

## 35. Rationale and Key Themes

The invited commentaries that follow are designed to kick-start further conversations and debate as a first step in widespread discussion to progress thinking about the practicalities of undertaking more effective research on complex real-world problems. If there is to be a discipline of I2S (or even just a storehouse of concepts, methods, case studies and guides to relevant knowledge for researching complex real-world problems), it is going to require a large, committed group to carry the ideas forward—to reshape, rework and refine them. To do this effectively, group members will need to engage with each other, as well as to hear the views of distinguished senior scholars and leaders of research organisations. At this time, there is no obvious forum where that interaction can occur, especially not one where the full diversity of pertinent and important viewpoints can readily connect.

The choice of commentators was influenced by the desire to engage a broad range of individuals and networks. When issuing the invitation to contribute, I provided a brief rationale for the selection of that individual<sup>1</sup> and often suggested areas where their views would be particularly valuable,<sup>2</sup> although they were encouraged to cover any topics they thought would promote productive discussion. They were also invited to address one or more of the following questions.

1. If you had \$1 million to spend, which of the proposals in this book would you fund to be further developed?
2. What is the book's greatest weakness and how could it be addressed?
3. Who do you think should be encouraged to be involved in the ongoing discussion about I2S?
4. How do you see yourself in relation to I2S?

I tried to make it clear that I was not looking for endorsement or a 'puff piece', but rather honest, constructive appraisal that would move thinking forward. Further, because the book does not discuss in detail related initiatives like transdisciplinarity or the science of team science, relevant commentators were also invited to discuss what is proposed here in light of their own work on these topics.<sup>3</sup>

---

1 Some invitees combined their efforts and others included co-workers as co-authors.

2 A footnote summarises the specific invitation to each commentator. While the person did not necessarily address these issues, I have included the information because it gives context for many of the commentaries. More information about my relationship with the contributors is provided in 'The book's origins and acknowledgments' section of the Preface.

3 Although proponents of most of the major approaches were invited to contribute, some of them were not able to do so, so that there is no representative of a number of these specific approaches.

About half of the invitees contributed and I am extremely grateful for their thoughtful insights. The commentary process occurred in two stages. The initial six commentators—Daniel Walker, Deborah O’Connell (and colleagues), Michael Smithson, Alison Ritter, Alice Roughley and Lawrence Cram—responded to the first full draft of the book produced in early 2010. Their inputs confirmed that the commentaries would be a strong addition to the book. I was pleased that some of the second group, who wrote their commentaries based on a book draft reworked in 2010–11, also responded to the original six contributions. I continued to edit the book to improve clarity during the second commentary phase. The commentators had an opportunity to review the final version of the book and to make amendments.<sup>4</sup>

Unsurprisingly the commentaries reflect the diversity of the respondents. Because there are no straightforward ways to group all the contributions, I decided to present them in the order they were received. Overall, the commentaries reflect excitement about the challenges the book tackles, agreement that this area of endeavour has a significant (albeit scattered) body of work to celebrate and build on, the feeling that the time is ripe, and willingness to engage in the contest of ideas in order to find productive ways to improve the research contribution to addressing complex real-world problems.

In the remainder of this chapter, I present five themes, each of which ran through several of the contributions. The first is the importance of keeping the development of I2S grounded in research practice—a topic on which there was agreement. The second crosscutting theme covers the challenges in one area of research practice—namely the third domain, ‘*Providing integrated research support for policy and practice change*’, which provoked considerable discussion and a variety of views. The proposal that I2S should be a new discipline was also an area of debate and this intersected with input about the theoretical base of this endeavour. These are encompassed as the third theme. The fourth reports on suggestions about institutional arrangements, where there was accord about their importance, but not about ways forward. The final theme pulls together issues relevant to progressing the I2S Development Drive, particularly methods and areas to search, and major suggestions for further work, including ideas for how to spend \$1 million.

It is impossible to write a synthesis that includes every nugget of insight contained in the commentaries. The main task now is to find ways to continue the exchange, so that all the gems can be considered. It would be particularly productive to expand the discussion forums to include other integrative applied research practitioners, as well as theorists in this and related areas, for the large-scale exchange of experiences and ideas.

---

4 Further changes—editing for clarity, rather than substantive—were made in light of the comments of the anonymous reviewers.

## Keeping I2S Grounded in Research Practice

In the opening commentary, Daniel Walker argues that I2S will only be useful if there is a fertile interplay between theory and practice; if the frameworks, concepts and methods provide those undertaking integrative applied research with better approaches and tools *and* if the investigation-based experience of the research practitioners influences the building of new theory and the sharpening of that which already exists. In his proposal that philosophy could help build the theoretical base for I2S, Michael O'Rourke puts forward a similar proposition, as does Michael Smithson with his suggestion that decision science ('the bastard offspring of psychology, probability theory and behavioural economics') provides a useful model for the development of I2S, especially because it has a 'descriptive branch' (that is, practitioners) that actively debates with its 'prescriptive branch' (that is, theoreticians).

