28th Annual INCOSE international symposium

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Composing Complex Capability

Stakeholder Driven Development Framework

www.incose.org/symp2018

Background

- Australian Defence is increasingly involved in the acquisition of Complex capabilities
- The challenge Australian Defence and Industry are facing is “How do we develop these Complex capabilities?”
- NSID's focus is to provide support to the ISR aspects of these capabilities
- In this context, NSID is developing a strategy called the SDDF

https://www.defensenews.com/naval/2018/06/29/australia-officially-announces-26b-frigate-contract-here-are-the-build-details/

http://australianaviation.com.au/2018/06/australia-to-acquire-triton-maritime-surveillance-drones-for-2023-service-entry/

https://www.bing.com/images0

Complex Problem (SDDF perspective)

- Problem is not well understood
- No clear way ahead
- Problems tends to change
- Problem tends to smear across organisational boundaries
- No clear end goal
- Solutions are facilitations/mediations at best - no absolutes

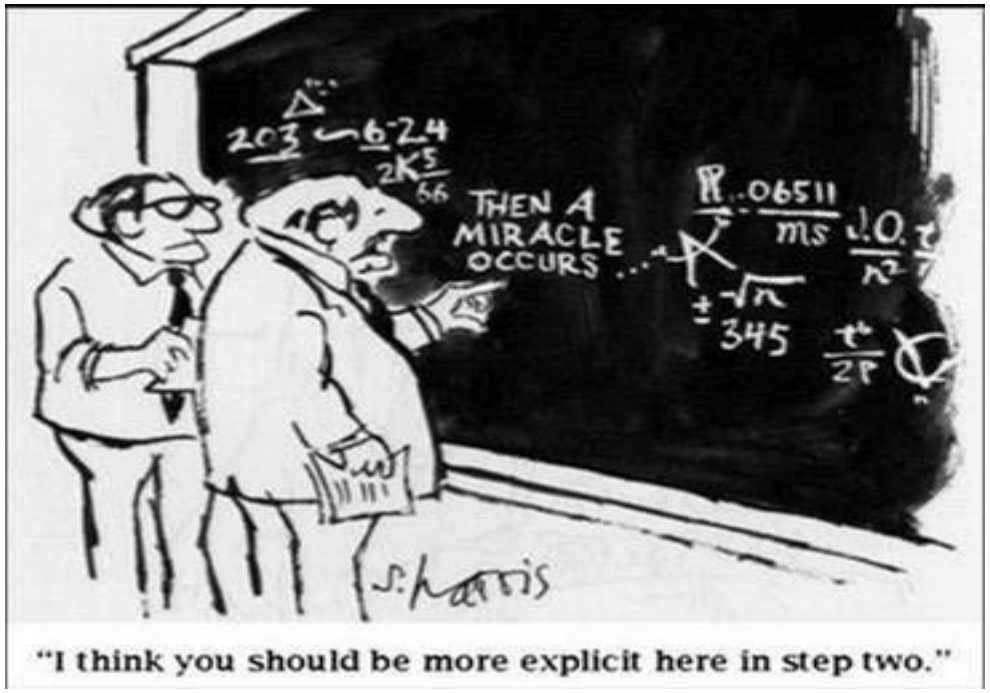
https://www.bing.com/images/

H. W. J. Rittel and M. M. Webber, 'Dilemmas in a General Theory of Planning', *Policy Sciences*, Vol. 4, No. 2, June 1973, pp. 155–69.

Acquisition of a Complex Capability is a Complex Problem

Characteristics:

- CONOPS not well understood – needs to evolve by trial/assessment
- Integration of a complex capability is a complex problem (e.g. Integrated ISR).
- End goals are problematic
- Different Stakeholder views
- Need to facilitate/mediate outcomes across multiple organisational boundaries
- Risk issues not stable

