

Speed to Capability with the Incremental Commitment Spiral Model

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Topics

The Challenge

Origins of the Incremental Commitment Spiral Model (ICSM)

An Overview of the ICSM

Benefits and limitations of ICSM

When and how to utilise ICSM

Why ICSM empowers project managers


The Defence Strategic Review (DSR)

- ▶ One of the identified six priority areas for immediate action
 - Lifting our capacity to **rapidly** translate disruptive new technologies into ADF capability, **in close partnership with Australian industry**
 - ▶ In a speech the Minister for Defence Industry has called for
 - A minimum viable capability to accept platforms into service at 80-85% capability
 - Then use an iterative approach to reach 100%
 - But also reflect the modern technology cycle
 - Increase speed by embracing risk
- » <https://www.minister.defence.gov.au/speeches/2023-06-14/defence-industry-post-dsr-world>

- ▶ **The Challenge:**
How to increase Speed to Capability without the wheels falling off!





Let's Breakdown the Minister's Points

Minister's Point	Rejoinder
A minimum viable capability (MVC) to accept platforms into service at 80-85% capability	Defence Acquisition University defines MVC as: The initial set of features suitable to be fielded to an operational environment that provides value to the warfighter or end user in a rapid timeline. The MVCR delivers initial warfighting capabilities to enhance some mission outcomes. The MVCR is analogous to a minimum marketable product in commercial industry
Then use an iterative approach to reach 100%	Let's use an Agile approach But without discipline 

<https://tenor.com/>



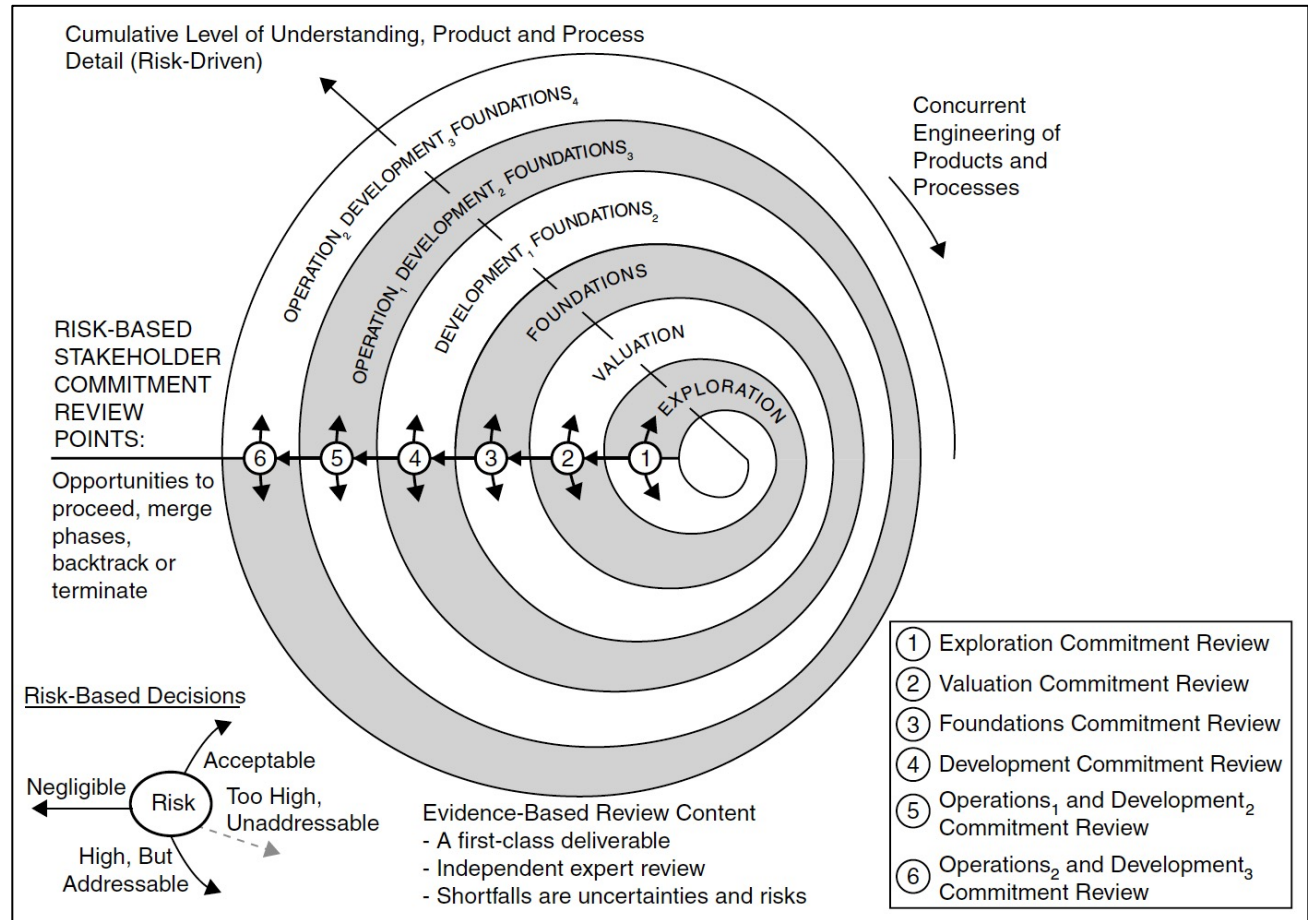
Let's Breakdown the Minister's Points – Part 2

