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Research integration in the
Desert Knowledge
Cooperative Research Centre

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Desert Knowledge
Cooperative Research Centre

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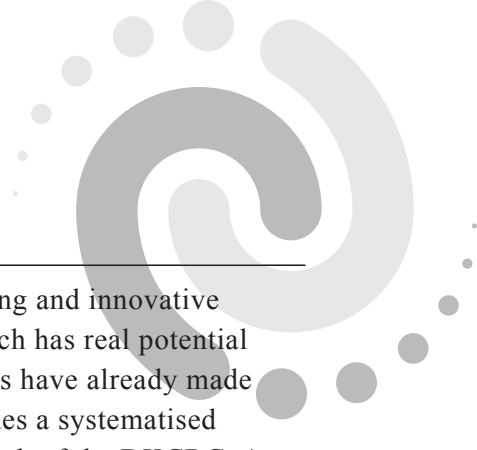
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Executive summary

The Desert Knowledge Cooperative Research Centre (DKCRC) is an exciting and innovative venture, which has attracted a broad range of excellent researchers and which has real potential to make a difference to the desert region. DKCRC managers and researchers have already made significant inroads in meeting the integrative challenges. This report provides a systematised account of formal knowledge about integration and its application to the work of the DKCRC. A case is made for promoting on-going explicit consideration of integration in the research of the DKCRC, giving the DKCRC the potential to be a world-leader in the application of integrative research strategies.

A standard protocol for describing integration

There is currently no procedure for describing integrative research. A protocol is presented based around six key questions:

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. how will we know if we have been successful?

Applying the standard protocol to describing integration in the DKCRC

A workshop was held with almost all of the managers, coordinators and core project leaders at which the integrative work of the DKCRC was examined using the six integrative questions.

The DKCRC's four objectives – sustainable livelihoods, viable communities, thriving regions and increased social capital – provide the core of what integration in the overall research program is aiming to achieve. The intended beneficiaries are all desert Australians – Aboriginal and non-Aboriginal – at the individual and community, as well as private and public sector levels. Meeting one or more of these objectives is also central to the integrative work of the core projects, as well as of the social science and education and training programs, although many have additional subsidiary aims.

There are five key foci for integration: between (1) disciplines and epistemologies, (2) Aboriginal and non-Aboriginal knowledge, (3) research and enterprise opportunities, (4) research and service provision, and (5) research and policy. A number of additional integrative tasks were also identified.

In terms of who is doing the integration, the executive management team, core project leaders and social science and education coordinators all saw integration as a key aspect of their leadership roles. A number of key characteristics for successful leadership in integration were identified. The role played by others involved in the DKCRC, including the Board, stakeholders/end-users and the communications team, was also discussed, and highlighted that responsibility for various integrative tasks is often not clearly specified, documented or recognised, supporting the need for a standard protocol for considering integration.

The integration methods used by the DKCRC mostly fit fairly comfortably into one of four primary categories: product-based, model-based, vision-based and dialogue-based. However, there is a real recognised need for the development of a toolkit of specific integrative methods, linking methods to particular tasks. Within the DKCRC, workshop participants identified the greatest need for specific tools to integrate (1) epistemologies, (2) ideologies, (3) research and business interests, and (4) research and policy. Given that there is little current work developing such a toolkit, this is an area to which the DKCRC could make a significant contribution. An outline of principled negotiation and other dialogue-based methods, which provides the beginnings of such a toolkit, is presented.

The context in which the DKCRC is located is rich and complex. A detailed exposition is beyond the scope of this report, but a brief overview is presented focusing on: (1) the economics of the desert, (2) the Aboriginal population, and (3) the practicalities of DKCRC funding.

Finally, a range of indicators of success in accomplishing integration are outlined. These relate both to achieving the outcomes and to maintaining the relationships central to integration.

Integration across the whole DKCRC program

Core Project 6: ‘Thriving desert regions’ and the ‘Science of Desert Living’ project provide excellent complementary overarching integration for the DKCRC. Decision support provides the rationale for integration in Core Project 6, while the development of a new science provides the rationale for integration in the ‘Science of Desert Living’ project. In addition, the proposed *Journal of Desert Knowledge Research* has the potential to make a further significant contribution to the overarching integration.

Conclusions for making the DKCRC a world leader in integration

Despite wide-spread calls regarding the value of and need for integration, it is rare for integrative challenges to be explicitly described and for systematic approaches to be used to address the challenges. Doing both of these would make the DKCRC internationally ground-breaking. Four specific steps for achieving these goals are:

1. promoting the use of the integrative framework by all DKCRC researchers
2. setting in train processes among interested researchers and stakeholders/end-users to make epistemologies and knowledges explicit
3. developing and publishing papers about the integrative approaches in high-ranking international journals
4. holding an annual one-day workshop on integrative processes with the executive management team, core project leaders and social science and education coordinators. The aim would be to share methods and strategies, as well as to develop a toolbox of specific methods and processes for key integration tasks.

Introduction

The Desert Knowledge Cooperative Research Centre (DKCRC) is an exciting and innovative venture, which has attracted a broad range of excellent researchers and which has real potential to make a difference in the desert region. As with all CRCs, integration across disciplines and between research and its application is an essential feature of the research program. The DKCRC has a stated commitment to the following principles:

- Collaboration (involving multiple DKCRC partners)
- Engagement of end-users and stakeholders in the research
- Quality of research and ethical implementation
- Systemic education and training
- Aboriginal partnerships
- Linkages between local and western scientific knowledge systems.

While each individual project is not expected to address every aspect encompassed by the principles, project proposals are prioritised against them (DKCRC Project Proposal Form & Guidelines for Projects, October 2003).

DKCRC managers and researchers have set solid groundwork for and made significant inroads in meeting the integrative challenges. The aim of this report is to document the integrative work that has been undertaken to date in a systematic way¹. In doing so, a framework is provided that can be routinely used by the DKCRC. The DKCRC is tackling numerous and diverse integrative tasks and is a veritable ‘integrator’s delight’. This range plus the explicit consideration given to integrative tasks arguably makes the DKCRC a world-leader in the application of integrative research strategies.

This report has four sections:

1. Outline of a standard protocol to describe research integration
2. Application of the protocol to the DKCRC core projects and overall research program
3. More detailed consideration of integration across the whole DKCRC program
4. Conclusions and suggestions for making the DKCRC a world-leader in the application of integrative strategies.

¹ The brief for this report had two components. The first was to attend the Core Project leaders’ meeting and the DKCRC wide conference in February 2006 as an observer. From this a report was prepared proposing key strategies for integration across the research portfolio, as well as strategies and considerations for developing a theoretical framework for the research portfolio. The second was to present the resultant report to core project leaders, the social science and education coordinators and the executive management team in a facilitated workshop, which was held on August 9, 2006. This final report combines the original report with the workshop findings.

A standard protocol for describing integration

When researchers describe biophysical or social sciences investigations, they follow an accepted procedure to explain how they went about the research and the methods they used. In contrast, there is currently no widely adopted standard way of describing integrative research. However, the following six questions provide a useful standard way of thinking about and describing 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. How will we know if we have been successful?

(Adapted from Bammer and LWA Integration Symposium Participants, 2005).

What is the integration aiming to achieve and who is intended to benefit? helps us think specifically about the aims of the integration, in addition to other aims the research may have.

