

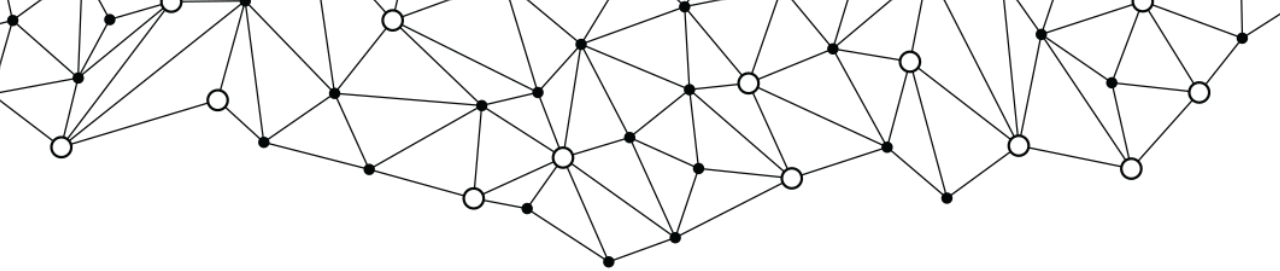


AMS FRAMEWORK USING A MODEL-BASED APPROACH

16 April 2018

Chris Sproston and Brad Hocking

SHOALTM



Who are we?

Chris Sproston

Systems Engineer with experience in pharmaceutical, food, oil and gas, defence and rail industries

Brad Hocking

Systems Engineer with experience in oil and gas, defence and rail industries

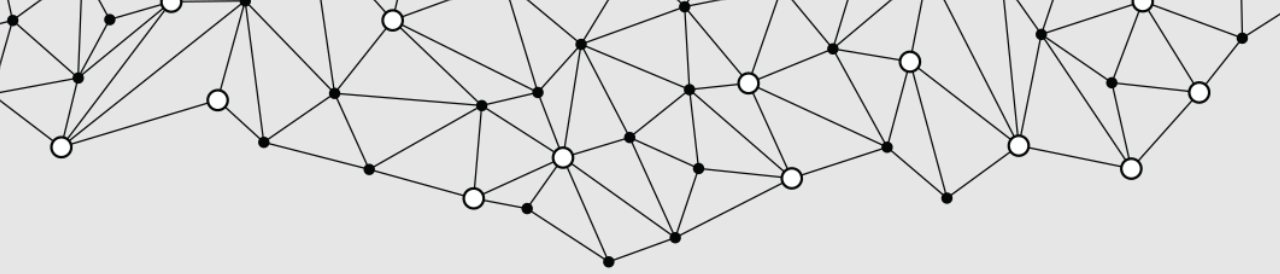


Systems engineering specialist
Based in Australia and USA

Agenda

- Asset Management System - principles and challenges
- Overview of model-based systems engineering
- Research objectives and outputs
- Findings & further work

Questions welcome at
the end!

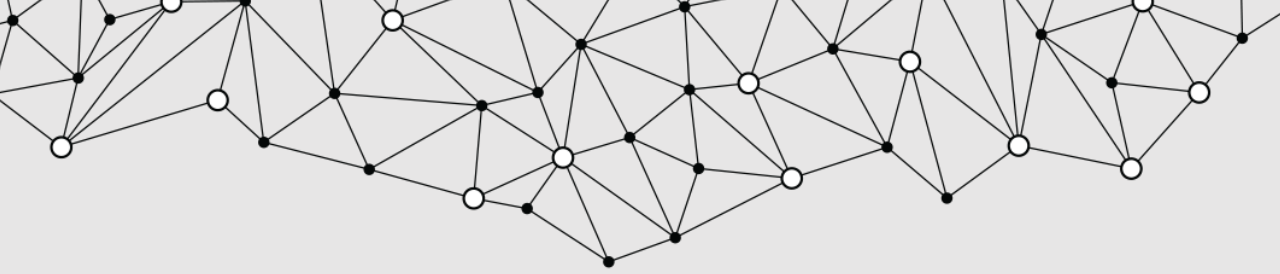


ISO55001:2014

What is an

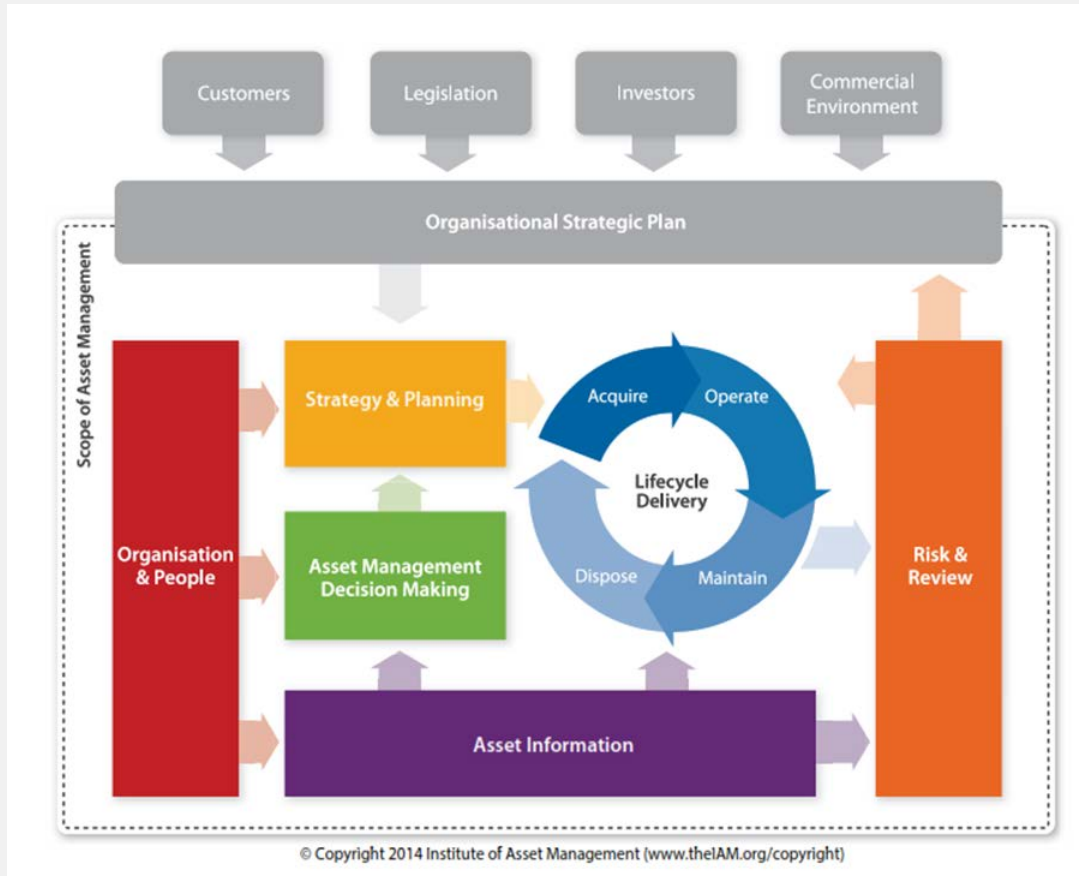
Asset Management System?





