A contextually adaptive & collaborative data innovation using action research

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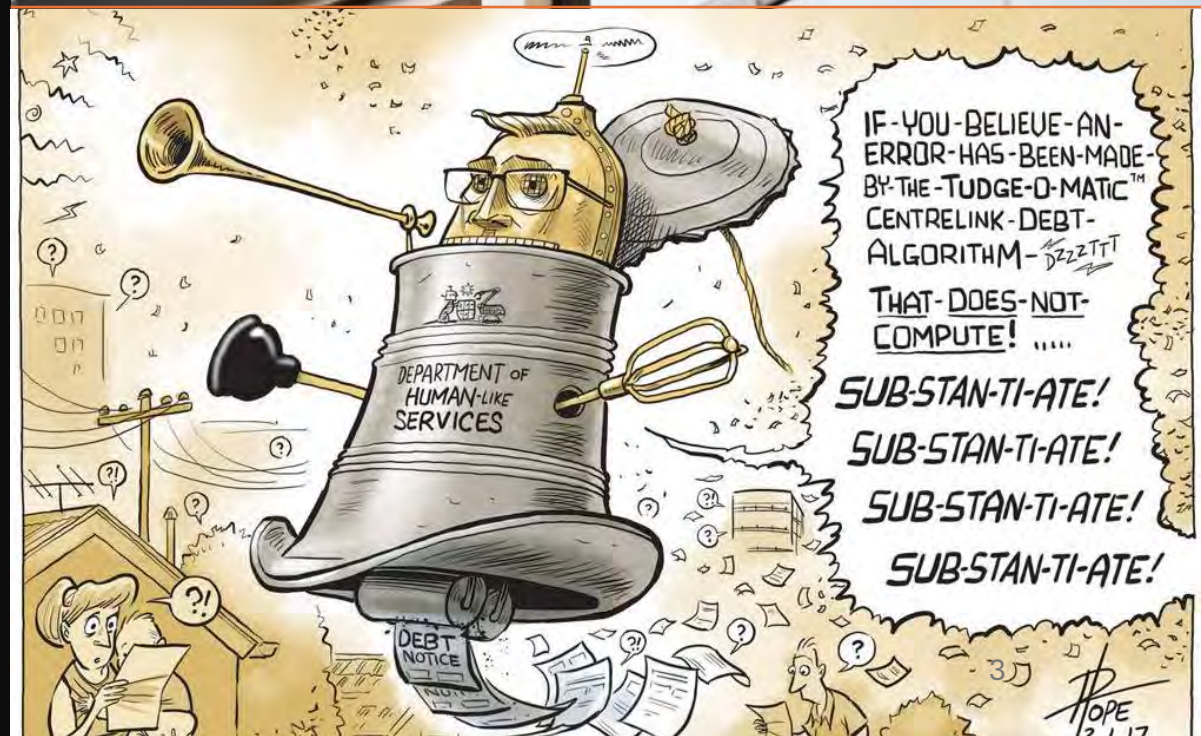
Action Learning Action Research Association Conference
University of Technology Sydney, NSW
10:30 A.M., 8 November 2024

Does today’s revolution in AI and big data make humans obsolete?

“A failure in design and implementation.”



What are the marks of a successful data innovation?

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Technical

Social

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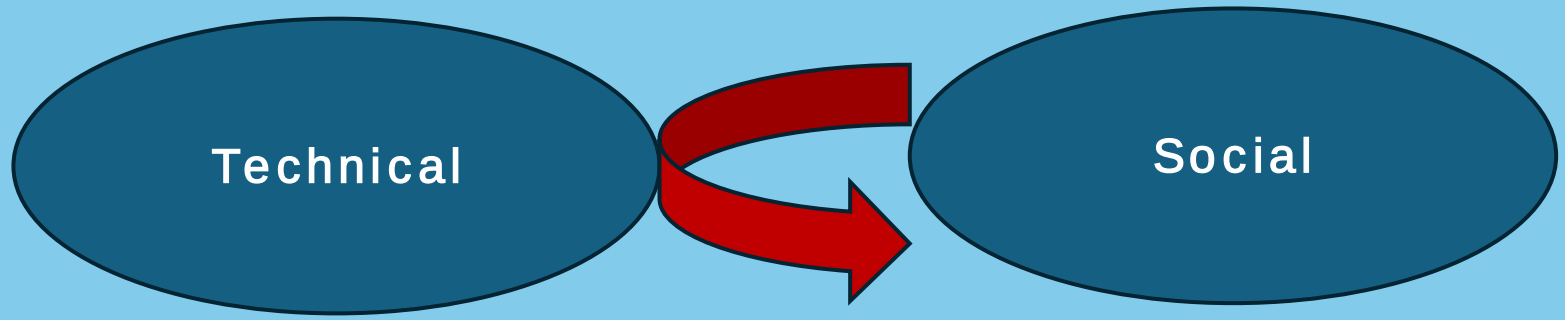

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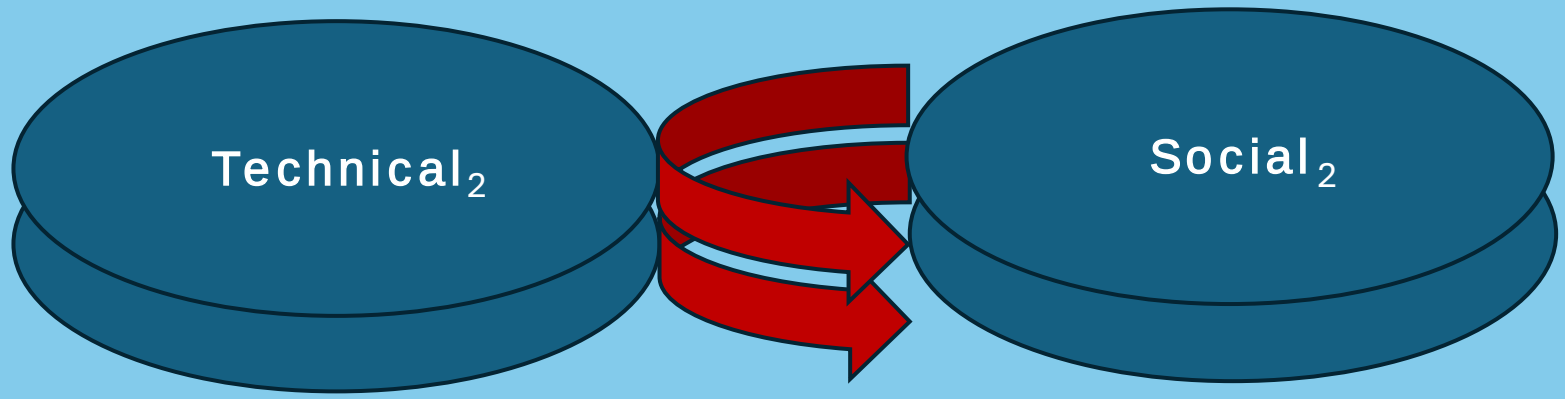

