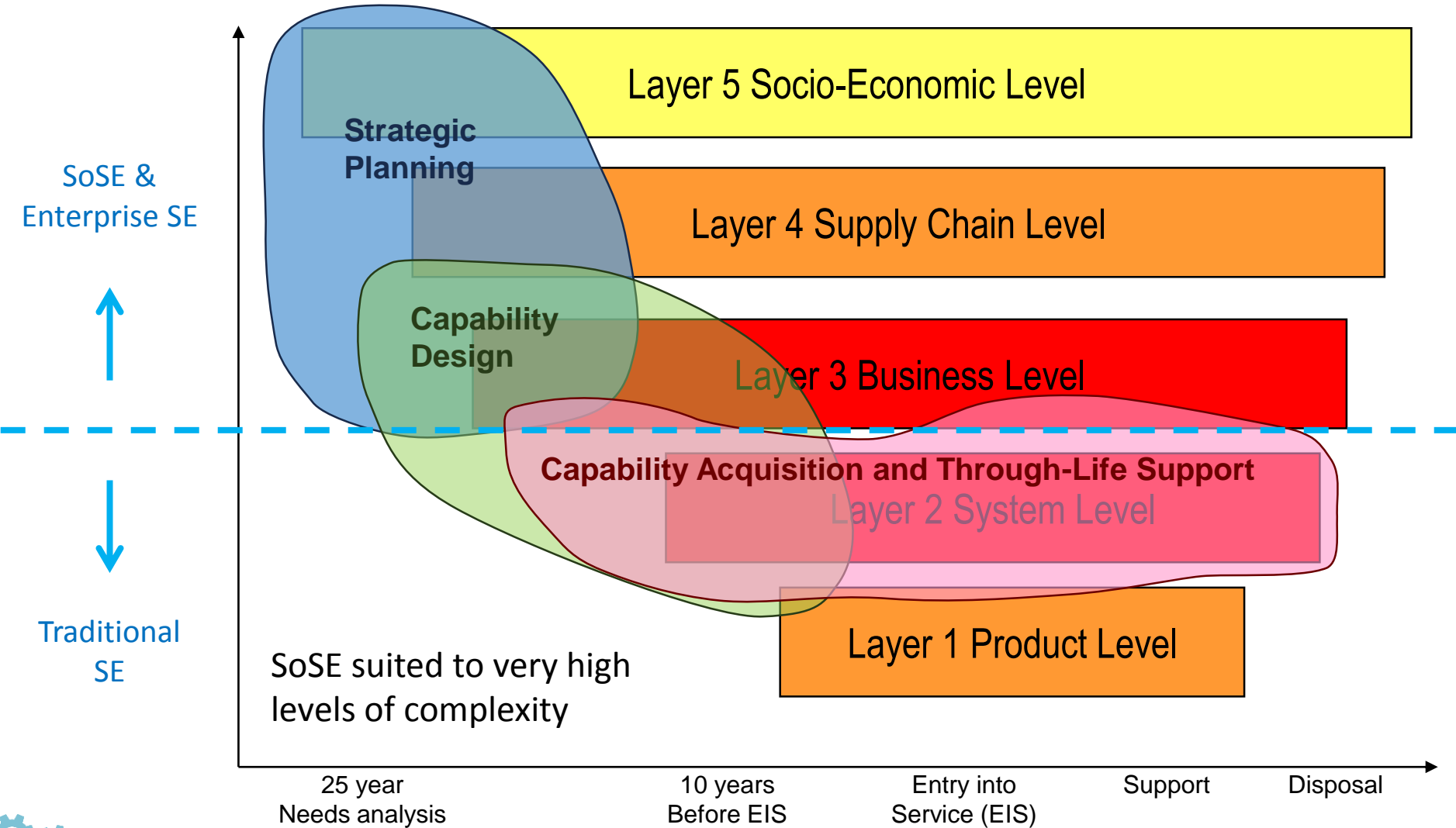
- Enterprise SE
 - Uses different techniques
 - Needs to deal with lack of direct control of the constituent systems
 - Is more complex because of the scale of the work undertaken and the socio-technical nature of the problems

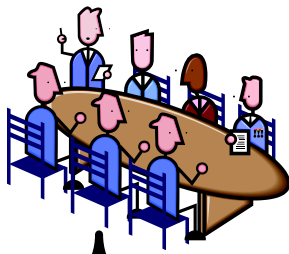
Both types of SE ultimately support building capability:

- Enterprise SE: guide development of SE capability
- Project SE: carry out 'whole life, whole systems' practices on each project