A Management System for Asset Management

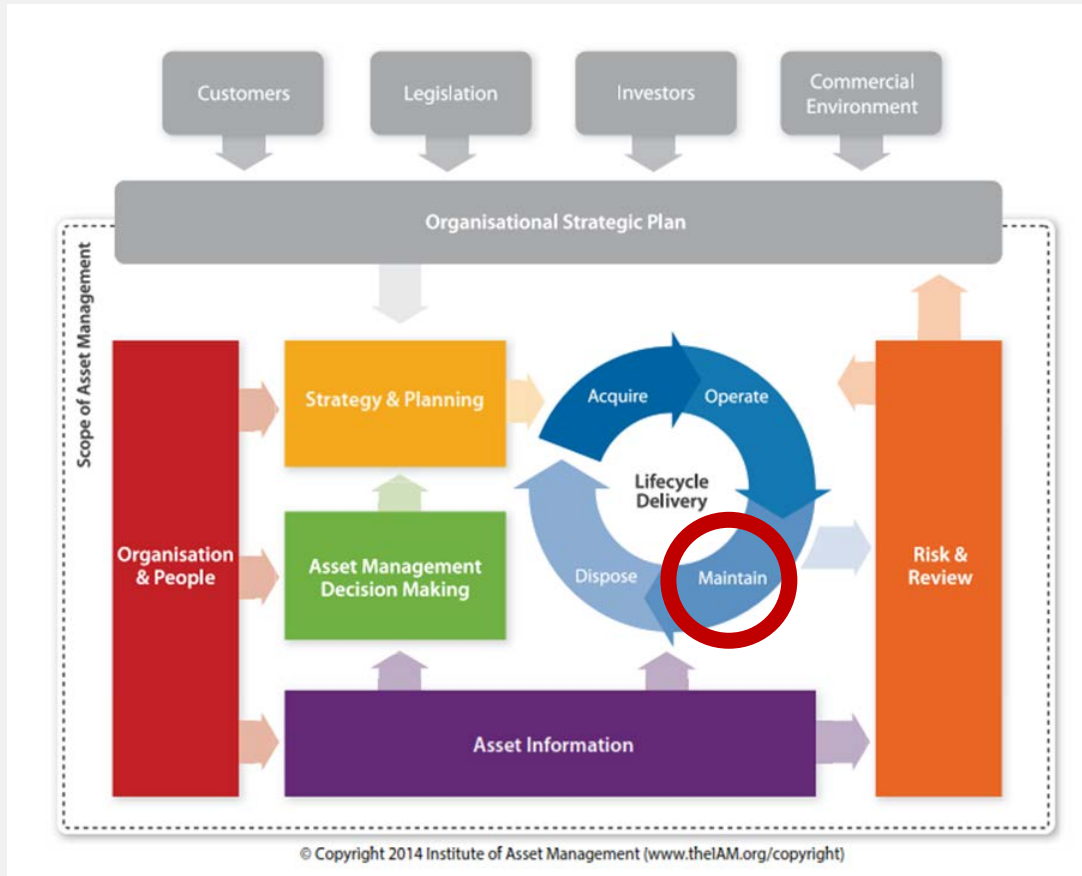
Asset Management System



Multiple sub-systems

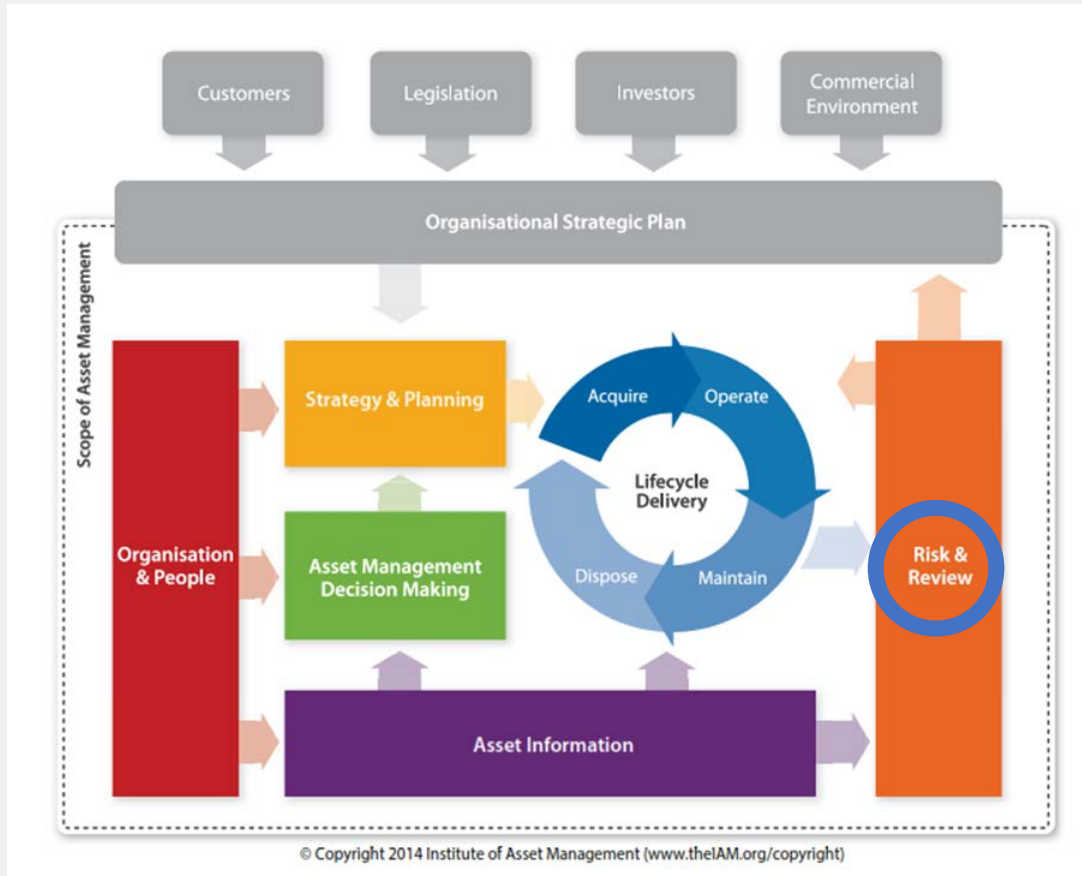
Pockets of managed information

Asset Management System



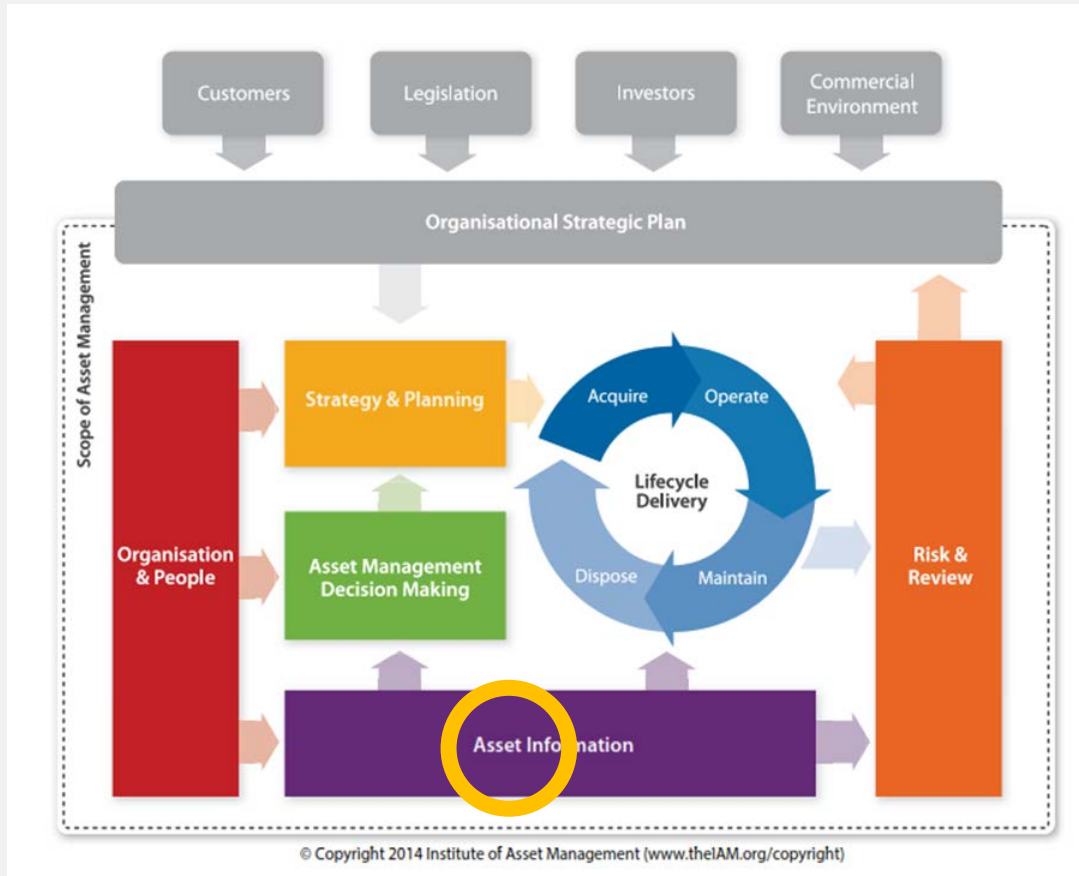
Maintenance management

Asset Management System



