

2. Getting Specific: Three domains, a five-question framework and the overall approach

This chapter presents a preview of the disciplinary structure of I2S, which is developed in detail in Chapters 3 to 30. The starting point is the three domains that characterise integrative applied research and I2S: 1) synthesising disciplinary and stakeholder knowledge, 2) understanding and managing diverse unknowns, and 3) providing integrated research support for policy and practice change.

I then provide a series of definitions for terms used throughout the book. I have delayed presenting the definitions until now because it is only at this stage that all the terms have been introduced and fully explained.¹

Returning to the main argument, a five-question framework for fleshing out each of the three domains is presented. The notion of an I2S disciplinary ‘storehouse’ is then introduced, along with discussion of how it will be filled with concepts, methods and case examples by the I2S Development Drive.

The last two parts of this chapter focus, first, on the structure of the book and, second, on the audiences and the function of the commentaries, reiterating and expanding on what I have set out beforehand.

Three Domains

I propose three foundational domains for integrative applied research and I2S. These were foreshadowed in Chapter 1, but are described in more detail here—namely

1. synthesising disciplinary and stakeholder knowledge
2. understanding and managing diverse unknowns
3. providing integrated research support for policy and practice change.

The basis for the first domain—synthesising disciplinary and stakeholder knowledge—is the widespread recognition² that improved appreciation of

1 To try to keep the argument clear, some terms were only partially explained in Chapter 1, with this description being embellished after other necessary concepts are introduced.

2 Especially in the approaches that have informed the development of integrative applied research—namely interdisciplinarity, multidisciplinarity, transdisciplinarity, post-normal science, systemic intervention, integrated assessment, sustainability science, team science, mode 2, action research and related initiatives.

complex real-world problems does not just involve combining knowledge from multiple disciplines, but also requires relevant stakeholder knowledge to be taken into account. Stakeholders are all those groups who have a practical grasp of the problem. It can be useful to think about them as: a) those affected by the problem, and b) those in a position to influence the problem. Relevant stakeholders will vary from case to case, but can include communities, occupational groups, socioeconomic groups, people affected by a disease, as well as business groups and politicians. To take a specific example, the World Commission on Dams worked with ‘government agencies, project affected people and non-governmental organisations, people’s movements, the dam construction industry, the export credit agencies and private investors, and the international development community’.³ Stakeholder groups are rarely homogeneous, but are likely to contain a range of perspectives about the problem of interest. Common ways of capturing stakeholder knowledge are to undertake surveys of relevant groups, to conduct workshops with them and to invite representatives to be on research advisory committees.⁴ This domain is described in detail in the next section, encompassing Chapters 3 to 9.

While there is broad agreement about the importance of bringing together disciplinary and stakeholder knowledge, the second domain—understanding and managing diverse unknowns—generally receives much less attention, although its significance has been highlighted by post-normal science,⁵ as well as some research on environmental problems.⁶ In integrative applied research, the focus on complex real-world problems means that new ways of understanding and managing unknowns have to be developed, rather than relying only on current standard approaches. As I describe in Chapter 10, a key issue for complex real-world problems is that unknowns cannot be eliminated and that imperfection is an inevitable result. I return to the theme of imperfection at various places in the book.

The approach taken here contrasts with most research traditions, which see unknowns only as the substrate that they convert to knowledge. In fact, the hallmark of good discipline-based research is to carve out a specific productive unknown to work on and to banish the rest from consideration. That is how progress is made; however, in integrative applied research, the problem-based focus has two consequences. One is that, from the perspective of understanding the problem, there may be critical gaps resulting from issues that do not come into the domain of a discipline or have been banished in the various disciplinary approaches. A path has to be found that brings consideration of these gaps

3 World Commission on Dams (2000, p. viii).

4 Some approaches, like action research, aim to include stakeholders as co-researchers, but this is more likely to work on a small scale, such as improving a particular health service.

5 Funtowicz and Ravetz (1993).

6 See, for example, Kasperson (2008).

into play, without drowning in the impossibility of dealing with all relevant unknowns. The other consequence is that different disciplinary and stakeholder approaches to the unknown need to be brought together to provide a rich understanding of different types of, and ways of dealing with, unknowns. This domain is much less well developed than the other two, but, as described in the third section of the book (Chapters 10–16), significant steps are being made to find ways forward.