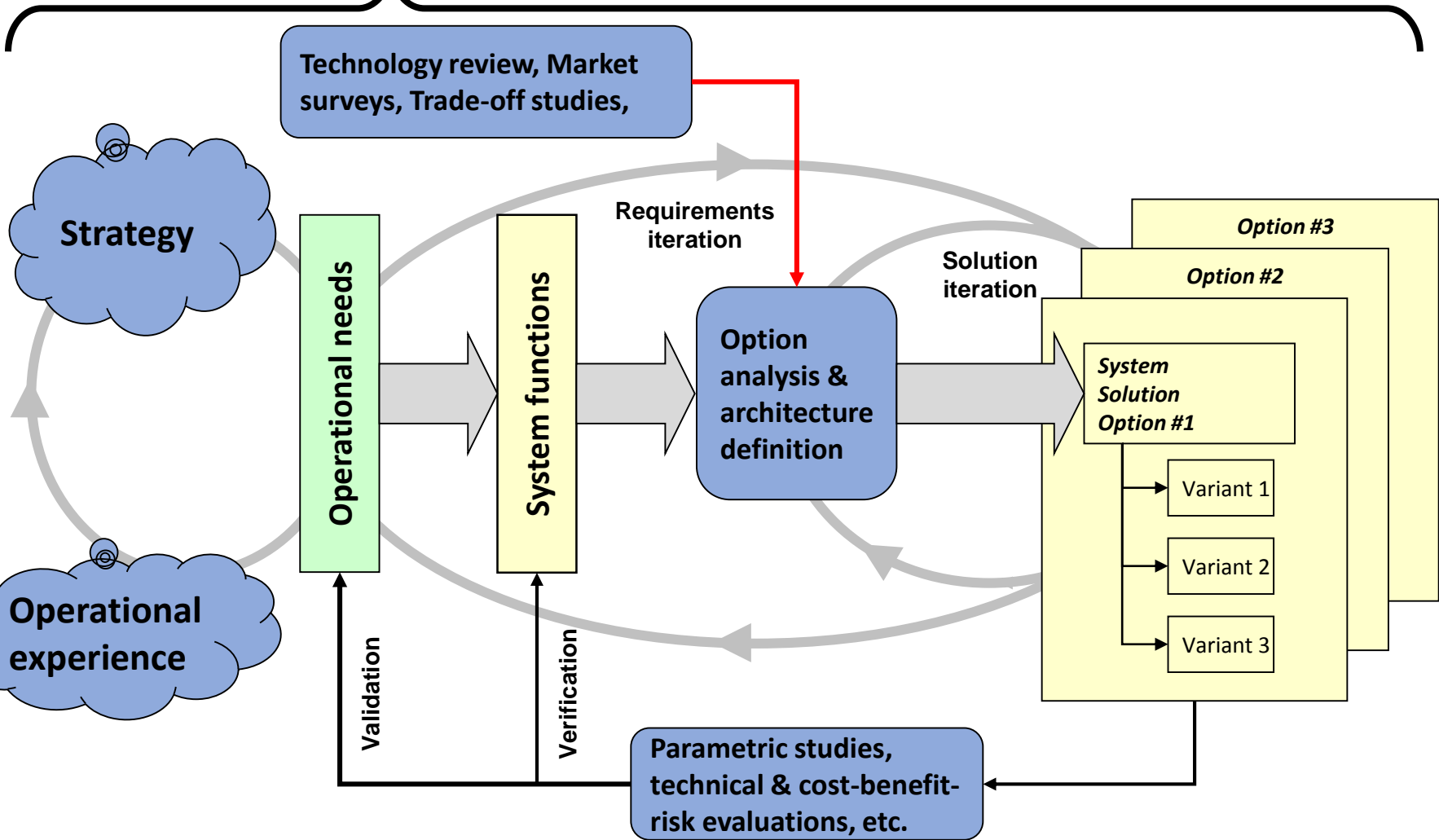
Hitchins' Five-Layer Model

(Adapted from Hitchins, 2007)





Capability design cycle



Design questions

- **Why** does it do it?
 - goal and objectives => mission
- **Who** uses it? Who is impacted by it?
 - organization elements and relationships
- **Where** is it used?
 - locations, logical and / or physical
- **When** is it used?
 - time, sequence, major events, cycles
- **How** is it used?
 - processes and procedures, behavior