The point is strongly reinforced by the case studies that form the basis of some of the contributions—in particular, those by Deborah O'Connell and colleagues, Ted Lefroy, Budi Haryanto and Merritt Polk. Merritt Polk wrote her commentary when she was two years into her investigation, Deborah O'Connell when her team's program of work was four to five years old, and Ted Lefroy and Budi Haryanto reflected on completed investigations. These accounts provide a richness and level of detail that are essential complements to the theoretical framework. Some of them also describe the value of the structured approach provided by the I2S framework in making explicit their actions based on collective experience, intuition and serendipity, as well as giving them greater appreciation of what they did well and where there were gaps and areas for improvement. Fasihuddin, in his reflections on applying the I2S framework, echoes that view.

More particularly, the cases demonstrate how practical experience will aid the further development of I2S. Let me give three examples. One is that they illustrate different structural approaches to integrative applied research. Deborah O'Connell outlines how her team embedded disciplinary, multidisciplinary, interdisciplinary and transdisciplinary sub-projects, with important roles played by two classes of integrators: conceptual integrators, and data, model and platform integrators. In his project, Ted Lefroy set up specific teams for 'knowledge integration' and 'knowledge broking' to work with five 'knowledge discovery' teams. Merritt Polk describes the principles that govern the intense negotiation required to establish her transdisciplinary investigation. A second input comes from the description of specific concepts, methods and tactics, such as Merritt Polk alerting us to useful terms coined by others, specifically 'agonistic' interactions and 'optimal ambiguity', as well as Budi Haryanto's strategies for capturing media attention. The final example is

reinforcement of the importance of ‘people factors’. Ted Lefroy argues that the I2S framework needs to place much more emphasis on the importance of ‘social cohesion, collaboration and personal and professional satisfaction’. His proposal is bolstered by results from a survey of the various participants in his project. The point is also made strongly by Deborah O’Connell, who further warns that ‘[i]t is easy to discuss “assembling a team”...as if it were as simple as going shopping; however, the reality...is quite different.’

There is clearly scope for fertile interchange between those developing the I2S framework and those undertaking various forms of integrative applied research. In the first instance this will involve reflections on completed or ongoing work, which can be at varying levels of detail, as the commentaries illustrate. Fasihuddin raises the acid test that I2S will face as it matures: will it be useful prospectively? While there are encouraging signs that I2S can help people reflect on accomplishments, will it add value in planning and executing new integrative applied research? Deborah O’Connell and Merritt Polk foreshadow that the guidance provided by the framework and the training of a cadre of researchers will make new investigations more efficient and effective, but that aim has still to be tested.

## **The Challenges of Providing Integrated Research Support for Policy and Practice Change**

Three different but intersecting issues are raised in the commentaries: conducting research in highly political environments, differentiating between adoption and use, and the benefits and costs of close engagement between researchers and end users. Let us deal with each in turn.

The sorts of complex real-world problems integrative applied research and I2S set out to tackle are generally political and the challenge of conducting research in a highly contested environment is addressed in four of the commentaries (by Alison Ritter, Lawrence Cram, Howard Gadlin and Michelle Bennett, and Michael Wesley) and highlighted as an issue that needs more attention in two others (by David Brown and Simon Bronitt). Although these issues are relevant to all three arenas (government, business and civil society), most of the commentaries focused on the first. A major challenge is what Michael Wesley calls ‘a crumbling divide between politics and policy’, where ‘the domain of objective policy analysis and actions has been dragged into that of values-based contestation and the contending of absolute knowledge claims’. Lawrence Cram puts it a little differently as ‘the risk of cynical exploitation of the academy’. He suggests that while academics see competing evidence and ideas as ‘an essential feature of the discovery, construction and reframing of knowledge’, partisan

politics eschews these niceties. These commentators recognise that (again, quoting Michael Wesley) ‘politics intrudes on both sides of the I2S equation’: first in a political contest over how to define and attack the problem and later in interpreting the proposed solution. Although the commentaries are similar in defining the challenge, they come to different conclusions.

Michael Wesley urges an expansion of the I2S framework to grapple more specifically with these issues. Lawrence Cram suggests a partial way forward in a ‘gate-keeping and filtering’ role for I2S specialists so that research teams avoid spending valuable effort on ‘wrongly stated and prioritised problems, or on unworthy causes’. Alison Ritter argues that the I2S approach ‘dissolves’ what she refers to as the ‘researcher–advocacy delineation/impasse’, not only by making implementation ‘core business’ as the third domain, but also by the process of engaging all stakeholders and identifying beneficiaries at the start, dealing with values and value congruence, as well as boundaries and scoping, and by paying specific attention to unknowns. Further, being part of a discipline provides access not only to concepts and methods for undertaking these tasks, but also to peer review and the ability to differentiate scholarly from political criticism. Howard Gadlin and Michelle Bennett strongly disagree. They take particular issue with Alison Ritter’s suggestion that the researcher–advocacy dilemma is dissolved, arguing that it is not and ought not be, as it ‘provides the creative tensions necessary for democratic policy decision-making processes’.