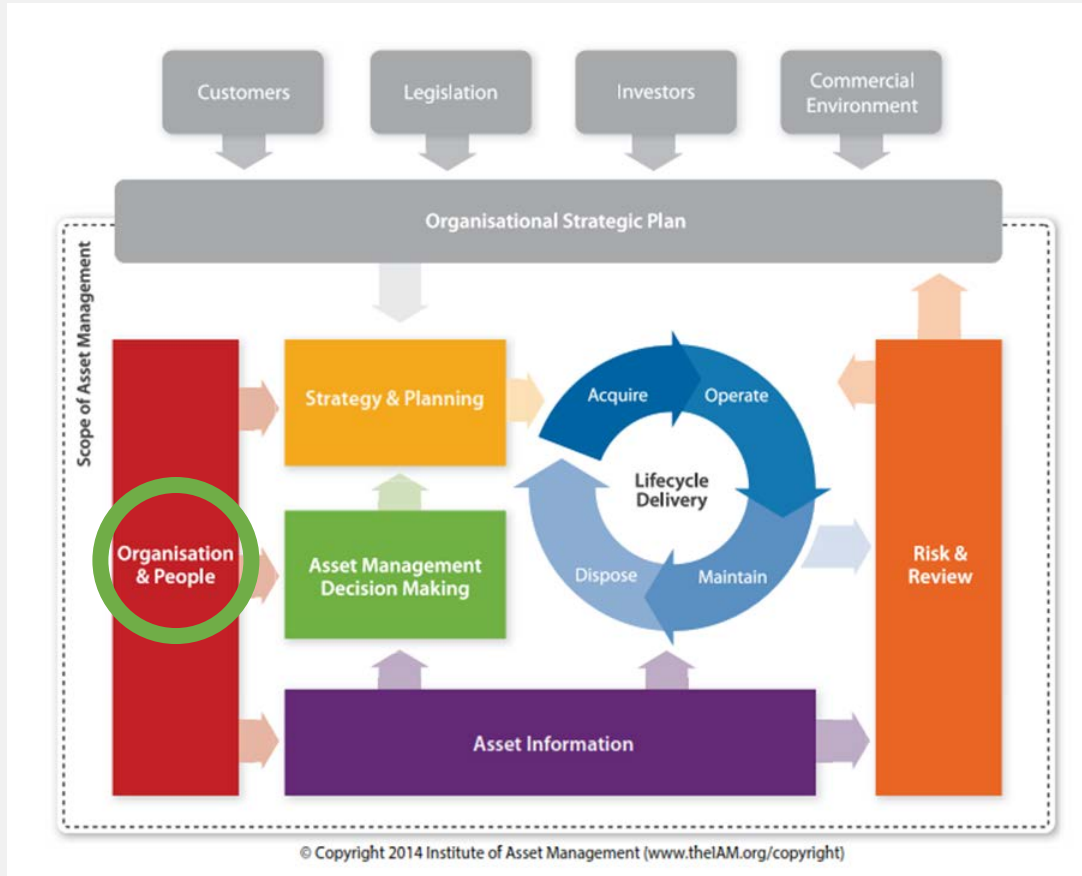
Risk management

Asset Management System

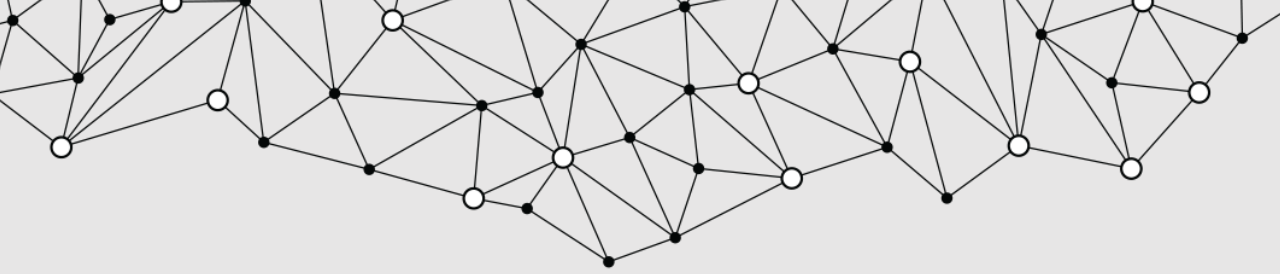


Information
management

Asset Management System

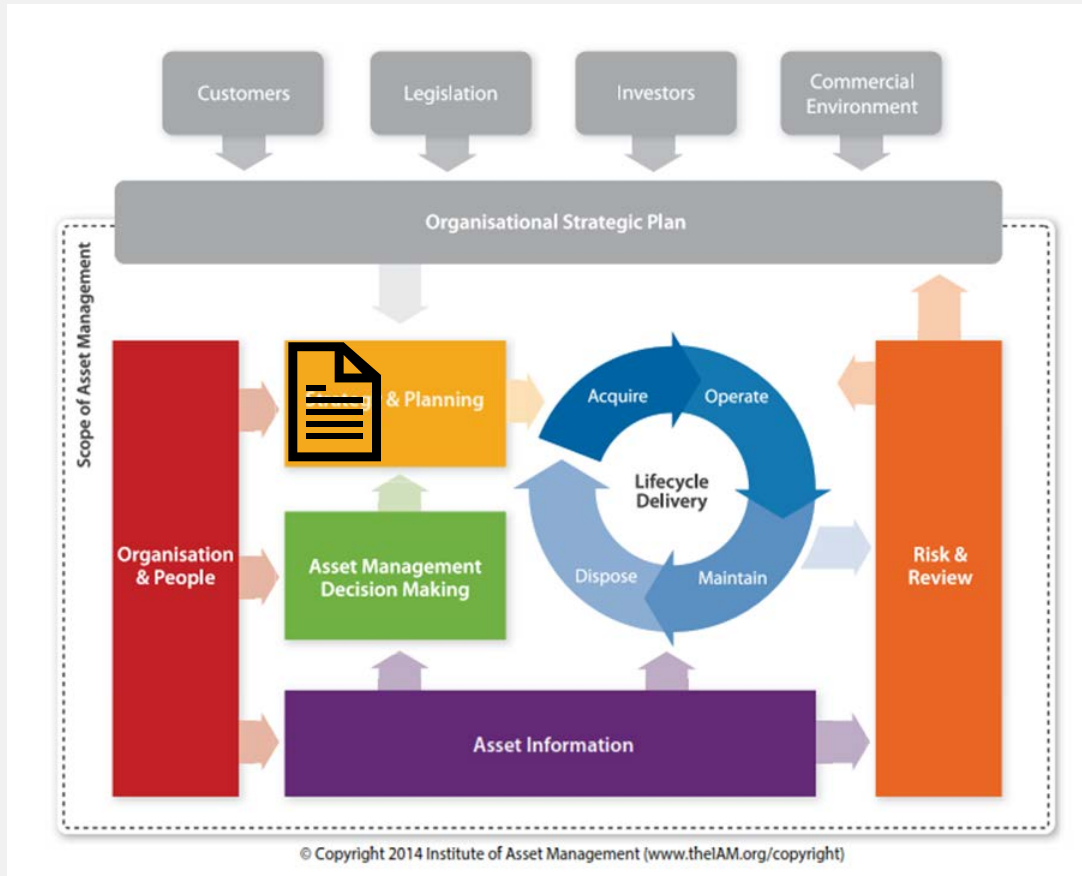


Competency
management



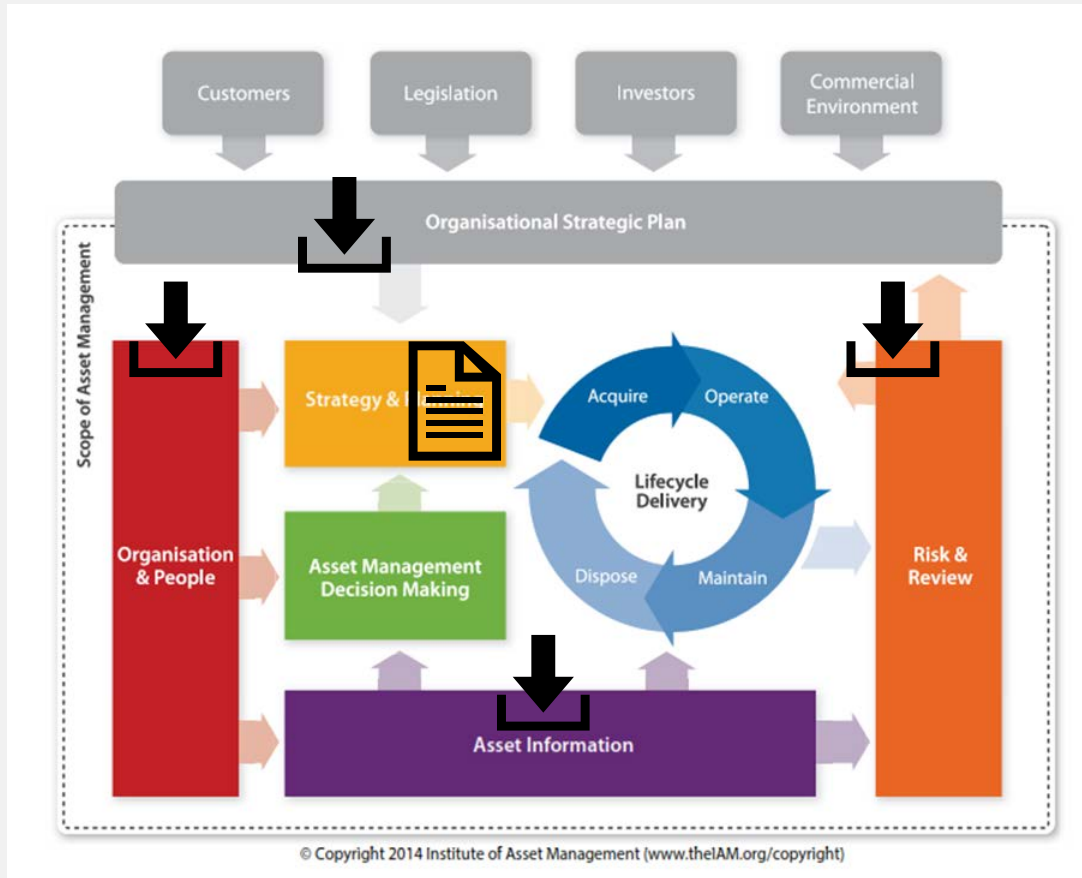
But what about the AMS?