- What is in it & what does it do?
- How is this achieved?

Problem Definition

Operational
Analysis

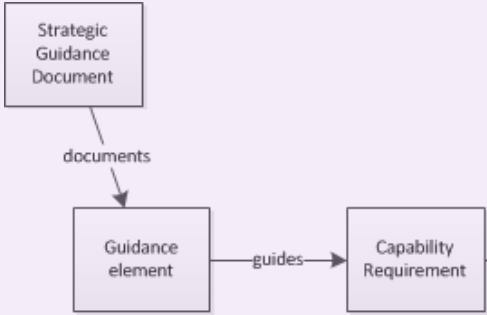
*“Black Box” context
analysis*

Solution Concept

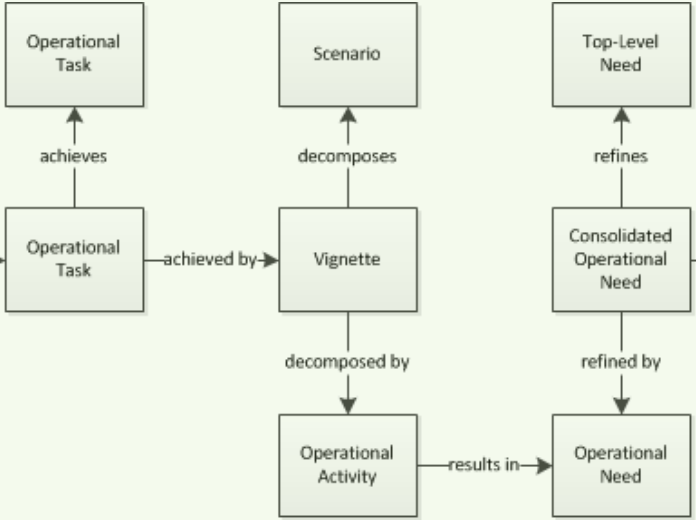
Solution Design

From strategy to implementation

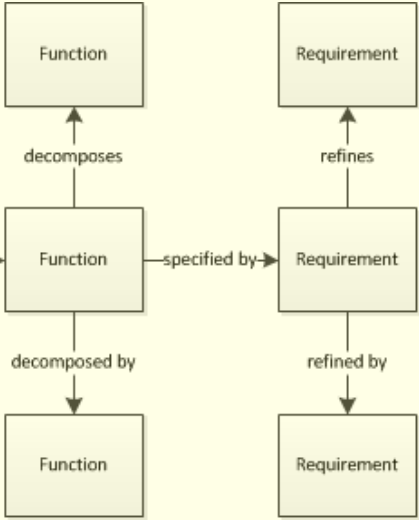
Strategic



Operational



System



Capability Design modelling purpose

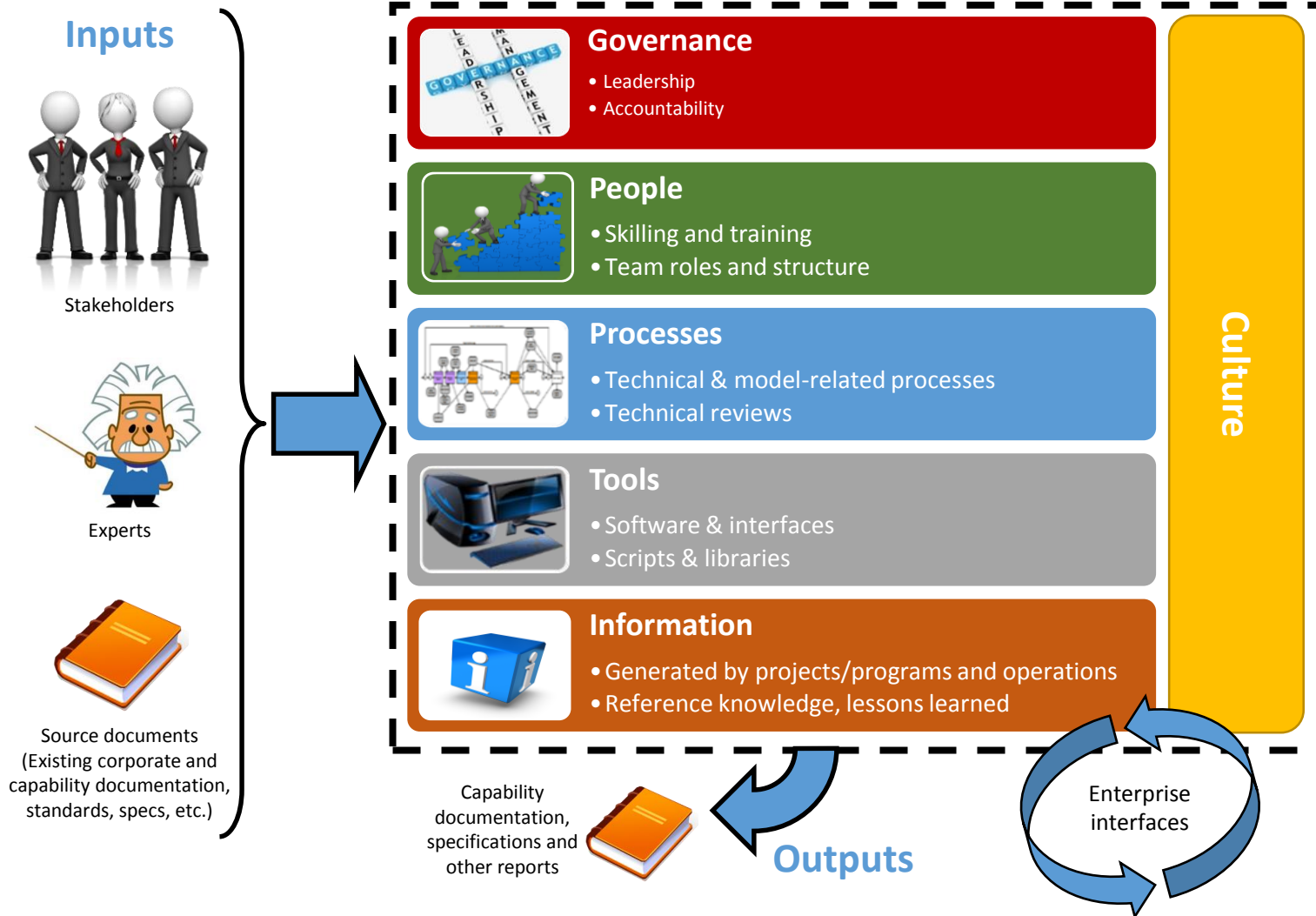
Modeling purpose for this Capability Design effort:

To assess and demonstrate alignment, consistency, inter-dependencies between various enabling enterprise initiatives and to identify gaps

Enterprise Capability Enablers
Executive strategic management
SE capability design
Tools and procedures
Project management framework and governance

- Maintain alignment, highlight inconsistencies between multiple activities across:
 - Range efforts/expertise across multiple implementation teams, over time
 - Range efforts across departments, liaisons and working teams, over time

Capability design components considered when adding or enhancing enterprise capability





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Organisational capability needs to implementation

IMPLEMENTATION EXAMPLES



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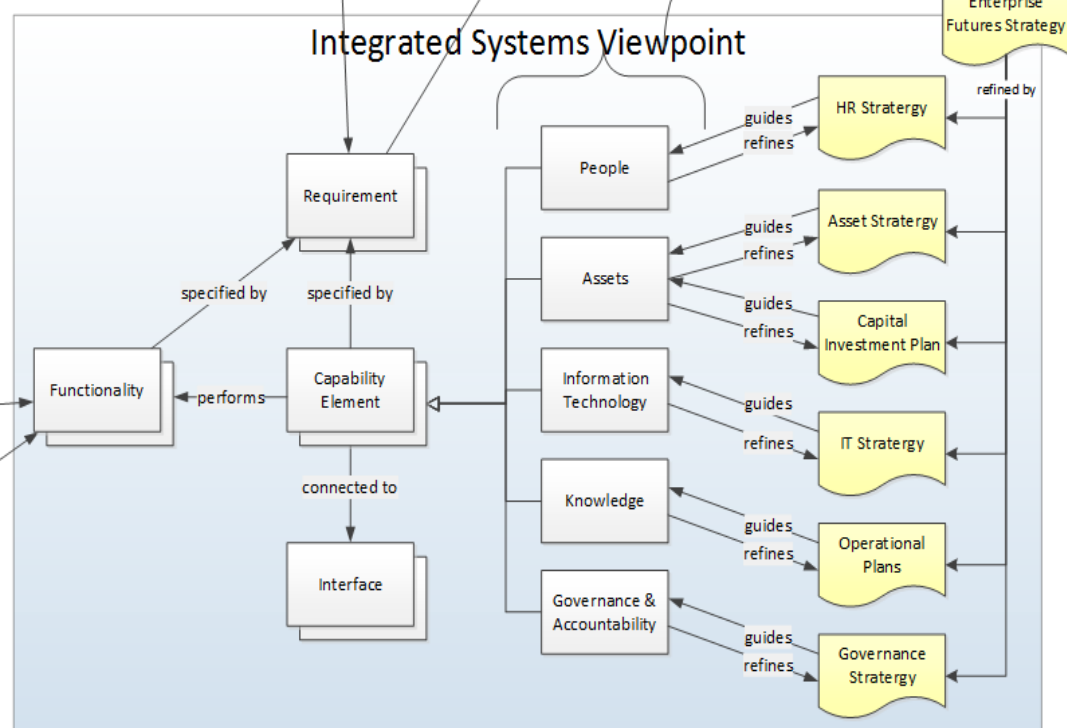
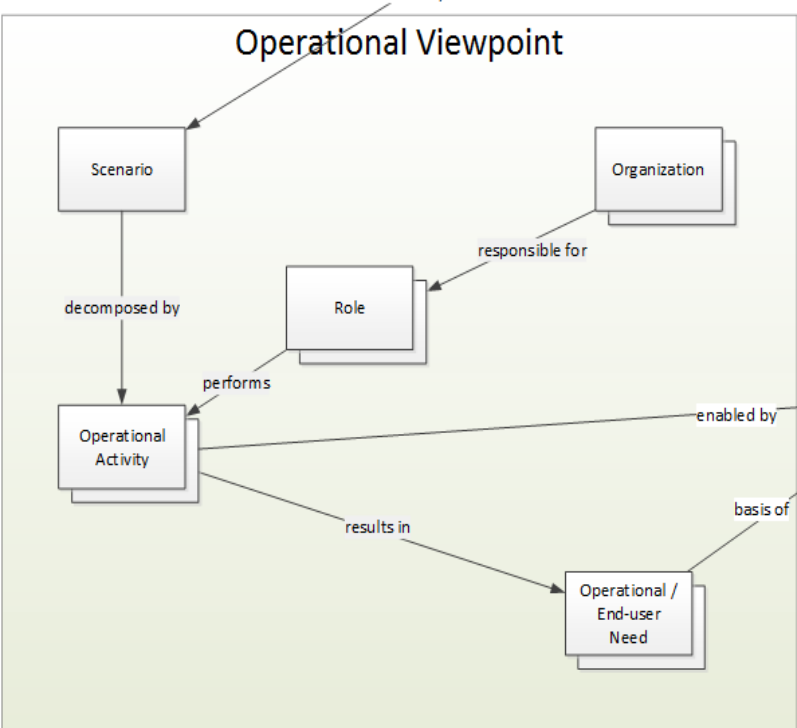
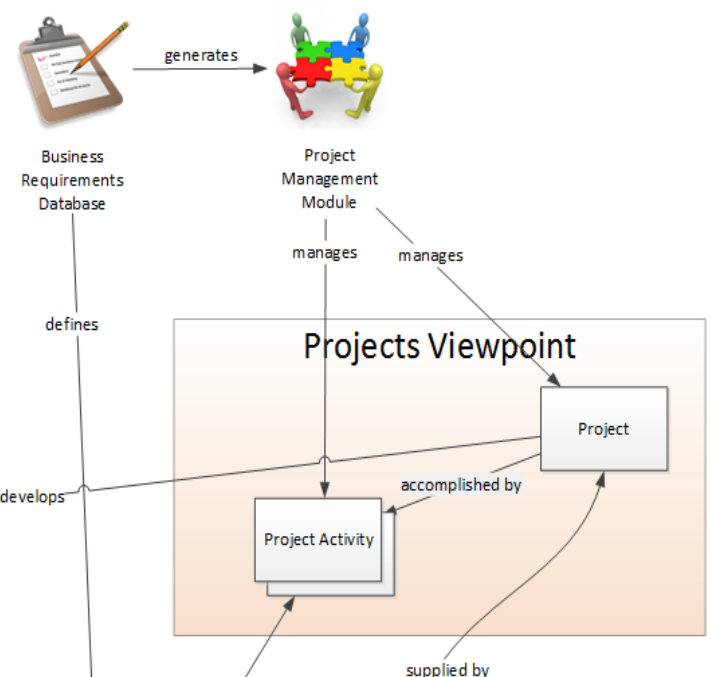
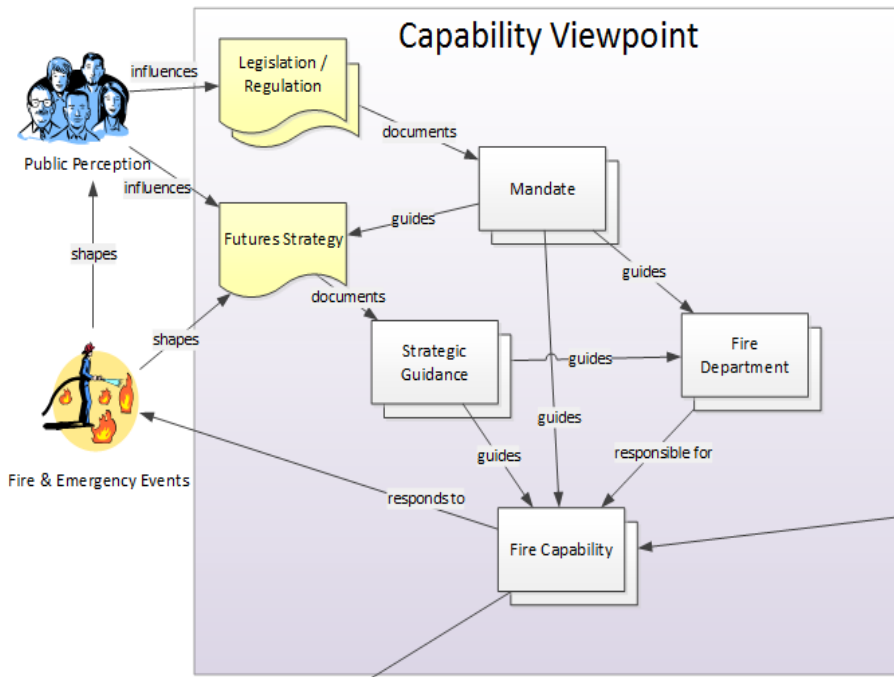
Identifying capability needs

