13. How?

In this chapter, addressing the framework question '*How are diverse unknowns understood and managed, by whom and when?*' focuses on ways of responding to unknowns that move beyond the standard approaches in disciplines and that can encompass the diversity of unknowns. Dealing with imperfection is an area that has yet to be developed. Let us start by recapping how researchers are educated about unknowns in the disciplines. Becoming a skilled researcher requires mastering the ability to pick key unknowns (those that substantially move the discipline's knowledge base forward and open up fertile areas for future research), which are targeted for reduction, while the rest are put to one side (banished). How to do this is part of the tacit knowledge that researchers acquire as they develop expertise in their disciplines. This approach has been highly productive in understanding many aspects of the world around us, but, as I argue here, it is not sufficient for comprehending and dealing with complex social and environmental problems. Smithson[1] proposes four additional strategies for managing unknowns. These responses provide starting points for developing a systematic approach in I2S. Unknowns can, therefore, be

- reduced
- banished
- accepted
- surrendered to
- exploited
- denied.

A brief description of each is presented next. As well as using these six strategies to respond to unknowns in integrative applied research, it is also useful for I2S specialists to understand how else they can be employed. For example, fundamentalists deny unknowns and offer dogmatic solutions to all questions. These aspects of responding to unknowns are also discussed briefly. After reviewing these six approaches to managing unknowns, I deal with who in the integrative applied research team considers unknowns, followed by when in the research process this occurs.

1 Smithson et al. (2008).

Reduction

The focus here is not on reducing unknowns as would occur in conventional disciplines, but rather how else reduction can be used in I2S. The challenge involves thinking about *diverse* unknowns—in other words, unknowns that would not normally be considered in discipline-based research—and how these can be reduced. This includes the following.

- Looking for productive unknowns at the intersection of two or more disciplines. For example, many thriving areas of 'interdisciplinary' research such as behavioural economics and mathematical psychology explore fertile unknowns at the intersections of two disciplines. Such research can also occur in a more ad-hoc manner, such as when a legal scholar looks at informed consent in medical practice or an international relations expert examines organised crime.
- Importing a reduction method from one discipline to another to allow previously intractable problems to be tackled. An example is the revolution in archaeology by applying the methods of genome sequencing, which has provided new insights into the evolution of humans.
- Finding ways to understand some types of unknown unknowns. Some dialogue processes may be able to more specifically target unknown unknowns, especially those which occur on an individual or community basis, by exposing them and bringing countervailing evidence to bear in a way that allows learning rather than entrenching existing positions.
- Making tactic knowledge explicit. An important limitation to partners from different disciplines and stakeholder groups understanding each other is lack of appreciation of tacit knowledge. Not understanding the way things are done can lead to ill feeling and even conflict, and I2S specialists can make integrative applied research team members aware of this. If we take the example of good laboratory practice, a sociologist who lacks this knowledge will often not appreciate why sandals are not appropriate footwear and eating a sandwich while visiting someone in a laboratory is unacceptable. The response to such inappropriate behaviour is often 'they should have known', but I2S training can explain why this is not the case.

Banishment

Banishment rules some unknowns out of bounds. As already discussed, this is what disciplinary approaches to unknowns do. They effectively define which unknowns a particular piece of research will aim to reduce and everything else is generally put aside. One method to explore in developing I2S is whether and

when it can be profitable to revisit the unknowns that have been banished in discipline-based investigations to determine if these are important when the complex real-world problem is considered as a whole. How to do this is also a challenge, because much of the banishment in discipline-based research is unconscious. Nevertheless, it is sometimes articulated—for example, when researchers declare that an investigation will not deal with specific topics.

Of course banishment will also be employed in I2S because it is key to the boundary-setting process. As discussed in Chapter 12, the challenge when considering diverse unknowns at different levels of sophistication is to develop effective criteria for banishment. Certainly an aim for I2S is to make banishment an explicit, considered process.

Acceptance

We now move to the first of the four less common strategies. Acceptance is a key approach to dealing with unknowns that cannot realistically be reduced, but are also too important to be ignored. Acceptance is particularly relevant in integrative applied research and I2S. The challenge for I2S is to decide which unknowns in the real-world problem of interest should be accepted, how much effort to put into developing acceptance methods and which techniques to concentrate on.