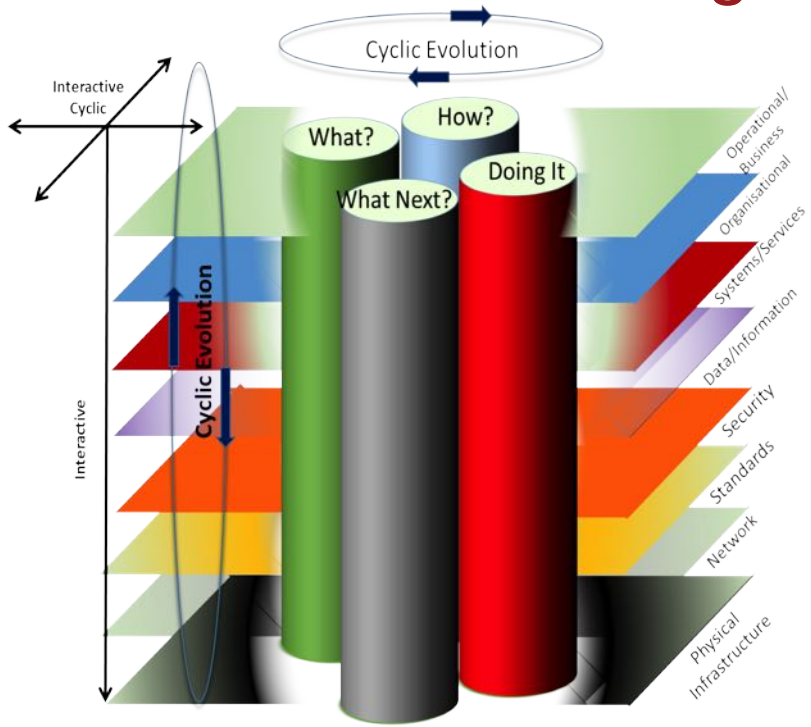


http://hnmath.yolasite.com/resources/miraclemath.jpeg

What is the SDDF – Growing Complex Capability 1 of 2

- The SDDF is a novel strategy that tackles complex problems.
- It uses System Thinking
- Multiple Worldviews to provide a holistic approach to the problem space
- Problem typology drives the methodology selection from these multiple worldviews
- The SDDF strategy cycles through four elements for each evolution/phase – each element involving Stakeholder and System Practitioner to decide the best way forward….

What is the SDDF – Growing Complex Capability 2 of 2



- **What to Do** – focus on problem framing
- **How to Do it** – the selection of methodologies to tackle the problem/development
- **Doing i**t – analysis-synthesis-assessment loop
- **What next** – Collective decision-making

Growing Complex Capability in a measured and balanced manner.

- **Measured** in terms of having a regard for progressive and stable growth of realisable aspects of the complex capability and
- **Balanced** to reflect the risk based facilitation processes between stakeholder priorities and program complexities

What makes it Unique?

SDDF

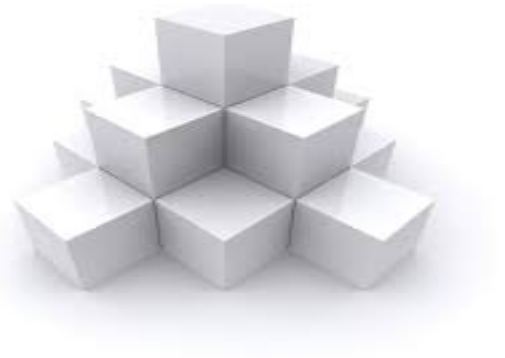
A Different Approach : The Stakeholder Driven Development Framework (SDDF)
The Conceptual Basis - A Work in Progress

- Based on rigorous management science research, systems thinking, practice and lessons learnt
- Uses a Multi-Methodology Multi Paradigm strategy, that is, a mix of methodologies from different world views combined with system practice strategies
- Uses a Simplifying Framework to tackle the problem:
  - Four Interactive Elements - What, How, Doing it and What Next?
- Guided by a set of Foundational Design Principles for Composing Complex Capability

http://previews.123rf.com/images/masterart/masterart1510/masterart151000015/47048595-A-word-cloud-of-systems-thinking-related-items-Stock-Vector.jpg

Candidate Guiding Foundational Design Principles for Composing Complex Capability

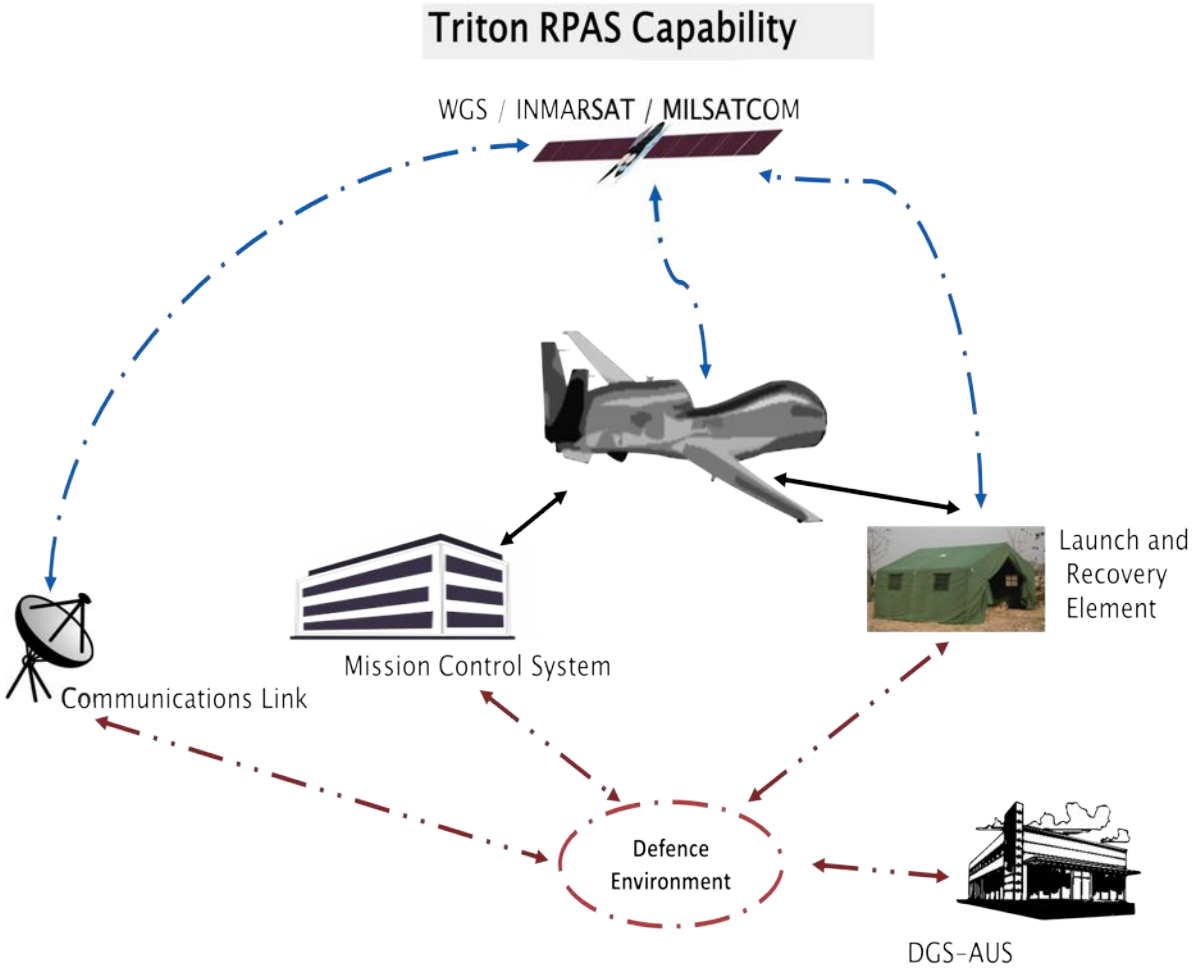
1. Manage Complexity, don't reduce it:
2. Use Multiple Worldviews / Perspectives
3. Build Trust Relationships
4. Ensure Management Buy-in:
5. Adopt a Composeable Design Strategy
6. Establish an Interactive Learning Laboratory
7. Satisficing i.e., a continuous risk prioritisation with stakeholders
8. Adopt Composable and Extensible architectures
9. Kaizen - Continuous Improvement in all aspects of the capability development process as a culture
10. Employ Stable Intermediate Forms e.g. baby steps
11. Incorporate Technology Innovation:(Future growth options).
12. Skills Profiles - right skills for the job