- Western Australia's Department of Fire and Emergency Services (DFES):
 - Coordinate emergency services for a range of natural disasters and emergency incidents across a huge area
 - Rural and urban fires
 - Hazmat incidents
 - Floods
 - Etc ...
- Difficult problem space – lots of inter-related systems and organisations
 - Modeling to support decisions on what systems to buy or design and build
 - Need to prioritise resources – support to, and justification for, decisions

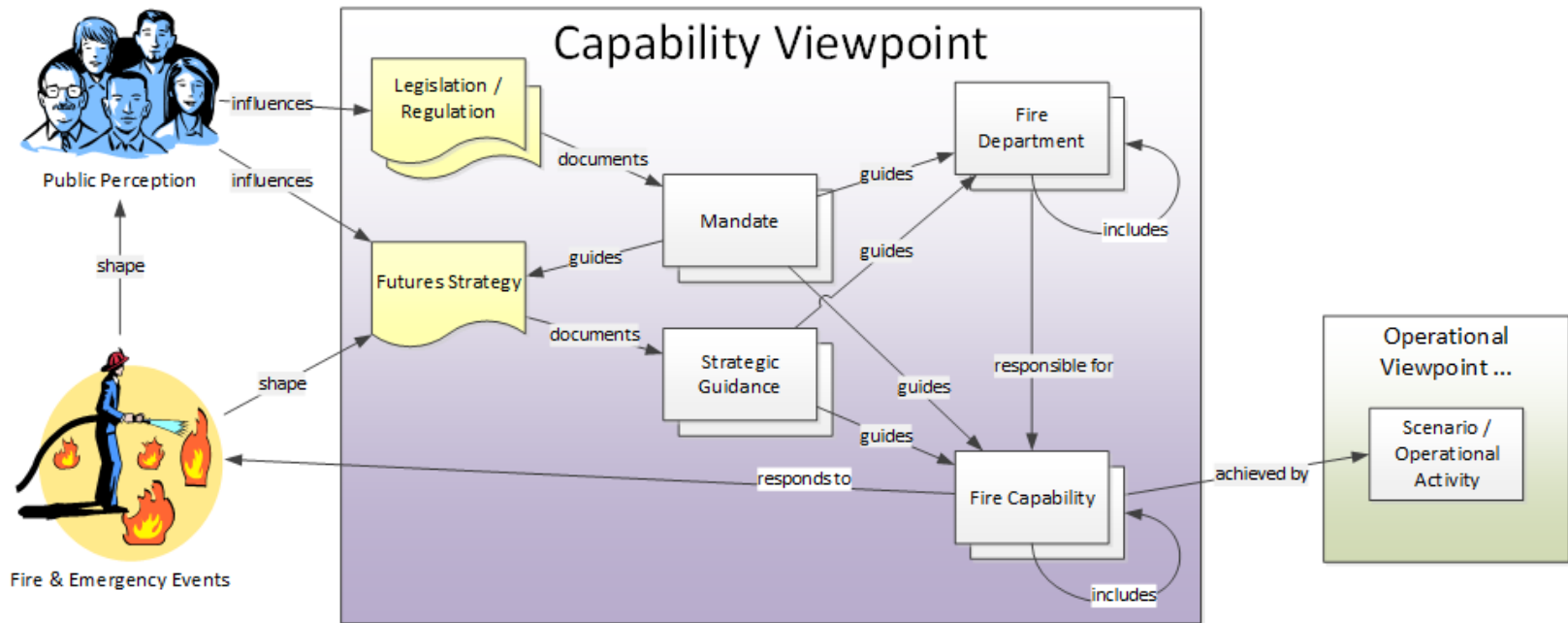


Capability framework

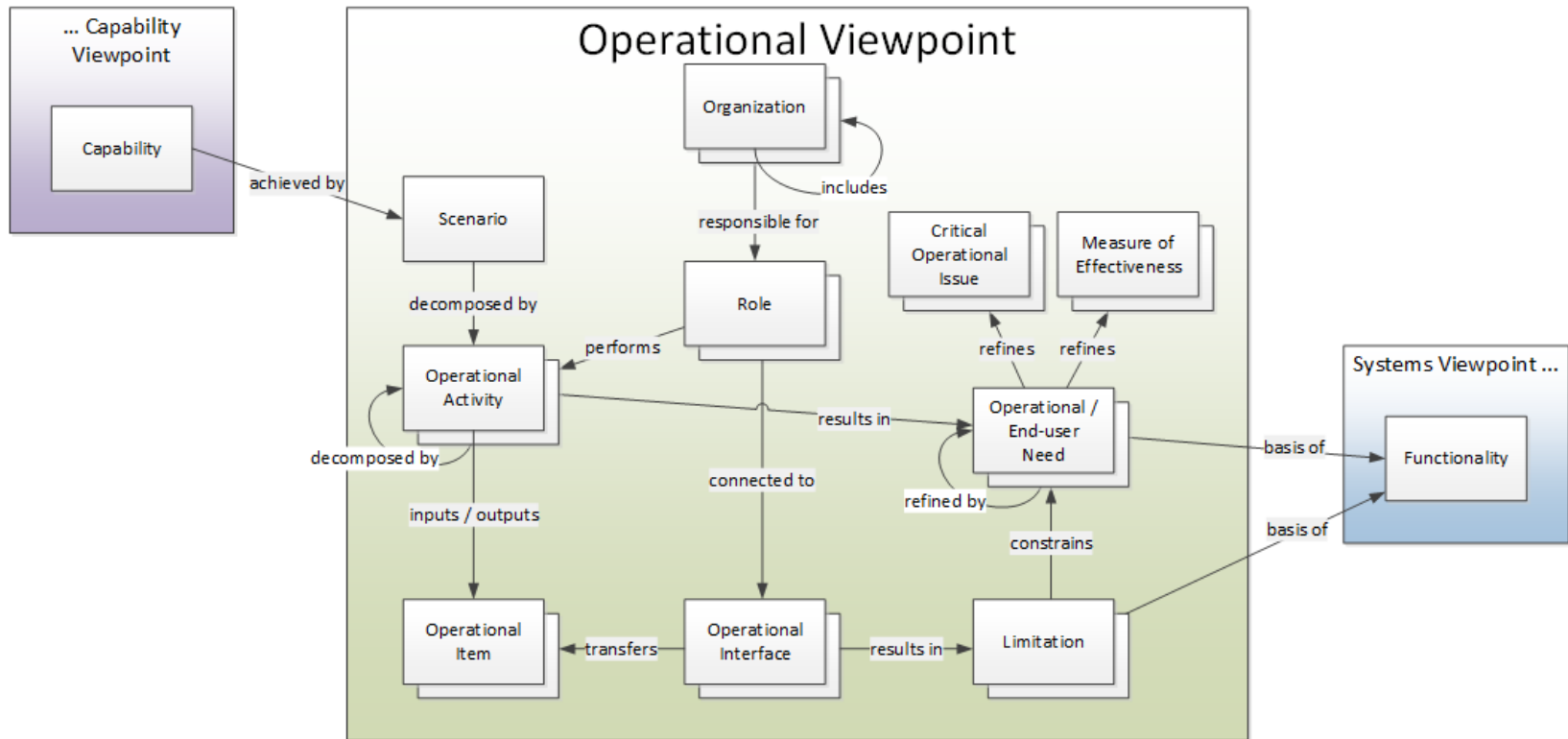
- Model which *defines, describes* and *documents* organisational capabilities and characteristics and elements necessary to deliver them
- Supports different but consistent *views* of a capability
- Benefits of having one
 - Basis of requirements for projects
 - Capability options analysis
 - Development of robust business cases
 - Informing stakeholders of organizational capabilities
 - Providing justification for organizational capability decisions