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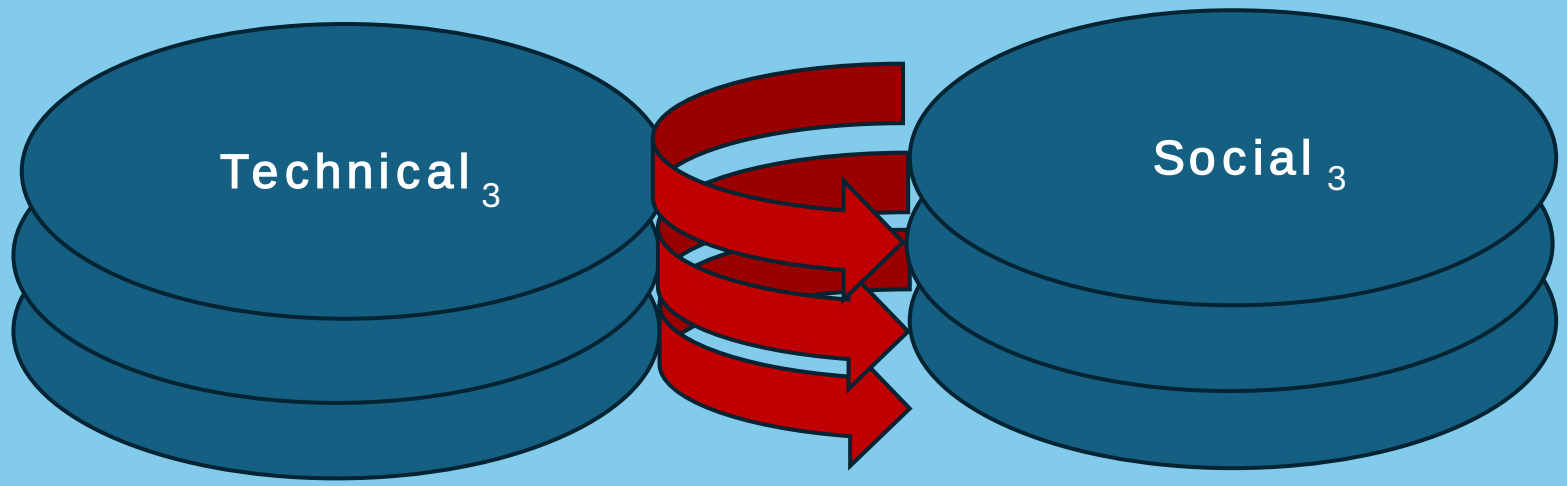
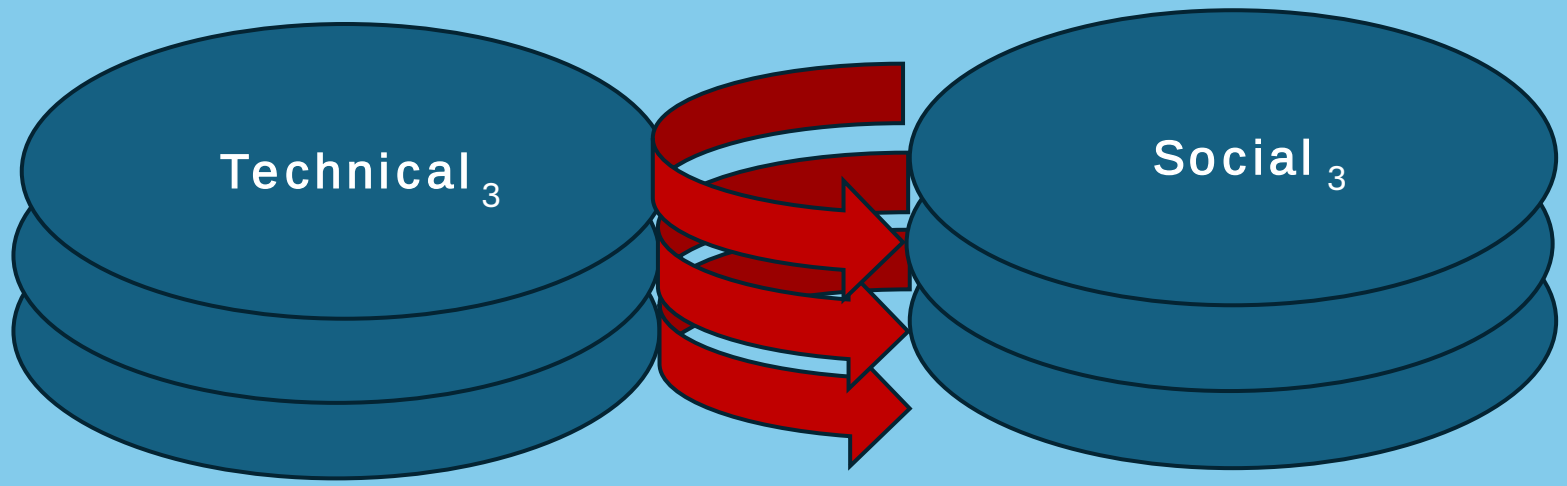


Action design research

ADR focuses "on the organisational context … and how this affects the development and use of an artefact" (Peffers et al 2018, p. 134).

It is an integration of the action research paradigm with design science research, in that it is "a research method for generating prescriptive design knowledge through building and evaluating ensemble IT artefacts in an organisational setting" (Sein et al., 2011, p. 39).



Structure of presentation

Part 1: Challenges faced by SA government necessitating the data innovation (SA BLADE)

Part 2: Data innovation, process, stakeholders, intended outcomes

Part 3: Framing and results of the research into what constitutes success

Part 4: Wider implications of the project and research study

Part 5: Concluding remarks

Part 1: Innovation challenge

The “real world” challenge

The Sydney Morning Herald

BHP mothballs Olympic Dam expansion

By Peter Ker
August 22, 2012 – 3.31pm

BHP Billiton has taken the axe to more than $US30 billion in spending on Australian expansion projects, in the clearest sign yet that the nation is past the peak of its resources boom.

news.com.au — News Corp Australia

National | World | Lifestyle | Travel | Entertainment | Technology | Finance | Sport

finance business

South Australia stunned as GM announces Holden's closure in Adelaide in 2017

THE Australian car industry is all but dead and South Australia is in shock following confirmation that Holden will cease production after more than 60 years.

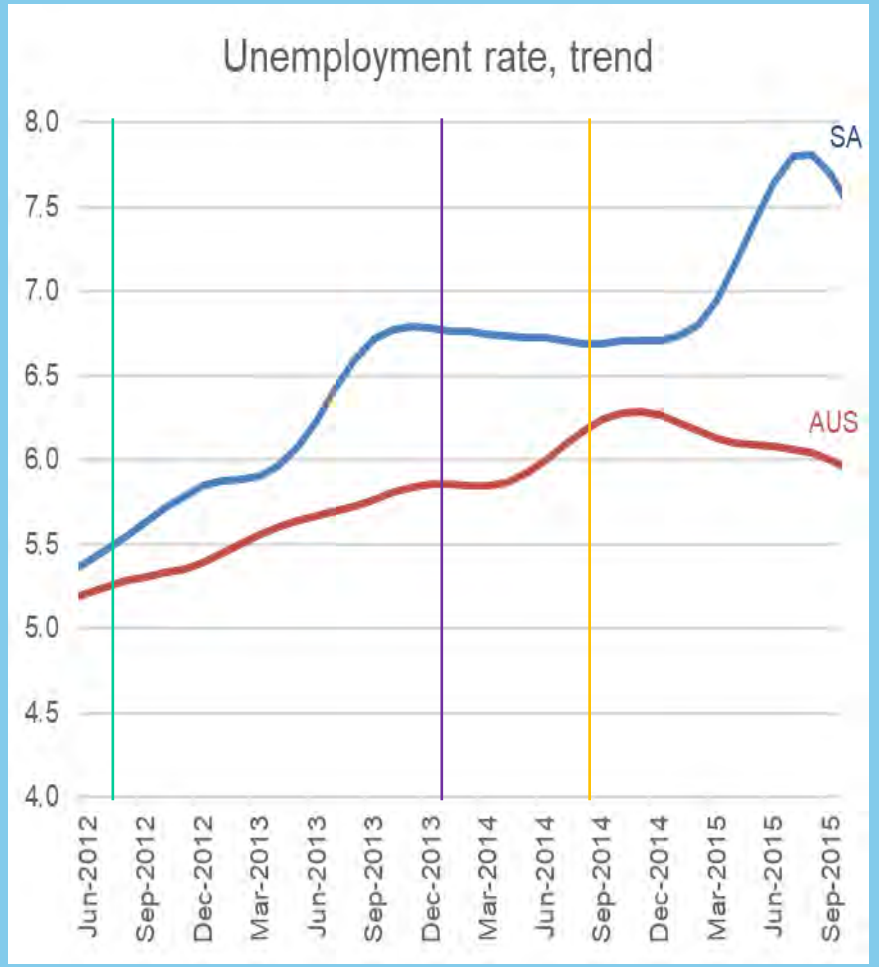
Tory Shepherd and Joshua Dowling — The Advertiser JANUARY 29, 2014 1:14PM