Alice Roughley and Ian Elsum take a different tack. Alice Roughley maintains that supporting policy and practice change should provide the overarching rationale for the whole framework and points out that discussion of how researchers might recommend a particular course of action for policy or practice change is missing. Ian Elsum embellishes this point by presenting useful lessons from the work that has been undertaken on innovation and applied research in distinguishing between adoption and use—namely:

Adoption—the willingness and ability to take research results and convert them into something that is useable more broadly—and use by others apart from the adopter must be considered separately as they are distinct processes: the factors causing a person or organisation to adopt research results and incorporate them into an artefact, service or advice will differ in many important ways from those factors pertinent to a person or organisation deciding to use the artefact, service or advice.

He also describes the challenges researchers face when they find themselves in situations that are inherently chaotic and defy ordering, and where less-than-perfect solutions are acceptable, as long as they are workable.

Other commentators contend that I2S needs to pay more attention to the relationships with policy makers and practitioners (who are often referred to as 'end users'). There is a strong push by Ted Lefroy and Linda Neuhauser for greater recognition to be given to the benefits for eventual research implementation of close engagement and co-production of knowledge between researchers and end users. Merritt Polk and Christian Pohl take this as a given in the transdisciplinary research they describe. Simon Bronitt presents a different angle in arguing for the embedding of end users in research projects to overcome three challenges for bridging the cultural divide between the research and the policy and practice worlds: 'understanding the intrinsic difficulty of doing good research', 'accepting equivocal research findings' and 'government preference for consultancy-driven policy'. He also worries about 'New Public Management' and narrow models of accountability, which operate 'as a straitjacket for the research as well as the policy and practice communities'.

Still others—in particular, Catherine Lyall and Alice Roughley—raise cautions. Catherine Lyall submits that it may be difficult to maintain impartiality and confidentiality, avoid being immersed in stakeholder concerns and overcome impatience at the time taken to achieve research results. She is also concerned about outcomes if end users have a role in evaluating the research, particularly if they do not understand research goals, norms and methods. In her mind, the danger is that integrative applied research is consigned to short-term problem solving and a service role, unable to compete effectively against 'problem portable knowledge'. Although Alice Roughley generally supports an engaged approach, she points to lessons from social impact assessment, which reinforce the risks of cooption.

The broad issue of research implementation is not only pertinent to integrative applied research and I2S, but is also a topic of conversation, analysis and investigation in its own right in several applied areas: certainly in those that I know moderately well (medicine and other health, the environment, and policing and security). It is striking that the relatively small number of commentaries in this book, written largely independently, have advanced many of the key arguments and debating points. As they demonstrate, there is still a long way to go to achieve consensus and a clear way forward.

## **I2S as a Discipline and the Need for a Stronger Theoretical Base**

There are two primary sets of arguments in this theme: concerns about proposing the formation of a new I2S discipline and suggestions about the work that is required to establish such a discipline. In addition, there are several

comments about the immature state of I2S at this stage—well summarised by Linda Neuhauser, who maintains that to be a discipline I2S needs ‘a stronger theoretical foundation, better-defined methods and rigorous testing in multiple contexts’. Daniel Walker takes this further, contending that additional work is required to demonstrate a convincing case that I2S is ‘a legitimate, viable and useful discipline’, and Alison Ritter asks whether I2S ‘must be dealt with as a whole discipline or whether researchers and practitioners can cherry-pick the components that are most helpful or useful to them at that point in time’.

Some oppose the notion of an I2S discipline. Ted Lefroy suggests that it is ‘further complicating an already challenging area by attempting to define it as a discipline with an unfriendly name with an inaccessible acronym’.<sup>5</sup> Christian Pohl recalls a highly charged reaction when the idea was first presented at a conference, wondering ‘[w]hat deep convictions had been disturbed by the idea of a specialisation in collaborative research processes for policy-relevant research?’. Marcel Bursztyn and Maria Beatriz Maury argue that there are major differences from disciplines, especially that ‘[i]nterdisciplinary programs... are multiform and nonlinear spaces of integration. Shaped largely in reaction to problem-oriented demands, these programs have, by definition, a complex identity’.

Later, they state:

... we strongly caution against turning interdisciplinarity into a discipline. Interdisciplinarity is a process; it can constitute specific fields, and even lead to the formation of epistemic communities with their own identities. But there will be no integration if the processes of institutionalisation follow the previous practices of creating university departments. We do not oppose formal interdisciplinary arrangements, but we see these as opening a space where complex problems can be addressed by teams comprising researchers with varied backgrounds.