Minister's Point	Rejoinder
But also reflect the modern technology cycle	Absolutely! But how, when and where?? 
Increase speed by embracing risk	Requires Effective Risk Identification and Management 

A possible solution: The Incremental Commitment Spiral Model



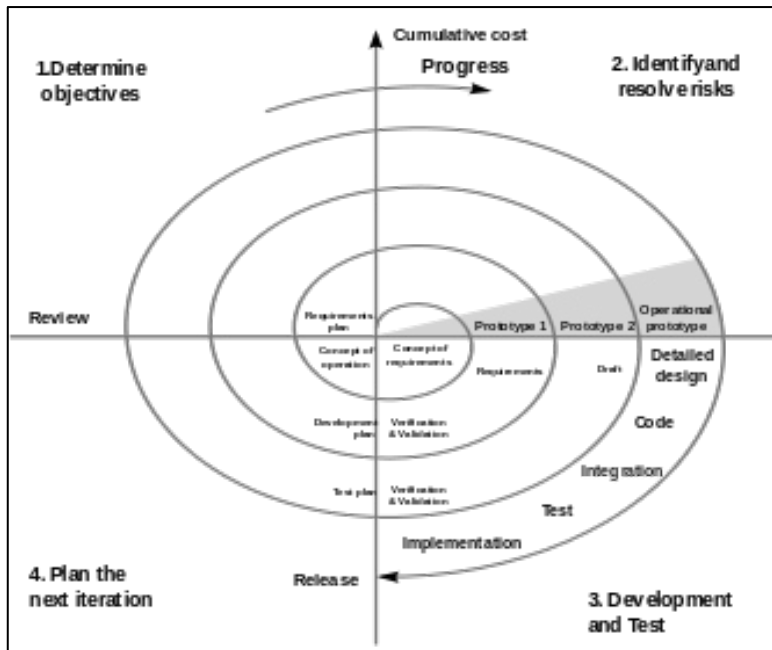
Barry W. Boehm



Boehm Center for Systems and Software Engineering

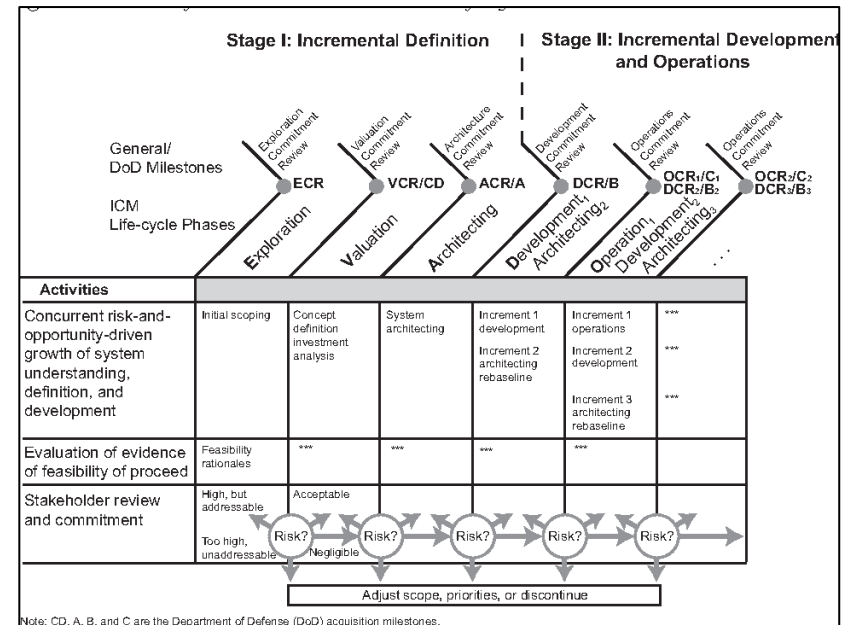


Origins of ICSM



Spiral model (Boehm, 1988)