What is being integrated? helps us think about the expertise we need to marshal to achieve our integration aims. For example, which disciplines are relevant? Which practice experience? Furthermore, are we integrating across epistemologies, cultures, geographical regions, timescales, institutions, values, power bases or other relevant dimensions? These questions also start us thinking about the best integrative methods and processes for each different type of integrative task.

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

How is the integration being undertaken? focuses our attention on integrative methods. At present we do not have a good understanding of the range or diversity of integrative methods. Building on the work of Rossini and Porter (1979), Klein (1990) and Bammer (in preparation), four categories of integration methods are proposed:

1. product-based
2. model-based
3. vision-based
4. dialogue-based.

Individual methods may use elements from more than one of these categories.

What is the context for the integration? involves 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, managing or in other aspects of the 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.

How will we know if we have been successful? Both outcomes and process are dimensions of success. 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?

This protocol can be used at any scale – individual study, core project, or DKCRC research program. In the next section it is applied to the DKCRC core projects and the research program overall.

Applying the standard protocol to describing integration in the DKCRC

Most of the core project leaders and executive management team, along with the social science and education coordinators, participated in a workshop which applied the six questions outlined above to the core projects and the research program overall². This section presents the workshop results.

What is the integration aiming to achieve and who is intended to benefit?

The DKCRC's four objectives provide the core of what integration in the overall research program is aiming to achieve:

1. Sustainable livelihoods for desert people based on new natural resource and service enterprise opportunities that are environmentally and socially appropriate.
2. More viable remote desert communities to support the presence of desert people, as a result of facilitating access to more attractive services that are delivered more efficiently.
3. Thriving regional desert economies that are based on unique desert knowledge and which are more self-sufficient.
4. Increased social capital of desert people, their communities and service agencies.

<http://www.desertknowledgecrc.com.au/downloads/2-Whoware.pdf>

The intended beneficiaries are all desert Australians – Aboriginal and non-Aboriginal – at the individual and community, as well as private and public sector levels.

Meeting one or more of these objectives is also central to the integrative work of the core projects, as well as of the social science and education and training programs. These also have additional specific aims, some of which involve integration, others of which do not. Notable additional integrative aims include:

Core Project 1 (Jocelyn Davies)	Valuing the work of desert landowners in managing the natural and cultural resources for public benefit. The beneficiaries are desert landowners as well as the broader Australian public. The former gain through the contribution such recognition would bring to more sustainable livelihoods (including stronger health and wellbeing). The latter profit from the maintenance and enhancement of ecosystem services and cultural services, such as dust and flood abatement and aesthetic value.
Core Project 2.1 (Maarten Ryder)	Strengthening the value chain in bush food production, including appreciation of consumer demand, new niche markets and pest control.
Core Project 2.3 (Mark Ashley)	Helping develop government policies that enhance Aboriginal economic development in the desert pastoralism industry.

² The workshop participants were: Mark Ashley, David Atkinson, Alicia Boyle, Jocelyn Davies, Sarah Holcombe, Craig James, Murray McGregor, Mark Moran, Fay Rola-Rubzen, Alice Roughley, Maarten Ryder and Kurt Seemann. Jan Ferguson participated in the second half of the workshop. Kurt Seemann, leader of Core Project 4, has also thought deeply about integration. Whereas integration and synthesis are used interchangeably in this report, he differentiates between integration and synthesis, with synthesis involving a more intense combination of elements. The analogy he uses is with baking a cake – aggregation is bringing the ingredients together, integration is mixing them and synthesis is putting them in the oven.

Core Project 3 (Fay Rola-Rubzen)	Ensuring alignment of the three project streams – auditing, measuring impact and undertaking action research – in order to support small business in desert Australia.
Core Project 4 (Kurt Seemann)	Developing an approach to assist desert people monitor for settlement sustainability. This would allow early identification of fragility and vulnerability and mitigation of negative impacts.
Core Project 5 (Mark Moran)	Enhancing local governance arrangements at the interface between consumers and service providers, as these largely bridge the gap between local capacity and the expertise required to process and administer services.
Social Science Program (Sarah Holcombe)	Developing authoritative research, including local voices, which is taken up in government policy.
Education and Training Program (Alicia Boyle)	Providing opportunities for Aboriginal youth to participate in and learn more about research.

What is being integrated?

There are a number of key foci for integration. Five primary types of research integration for the DKCRC are between:

1. disciplines and epistemologies
2. Aboriginal and non-Aboriginal knowledge
3. research and enterprise opportunities
4. research and service provision
5. research and policy.

These are elaborated below. A number of additional areas for integration were also identified at the workshop:

- integration between research and more than one of the above (or other) sectors, e.g. integrating perspectives and priorities of researchers, policy makers and non-government organisations, or between researchers, consumers and service providers. Integration between sectors was also recognised, such as aligning policy responses with community aspirations and assets or bringing together landowners and public values in relation to land, natural resources and cultural resources.
- cross-cutting synthesis, such as integration across jurisdictions, both across States and Territories, as well as between the Commonwealth, the States/Territories and local governments. Other examples here are integration:
 - between top-down and bottom-up approaches
 - between institutions involved in the DKCRC, as well as between mainstream (formal) and customary (informal) institutions affected by the DKCRC's work
 - between process and product
 - across values and ideologies
 - across different scales of operation and between the different systems in the desert.
- specific integration tasks within projects, such as:
 - integrating natural resource, cultural resource, health and wellbeing outcomes from 'Working on country' (Core Project 1)
 - settlement living, plus work on the land where the settlement is located (Core Project 1)
 - the role and functionality of human factors and institutional factors in the sustainability of settlements, as well as the role and functionality of physical/natural factors and systems in viability and sustainability (Core Project 4).

- integrating across projects, within projects (between different streams or research addressing different parts of the value chain) and between the research and education activities. The need to integrate the multiple goals of stakeholders, researchers, the Board and government was also recognised, as was balancing project intellectual property and development.

The list of integrative tasks is long. In general, it is rare for the integrative tasks to be clearly described and differentiated. Apart from making integration more apparent and transparent, the main reasons for specifying the integrative tasks are to highlight who needs to be involved in the research and to link integrative tasks to integrative methods. As emphasised in the section on Question 4 below, such linkage is still in its infancy.

The DKCRC is well advanced in thinking about the integrative tasks and has been exemplary in identifying the disciplines and stakeholders/end-users who need to be involved. As will be discussed in more detail below, the work of the DKCRC also provides an excellent platform for beginning the process of linking tasks to methods. Before moving on, a brief discussion of key challenges involved in the five primary types of research integration is presented.

Disciplinary and epistemological integration challenges

The DKCRC has an overarching systems approach, within which it draws on a wide range of disciplines, predominantly in the biophysical and social sciences. Finding ways to synthesise the approaches and findings of different disciplines is compounded by underlying differences in understanding about the nature of knowledge and how it is generated, or epistemologies. As these are often unspoken and even unrecognised, a brief overview of three prominent epistemologies – positivism, interpretive social science and critical social science – is presented in Appendix 1. The biophysical sciences are generally underpinned by a positivist orientation, whereas the social sciences can be underpinned by a broader set of orientations, ranging from positivist through interpretivist to critical. Hybrid epistemologies, which combine elements from different orientations are also becoming more common. Different systems approaches also have different epistemologies, for example, general systems thinking and system dynamics often have a positivist orientation, soft systems thinking has an interpretivist orientation, critical systems thinking has a critical orientation and Midgley's pluralist approach can use hybrid epistemologies (Midgley, 2000).

