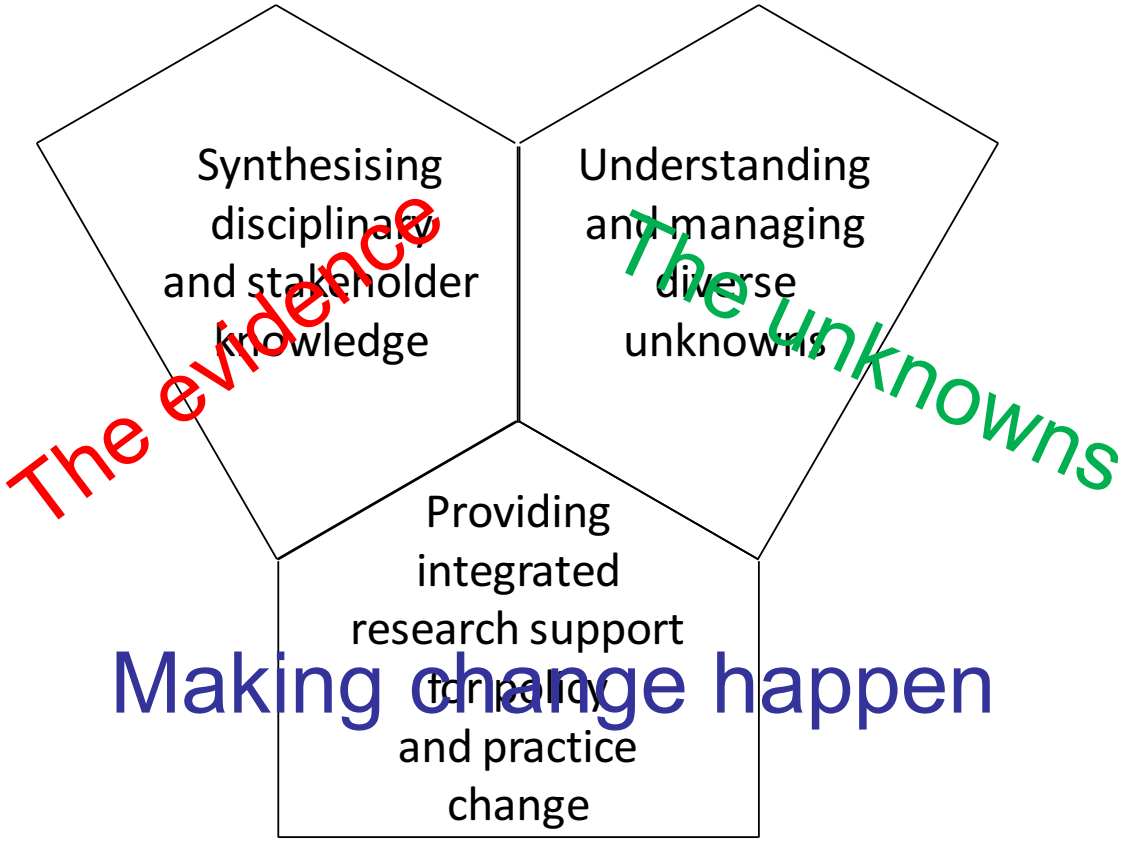
Australian National University

What knowledge and skills do you need to be a good inter- or trans-disciplinary researcher?

Gabriele Bammer

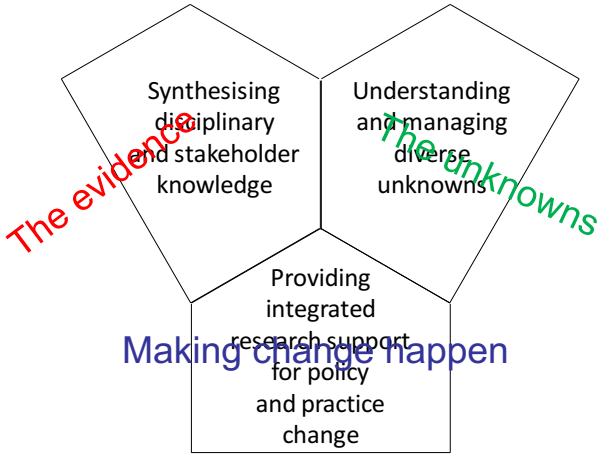
In a nutshell… 1

1. Three key domains of knowledge & skills…



In a nutshell… 2

1. Three key domains of knowledge & skills…



2. Ability to diagnose the problem…

Especially – is it solvable or ‘wicked’?

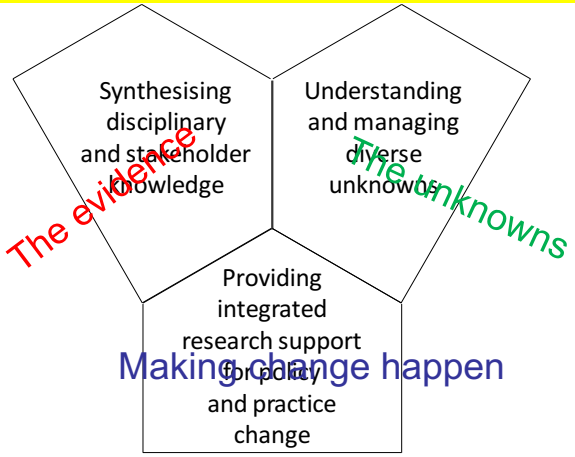
If ‘wicked’ – additional knowledge & skills

In a nutshell… 3

1. Three key domains of knowledge & skills…

2. Ability to diagnose the problem…

Especially – is it solvable or 'wicked'? (if wicked ++)

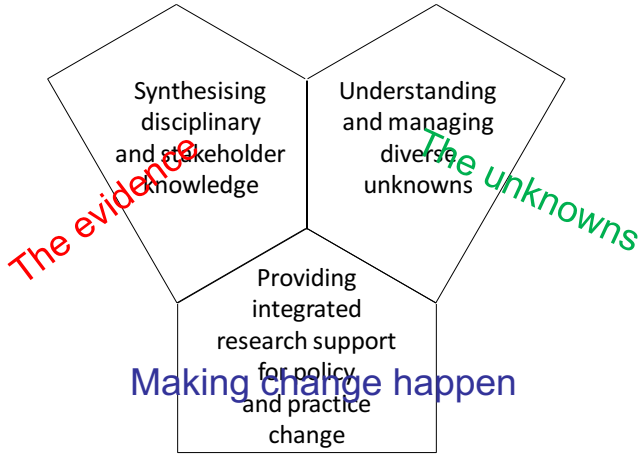


3. Your position in the team:
   - Leader
   - Transdisciplinary expert
   - Disciplinary expert

Three key domains of knowledge & skills…

The evidence

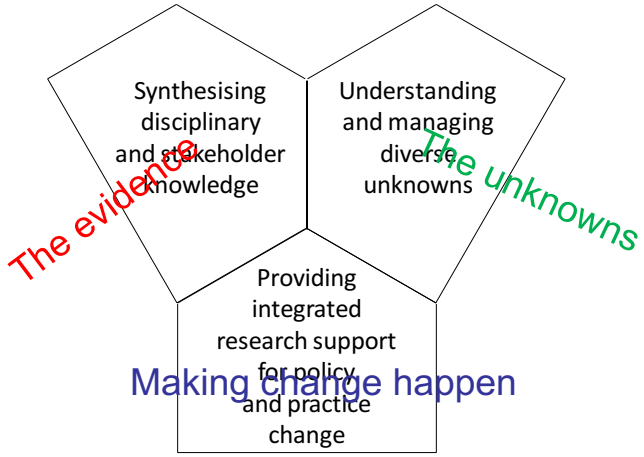
- which disciplines and stakeholders?
- what can they contribute?
- how will they contribute? (level of collaboration)
- how to synthesise contributions? (eg dialogue? model? co-production?)