national south australia

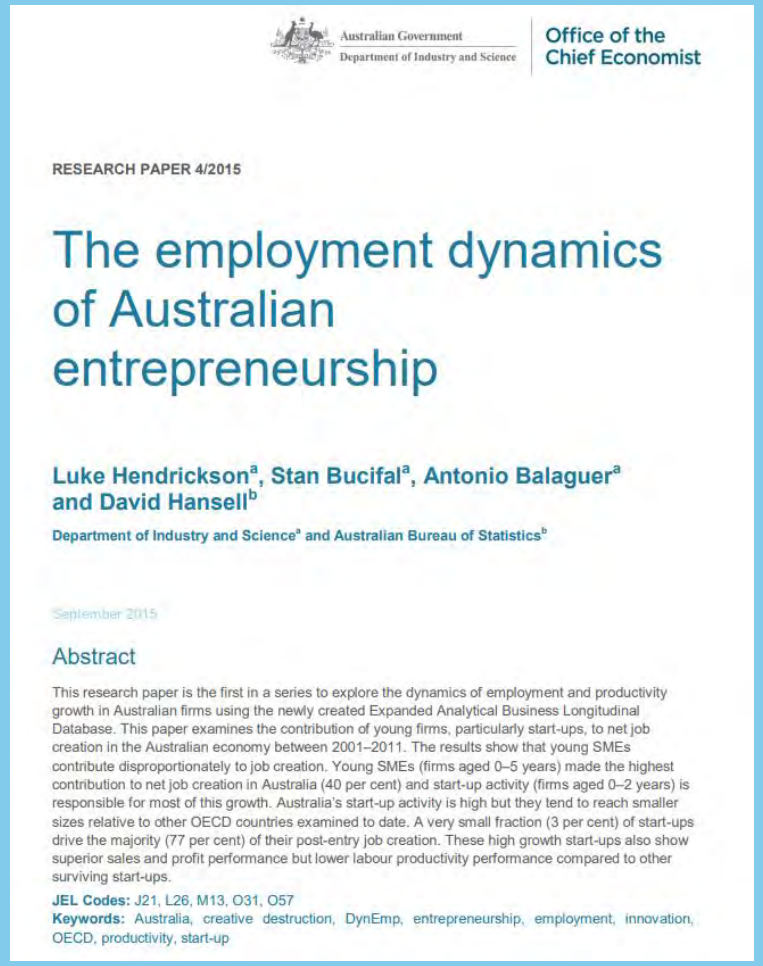
Abbott Government to spend $20 billion on Japanese submarines in major blow to SA's defence industry

THE Premier and Prime Minister have both responded after The Advertiser today revealed the next generation of Australian submarines is all but certain to be built in Japan, not the Adelaide shipyard.

Ian McPhedran National Defence Writer — News Corp Australia Network SEPTEMBER 8, 2014 6:01PM



The spark



Australian Government
Department of Industry and Science

Office of the Chief Economist

RESEARCH PAPER 4/2015

The employment dynamics of Australian entrepreneurship

Luke Hendrickson[a], Stan Bucifal[a], Antonio Balaguer[a] and David Hansell[b]

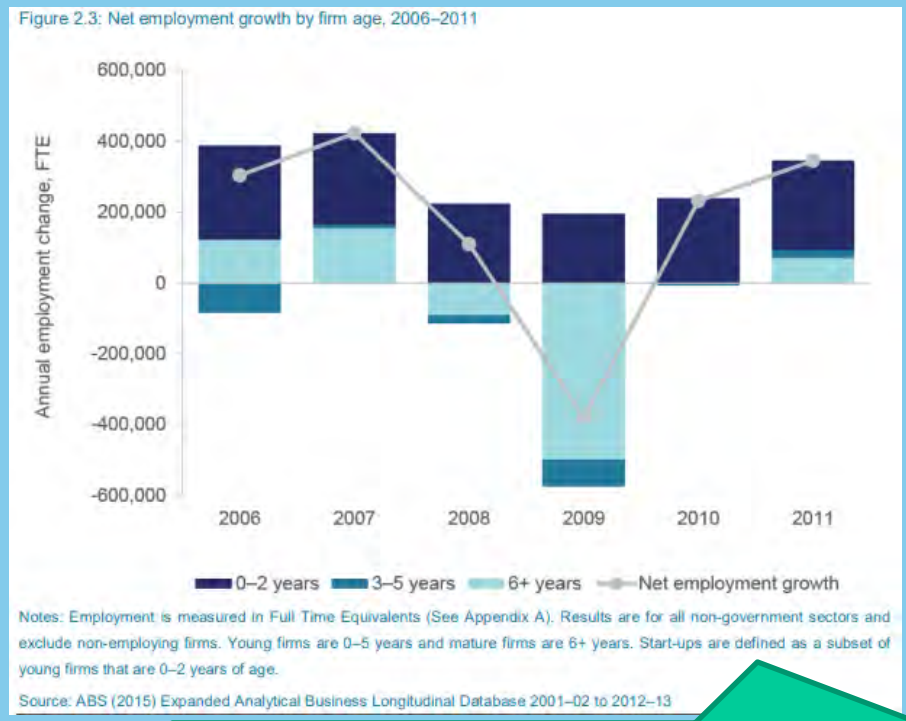
Department of Industry and Science[a] and Australian Bureau of Statistics[b]

September 2015

Abstract

This research paper is the first in a series to explore the dynamics of employment and productivity growth in Australian firms using the newly created Expanded Analytical Business Longitudinal Database. This paper examines the contribution of young firms, particularly start-ups, to net job creation in the Australian economy between 2001–2011. The results show that young SMEs contribute disproportionately to job creation. Young SMEs (firms aged 0–5 years) made the highest contribution to net job creation in Australia (40 per cent) and start-up activity (firms aged 0–2 years) is responsible for most of this growth. Australia's start-up activity is high but they tend to reach smaller sizes relative to other OECD countries examined to date. A very small fraction (3 per cent) of start-ups drive the majority (77 per cent) of their post-entry job creation. These high growth start-ups also show superior sales and profit performance but lower labour productivity performance compared to other surviving start-ups.

JEL Codes: J21, L26, M13, O31, O57
Keywords: Australia, creative destruction, DynEmp, entrepreneurship, employment, innovation, OECD, productivity, start-up



Driving question:
Is this pattern the same for South Australia?

The gaps

There are few statistics available relating to sub-national economic activity.