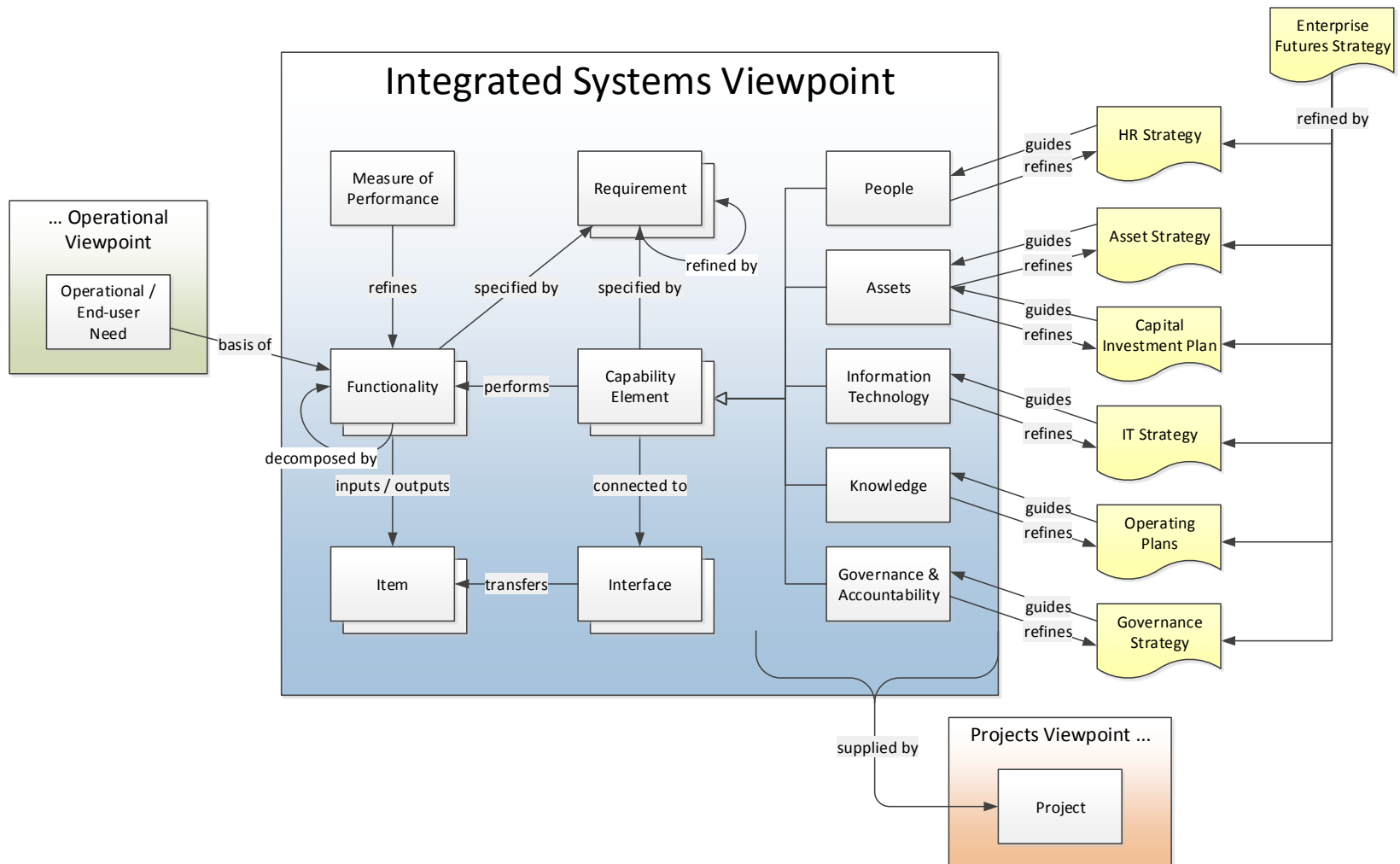
Capability viewpoint



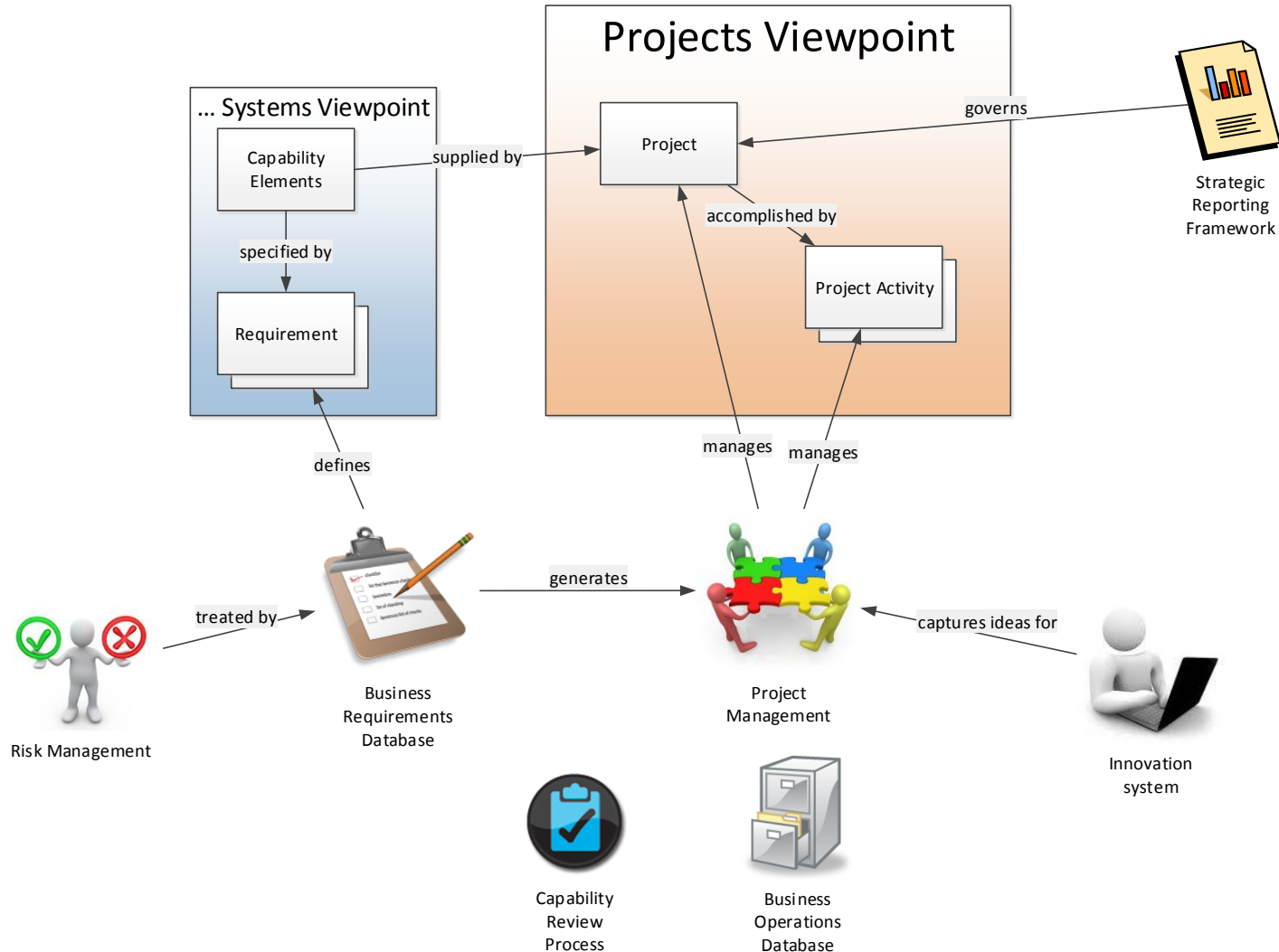
Operational viewpoint