Three key domains of knowledge & skills…

The unknowns

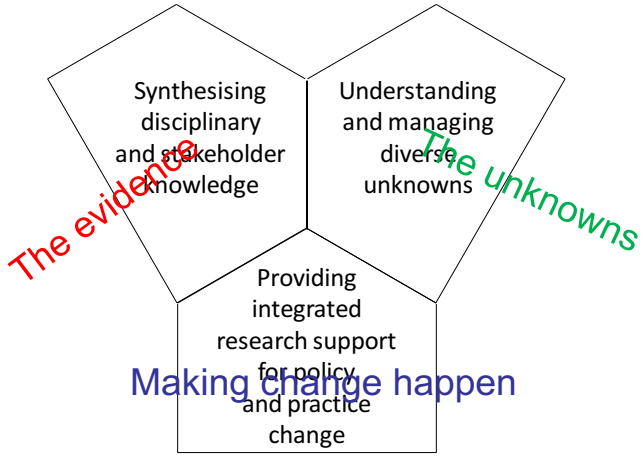
- which disciplines and stakeholders?
- what can they contribute?
- how will they contribute? (level of collaboration)
- how to synthesise contributions? (eg dialogue? model? co-production?)



But there are complexities…

The unknowns

- multiple kinds of unknowns



Current training on unknowns

Discipline-based training – focus on unknowns to reduce, banish the rest

Disciplinary excellence – pick productive unknowns (not dead end or trivial)

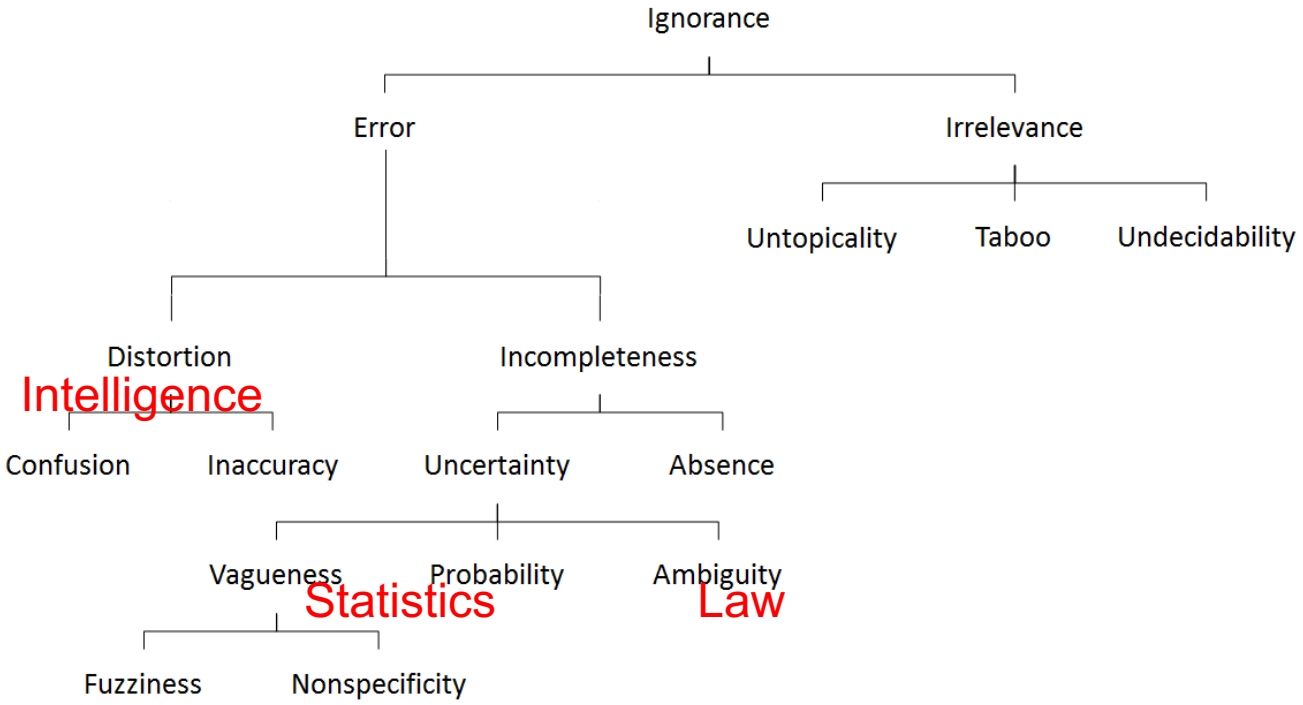
But there's more to it…

Unknowns the disciplines don't deal with

Known knowns	Known unknowns (conscious ignorance)
Unknown knowns (tacit knowledge)	Unknown unknowns (meta-ignorance)

(adapted from Kerwin, 1993)

Different disciplines concern themselves with different unknowns



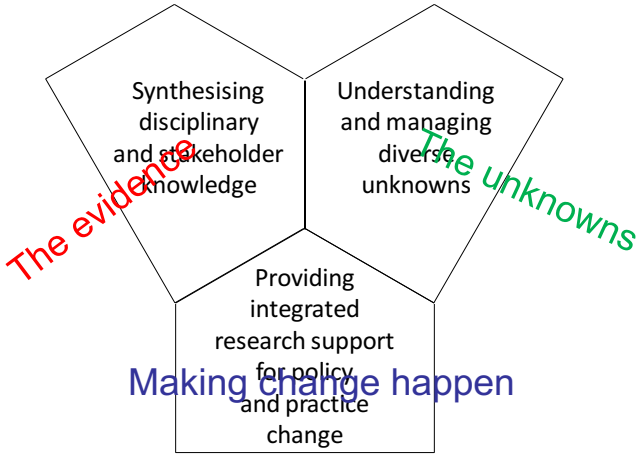
Unknowns in inter- & trans-disciplinary research

1. Disciplinary unknowns
2. Unknowns in the overlap between disciplines
3. Unknowns of concern to stakeholders
4. Unknowns marginalised by power imbalances
5. New problem-based unknowns
6. Tacit knowledge (unknown knowns)
7. Intractable unknowns