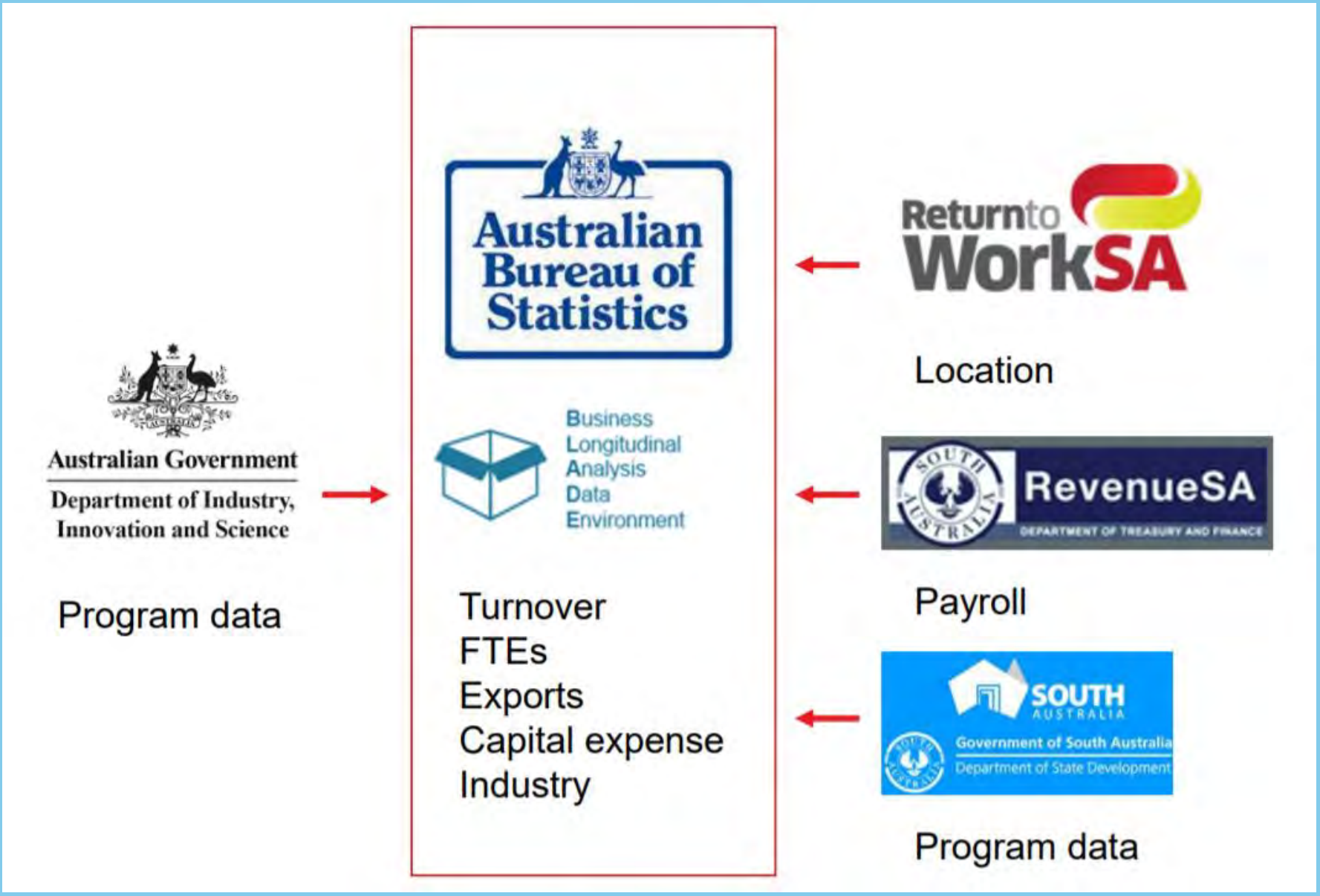
Existing data suffer from small sample sizes, large standard errors.

Incomplete data at the state level to evaluate existing economic development programs, in a robust and rigorous manner (e.g. RCT).

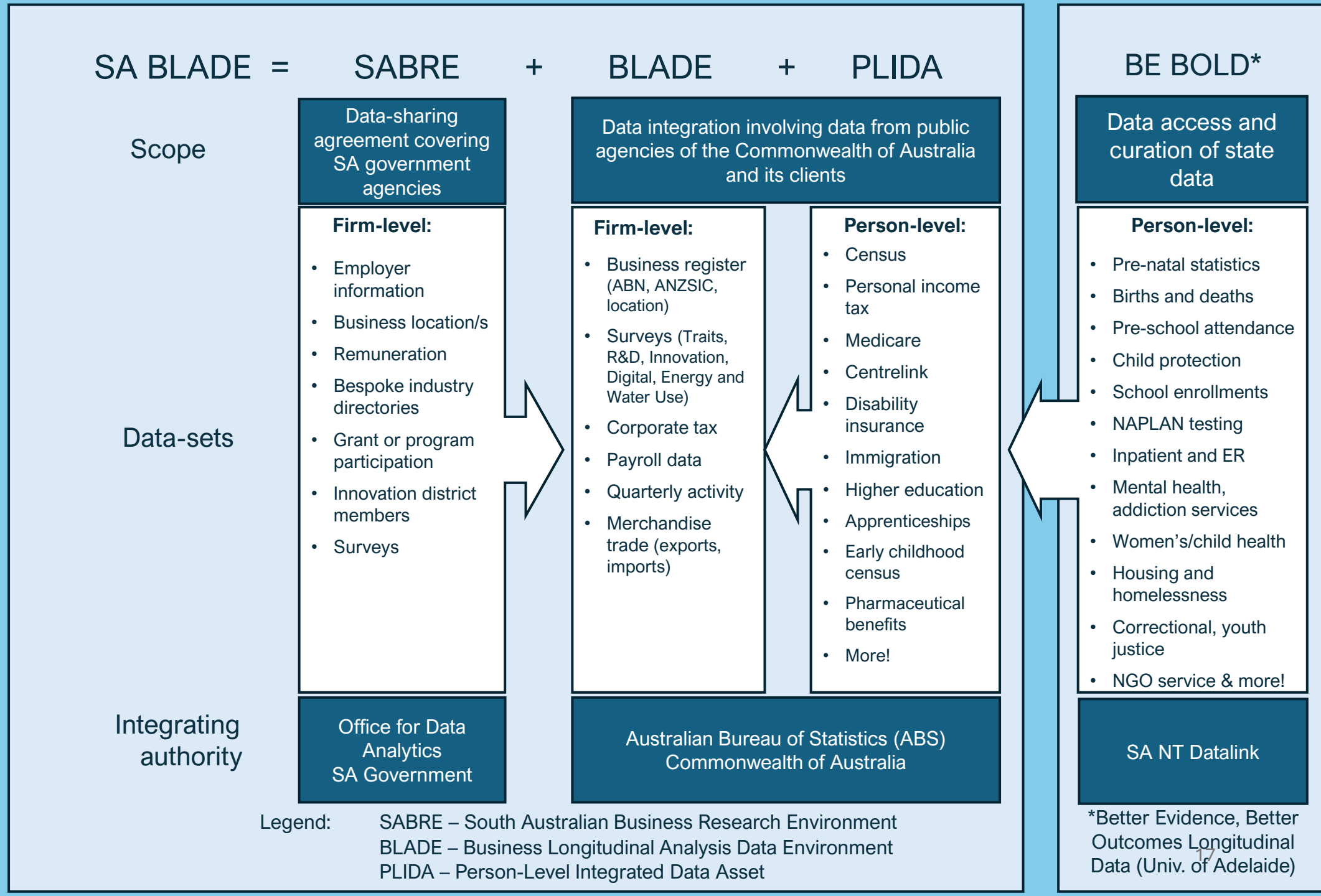
Our data innovation was aimed at enhancing business location data in SA and explore its potential for State and sub-state analyses using tax and other data held by the Commonwealth to evaluate programs run by the state.

Part 2: Innovation, process & stakeholders

The innovation (pilot, SA BLADE 1.0)



