

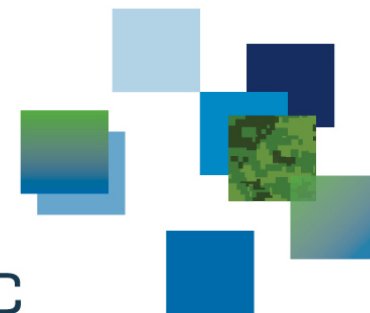


Defence Investment Prioritization

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DRDC Centre for Operational Research & Analysis

To the 13th NATO OR&A Conference



DRDC | RDDC

Challenge for NATO OR&A in a Changing Global Security Environment



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Defence Investment Prioritization

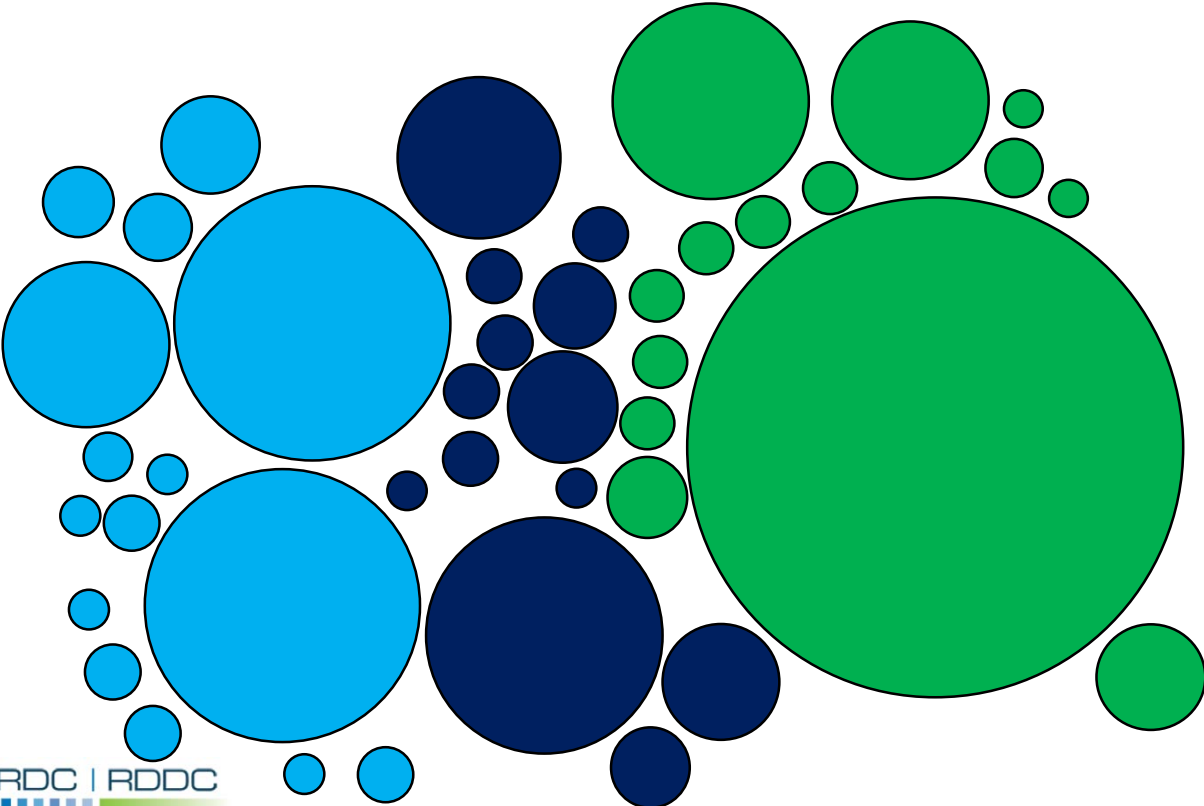
- Best practice
 - In the literature
 - In NATO &
 - In partner nations



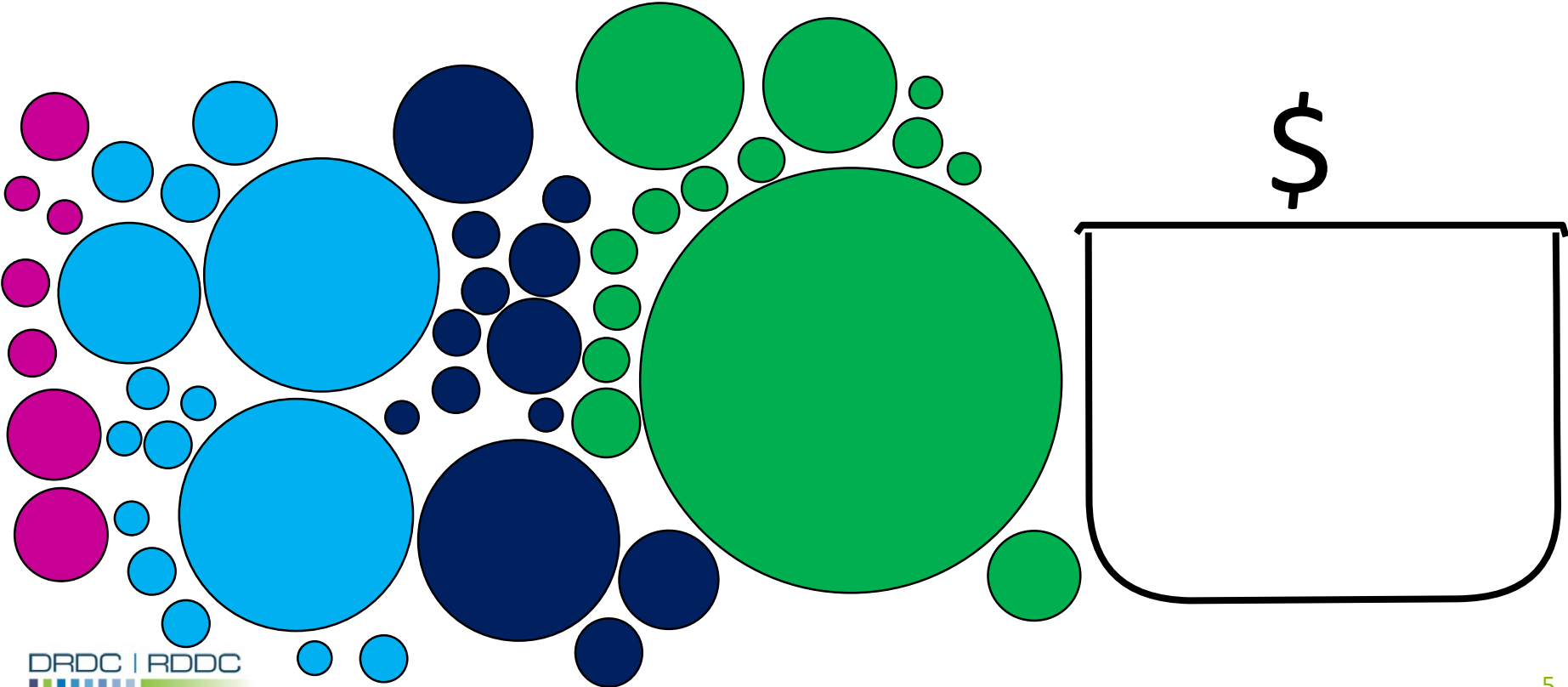
1.0 Introduction - Origins

- Work “modelling value”
- Showing how Canada optimizes investments
- NATO SAS-134 “Linking Investment & Divestment to Defence Outcomes”
 - AUS, CAN, CZE, FIN, FRA, USA