Asset Management System



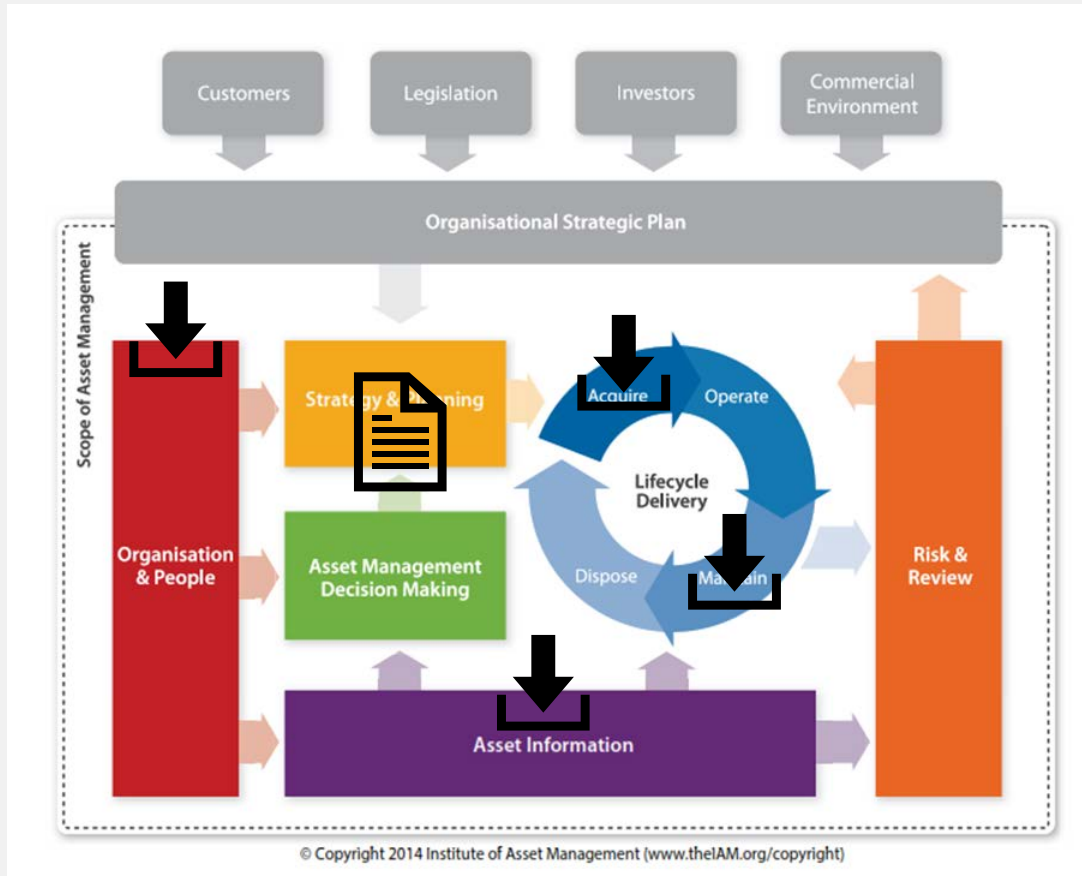
AM Policy

Asset Management System



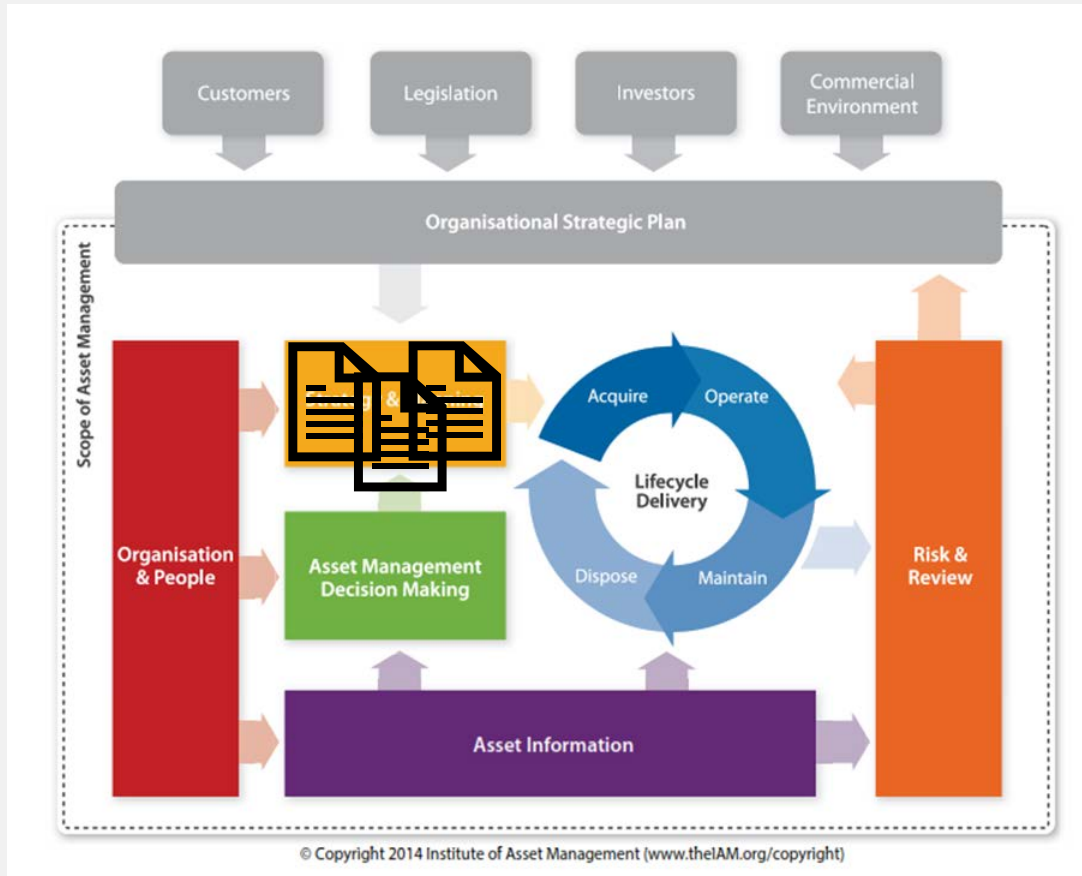
SAMP

Asset Management System

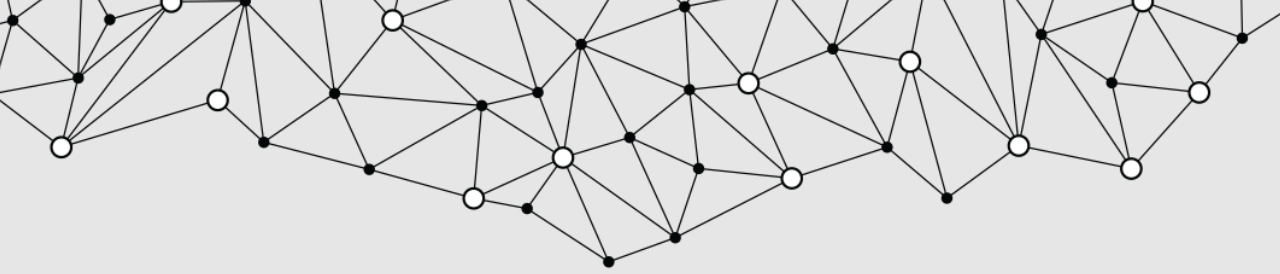


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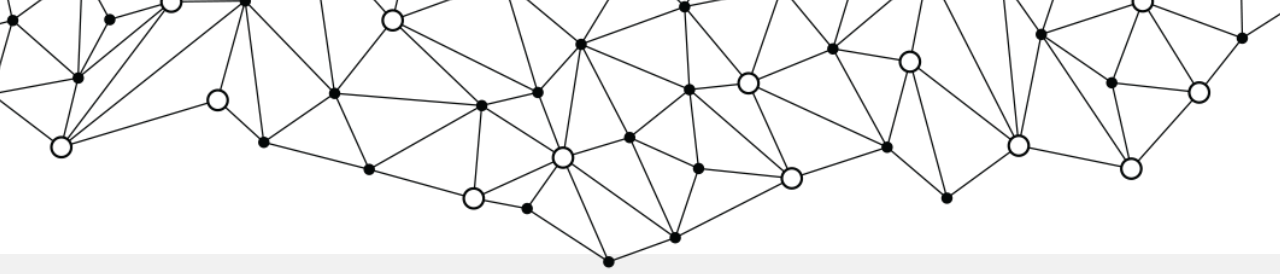
Asset Management System



AM Policy
SAMP
AMPs



So what about the AMS?



Seem familiar?



- Document-centric
- Disconnected

Results in:

- Duplication of data
- Inconsistencies
- Traceability impractical

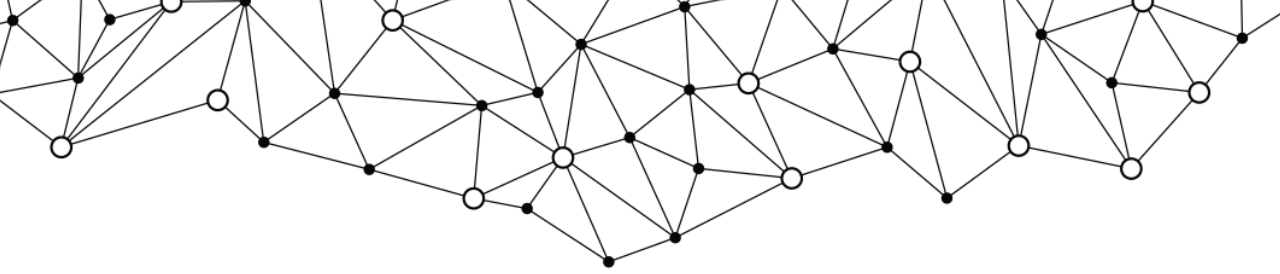
<https://www.ourwarwickshire.org.uk/content/article/biddle>



What if?

- Single information source
- AMS elements connected
- Multiple views of the elements and connections
- Key documents an output