Maritime Intelligence Surveillance and Reconnaissance (ISR)

AIR7000 Phase 1B Case Study

Aim: To Investigate the inter-relationships between DGS-AUS (Interim Capability) and the Australian Mission System Trainer (AUS-MST) and project this towards DGS-AUS (Major) and Triton/MCS



How should the AUS-MST be utilised?

How can the integration risk of the Triton/MCS with the Australian Defence Single Information Environment (SIE) be mitigated?

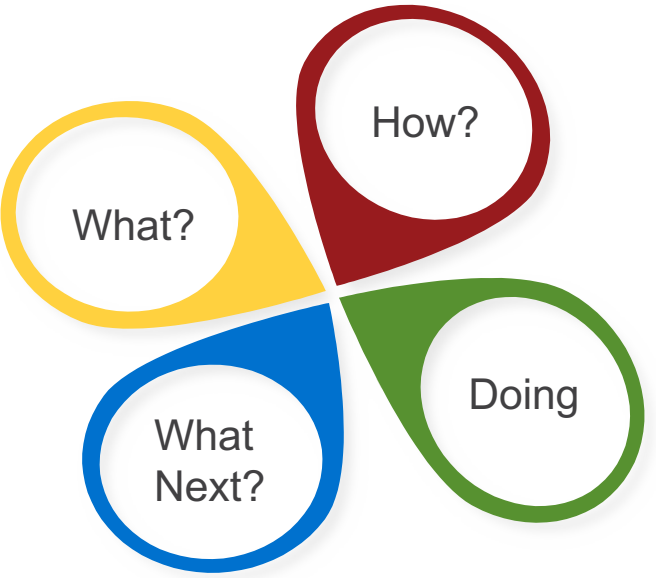
DGS-AUS is the Australian Distributed Ground System ISR Exploitation environment for the Royal Australian Air Force (RAAF).

Triton MQ-4C is the Northrop Grumman remotely Piloted Aircraft System (RPAS) including its associated ground station; the Mission Control System (MCS).

The Australian Mission System Trainer (AUS-MST) is intended to simulate the Triton Ground support environment. (Triton/MCS)

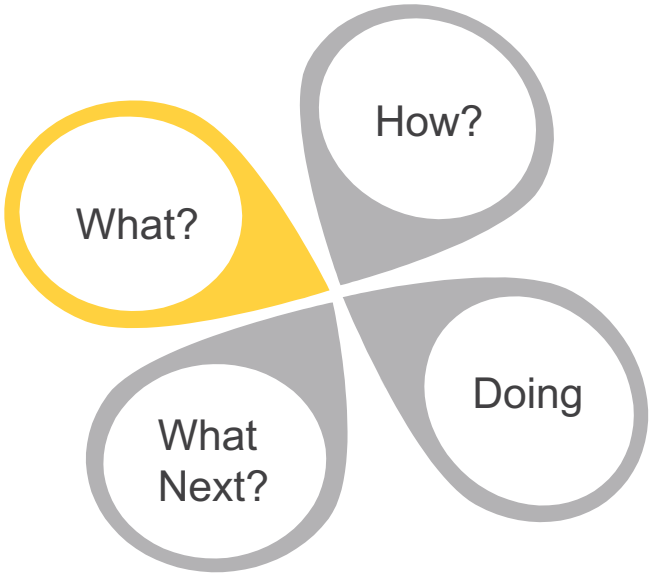
The Case Study will cover the use of the SDDF - i.e. the What, How, Doing Elements