Others also express unease based on the history of established disciplines. In particular, Daniel Walker and Ian Elsum echo my concerns about I2S becoming self-referential rather than engaged (with Ian Elsum providing examples of ways other than forming a discipline to share knowledge and learning), while Howard Gadlin and Michelle Bennett worry about ‘the elitist assumption that those who know the most know the best’.

---

5 Ted Lefroy argues strongly against both the I2S acronym, which he sees as a ‘barrier to communication’, and moving away from the use of the term interdisciplinarity to the more specific nomenclature proposed. On the latter point, he contends: ‘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.’

Some suggest that a discipline is the wrong construct. In particular, Michael O'Rourke, Michael Wesley and Julie Thompson Klein suggest that I2S is bigger than, and/or different from, a discipline, respectively referring to it as 'an umbrella area covering a number of more or less loosely connected disciplines' ('as biological science is to microbiology and evolutionary biology'), a potential 'metadiscipline' and an 'interdiscipline'. Julie Thompson Klein adds that this term does not 'acknowledge the "interprofessional" dimensions of practice', but 'at least takes into account the relevance of not only disciplines but also interdisciplinary fields and networks as well as the interfaces of disciplinary, interdisciplinary and professional spheres'.

Howard Gadlin and Michelle Bennett express disquiet about the idea of setting out to create a discipline rather than letting it emerge naturally. They point out what they see as a flaw arising from the construction—namely a fundamental incommensurability at the heart of the three domains, which they argue makes it impossible for I2S to be a discipline. In particular, they contend:

We do not doubt that one can develop processes for setting policy or making crucial decisions that involve people from the three domains (science, advocacy and policy), but we believe that the challenge in doing this is very different from the challenge of integrating multiple scientific disciplines and methodologies into an inter- or trans-disciplinary field. I2S is an attempt to bring together components that are incommensurable and we believe that any approach for dealing with incommensurability must be based on acknowledging and maintaining the distinctiveness.

Alison Ritter and Michael O'Rourke would like to see justification for the selection of the three domains and the five questions that are used to address them. Daniel Walker raises a connected issue in asking for I2S to be mapped against the areas that cover associated terrains, such as multi-, inter- and trans-disciplinary research, action research, planning and management, and the science of team science. He suggests that it will be helpful in achieving clarity about where the contest of ideas will play out. Christian Pohl starts to do exactly this in his comparison of transdisciplinarity with I2S, proposing that, among many similarities, unknowns and the importance of theory are useful points of differentiation.

Glenn Withers addresses a more fundamental concern relevant to integrative applied research rather than I2S. He argues that any attempt to modify interdisciplinarity must be 'clear and precise on what the counterpart, "disciplinarity", is'. He goes on to say:

The point is important because the fact is that disciplinary boundaries, their subjects and methods are dynamic and blurred, partly from

internal evolution as knowledge advances and sometimes because of the tensions emanating from the reasons interdisciplinarity is sought. One possibility is that disciplines are indeed dynamically interdisciplinary—but that interdisciplinarity emerges from a micro-evolution, bottom-up approach and often implicitly rather than explicitly. As weaknesses or opportunities for innovation emerge in present research within disciplines, researchers seek to adjust assumptions, methods and topics to embrace these...Sometimes intellectual curiosity seeks a more ‘big bang’ answer. Correspondingly in the Bammer project interdisciplinarity is top down rather than merely incrementalist. It wants overview, taxonomy, method and impact all at once as its overarching ambition. This is no mean ambition. Such a macro-approach can give context and connection in ways that iterative research evolution may not, except by serendipity. The ideal might be in the end for the macro-approach to have micro-foundations, and thus blend the incremental with the bigger picture.

Let us now move on to suggestions about the work that would be required to establish I2S as a discipline, focusing on the commentaries provided by Lawrence Cram, Michael Smithson and Michael O’Rourke.

Lawrence Cram considers where I2S ‘fits’, suggesting that it is located at the intersection of the human and the design sciences (also known as ‘the sciences of the artificial’): ‘I2S is a human science since it entails interpersonal and inter-group interactions, and a science of the artificial since it leads to the creation of symbols, objects, services and environments by and for humans.’

He also suggests that as well as having much to learn from the design sciences, the evolution in sociology in understanding relationships between publics and academics—especially in ‘public, policy, professional and critical sociologies’—has useful lessons for I2S.