A risk-driven, cyclical model emphasizing prototyping and feedback

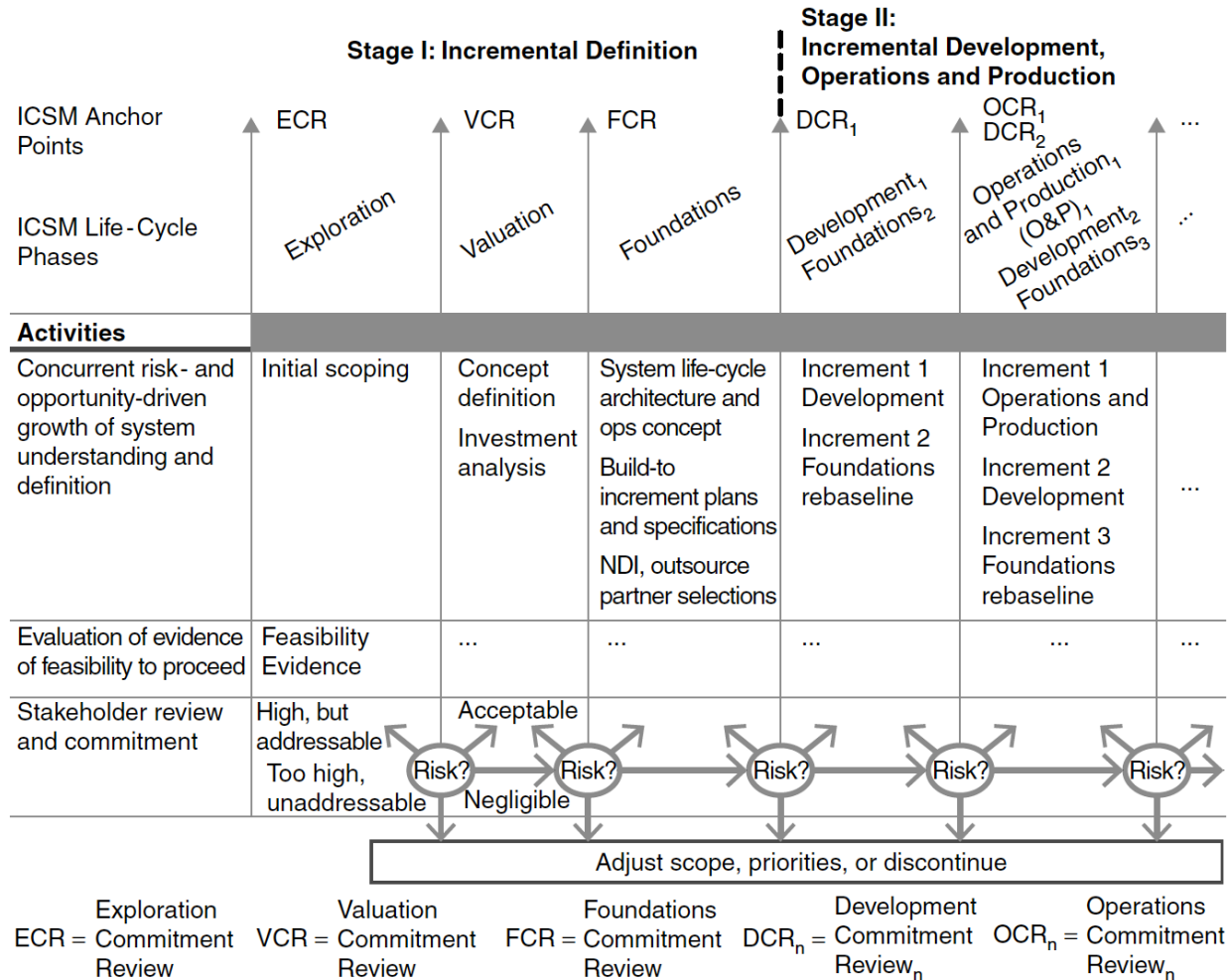


Incremental Commitment Model (Boehm, Lane, 2006)