- Problem framing at the operational level
- Use of a mix of methods to develop insight into the problem
- Aim to produce a set of core issues / benefits / aspirations of the integration activity.
- Workshop held with the Stakeholders to present the findings and:
  - Facilitate/mediate the findings
  - Agree on a list of priorities
  - Determine a set of actions against the list
- Next activity depended on Workshop outcomes



The What Element

- What problem? Determine Problem Topology
  - Complex problem
    - Multiple stakeholders
    - End goals ill-defined
    - Not clear how we will integrate with DGS-AUS
    - DGS-AUS is evolving
- What type of Strategy do we want to adopt?
  - Incremental and Iterative
  - Methodological mix – hard and soft methods
  - Determine perceived issues and aspirations.
  - Stakeholder mediated

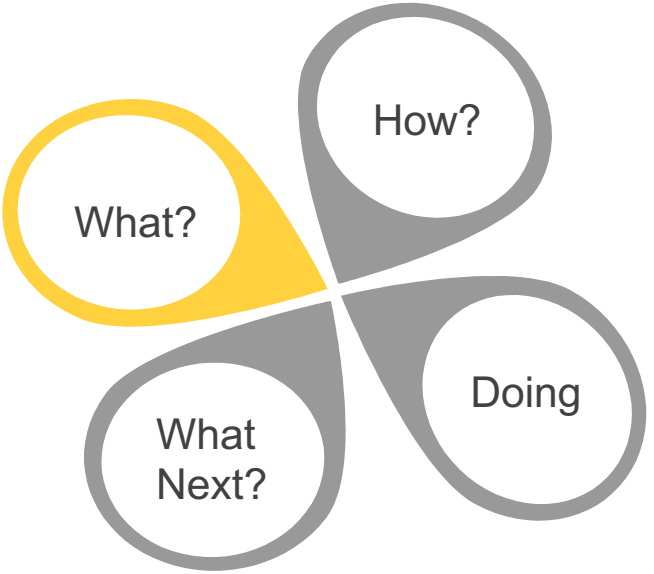


Stakeholder Selection - Scope

- Capture a comprehensive set of viewpoints within schedule and program budget constraints.
- Selection of key stakeholders with client
- Broad set of perspectives and views

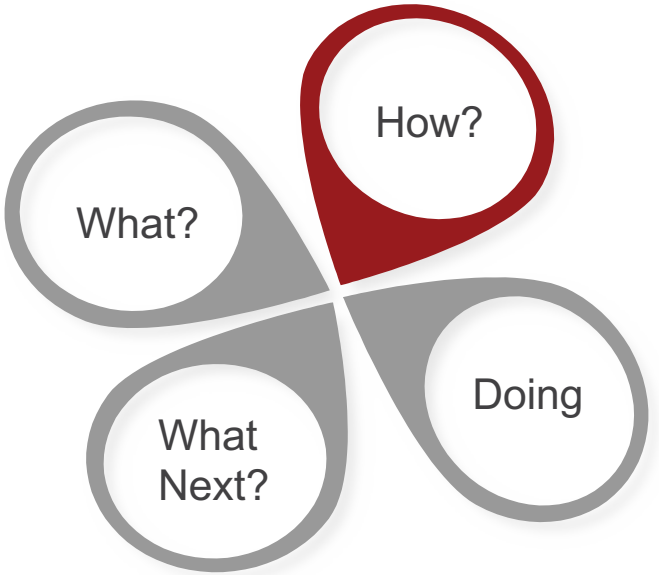
Ensuring within Time / Budget Constraints