It was clear from the DKCRC conference that the researchers involved are very diverse in their epistemological orientations. Unrecognised differences in epistemology can be sources of mutual irritation, and some hints of this were evident. For example, positivists tend to see those with interpretive and critical orientations as sloppy analytically and focused on political correctness, while interpretive and critically oriented researchers often see positivists as narrow and rigid. Developing an appreciation of differences in epistemologies and how their strengths can be combined (and weaknesses overcome) can be a source of creative energy and excitement and this was also evident at the conference and workshop. Impressively, the managers, coordinators and core project leaders display ability and enthusiasm for building on the strengths of epistemological diversity.

Aboriginal and non-Aboriginal knowledge integration challenges

As well as specialist academic knowledge highlighted in the section above, understanding the desert requires local knowledge, which is the ‘accumulated and shared lived experience of people in a place’ (Brown, n.d.). Both Aboriginal and non-Aboriginal people have local knowledge, which can also vary from area to area within the desert. Local knowledge is often tacit rather than explicit. The DKCRC has clearly recognised the importance of such knowledge and has given extensive consideration to protection of the intellectual property inherent in it. There are two important integrative challenges for the DKCRC. The first is to synthesise different local knowledges – between Aboriginal and non-Aboriginal knowledge and between different desert regions – which also involves synthesising across cultures. The second is to synthesise local knowledge with other relevant knowledge, such as integrating local knowledge with research knowledge, business knowledge, practice knowledge and policy knowledge. A brief overview of different forms of knowledge is presented in Appendix 2.

Research and enterprise opportunities integration challenges

CRCs aim to ‘maximise the benefits of research through an enhanced process of utilisation, commercialisation and technology transfer’ (<https://www.crc.gov.au/Information/default.aspx>). In the case of the DKCRC this translates into the key outcome of ‘Sustainable livelihoods for desert people based on new natural resource and service enterprise opportunities that are environmentally and socially appropriate’ (DKCRC 2005).

The DKCRC aims to both develop commercialisation opportunities and use existing and new businesses to enhance desert livelihoods. Commercialisation opportunities have been identified from the completed Theme-based projects and are currently being explored. Further commercialisation opportunities are expected to emerge from the current core projects.

The DKCRC has embraced the commercialisation brief with enthusiasm and has made considerable inroads into considering the balance between protection, utilisation and appropriate rewards for intellectual property.

Five types of products are recognised in the DKCRC’s Commercialisation and Utilisation Plan:

- commercialisable products
- commercialisable services
- knowledge for small business
- knowledge for communities
- knowledge for policy.

The first two focus on private benefit and the last three on public benefit. Each faces different integrative challenges.

Enterprise opportunities focusing on private benefit face the same integrative challenges as other commercialisation of research. Primarily this involves recognising and accommodating the different goals and ways of operating of researchers and entrepreneurs. They usually have different values, imperatives, agendas and ideology. For example, researchers are primarily interested in improving understanding, while entrepreneurs are interested in producing a product or service. Entrepreneurs are oriented towards profit, or at least self-sufficiency, while researchers rarely have economic goals. For the public benefit activities, the main integrative challenge is to turn outputs into outcomes through the partners. This is dealt with in more detail in the next section.

In both cases, the DKCRC has undertaken significant action to bridge the gaps by providing commercialisation training for the core project leaders. Core project leaders have used this training to develop Commercialisation and Utilisation Plans, with aligned Communications Plans.

Research and service provision integration challenges

This integration challenge is also tied to an outcome for the DKCRC, namely ‘Remote desert communities that are more viable to support the presence of desert people, as a result of facilitating access to more attractive services that are delivered more efficiently’ (DKCRC 2005). The emphasis here is on providing demand-driven service delivery – often, but not exclusively, focused on improving housing. Demand-driven service delivery involves three partners: the consumers (demand side), the service providers (delivery side), and the researchers (developers or mediators). One integrative challenge is to recognise and accommodate different goals and ways of operating between consumers, service providers and researchers. A second integrative challenge is to encourage partners such as state and territory governments, communities and relevant organisations (e.g. the Centre for Appropriate Technology) to build on the work of the DKCRC and develop commercial demand-driven services (i.e. turning outputs into outcomes).

Research and policy integration challenges

Commonwealth, state and territory, and local government policy will all influence the ability to enhance desert livelihoods through enterprise opportunities and through better demand-driven service provision. Working within existing policies and helping to shape future policies are therefore core to the DKCRC, leading to three important roles:

- working with communities and relevant stakeholders to help them understand the policy environment and how it might be changed
- providing critique of the strengths and limitations of existing policies
- providing decision support to policy makers for the development of new policies.

In terms of providing decision support, joint work between researchers and policy makers must accommodate different goals and ways of operating. There is a growing body of literature describing these differences and the tensions they give rise to. For example, Gregrich (2003) highlights:

- different research and policy priorities, so that research does not address the most pressing questions for policy makers
- inability on each side to effectively manage uncertainties, plus lack of understanding of the limitations inherent in research and policy approaches
- inability to communicate vital information to the ‘other side’
- different time cycles, so that, for example, release of research findings rarely takes into consideration the policy makers’ decision-making cycles (budget cycles, legislative cycles)
- lack of researcher appreciation of policy funding constraints
- no current differentiation of researchers from self-interested parties seeking to influence public policy.

An additional issue for the DKCRC interaction with policy makers is that the DKCRC must position itself in a context where political party ideology may: be prominent; differ between the Commonwealth, states and territories, and local government; and change over time. This has an important intersection with researcher epistemology. The most powerful and appropriate stance for

the DKCRC is, arguably, to be ideologically neutral, i.e. disinterested. This is easier for researchers with a positivist or interpretivist orientation than for researchers with a critical social science orientation, who are explicitly ideologically engaged. This is discussed further in Appendix 1.

Who is doing the integration?

Although everyone in a project will do their own individual integration, formal responsibility for different specific integrative tasks can be variously allocated to individuals or groups. At the workshop, the executive management team, core project leaders and social science and education coordinators all saw integration as a key aspect of their leadership roles. It was also seen as an important facet of the work of both the DKCRC Board and of the communications team.

In the participatory processes undertaken in various projects, it was generally agreed that the stakeholders and end-users involved should also play a role in the integrative work, which should be embedded in the participatory process. Stakeholders and end-users were also seen to be important in the synthesis involved in research being adopted in on-the-ground practice.

Researchers and research teams, modellers, steering committees and reference groups, as well as settlement location teams, were also all seen as having a role to play in different types of integration.

The point here is that responsibility for various integrative tasks is often not clearly specified, documented or recognised. The value of a standard descriptive framework is that it can help overcome this deficit.

Leaders' roles in integration

At the workshop there was specific discussion about leaders' roles in integration. A number of key characteristics were identified, particularly:

- both ability and appreciation of timing in taking the integrative lead
- project management skills and being a good manager
- being reflective, listening and being respectful, as well as using these skills to move forward
- developing common vision and methodological robustness, as well as attracting influential others
- ability to innovate and step out of one's comfort zone
- courage and the ability to manage self doubt, as well as using these to manage risk and to 'let go' of anxieties
- supporting those below and getting support when necessary; mentoring and coaching others and seeking it for oneself; looking after others and oneself
- maintaining energy for integration, especially when everyone else is busy with disciplinary work
- ability to inspire and motivate, including being passionate, capturing the imaginations of others, being positive about the work of others, and being there for them
- overcoming negativity and avoiding being judgmental
- making decisions and taking risks, avoiding procrastination and sticking with decisions
- learning from mistakes
- talent for and honesty in communication, including 'calling problems as you see them'

- ability to set and communicate boundaries, contain issues and complete tasks
- flexibility
- consistency
- ability to foster goodwill and to start with assumptions of goodwill to build trust.