Finally, there is now considerable interest in how research influences policy and practice change, with growing literatures on ‘research translation’, ‘knowledge brokering’, ‘commercialisation’, and so on. The third domain—providing integrated research support for policy and practice change—seeks to synthesise and build on these advances. Two major foci are significant. One is the emphasis on *integrated* research—in other words, not just dealing with what is known about a problem, but also providing a way to understand and respond to what is not known.⁷ An important aim here is to assist with better decision making, which encompasses reducing, or at least being better prepared for, unintended consequences of policy or practice initiatives, which arise from ineffective understanding and management of unknowns. The second focus is *research support*. As described in the fourth section of the book (Chapters 17–23), which deals with this domain, research has a challenging role vis-a-vis policy and practice change: it is neither dominant nor subservient, and I seek to characterise this through the term ‘support’. As described further in that section, it can be helpful to think about change as occurring in three major arenas: government, business and civil society. Research may set out to be useful on a narrow or a broad scale. For example, it may be confined to one part of one arena, seeking to inform one government policy (such as a policy on homelessness) or one set of practices (such as the way illicit drug users are dealt with in treatment services). Broad input can be offered across two or three arenas and, within them, several policy and practice areas. Research on global climate change provides a good example here, in that it seeks to influence government policy in a range of areas (transport, housing, industrial development, and so on), as well as reorienting business activities and changing consumer and community behaviours.

As I have foreshadowed, these three domains provide the primary structure for the book, with a section comprising seven chapters devoted to each of them, as well as a fifth section (Chapters 24–30) that looks at all three together. Before considering the domains in more detail, let me define the key terms that have now been introduced and will continue to be used throughout the book.

⁷ This moves beyond focusing only on the *evidence* base for policy and practice.

Definitions

I make a central distinction between ‘synthesis’ and ‘integration’.⁸ ‘Synthesis’ is used for the bringing together of disciplinary and stakeholder knowledge, as in the first domain of I2S. ‘Integration’ (and related terms) refers to the combination of the synthesised knowledge with a considered response to the remaining unknowns about the problem.

Thus

Integrated research support is based on both what is known about the problem (resulting from the synthesis of disciplinary and stakeholder perspectives) and explicit recognition of what is not known about the problem (resulting from the consideration of diverse unknowns).

Integrative applied research is a research style that deals with complex real-world problems by bringing together disciplinary and stakeholder knowledge and explicitly dealing with remaining unknowns, in order to use that integrated research to support policy and practice change. An **integrative applied research team** is composed of investigators from a range of disciplines, including one or more I2S specialists. Many, but not necessarily all, team members also have expertise in the complex real-world problem under consideration. The team explicitly interacts with stakeholders, policy makers and practitioners.

Integration and Implementation Sciences or I2S is the discipline that underpins integrative applied research and which develops and applies concepts and methods for knowledge synthesis, understanding and managing diverse unknowns and providing integrated research support for policy and practice change.

In day-to-day English, synthesis, integrated, integrative and integration are variously interchangeable, but I have stuck to the specific uses defined throughout this book.

Similarly I use ‘stakeholders’, ‘policy makers’ and ‘practitioners’ in particular ways.

‘**Stakeholders**’ is used in the first domain to cover all the non-academic groups who have a valuable perspective on the problem.

‘**Policy makers**’ and ‘**practitioners**’ are used in the third domain specifically to cover the groups who will take action on the problem.

⁸ These words have not been used in the carefully defined ways described here in my previous publications.

There will often be overlap between these groups—in other words, a stakeholder group which provides a helpful perspective on a problem may be identical to a policy maker or practitioner group which is charged with responding to the problem. Nevertheless, for the purposes of clearly describing the I2S structure, I distinguish between them, depending on whether they are *aiding understanding* about the problem or *acting* on it.

Finally, it may be useful to summarise how this book ‘locates’ integrative applied research in relation to inter-, multi-, and trans-disciplinary research, post-normal science, systemic intervention, integrated assessment, sustainability science, team science, mode 2, action research and related initiatives. While integrative applied research builds on these other approaches, as outlined above, it also provides some key advances, specifically

- restricting the focus to team research on complex real-world problems
- defining a research style, which has a range of methodological options
- identifying three core domains
- specifying an underpinning discipline—namely I2S.

