

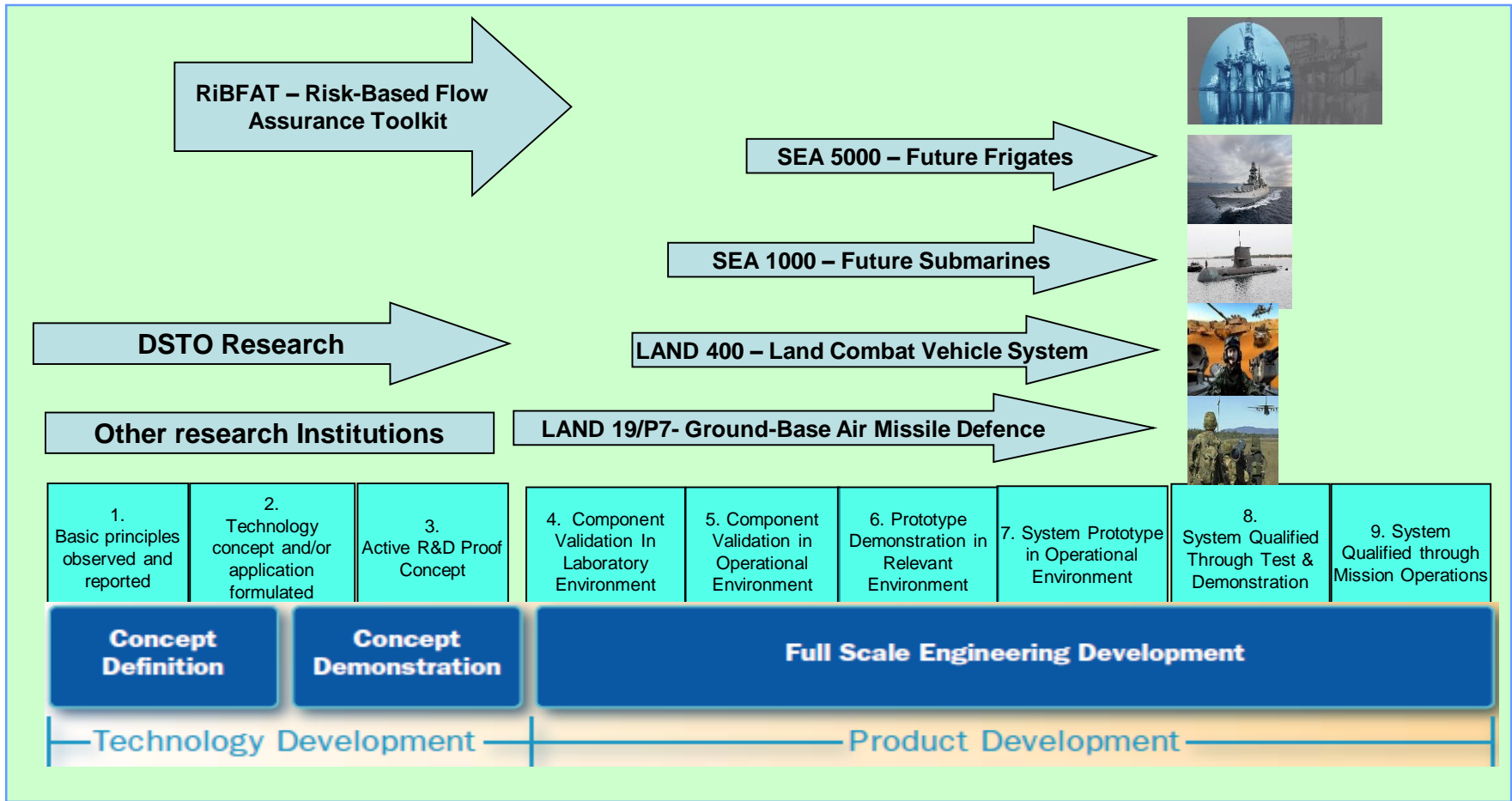
MBSE Opportunities and Challenges for Systems of Systems:

An Australian Research and Practice Perspective

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SYSTEMS AND ENGINEERING TECHNOLOGY

Current MBSE Adoption



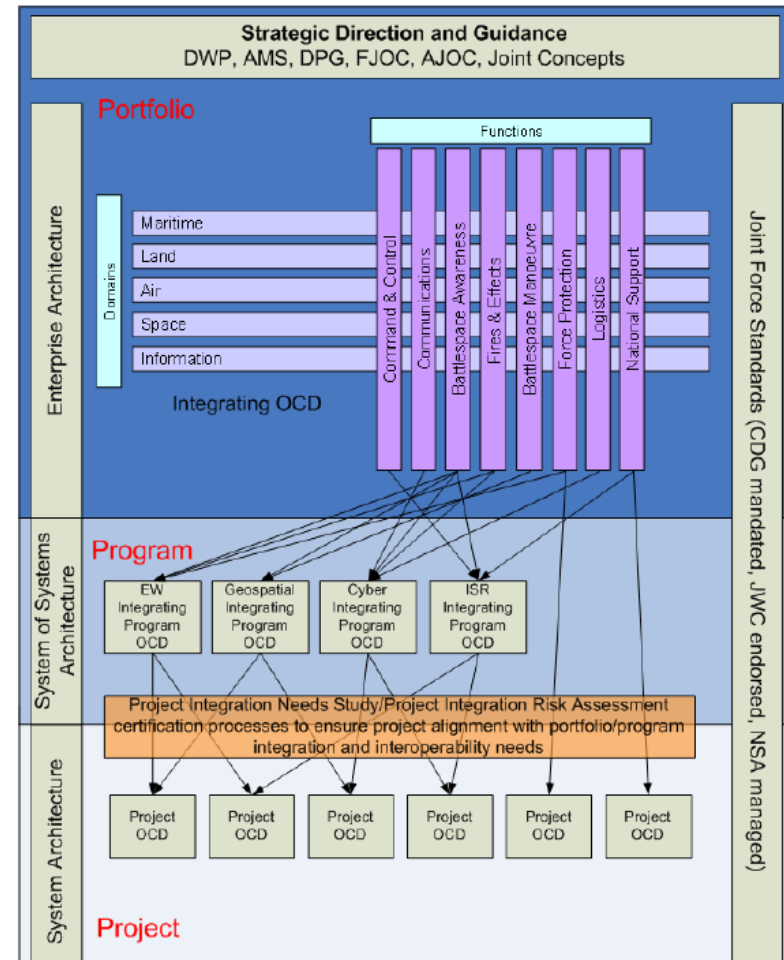
MBSE has been adopted in major defence projects in Australia

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New SoSE Initiatives

- ▶ Integrated Operational Concept Document (IOCD) initiative to ensure projects are developed with an integrated framework:
 - ▶ Project portfolio management; and
 - ▶ Across projects dependency.