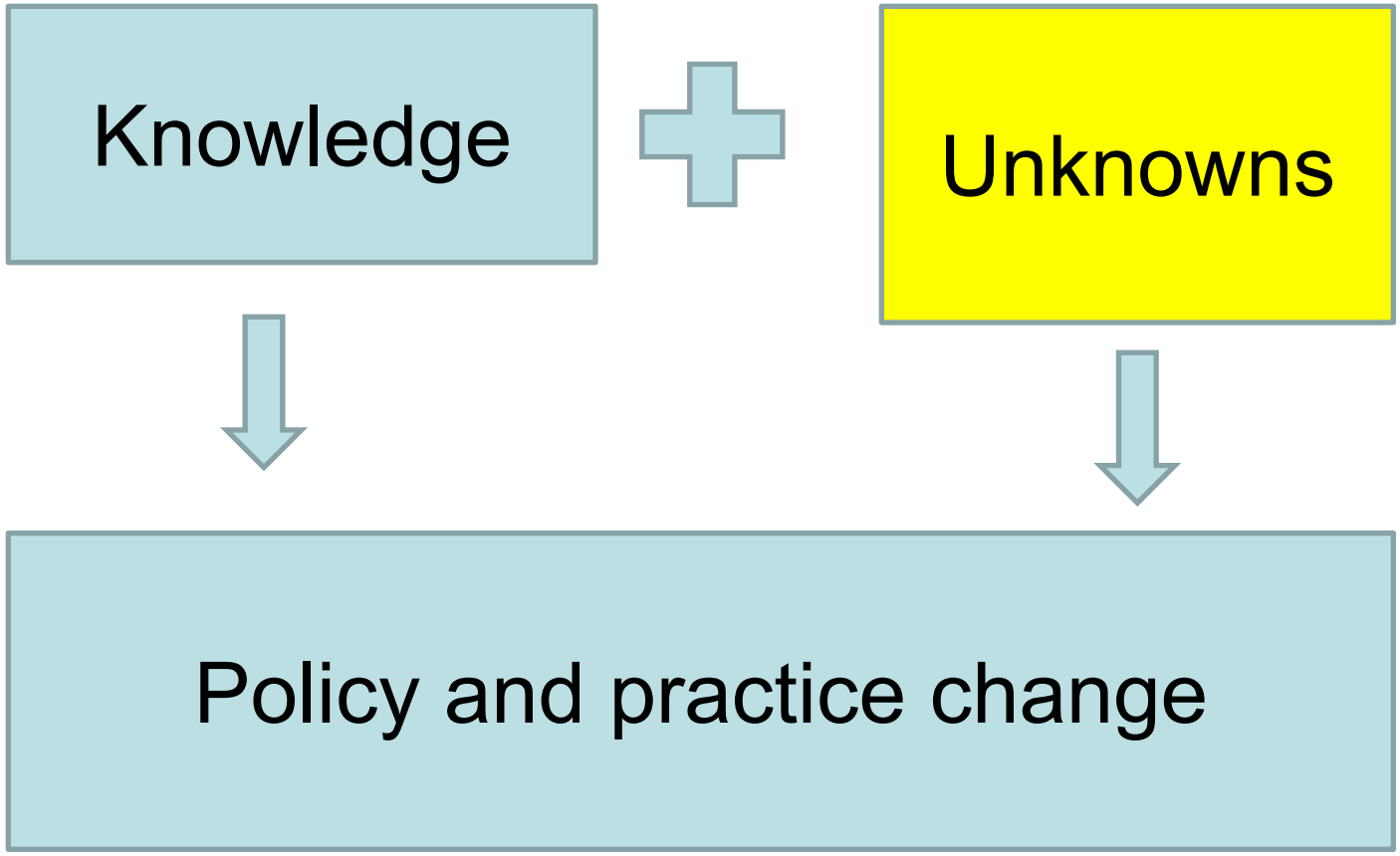
Three key domains of knowledge…

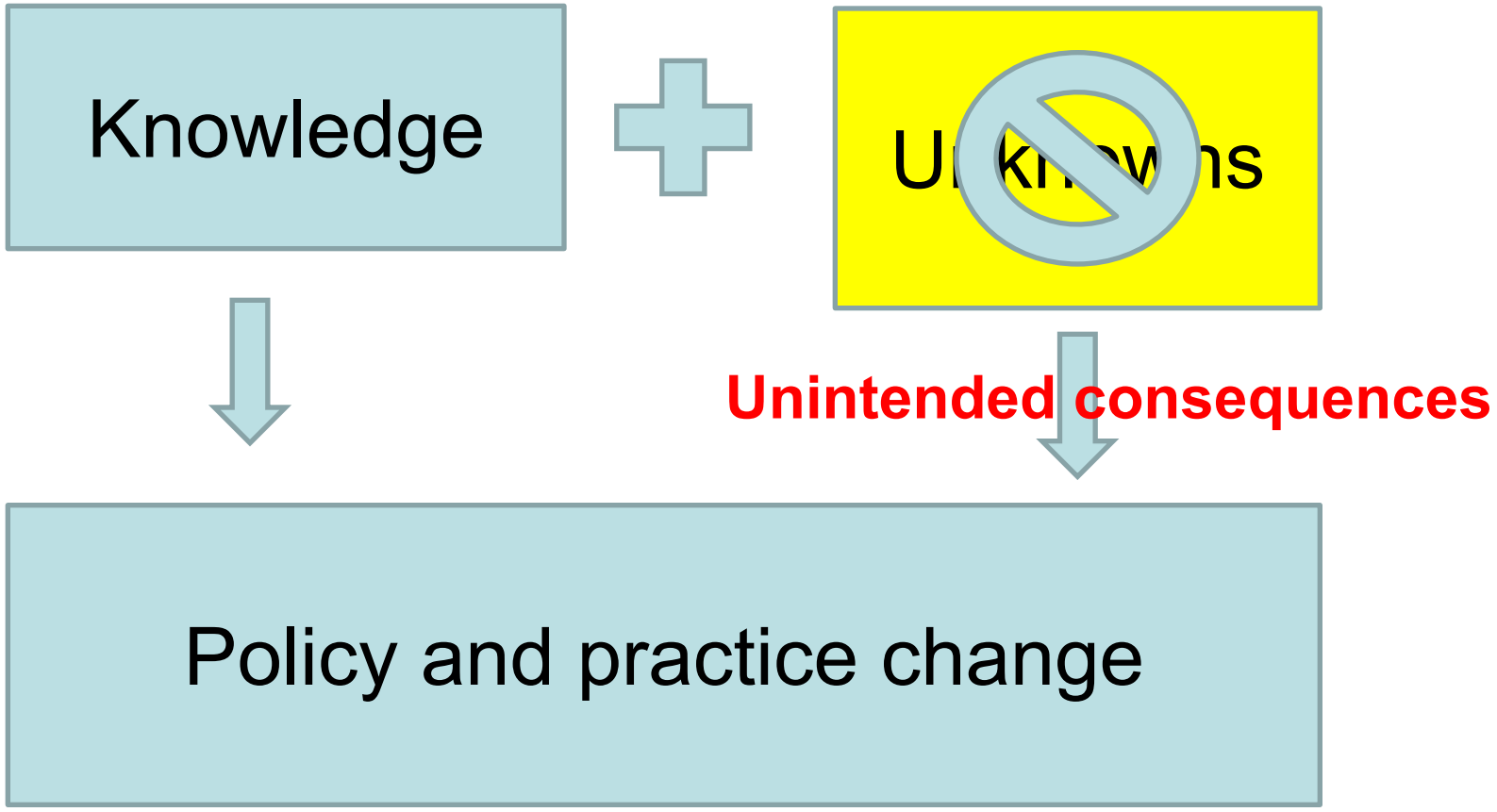
The unknowns

- multiple kinds of unknowns
- multiple ways of dealing with unknowns, including
  - reduction
  - banishment & adverse unintended consequences
  - acceptance