Michael Smithson also reflects on lessons that other disciplines can provide. In particular, he points out the limitations in using statistics as an analogy for I2S and, as discussed earlier, submits that the decision sciences provide a useful template for the further development of I2S. He overlaps with Glenn Withers in suggesting that the development of I2S ‘would include histories of relations among disciplines and subject areas. These histories influence the current relations among the disciplines concerned, and thereby affect the potential for integrative applied research that involves those disciplines.’ He describes a number of additional tasks that are included in the last theme.

Third, Michael O’Rourke recommends engaging philosophy to explore whether I2S has a ‘secure conceptual foundation’. He goes on to say that ‘[a]

good disciplinary theory should satisfy two desiderata: a) supply a systematic conceptual foundation for the discipline that unifies its questions, methods and confirmation standards, and b) frame the disciplinary problem space in ways that are productive of new questions and insights.

He also foreshadows the contributions philosophy could make to analysing major I2S concepts:

We can use the standard, three-part distinction of philosophy into epistemology, metaphysics and axiology to help classify these. Within epistemology some concepts will concern more local aspects of integrative applied research practice, such as the relationship among the six identified ways of dealing with unknowns, while others will concern topics of exogenous interest to philosophers, such as the prospects for reasonable disagreement in integrative applied research... Many issues of theoretical interest will fall under the banner of metaphysics, including those related to the disparate scales that figure into integration and implementation, the character of emergent phenomena in complex systems, and the ontological status of various boundary objects used to effect synthesis and integration. With respect to axiology... 'dealing with values'... will be an important topic for philosophical theory. Ethical considerations will come into play across the trajectory of integration and implementation, as will issues of advocacy, bias and cultural variation. Philosophical attention to these topics and many others will be an important part of theoretical development of an enterprise such as I2S.

He also considers how the principal I2S concepts might be melded together into a foundation for a discipline, undertaking preliminary analysis on the ideas of 'synthesis' and 'integration'. He proposes that the current distinction could be improved by re-conceptualising where stakeholders fit using three classifications: disciplinary, translational and professional.

To conclude, let us return to the hesitation about an I2S discipline. It is particularly worth noting that this does not signify satisfaction with the status quo, but rather questioning if establishing a new discipline is the best way to overcome the fragmentation and marginalisation that beset integrative applied research. There is widespread support for strengthening the practice of integrative applied research through more structure, more formal arrangements and defining 'epistemic communities' or 'communities of practice'. As Julie Thompson Klein says, positing I2S as a discipline 'underscores the need for a robust structure that is more than an add-on to existing ones'.

## Institutional Factors

As the conclusion to the previous theme highlights, enhancing the research contribution to tackling complex real-world problems in a way that is embedded in the academic mainstream remains an ongoing challenge. One option is to organise the research so that it fits with existing institutional structures and reward systems, which is part of the intent of proposing an I2S discipline. Another is to change the institutional structures and reward systems. And, of course, combining elements of these two strategies also has potential. In this theme, I have identified the countries the commentators work in because, although there are general pervasive concerns, they play out differently in specific country contexts.

Based on her empirical research in the United Kingdom, Catherine Lyall lays out many of the key institutional constraints: difficulties in agreeing on quality and hence undertaking effective evaluation; inability to identify suitable peers to act as reviewers; inconsistency and lack of follow-through in funding priorities; challenges in developing effective teamwork when members have different restrictions on their contributions depending on their home departments and organisations; and risks for building a career. While the details vary, Duane Nellis describes the same categories of problems in the United States. Marcel Bursztyn and Maria Beatriz Maury from Brazil and Alison Ritter, Deborah O'Connell and colleagues and Glenn Withers from Australia make some of the same points, with Deborah O'Connell adding the challenge of finding appropriate journals to publish in. The focus on publishing in highly ranked journals as primary measures of quality and prestige is a particular concern and described for the United Kingdom (Catherine Lyall), the United States (David Brown) and Australia (Deborah O'Connell and colleagues, Alison Ritter and Michael Wesley).<sup>6</sup>

So how can we advance? Do we need to move outside universities? Both Alice Roughley in Australia and David Brown in the United States submit that the best work is currently happening in other institutions, including think tanks and consulting firms. David Brown goes on to say that the evolution of I2S 'will depend substantially on how and with whom it defines its bases of legitimacy and standards of accountability', adding: 'Legitimacy can be grounded in normative, legal, technical, political, cognitive or associational terms with a wide range of stakeholders; accountability refers to answering expectations established with more specific stakeholders, such as those affected by or affecting particular research or practice programs'; and concluding with: 'it will be important to develop ideas about indicators of I2S performance as a basis for assessing its

---

<sup>6</sup> Catherine Lyall, Alison Ritter and Glenn Withers see hope in the development of new assessment criteria based on impact.

impacts and enabling its accountability to immediate stakeholders, for building its legitimacy with wider publics, and for catalysing ongoing learning in the field. These raise clear challenges for how universities currently operate.