An iterative approach with phased deliverables and early risk assessment



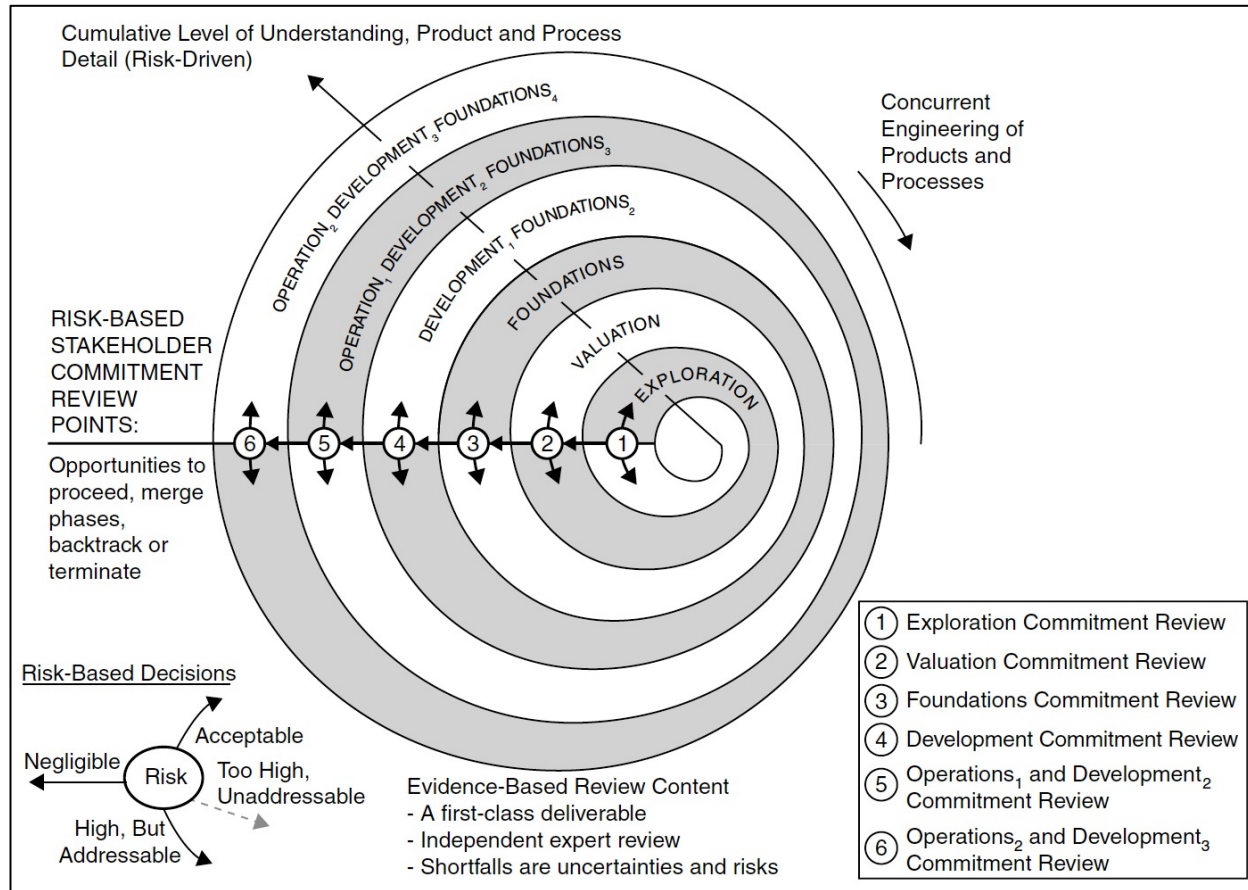
The ICSM Phased View (Boehm)



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The ICSM Spiral View (Boehm, Lane and Turner)



Boehm Center for Systems and Software Engineering



ICSM Stage I Incremental Definition

Three phases

- 1.Exploration
 - Initial Scoping
- 2.Valuation
 - Concept Definition
 - Investment Analysis
- 3.Foundations
 - System life-cycles architecture and operational concepts
 - Build-to increment plans and specification