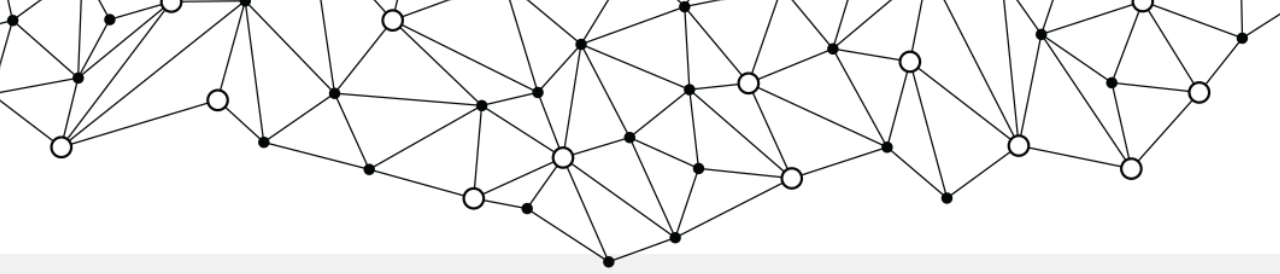
A management system is
a complex system



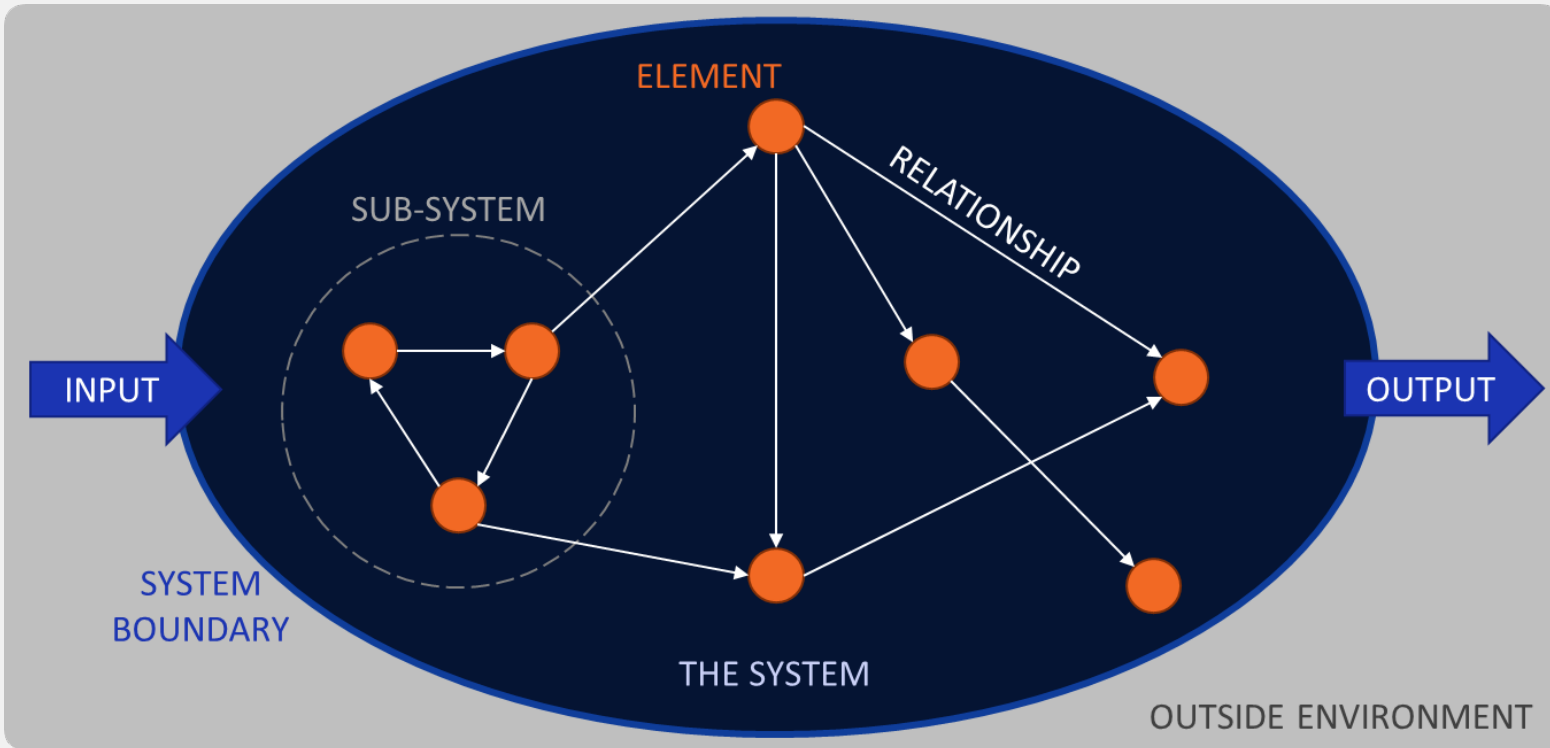
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Overview of model-based systems engineering





System concept



“A construct or collection of different elements that together produce results not obtainable by the elements alone”

- INCOSE

Systems engineering

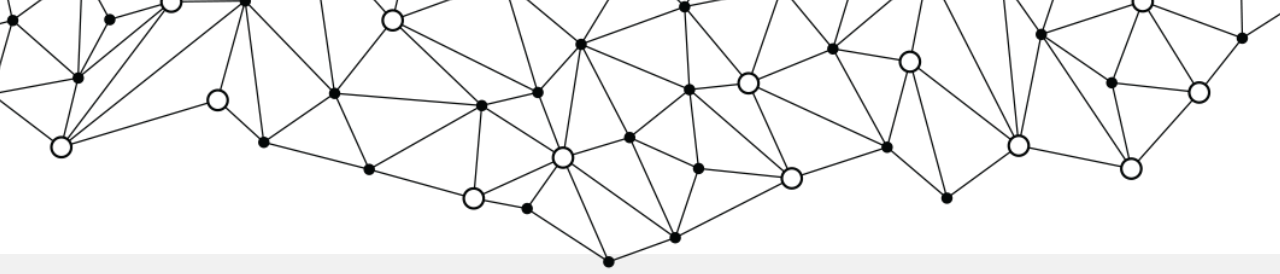
Systems engineering (SE) aims to:

- understand the complete problem: lifecycle, context, components and how to recognise a good solution
- integrate work across disciplines and speciality groups
- define stakeholder needs and system functionality early in the system life cycle

“An interdisciplinary approach and means to enable the realization of successful systems”

- INCOSE





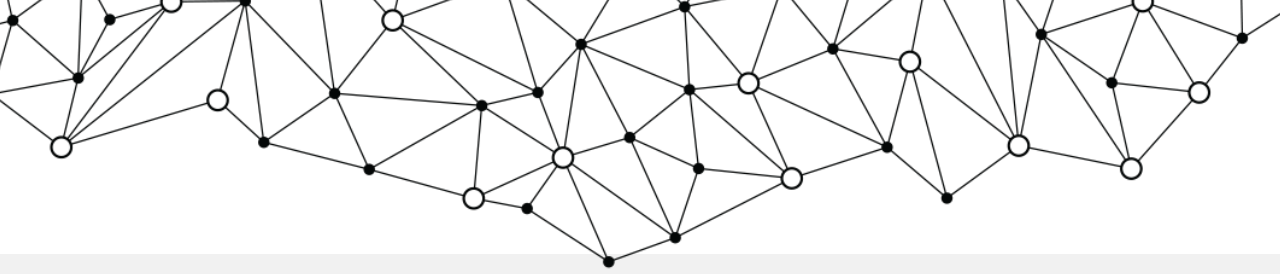
Model-based SE

Model-based SE (MBSE) is:

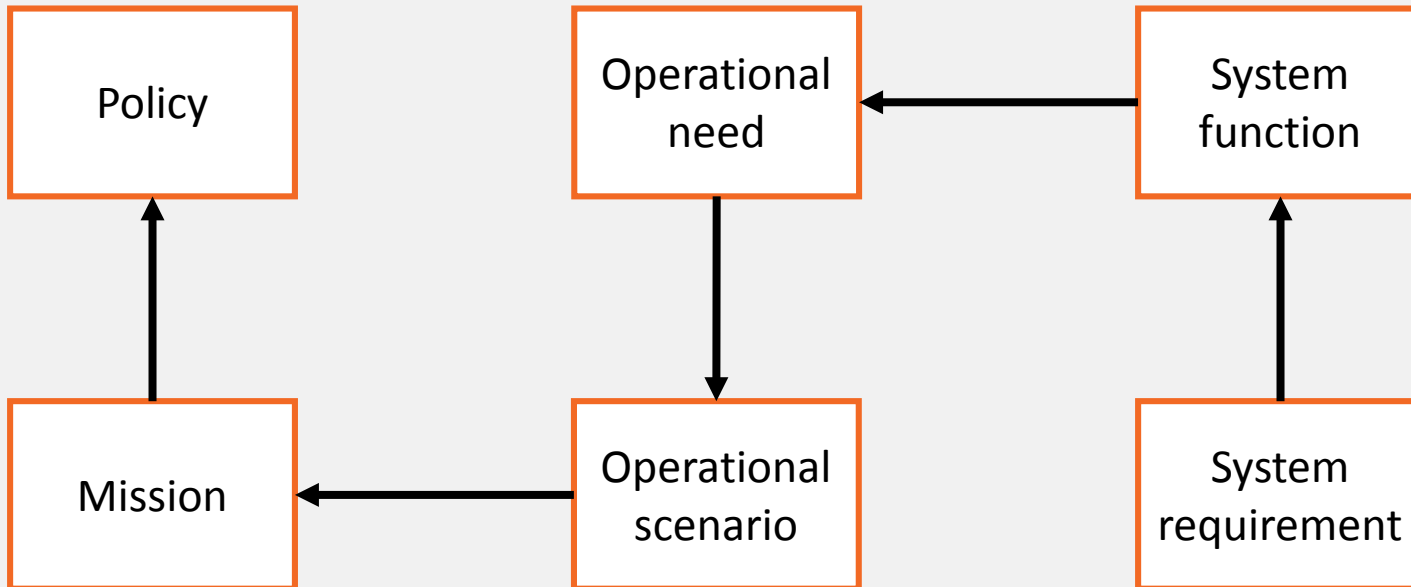
- The modern approach to SE
- Used to capture information about the problem and designed system solution
- Used throughout the system life cycle by multiple teams and disciplines
- Used to produce system specifications and documentation from the model

The model is essential, it is the “**current collective understanding**”

Dr David Harvey
(University of Adelaide)

