Evaluation and Innovation:
Why improvements to dealing with uncertainty and risk in evaluation are a key enabler of public sector innovation

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The shape and texture of the new Commonwealth-ANU strategic relationship – to this (the Enhancing Public Policy Initiative)

Australian National Institute for Public Policy (see Note)

Formalising and explicitly funding the interface mechanisms

APS

ANU

National Security College

Australian Centre for China in the World

Sir Roland Wilson scholarships

Note: ANIPP includes a course delivery function, as well as the HC Coombs Policy Forum together with an enhanced Crawford School and ANZSOG presence in Canberra
Framing the generic challenges

My topic today aligns well with this framework
Current portfolio of Coombs projects

Visioning Australia’s future
- Future of the national balance sheet
- Increasing participation
- Regional disparities

Advancing the methods used in the National Energy Security Assessment

Re-designing Natural Resource Management architectures

Pilot joint-venture with ABC24

Visualising complex policy challenges
Some background on what influenced my own thinking

- UK work on advanced cost modeling for defence aircraft design and production
  - it’s all about investment under uncertainty
  - financial economics and engineering are “risk-driven” pursuits that are pretty good at handling that challenge
- Exposure to UK Govt. thinking on managing risk and uncertainty
- “Safeguarding Australia” expert sub-committee of NCRIS
  - the importance of “preparedness” as a general outcome from public support for science and innovation
- Exposure to how oil and gas companies assess the value of natural resources
- Several evaluations in which risk-aware approaches were both appropriate and well-received
- Some troubling encounters with “risk-averse” implementations of output-outcome budgeting
A heads-up on my key message

• The public sector innovation (PSI) narrative risks being ‘over-sold’ within OECD governments because….

• effective PSI is facilitated by developing a clearer appetite for risk and appropriate investment risk management tools

• but even these won’t help much given governments’ key role in managing the uncertainties that markets can’t cope with

• coupled with transparency and accountability guidelines that are risk-averse

• IF WE ARE SERIOUS ABOUT DOING PUBLIC SECTOR INNOVATION WE NEED TO GET MUCH BETTER AT BUILDING UNCERTAINTY AND RISK-AWARE APPRAISAL AND EVALUATION METHODS
The core of the challenge

1. The more realistic and uncertainty/risk aware the appraisal and evaluation methodology - the easier it is to fudge and rely on highly subjective opinion

2. Government is the uncertainty and risk manager of last resort

3. Negative unintended consequences require ‘fit for purpose’ aversion to uncertainty and risk

These are complex issues to address – I will explore by focusing on government support for private sector innovation and business competitiveness
Risk-aware and risk-averse government

• Paradox: if we have governments to handle the uncertainties and risks that markets can’t cope with then why do governments put into place such risk-averse practices and procedures?

• Consider:
  – Reactions to probity and transparency aims
  – How output-outcome budgeting has been implemented
  – Experience with fostering creativity and innovation within government

• Tendency for governments to treat risk as a problem rather than an opportunity (as it is the private sector)

• If risk is seen as something to be eliminated in operations then it is hard to articulate good public policy formulation and delivery

• Problem exacerbated by the influx of risk-averse private sector accounting methods and expertise into the public sector
Real survey results on a business support programme: demonstrates a subjectively assessed benefit – but how robust is this?

An issue that has dogged some national intelligence agencies told to comply with output-outcome budgeting
Learning cycles are critical: hence the architecture of the ANAO decision support framework

AN ATTEMPT TO FOSTER A GREATER APPETITE FOR RISK WITHIN THE APS VIA THE ANAO

4.1 Understand the need, problem or opportunity
4.2 Think outside the current paradigm
4.3 Assess the options to develop effective solutions

7.1 Reconsider aspirations and objectives
7.2 Build on experience and success
7.3 Prepare for the next development cycle

SPEED MATTERS:
CRISIS DRIVEN INNOVATION REQUIRES ACTION TOWARDS THE CENTRE OF THE DIAGRAM
The risk-averse implementation output-outcome budgeting