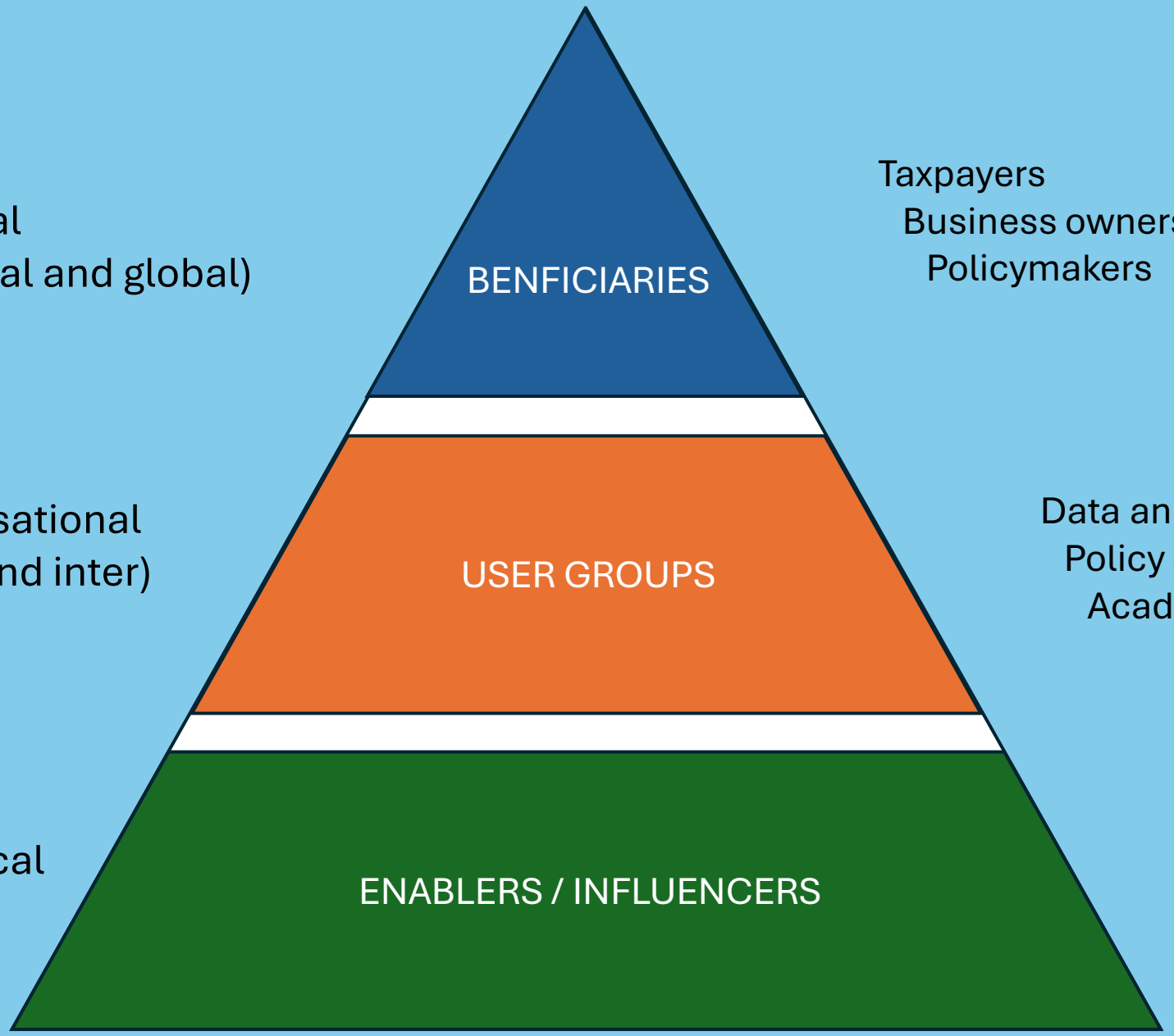
Succeeding cycles: SA BLADE 2.0 – 5.0



Type of innovation

Typology	Examples
Incremental innovation	SA BLADE project was the "*first-of-its-kind*" for a state to link its business data with the Commonwealth via BLADE (ABS, 2020)
Demand-driven or user-based	Co-designed by agencies, industry representatives and academic researchers (hackathon and workshops held)
Process improvement	From a *single use* data linkage for a specific point in time, to a *general purpose*/continuous use thru the framing of general research areas rather than specific research questions.
Product innovation	An information system analytic tool, adaptable, expandable, customizable, based on evolving needs
Social innovation	A change in the way policy is conducted, in the way new knowledge is generated in "the way we do things around here"

Stakeholder groups



Societal
(sectoral and global)

Taxpayers
Business owners
Policymakers

Organisational
(intra and inter)

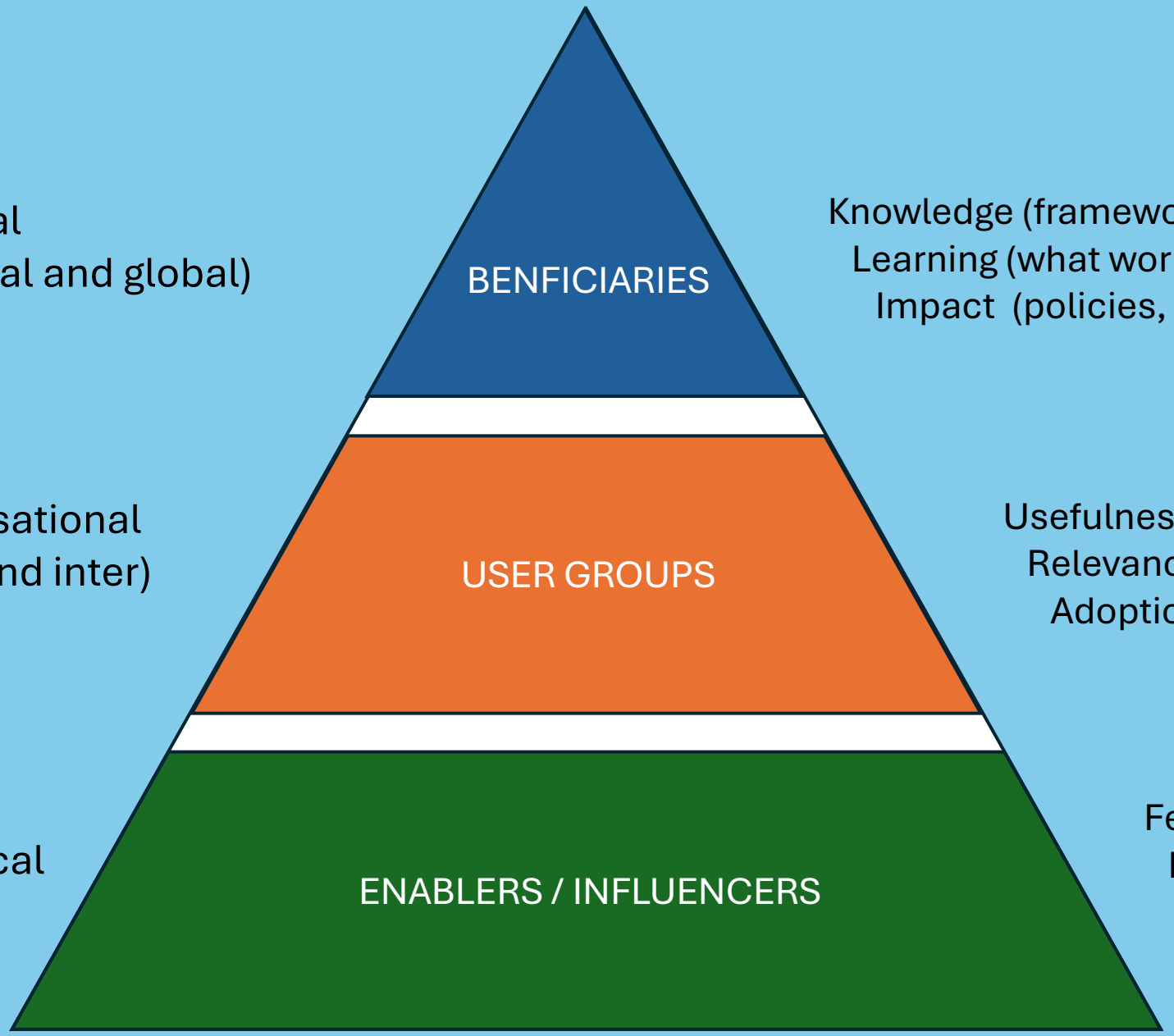
Data analysts and discussants
Policy and program leaders
Academic researchers

Technical

Data integrators
Data collectors/curators
Data framers
Data custodians

Part 3: Framing of success and results

Success criteria



Societal
(sectoral and global)

Knowledge (frameworks, models)
Learning (what works?)
Impact (policies, outcomes, change)

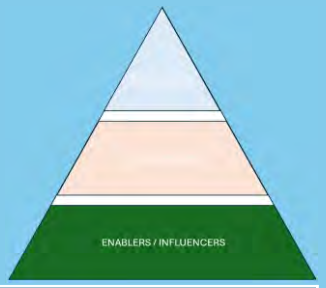
Organisational
(intra and inter)