The danger of banishing unknowns…




Knowledge
Unintended consequences
Policy and practice change

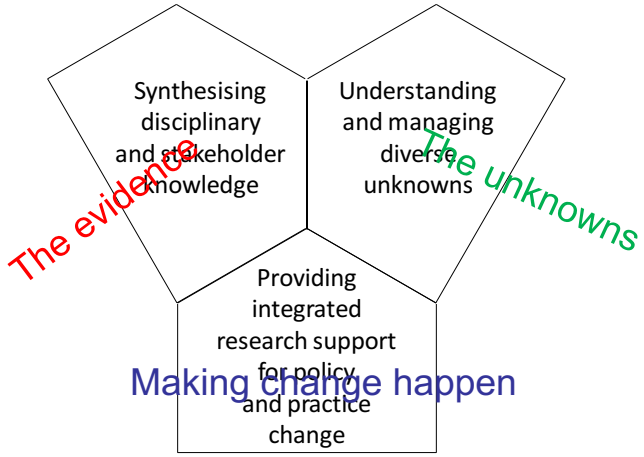
Strategies for accepting unknowns include:

- building in flexibility or resilience (recovery)
- precautionary principle (avoiding potential for catastrophe)
- scenario development (possible futures)
- modelling (explore potential impacts)
- adaptive management (constant review and tweaking)

Three key domains of knowledge & skills…

Making change happen

- lack of control



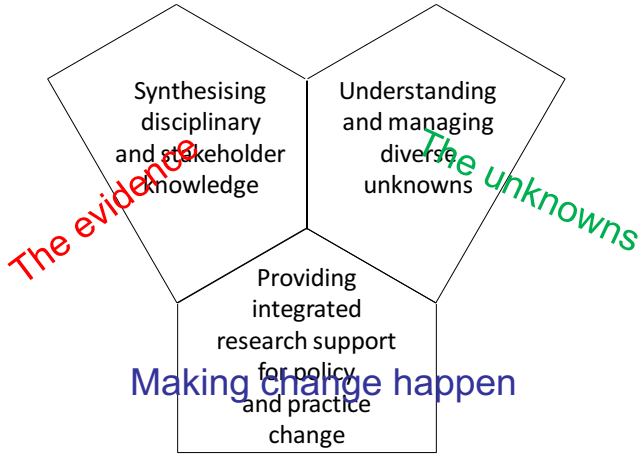
Big picture: Dynamic change environment

- Continuity and conservation require work
- Inbuilt inertia or resistance to change means once something exists it can be hard to get rid of
- Change does not necessarily lead to improvement
- Success is in the eye of the beholder
- The outcomes of any attempt to influence change are unpredictable

Three key domains of knowledge & skills…

Making change happen

- lack of control



which strategy?

- communication (informing)
- advocacy (driving)
- engagement (co-producing)

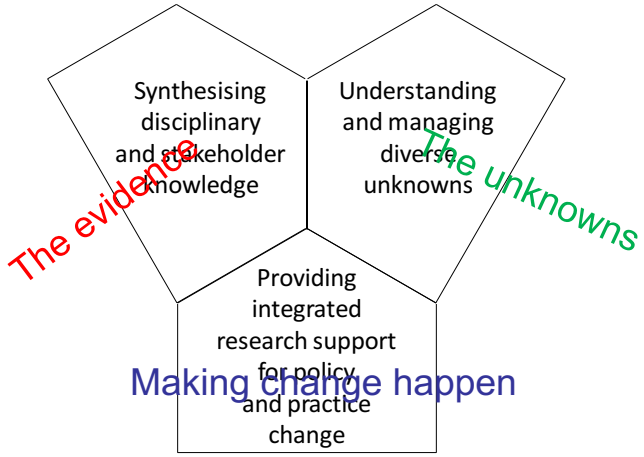
Three key domains of knowledge & skills…

Making change happen

- lack of control

which strategy?

- communication (informing)
- advocacy (driving)
- engagement (co-producing)



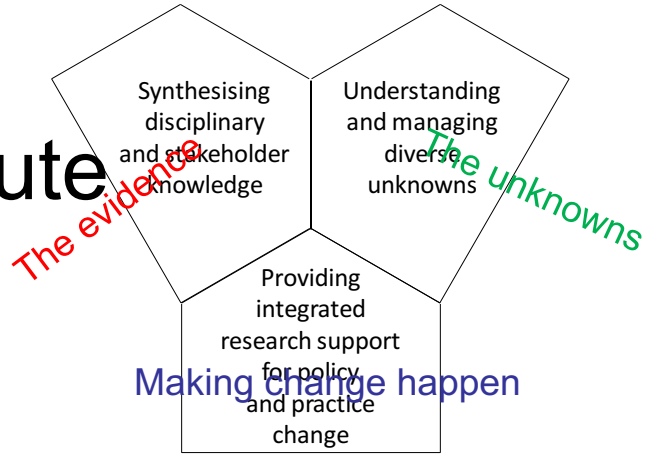
How?

- Target (govt, business, civil society)
- Understand target structure and processes (eg policy making process)

Summary: Three key domains

Recognising what disciplines & stakeholders can contribute

Synthesis etc

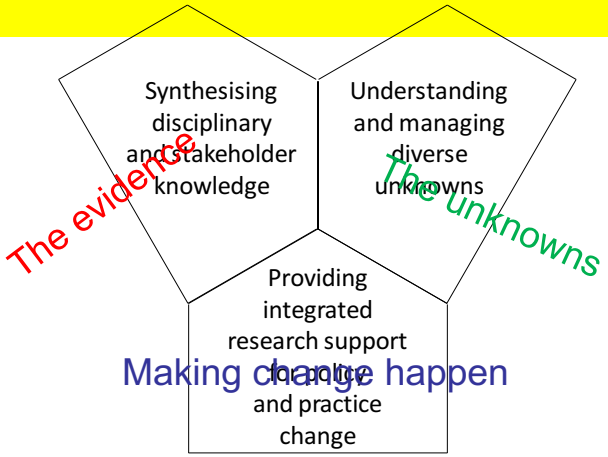


Additional complexities of:

- Unknowns
- Making change happen

In a nutshell… 2

1. Three key domains of knowledge & skills…



2. Ability to diagnose the problem…

Especially – is it solvable or ‘wicked’?