The development of ways to accept unknowns is well under way and includes methods devised by disciplines such as statistics (figuring out the likelihood of some important unknowns occurring) and economics (diversification and hedging),[2] as well as approaches widely applied to environmental and other problems, such as the development of scenarios[3] and the precautionary principle.[4] These different acceptance methods are illustrated in the following hypothetical example about the environmental impact of banks of solar panels in deserts. Let us consider just one impact—that on surface and soil water. Some of the ways in which acceptance techniques could be employed are

- the probability of rain could be calculated, along with likely run-off and penetration into the soil

2 Diversification is 'not putting all your eggs in one basket', as the old adage goes, whereas hedging aims to limit risk by investing against failure (for example, taking out insurance in case the original investment does not succeed).

3 Badham (2010).

4 At the 1992 Earth Summit in Rio de Janiero, the precautionary principle was stated as follows (Principle 15): 'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation' (United Nations Conference on Environment and Development 1992; <www.un.org/documents/ga/conf151/aconf15126-1annex1.htm>, accessed 19 September 2012).

- scenarios could be developed for normal and extreme events, the latter including abnormally high or frequent rainfall or unusually long dry spells
- if different spacing of the solar panels in the banks has different impacts, diversification could be achieved using a range of spacing regimes
- an irrigation system could be installed to hedge against soil drying.

Scoping and boundary setting apply here too, in that the challenge is not just to identify a range of acceptance methods, but also to decide which ones to concentrate on, as resources will always be limited. Taking the options above, decisions have to be made, for example, about whether to focus on different rainfall scenarios or to design diverse spacing options.[5]

Another method that warrants mention is adaptive management as this is an acceptance technique that also takes imperfection into account. This has been developed largely in the area of natural resource management and follows implementation of the best available response to a problem by an ongoing process of monitoring, learning from what happens and setting in place modified responses based on that learning. At this stage it is primarily an ideal rather than a demonstrated reality.[6]

Surrender

Surrender to the unknown moves beyond acceptance by making unknowns an active partner. The worlds of art and extreme sport provide the best examples. In art, two illustrations come from the Australian John Wolseley, who actively incorporates the unknown into his creations. One instance is a series where he buried half of each painting under a rock in the outback, letting natural processes complete the work. Another is where he brushed his canvas across bushfire-blackened plants to create the artwork.[7] Similarly, the attraction of extreme sport is the high number of variables that cannot be controlled.

I have not been able to find an example in the research context, but it is interesting to speculate what research that involves surrender to the unknown could look like. Let us imagine an ethnographic study involving participant observation where a researcher goes to a party to study illicit drug use. The researcher could use chance explicitly to guide many key decisions—where in

5 But priorities have to be decided on another level, too. For example, should the environmental risks of all the energy options (not just this type of solar energy) be considered instead? And, if so, which risks should be the focus of attention?

6 Stankey et al. (2005).

7 Grishin (2008).

the room to start, who to observe, when to move and change observations, and so on.[8] It is not clear how this could be relevant to I2S but having it available may turn out to be useful.

One aspect of surrender that is helpful for I2S is that it can explain fatalism. While the forms of surrender described above are active, fatalism is passive. In other words, certain actions are not taken (usually to avoid disturbing the status quo) because 'what will be will be'. This can help integrative applied researchers understand what is occurring in some situations and potentially design countervailing strategies.

Exploitation

An important example of exploitation of unknowns in integrative applied research is the use of vagueness. Indeed no research can proceed if outcomes and processes are too rigidly specified, as this stifles initiative, innovation and flexibility. Vagueness can be particularly valuable when team members have diverse expertise, as it can be used to get the research started without incurring all the transaction costs of establishing fully shared knowledge and processes up front.[9]

The use of exploitation is also something I2S has to understand. How different stakeholder groups employ exploitation can provide integrative applied research teams with valuable insights into how a problem has developed or how it is being managed in the policy or practice worlds. For example, terrorists gain much of their power by exploiting unknowns.[10] Even relatively small-scale acts of violence can provoke widespread fear because when, where and whether they will occur again are unknown. A different way of exploiting unknowns is found in political and religious fundamentalism. Here power is gained by taking advantage of people's desire for certainty.

