47. Interdisciplinary Research is about People as well as Concepts and Methods

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This commentary starts with responses to four questions posed by the book's author, and finishes with some reflections on a recent interdisciplinary research project in the field of environmental management.

If You Had $1 Million to Spend, Which of the Proposals in this Book Would You Fund to be Further Developed?

First, I applaud the approach proposed in Chapter 34 of investing in systematic case studies of past practice to understand what approaches have been used in interdisciplinary research across a wide range of fields, what has worked and why. The book author has already contributed to this endeavour through publication of a handbook of dialogue methods appropriate to interdisciplinary research,[2] and to capture knowledge from many fields under the five-question framework used in the book would be very valuable; however, I part company with the book author on two aspects of I2S and the I2S Development Drive in particular. One is seemingly trivial but important to the wider application of interdisciplinary research to problem solving, and the other is more fundamental to its practice.

The trivial point is the name, I2S. Acronyms are a barrier to communication, accessible to the initiated and excluding others. I would argue strongly against adopting this or any other inaccessible name, and even against adopting the title Integration and Implementation Sciences. Interdisciplinary research is awkward enough as an umbrella term, but most researchers and many research users can understand what is meant: people from different disciplines working together. Sure, it can and does involve more than that, but the more we get involved in subtleties the more inaccessible we make what is an enabling practice. Given

1 Ted Lefroy was invited as a 'senior researcher who grapples with complex real-world problems requiring research integration and implementation. Your comments on whether the ideas in this book could enhance your ability to undertake such research would be very pertinent.'

2 McDonald et al. (2009).

that engagement with people tackling real-world problems is the common goal of those of us who work in this area, it is important that we describe the field and communicate its achievements in accessible language. Those more deeply involved are naturally interested in the distinctions between multi-, inter- and trans-disciplinary, team science and other variants but devoting time to taxonomy and becoming method focused rather than outcome focused are death to applied research and are only likely to alienate those with whom we wish to work. The further we move from plain English the harder we make our common goal of working with managers and policy makers to solve real-world problems.

That said, it is important to deal with definitions in a book that aims to pull together a new discipline. Early on (Chapter 1) we are told that of several interpretations of interdisciplinary research, this book will concentrate on research that 'involves experts from multiple disciplines working together on a common problem'. Soon after, this becomes research 'involving experts from several disciplines working with stakeholders on a common complex real-world problem'. The difference is significant, and is the distinction used by Tress et al.[3] and Klein[4] to distinguish interdisciplinary from transdisciplinary research or team science. To paraphrase, interdisciplinary research is more than one discipline working together to solve problems, and transdisciplinary research or team science is more than one discipline working with end users to solve problems.

This distinction is significant and brings me to my second point: the relatively passive role of the end users of research implied in this book. We are introduced to the three domains of Integration and Implementation Sciences as knowledge synthesis, managing unknowns and 'providing integrated research support for policy and practice change'. The third domain is further described as 'supplying policy makers and practitioners with a better understanding of the problem (both what is known and what is not known) in a way that supports them in making decisions' (Chapter 1). This sounds like an essentially one-way flow of knowledge, from the experts to the users. Yet a major obstacle to adoption and implementation of innovation is that researchers fail to understand the worlds of policy and practice for which the results of their research are intended, as captured by the quotation from Peter Shergold in Chapter 17. One of the values of close participation with end users in framing questions and engaging in the research process is the opportunity for, if not the obligation of, researchers to understand the policymaking and implementation processes and to adapt to their needs, rather than view them as obstacles to achieving the researchers' goals.

3 Tress et al. (2005).
4 Klein (2008).

To dismiss political opportunity, organisational advocacy and financial exigency as capricious is to ignore the realities of the paths to adoption. Evidence, as Frieberg and Carson[5] point out, is not the only seat at the table.

The fields of agricultural and environmental research and development are knee-deep in decision-support tools built with good intention but never used,[6] and researchers have much to learn from practitioners if this is to change. End users often have little role in the development of decision-support tools let alone framing the initial questions. Of course there are exceptions, and the great value of compiling case studies based on the five-question framework used throughout the book (Table 34.1) is the opportunity to identify examples of applied interdisciplinary research that have resulted in implementation and the approaches they employed. To that framework, I would add evaluations of selected case studies from the perspectives of the three major parties involved—that is: the funders with their interest in return on investment, the users from the perspective of the relevance of the research, and researchers who typically place value on the rigour of research outputs and the contribution they make to their professional development.[7] Summative evaluation is a luxury few interdisciplinary research projects experience, partly due to the time delay in the adoption process, and a great deal could be learned by carefully scoped and well-resourced evaluations.[8]

So back to the question of $1 million dollars; I would invest in three things. First, commission systematic reviews of applied interdisciplinary research from each of the major fields in which it is practised (public health, justice, education, environment, security, innovation and business, and so on, as shown in Figure 32.1). Second, convene an international Congress of Interdisciplinary Research at which these would be presented along with other invited papers and an open call. Third, publish, in addition to the proceedings, an analysis of selected case studies to facilitate the exchange of practical experience across these fields.