Upfront growth in

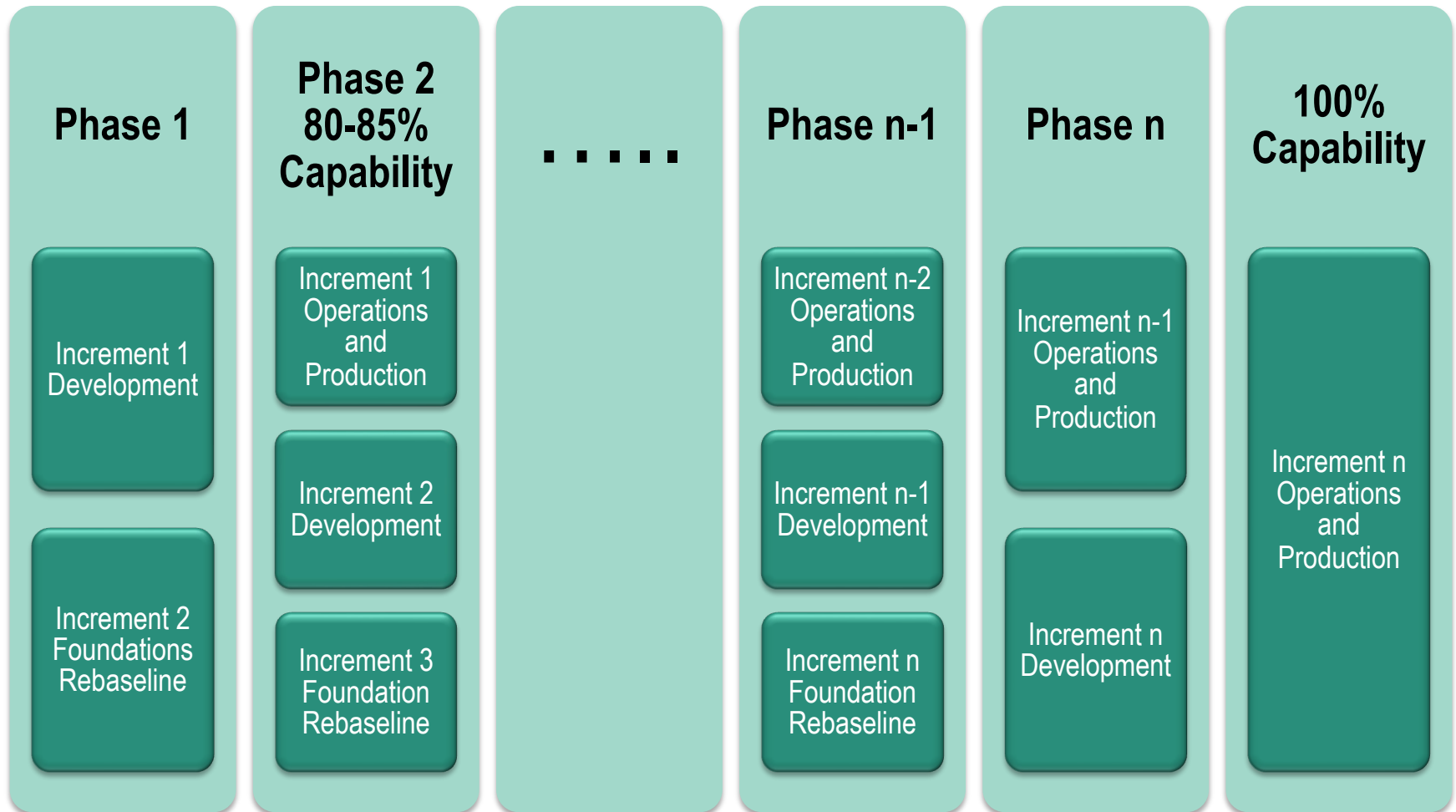
- System Understanding
- Definition
- Feasibility Assurance and
- Stakeholder Commitment

Provides the commitment to proceed to
Stage II Incremental Development, Operations and Production

- Dependent on evidence and risk-based decisions
- Output is the **Increment 1 Foundations baseline** i.e. systems architecture and associated artefacts

ICSM Stage II

Incremental Development, Operations and Production



Salient Features of ICSM

Continuous Validation

- User feedback on incremental deliverables validates requirements and functionality continuously rather than just at the end

Incremental Delivery

- Each cycle concludes by producing an operational subset of the final product, enabling incremental deployment