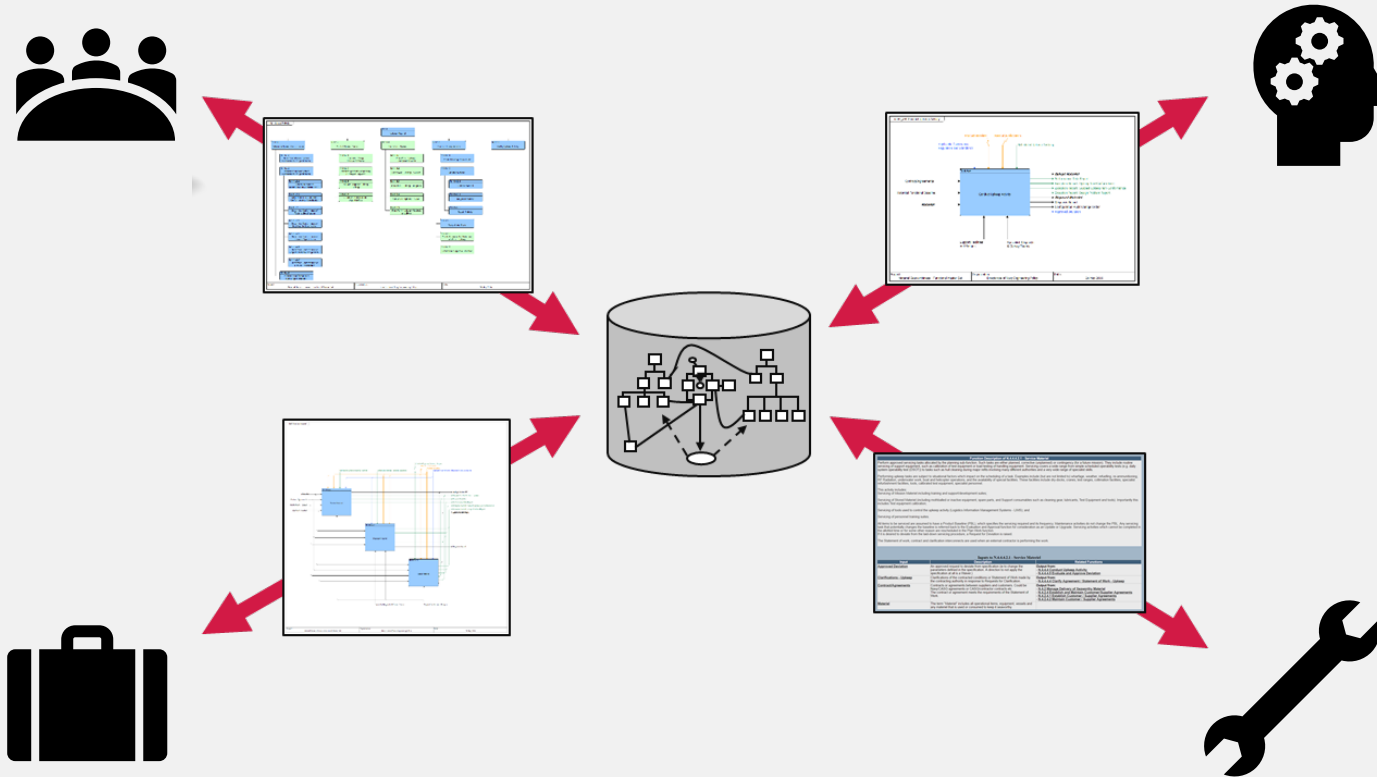


Traceability

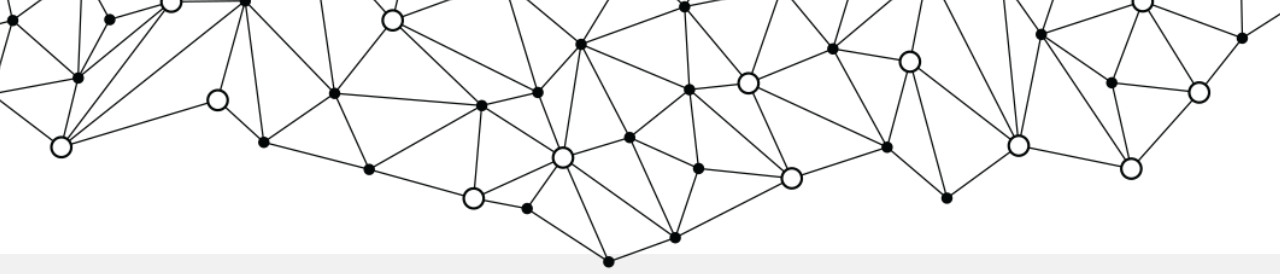


Traceability is the heart of MBSE

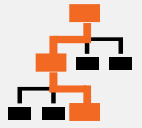
Multiple views



The model enables a
**single source of
information**
and
**multiple views and
outputs**



Benefits of MBSE



Traceability

- Links established and maintained as part of the approach



Consistency

- ‘Current collective understanding’
- Internal consistency



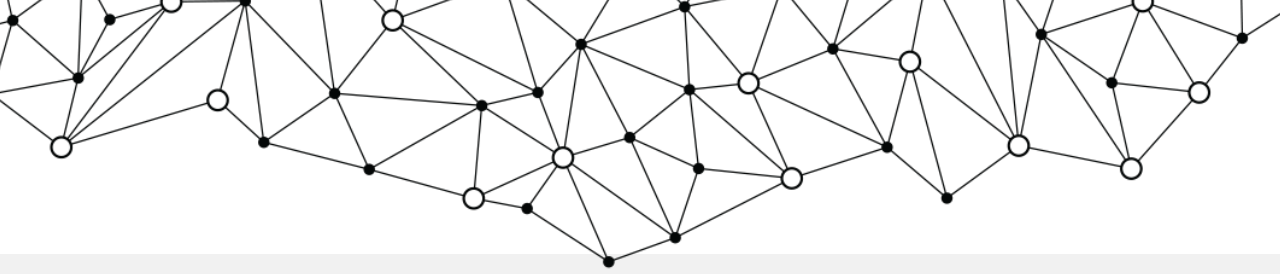
Adaptability

- Any number of views or documents can be produced as snapshots of the model

MBSE is not a silver bullet
rubbish in, rubbish out
and
complete automation is not possible, nor desirable, input and review needed

Research project objectives and findings





Research aims

Develop a framework to:

- capture an organisation's asset management information
- produce a suite of artefacts, such as:
 - Asset management policy
 - SAMP
 - AMPs
 - Role descriptions
 - Asset management maturity assessment

How did we do?

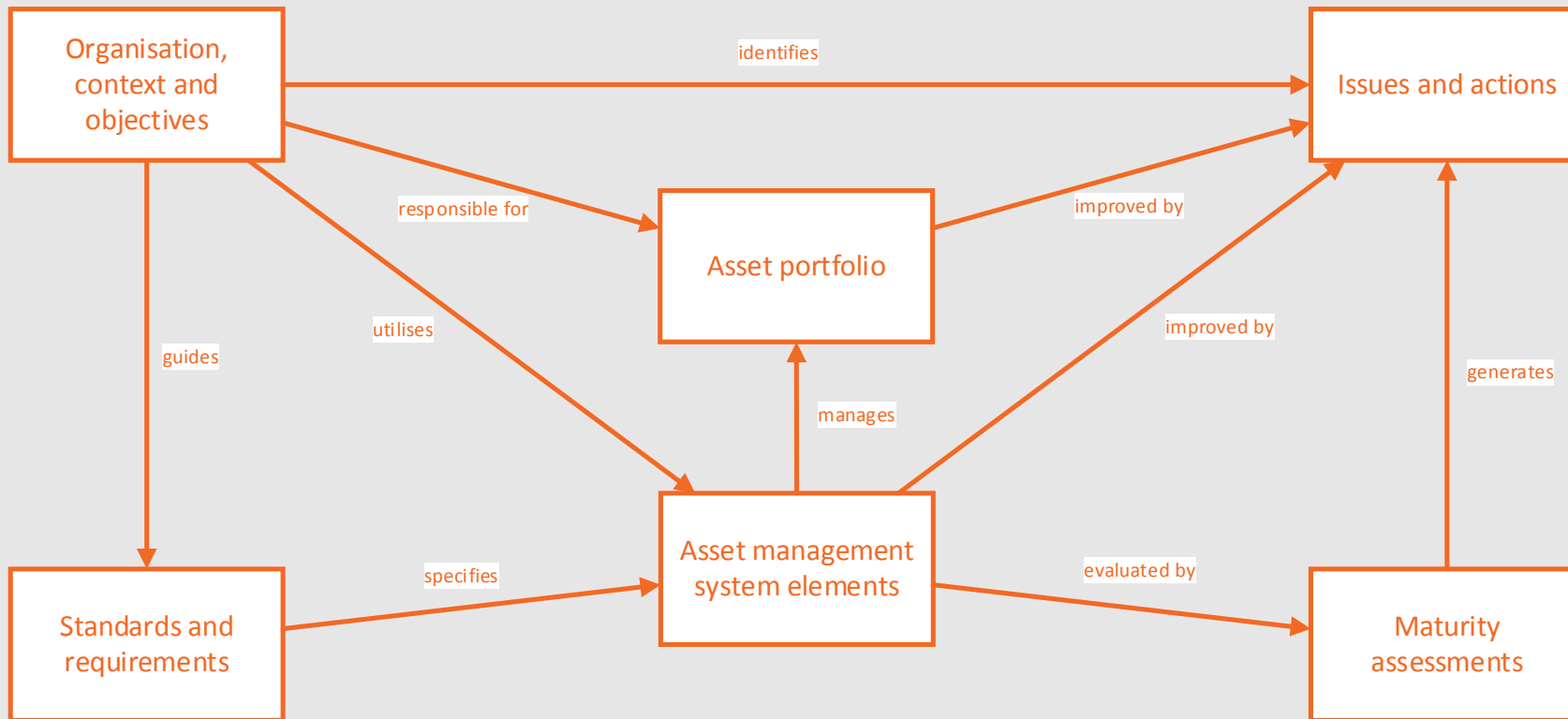
AMS concept model

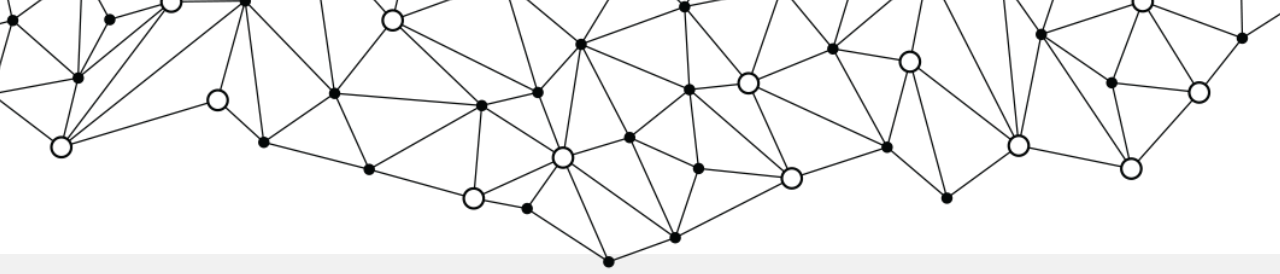
- Greater focus on 'operate & maintain'
- Connectivity between:
 - Objectives
 - Policy
 - Strategy
 - Execution