- Derived from post-WW2 corporate methods
  - from Ford Motor Co into the Kennedy Administration then on to the World Bank etc
- Easily aligns with “accounting” perspectives
  - uncomfortable with ambiguity “there is one verifiable answer”
- Has tended to distort how departments and agencies agree to how their performance will be measured
- Deflected attention toward the commercial outcomes from innovation and away from uncertainty & risk management outcomes?
The neo-classical economic mind-set within governments can distort how we approach innovation

• Problems arise when central economic ministries frame policy issues in relation to “degraded” perfect information rather than overcoming substantive uncertainty/sheer ignorance

• Many aspects of creativity and innovation seek to translate ignorance into risk and then to obtain more compelling risk profiles
  – Reflects a basic preference for quantifiable risk over ignorance

• Markets should be viewed as inherently creative & exploratory processes (not reified as “things”)

• We look to governments to fund work that specifies the risks that markets can handle (up to limits)
Some implications

• Creativity and innovation in government can be viewed as exploratory processes for translating ignorance into risk
  – Risk is tractable but ignorance is not: risk will always be preferred to ignorance!
  – Translating ignorance into risk is core concern for government
• Similarly, much of what governments fund to be done externally is concerned with translating ignorance into risk
  – E.g. Public science as a whole!
• If markets are inherently creative & exploratory processes then intervention rationales can differ from those in the neo-classical mind-set
• The fallacy that you need the profit motive as the incentive to innovate is made clear
Increased Net Present Value (NPV) of designs that push the performance envelope

Lower discount rate in investment appraisal and/or lower modelled risks to cash flows

Lower Weighted Average Cost of Capital (WACC)

Decreased investment risks associated with adopting technologies that push the performance envelope

Lower risk premiums attached to the Cost Debt Finance and the Required Rate of Return on Equity

Lower Weighted Average Cost of Capital (WACC)

Increased Net Present Value (NPV) of designs that push the performance envelope

Challenges for basic research

Challenges for applied research

Advances in the practical application of theory

Advances in the coupling of theory and practical application via experimental development

Testing of advances in coupling theory and practical application via experimental development

Testing of advances and scale-up solutions via technology demonstrators

Advances in underpinning theory

Generation of data on real-world versus modelled performance and identification of failings in theory and simulation model designs

Increased ‘learning-by-doing’ and de-bugging of real-world designs that push the performance envelope

Commercialisation/Investment Preparedness

Securing intellectual property rights over:

- Data demonstrating proof of design concept and principles
- Associated formal models and algorithms
- Associated trade secrets and know-how

Identification of investment risk comparators

Due Diligence etc

Due Diligence etc

Financial domain

Legal domain

R&D domain

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Using the expected value (EV) equation to think about the dynamics of the innovation process

\[ EV = P_S \times NPV_S - P_F \times NPV_F \]

Where:
- \( P_S \) = Probability of Success
- \( P_F \) = Probability of Failure
- \( (1 - P_S) \)
- \( NPV_S \) = Net Present Value of Success
- \( NPV_F \) = Net Present Value of Failure

- A useful means of easily factoring risk into investment decisions
- Demonstrates the impact of changes in \( P_S \) and the net cost of achieving this
- More complex methods exist that expand upon these principles
Illustration: driving down $P_f$

Note:

- the important dip in EV
- Especially the fact that EV can get worse before it gets better
- VC’s and other investors tend to get involved when EV is positive and increasing
The Australian National Institute for Public Policy and the HC Coombs Policy Forum receive Australian Government funding under the Enhancing Public Policy Initiative.
“We want a lower beta”

- The corporate sector calculates the required rate of return necessary to compensate an investor for the risks faced relative to generally prevailing market risks using the coefficient ‘β’ in what is known as the Capital Asset Pricing Model (CAPM):

\[ K_d = R_f + \beta [R_m - R_f] \]

Where
- \( K_d \) = required rate of return from the investment (i.e. the cost of debt)
- \( R_f \) = the risk free rate of return (usually the 10 year govt. bond rate)
- \( \beta \) = the measure of specific project risks relative to general market risks
- \( R_m \) = the expected rate of return prevailing in the market as a whole