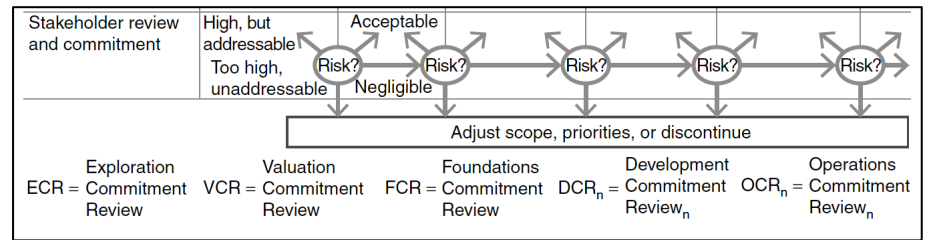
Dynamic Planning

- Objectives, priorities, activities etc. are planned dynamically between cycles based on learning and feedback

Documentation

- All processes, analyses, prototypes, and decisions are well-documented for traceability

Critical to success



Commitment Review Milestones

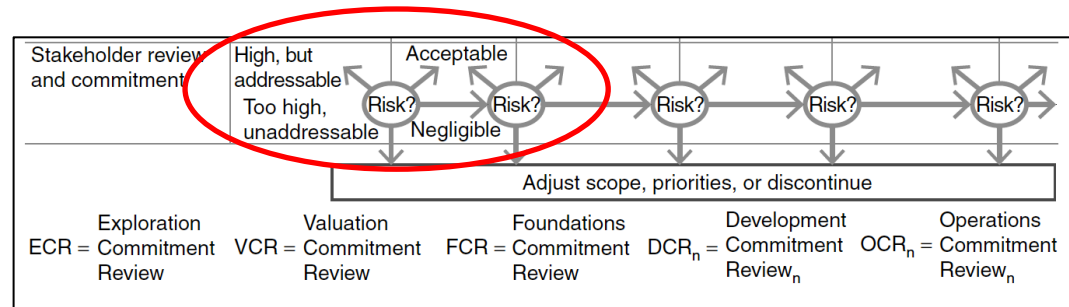
- A Stakeholder Review of the Risks and
- The Stakeholder Commitment Decision to proceed

At the end of each phase or spiral, product development concurrently considers

- Requirements (objectives and constraints)
- Solutions (alternatives, **new technologies?**)
- Products and processes
- Hardware and Software
- Human factors
- Business case analysis of alternative product configurations (**new technologies?**)

Independent experts review the evidence above to determine the level of risk

Levels of Risk



Negligible

- Proceed to next phase

Acceptable

- Proceed to next phase with Risk Mitigation Plans

High but addressable

- Do NOT proceed to the next phase until the risk has been addressed

Too high, unaddressable

- Adjust scope, priorities or discontinue

What Independent Reviews of Risk are available?

Contestability

- Particularly from a cost perspective

Independent Assurance Reviews (IARs)