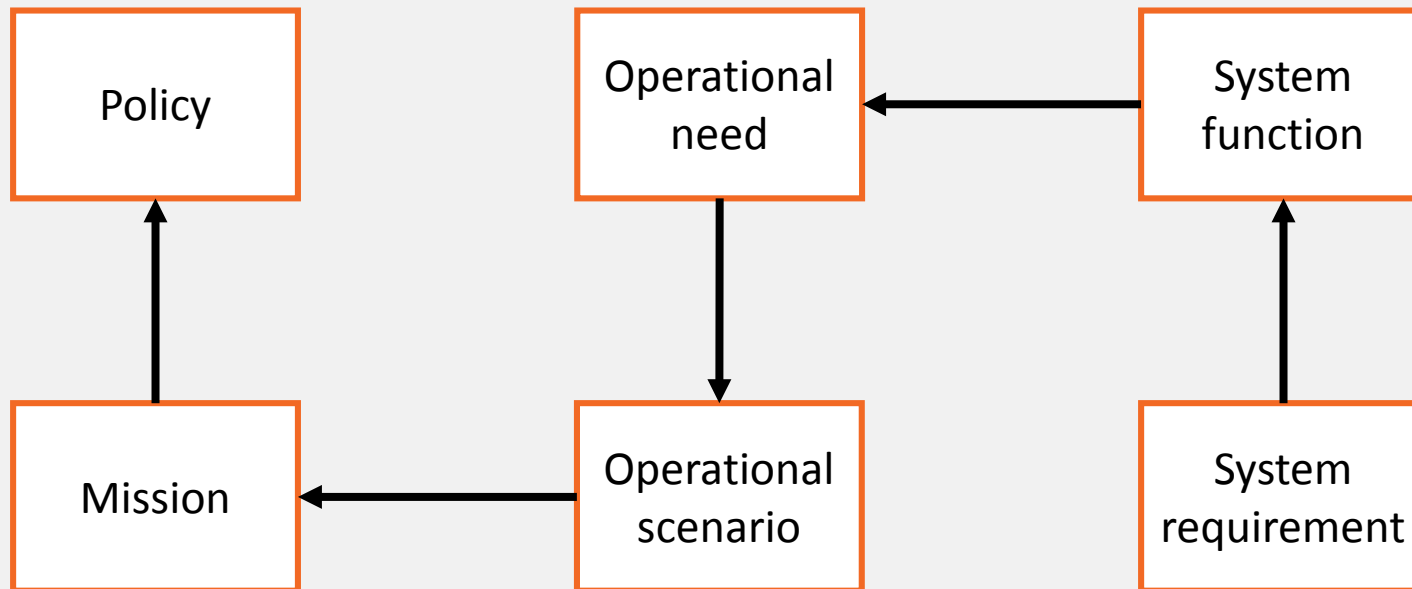
AMS model schema

- Developed a schema based on best practice MBSE to capture information relevant to the asset management system which can be used to produce the required outputs