Usefulness/insightfulness
Relevance (policy/knowledge)
Adoption and diffusion

Technical

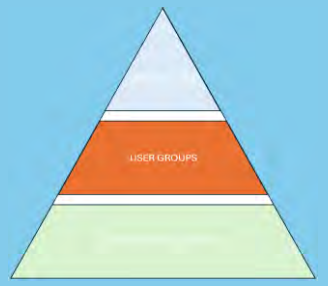
Feasibility (match/link rate)
Data quality
Data privacy/security

Success criteria – technical level



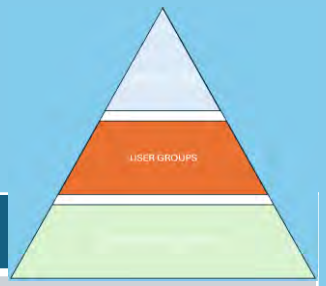
Criteria	Artefacts	Reflections/realisations
Feasibility	SA BLADE linkages (ver. 1 to 4a)	"High linkage rates of SA Government datasets to BLADE (each had a match rate above 90%) spoke to the high quality of ReturnToWorkSA, RevenueSA and business program data" - ABS, 2020a, p. 9.
Data quality	ABS pilot evaluation study	"The integrated dataset was a valuable information asset that expanded the evidence base available to inform SA Government's economic development policy…The benefits that these insights provide will continue to be realised beyond the pilot phase." – ABS
Data privacy/security	ABS case study online	"The pilot project underwent a rigorous assessment and approval process, managed by the ABS, and was overseen by a Steering Group of senior officers from the SA Government, the ABS and the Department of Industry, Science, Energy and Resources … Authorised researchers were granted access to de-identified microdata for policy analysis, research and statistical purposes." – ABS

Success criteria – organisational level



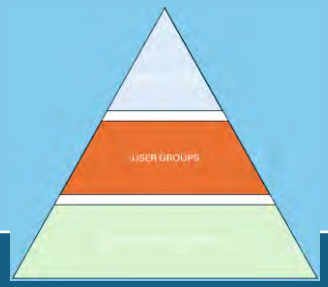
Criteria	Artefacts	Reflections/realisations
Usefulness/ insightfulness	New business location module in BLADE	"The integrated dataset provided better identification of employing firms operating in SA and improved utility for regional analysis … Relying on location information available in BLADE would have biased job counts toward states where large, complex businesses are registered for tax purposes." – ABS, 2020, p. 9 "It's basically enabling a better and more detailed understanding of things like opportunities, challenges, performance, contribution to the economy." - Focus group participant "SA BLADE was so ground breaking" in that "it allowed greater accuracy than we'd ever had, and when you hear people … in different parts of Australia talk about … (how) we just relied on old census data before … that's when you realise what a powerful tool it actually is" – Focus group participant

Success criteria – organisational level



Criteria	Artefacts	Reflections/realisations
Usefulness/ insightfulness	Evaluation studies (cont'd)	"The evaluation was a very good piece of work, highlighting quantitatively the contribution of (the program) to firm operational performance." – Client survey "Highlighting contribution of audit component (of programs) insightful, and leads to consideration of options for future program design." - Client survey
	Regional profiles	"(T)he profiling pieces have been unexpectedly more useful than perhaps we were first contemplating. The most useful application of this data is probably the low-level geography information that you can get." – Focus group participant
Relevance (policy/knowledge)	Evaluation study	"This was a valuable report … a welcome addition to our knowledge base." – Client survey
	Policy review	"(T)he report will continue to be useful in scoping and assessing further initiatives for that portfolio and for the subsequent phases of the small business growth strategy" – Internal agency report

Success criteria – organisational level



Criteria	Artefacts	Reflections/realisations
Adoption and diffusion (replicability, scalability)	Industry dashboard	"We will definitely be using this in an ongoing manner to inform many investment and policy decisions (for) broader industry development." - Focus group participant
	Pure research papers	"I can see enormous opportunities for doing some interesting academic stuff with the data" (and) "hopefully in the future to get other types of data that's confidential and that we can use it in an effective way" – Focus group participant
	Knowledge management portal	"You can think about using this to inform policy, design and development. You can think about it in terms of program evaluation, but also profil(ing), understanding, you know the nature of businesses in particular regions, and when something happens, if there needs to be a response, (and) you know what might the scale of that response needs to be." – Focus group participant

Artefacts – Evaluations

Figure 1: Average export value of firms who received the grant in 2017-2018

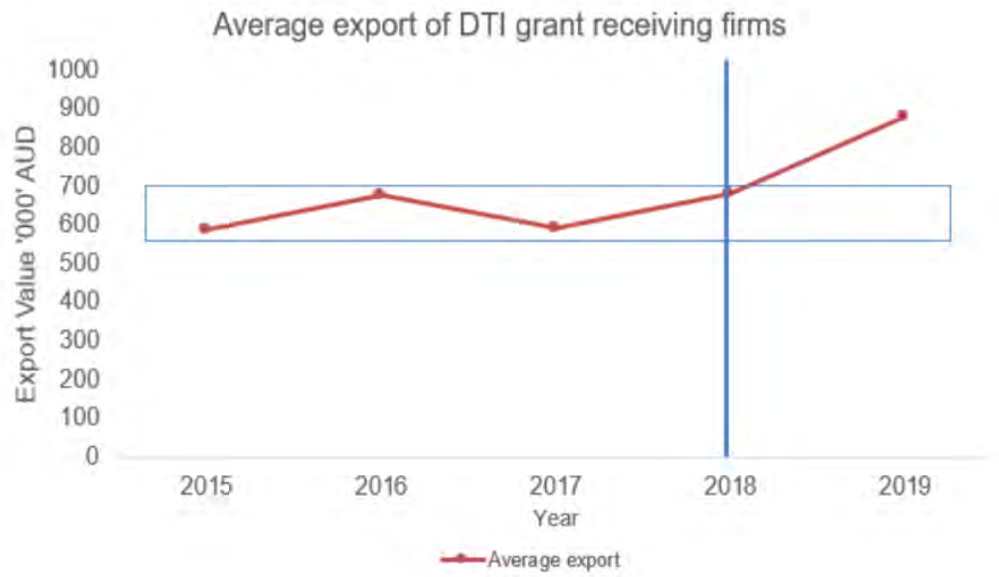
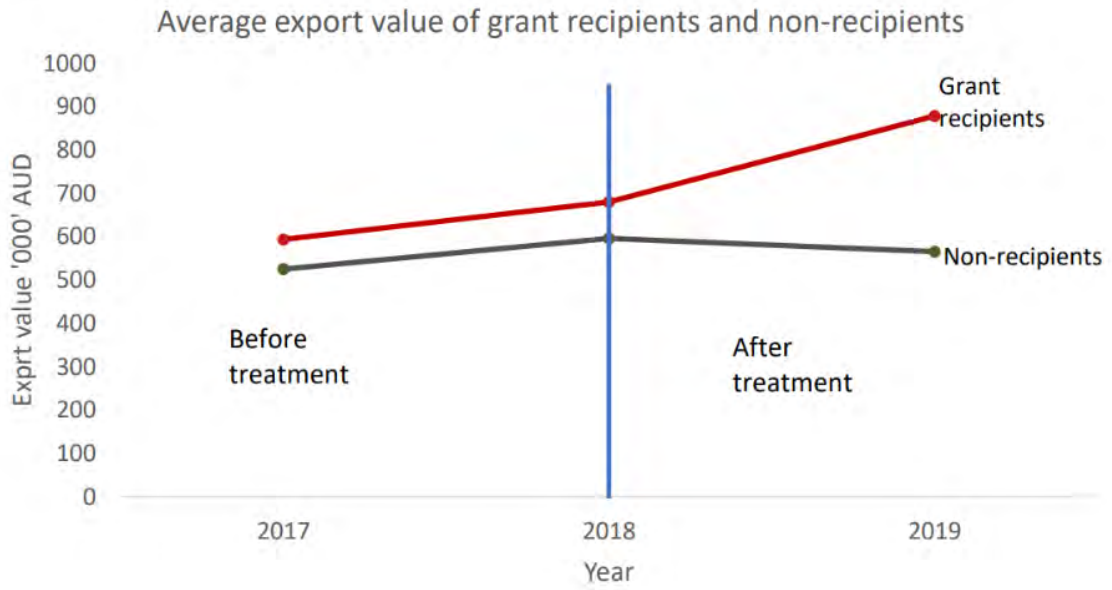
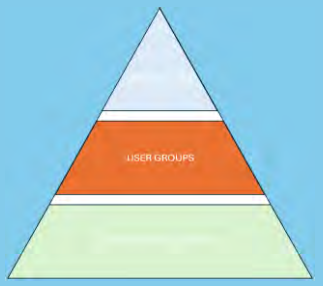


Figure 2: Average export value of recipient vs non-recipient firms



Artefacts – Online dashboards, reports



In 2017-18, over **9,200 creative businesses** in South Australia directly contributed **$1.45 billion** in gross value added (GVA) to the South Australian economy, and employed **15,623 full time equivalent employees** (FTEs).