1.1 Introduction – Problem



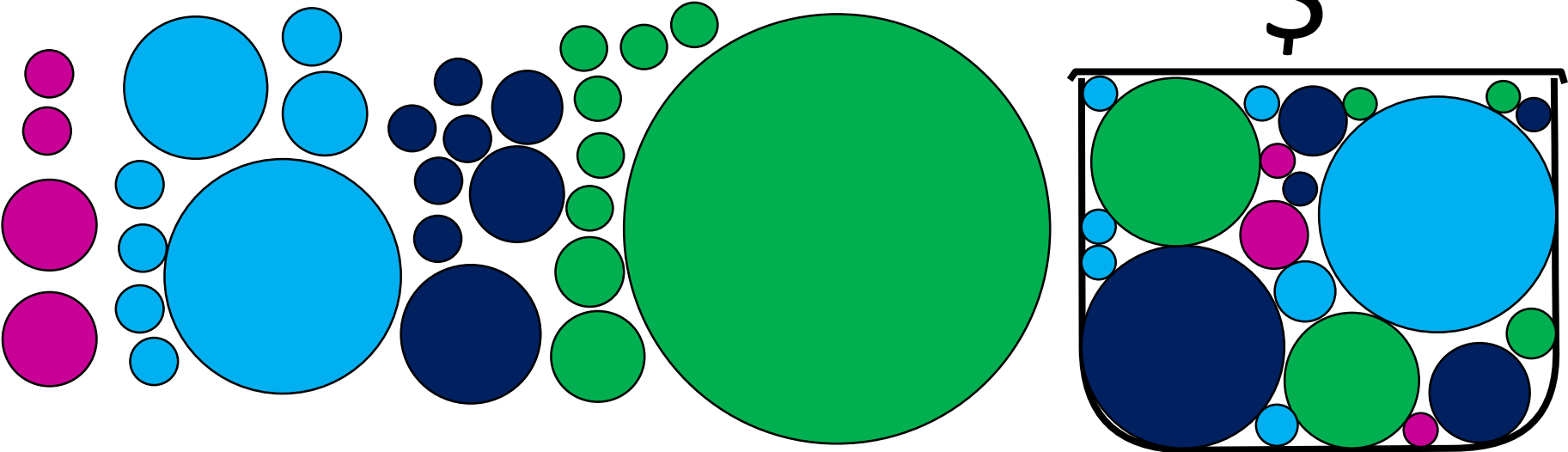
1.1 Introduction – Problem



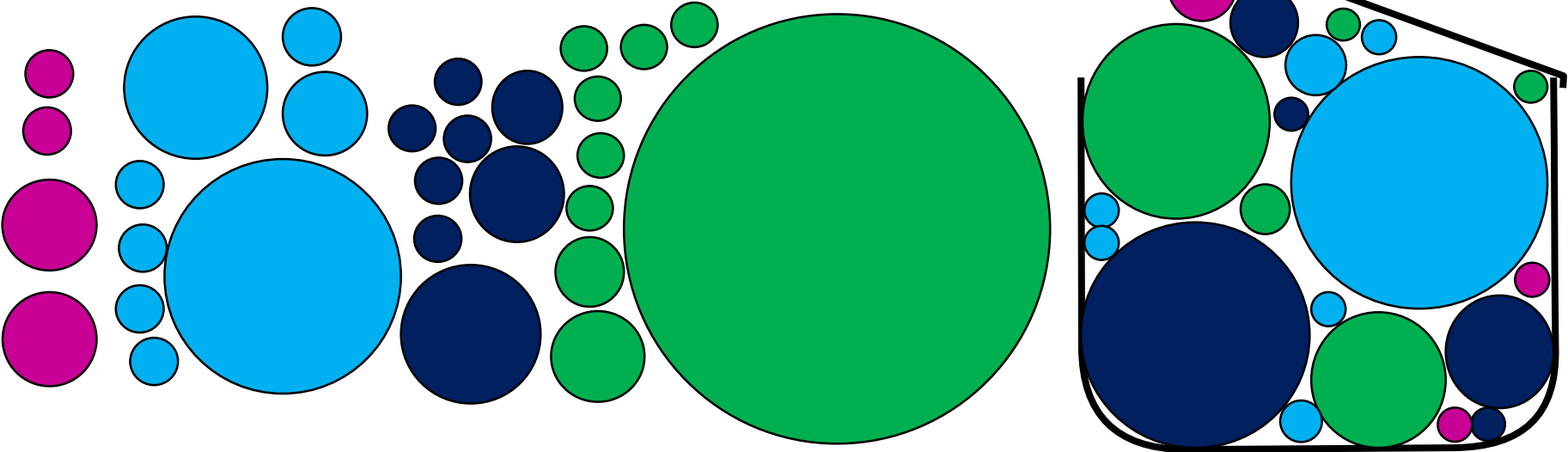
Introduction – Defence Investment Portfolio Problem



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Introduction – Defence Investment Portfolio Problem

- Assuming we know something about the future ...
 - What National Defence may need to address
 - How capabilities evolve
 - How current investments will deliver

- Assuming we have not yet confronted
 - Expected investment costs
 - Expected budget allocations

Outline

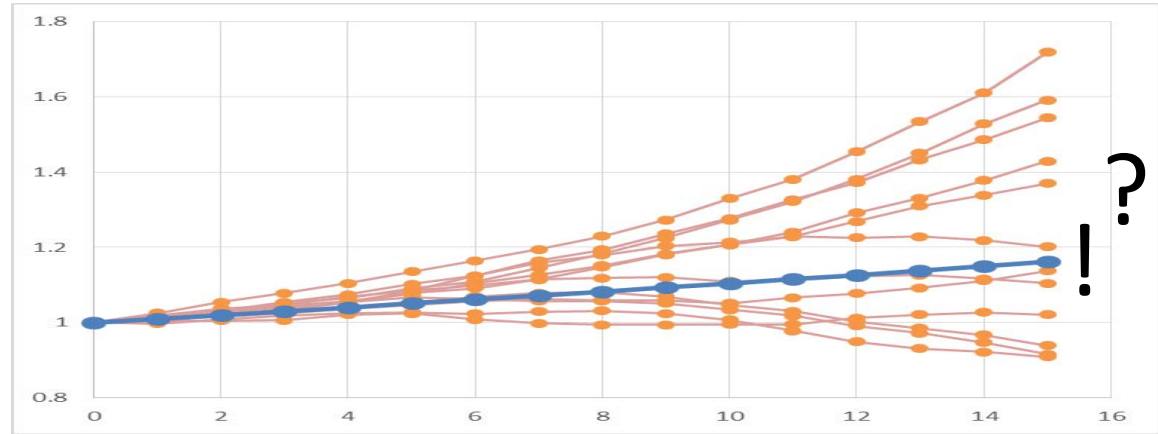
- 2.0 Types of literature
 - 2.1 Financial
 - 2.2 OR
 - 2.3 Decision Analysis
- 3.0 Best Practice: (Portfolio) Decision Analysis
 - Decision Quality
 - 3.1 Frame decision, define process
 - 3.2 Define success
 - 3.3 Identify options
 - 3.4 Measure success
 - 3.5 Translate into value
- 3.0 Best Practice (cont'd)
 - 3.6 Find total value
 - 3.7 Interactions
 - 3.8 Risk and uncertainty
- 4.0 Concluding invitation
 - How do YOU do it?