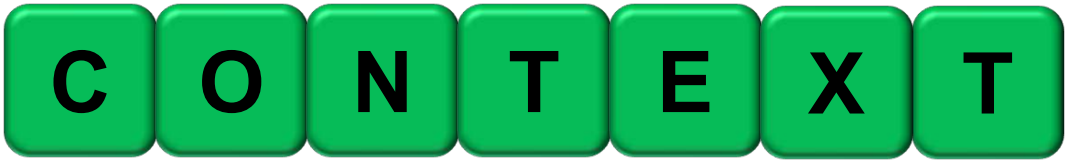
If ‘wicked’ – additional knowledge & skills to deal with…


S Y S T E M S

- Non-existent boundaries
- Understanding the whole
- Emergence
- Feedback loops (reinforcing and balancing)
- Non-linearity
- Delays
- Unintended consequences…


VALUES

Especially value conflict

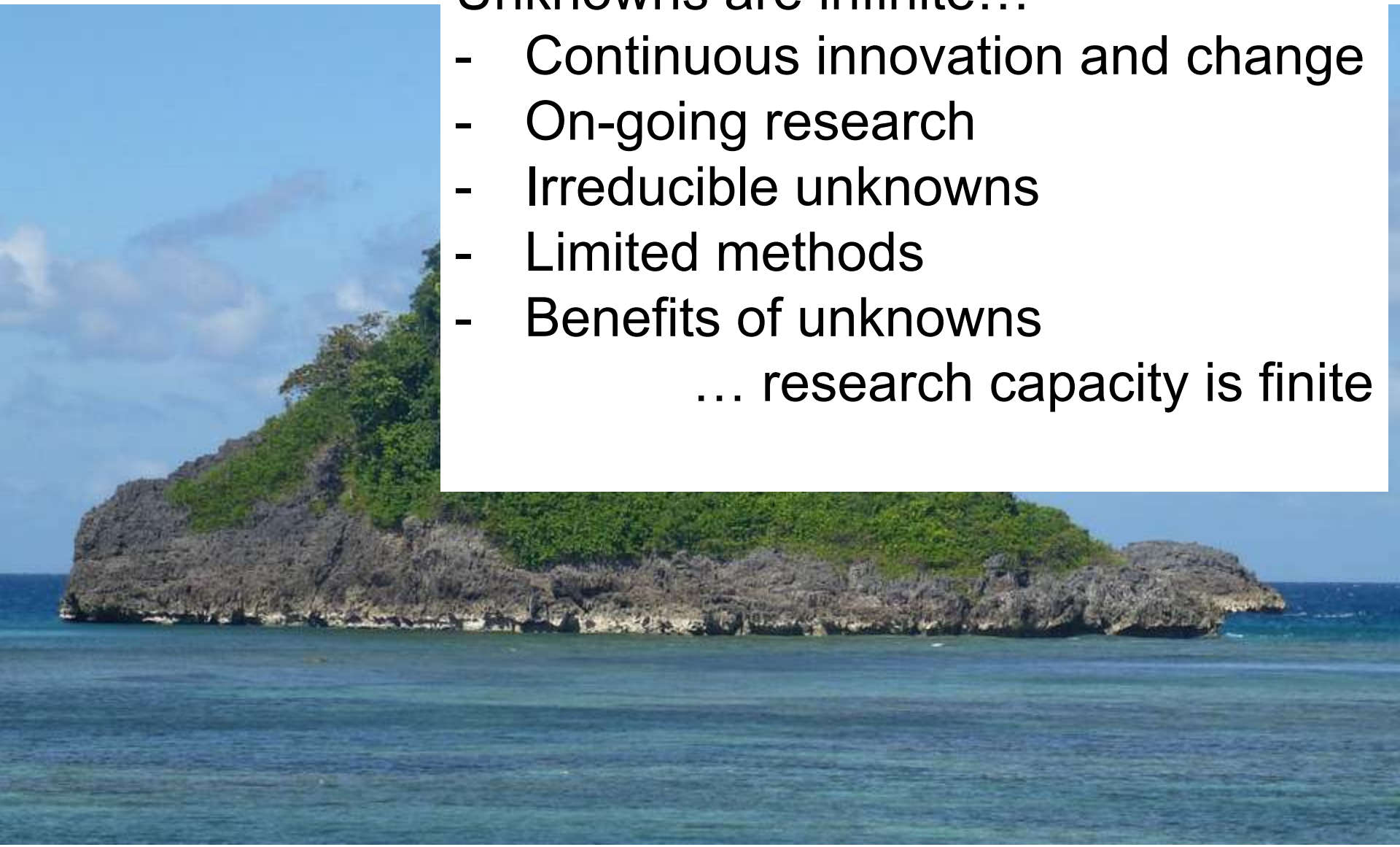

CONTEXT

1. Relevant historical, cultural, political, economic and other circumstances

2. Authorization

3. Institutional setting


U N K N O W N S



Unknowns are infinite…

- Continuous innovation and change
- On-going research
- Irreducible unknowns
- Limited methods
- Benefits of unknowns