It was suggested that many of these skills could be encapsulated in seven emotional intelligence competencies of leaders: trust, compassion, intuition, constructive discontent, interpersonal connections, resilience and creativity (Suchy, 2000).

Although the focus was on leadership roles in integration, two important challenges for leaders in the DKCRC were also mentioned. One was that innovation could expose a leader to attack from within as well as from outside. The other was the tension some participants felt between the intellectual leadership and integration in the research and broader project leadership and synthesis skills. This can be exemplified by the distinction between being a Professor and a Head of Department. A professor sets intellectual direction and integrates a team's work around it, while a head of department is less engaged in intellectual work, but fosters the work of others and ensures that the administration supports it. Many leaders are likely to be more proficient in one or other set of skills than in both.

How is the integration being undertaken?

There is a real need to develop a toolkit of integrative methods, linking methods to specific tasks. Thus it would be useful, for example, to know the best methods for integrating across epistemologies or between research and policy. However, this is still a long way from state-of-the-art integration. Although numerous methods have been developed, they are usually not linked to tasks and have often not been well evaluated. The time is arguably right for starting to compile methods into a toolkit and the DKCRC could contribute significantly to that task.

A useful beginning is to think about categories of integration methods. Based on the work of Rossini and Porter (1979), Klein (1990) and Bammer (in preparation), four primary categories of integration methods can be proposed:

1. product-based
2. model-based
3. vision-based
4. dialogue-based.

Although individual methods may cut across more than one of these categories, most will primarily fall into one group. At the workshop, the integrative methods and processes being used were sorted using these categories. This exercise showed that the four classes have considerable value.

Product-based integration uses the development of a specific material object or service as a way of focussing disparate disciplines and practice areas. A classic example is the development of the atomic bomb, which provided a focus for the work of 'theoretical physicists, nuclear chemists, analytical chemists, corrosion experts, metallurgists, hematologists and meteorologists', as well as engineers, military planners and defence policy makers (Compton, 1956, p. 333). Product-based integration in the DKCRC was seen to include the development of:

- commercialisable activities such as bush foods, 4-wheel drive tourism, service delivery through Core Project 5 and the likely outcomes of action research projects in Core Project 3
- educational resources

- communication plans and commercialisation plans
- communication products, including topical policy pieces, an effective website with downloadable materials, reports, papers and other suitable materials
- a field manual (for Core Project 5), with a clear structure and hierarchy of research questions, outcomes and deliverables
- policies developed in the Science of Desert Living project
- an on-line library of references to share information in the group
- valuation methods and other tools.

Model-based integration uses the development of an economic, systems or complexity-science based model as an integrative tool. The model can be conceptual or mathematical. The discussions which lead to the development of the model are a primary source of integration, but the model itself can also be useful. For example, the CRC for Greenhouse Accounting has used the production of a range of models and other decision support tools as integrative mechanisms (<http://www.greenhouse.crc.org.au/tools/>; van Kerkhoff, 2002, 2005a). Model-based integration was seen to be important in the DKCRC, with many of the core projects having a conceptual model base. Core Project 1, for example, is using a social enterprise model to develop natural and cultural resource management and, along with Core Project 2.1, is also using a value chain model. Core Project 1 is also developing an investment model using cost-utility assessment of management of natural and cultural resources by alternative pathways as a primary integrative tool.

In **vision-based integration** the driving force is not a product or model, but an idea. Here the integration involves fleshing out and/or applying the idea. Vision-based integration in the DKCRC was also important in many of the projects. The vision guiding the development of the overall research program seeks to achieve four outcomes: sustainable livelihoods, viable communities, thriving regions and increased social capital, as outlined earlier. Complementary specific visions guiding core projects or other activities include:

- Core Project 1: that Australian society values services provided by people living and working in desert Australia. These services include managing natural and cultural resources, emergency response and so on. Another vision specifically for Aboriginal people is ‘healthy jobs in country’.
- Core Project 4: developing integrated understanding of settlements, particularly (1) the role and functionality of human factors and institutional factors in settlement sustainability, and (2) the role and functionality of physical/natural factors and systems in viability and sustainability.
- Core Project 5: to realise the potential of a demand-responsive system where residents are in a financial position to purchase services and resources freely and to use this to replace the welfare economies of desert settlements.
- Education and training program: to increase the number of Aboriginal and non-Aboriginal people studying, working, living, researching and developing desert Australia.

Finally, **dialogue-based integration** uses forums, workshops and other participatory events to develop a bottom-up style of integration which is driven by stakeholders. Dialogue and participation are also important in the three categories of integration method described above, but here it is the sole focus and often involves the development of consensus based on the grounded experience of participants. All of the core projects have involved dialogue-based integration in developing the projects. While there have been some differences between projects, broadly they have started with a 2-page scoping document, followed by a workshop for researchers

and stakeholders/end-users. The first day has generally been devoted to the stakeholders/end-users laying out the problems and research questions they see as important. The second day has largely involved the researchers developing projects to address these problems. The project ideas have then been fed back to the stakeholder/end-user group for refinement. At the same time stakeholders/end-users are invited to form a project steering group and embed their staff in the research process. Dialogue-based integration can also be used to synthesise a range of results as the project progresses. In such a process, the researchers and stakeholders/end-users work together to amalgamate research results and practice-based judgement to chart the best way forward on the problem. As well as the meetings, workshops, forums, round tables and think tanks, dialogue-based integration is evident through:

- participatory modelling leading to an on-line Delphi process (Core Project 1)
- development of field teams with researchers and community members; also engaging governments and non-government organisations as part of the research. This could lead to co-authorship of papers, and reports, as well as joint ownership of intellectual property.

Other considerations in ‘doing’ integration

In general, the success of product-, model- and vision-based integration depends on the strength of the product, model or vision and on the ability of their proponents to rally other researchers and stakeholders to participate in their development. The advantage of these integrative processes is that direction is set by the product, model or vision. However, the level of buy-in by researchers and other stakeholders cannot be guaranteed. Most will have other interests than simply the development of the product, model or vision. For example, researchers will want publications in peer-reviewed journals on their own areas of expertise, entrepreneurs will want to extract commercial advantage, while policy makers will want to extract political advantage. Both entrepreneurs and policy makers will want to hedge risks. A potential disadvantage of product-, model- and vision-based integration is that there may not be sufficient flexibility to accommodate other researcher and stakeholder interests. These forms of integration require an imaginative and adaptable leader who understands the importance of these other interests and who can find ways to accommodate them within the integrative task.

The advantage of dialogue-based integration which builds on grounded consensus is its ability to be flexible and accommodating of different interests and contributions – indeed these are the substrate for the integration. Potential disadvantages are that such integration may be very time-consuming and lack direction. Another potential problem is that sometimes particular participants may try to hijack the process, preventing real consensus from emerging. This form of integration requires a leader or facilitator who is an accomplished synthesiser, able to pull disparate strands of researcher and stakeholder contributions and interests together.