2.1 Financial

- The time value of money
 - Discount rates



- Risk is linked to return
 - Set goals for both



- Real Options
 - Buying time *while the future reveals itself*

2.2 Operational Research

- Computational strategies for classic problems
 - Given lots of data
- Optimizing portfolios of
 - Known investment costs
 - Simple benefits
 - Sequential dependencies

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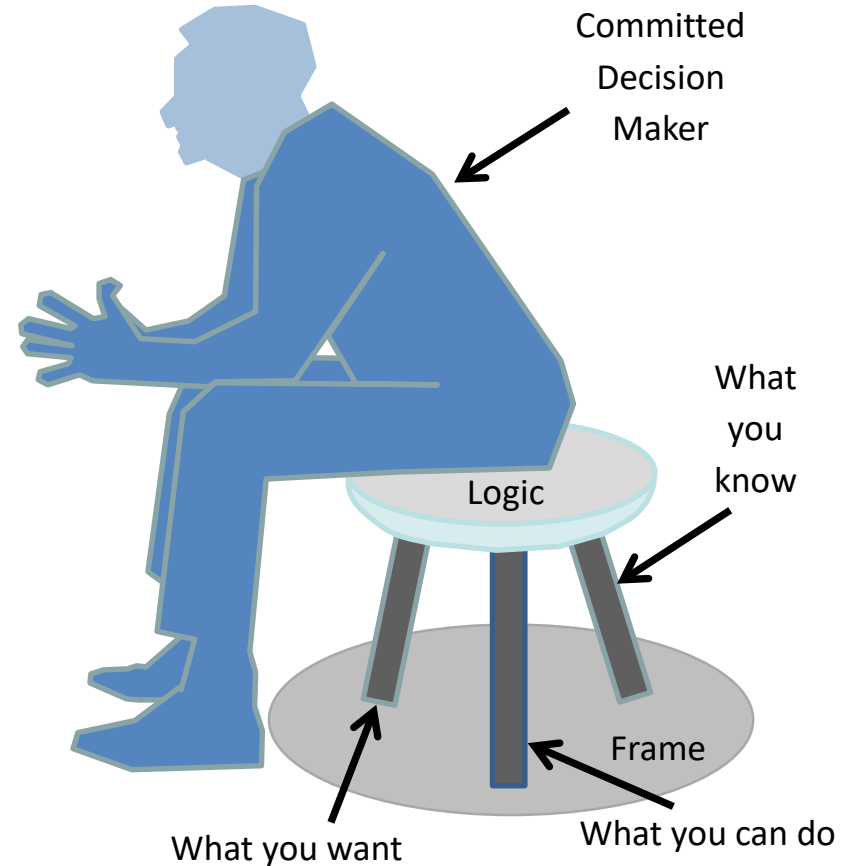
- Sequential dependencies

} Perilous if

- Decisions are strategic
- Objectives conflict
- Uncertainty abounds

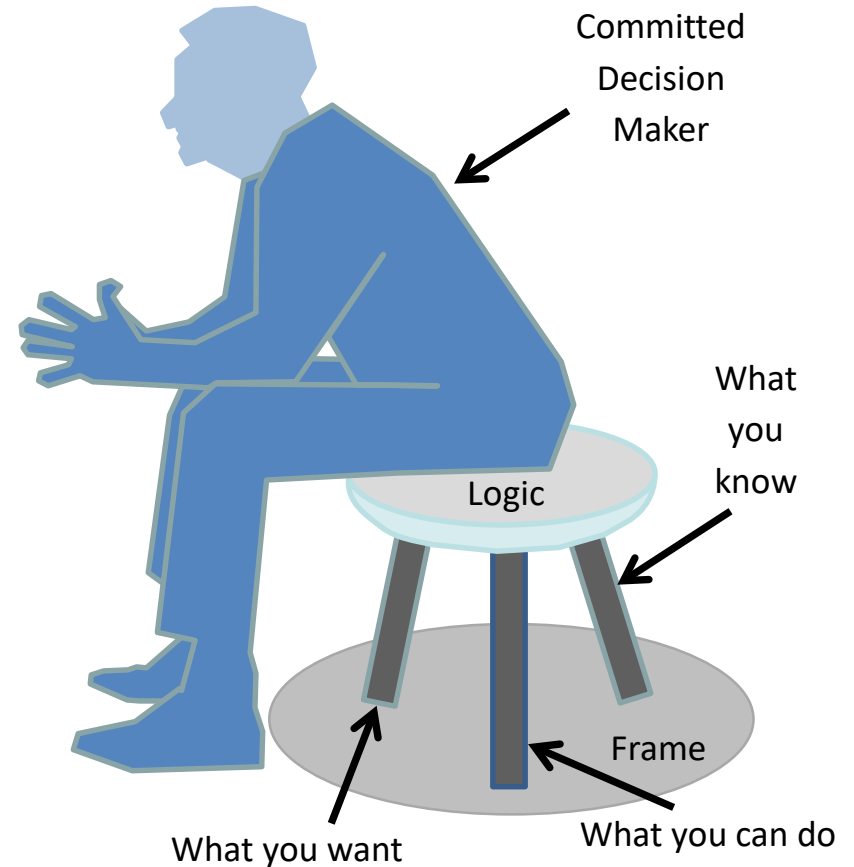
2.3 Decision Analysis

- Manage decision complexity with
 - Formal decision elements
- Most powerful
 - MAVT (outcomes certain)
 - MAUT (outcomes uncertain)
- Less powerful
 - Outranking
 - AHP
 - Non-compensatory



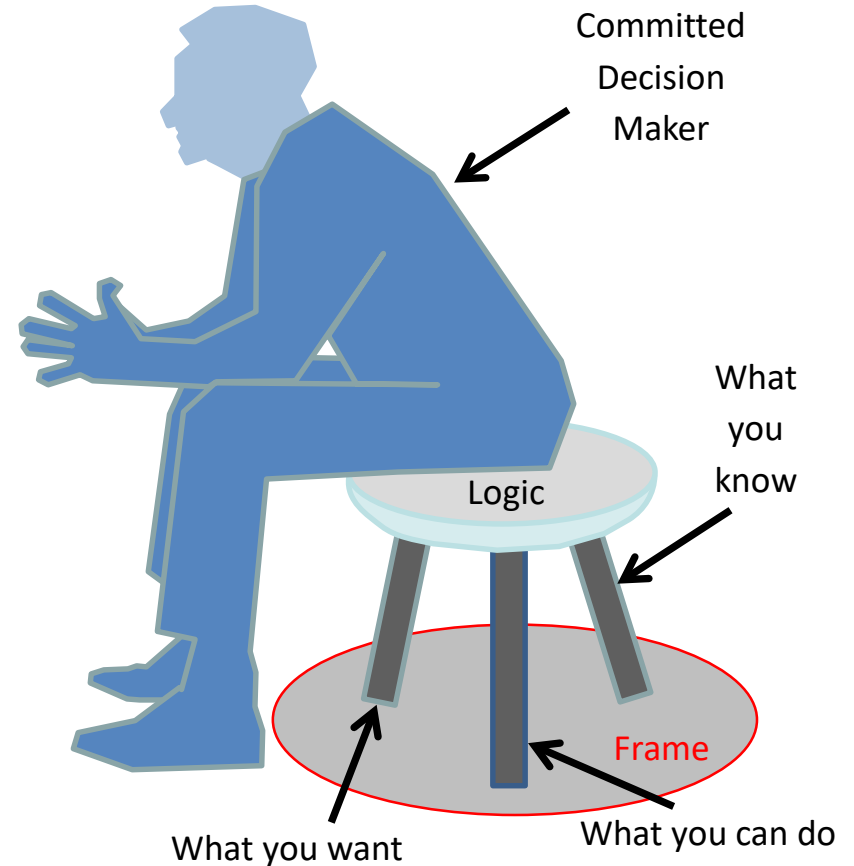
3.0 Best Practice: Portfolio Decision Analysis