… research capacity is finite

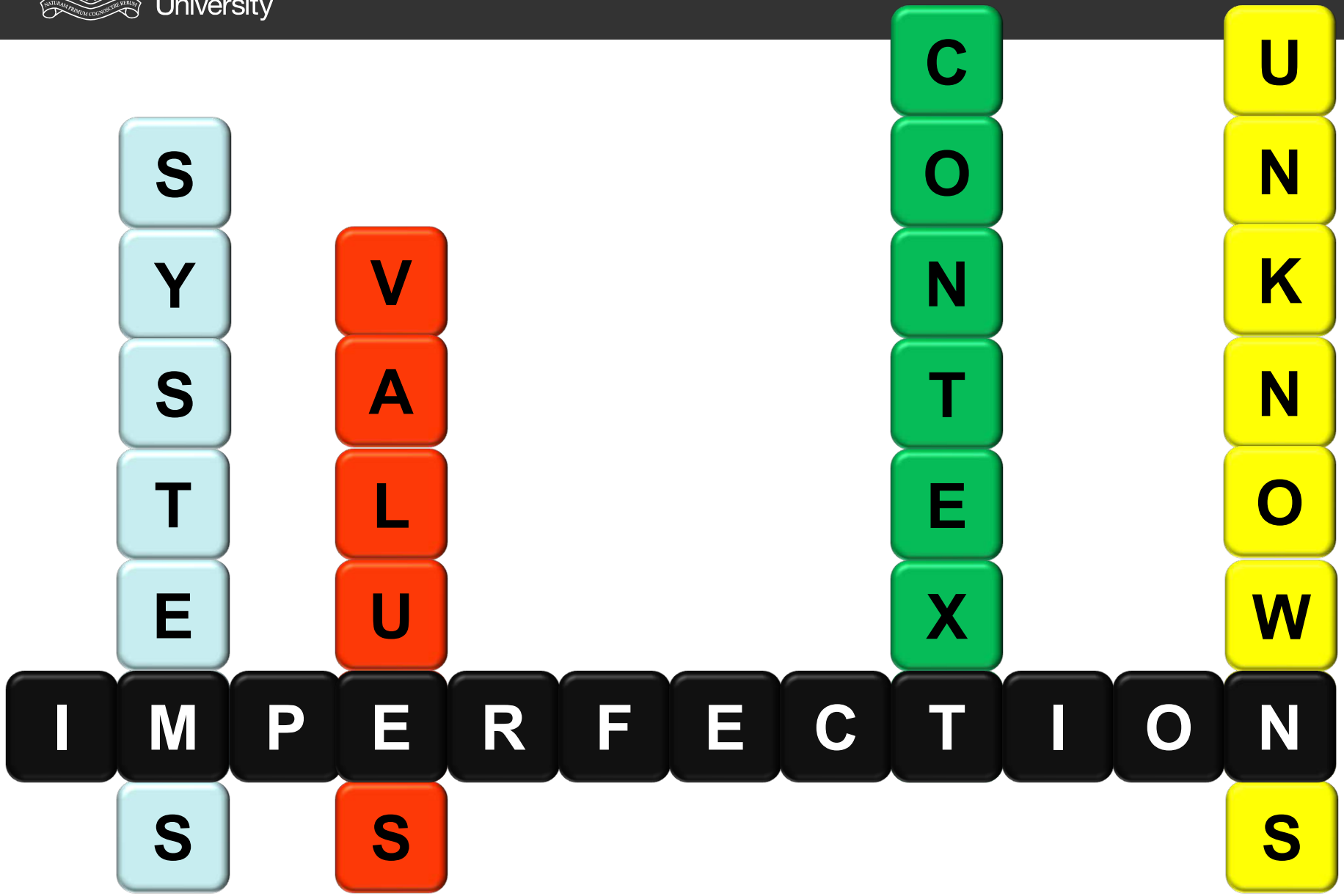
Current training on unknowns

Discipline-based training – focus on unknowns to reduce, banish the rest

Disciplinary excellence – pick productive unknowns (not dead end or trivial)

Systems-based focus (problem as a whole) – worry about what's been banished

Australian National University

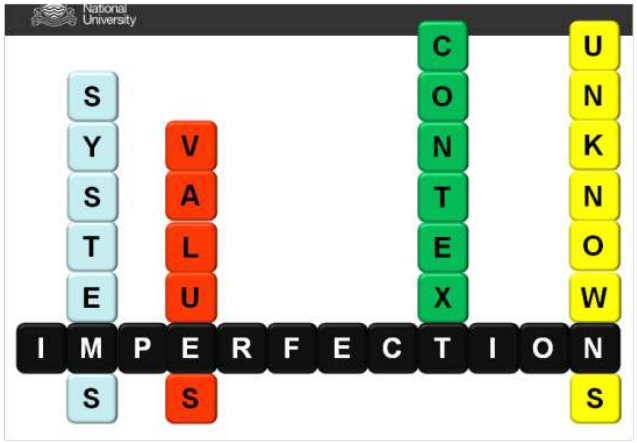


Imperfection is inevitable because of…

- Artificial boundaries within systems
- Inability to resolve value conflicts
- Magnitude of context
- Unavoidable unknowns

Summary: Ability to diagnose problem

‘Wicked’ or complex problems need an additional set of skills

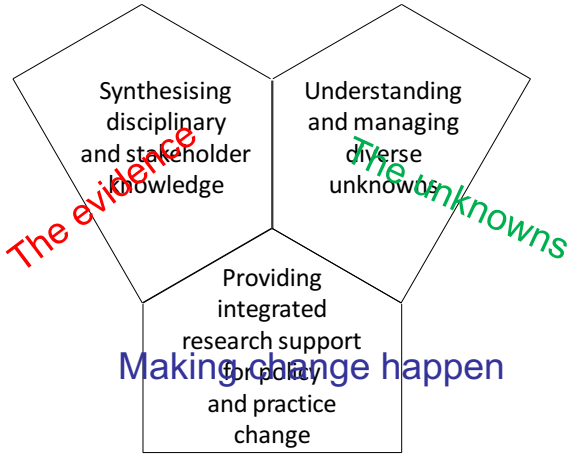


In a nutshell… 3

1. Three key domains of knowledge & skills…

2. Ability to diagnose the problem…

Especially – is it solvable or 'wicked'? (if wicked ++)



3. Your position in the team:
   - Leader
   - Transdisciplinary expert
   - Disciplinary expert

Your position in the team…

Leader – you need to understand and legitimise the approach

Transdisciplinary expert – you need to be able to do it

Disciplinary expert – you need to effectively contribute your skills in this environment

Where can I go in a university to learn how be a transdisciplinary expert?

It's no-one's job to…

- Deal with problem as a system
- Identify which disciplines and stakeholders are relevant
- Bring their perspectives together
- Identify relevant aspects of context
- Identify and manage value conflict
- Worry about unknowns esp unintended consequences
- Figure out best possible solution …

It's no-one's job to…

- Deal with problem as a syst
- Identify which disciplines relevant
- Bring the
- Id context
- value conflict
- unknowns esp unintended consequences
- Figure out best possible solution

What would it mean for this knowledge and skills to be recognised as a discipline?

Enter…

i2

Integration and Implementation Sciences

How would a discipline work?

- Provide an underpinning framework and resources repository
- Harness the power and respect the differences among communities
- Make the diverse range of theory and methods available
  - Across communities
  - To and across teams
- Provide a focus for an academic power base