As outlined above, the DKCRC is employing each of the four integration processes, alone or in combination. The achievement of integration may be assisted by making these processes more explicit and promoting discussion and documentation of them. Explicitness can help defuse misunderstandings. For example, a common assumption about integration is that it must involve a grounded consensus-based process. This may hamper some people’s willingness or ability to get involved in integration, which can be overcome by highlighting other integration methods.

As the foregoing suggests, the discussion of ‘how’ integration is undertaken in the DKCRC was still quite general, with only a small number of specific methods discussed. This was partly because of time constraints, but also because specific integration methods tend to make sense only when

linked to particular integration tasks and this is not yet a familiar and accepted way of describing integration. Cataloguing specific integration methods used in the DKCRC warrants further investment of time and energy.

Additional integrative tools and processes that do not fit neatly into the four categories above were mentioned in the workshop, including:

- developing a framework which is simple to remember, such as for Core Project 4 which uses a three point framework of ‘human’, ‘physical’ and the ‘integration of the two’
- employing and building the capacity of knowledge brokers. The DKCRC has taken this up specifically with Aboriginal communities. For example, there has been close work with members of the Alice Springs town camps and Tangentyere Council to train Aboriginal people in research methods. Outcomes have included significant impacts of decision making associated with the town camps, jobs for a number of the researchers with the Australian Bureau of Statistics as census enumerators and, in two cases, full employment. Similarly research method training has been initiated with the Waltja women’s group as the initial pathway for them to develop a livelihood acting in the interface between Aboriginal knowledge and thinking and western science and thinking.
- mapping activities to identify commonalities and synergies, as well as strategies to strengthen them, such as using common methodologies or integrating different methodologies in an overarching approach, such as an internationally recognised livelihoods approach (used in Core Projects 1, 4 and 5). Core Project 5 also emphasised common structures for research questions and methodologies
- ensuring that the design of teams and organisational processes is in line with the vision for the project, including establishing space for creativity (Core Projects 4 and 5)
- ensuring that research projects take account of social science methods, especially reflective and interpretive methods that can maximise the uptake of outcomes (social science coordination).

Discussion also focused on the intuitive nature of much current integrative work, the importance of collaboration and building a culture of collaboration, linkages, creating the conditions for productive relationships, building a learning organisation, team building exercises, team bonding and fun. Some suggested a need for better structure and facilitation in meetings. Three rules for dialogue were proposed: (i) preparedness to listen and engage, (ii) putting aside paradigms and agendas while listening, and (iii) accepting that everyone needs to move outside their comfort zones to engage.

Four key integrative challenges requiring specific synthesis tools and strategies were identified at the workshop, namely:

1. between epistemologies
2. across ideologies
3. between research and business interests
4. between research and policy.

There was a brief discussion of tools and strategies to meet these challenges, particularly:

- fostering respect for different theories of knowledge
- using conflict as an opportunity for building understanding, as well as recognising that articulation of opposing views is necessary for constructive discussion. This could sometimes be enabled through role plays, where people were asked to take on roles they did not agree with or did not understand

- having the ability to identify differences in language and to translate where necessary
- sharing knowledge and building relationships, but maintaining the boundaries of professional relationships
- recognising the importance of time, including allowing time to foster productive exchange and to build relationships
- fostering reciprocity and seeking mutual benefit
- good facilitation, as well as team building, and, often, just working together
- researchers keeping in mind end-user practicality, perhaps via steering committees
- having conflict resolution processes in place and ensuring that conflict is recognised and named when it occurs
- keeping in mind that people can and do act on information in order to change. Of particular relevance to the DKCRC is appreciation that Aboriginal beliefs are not static
- being mindful that perfect integration is not possible, because, for example, all frameworks have constraints.

Appendix 3 provides an outline of principled negotiation, which highlights different interests and ways of meeting them. Originally designed as a tool for conflict resolution, it has wider applicability in situations where the interests of those involved are quite diverse. It is particularly relevant to the DKCRC in terms of meeting the sorts of challenges outlined above. A small number of other dialogue-based methods that are useful in particular situations are also outlined. As foreshadowed earlier, developing a more extensive toolbox of methods is an important role that the DKCRC could fill.

Finally the role of the Social Science Coordinator in integration warrants special mention. Integration is inherent in much of the Social Science Coordinator's work, including:

- enhancing appreciation of and uptake of social science theory and methods across the DKCRC
- engaging stakeholders/end-users in socially inclusive research
- ensuring that research findings are taken up at all levels from local community to national government.

Nevertheless it is important not to conflate social sciences and integration. The integration inherent in the role of the Social Science Coordinator is only part of the total integration picture. In some organisations social scientists are responsible not only for ensuring the incorporation of their disciplinary strengths, but also for the development and inclusion of integration per se, which is usually an unreasonable expectation (Roughley and Salt, 2005). To its credit, the DKCRC has not fallen into this trap and has made integration inherent in all roles. This approach should be supported and continued.

What is the context for the integration?

The context in which the DKCRC is located is rich and complex, and a detailed exposition is beyond the scope of this report. A brief recounting of the major contextual issues which were outlined at the workshop is presented. The primary purpose is to act as a reminder that in explaining the integrative work of the DKCRC to outsiders, placing the work in context can considerably aid the ability to comprehend why particular approaches to synthesis have been

undertaken. The contextual issues discussed here are grouped into the following topic areas: (1) the economics of the desert, (2) the Aboriginal population, and (3) the practicalities of DKCRC funding.

The economics of the desert

Most of the economic circumstances described here affect both Aboriginal and non-Aboriginal inhabitants. The special circumstances of Aboriginal peoples are highlighted in the next section. Key economic contextual issues include:

- ‘invisibility’ of remote areas and communities, particularly to business and policy makers
- poor infrastructure, particularly transport infrastructure
- the desert crosses jurisdictional boundaries, and different states and territories may have different rules
- a sparse, dispersed population
- decreased availability of a wide range of professionals, compared with other areas
- need for innovation
- the history and geography of value chains, as well as understanding their elements and how they function
- basing business on consumers and ‘taste’
- difficulties in quantifying and measuring change in ecosystem and cultural services. People with the strongest appreciation of underlying natural and cultural resources, such as Aboriginal people and pastoralists, have often been the most economically disadvantaged; and
- different priorities for locally-based businesses, compared with those with a home base outside the desert.

The Aboriginal population

There is a long Aboriginal history in desert Australia and the current situation is fraught with problems for many communities, including:

- a passive welfare system where there is no link between effort and benefit
- disempowerment and marginalisation
- low literacy, poor health and general disadvantage
- social dysfunction in some remote communities
- an emotive and ideologically driven policy context.

One historical legacy of Aboriginal–non-Aboriginal relations is distrust resulting from previous exploitation, making protection of Aboriginal intellectual property a high priority for the DKCRC.

The practicalities of CRC funding

Being part of the CRC program brings certain imperatives, including a focus on commercialisation and on education and training. Commercialisation, in particular, may bring constraints related to confidentiality and intellectual property. Further, important non-market values may be difficult to quantify, leading to their importance being downplayed. CRCs are getting larger, making the virtual, dispersed nature more challenging to administer. CRCs also require the management of diverse disciplines, especially bridging divides between the biophysical and social sciences. They

also require research to be applied, so that the practical demands of stakeholders/end-users must be a major consideration. Stakeholders/end-users may have multiple conflicting goals, which require resolution.