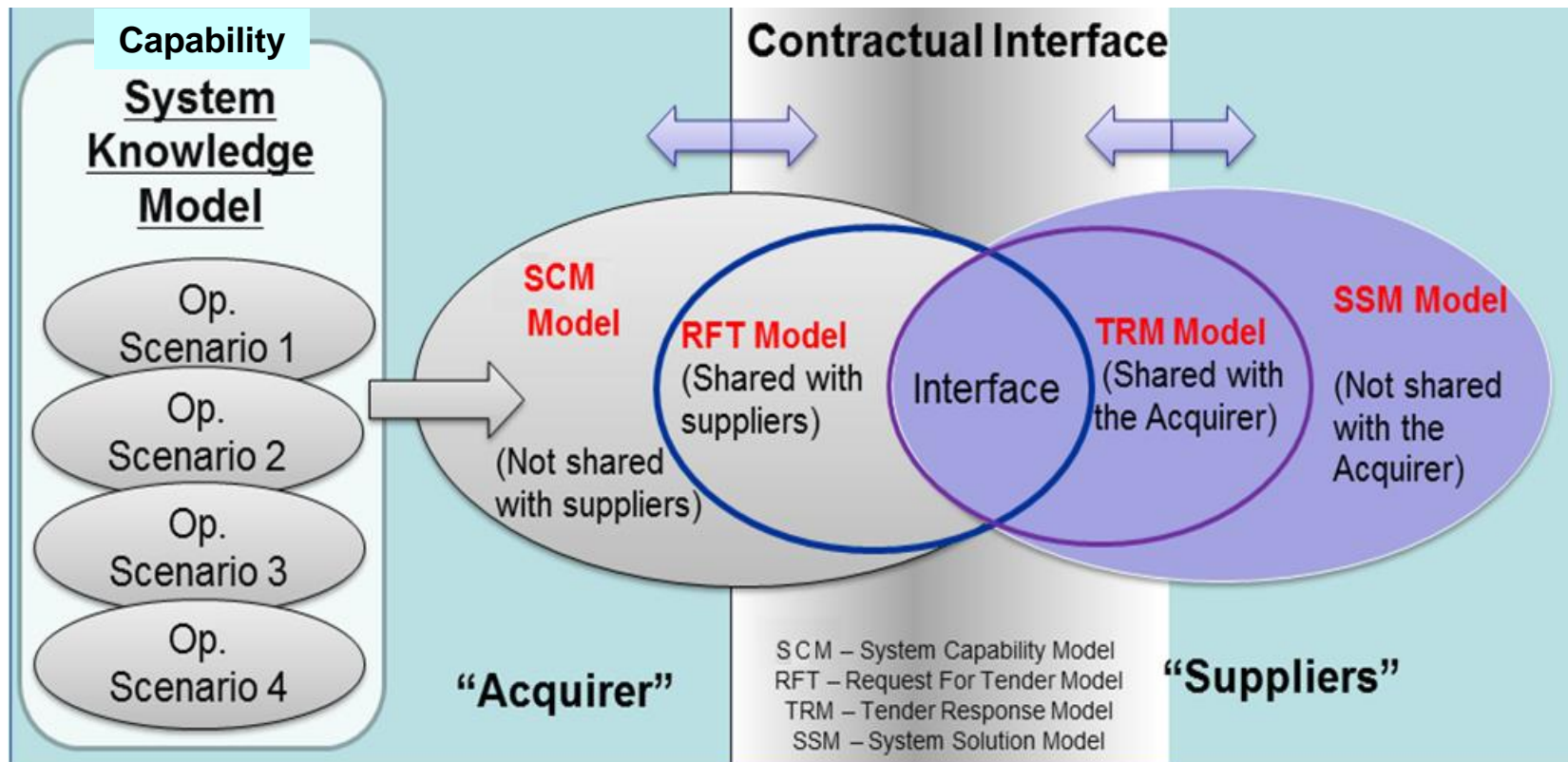
- ▶ Enterprise Modelling – Royal Australian Navy
 - ▶ MBSE in organizational modelling and design; and
 - ▶ Model-based change impact analysis from the enterprise model through to engineered system models.



Integrated OCD Framework
(Badgery, 2014)

Recent MBSE research

- ▶ Model-based system acquisition (DSIC, DSTO, FNC)
- ▶ Model-based technical risk assessment (DSTO, ACPL)
- ▶ Model-based return on investment (UniSA, DSTO)



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MBSE Opportunities and Challenges for Systems of Systems (1)

- ▶ MBSOSE has a low TRL, need to promote adoption through:
 - ▶ Stakeholder persuasion with well-supported arguments, RoI, case studies, etc;
 - ▶ Attention to non-modelling aspects: collective training, policies, processes, guidance, tool infrastructure etc; and
 - ▶ Organizational support and incentives for SE to operate in a Systems of System engineering environment.