Ensuring sufficiency of Stakeholder data set

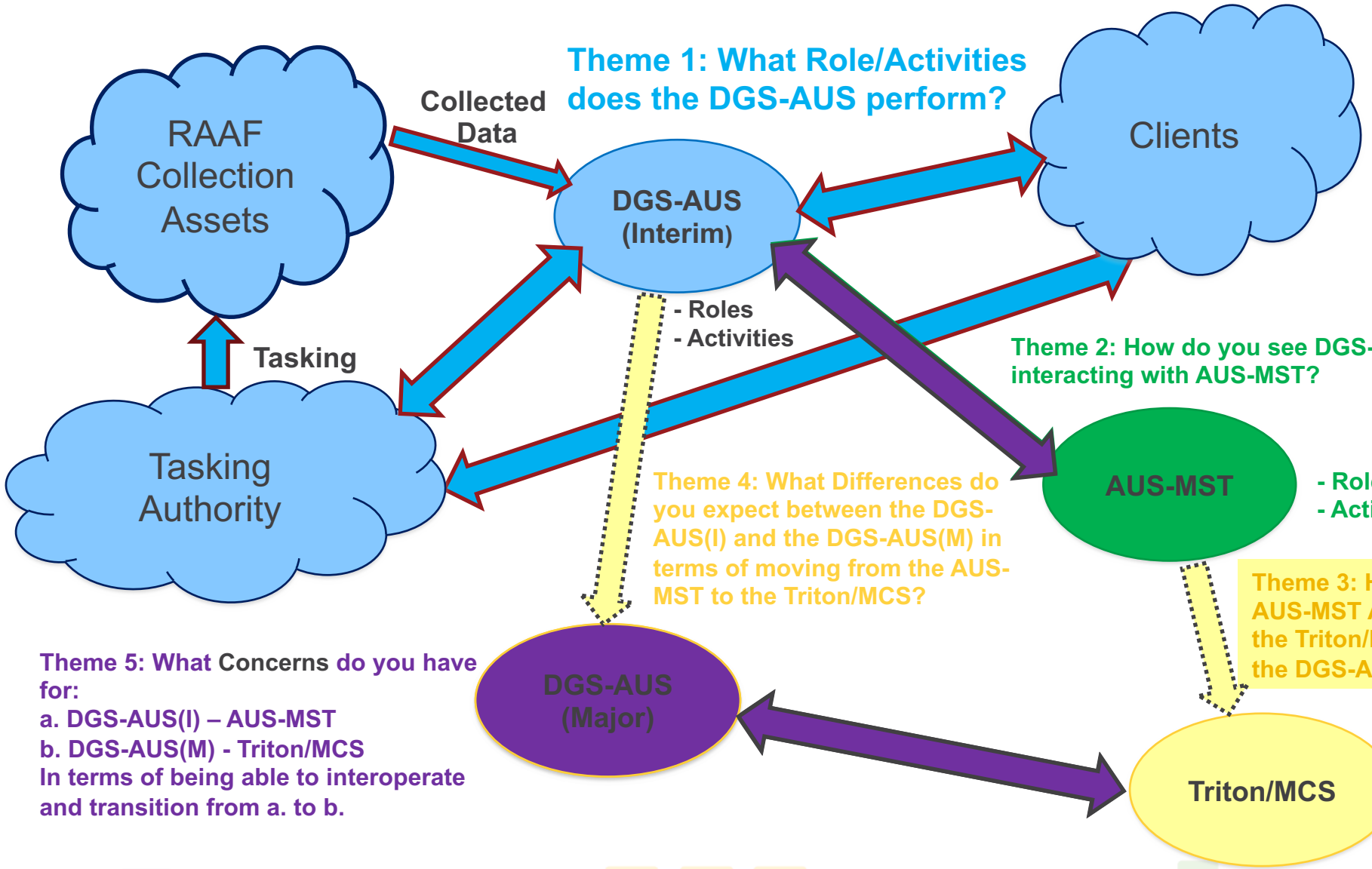


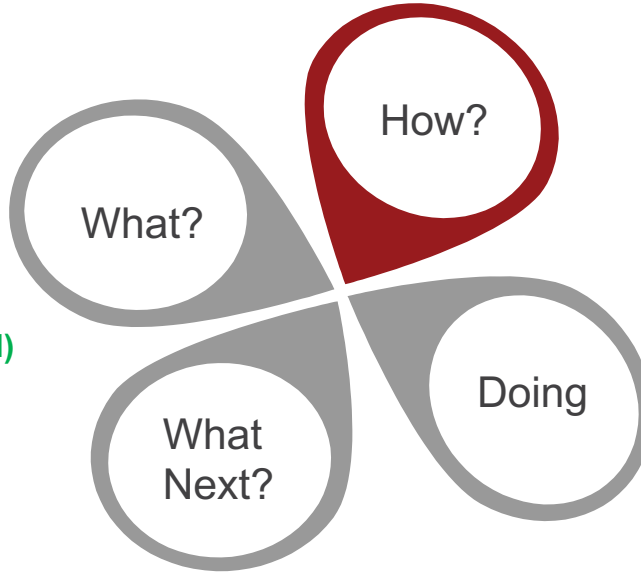
How are we going to implement the Strategy?

- Use of Enquiry Sessions
- Mix of qualitative and quantitative methods to gain insight into Concerns & Aspirations
- Use of a Thematic storyboard to focus on key themes
- Ethics considerations
- Verification
- Products (mud-maps, Concerns/Aspirations, Interview log)
- Root Cause Analysis
- Outcomes of the analysis to feed into a Stakeholder Workshop