- Sophisticated companies seek a lower beta for portfolios of technology ‘options’
- A lower beta is itself a useful outcome from cooperative/collaborative research
- Major impact on the cost of debt and hence the NPV of debt financed investments
- Highlights the importance of whether the commercialisation process is debt financed or equity financed (or how both are mixed)
- DOES NOT ALIGN WITH THE ‘WELL DEFINED PATH THE COMMERCIALISATION’ ETHOS IN CURRENT GOVERNMENT SUPPORT FOR INNOVATION
Stage-Gate methods

“A good R&D manager is defined by the number of projects they cull in the innovation process”

The better the Stage-Gate method the greater the ability to generate a wide range of potentially useful options (with a low risk of ‘lock-in’)

Using Stage-Gate methods allows for rapid response, flexibility and resource optimisation in a risk-aware manner
To summarise

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Private sector</th>
<th>Public sector</th>
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<tbody>
<tr>
<td>Appetite for risk</td>
<td>Unusually high profits made from operating in the outlier regions of the risk-reward relationship</td>
<td>Transparency and accountability limit outlier operation (unless a crisis response)</td>
</tr>
<tr>
<td>Treatment of risk</td>
<td>Quantified and managed explicitly in financial terms – “risk is good”</td>
<td>Avoided where possible and managed as such – “risk is bad”</td>
</tr>
<tr>
<td>Opportunity costs of not innovating</td>
<td>Upside dominated (make history and don’t get left behind the competition)</td>
<td>Downside dominated (avoiding damage that is likely to happen)</td>
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**IS THE LESSON THAT THE PUBLIC SECTOR NEEDS A MORE EXPLICIT AND FORMAL APPROACH TO INVESTMENT RISK MANAGEMENT IN PSI?**
Contingent and “risk-aware” approaches

• Real options methods now starting to be used in evaluations of S&I funding (e.g. CSIRO)
• Conceptually appealing and supports growing recognition of the importance of preparedness as a research outcome
• The challenges to using real options methods have already been encountered in the private sector
  – The findings can be opaque and hard to grasp for non-initiates
  – Can require sophisticated and costly expertise in applied mathematics to handle complex cases
  – Raises cost-benefit questions about “how many options are enough”
Moving forward

1. Being more realistic and honest about limitations to forecasts and predictions, particularly in complex systems environments where simple Newtonian dynamics of linear cause and effect do not apply.

1. Making a more explicit distinction between risk and uncertainty, and doing more to understand the ‘fuzzy’ grey area between the two, again giving due recognition to the inherent unpredictability of complex systems.

1. Putting more effort into demonstrating how science translates uncertainty into risk and in so doing increases our levels of preparedness.


1. Doing more to specify how preparedness outcomes are reflected (in the short term) in greater accuracy in the estimated Net Present Value of economic assets and also (in the very long term) the challenge of being fairer to future generations.
A formal approach to investment risk management in PSI

1. Stage-Gate methods to foster diversity, robust selection between competing concepts and ‘failing fast/early’
2. A quantified appetite for risk aligned with the distinctive role of governments
3. Recognition of learning curve benefits
4. Stronger recognition of learning how to manage investment risks in PSI in programme evaluation and review
   - derived from quantified appetites for risk (ex ante – ex post comparisons)
5. Use these formal methods to allow for transparency and accountability as demonstrably ‘calculated risk taking’
6. Use the formal characteristics of the above to draw Finance and Treasury more strongly into the PSI arena
Addressing the remaining challenges

• Dealing with unintended consequences
  – Greater use of Stage-Gate methods as part of ‘experimental governance’
  – Policy design ‘hacking’ (build into Stage-Gate)
• Requires educating the electorate and evolving the ‘blame game’ political discourse
• Amounts to a ‘wicked problem’ in itself!
• Adopt ‘rapid spiral development’ methods?
The ‘rapid spiral development’ approach

As applied in developing software, weapons systems, space vehicles

Evolve design through repeated cycles (develop, implement, check, adjust)

Incrementally increase budgets with each evolutionary cycle

Appraisal and evaluation become more closely coupled

Not just one pilot then rollout – use successive policy design vintages

Easier to manage uncertainty and risk