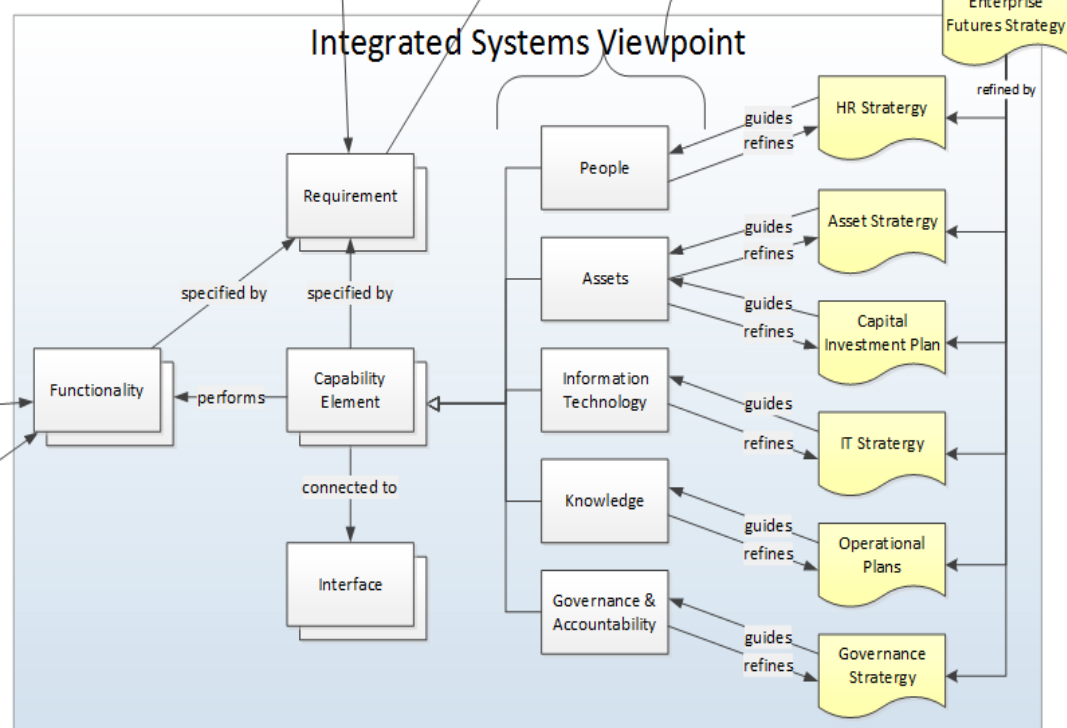
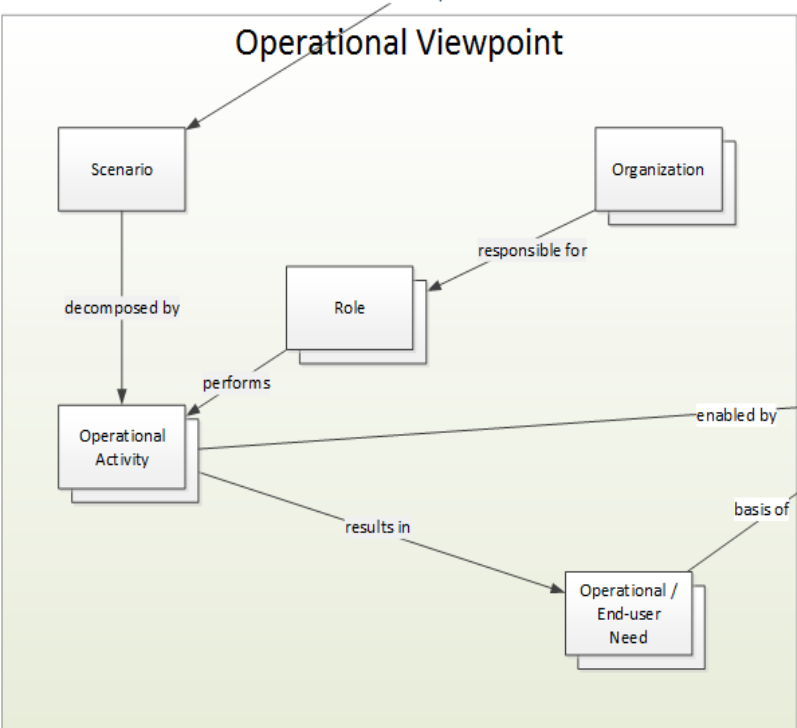
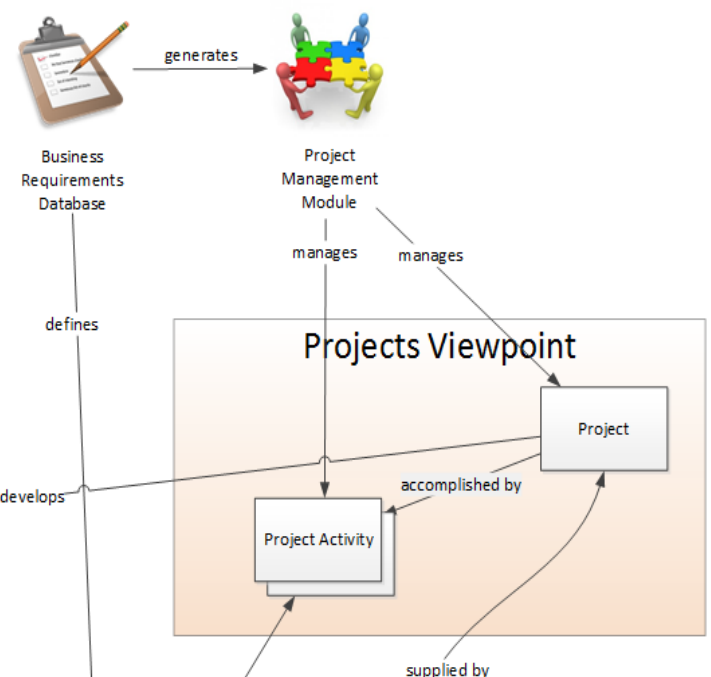
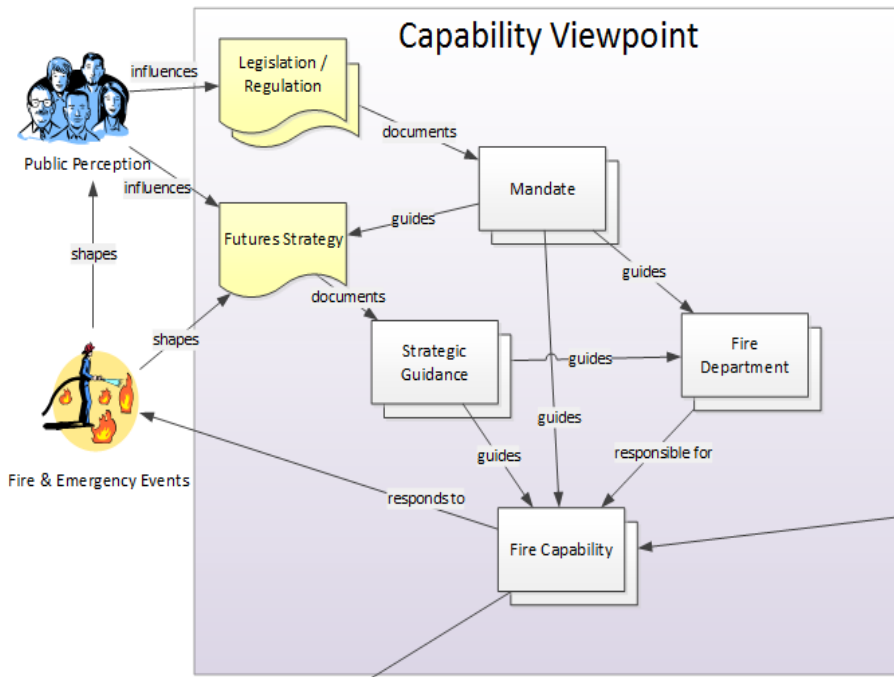