In addition, integrative applied research puts considerable emphasis on the exchange of methodological insights between research groups working on very different problems.⁹

In various places in the book multidisciplinary research and transdisciplinary research are used as examples of different ways in which integrative applied research can be conducted—in other words, as two methodological options for that research style.¹⁰ But otherwise I do not look in detail at the groundbreaking initiatives that have laid the foundations for integrative applied research. I have not analysed exactly where the ideas presented here originated or explored the similarities and distinctions between integrative applied research and the earlier initiatives. Such analysis and exploration are important future projects.

Fleshing Out the Three Domains: The five-question framework

Review of publications describing studies that tackled complex social and environmental problems reveals that there is no agreed systematic way to report on integrative applied research. Let us start with the first domain and use the

⁹ This is not precluded by interdisciplinarity and other approaches but is not a point of emphasis, which, as I proposed earlier, has limited their development.

¹⁰ In these examinations the specific meanings described in Chapter 1 (see Note 20) are used. These various discussions are drawn together and built on in Chapter 33.

investigations undertaken by the World Commission on Dams as an example.¹¹ The Commission marshalled a wide range of academic and stakeholder knowledge, drawing on perspectives both supporting and opposing dams. But if we want to learn from the methodology it employed, it turns out that the published documents offer only limited clues about a number of key questions concerning the synthesis of disciplinary and stakeholder knowledge. In other words, there is almost no information to help answer questions like the following.

- How did the Commission decide which disciplinary knowledge to build on and which to ignore, as well as which stakeholders to include and to exclude?
- How did it synthesise the findings of its various studies?
- Who was responsible for the synthesis?
- How were any barriers to synthesis addressed?

There are now countless examples of synthesis of disciplinary and stakeholder knowledge, but, as is the case with the World Commission on Dams, developing a comprehensive appreciation of how the investigations were conducted and which concepts and methods were employed remains elusive. The intent here is not to be critical of the Commission, or indeed to complain about other research projects. Rather, it is to show how much poorer the research community undertaking integrative applied research is for not being able to learn detailed lessons from the experience of the Commission and other investigations.

How can we systematically plan and report knowledge synthesis? I propose that the following five questions provide a useful framework.¹²

1. What is the synthesis of disciplinary and stakeholder knowledge aiming to achieve and who is intended to benefit?
2. Which disciplinary and stakeholder knowledge is synthesised?
3. How is the disciplinary and stakeholder knowledge synthesised, by whom and when?
4. What circumstances might influence the synthesis of disciplinary and stakeholder knowledge?
5. What is the result of the synthesis of disciplinary and stakeholder knowledge?

¹¹ World Commission on Dams (2000).

¹² The lack of an explicit methodology for knowledge synthesis was addressed at a 2004 symposium on the topic of 'integration' organised by the (then) Australian Research and Development Corporation, Land & Water Australia. (The organisation was defunded in 2009.) The results of the symposium can be found in Bammer et al. (2005a, 2005b). At the symposium we developed six questions, but I have subsequently combined two separate questions on 'how' and 'who'. For the original questions, see Bammer and LWA Integration Symposium Participants (2005).

The five-question framework can also be adapted to the other two domains of I2S, allowing them to be covered systematically.¹³ Taking all three domains together, the five-question framework becomes the following.

1. What is the integrative applied research aiming to achieve and who is intended to benefit?
2. What is the integrative applied research dealing with—that is, which knowledge is synthesised, unknowns considered and aspects of policy and practice targeted?
3. How is the integrative applied research undertaken (the knowledge synthesised, diverse unknowns understood and managed, and integrated research support provided), by whom and when?
4. What circumstances might influence the integrative applied research?
5. What is the result of the integrative applied research?

The questions can be stated in brief.

1. For what and for whom?
2. Which knowledge, unknowns and aspects of policy and practice?
3. How?
4. Context?
5. Outcome?

While these questions look simple, they encompass considerable methodological depth and this is fleshed out in the chapters that follow. As a set, the questions can be used to plan new integrative applied research or to describe ongoing or completed research. The order of the questions is not fixed. Sometimes it may be useful, for example, to describe the context first or to consider questions two and three together.