Success in bidding for a second round of CRC funding is a significant practical concern.

How will we know if we have been successful?

A range of indicators of success in achieving integration were mentioned. The key factors related to achieving the DKCRC goals, variously expressed as:

- positive community change, both economic and personal
- demonstrated economic success at a multiplier above investment
- a positive influence on livelihoods, for example, showing that more people were involved in livelihood activities
- greater willingness of taxpayers to pay for, and shift in public investment towards, desert natural resource and cultural resource management
- public support for outstation infrastructure
- less passivity and more active community engagement with government and service providers, leading to the development of a local voice which ‘radicalises remoteness’
- community change in the pastoral industry, measured by surveys and research evaluations
- achievement of program outcomes and performance targets in Aboriginal pastoral development programs, as measured by external evaluations
- a socially inclusive desert society
- uptake of the education program nationally and internationally, reflected in numbers of graduates, as well as employment of graduates in desert Australia, numbers of participants in industry training programs, and numbers of participants enrolled in units relevant to desert knowledge
- Aboriginal employment and education, including increased numbers of young Aboriginal researchers with recognised livelihood pathways
- numbers of young people and researchers staying, working, researching and developing desert Australia.

Workshop participants identified the following factors as important in achieving the DKCRC outcomes:

- being able to illustrate how integration led to the desired outcomes, encompassing
 - ‘elegant’ understanding, including new concepts for new practice
 - higher levels of analysis
 - truly synthesised products
- being able to demonstrate progress along the way through the core projects
- core projects delivering outputs expected by stakeholders
- positive impacts as expressed by end-users, partners and researchers
- diffusion measured by influence and adoption of ideas and findings resulting from the research.

In terms of the relationships central to integration, successful outcomes were identified as:

- relationships that were working, stronger and ongoing

- the DKCRC being asked for policy advice, and that there were requests for research from industry, business, and communities
- the work of the DKCRC having champions with facts and figures to inform their advocacy, including approval from Aboriginal academics and leaders
- a broad network with increased awareness of desert issues and the work of the DKCRC
- researchers having fun and high energy.

Additional outcome goals mentioned at the workshop included:

- having an Aboriginal-driven research agenda, with a network that is self-operating
- greater involvement of Aboriginal academics in communities
- increased understanding of the practicalities around intellectual property, as well as new ways of conceiving intellectual property that gives Aboriginal people an appropriate share of the benefits
- higher level understanding and appreciation of skills and processes for working across disciplines, ideologies and cultures
- new opportunities being identified, new income streams, and researchers generating new ideas
- desert research education being undertaken by desert-based education researchers
- a successful rebid for funding for the DKCRC.

It is worth injecting a note of caution here. While the outcomes and measures suggested above are largely straight-forward and sensible, the bar for proving the success of integration is often set unrealistically high, or the criteria for assessment become very complex. Peer-review has proven to be a successful and widely accepted way of evaluating accomplishments in all other areas of research and should also be at the core of the appraisal of research integration in the DKCRC. Peer reviewers should be chosen from researchers who are experienced in similar kinds of integrative work.

Integration across the whole DKCRC program

In this section consideration is given to how the core projects mesh together so that the DKCRC is more than the sum of its parts. Overall, the themes of sustainable livelihoods, viable communities, thriving regions and increased social capital provide strong integrative vision for the DKCRC. The focus is on both Aboriginal livelihoods and livelihood-based partnerships between Aboriginal and non-Aboriginal people, with a leaning towards the former.

Core Project 6 and the ‘Science of Desert Living’ project provide excellent complementary overarching integration for the DKCRC. In essence, it can be argued that decision support provides the rationale for integration in Core Project 6, while the development of a new science provides the rationale for integration in the ‘Science of Desert Living’ project. In addition, the proposed Journal of Desert Knowledge Research has the potential to make a further significant contribution to the overarching integration. Each of these is discussed below.

Core project 6 ‘Thriving Desert Regions’: combining decision support, scenarios and a leadership group

A primary aim of all CRCs is to support decision making – those decisions might be commercial, service-oriented or policy-oriented. Decision support provides an excellent underlying rationale for integration, as support for different decisions will require the synthesis of different strands of

knowledge within the DKCRC. Decision support can be reactive or proactive. In other words, it can provide information to decision makers when they request it or it can provide information that decision makers may not yet know will be helpful for their work. Arguably, a combination is very effective, as the reactive support helps build the relationship with the decision maker and provides more fertile soil for the proactive support.

Core Project 6 ‘aims to provide integrated information to support government policy makers, industry and regional bodies in their planning and decision-making and to create opportunities for desert livelihoods by:

- clarifying the elements, the major drivers of change and development and how they are interrelated
- providing information and data that estimates opportunities for sustainable, thriving desert economies
- presenting scenarios of regional futures across desert Australia which contribute to informed decisions on public and private investment.

(Core Project 6, Draft project overview, 2006).

Guided by the vision of the DKCRC, Core Project 6 plans to use modelling and dialogue-based integration as its two primary methods. A key role for futures scenarios, which use both of these methods, has already been foreshadowed. As Cork et al (2005) have highlighted, futures scenarios can involve building models, developing trend analyses, surveys and/or discussions on which to base scenarios. Scenario-based modelling, which allows quick responses to a range of ‘what if’ questions can provide a particularly effective forum for interaction with decision makers.

A leadership group, with a diverse range of discipline and practice skills, will provide the nucleus for the dialogue-based integration. This group will combine evidence, modelling and judgement to provide support for this project in its integrative work.

The work of Core Project 6 might be assisted by the development or adoption of a decision support theory and methods framework. Specifically documenting and analysing the processes used in Core Project 6 will be particularly significant for furthering understanding about integration.

The ‘Science of Desert Living’ project

The investigators in this project have recognised commonalities in the underlying biophysical, economic, social and cultural aspects of the DKCRC projects, commonalities which they argue are unique to the desert. These include variability and remoteness, along with sparse and mobile populations (<http://www.desertknowledgecrc.com.au/research/sciencedesertliving.html>). While the investigators primarily conceive this project as ground-breaking science, which will provide a coherent theoretical underpinning to the whole of the DKCRC’s work, this project is also an exemplary display of integration.

This project is likely to use at least three integrative methods: vision-based, product-based and dialogue-based. The project has a guiding vision of the possibility of a science of desert living. It aims to engage the DKCRC researchers to develop consensus about the key elements of the science of desert living, while also producing a book and other printed products, as well as develop ‘master classes’.

Again, specifically documenting and analysing the processes used in this project will be particularly significant for furthering understanding about integration.

The Journal of Desert Knowledge Research

The proposed journal is an important vehicle for communication, but is not an integrative tool per se. However, the journal could play two important integrative roles. Firstly, it could promote the publication of integrative papers and highlight protocols for writing about integration. Secondly, it could complement Core Project 6 and the ‘Science of Desert Living’ project by producing special issues on other overarching integrative themes that may be proposed by DKCRC participants. There seems to be considerable support for the journal within the DKCRC and strong leadership to develop it. That leadership is also very appropriate for promotion of integration through the journal. Proposals for special issues could be developed on an ad-hoc basis and could provide additional integration leadership opportunities for a range of people in the DKCRC. Given the DKCRC emphasis on livelihoods, special issues on particular aspects of livelihoods could be especially encouraged.