Breaking these figures down for each creative business grouping:[2]

Advertising and marketing

654 businesses

$179 million in value added, or **12%** of creative industries GVA

1,649 FTE workers, or **11%** of creative industries employment

Design

1,179 businesses

$104 million in value added, or **7%** of creative industries GVA

1,070 FTE workers, or **7%** of creative industries employment

Architecture

817 businesses

$168 million in value added, or **12%** of creative industries GVA

1,423 FTE workers, or **9%** of creative industries employment

Fashion

1,089 businesses

$218 million in value added, or **15%** of creative industries GVA

2,576 FTE workers, or **16%** of creative industries employment

Broadcasting

52 businesses

$98 million in value added, or **7%** of creative industries GVA

868 FTE workers, or **6%** of creative industries employment

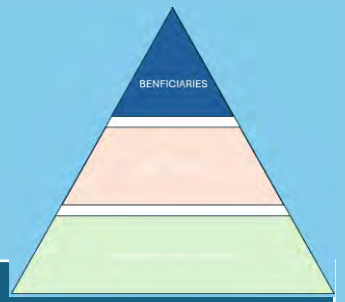
Festival operations

12 businesses

$32 million in value added, or **2%** of creative industries GVA

331 FTE workers, or **2%** of creative industries employment

Success criteria – social level



Criteria	Artefacts	Reflections/realisations
Knowledge (frameworks, models)	Networks Social capital	SA BLADE was "a project that brings us together across government with a sort of shared purpose and a shared understanding". "It's bringing people to the table. It's building bridges … it's connecting with people in the research community." - Focus group participants
Learning (what works?)	Mindset	"There was a lot of nervousness around sharing data, and a lot of concern about how it (might) be used or misused. Having the hook of being able to link into the Commonwealth data provides some early answers that we just couldn't (get) with (our) own data sets has opened up the idea that some of our previously tightly held admin data does have a strategic use." - Focus group participant
Impact / Fitness (policies, outcomes, change)	Club goods	SA BLADE has "actually allowed us to respond to an industry recommendation and creative industries strategy, which was what industry wanted to see." – Client survey

Part 4: Wider implications of project & study

Future adaptations

...other contexts and studies

...use of AI and ML

Future (potential) adaptations

Application	Purpose
Business surveys	Creating representative samples out of employer data
Web-scraped data	Profiling of certain types of businesses, industries or sectors using social media and webpages
Sentiment analysis	Use of user generated content on social media platforms to gauge sentiment and predict future performance
Sub-national social stats	Service delivery improvement, life-cycle, intergenerational analysis

Replication by other jurisdictions

Replicationd	Purpose
National startup data project	Estimate the size and contribution of startups to the overall economy
Business location module in BLADE	Use of work cover data from other states to improve business location
Satellite accounting	Develop a profile of Australia's defense and creative industries and sub-sectors

Use of AI and machine learning

Application	Purpose
Large language models	To help de-bug codes of analysts / fill skills gap
	To augment desk research, improve identification of sectors that form part of emerging products' supply chain
Machine learning	For predictive and inferential analysis

Conclusion

- Any new context, requires adaptation on the part of any system to achieve fitness for purpose.
- This gives rise to innovation as new elements responsive to local needs are added.
- Collaboration with partners and stakeholders, particularly end-users is key.
- Fostering a socio-technical system of co-evolution that mutually informs the other process helps to avoid adverse unintended consequences.
- Action research and reflective practice help to foster learning and harness that learning for positive impact, continuous improvements and adaptations down the line.

Sources:

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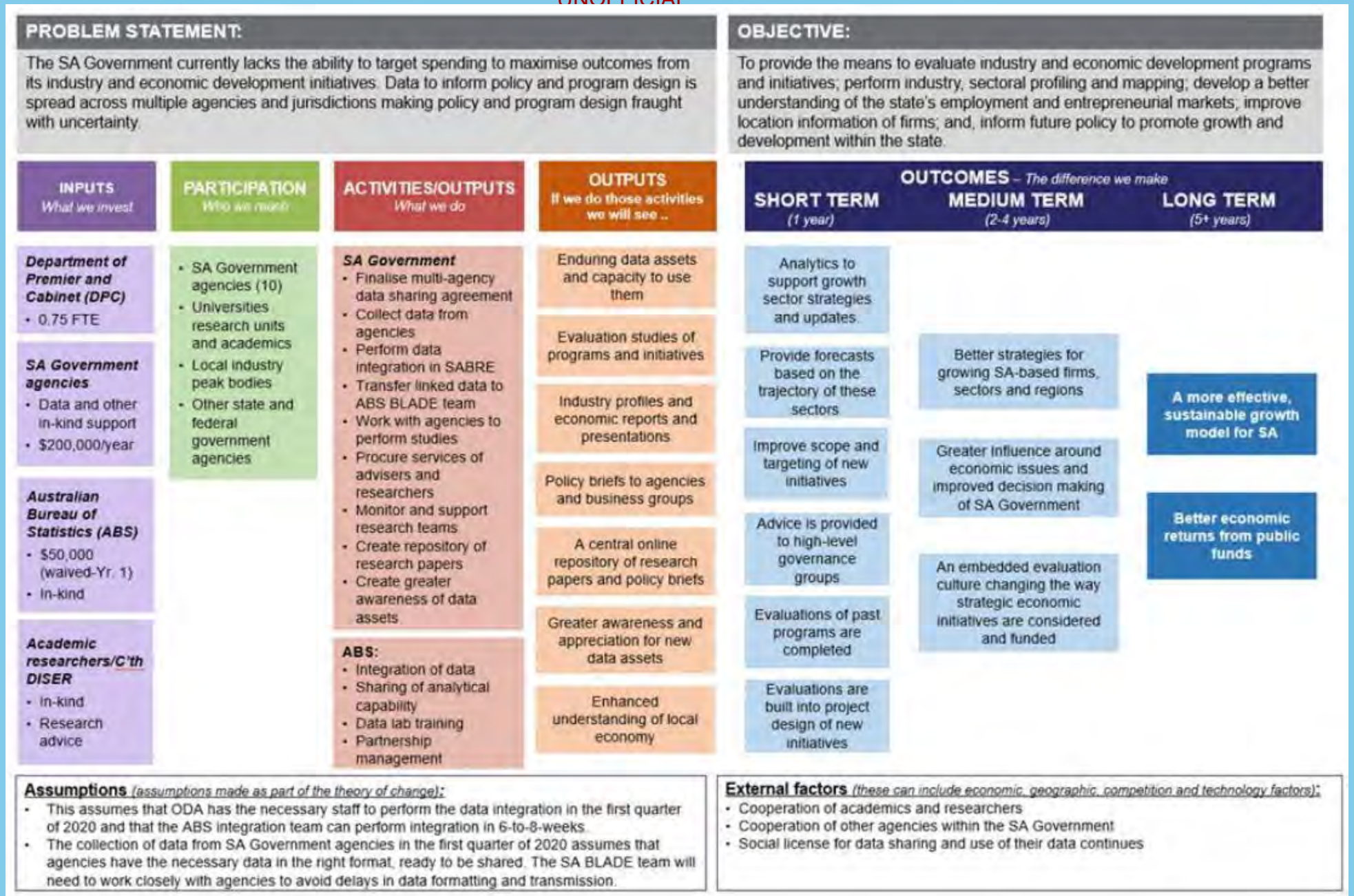
Reflective questions:

How is data used in my workplace?

