32. How I2S Functions as a Discipline

What practical ideas about the operation of I2S can be drawn from other disciplines? As discussed in previous chapters, I have found statistics to be a particularly useful model for some key aspects of how I2S works. To recap briefly, both achieve effectiveness by interacting with other disciplines in a problem-focused approach. In the case of statistics, this involves improving research projects by enhancing their ability to tackle the quantitative aspects of problems. I2S plays an analogous role, improving the ability of integrative applied research teams to synthesise knowledge about the problem, better understand and manage remaining diverse unknowns and provide integrated research support to policy makers and practitioners. Four primary areas where statistics provides useful lessons for I2S are considered here

1. enhancing the discipline by working on problems
2. transmitting findings
3. fostering widespread awareness and appreciating different levels of expertise
4. building capacity.

Enhancing the Discipline by Working on Problems

Good statisticians not only bring their existing disciplinary knowledge to bear, but they are also on the lookout for how the demands of the research problem might be used to expand their disciplinary skills base. For example, my colleague Keith Dear[1] is the statistician in a research program exploring the potential effects of global climate change on health. He is using the opportunity to develop statistical methods for spatial regression analysis of time-series data, to allow him to simultaneously map deaths geographically, investigate multiple possible potential causes, include lag effects, and to study nonlinear relationships between variables. I2S operates in a comparable way. For instance, an I2S specialist may be able to use their involvement in an integrative applied research team as an opportunity to develop and trial a new boundary-setting method or apply a new concept about unknowns. Like statisticians, I2S specialists will be rewarded for the contributions they make to developing new disciplinary concepts and methods, as well as the insights into important problems they help their teams achieve.

1 See <https://researchers.anu.edu.au/researchers/dear-kbg> (accessed 1 August 2011).

Transmitting Findings

The second lesson to be drawn from statistics relates to the transmission of findings, which was raised in Chapter 1. When Keith Dear develops or improves a statistical method, it is not published in the health literature, but in a statistics journal, where it can be picked up and employed as appropriate by statisticians working in completely different areas like education or security. I2S requires a similar discipline-based literature in which to publish, making it possible for integrative applied research to build on the wealth of knowledge available and for I2S specialists to learn from each other's insights and experiences. In addition, there will be an I2S college of peers who can assess these contributions.

Fostering Widespread Awareness and Appreciating Different Levels of Expertise

A third parallel is that most researchers are aware of the discipline of statistics and the relevance of statistics to their work, as well as their own level of statistical expertise and when it needs supplementing.[2] In addition, research grants bodies will not fund quantitative projects unless the team has adequate statistical know-how, and journals will not publish papers unless the analyses are up to standard. The aim of formalising I2S is to produce an analogous situation.[3] The majority of researchers will have a basic education in I2S concepts and methods, so that they know when to call on I2S specialists. Funders and journal editors will become more demanding in relation to the extent and quality of I2S contributions in integrative applied research.

Figure 32.1 encapsulates these points by illustrating the relationship between the core discipline (statistics or I2S) and key areas of application. The central circle, labelled 'Theory and methods', represents the home discipline, either statistics or I2S. Researchers in this circle are primarily concerned with the development of the discipline, rather than its application to problems. In statistics, they work on the general theories of experimental design, statistical modelling, probabilistic inference and stochastic systems.[4] In I2S, they are involved in strengthening and maintaining the storehouse. For example, they may explore how various dialogue methods treat knowledge synthesis and whether they can encompass unknowns or match the insights that different

2 The range of relevance and expertise can vary from little to deeply intertwined. At one extreme a historian studying festivals in medieval Europe may find little of relevance, whereas at the other end an epidemiologist investigating the effects of sun exposure will find multiple intersections with statistical concepts and methods.

3 This will replace the current situation where I2S skills are seen as innate attributes of talented researchers.

4 They might also collaborate with mathematicians who work on the underpinning mathematics or philosophers who are developing the theory of probability. For the latter, see Hájek (2008).

modelling techniques can provide with types of research questions relevant to different social and environmental problems. The I2S specialists (or statisticians) in this group are a small percentage of the whole.