Glenn Withers from Australia proposes 'creating the new university', arguing that universities are enduring and useful, but significant reform is needed because 'there is nothing in the disciplinary research enterprise that ensures comprehensive coverage of the knowledge needs of human kind'. Both Glenn Withers and Ian Elsum (also from Australia) point to the important links between research and teaching, with Ian Elsum arguing not only that existing research organisations have a responsibility to foster integrative applied research, but also that '[u]niversities have a particular responsibility because students, both graduate and undergraduate, must experience learning across disciplines as well as within the specialisations of traditional disciplines'. Marcel Bursztyn and Maria Beatriz Maury add to this by highlighting the challenge of building new models of research and teaching at the same time as implementing them.

Others suggest changes that are less radical than those Glenn Withers proposes, building on current developments within existing structures. From his vantage point as a highly sympathetic university president, Duane Nellis provides insights into how change happens and the importance of having successful programs and projects to build on. The available expertise has to match the desire to do things differently:

Facilitating strategies and mechanisms for interdisciplinarity and environments for I2S will require alternative administrative structures and leadership throughout every level of the university, with appropriate investment, infrastructural support and reward structures. Certainly, central and college-level advocacy and support are crucial, but without interdisciplinarity and facilitation of I2S percolating at the faculty level, such efforts will not work in the environment of a complex public research university...

New funding can help lubricate reform and being able to piggyback on other initiatives is helpful. Both he and Catherine Lyall point to the importance of advocacy at all levels.

Duane Nellis is looking to establish a 'School of Interdisciplinary Studies', which is in line with Lawrence Cram's proposition that in Australia

[t]he normal pathway for an emergent discipline in the modern university is to acquire initial formal recognition through formation as a 'centre' or 'institute' or 'network' either within or between existing academic disciplinary units. If the centre prospers in an academic sense, through growth in educational and/or research attention, the university

will likely find ways to support growing independence. Colonisation of affiliated disciplines can occur and will support rapid growth; legitimacy in an academic sense requires emergence of similar disciplinary foci in several universities.

An associated point of leverage is to concentrate on sympathetic areas of activity. Linda Neuhauser from the United States proposes public health as the 'platform on which to build and test the I2S concepts', as public health is home to researchers from many disciplines and provides compelling examples of how research linked to practice can result in improved wellbeing for the community at large. She suggests:

Public health is one of the most interdisciplinary disciplines both within and outside the university. Schools of public health include faculty trained in medicine, sociology, public policy, business, psychology, anthropology, biology, communication, education, economics, law, environmental science, architecture, city planning, government and many other fields, and joint appointments with other disciplinary schools are common. In addition, many public health academics not only have expertise in research, but also in practice with government, communities, policy institutes, and/or the private sector...Because public health problems intersect biological, behavioural, environmental and other domains, they are inherently complex to understand and to address.

Glenn Withers submits that the environmental sciences are where initiatives relevant to integrative applied research and I2S are currently playing out and that they are a litmus test for whether universities can adapt to new research forms.

Taking a different perspective, Holly Falk-Krzesinski proposes that the new and growing cadre of research development professionals provides a group of potential I2S specialists and that they would both benefit from and contribute to the further development of I2S. Such professionals are increasingly being employed in US universities to catalyse and facilitate team-based research. Initially their role was to help produce funding applications, but they are now often embedded as integral members of the team. Holly Falk-Krzesinski particularly highlights their strengths in working with stakeholders, dealing with unknowns and engaging with policy makers and practitioners, adding:

Trained as a class of I2S specialists, research development professionals could help funders and stakeholders navigate the limitations academicians bring to partnerships. Moreover, they could provide professional development and training for faculty and university

leadership in basic I2S concepts and methods to enable them to gain a better understanding of considering unknowns in their research and the most effective mechanisms for extending their findings.

Nevertheless, their designation as ‘servant leaders’ who do not initiate or head research programs provides a reminder of a concern raised by Catherine Lyall that these skills are often relegated to a service role and therefore not valued. Ted Lefroy from Australia provides a complementary perspective, reporting that conceiving knowledge integration (as well as spatial analysis and social research) in a service role in his project was a mistake as it under-represented ‘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.’

Regardless of the merits of Holly Falk-Krzesinski’s proposal, fleshing out specialist roles and competencies can provide a helpful focus for discussion, as Christian Pohl points out, and leads to the question Daniel Walker raises: ‘what new dynamics (for better and for worse) will such specialists introduce into the practice of integration and implementation?’

Finally, in a different take on institutionalisation, Julie Thompson Klein challenges us to join the modern era and establish a ‘prominent virtual presence’. She sees this as a critical component of the large-scale and widespread engagement required to overcome current marginalisation and fragmentation.