- Decision quality:
 - Profitable attention to each decision dimension



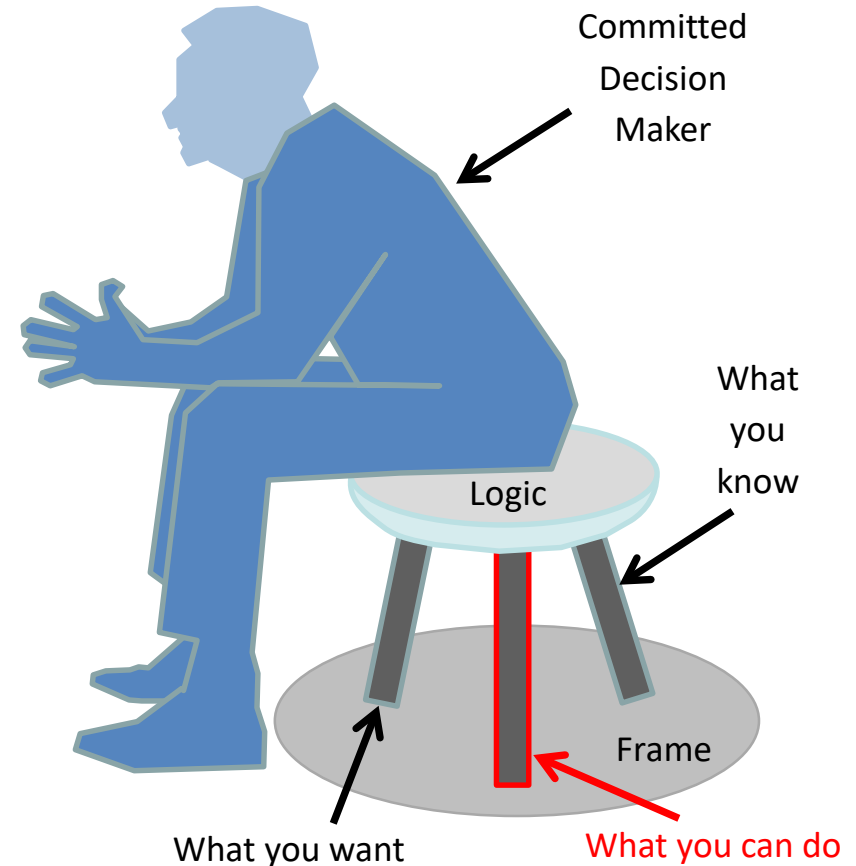
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- Including
 - Decision frame (set-up)



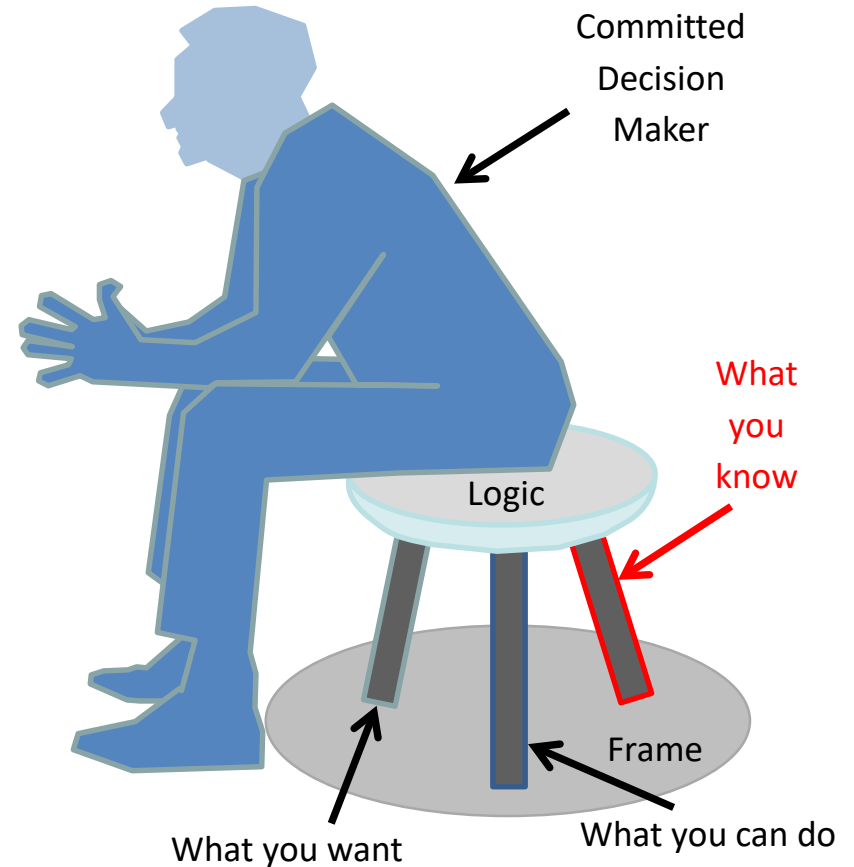
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 - **Creative, feasible alternatives**



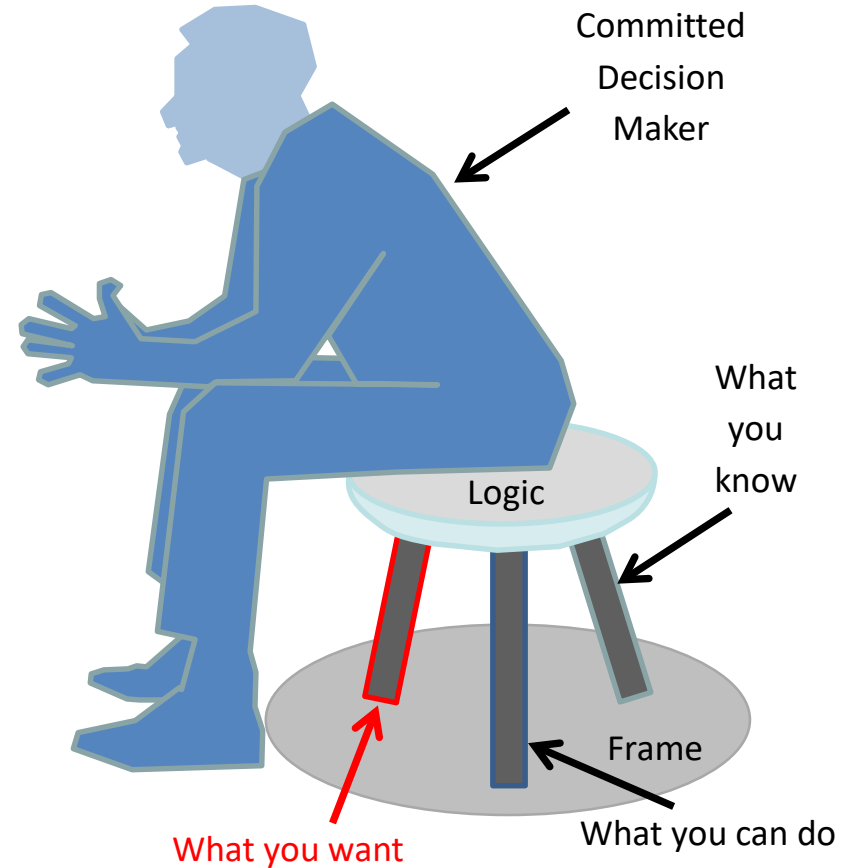
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 - **Meaningful, reliable information**