Thematic Storyboard: DGS-AUS AUS-MST





Analysis – Partitioning & Aggregation

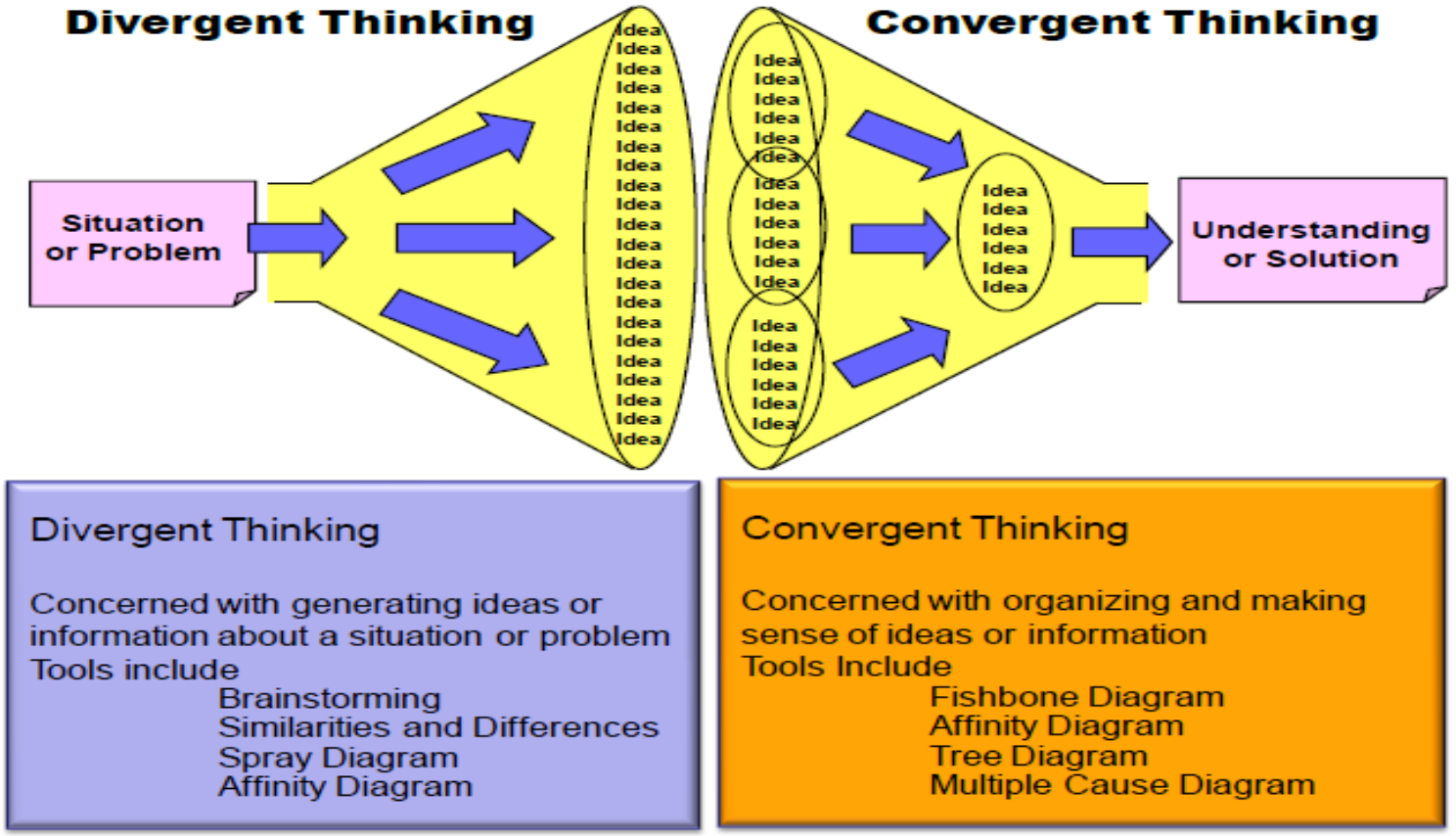
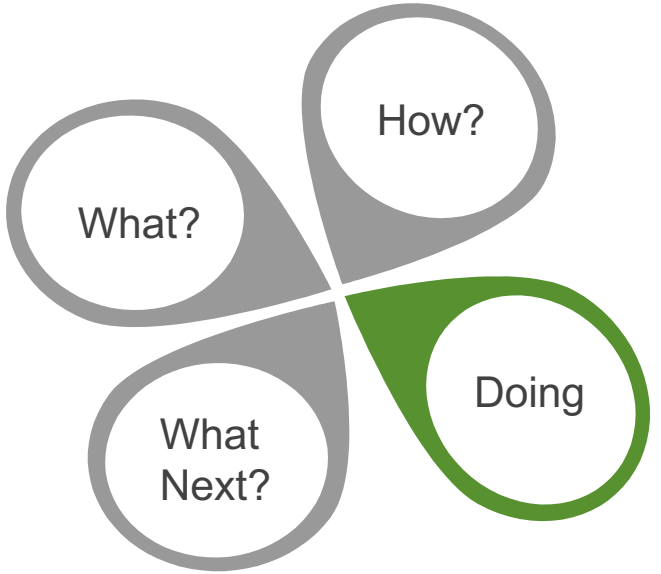


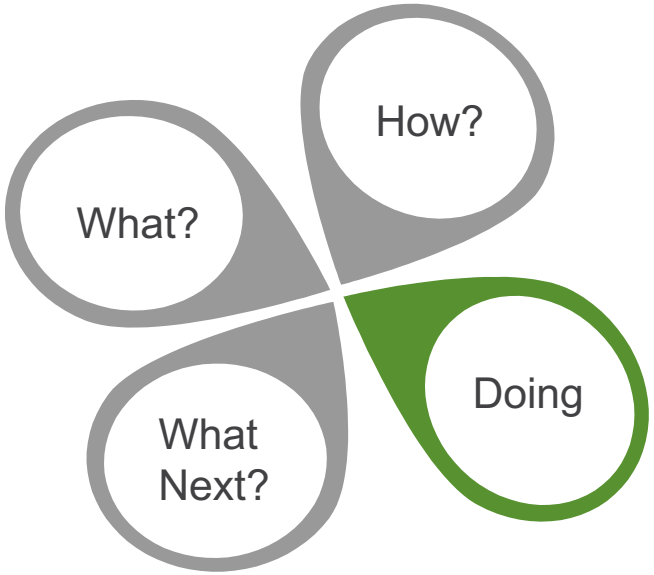
Figure 1: Affinity Diagramming fully supports Divergent and Convergent Thinking



http://www.burgehugheswalsh.co.uk/Uploaded/1/Documents/Affinity-Diagram-Tool-Draft.pdf