Making theory and methods accessible http://i2s.anu.edu.au/

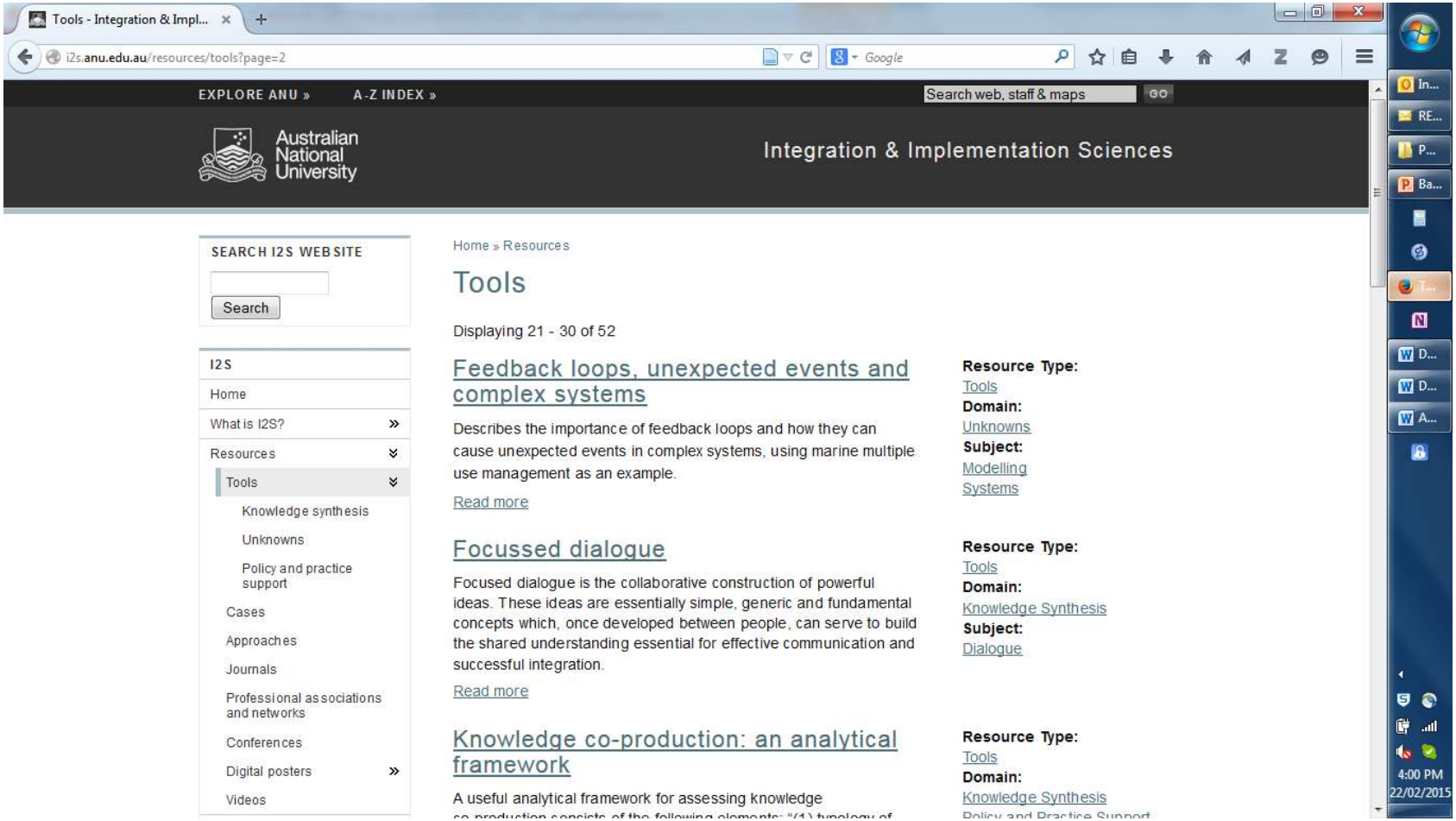
Integration and Implementation Sciences (I2S): Improving research impact on complex real-world problems

I2S enhances:
- knowledge synthesis
- dealing with diverse unknowns
- providing integrated research support for policy and practice change

I2S provides a growing repository of resources drawing from related approaches, including systems thinking, transdisciplinarity, implementation science, action research and more. I2S books and reports present original concepts, methods and applications.

» read more about I2S aims, publications and projects

Developing a repository http://i2s.anu.edu.au/resources…



Individual methods

Collaboration and team science field guide

Critical back-casting

CoNavigator

Ethical matrix

Boundary critique

Fishbone diagram

Three types of knowledge tool

Eight question scoping framework

Agent-based modelling

Metaphors

Critic systems heuristics

Six dimensions of context

Five why's

Nominal group technique

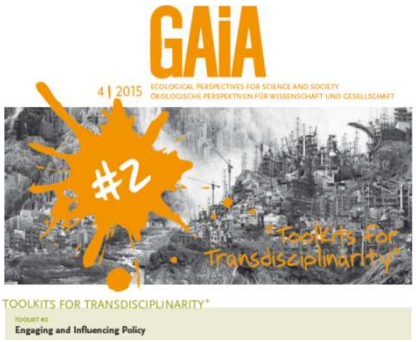
Patterns

Walt Disney circle

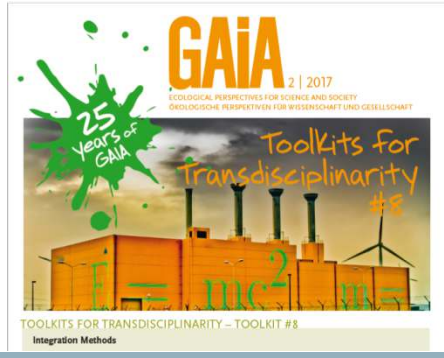
Immunity to change™ process

Causal loop diagrams and system dynamics modelling

GAIA's Toolkits for Transdisciplinarity



Co-producing knowledge - Engaging and influencing policy - Collaboration - (Dynamic) Systems thinking - Dialogue methods for knowledge synthesis - Integration methods - Integration and Implementation Sciences - Change



Powhiri: An indigenous example of collaboration from New Zealand

December 8, 2016 Community Member Concepts Author - Rawiri Smith, Collaboration, Communication, Dialogue, Indigenous knowledge

Community member post by Rawiri Smith


Rawiri Smith (biography)

Collaboration is important in New Zealand as a method of bringing communities together to work on complex problems. A useful collaborative model is the Powhiri, practiced by Maori, the indigenous people of New Zealand, for hundreds of years.

The formal welcome to an area in New Zealand is a Maori process known as the Powhiri. The Powhiri recognises the mana of all the participants. One of the most important values of the Maori people is manaaki,

Should I Trust that Model?

October 6, 2016 Community Member Methods Author - Val Snow, Best practice, Evaluation, Modelling

Community member post by Val Snow

How do those building and using models decide whether a model should be trusted? While my thinking has evolved through modelling to predict the impacts of land use on losses of nutrients to the environment – such models are central to land use policy development – this under-discussed question applies to any model.

In principle, model development is a straightforward series of steps:

Undertaking bi-cultural research: key reflections from a Pākehā (non-Māori) New Zealander

September 26, 2017 Community Member Concepts Author - Maria Hepi, Best practice, Collaboration, Cross-cultural, Diversity, Indigenous knowledge, Mutual learning

Community member post by Maria Hepi


Maria Hepi (biography)

What does it mean to be a bi-cultural researcher? The following eight key reflections are based on working bi-culturally in New Zealand.

I am a Pākehā (non-Māori) New Zealander and started learning Māori language and culture at university in 1995. Previously I had little to no contact with te reo Māori (the Māori language) or te ao Māori (the Māori world and culture). During my studies I became involved in kapa haka (the university Māori cultural club), and as such was exposed to a whole new world.

http://i2insights.org

Cross-cultural collaborative research: a reflection from New Zealand

December 15, 2016 Community Member Concepts Author - Jeff Foote, Boundaries, Collaboration, Framing, Indigenous knowledge, Trust

Community member post by Jeff Foote


Jeff Foote (biography)

How can non-indigenous researchers work with indigenous communities to tackle complex socio-ecological issues in a way that is culturally appropriate and does not contribute to the marginalisation of indigenous interests and values?