What is the Book's Greatest Weakness and How could it be Addressed?

I would nominate the two issues discussed in response to question one above. That is, further complicating an already challenging area by attempting to define it as a discipline with an unfriendly name with an inaccessible acronym. Developing a community of practice relevant to many fields would be very timely,

5 Frieberg and Carson (2010).
6 Stone and Hochman (2004).
7 Roux et al. (2010).
8 Scriven (1993).

and a welcome opportunity for greater learning, but creating a discipline out of an interdisciplinary activity seems self-defeating. For interdisciplinary research to be effective, effort has to be devoted to breaking down boundaries between disciplines and finding common ground in areas such as the rules of evidence, disciplinary language, reward structures and forms of communication. So, for a relatively immature area of research it seems too early to standardise methods and approaches when there is so little evidence that what has been tried to date actually works. The second weakness is the tendency to view implementation as a process dependent on improving the one-way flow of knowledge from researchers to research users.

Who do You Think Should be Encouraged to be Involved in the Ongoing Discussion about I2S?

Anyone who has published the results of interdisciplinary research or published on the practice of interdisciplinary research, in any field. These could be identified from the literature and invited to submit case studies that would be candidates for commissioned, systematic reviews to be presented at an international congress.

How Do You See Yourself in Relation to I2S?

As a practitioner who, like the book author, is keen to learn from more systematic evaluation of past efforts in this field, but who is quite happy to keep calling it interdisciplinary research.

The Importance of Social Cohesion

Reflecting on a recent experience of interdisciplinary research raises an issue not adequately covered in the book. In this section I briefly outline the project and its context, and then report on a survey conducted at its conclusion that highlighted the issue of social integration or managing the social cohesion of a research partnership.

Landscape Logic was an interdisciplinary research project that ran from 2006 to 2010.[9] It set out to infer causal links between past management interventions

9 Lefroy et al. (2012).

and the condition of natural resources in two areas: water quality, and vegetation extent and condition. The two areas were identified by the research users involved in the project (six catchment management organisations in south-eastern Australia), from analysis of their largest areas of investment about which there was greatest uncertainty. The project was prompted by a series of reviews of large public environmental programs by the Australian National Audit Office, which all concluded that, while they could see where the funds had been invested, they could find no evidence that this had resulted in the desired outcomes. The aim was to use retrospective studies to improve the quality of information available to environmental managers about the likely environmental response to management interventions as a guide to future investments. Seven small research teams were set up within three themes: Knowledge Discovery (5), Knowledge Integration (1) and Knowledge Broking (1). The Knowledge Integration (KI) and Knowledge Broking (KB) themes were designed to complement the biophysical and social research of the knowledge discovery projects by performing the following functions.

- Helping to articulate the information needs of natural resource managers (KB).
- Mapping the knowledge base required to elucidate how human interventions, climate change, climate variability and other drivers are likely to have influenced natural resource condition (KI).
- Identifying the appropriate level of information required to relate the essential variables (including the scale and complexity of relationships to be represented), taking into account the data, information and knowledge available, and as far as possible their uncertainty (KI).
- Undertaking these tasks in a participatory and iterative fashion that included the researchers in the knowledge discovery projects, our collaborators in the catchment management organisations and selected industry groups and landholders (KB and KI).

The roles of the integration and knowledge broking projects included incorporating and synthesising many forms of identified knowledge, not just that obtained from the knowledge discovery projects. This existed in many forms including disciplinary socioeconomic and biophysical knowledge, as well as the perspectives and aspirations of environmental managers, industry representatives and landholders.

At the project's conclusion, 89 people associated with the project were invited to respond to an online survey (42 researchers, nine steering committee members and 38 people from partner and stakeholder organisations). From the 41 responses (26 researchers and 15 from partner and stakeholder organisations), several lessons emerged about what worked well and what could have been improved.

1. *Allowing sufficient time for teams to develop*. Acknowledging the sequences involved in group development (storming, forming, norming and performing as described by Tuckman)[10] and allowing sufficient time for their expression proved to be important contributors to a collaborative culture. Our experience was that the length of these phases varied with different teams, which required more flexible time lines for problem definition, scoping research questions and planning research than we had envisaged.

2. *Reaching agreement on the research questions*. This point is closely related to the previous one, and centres on allowing sufficient time for the processes of problem definition and identifying researchable questions. The six months allocated to the 'storming and forming' stages, which included defining research questions, was not sufficient for all areas of research or all teams. Getting the questions right (as in reaching agreement between researchers and research users) has great bearing on the effectiveness of collaborative research, and in hindsight this could have been more flexibly managed to ensure a well-planned start to all projects.

3. *Collaborative model development*. Developing conceptual models or influence diagrams with environmental managers proved to be a very effective tool for involving managers in hypotheses setting and very useful for researchers to gain a better understanding of the systems they were studying. A major factor in their success was their graphical structure and the effort that was put into training by the integration team who introduced the language and associated software of network modelling through 13 workshops with researchers and managers during the first 18 months of the project.[11]

4. *Identifying a 'service' role for research teams*. Three of our seven research teams (spatial analysis, social research and knowledge integration) were originally conceived as providing a service role to what were essentially seen as biophysically driven research questions. This proved to be a mistake, and was acknowledged during the course of the project as under-representing the primary research contribution of these teams to the collaboration. This distinction influenced relationships between teams and presented obstacles to progress that had some negative implications evident throughout the course of the project.