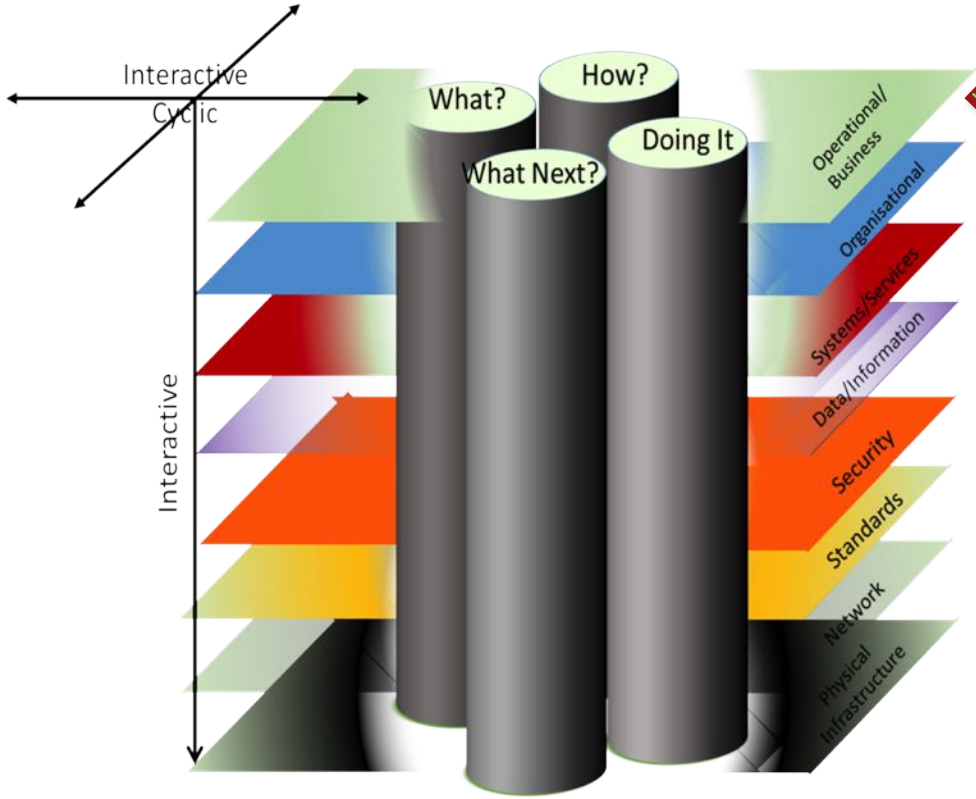
Stakeholder Workshop Driven :

- Do the Enquiry Sessions with identified stakeholders
- Undertake the Root Cause Analysis (RCA) to develop the core issues into actionable outcomes
- Capture Aspirations
- Assign Stakeholder priorities
- Completes the Doing Element for the First Iteration
- Progress to “What Next”



The Doing Element

SDDF – Transitions in Evolving Complex Capability



Example - Operational Layer Only

Case Study – DGS-AUS – AUS MST
Structuring/Framing a Complex problem

What to Do:

Definition of Problem/Structuring strategy

- Problem Typology
- Stakeholder subject list – representative set
- Methodology selection
- Verification process
- Inter-relations and Concerns capture
- Data Filtering
- Stakeholder Driven prioritisation and de-risk process

How to Do:

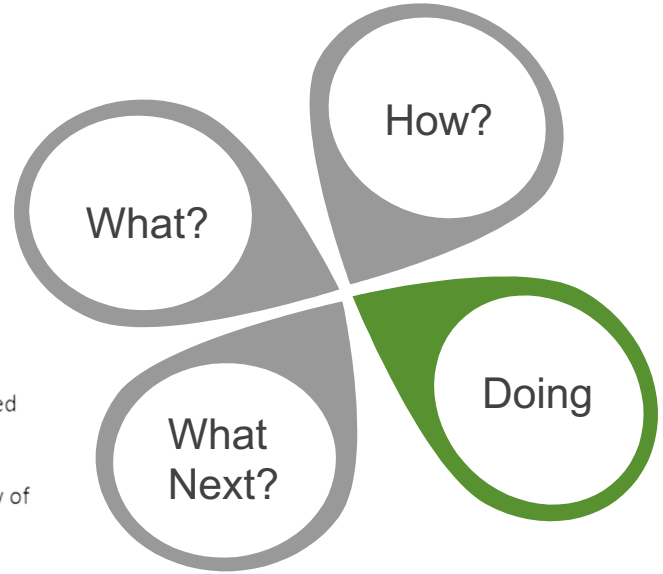
Methods

- Ethics Guidance
- Mix of methods – analytic, Structured and interpretative
- Inquiry sessions (IS) – whiteboard driven
- (IS) Method – Thematic Storyboard – use of themes to focus
- Verification – stakeholder to verify, modify before baselined
- Partitioning & Aggregation – formation of composite mud-maps, views concerns
- Root Cause Analysis (RCA) – concerns filtered to root issues
- Workshop – review outcomes, prioritise issues

Doing It:

Analysis, synthesis & assessments

- W/board Inquiry sessions
- Analysis of collected data
- Verification stakeholder review of analysed data
- RCA (range of available processes – combined subjective and Fishbone approach)
- Synthesis of Composite products – operational diagrams, core issues & correlated inter-relationships, activities, etc.
- Workshop driven stakeholder review



Outcomes from the Case Study

The SDDF allowed a deep insight in aspects of the interaction between the DGS-AUS - AUS-MST.