Conclusions for making the DKCRC a world leader in integration

The DKCRC has made giant strides in recognising and meeting many of its integration challenges. The principles under which the DKCRC operates, outlined in the introduction, strongly encourage cross-disciplinary research, the embedding of end-users and other stakeholders, and collaboration between Aboriginal and non-Aboriginal experts. In terms of meeting the challenges, noteworthy examples include consideration given to guidelines for research collaborations between researchers and Aboriginal communities, ethical principles, IP protection, and commercialisation opportunities.

The DKCRC could specifically contribute to knowledge about integration by being reflective about and documenting the challenges it faces and how it is meeting them. There is now enough existing knowledge about integration to underpin such reflection and to give it ‘academic mileage’. In other words, it is highly likely that real advances in understanding and publishable material will result. Although integration is a core task for all CRCs, this has rarely been dealt with explicitly, as an examination of integration in the CRC for Greenhouse Accounting and in the CRC for Coastal Zone, Estuary and Waterway Management by Lorrae van Kerkhoff (2002, 2005a, 2005b) showed. The DKCRC could be the first CRC to make explicit consideration of integration part of its core work.

Despite widespread calls regarding the value of and need for integration, it is rare for integrative challenges to be explicitly described and for systematic approaches to be used to address the challenges. The DKCRC has the opportunity to be internationally ground-breaking in doing just this.

It is clear from the DKCRC documentation and from the workshop that the managers, coordinators and core project leaders have the various integrative challenges ‘front of mind’ and are actively working to meet them. The framework for systematically describing integration presented in the first section of this report was effectively used in the workshop and provides the foundation for explicit description of integrative methods and processes as part of the DKCRC’s work. Furthermore, the DKCRC could be a leader in developing a toolbox, linking integrative tasks with appropriate methods and processes.

Potential next steps for achieving these goals are:

1. Promoting the use of the integrative framework by all DKCRC researchers. For example, presentations which use this framework could be encouraged and showcased at the annual conference.
2. Setting in train processes among interested researchers and stakeholders/end-users to make epistemologies and knowledges explicit. Case studies of DKCRC research where several epistemologies and/or knowledges are combined could be documented and submitted for publication in peer-reviewed journals.
3. Developing and publishing papers about the full range of integrative approaches in high-ranking international journals. A range of potential journals can be found on the following two websites: www.anu.edu.au/iisn and www.transdisciplinarity.ch. The proposed *Journal of Desert Knowledge Research* could also be a prime vehicle for publishing papers with an integrative focus, including case studies and analyses of integration.
4. Holding an annual one-day workshop on integrative processes with the executive management team, core project leaders and social science and education coordinators. The aim would be to share methods and strategies, as well as to develop a toolbox of specific methods and processes for key integration tasks.

The two projects which provide overarching integration for the whole DKCRC program – Core Project 6 and the ‘Science of Desert Living’ project – are potential standouts for gaining international recognition of the DKCRC’s integration work. However, it is important that they do not overshadow the significant work being conducted across and within each of the core projects. Each is a potential treasure trove for highlighting crucial aspects of integration.

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Appendix 1. Exploring different epistemologies

In terms of exploring different epistemologies, Neuman (2003) provides an accessible comparison of positivism, interpretive social science and critical social science. He compares these epistemologies on eight dimensions of research:

1. The reason for research:

- Positivism:** to discover natural laws so that people can predict and control events
- Interpretive social science:** to understand and describe meaningful social action
- Critical social science:** to smash myths and empower people to change society radically.

2. The nature of social reality:

- Positivism:** consists of stable pre-existing patterns or order that can be discovered
- Interpretive social science:** consists of fluid definitions of a situation created by human interaction
- Critical social science:** is conflict-filled and governed by hidden underlying structures.

3. The nature of human beings:

- Positivism:** self-interested and rational individuals who are shaped by external forces
- Interpretive social science:** social beings who create meaning and constantly make sense of their worlds
- Critical social science:** creative, adaptive people with unrealised potential, trapped by illusion and exploitation.

4. The role of common sense:

- Positivism:** clearly distinct from and less valid than science
- Interpretive social science:** powerful everyday theories used by ordinary people
- Critical social science:** false beliefs that hide power and objective conditions.

5. What theory is:

- Positivism:** a logical, deductive system of interconnected definitions, axioms and laws
- Interpretive social science:** a description of how a group's meaning system is generated and sustained
- Critical social science:** a critique that reveals true conditions and helps people see the way to a better world.

6. Characteristics of an explanation that is true:

- Positivism:** is logically connected to laws and based on facts
- Interpretive social science:** resonates or feels right to those who are being studied
- Critical social science:** supplies people with tools needed to change the world.

7. Characteristics of good evidence:

Positivism: is based on precise observations that others can repeat

Interpretive social science: is embedded in the context of fluid social interactions

Critical social science: is informed by a theory that unveils illusions.

8. The place for values:

Positivism: science is value-free; values have no place except when choosing a topic

Interpretive social science: values are an integral part of social life; no group's values are wrong, only different

Critical social science: all science must begin with a value position; some positions are right, some are wrong.

Better understanding the epistemological diversity among its researchers can contribute to the work of the DKCRC in at least two ways. First, understanding differences is a key step in avoiding (and alleviating) discord and facilitating collaboration. Indeed harnessing the strengths of the different epistemologies can significantly enhance the work of the DKCRC.

Second, the DKCRC has to negotiate murky political and ideological waters. It is useful to understand that political disinterestedness is easier for researchers with a positivist or interpretivist orientation, than for those with a critical orientation. The last group are highly engaged politically and ideologically and understanding this is essential for effective management of the DKCRC's research.

Appendix 2. Exploring different knowledges

Valerie Brown (n.d.) has recently differentiated between five kinds of knowledge:

- *Individual knowledge: the personal lived experience of each human being, including lifestyle, learning style, and social roles*
- *Local knowledge: the accumulated and shared lived experience of people in a place*
- *Specialist knowledge: contributions from the research disciplines and specialised professions relevant to each issue*
- *Strategic knowledge: options for managing the issues within the political and administrative systems*
- *Holistic knowledge: the essence or core purpose of the actions to be taken.*

CRCs, by their very nature, are required to engage with forms of knowledge other than specialist *research* knowledge, particularly specialist *commercial* knowledge. The DKCRC is also successfully engaging with local knowledge – Aboriginal and non-Aboriginal – and strategic knowledge and indeed has employed a Managing Director with particular strengths in these two forms of knowledge.

In general, developing an appreciation of different kinds of knowledge is much less well advanced than understanding different epistemologies, for example. The DKCRC has recognised and is actively exploring Aboriginal traditional knowledge to advance its work. Again, as with understanding epistemological diversity, understanding difference is a key step in avoiding discord and facilitating collaboration.

Appendix 3: Principled negotiation and other dialogue-based tools

Dialogue is central to all integration, but there is no readily available catalogue or toolkit of methods that links specific forms of dialogue to particular integration needs. In this Appendix five dialogue methods are presented to lay the foundations of building such a toolkit³. They are:

- Principled negotiation, which synthesises interests
- Strategic assumption surfacing and testing, which synthesises underlying assumptions or mental models
- Soft systems methodology, which synthesises different views about a problem
- Interactive planning, which synthesises different views about ideal worlds
- Critical systems heuristics, which allows for exploration, and potentially synthesis, of values.