¹³ For the second domain the questions are: 1) what is the understanding and management of diverse unknowns aiming to achieve and who is intended to benefit; 2) which unknowns are considered; 3) how are diverse unknowns understood and managed, by whom and when; 4) what circumstances might influence the understanding and management of diverse unknowns; 5) what is the result of understanding and managing diverse unknowns. For the third domain, the questions are: 1) what is the integrated research support aiming to achieve and who is intended to benefit; 2) which aspects of policy and practice are targeted by the provision of integrated research support; 3) how is integrated research support provided, by whom and when; 4) what circumstances might influence the provision of integrated research support for policy and practice change; 5) what is the result of the provision of integrated research support.

I2S as a Storehouse

One key function of a discipline is to provide a storehouse for relevant concepts, methods and case examples, and the book concentrates on this aspect of I2S. The three domains are the three main storerooms (Figure 2.1). Each of the five questions provides a 'wall' of each room, with a more detailed structure of the storeroom for the first domain (synthesising disciplinary and stakeholder knowledge) shown in Figure 2.2.

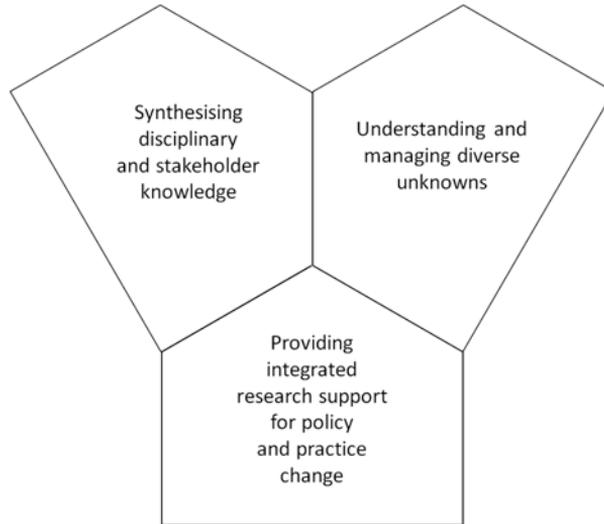


Figure 2.1 The Floor Plan for the I2S Storehouse

Source: Author's illustration.

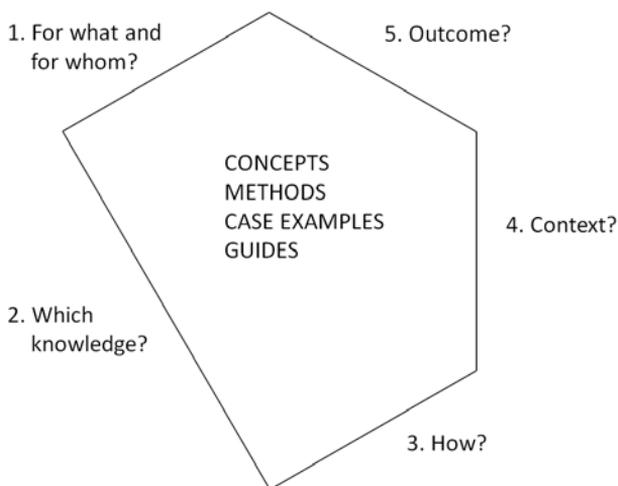


Figure 2.2 The Storeroom for Synthesising Disciplinary and Stakeholder Knowledge

Let us examine two issues about what is collected in the storehouse in more detail, beginning with the case examples. I have already briefly indicated their value in helping I2S disciplinary specialists understand the strengths and weaknesses of different concepts and methods. They can also assist in identifying criteria for choosing between options. For instance, one way of undertaking knowledge synthesis is through dialogue methods. Here case examples can start to match different kinds of knowledge synthesis with various dialogue methods. Another benefit of case examples is that they can be used to illustrate less tangible processes that do not lend themselves to being thought of as methods. For example, considering 'by whom' knowledge synthesis is undertaken alerts us to options: it can be carried out by the whole integrative applied research team, by a subgroup or by a single researcher (usually the project leader). Each process has strengths and weaknesses and will be more appropriate in specific circumstances. Documenting a number of instances where each was employed will provide useful information on which I2S disciplinary specialists can base advice to integrative applied research teams and their leaders who are making decisions about how to proceed.