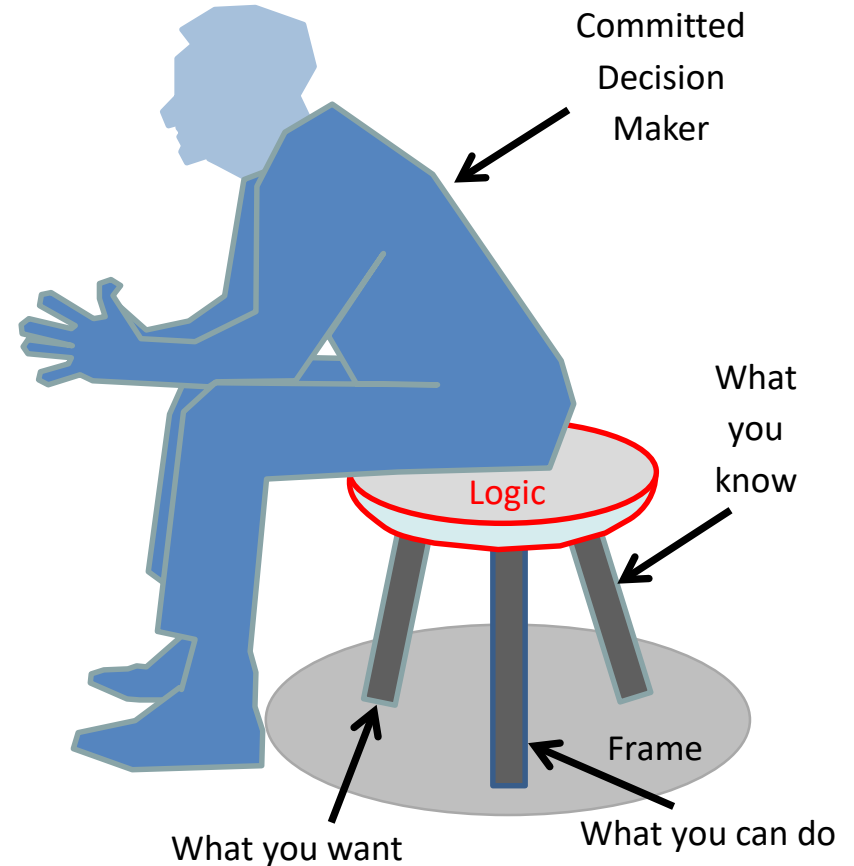
3.0 Best Practice: Portfolio Decision Analysis

- Decision quality:
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 - Creative, feasible alternatives
 - Meaningful, reliable information
 - **Clear values & trade-offs**



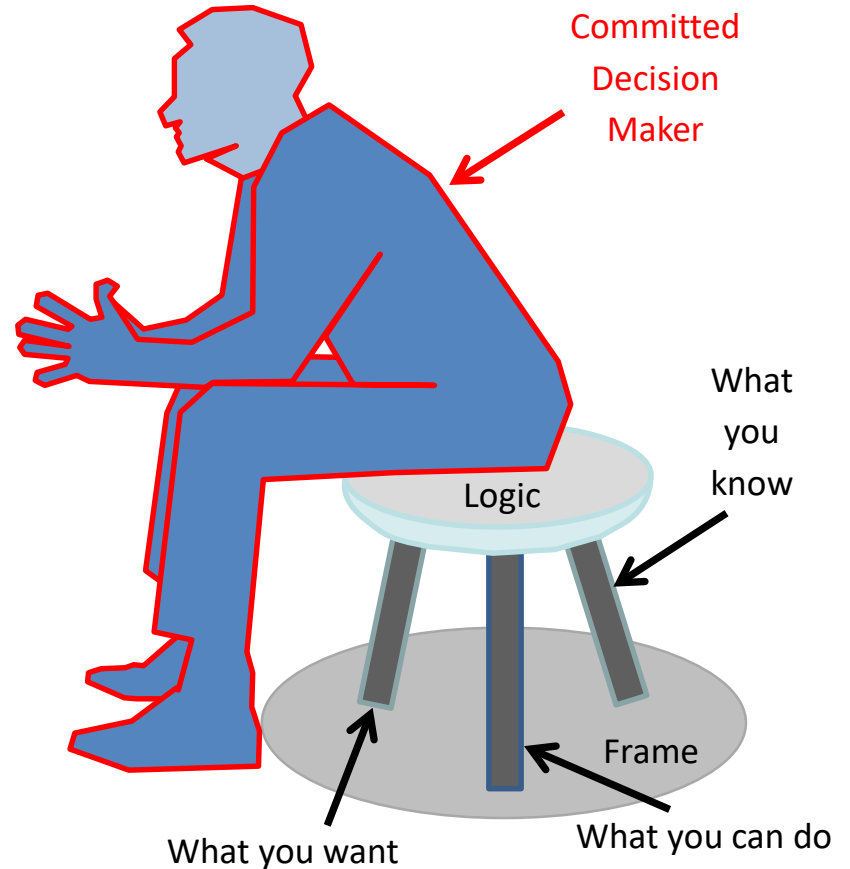
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 - **Logically correct reasoning**



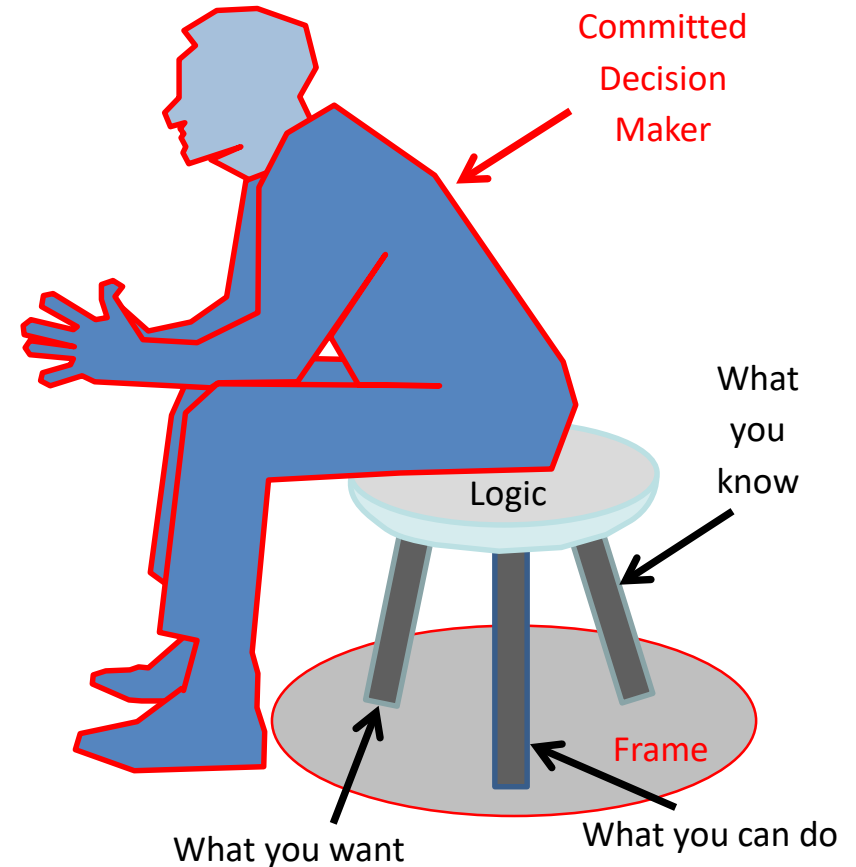
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 - Logically correct reasoning and
 - **Commitment to follow-through**