- ▶ Diverse and conflicting stakeholder imperatives, address through:
 - ▶ Stakeholder knowledge model;
 - ▶ Success criteria for SOS and their constituent systems; and
 - ▶ Mechanisms to trace impact of CS and SoSE changes on success criteria and individual stakeholder imperatives.

MBSE Opportunities and Challenges for Systems of Systems (2)

- ▶ MBSE models are largely static and descriptive, how can they be made dynamic and executable to cope with emergent behavior of SOS?

- ▶ Numerous tools and modelling approaches employed across constituent systems (Projects select tool environment), and need:
 - ▶ Model interoperability:
 - ▶ Standardized model interfaces between tools;
 - ▶ Standardised metamodels;
 - ▶ Compliant executable models; and
 - ▶ Model sustainability and obsolescence management.

MBSE Opportunities and Challenges for Systems of Systems (3)

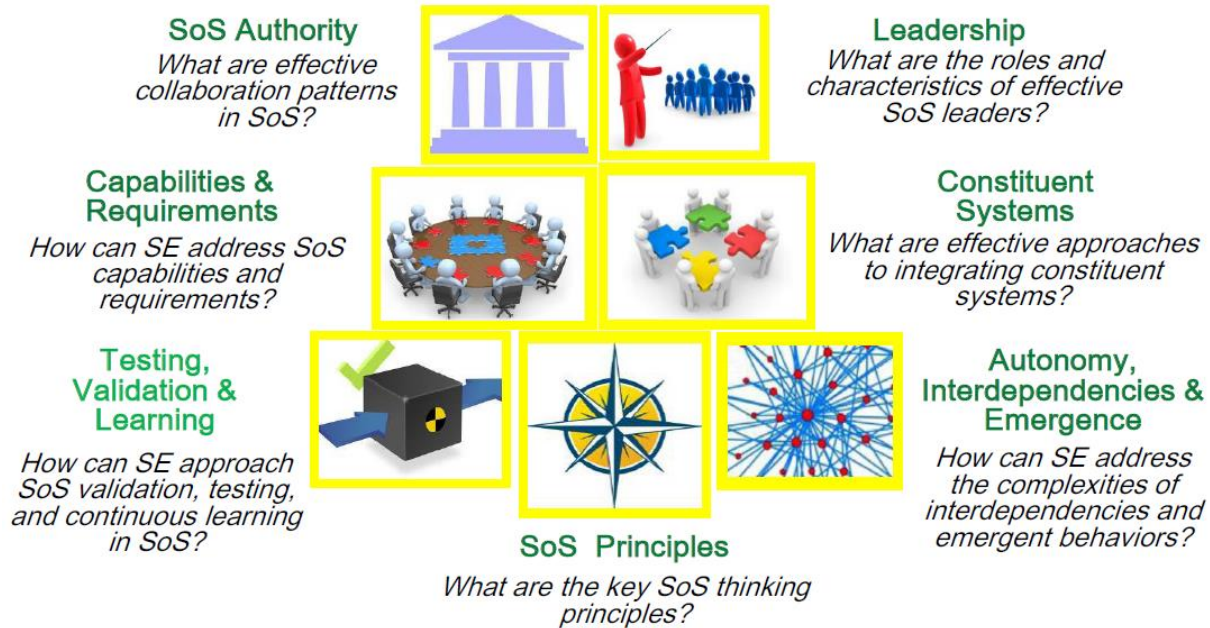
- ▶ Change management:
 - ▶ Compatible knowledge management of evolving constituent systems; and
 - ▶ SoSE tools need to alert SoS team to critical CS changes and indicate impact on performance, utilities, SoS capability, risk, individual stakeholders.

- ▶ SOS modelling effort - need to address:
 - ▶ Affordability
 - ▶ stopping criteria

These address some of the SoS Pain Points

System of Systems Pain Points,
SoS Working Group Initiative
Dr. Judith Dahmann,
The MITRE Corporation,
24th Annual INCOSE IS

Pain Points



Complexity, Perspectives, Interdependencies, Dynamics

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