Main Points:

- Developed a deeper shared understanding between the various stakeholders
- Identified concerns that stakeholders were not in general aware of
- Highlighted where improved communications between groups was required
- Highlighted key activities that had not been addressed and were causing problems
- Allowed a more focused approach for the next stage – with stakeholder agreement and facilitation.

Future SDDF Activity

Further SDDF Application

- Determination of the C4ISR Enterprise Architecture for AIR7000 in a Joint Networked Environment that will Allow User Desired Behaviour

- In a nutshell – what architectures in a C4ISR Joint networked environment do we need to allow users to interact with AIR 7000 in an efficient and modern manner.

- Part 1: Baseline current P-8A – MTOC operations

Theoretical Growth of the SDDF

- Theoretical rigor of the Multi Paradigm, Multi Methodological basis and the applicability to the SDDF.
- Foundational Design Principles and Rules of Practice
- Incorporate the “WHY”
- Collaboration with Industry / Universities

Backup Slides

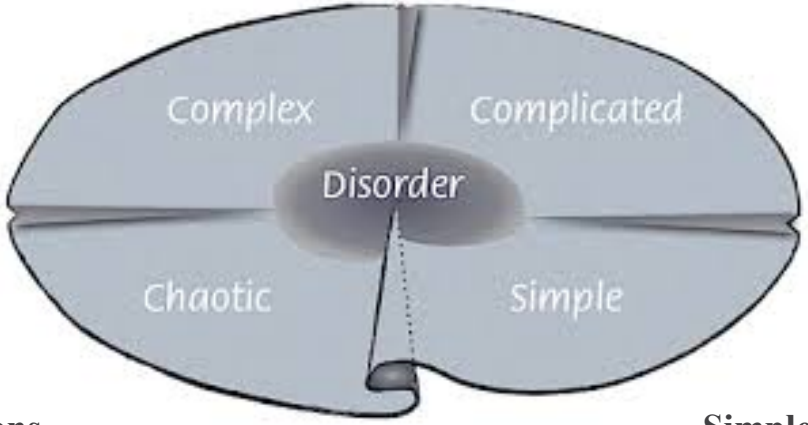
Cynefin Framework

Complex is the domain of **emergent solutions**.

Characteristics: There are unknown unknowns. You don't even know the right questions to ask.

Complicated is the domain of **good practices**.

Characteristics: You have a general idea of the known unknowns — you likely know the questions you need to answer and how to obtain the answers.



Chaotic is the domain of **novel solutions**.

Characteristics: As the name implies, this is where things get a bit crazy.

Simple is the domain of **best practices**.

Characteristics: Problems are well understood and solutions are evident.

http://www.everydaykanban.com/2013/09/29/understanding-the-cynefin-framework/

Integrated ISR – Is it that hard?

"An activity that coordinates and collectively prioritises the capability development, planning and operation of collection, processing, exploitation and dissemination resources across multiple organisational elements in direct support of current and future operations.

Integrated ISR enables timely access to relevant ISR support, actionable information and integrated intelligence products.

It incorporates common vocabularies, shared doctrine and procedures, training and collaboration amongst ISR users and producers so that information can be consistently interpreted and applied."

Knight, M., et al. (2010). Integrated Intelligence, Surveillance and Reconnaissance (ISR) Study. Australia, Defence Science Technology Group.

http://australianaviation.com.au/2018/06/australia-to-acquire-triton-maritime-surveillance-drones-for-2023-service-entry/

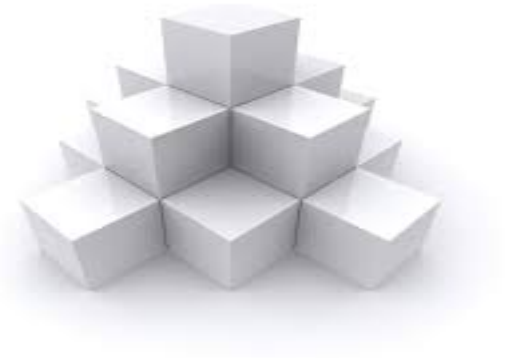
Right Information to the Right People at the Right Time

https://www.defensenews.com/naval/2018/06/29/australia-officially-announces-26b-frigate-contract-here-are-the-build-details/

https://www.bing.com/images0

Some Keys to Success in Composing Complex Capability – based on Lessons Learnt

- Identify the “Right” Problem
- Develop Trust Relationships
- Ensure Senior Management Buy-in
- Provide Multiple perspectives on Stakeholder Needs / Concerns
- Improve Stakeholder / Developer Alignment
- Improve Risk Facilitation via Satisficing
- Adaptive and Agile
- Extensibility



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