Integrated systems viewpoint



Projects viewpoint



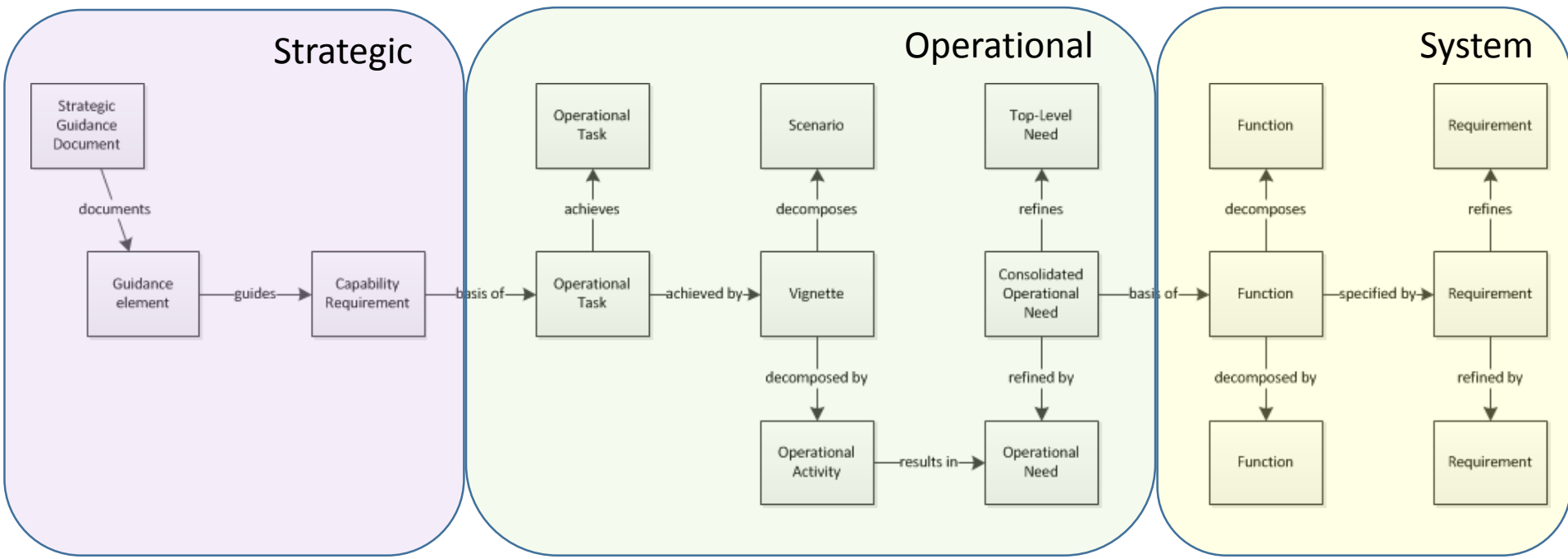


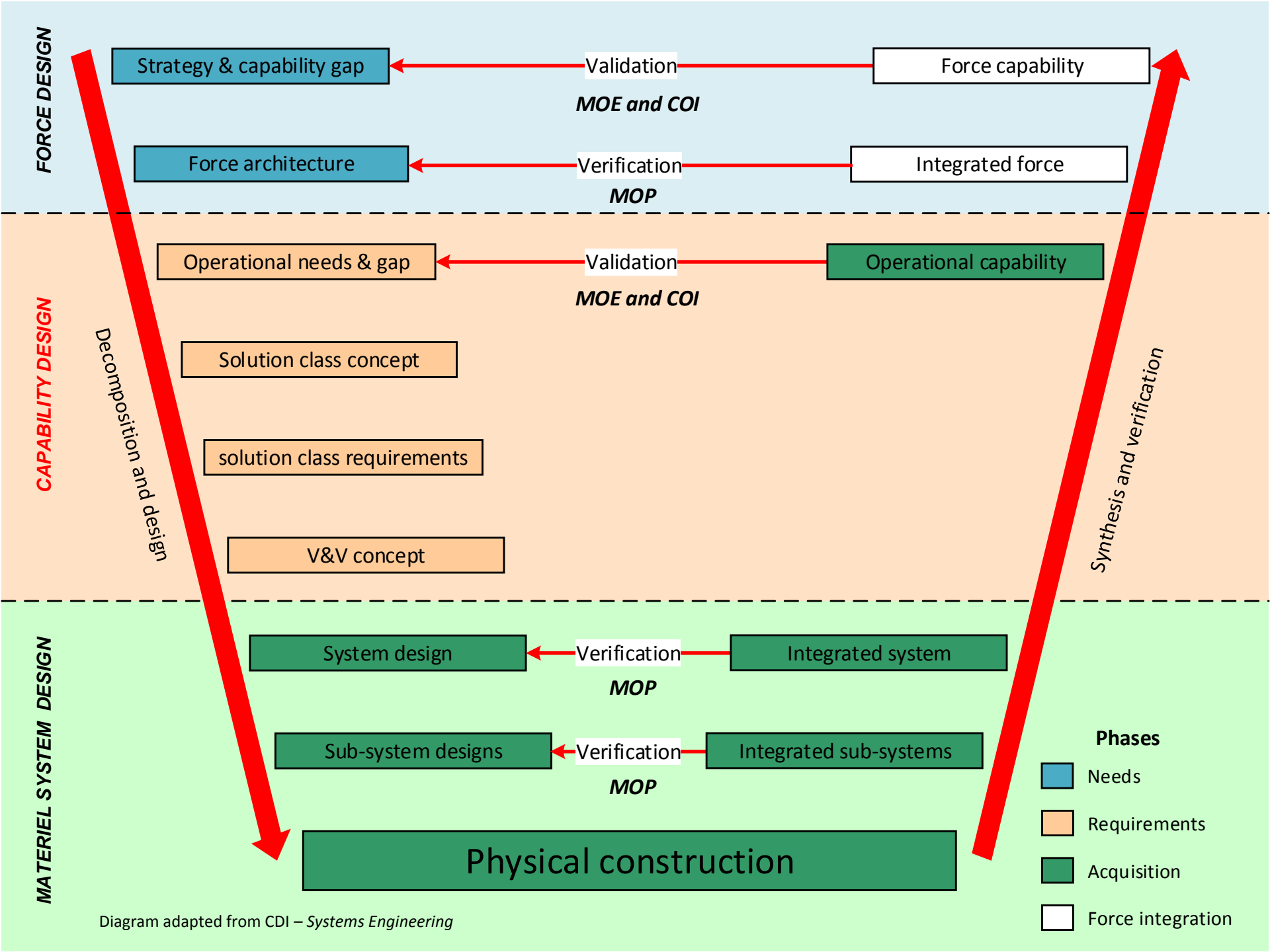
Initiation to funding approval

LESSONS LEARNED FROM THE AUSTRALIAN NAVY'S *FUTURE FRIGATE* PROGRAM

Role of capability design in program

Take 'corporate' guidance (Defence White Paper, Govt direction on shipbuilding, etc.) and translate to concept then to acquisition specifications





Applied to Navy surface fleet

High Level/Strategic Guidance (DWP, DPG, FMOC, IOCD etc.)

Evolving Strategic Needs/Capability Gaps/Deficiencies

Surface Combatant Force 2025-30
Operational Concept Document (OCD)

*Joint Force Integration/
Interoperability Needs*

*Evolving Surface Combatant Force
Needs/Capability Gaps/Deficiencies*

ANZAC Class FFH
FPS

Hobart Class DDG
FPS

Future Frigate
FPS

CIWS FPS

SM-2/ESSM FPS

MH-60R FPS

Related 'Internal' Projects/Systems

DNPS Framework Surface Combatant FPS

AOR

OCD

FPS

OCV

OCD

FPS

LHD

OCD

FPS

....

MPA

OCD

FPS

Related 'External'
Projects/Systems



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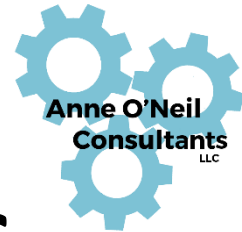
How does this resonate? Share application experiences

DISCUSSION & EXCHANGE





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Additional INCOSE references

INCOSE MBCD WG

Co-chair, David Harvey, Chief SE Shoal Engineering

www.shoalgroup.com

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