As these commentaries illustrate, there is an important discussion to be had about how much and exactly how we need to change the research (and teaching) landscape. Whatever changes are made, there are unlikely to be perfect solutions—a point well illustrated by Deborah O’Connell and colleagues. The organisation in which they work, Australia’s CSIRO, moved to a matrix structure to make it easier for those with specialist skills to contribute to various flagship projects tackling major national priorities; but for the on-the-ground research program manager, the flexible structure still does not translate easily into the formation of viable productive teams. It is important, therefore, to ground discussion about requisite institutional changes in experience: building on successes, overcoming problems and always keeping in mind realistic targets given that perfection is impossible.

## **Moving the I2S Development Drive Forward**

The point of the I2S Development Drive is to build a storehouse of concepts, methods and cases, as well as guides to relevant knowledge from outside I2S.

This involves finding, gathering, organising and classifying, making accessible and encouraging use. While the Development Drive was conceived as a way of building the I2S discipline, the idea of strengthening and systematising research practice for investigating complex real-world problems has support, even among those who eschew the notion of a disciplinary base. Julie Thompson Klein summarises the issues:

[R]esources are under-utilised, cross-fertilisations foreshortened and progress in establishing an identifiable field stalled by fragmentation and marginalisation. The fragility and vulnerability of local projects and programs mirror this problem at the level of individuals and teams. Ill-informed definitions, shallow practices and inappropriate criteria for evaluation also prevail.

She adds later: ‘the price of waiting is high, impeding progress at a critical moment in the host of problems in need of integrative applied research.’

David Brown also describes the significance of moving beyond immediate processes and particular problems to thinking ‘about the long-term, large-scale implications...for developing a new field’, and Christian Pohl notes the ‘magnitude of the scientific endeavour we are talking about—one that requires big money, a lot of brain power and the engagement of a wide range of scholars’.

There were many helpful suggestions for how to proceed, which form the basis of this final theme. I deal first with specific suggestions for how the search could be undertaken and areas where relevant materials are likely to be found. I do not reiterate the importance of learning from cases or summarise the resources developed by many of the contributors themselves. These must also be gathered in the I2S Development Drive. I then move on to bigger-picture issues, especially how contributors would spend \$1 million and other large-scale ideas for moving I2S forward.

Let us begin with how to undertake the I2S Development Drive. Julie Thompson Klein reminds us about the boom in advanced database search tools that can assist in finding relevant concepts, methods and case studies. These can help tackle the problem of the ‘scatter’ of relevant materials throughout the published and grey literatures and can provide outcomes better than the simple Google and Wikipedia searches many resort to. Her encouragement to establish a ‘prominent virtual presence’ is necessary not only for institutionalisation of I2S, but also to find useful undocumented materials for the Development Drive. Christian Pohl adds to this, proposing that theory should guide priorities for ‘what empty spaces in the storehouse’s shelves are the most relevant to fill with concepts, methods, case examples and guides’.

If we now move on to what needs to be collected and areas that may provide useful materials: one important aspect is gathering practical theories about different ways of thinking about integration and implementation (this is different from the theory underpinning I2S discussed above). David Brown suggests that the following fields will be helpful: 'ecology preservation, peace building or rights-based development', as well as '[e]xisting research and theory about bringing together diverse groups for joint action, such as public-private partnerships'. Linda Neuhauser points to applicable models from public health, such as 'Stokol's use of analytical, organisational and geographic dimensions' and 'Sussman and colleagues' emphasis on cyclical phases of interdisciplinary and implementation activity'. Christian Pohl notes the lively debate about theory within transdisciplinarity, especially regarding concepts for the co-production of knowledge and the inclusion of stakeholders.

While the focus of these commentators is on theory, others have suggested areas useful for methods and case studies as well. Alice Roughley points to the 'large literature on community engagement, participatory research methods and research adoption', as well as practical experiences that can be learnt from professionals 'working in areas such as human relations, evaluation, risk analysis, Indigenous health, natural resource management, and social and environmental impact assessment', as well as 'community, social and international development and social geography'. In advancing his argument to increase attention to social cohesion, Ted Lefroy proposes that '[l]eadership, project management and internal communication methods all contribute to this and are areas in which we could all learn'.

Howard Gadlin and Michelle Bennett highlight 'a considerable amount of theorising, thinking and activity directed towards creating decision-making processes for controversial, multi-party issues and conflicts that require cooperation and collaboration among groups of people quite disparate in values, perspective, culture, power and just about every dimension of identity you can list'. They specifically point to lessons from academia (such as the work of the German philosopher Jürgen Habermas) and from various government and non-government organisations, as well as from the fields of collaborative governance and negotiated rule making. In addition, although they use it to bolster their arguments about problems with an I2S discipline because of incommensurability, Howard Gadlin and Michelle Bennett's descriptions of the US National Institutes of Health Consensus Development Program and the recommendations of the US Bipartisan Policy Committee (presented in Box 53.1) can also be seen as providing ideas for dealing with conflicts of interest and bias in I2S.