On a more benign level, politicians routinely exploit unknowns in at least two ways. First, unknowns can be used to cause delay. If politicians want to postpone a decision on a particular topic, referring the issue to an inquiry or

8 For example, the room could be divided into six quadrants and a dice thrown to determine the starting point. If there are 10 people in that quadrant a random number generator could be used to choose one to observe closely.

9 While there have been calls for integrative applied research teams to settle on a 'shared language' before proceeding, an alternative is to dive in, with important differences being dealt with when they become evident. This works best when team members are invigorated rather than annoyed when differences become evident, as these are powerful moments in collaborations. One role of I2S specialists is to be alert to the likelihood of differences and to help the team work through them when they become apparent. Of course, this approach also has costs, as considerable backtracking may be required.

10 McFadden et al. (2008).

commissioning new research are effective techniques. Second, politicians avoid setting well-specified goals with measurable criteria for success. This is because any deviation, especially if some outcomes are not accomplished, provides ammunition for opposition parties during election campaigns.[11] Furthermore, being too specific may prevent policy experimentation or modifications when they are warranted.[12]

Denial

Denial can be helpful in a crisis. As Aileen Plant (cited in the opening to Chapter 10) demonstrated, in a situation like the SARS epidemic where unknowns are overwhelming, the only way forward is to act and to base those actions on the best available analogies to the current situation. This involves effectively denying the unknowns.[13]

Denial is also widely used and therefore important to understand. For example, fundamentalism not only exploits unknowns, but also denies them, asserting that a dictator or a holy book has all the answers. But fundamentalists are not the only ones who deny unknowns. In the diamorphine trial feasibility research, we became aware of how partisan groups exploited and denied unknowns. It is a common observation that advocates use the facts that suit their case and ignore the rest. This is also true of unknowns. Those supporting a trial would often dismiss or deny the unknowns, whereas those opposing a trial exploited the unknowns to raise concerns about a trial.

Furthermore, Smithson argues that denial probably occurs more frequently than we are aware of. He cites an example where the *British Medical Journal* banned the word 'accident' from its publications.[14] Understanding how denial is used, particularly when it is misused, can therefore be important for I2S.

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11 Moore (2008, p. 178) pointed out that '[t]here is a clear political advantage in maintaining an unclear situation so that a perception can be created of achievement without actually having to deliver anything specific'. While such exploitation of unknowns can be used in a cynical manner, Moore also highlighted the danger of specific goals, especially if all were not achieved—namely that 'an opposition at the next election… would ignore the 11 (or however many) achievements and focus on the failure(s)' (p. 176).

12 For example, policy makers may need 'the freedom to explore and implement a raft of policies', especially when the evidence base is not strong (Ritter 2008, p. 168).

13 As this and other examples show, the distinction between denial and banishment is not clearcut. I use denial when the process of ignoring some unknowns is not freely acknowledged out of strong beliefs or for political purposes, such as acting in the best interests of the public (as in Plant's case).

14 See Davis and Pless (2001). This was done to emphasise that many accidents are preventable.

Complexities in Managing Unknowns

The complex nature of unknowns was introduced in Chapter 10, especially the different kinds of unknowns, the diverse ways disciplines and stakeholders understand unknowns and various dimensions of unknowns that different disciplines and stakeholders highlight. Further complexities become apparent when the management of unknowns is addressed. Two in particular are described here.

First, depending on the circumstances, each of the six strategies presented above can be adaptive or maladaptive.[15] In other words, it is not possible to make blanket statements like reduction is always good and denial is always bad. This was illustrated in the description of denial, which is often negative, but which can be an adaptive response in an emergency. A different example is where a patient may wish to thoroughly investigate the benefits and risks of competing options before having elective surgery (reduction), but is likely to be better off trusting the doctor's judgment in a life-threatening situation (acceptance). A similar instance for a research project is that it might include a detailed study aimed at reducing particular unknowns if there is no urgency to act, but may devise a rapidly implementable strategy for dealing with the unknowns based on acceptance if there is a window for developing new policy based on the best available evidence. An important determinant, therefore, of whether a management strategy is adaptive or maladaptive is the context in which the strategy is being implemented, as well as the implementer's resources, mental state and time constraints.