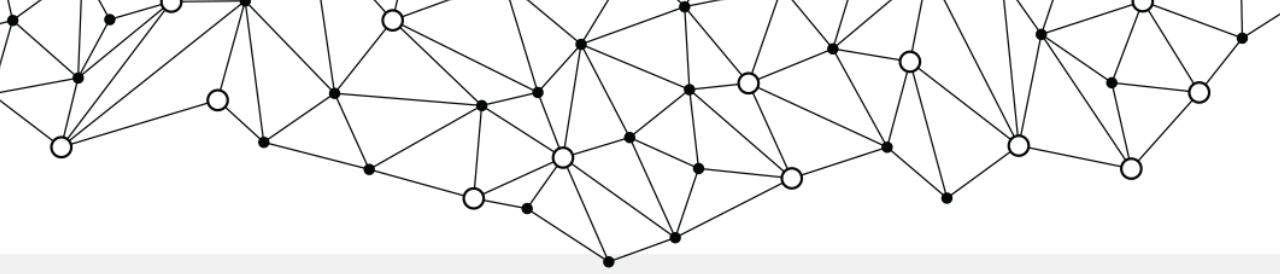




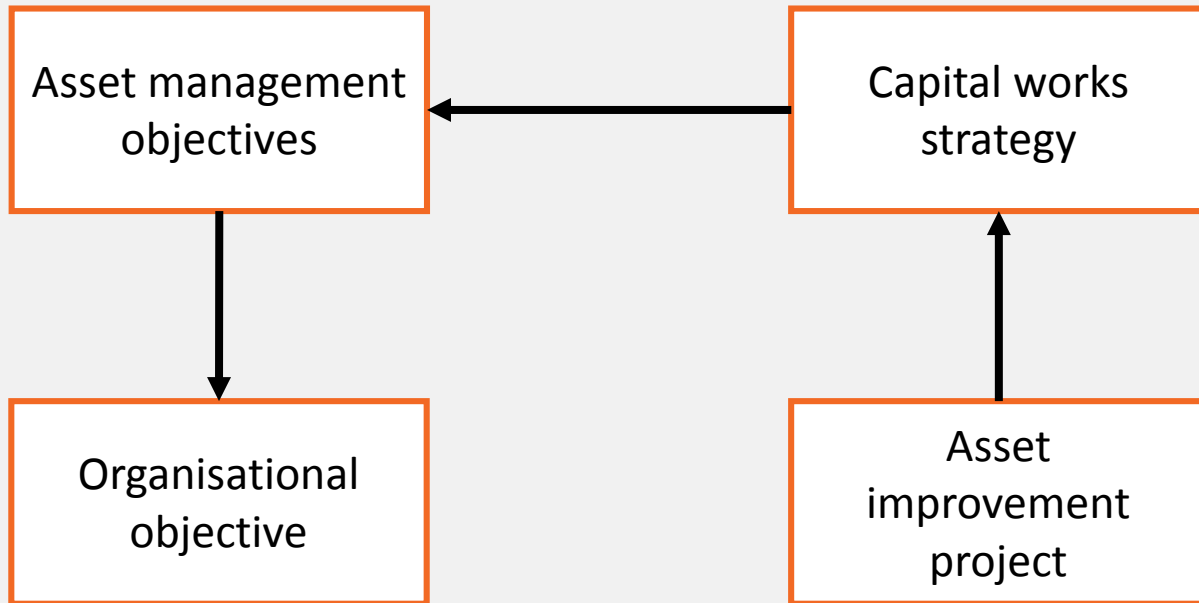
Traceability in an AMS



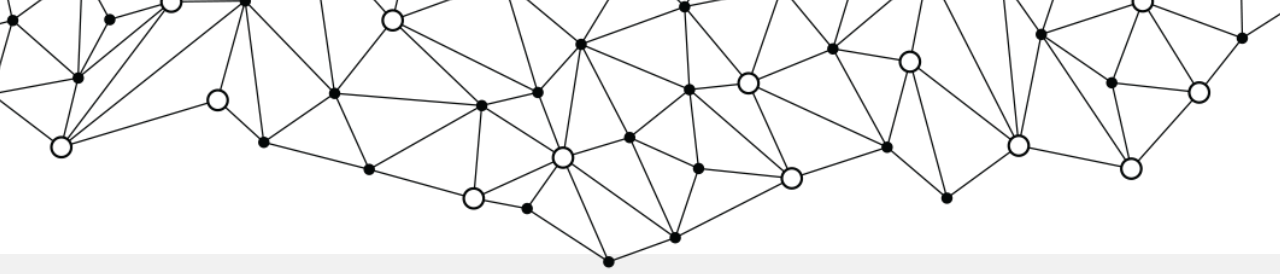
Traceability is the heart of MBSE



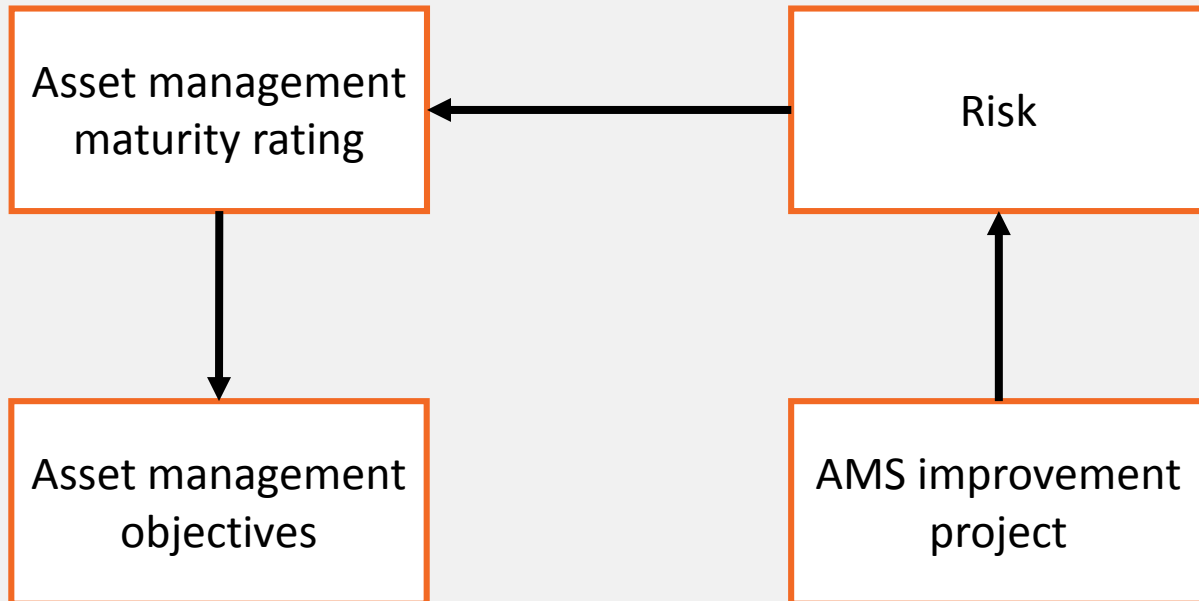
Traceability in an AMS



Example traceability:
Asset improvement project



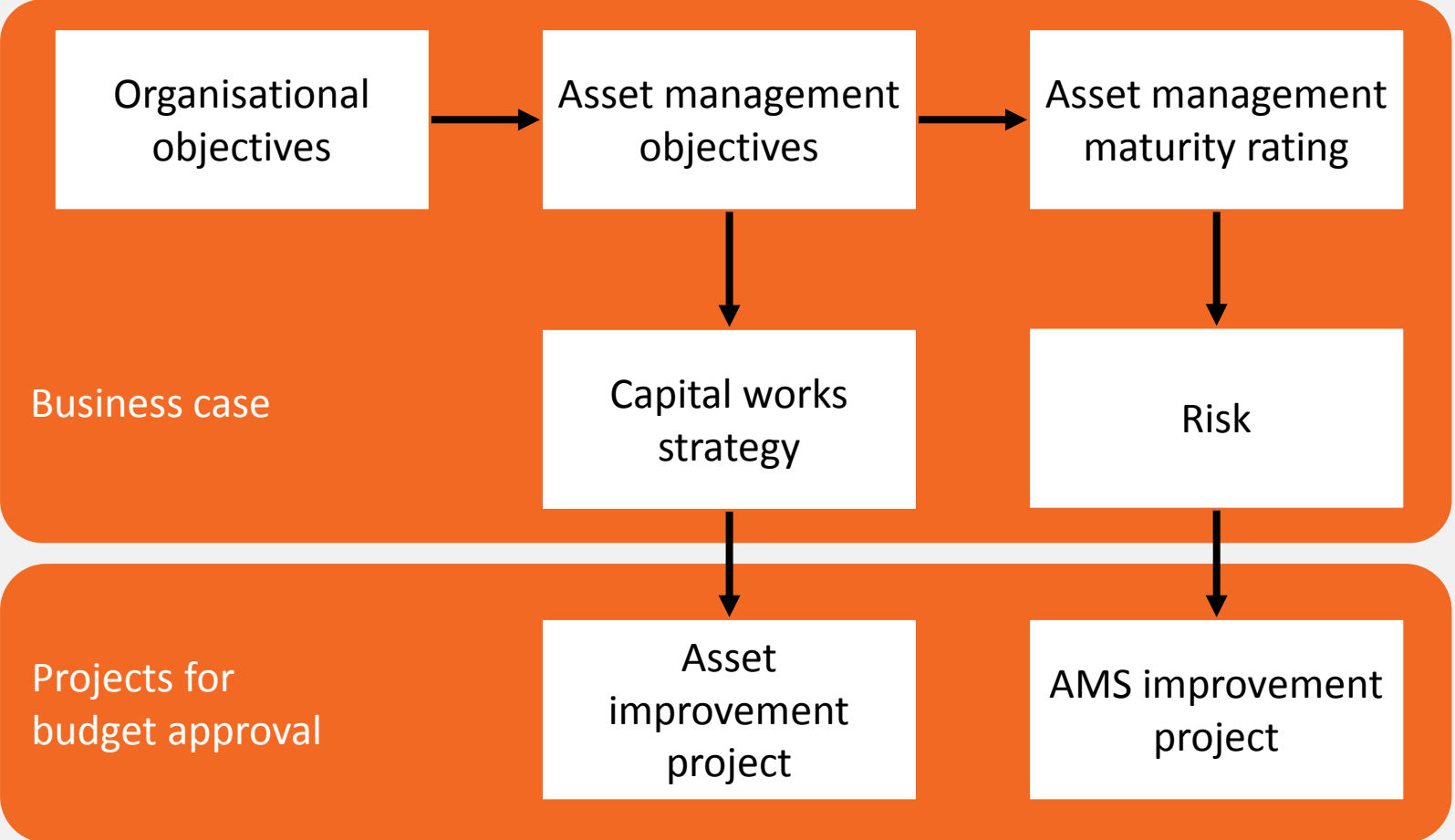
Traceability in an AMS



Example traceability:
AMS improvement project



Traceability in an AMS

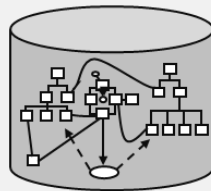


Ideal world:
Objectives drive action

Multiple views




Maturity
rating

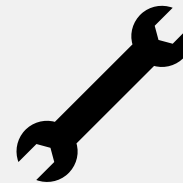



SAMP

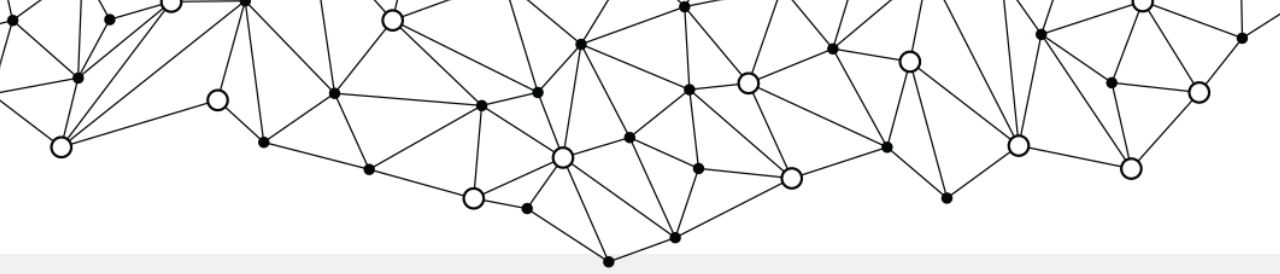



Business
process

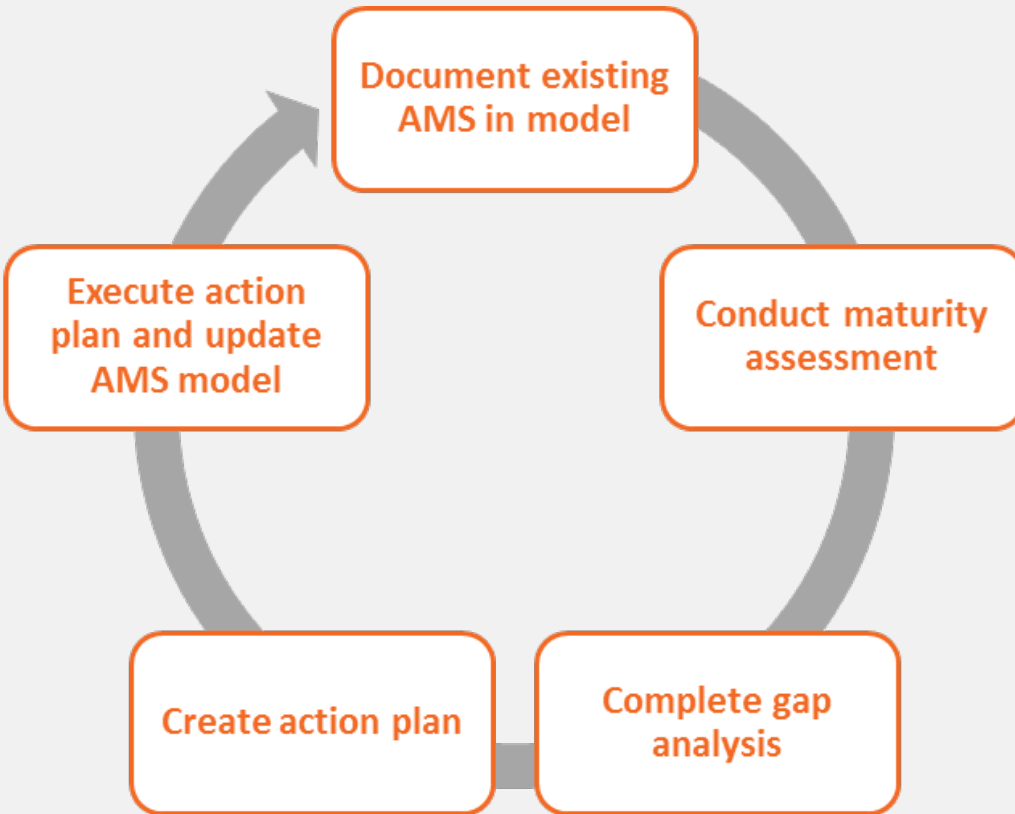

AMP



The model enables a
**single source of
information**
and
**multiple views and
outputs**



Proposed application



Following a PDCA process



Findings & further work

Initial findings

- Framework can be built
- Key outputs can be produced

Further work

- Select appropriate system modelling tool
- Populate and test the framework for a rail organisation
- Build in other requirements e.g. ONRSR

A best practice Asset Management System should be defined using an **information model**



ADDRESS

PO Box 7038 Hutt Street
SA 5000 AUSTRALIA



PHONE NUMBER

+61 2 6239 4288



EMAIL

support@shoalgroup.com



WEBSITE

www.shoalgroup.com



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