The second issue about what is collected in the storehouse is to add another category of items. As well as concepts, methods and case examples, each storeroom also needs to contain guides to additional specific knowledge from outside the I2S discipline. Some of the I2S foundations are already well established in particular disciplines or other areas of academic work. The aim of I2S is not to reinvent them or appropriate them uncritically, but to tailor these developments to integrative applied research. Two examples will elucidate the point. First, the third domain (providing integrated research support for policy and practice change) includes building on political science theories about government processes to provide useful insights into different ways that integrated research can support policy. Customised guides to these theories are therefore required. Second, systems thinking is integral to all three domains of I2S in that both problems and the policy and practice arenas to be supported are most usefully thought of as systems. Again, well-developed guides to the relevant aspects of systems thinking are key to the development of I2S.¹⁴

Each storeroom is therefore designed to contain concepts, methods and case examples specific to an I2S domain, as well as guides to relevant knowledge from outside I2S.

14 A summary of all relevant guides is provided in Chapter 34 at Table 34.2.

The Structure of the Book

The book has seven sections. The next three cover the domains in turn and include chapters dealing with each of the five questions. The fifth section, which draws the three domains together, focuses on the shared space where the domains interact. It specifically looks at I2S as a whole and deals with synergies and conflicts that can occur when concepts and methods from the different domains are combined.

A discipline is, of course, more than a storehouse—hence the sixth section ('Moving Forward') takes a selective look at some of the other aspects of I2S, especially concerning its functioning in integrative applied research. The starting point in Chapter 31 is a hypothetical scenario about the role of I2S in research in 2025, followed by the description of a virtuous cycle between capacity, demonstrated success and funding. Chapter 32 then explores practical ideas about the operation of I2S as a discipline, drawing on statistics as an analogy. The following chapter, Chapter 33, specifically explores the relationship between integrative applied research and I2S, on the one hand, and multidisciplinary and transdisciplinary research, on the other. It describes how I2S could enhance both types of research, as well as demonstrating how integrative applied research provides a home for hybrids between multidisciplinary and transdisciplinary investigations. I then return to the notion of the storehouse and in Chapter 34 list what the I2S Development Drive needs to cover, as well as discussing how proof-of-concept can be demonstrated and what the forces opposed to building I2S might be. That chapter also draws together the arguments made in earlier parts of the book about an important sub-theme—namely the inevitability of imperfection. It explores the consequences of recognising that there is no way to provide perfect solutions to complex real-world problems.

The final section of the book is devoted to commissioned commentaries, with the aim of launching debate about integrative applied research as an investigative style, the I2S discipline and the I2S Development Drive.

Commentaries and Audiences

Eminent colleagues were asked to write brief essays reviewing the ideas presented in the first six sections of the book. The commentators fall into two main groups

- research leaders and team members tackling real-world problems, including proponents of existing approaches, such as transdisciplinarity or team

science, as well as researchers who have developed useful concepts and methods outside these existing approaches

- those concerned that academic research falls short of its potential to contribute to addressing complex real-world problems, including leaders of universities and major research organisations.

The aim of the commentaries is to provide a foundation for further discussion and debate, by providing the initial reactions of individuals from diverse networks. They were invited to focus on issues most pertinent to their interests and experience, as well as urged not to refrain from being critical in responding to the book's ideas. In Chapter 35 I draw out five themes that were raised in several of the commentaries and which could provide the starting point for future conversations and research.

The two categories of commentators also correspond to the main intended audiences for the book. In other words, this book is geared to people who already have an interest in embedding in the academic mainstream what I call integrative applied research. One group is researchers undertaking integrative applied research, who want their work and the work of their colleagues to be more prominent and recognised, and who accept that high standards must be set. The others are leaders of research institutions who want to put their organisations in a position where they can contribute more to tackling complex real-world problems than can be achieved by the disciplines alone. The book aims to give these audiences concrete ideas for a way forward, as well as—through the commentaries—initial reactions from leading members among their peers.

The book sketches a new research style and disciplinary storehouse, as well as proposing a building plan. The aim is to provide enough information to allow fruitful discussion about whether a new research style is warranted; if a new discipline would be beneficial; whether the proposed disciplinary storerooms are indeed workable or need major restructuring; and what sort of effort will be needed to fill the storehouse. In doing so, I seek to provide a constructive and practical answer—and one that can become embedded in the research mainstream—to the question '*How can academic research enhance its contributions to addressing widespread poverty, global climate change, organised crime, escalating healthcare costs or the myriad other major problems facing human societies?*'

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