Principled negotiation is described in some detail, although the description is still necessarily curtailed, given that numerous books have been written about it. Only brief overviews and key references are presented for the other methods.

Principled negotiation

An important challenge for the DKCRC, as for all collaborations, is to meet the different interests of the researchers and other stakeholders. Principled negotiation, also known as ‘getting to yes’, is an effective way for achieving this. Despite its importance, principled negotiation is rarely explicitly used in research projects. Although it was developed as a tool for resolving conflict, it is equally applicable for resolving normal differences in interests in any form of partnership or collaboration (Bammer, in preparation).

Fisher et al (1991) have developed four steps for principled negotiation, which are adapted here to the circumstances that are likely to arise in the DKCRC:

1. separate the relationship from the substance of the difference or problem
2. focus on interests, not positions
3. generate a variety of possibilities before deciding what to do
4. look for a fair solution, based on the merits.

Separating the relationship from the content of the difference or problem requires recognising that any problem has two components: the relationship, and the substantive or content issue. They often become intertwined. In terms of problem solving, there are three aspects of relationships to be mindful of: emotions, perceptions and communication.

A key element of principled negotiation is to recognise and understand emotions – our own and those of our partners. Sometimes, it can be helpful to make how we are feeling explicit and to encourage our collaborators to do the same, thus acknowledging the legitimacy of emotions. The aim of principled negotiation is to channel emotions into a productive vision of working side by side to bridge differences (or, if there is conflict, to attack the problem). In terms of perceptions, everyone has their own version of reality. A common problem is that we misinterpret others’ intentions. It is important to try to see the issue from the other person’s perspective. Understanding is not the same as agreeing. Communication is the third aspect of relationships that is important for

³ I am grateful to Gerald Midgley who provided brief descriptions of these methods which have been adapted here.

bridging differences or problem solving. Essentially communication founders when people do not listen, do not hear, misunderstand, or misinterpret. In brief, it is important to listen actively in order to better understand, and to be tolerant and slow to take offence.

Focusing on interests, not positions recognises that it is generally hard to find mutually satisfactory resolution between competing positions. It is therefore important to shift focus from positions to interests. Behind opposed positions lie shared and compatible interests, as well as conflicting ones. The process of identifying interests therefore usually clarifies where real disagreements lie, and, because some interests will be shared or complementary, the areas for conflict will generally be smaller than first thought. Listen with respect, show courtesy, emphasise concern to meet the basic needs of the other person. In addition, be specific about your interests and how important they are to you. Frame a joint attack on the difference or problem.

Generate a variety of possibilities before deciding what to do: Generating options can often be the hardest step to get partners to participate in. Fisher et al suggest that there are four particular obstacles: premature judgment, searching for a single answer, assumption of a ‘fixed pie’, and thinking that solving their problem is their problem. The temptation to leap to a solution before considering the options is often coupled with the assumption that there is only one ‘right’ answer, rather than an appreciation that there are generally many ways in which interests can be met. Further, it can also be a trap to assume that there are no further resources that can be brought into play (a ‘fixed pie’). The key is to see the areas of difference or conflict as shared problems requiring shared solutions. Seeing them as simply the partner’s problem may result in the partner developing solutions that don’t take our interests into account.

The most widely used method for generating possibilities is brainstorming, where participants are encouraged to rapidly put forward ideas, while at the same time withholding judgement on their merits. Encouraging interaction at speed, with no in-depth discussion, tends to circumvent narrow thinking and opens up the possibility of creative solutions. The idea is to search for mutual gains, to dovetail different interests and, if necessary, to give all partners an easy way of backing away from previously stated positions. It is essential to look forward and to leave past disagreements to one side.

Look for a fair solution, based on the merits: Once options have been generated, the next step is to evaluate them and to find a fair solution based on the merits. It helps to be concrete but flexible, in other words to work through the options in detail, but to treat the options as illustrative rather than fixed. The commitment has to be to interests, not to a position. By pushing hard on the interests, partners can stimulate each other’s creativity in thinking up mutually advantageous solutions. Be hard on the problem, soft on the people; the aim is to move the solution away from a notion of partners giving in to each other – rather, both are deferring to a fair solution. They are yielding to principle, not pressure. Developing an agreement should be framed as a joint search for objective or fair criteria and this will promote reasonableness, fair play and trustworthiness.

Principled negotiation promotes accommodation of different goals and methods of operation, not only between researchers, but also between researchers and policy makers, service providers, businesses and community groups. It is also a highly successful method for resolving disputes. Given the importance of partnerships within the DKCRC, specific training in principled negotiation would be a good investment for its participants.

Strategic assumption surfacing and testing

This method was developed by Mason and Mitroff (1981; cited in Midgley, 2000) to facilitate rational argument on important problems. It can be effective in allowing integration of different assumptions or mental models. The method involves working with separate stakeholder groups to surface assumptions and then bringing the groups together to test the assumptions in debate. This can help with evaluating alternatives, and can also lead to the generation of new options. The method is also useful for highlighting uncertainties that might usefully be addressed through research.

Soft Systems Methodology

This approach, developed by Checkland (1984), helps stakeholders learn more about different viewpoints on the complexities of the situation, especially when people are struggling to identify an appropriate way forward. Soft Systems Methodology is divided into seven distinct stages. These are:

1. finding out about the problem situation with as few presumptions as possible
2. expressing the problem situation through Rich Pictures
3. root definitions of relevant systems, especially **C**ustomers, **A**ctors, **T**ransformation, **W**eltanschauung, **O**wner and **E**nvironmental Constraints (CATWOE)
4. making and testing conceptual models
5. comparing the conceptual models with the real world
6. identifying feasible and desirable changes
7. action to improve the problem situation.

Interactive planning

Interactive planning was developed by Ackoff (1981; cited in Midgley, 2000) and encourages stakeholders to temporarily set aside current constraints, that is, plan as if current policies or other plans did not exist, and the job of participants is to design new ones from scratch. The purpose is to generate desirable, creative but still feasible new options. Through the creative process, people should be able to transcend narrow interests, allowing a consensus or a win/win vision to emerge. This is then used as the basis for action planning, and the time frame for implementation depends on the nature of the changes required. This kind of method usually involves a series of workshops with different stakeholder groups, either within a single organisation or across organisations. Ideas from one group are tested out with all the others, seeking solutions to problems and conflicts along the way.

Critical Systems Heuristics

This is a participative method developed by Ulrich (2005) that helps stakeholders explore their values. The method offers twelve questions about what is the case and what ought to be done. Stakeholder groups may either work separately, so their answers to the twelve questions can be compared and contrasted, or they can work together so that differences can be debated and possibly transcended. The twelve questions (presented here in the ‘ought’ mode) cover four areas:

- motivation (whose interests ought to be served? what should the consequences of the research be? how should success be measured?)

- sources of power (who ought to be the decision maker, that is, be able to change the measures of success? what resources and other conditions of success should the decision maker control? what conditions should the decision maker not have control over?)
- sources of knowledge (what should count as relevant knowledge and know-how and what should be its role? who should be involved? who or what guarantees that the findings will be implemented?)
- sources of legitimation (who should argue the case for those who are affected by the research but who cannot speak for themselves (this can include non-human nature)? how are those who cannot speak for themselves treated in the research? what should the visions of success of those involved and those affected be and how should differing visions be dealt with?).