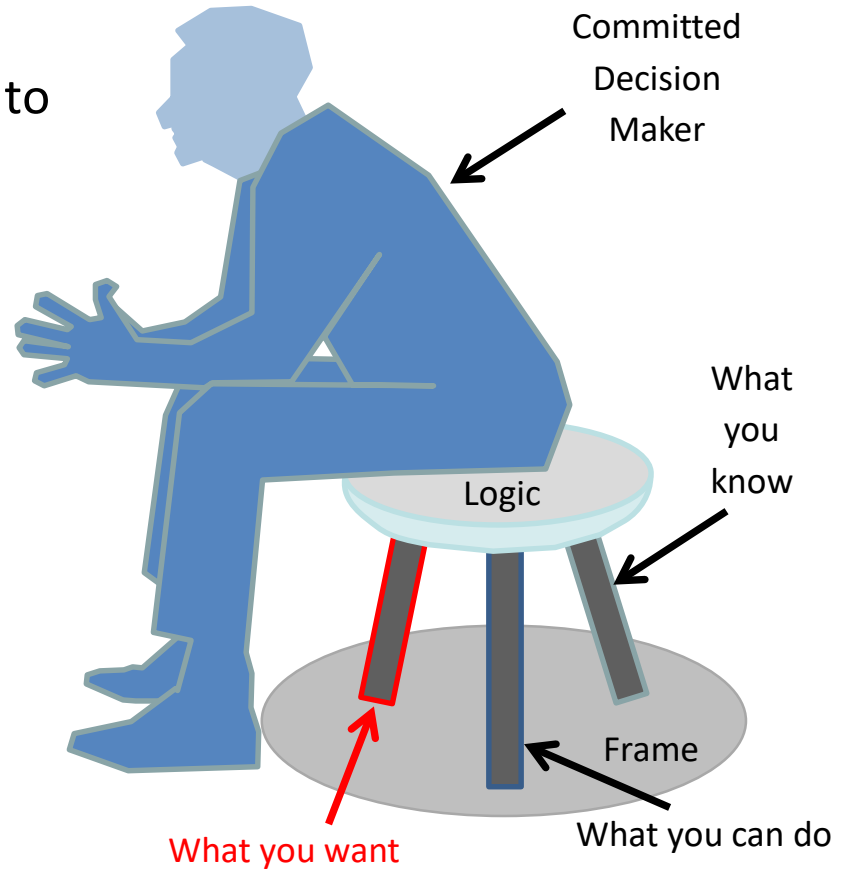
3.1 Best Practice: Frame the problem

- Specify
 - The type of portfolio
 - The problem to be solved
 - The key stakeholders
 - Decision process
 - In-house Decision Analysis
 - Decision & Analysis teams
 - Decision Conferencing
 - Facilitated development of decision criteria & analysis



3.2 Best Practice: Define Portfolio Success

- Develop a structure of objectives using
 - Fundamental Objectives break-down to
 - Sub-objectives supported by
 - Means objectives
- Objectives should be
 - Operational
 - Comprehensive in aggregate
 - Non-redundant
 - Decomposable, and
 - As few as necessary



3.3 Best Practice: Identify, characterize investment options

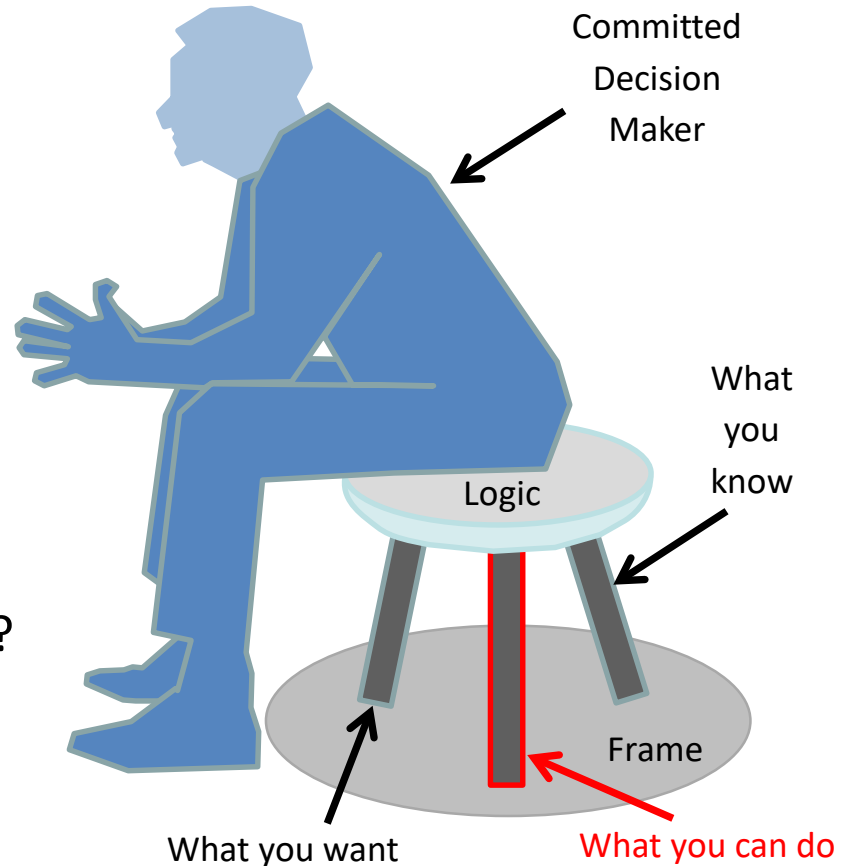
Collect all developing investment options

- A single ND-wide project database: easy
- Multiple different project databases:
 - Maybe, with care, time & luck

With matured Fundamental Objectives

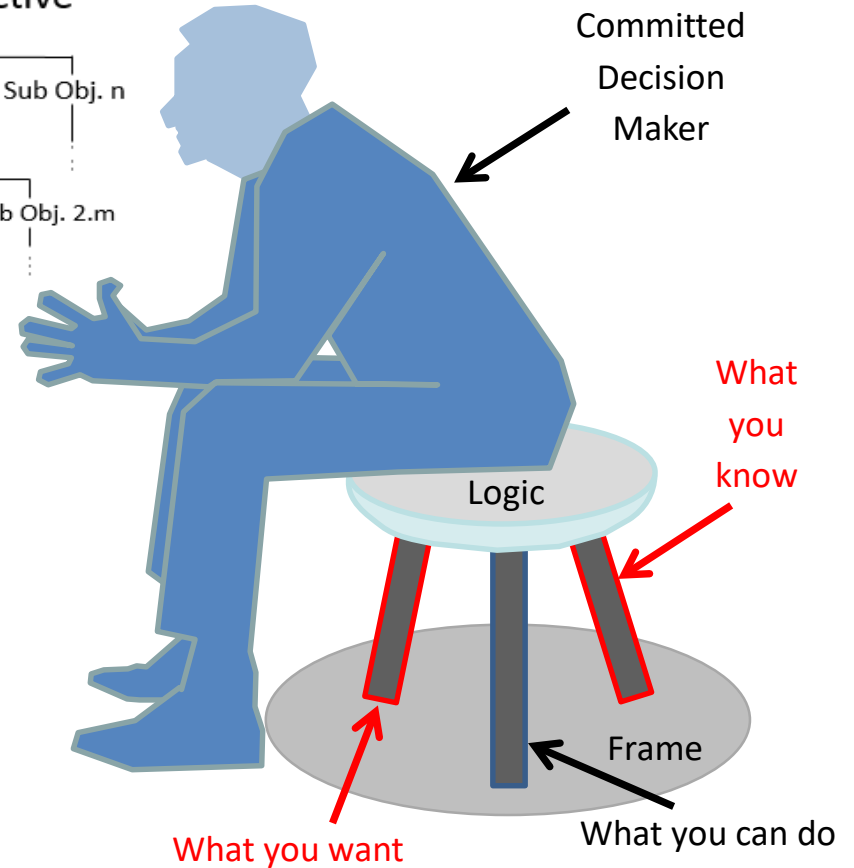
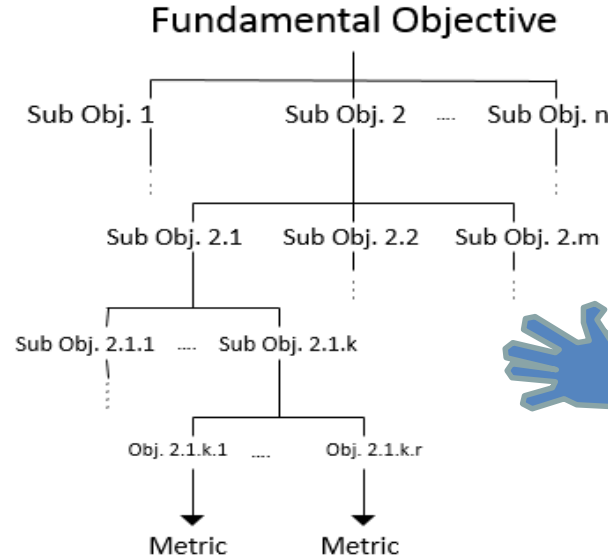
- “What investments are suggested by
 - Each Fundamental Objective?
 - Each pair of Fundamental Objectives?

