Australian Government

Land & Water Australia

THE AUSTRALIAN NATIONAL UNIVERSITY

INTEGRATION INSIGHTS

Number 1

A SYSTEMATIC APPROACH TO INTEGRATION IN RESEARCH

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ISSN 1834-304X

September 2006

DPMP

Drug Policy Modelling Program

ANU COLLEGE OF MEDICINE & HEALTH SCIENCES

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Gabriele Bammer

This is the first of a series of digests of concepts, techniques or real-world examples of integration as used in research. Six questions are proposed to provide a framework for explaining integration in a consistent manner. The framework can be used at an individual project level or to think more generally about improving understanding of complex issues and research application in policy, practice or product. In addition, the framework is a first step in developing toolkits of integration methods.

WHAT DO WE MEAN BY RESEARCH INTEGRATION?

Integration in research is only one kind of integration. Humans integrate all the time. For example, our brains synthesise the stimuli coming into our eyes and turn them into meaningful visual images. When we read or hear about something new, we immediately tag it to what we already know.

Furthermore there is no systematic way of describing or explaining integration in research and accounts vary greatly in their content and emphasis. This hampers our ability to learn from each other and to improve our approaches. Discipline-based research provides a standard we should aim for, namely an agreed way of describing problem framing, key theories, and methods. This is useful both in developing projects and in publishing the results.

This first *Integration Insights* puts forward six questions to provide a framework for describing and thinking about integration in a consistent manner. It also begins the process of matching integration methods to specific issues or areas for synthesis, laying the foundations for toolkits of integration methods.

SIX QUESTIONS PROVIDE A FRAMEWORK

The following six questions provide a framework that allows us to be consistent in our descriptions, as well as giving us the ability to collate what we learn from different studies and to compare different approaches to integration.

1. *What is the integration aiming to achieve and who is intended to benefit?*
2. *What is being integrated?*
3. *Who is doing the integration?*
4. *How is the integration being undertaken?*
5. *What is the context for the integration?*
6. *What is the outcome of the integration?*

These questions can be used at various levels. They were primarily developed to help researchers systematically plan, and later write-up, the integrative component of projects. But they are also useful at a higher level of abstraction, in terms of thinking about integration in research more generally. Both of these levels are discussed below. A detailed example of the application of these questions to a program of applied research – the World Commission on Dams – will be presented in *Integration Insights #2*.

1. FOR WHAT AND FOR WHOM?

The question *What is the integration aiming to achieve and who is intended to benefit?* helps us think more clearly about the integrative purposes and to differentiate them from other research aims, such as the development of new discipline-based knowledge.

Integration in research has two overarching aims. The first is to improve understanding by synthesising a number of different perspectives. The second is integration to improve the application or implementation of research knowledge. This can be to improve policy, professional practice, commercial products or some other application.

There are four primary ways of thinking about beneficiaries. Integration can be primarily aimed at benefiting:

(i) researchers; for example, the Human Genome Project, which integrated the work of many researchers in a range of institutions to determine the sequence of chemical 'letters' (the bases adenine, guanine, cytosine and thymine) in human DNA, aimed to provide the international scientific community with a solid foundation from which to tackle the genetic bases of disease (Sulston and Ferry, 2002).

(ii) powerful groups in society; for example, the building of the atomic bomb during World War II, which integrated a range of disciplinary and applied research, industrial production and military know-how, sought to benefit the US government and its allies.

(iii) powerless groups; for example, Partners in Health integrates medical treatment, public health research and the *"lived experience of the world's poorest and sickest communities"* to *"bring the benefits of modern medical science to those most in need of them and to serve as an antidote to despair"* (http://www.pih.org/whoweare/vision.html).

or

(iv) both the powerful and powerless; for example, the World Commission on Dams, which worked with both dam builders and financers and those displaced by dams, aimed to integrate those different perspectives to enhance decision-making on water and energy management and align it with emerging global commitment to sustainable human development and equitable distribution of costs and benefits (World Commission on Dams, 2000).

2. OF WHAT?

The question *What is being integrated?* helps us think about the expertise we need to marshal to achieve the integration aims in our projects. It also encourages us to be clear about the boundaries to our research – who and what is included, excluded and marginalised (Midgley, 2000).

Integration to improve understanding generally involves synthesising a number of different disciplinary perspectives, and it can also include perspectives of people who are affected by the issue under consideration, as well as of people who are or could be in a position to exert influence over the issue. At a more specific level, this can involve integrating different research results, epistemologies, cultures, values, power, geographical and temporal scales and so on.

For research aimed at implementation, the area of application can be policy, professional or other practice, or various products. In such cases the research has to be integrated with what we know about making effective policy or practice change or developing new products or other technologies. In other words research knowledge has to be integrated with specific application knowledge.

3. BY WHOM?

The question *Who is doing the integration?* highlights that integration does not necessarily involve a group process. Certainly the integrative process can be designed to involve everyone in the project, but equally it can be conducted by a sub-group or even one person. When a single person is responsible, the integrator is often, but not necessarily, the research leader.

A case can be made for a new category of researcher – an integration specialist. Such a person might further sub-specialise in integration for improving understanding or in integration to improve the application of knowledge. Such people are sometimes referred to as boundary spanners or knowledge brokers.