How can user-inspired data investigation benefit the context that I am in?

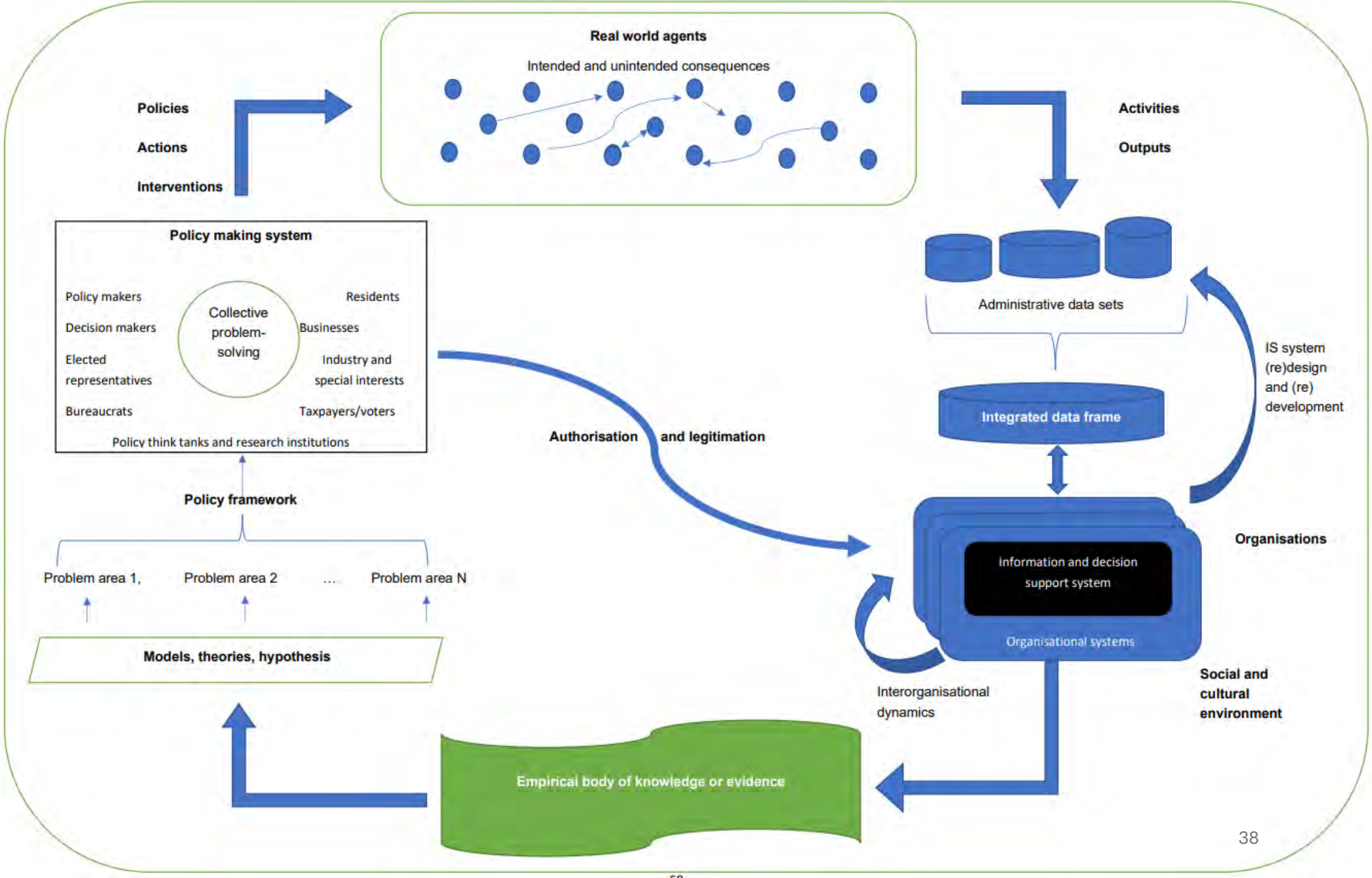
Extra slides

SA BLADE program logic

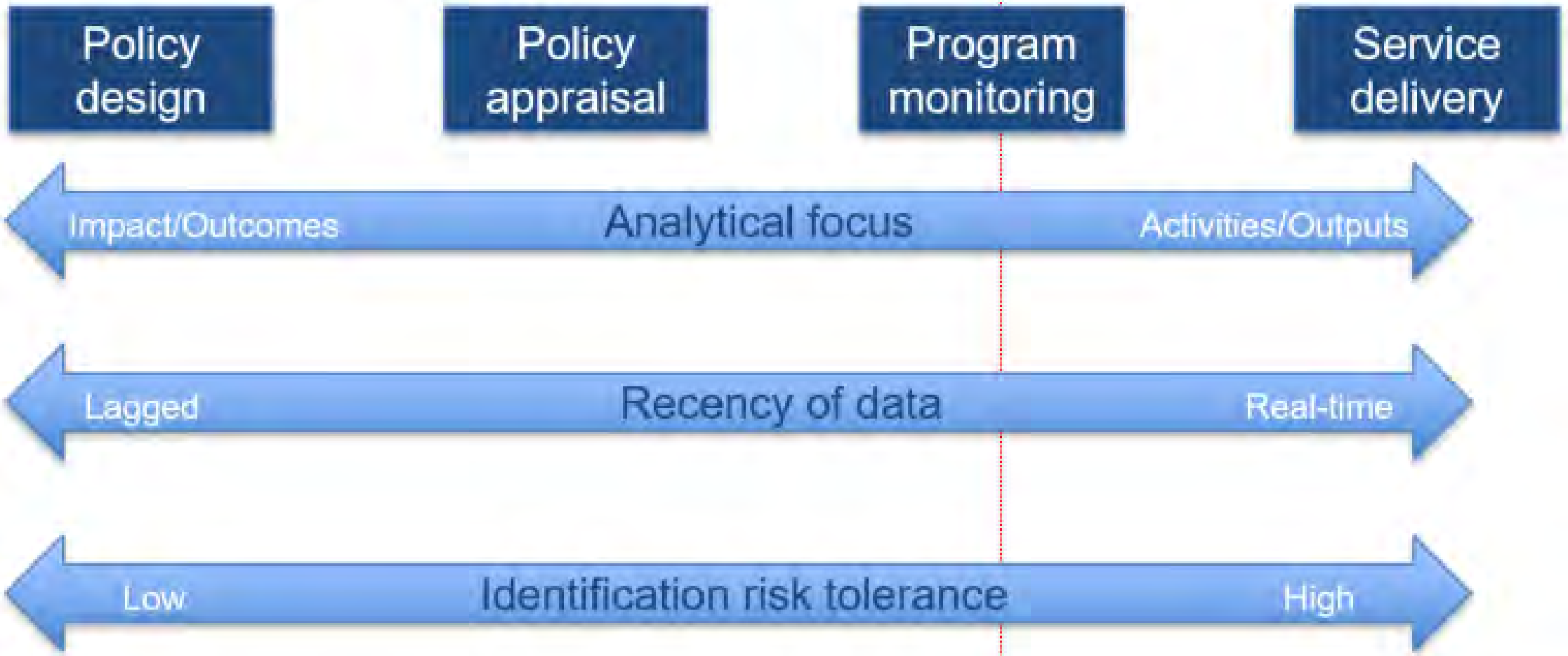


Source: Author's own construction

Conceptual framework



Scope of Work



Source: Author's own construction

Thank you!