→ Uncover overlooked options



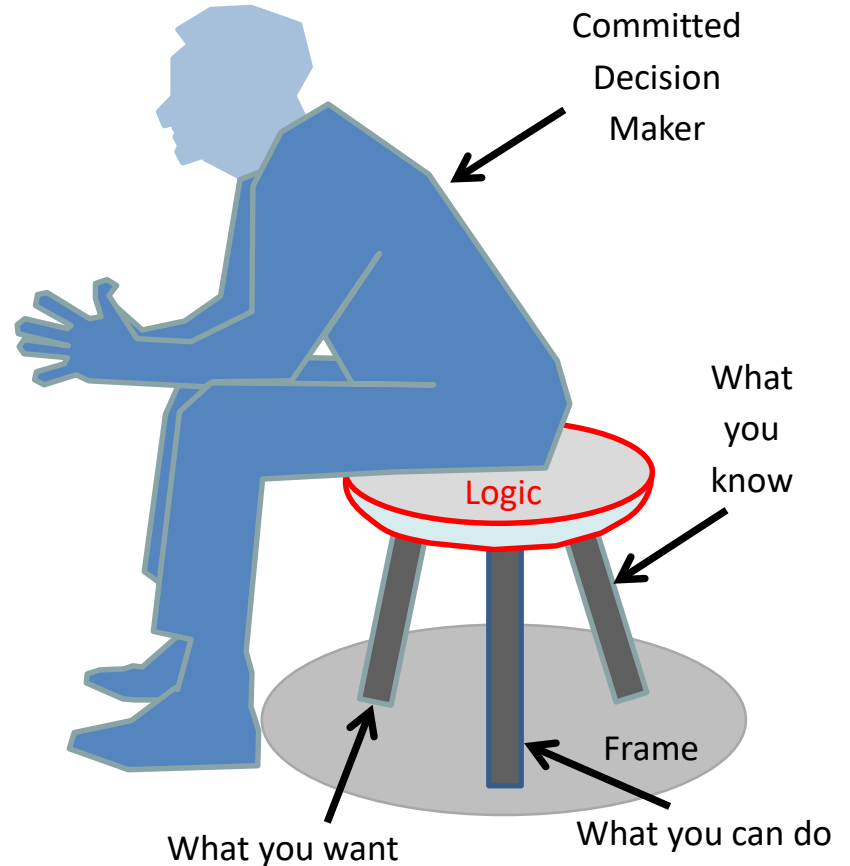
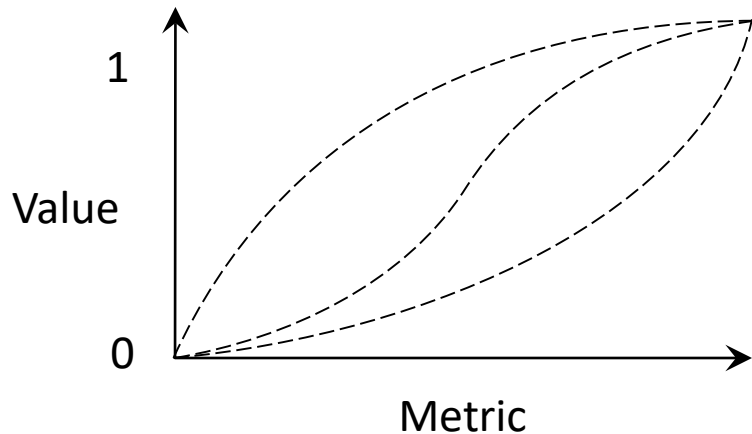
3.4 Best Practice: Measure success against objectives

- Quantify attainment with metrics
 - Anchored to sub-objectives
 - Either
 - Natural
 - Proxy or
 - Constructed



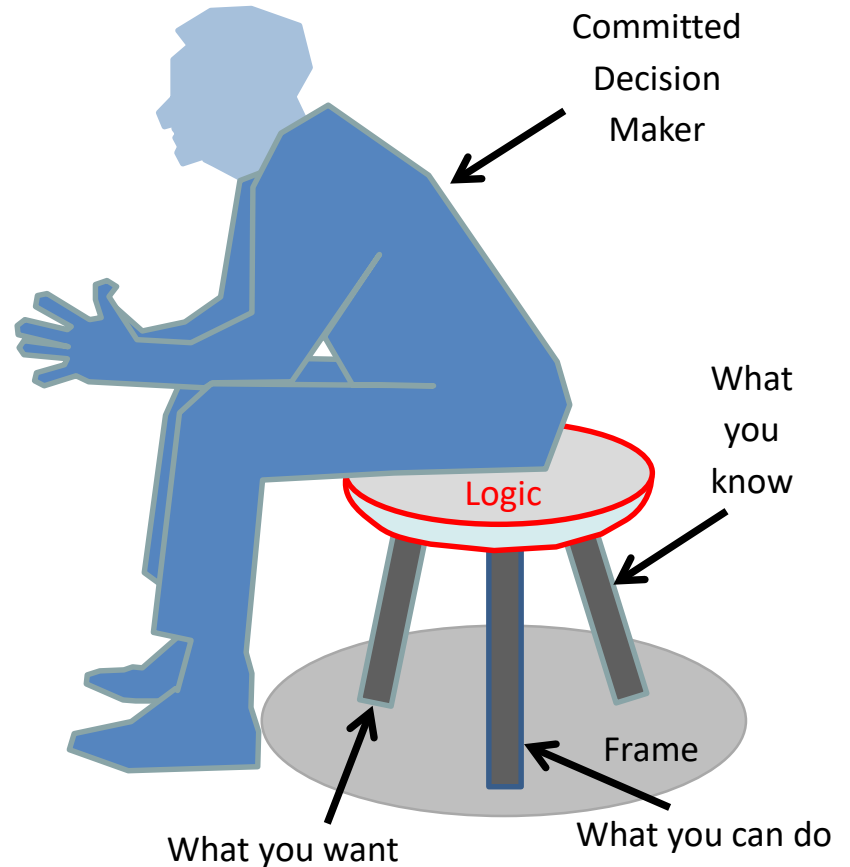
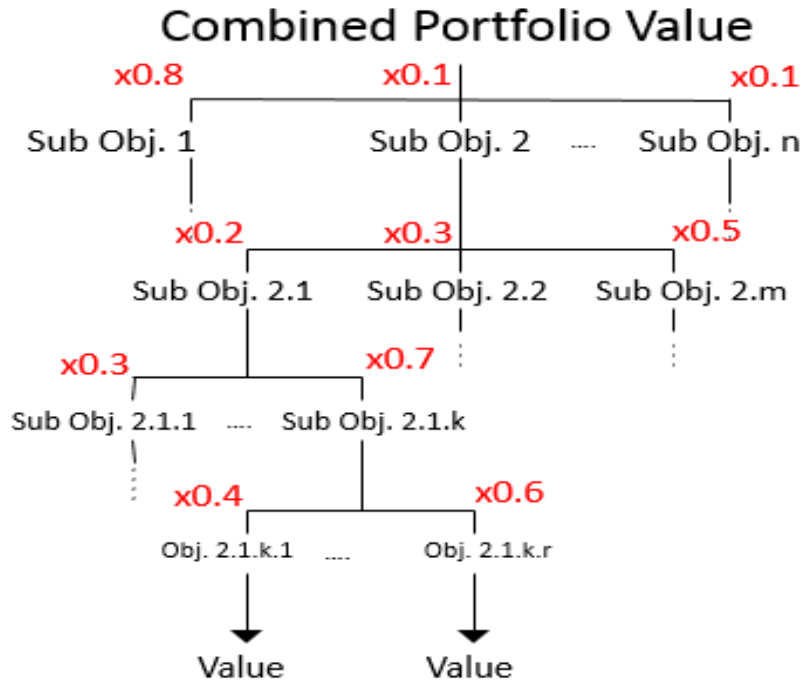
3.5 Best Practice: Translate metric scores into value types