- Confidence desired outcomes will be achieved

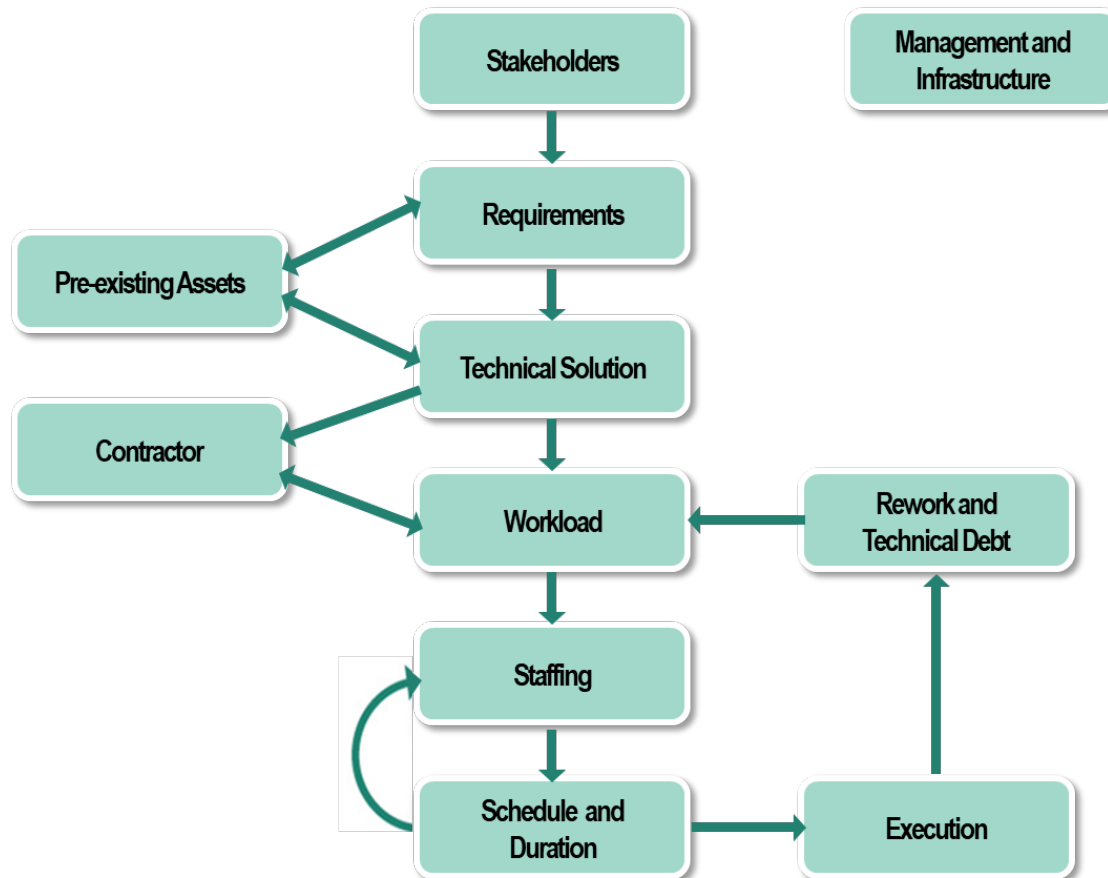
DSTG Technical Risk Assessment

- Is the technology feasible?

IPRI's Schedule Confidence Risk Assessment Methodology (SCRAM)

- What are the risks to schedule?

SCRAM uses RCASS to identify risks



Root Cause Analysis of Schedule Slippage (RCASS) Model

Benefits of ICSM

Accommodates changes in requirements and objectives

Risks are identified and managed early in each cycle

Stakeholders see progress through incremental deliverables

Issues can be identified and addressed during development

Allows for flexibility if new technologies/tools emerge



Limitations of ICSM

Complexity

- Initial setup and risk assessment can be demanding

Requires strong leadership

- ICSM's flexibility necessitates skilled project managers

Not suitable for all projects

- Best for complex, high-risk initiatives with evolving requirements

When to Use the ICSM

Complex or mission-critical software intensive projects

- Agile development of complex applications

Projects with unclear or rapidly changing requirements

Development involving significant technology risks

Product development

- Prototyping and iterative refinement of new consumer products

Examples of Projects that Used ICSM

Atlas V Launch Vehicle System

- Lockheed Martin used ICSM to develop the Atlas V rocket design, managing technical risks and evolving requirements over multiple spiral cycles

Mars Pathfinder Mission

- NASA's Mars Pathfinder project used ICSM to deliver the Sojourner rover, accommodating new technologies like airbag landings

Defense Advanced GPS Receiver

- An advanced military GPS product developed by Boeing that leveraged ICSM to incorporate new GPS capabilities

Aegis Advanced Combat System

- The US Navy utilised ICSM to upgrade its Aegis fleet combat and radar systems with state-of-the-art capabilities

NextGen Air Traffic Control

- The US Federal Aviation Administration is using ICSM practices to implement NextGen, upgrading air traffic management infrastructure

How ICSM empowers you

Proactively involve stakeholders at each commitment review

- Which is critical to success

The Minister for Defence Industry proclamations:

A minimum viable capability to accept platforms into service at 80-85% capability

- Building on an iterative (Agile) approach, the ICSM Stage II Incremental Development, Operations and Production Phase 2 can deliver a platform into service at 80-85% capability

Then use an iterative approach to reach 100%

- The ICSM continues its iterative (Agile) approach through to 100% capability
- Considers Operational and Production feedback on incremental deliverables

But also reflect the modern technology cycle

- At each Functional Rebaseline, new technologies can be incorporated

Increase speed by embracing risk

- Progress through the phases with a deep understanding and appreciation of the risks involved



More Information

- ▶ The Independent Project Review Institute delivers:
 - Schedule Risk Confidence Assessment Methodology (SCRAM) Reviews and
 - Managing Schedule Risk on-line courses

- ▶ If you're interested in learning more, please contact us
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Any questions?



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