Second, considerable work is still required to determine if different kinds of unknowns can be matched to particular management strategies. In cases where more than one strategy is applicable, investigation could elucidate the trade-offs based on the benefits and costs of each option. For example, decisions may need to be made about whether a particular unknown will be banished, reduced or accepted. In planning a new treatment service, for example, demand is usually an important consideration. If the clients are illicit drug users, demand can be challenging to ascertain. Planners then need to choose whether: a) they will banish consideration of the number of drug users who will seek such a service and simply set it up hoping for the best; b) undertake research on user numbers and the history of access to services to gain information on which estimates of demand can be based (reduction); or c) model different demand scenarios using different assumptions about numbers of users and factors that influence treatment access (acceptance). In this case, reducing unknowns or accepting them will take time and the opportunity for taking action may pass. On the other hand, banishing unknowns may be expedient, but may result in action that is poorly targeted and ineffective.

15 Smithson et al. (2008).

Tasks for the I2S Development Drive
Identify and catalogue the full range of methods that have been used for understanding and managing diverse unknowns, as well as their conceptual bases and case examples of their application. Update and improve existing compilations. Develop new methods for understanding and managing unknowns, including reduction (beyond methods used in the disciplines), acceptance, surrender, exploitation and denial. Draw together understandings of how stakeholders might use strategies like surrender, exploitation and denial in furthering their agendas, so that these can be taken into account in understanding and responding to complex real-world problems. Pull together concepts, methods and cases that will assist in appreciating and dealing with the complexities involved in understanding and managing diverse unknowns (for example, that the same strategy can be adaptive or maladaptive depending on the circumstances).

Who Undertakes the Consideration of Unknowns?

If integrative applied research is to achieve broader consideration of diverse unknowns, teams need to be open to moving beyond their disciplinary training in figuring out which unknowns the integrative applied research will deal with and how. This will include

1. responding to all the critical unknowns in the real-world problem, even if some methods are not very advanced
2. looking for innovative ways to strengthen or develop the less sophisticated approaches to managing unknowns
3. taking the complexity of unknowns into account
4. making explicit the banishment of unknowns through boundary setting.

It is possible for the whole team to be involved in such broader consideration of unknowns, or for it to be primarily the task of a subgroup or of an individual. Each option has advantages and disadvantages. The latter range from the transaction cost for a group process to a reduced grasp of unknowns for a single person.

When is the Consideration of Unknowns Undertaken?

Identifying unknowns and deciding how to deal with them are core to starting the integrative applied research. But one of the lessons that comes from understanding the complexity of unknowns is that flexibility needs to be built into any long-term project, as, for example, new unknowns may be uncovered, problematic trade-offs may become evident and opportunities to influence policy or practice may arise, each of which may require a new approach to the unknowns.

It is also useful to explore the advantages and disadvantages of multidisciplinary and transdisciplinary research in relation to unknowns, even though unknowns have not been a major consideration for those practising either approach. In multidisciplinary research, the emphasis is on disciplinary contributions, which has potential positives and negatives. Even though the mapping between different kinds of unknowns and disciplinary approaches is only partial, if disciplines with different approaches to unknowns are included, this can automatically broaden the consideration of unknowns. The challenge comes in bringing these different approaches together in a meaningful way in relation to the problem as a whole.

The advantage of transdisciplinary research is that it provides the opportunity for a rich and complex approach to unknowns to be built in at the beginning of the research process. But again, as for knowledge synthesis, the price can be lack of flexibility in responding to new unknowns, which becomes evident as the research progresses.

The distinction between multidisciplinary and transdisciplinary approaches to some extent also encompasses the discussion about vagueness presented earlier. In multidisciplinary research, how the different approaches to unknowns will fit together tends to be quite vague when the project commences, whereas in transdisciplinary research there will often be attempts to reduce vagueness up front—for example, by establishing a common language and shared problem framing.

Task for the I2S Development Drive
Collect case examples of implementation of different options for who undertook the comprehensive consideration of diverse unknowns and when in the research process this occurred.

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