- Identify types of value that
 - Metrics reflect
 - Stakeholders recognize
- Elicit how value accrues with metric



3.6 Best Practice: Combine value types with Swing Weights

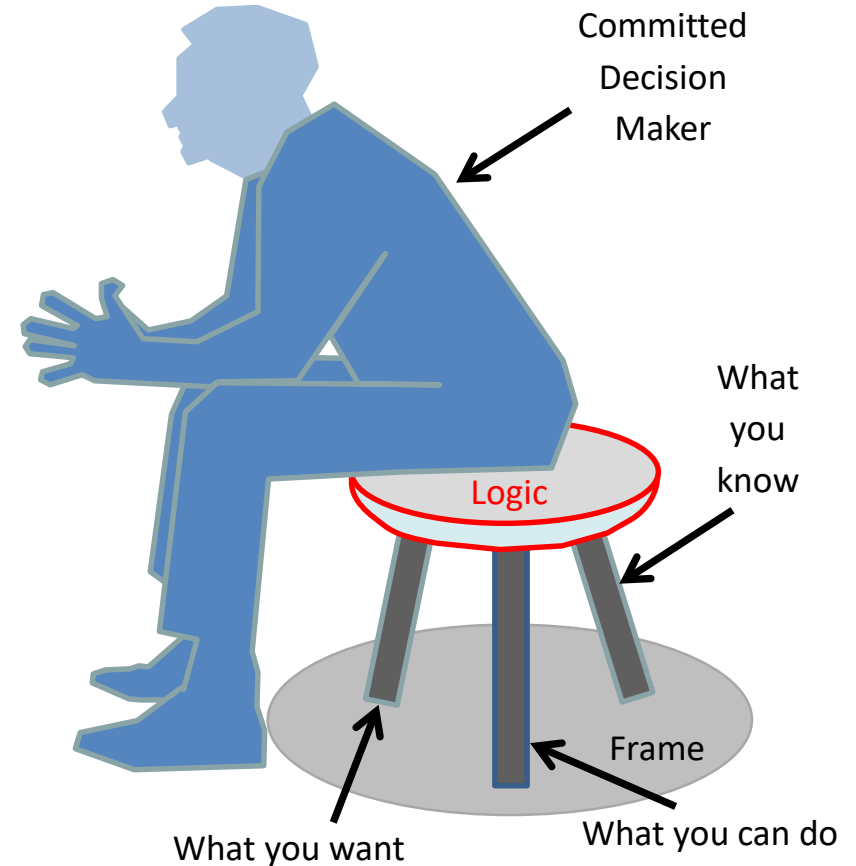
- Pose trade-offs to elicit relative importance of different types of value



3.7 Best Practice: Account for investment interactions

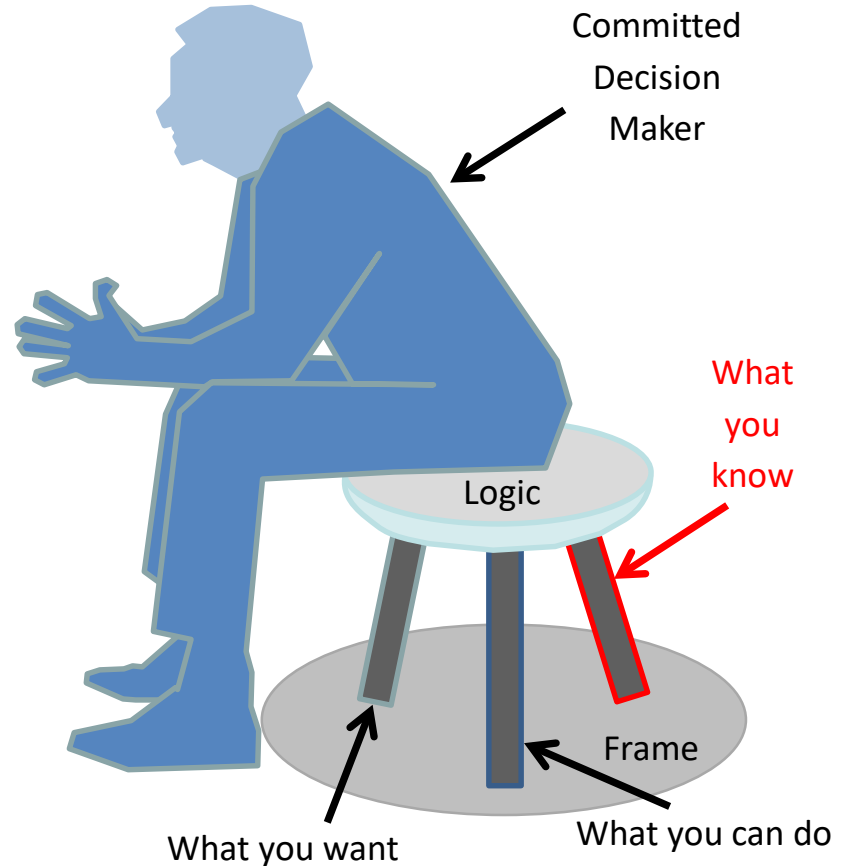
- Dependency
 - Sequence
 - Value
 - Partially substitutable
 - Synergistic

	New Option 1	New Option 2	New Option 3	New Option 4
Option 1	X	X		X
Option 2	X		X	X
Option 3		X	X	X



3.8 Best Practice: Assess risk and uncertainty

- Develop risk metrics
 - Threshold value
 - Metric, Cost, Schedule or Budget
 - Probability of exceeding



4.0 Conclusion: Literature vs National Practice

- SAS-134 asks:
 - How do *you* prioritize *your* defence investments?

- Do you
 - Make decisions on defence investment priority?
 - Support decisions on defence investment priority with analysis?
 - Work with someone who ... ?
 - Know someone who ... ?

- Please speak with me after my talk.

Questions





Defence Research and
Development Canada

Recherche et développement
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