These questions have long been considered by participatory action researchers, and are of growing relevance to mainstream science organisations, which are increasingly utilising cross-cultural research practices in recognition of the need to move beyond

Problem framing and co-creation

October 27, 2016 Community Member Methods Archetypes, Author - Graeme Nicholas, Boundary object, Co-construction, Co-creation, Co-design, Co-production, Collaboration, Conceptual models, Critical system heuristics, Diversity, Framing, Problem definition, Rich pictures, Sense-making, Soft systems methodology, Viable system model

Community member post by Graeme Nicholas

How can people with quite different ways of 'seeing' and thinking about a problem discover and negotiate these differences?

A key element of co-creation is joint problem definition. However, problem definition is likely to be a matter of perspective, or a matter of how each person involved 'frames' the problem. Differing frames are inevitable when participants bring their differing expertise and experience to a problem. Methods and

Unintended consequences of honouring what communities value and aspire to

January 26, 2017 Community Member Case study Author - Melissa Robson, Collaboration, Cross-cultural, Decision support systems, Modelling, Participation, Policymaking, Research, Scenarios, Stakeholders, Unintended consequences, Values

Community member post by Melissa Robson


Melissa Robson (biography)

It seems simple enough to say that community values and aspirations should be central to informing government decisions that affect them. But simple things can turn out to be complex.

In particular, when research to inform land and water policy was guided by what the community valued and aspired to rather than solely technical considerations, a much broader array of desirable outcomes was considered and the limitations of what science can

Australian National University

Where are the stakeholders in implementation science?

September 8, 2016 | Community Member | Concepts | Arnstein's ladder, Author - Allison Metz, Author - Annette Boaz, Co-construction, Co-creation, Co-design, Co-production, Collaboration, Implementation science, Participation, Stakeholders

Community member post by Allison Metz and Annette Boaz

Should implementation science make more room for consultation, collaboration and co-creation with stakeholders? Would finding more active roles for stakeholders in implementation science be a promising approach to increasing the use of research evidence for improvements in policy and services?

The goal of implementation science is to promote the sustainable implementation of research evidence at

What makes a translational ecologist? Part 3: Dispositional attributes

July 4, 2016 | Community Member | Concepts | Author - Translational Ecology Group, Communication, Diversity, Ethics, Higher education, Negotiation, Translational ecology, Values

Community member post by the Translational Ecology Group

Translational Ecology Group

This is the third and final blog post considering competencies to make ecologists more effective in informing and supporting policy and practice change (see the right sidebar for links to all four related blog posts on translational ecology). In other words these are the competencies underpinning a new discipline

Five principles for achieving impact

September 27, 2016 | Community Member | Methods | Author - Mark Reed, Change, Collaboration, Communication, Context, Diversity, Networks, Participation, Power, Research impact, Research implementation, Stakeholders, Teams, Trust

Community member post by Mark Reed

What key actions can help research have impact? Interviews with 32 researchers and stakeholders across 13 environmental management research projects lead to the five principles and key issues described below (Reed *et al.*, 2014).

1. Design:

- Understand what everyone wants. This can help in managing expectations of different stakeholders

Should researchers be honest brokers or advocates?

April 5, 2016 | Community Member | Concepts | Advocacy, Author - John Callewaert, honest broker, Integrated assessment

Community member post by John Callewaert

John Callewaert (biography)

When to advocate and when to be an honest broker is a question that deserves serious attention by those working on collaborative and engaged research initiatives. In my role as the Integrated Assessment director at the University of Michigan's Graham Sustainability Institute I facilitate a wide array of collaborative research efforts. For most of our initiatives we strive to work within an honest broker frame. Following the work of Pielke (2007), the honest broker engages in decision-making by clarifying and sometimes

http://I2Insights.org

Dealing with deep uncertainty: Scenarios

January 5, 2017 | Community Member | Methods | Author - Laura Schmitt Olabisi, Decision support systems, Modelling, Participatory Modelling, Scenarios, Simulation, Systems, Uncertainty, Unknowns

Community member post by Laura Schmitt Olabisi

Laura Schmitt Olabisi (biography)

What is deep uncertainty? And how can scenarios help deal with it?

Deep uncertainty refers to 'unknown unknowns', which simulation models are fundamentally unsuited to address. Any model is a representation of a system, based on what we know about that system. We can't model something that nobody knows about—so the capabilities of any model (even a participatory model)

Playing Around with PARTICIPOLOGY

June 7, 2016 | Community Member | Methods | Author - Alister Scott, Co-design, Collaboration, Education, Gaming, Participation, Stakeholders

Community member post by Alister Scott

Alister Scott (biography)

Have you ever wanted a new way to engage with stakeholders that is more engaging, fun and effective? PARTICIPOLOGY is a set of open-access web resources and associated guidance that sets out to achieve these aims. It uses a board game format where players encounter questions and challenges as a dice throw dictates. The board, questions and rules of the game can be designed from scratch or existing templates can be adapted to the specific goals you have in mind. The game was designed to be used in participatory forums

Five Steps for Managing Diversity to Create Synergy

May 19, 2016 | Community Member | Methods | Author - Doug Easterling, Co-construction, Co-creation, Co-design, Co-production, Collaboration, Diversity, Facilitation, Power, Stakeholders, Synergy

Community member post by Doug Easterling

Doug Easterling (biography)

How can we address social, environmental, political and health problems that are too big and too complex for any single person, organization or institution to solve, or even to budge? How can we pool our wisdom and work collaboratively toward purposes that are larger than ourselves?

In theory at least, co-creation generates innovative solutions that transcend what would otherwise be produced by the participants acting on their own. In other words, co-creation can foster synergy.

Advice to graduate students on becoming "translational"

August 18, 2016 | Community Member | Education | Author - Alexis Erwin, Higher education, Translational ecology, Translational science

Community member post by Alexis Erwin

In an earlier post on this blog, Mark Brunson posed the questions: *How does an ecologist become "translational"? What training is needed to venture beyond the lab or university and to engage with the potential beneficiaries or users of research?* Here I offer my own thoughts as someone who started working to "become translational" halfway through a traditional ecology Ph.D. program.

Although the focus of this blog post is on

Co-Production: It's all about relationships

June 30, 2016 | Community Member | Concepts | Author - Kirsten Kainz, Co-production, Relationships, Scale, Trust

Community member post by Kirsten Kainz

Kirsten Kainz (biography)

Relationships are the underpinnings of the co-production process. The quality of knowledge gained and the solutions produced are a function of the quality of relationships among the participants.

In a recent paper, Lorrae van Kerkhoff and Louis Lebel (2015) also made strong claims about the relevance, salience, and potential impacts of relationships in the co-production of science and governance needed for sustainable improvements responding to global environmental change.

https://www.edx.org/course/ignorance-anux-igno101x-0

If you want to know more…

http://i2s.anu.edu.au

http://I2Insights.org

Global Network for Research Integration and Implementation

http://www.linkedin.com/groups/Global-Network-Research-Integration-Implementation-4888295

@GabrieleBammer

#I2Sresources