5. *Acknowledging the need for technical and social integration*. Two different aspects of integration were recognised as contributing to a large collaborative project such as this. As well as having the mechanics of integration such as modelling frameworks, software and personnel skilled in integration methods (technical integration), it was just as important to have processes to

10 Tuckman (1965).
11 Ticehurst and Pollino (2007).

overcome the geographic, institutional and disciplinary distances between researchers and partners (social integration). While there is a growing array of useful technology at our disposal that can help to break down geographic constraints, such as internet meetings and file-sharing facilities, there proved to be no real substitute to regular meetings of team leaders (monthly), the advisory board (three-monthly), related research teams (six-monthly) and all researchers and partners across the project (annual). Breaking down boundaries and ensuring communication between disparate groups required constant attention from team and project leaders and were important aspects of fostering a collegial culture within and between groups. Social integration essentially meant investing a great deal of time in problem framing, relationship management and stakeholder engagement. The most challenging issues in our experience were achieving the relevant level of commitment from all participants and managing interdependencies between projects (when the outputs of one were inputs to another).

6. *Having dedicated knowledge brokers*. Having skilled communicators with well-established networks across research institutions, government agencies and environmental managers proved to be very valuable in breaking down cultural, institutional and language barriers between researchers and managers at all levels. The knowledge brokers helped to foster a shared understanding between partners from the first stages of scoping questions to exchanging information and new knowledge during the course of the research and negotiating the meanings, implications and implementation of findings in the final stages.

The challenge of social integration was a common feature of many of the issues raised in the survey. Social cohesion, and particularly managing interdependencies between projects, was an important issue and represented the highest area of investment in the project through travel, meetings, teleconferences and other communication events. So in conclusion, an area I would add to the exercise of compiling case studies of concepts and methods is some indication of social cohesion, collaboration and personal and professional satisfaction. Leadership, project management and internal communication methods all contribute to this and are areas in which we could all learn. While the book very thoroughly examines the architecture of interdisciplinary research, this experience suggests to me we would also benefit from a better understanding of the needs and interests of the researchers and the factors influencing the quality of their outputs and experience.

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References

Frieberg, A. and Carson, W. G. (2010). 'The limits to evidence-based policy: evidence, emotion and criminal justice'. *The Australian Journal of Public Administration*, 69 (2): 152–64.

Klein, J. T. (2008). 'Evaluation of interdisciplinary and transdisciplinary research: a literature review'. *American Journal of Preventative Medicine*, 35: 116–23.

Lefroy, E. C., Curtis, A. L., Jakeman, A. and McKee, J. (2012). 'Integrating science for landscape management'. In: *Landscape Logic: Integrating science for landscape management*. Collingwood, Vic.: CSIRO Publishing, 283–91.

McDonald, D., Bammer, G. and Deane, P. (2009). *Research Integration Using Dialogue Methods*. Canberra: ANU E Press; <http://epress.anu.edu.au/dialogue_methods_citation>

Roux, D. J., Stirzaker, R. J., Breen, C. M., Lefroy, E. C. and Cresswell, H. P. (2010). 'Framework for participative reflection on the accomplishment of transdisciplinary research programs'. *Environmental Science and Policy*, 13: 733–41.

Scriven, M. (1993). *Hard-Won Lessons in Program Evaluation*. San Francisco: Jossey-Bass.

Stone, P. and Hochman, Z. (2004). 'If interactive decision support systems are the answer, have we been asking the right questions?'. In: *New Directions for a Diverse Planet*. Proceedings of the Fourth International Crop Science Congress, 26 September – 1 October 2004, Brisbane, Australia.

Ticehurst, J. L. and Pollino, C. (2007). 'Build collaborative models or capacity? Comparison of techniques for building Bayesian networks for the natural resource management regions of Australia'. In: *Proceedings of MODSIM Conference*, 10–14 December, Christchurch, New Zealand.

Tress, B., Tress, G. and Fry, G. (2005). 'Researchers' experiences, positive and negative, in integrated landscape projects'. *Environmental Management*, 36 (6): 792–807.

Tuckman, B. (1965). 'Developmental sequence in small groups'. *Psychological Bulletin*, 63 (6): 384–99.

Brief Biography

Ted Lefroy graduated with a degree in agricultural science from the University of Western Australia in 1973, and spent the next 10 years working in rural development and extension in Queensland and Papua New Guinea. In 1987 he returned to Western Australia to work with watershed groups in a United Nations Man and the Biosphere Project on resource management and conservation in the farmlands around the World Heritage Fitzgerald River National Park. He has since held research positions with State departments of agriculture, the University of Western Australia and CSIRO, leading interdisciplinary research teams working with land managers to minimise the environmental impacts of agriculture. In 2005 he was appointed Professor of Environment and Director of the Centre for Environment at the University of Tasmania.