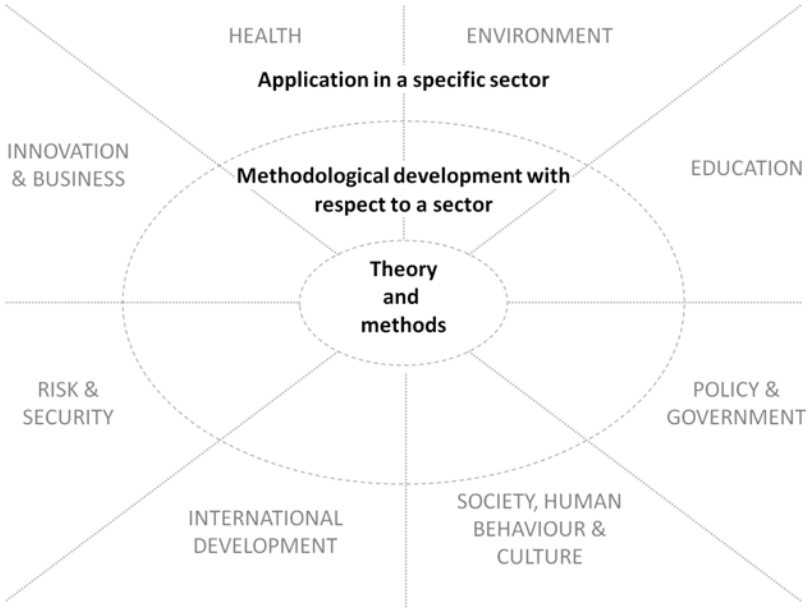

Figure 32.1 The Relationship between the Home Discipline (Statistics or I2S) and Key Areas of Application

Source: Adapted from an unpublished figure by Lorrae van Kerkhoff.

The eight wedges—health, environment, education, and so on—characterise 'sectors' in which complex real-world problems occur. They are mirrored in the organisational structures of many universities and government departments. Of course this is a simplification because many complex real-world problems cross two or more of these sectors. Nevertheless, they are a useful starting point for describing how statistics and I2S work.

The second circle, 'Methodological development with respect to a sector', represents the statisticians or I2S specialists who collaborate with teams working on a particular problem and who use the collaboration to develop new theory and methods, which can contribute to the inner circle. Keith Dear, for example, is located in the segment 'Health'. It is common for statisticians to specialise in a sector—for example, some tend to work on health problems, some on education problems, and so on. This allows them to become familiar with how those with expertise in health (or education or whatever) and relevant disciplines approach

problems, and to interact effectively with them. Similarly, many I2S specialists may also choose to focus their efforts in problem-specific areas. The bulk of I2S specialists (and statisticians) are located in this circle.

The outer circle, 'Application in a specific sector', represents the majority of researchers, covering all the other disciplines. The aim is for them to have a basic understanding of I2S, just as they have a general appreciation of statistics. In the case of I2S, this allows them to be more effective when they are part of an integrative applied research team. An elementary comprehension of I2S or statistics provides the foundation for drawing on those with specialist knowledge—and appreciating when this is necessary. Further, some researchers will be skilled enough to deal with various I2S or statistical issues themselves, but they only seek to apply I2S or statistics, not to develop the discipline. Another colleague, Lyndall Strazdins,[5] is typical of such researchers. Lyndall is trained in the quantitative end of psychology and analyses survey data to explore issues such as the relationship between the quality of work and health. She has the requisite skills to conduct some analyses, but calls on more qualified statisticians for others. She is only interested in applying statistics in her research, not in enhancing the development of the statistics discipline. Lyndall also provides an example of how I2S functions in this sector. She and her team have built a relationship with the relevant government department to inform them of pertinent research findings. They apply a specific set of concepts and methods about how research can be useful to policy makers to do this. From time to time, she calls on me (located in the inner circle for I2S) when she wants to expand her skill set and try different ideas.

Building Capacity

The fourth parallel with statistics relates to capacity building, which must be tailored to the needs of researchers in the three circles. Those located in the inner and second circles require strong I2S disciplinary skills. Such I2S specialists need to be educated in a broad framework encompassing all three domains—that is, knowledge synthesis, unknowns and supporting policy and practice change. Their training must equip them to recognise when leading-edge theory and methods are being used, when breakthroughs in thinking have been made and when wheels are being reinvented. Like their statistics colleagues, they will develop deep knowledge and expertise in particular areas—in other words, they will specialise within their discipline. In the case of I2S, there may be specialisation in one of the domains or in one of the five framework questions

5 See <https://researchers.anu.edu.au/researchers/strazdins-lm> (accessed 1 August 2011).

across the domains (for example, in all aspects of context). As indicated earlier, those located in the middle circle, both statisticians and I2S specialists, could also focus on a particular sector or type of problem (such as health).

Researchers located in the outermost circle will be educated to have a basic understanding of I2S (just as they have an elementary appreciation of statistics) that they can bring to the problems on which they work. They will generally be experts in another discipline and will contribute that disciplinary expertise to integrative applied research teams, like Davida Ritter in the fictional scenario in Chapter 31. Having a basic understanding of I2S will allow them to better understand what is required of them in contributing to integration and implementation processes and to collaborate effectively with other disciplinary experts, including the I2S specialist(s), in the team.

This text is taken from *Disciplining Interdisciplinarity: Integration and Implementation Sciences for Researching Complex Real-World Problems*, by Gabriele Bammer, published 2013 by ANU E Press, The Australian National University, Canberra, Australia.