4. HOW?

The question *How is the integration being undertaken?* focuses our attention on integrative methods. At present there is no real appreciation of the range or diversity of such methods, let alone toolkits of techniques.

Integration to improve understanding involves five classes of methods:

(i) dialogue-based; for example, there are a wide range of dialogue approaches such as Delphi Technique, Nominal Group Technique and principled negotiation.

(ii) model-based; for example, there are many types of modelling from conceptual mapping to formal system dynamics or agent-based models.

(iii) product-based; for example, designing and developing a new product can provide an effective way of integrating different perspectives. Building the atomic bomb illustrates this integrative method.

(iv) vision-based, for example, having an ideal to work towards. This is illustrated by the World Commission on Dams, which was guided by the idea of "*development effectiveness*", in other words equitable and sustainable human development (World Commission on Dams, 2000, p. xxxiii). Working towards the vision can then involve one or more of the other methods outlined here.

and

(v) common metric based, for example converting everything to a dollar value, which then allows integration through a range of methods from simple arithmetic to modeling. Other common metrics include disability-adjusted life years (DALYs) which are used in public health (http://www.who.int/healthinfo/boddaly/en/index.html) and the ecological footprint (http://www.footprintnetwork.org/).

To date there has been little consideration of the best integrative tools for specific types of integration. For example, we do not know the most effective ways to integrate across epistemologies, or geographical scales or cultures.

In terms of integration to improve the application of knowledge, again there has been little cataloguing or evaluation of methods. Approaches include research translation, developing decision support systems, co-production of knowledge, and advocacy.

Research translation generally means writing about research results in a succinct way that is meaningful to policy makers or other practitioners, so that they can easily appreciate the value of the research and apply it as appropriate. Decision support systems are generally models that give decision makers a way to appreciate a complex problem or issue. They can often be used to forecast the likely outcomes of a range of different policies or actions, so that policy makers or other practitioners can try out a range of "what if" scenarios. Co-production of knowledge involves researchers and policy makers or other practitioners working together closely at all stages of the research

project to ensure that the research is aligned with the practical needs of the decision maker. Finally, researchers may use a range of advocacy strategies to encourage practical uptake of their findings.

5. CONTEXT?

The question *What is the context for the integration?* directs attention to the political or other action circumstances which led to the research and which may be influential during its life. It also focuses on the institutions which are involved in funding or managing research integration. Integrated research is often undertaken in response to a driver from outside the research community – such as public concern, government policy or business innovation. Understanding the context can therefore be critical for appreciating how the research is shaped and the outcomes assessed.

6. OUTCOME?

The question *What is the outcome of the integration?* involves examining what the integration produced, as well as the process of integration.

Significant questions include: How well did the integration meet its aims? Was effective integration achieved? Were influential new insights produced? Did effective action result? Were effective integrative methods used? Would other methods have made useful contributions?

In traditional disciplines, research is assessed by others from that discipline through peer review. At this stage integration in research has no "college" or identifiable collection of fellow researchers, but developing a peer group is essential for the evaluation of outcomes. The Integration and Implementation Sciences Network (www.anu.edu.au/iisn) is a step in this direction.

DEVELOPING TOOLKITS OF INTEGRATION METHODS

While toolkits have their limitations, at this stage in the development of thinking and practice to improve integration in research, the process of developing toolkits can provide a useful step forward. This is primarily because it forces us to become more specific and to catalogue tools and their application to particular synthesis tasks. In other words, what effective methods exist for integrating different interests, or different epistemologies, or across different geographical scales?

For example, developing a toolkit of dialogue based methods raises awareness that different dialogue techniques are effective for different kinds of integration. Thus, for example, the Delphi Technique is useful for integrating judgements, Nominal Group Technique for synthesising different experiences and principled negotiation for integrating different interests.

Some of these methods will be useful not only for improving understanding but also for enhancing the application of integrated knowledge in policy, practice or product. But there may also be additional toolkits for implementation methods.

The *Integration Insights* series aims to identify and foster the uptake of new integrative ideas and tools. Future issues will present significant ideas and methods to further the development of such toolkits. For example *Integration Insights #3* will present an account of principled negotiation as a method for integrating different interests.

CONCLUSION

This first *Integration Insights* argues that integration in research will benefit from more explicit and organised consideration of six aspects. The aim is to provide a structure researchers can use when they are planning a research project and again when they are writing up the results of the research. Consistently using a framework such as the one outlined here provides the basis for learning from our own experiences, as well as those of others, and in turn that learning can be used to improve integrative concepts and methods. This can be further assisted by developing toolkits of integration methods, which match techniques to synthesis tasks.

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CITATION

Bammer, G. (2006) A systematic approach to integration in research. Integration Insights #1, September. Available at www.anu.edu.au/iisn.

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PUBLISHER

The National Centre for Epidemiology and Population Health, ANU College of Medicine and Health Sciences, The Australian National University, Canberra ACT 0200, Australia.

THANKS

The production of *Integration Insights* is funded through a Land & Water Australia Innovation Grant and the Colonial Foundation Trust through the Drug Policy Modelling Program.

Peter Deane, David McDonald, Alison Ritter and Lorrae van Kerkhoff provided valuable comments. Ros Hales designed the cover and layout.