Linda Neuhauser points to other lessons from the US National Institutes of Health, suggesting that evaluations of transdisciplinary research they have funded could also provide valuable concepts, methods and cases. Michael Smithson recommends

accounts of stakeholder perspectives and responses to research processes and outputs, and how researchers and stakeholders understand and manage unknowns. Both of these sub-areas could be built up initially by borrowing heavily from relevant disciplines and research areas (for example, political and social sciences re stakeholders and decision sciences re management of unknowns), but there would still be considerable work to be done by descriptive I2S scholars and researchers.

He then goes on to provide a number of useful suggestions for expanding ways of considering unknowns.

There are also a number of proposals for areas that need strengthening, without specific suggestions for where the I2S Development Drive might look. These include recommendations from David Brown and Alice Roughley for more work on ‘recognising and dealing with value differences’ and the ‘credibility of actors’. Ian Elsum gives high priority to ‘[d]evelopment of strategies for modularising a complex problem so that work on sub-problems can be reintegrated into the whole without distortion’.

The proposals for major further work and ideas for how to spend \$1 million are summarised in Table 35.1. Not surprisingly, many of them reprise ideas discussed in the previous four themes: gathering case studies, strengthening the theoretical core, codifying taxonomies of knowledge, linking methods and problems, and strengthening institutional arrangements, including opportunities to gather together the community of scholars dedicated to these issues.

**Table 35.1 Proposals for Further Major Work, Including Ideas for How to Spend \$1 Million**

'My Big-Science project would seek to: i) further articulate a foundational methodological and, better still, theoretical core to I2S, ii) position that core in the context of other relevant disciplines/discourses and demonstrate uniqueness, and iii) demonstrate the operational value of that postulated core theory and methods in the practice of integration and implementation across a range of domains.' (Daniel Walker)

'...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...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.'

This builds on an earlier recommendation: '... 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...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'. (Ted Lefroy)

'A descriptive branch of I2S would produce or accumulate careful accounts of integrative applied research and its near kin. It would develop frameworks and theories for understanding how and why this kind of research gets done. Descriptive I2S also would have an evaluative component, generating and guiding debates about the strengths, weaknesses, successes and failures of relevant research practices. This evaluative component would provide a conduit of exchange between descriptive I2S and prescriptive I2S.' (Michael Smithson)

Other tasks Michael Smithson raises have been discussed earlier, including 'histories of relations among disciplines and subject areas' and more on understanding stakeholders and on unknowns. In reviewing the array of necessary activities, he concludes that the type of labour and time-intensive research needed (historiography, ethnography and survey methods), along with time for reflection, mean that the maturing of I2S could not be a rapid process.

<p>'What might be the most productive nudges towards both more "muddle through" and genuine "big bang" interdisciplinarity in research? Step one might be projects that codify taxonomies of knowledge, so that the way in which each discipline treats the logical development of theory, the assembly and examination of evidence and the consideration of values in assessment of evidence would be a start. All rational knowledge generation, as opposed to intuition and experience as sources of knowledge for action, must incorporate these elements. But the language and techniques by which these components are expressed are many and various. They can be assembled, explicated and evaluated for what they contribute.' (Glenn Withers)</p>
<p>'If I had \$1 million to spend it would be on the methodology that assigns methods to problem types, funding the (daring) scholars who explore the methods and tools in co-production processes.' (Christian Pohl)</p>
<p>'A comprehensive research endeavour is required to establish whether the outcomes are different when the entire I2S toolkit is used versus selected components.' (Alison Ritter)</p>
<p>'Perhaps if I was in a philanthropic mood and had \$1 million to spend, I would focus on these issues of recognition, reward and evaluation, and, specifically, I would launch a new international journal of I2S to help establish proof-of-concept and build academic credibility.' (Catherine Lyall)</p>
<p>'The challenge for researchers, research institutions and research funders is to foster a community of reflective practitioners of this new approach. The initial step should be support for organisational centres and networks and recognition and reward for researchers who contribute to the advancement of integrative applied research.' (Ian Elsum)</p>
<p>'I suggest finding support for: 1) several meetings of people interested in I2S to discuss selected Drive issues and refine a two-year work plan; 2) synthesis of available information about I2S in several discrete areas; and 3) experimental training of I2S in a university or field setting.' (Linda Neuhauser)</p>

These suggestions ram home the magnitude of the work required to effectively build on what we know, reinforcing why the I2S Development Drive is at the scale of a Big-Science project. It is important to remember that the Drive seeks to boost multiplicity in approaches, along with an array of options for concepts and methods; or, in Julie Thompson Klein's words, 'a systematic approach that is greater than any single method or theory. Systematic does not mean universalist...The Drive...begins by accepting, not minimising or erasing, the diversity of forms of research on real-world problems.'

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.