



Acknowledgements

The Lincoln Hub DATA² project team wish to thank the Project Manager Sue Sutherland from Sue Sutherland Consulting for working with us on the production of the report.

Thank you to all the staff from across the five partners who attended workshops in Lincoln, Auckland and Palmerston North. Your collective contribution has added richness and ideas to the report.

We also wish to thank REANNZ, NeSI (New Zealand eScience Infrastructure) and the National Library of New Zealand for in principle support of the DATA² report and Government and other Crown agencies listed in Appendix 2.

Status of this Document

This document has been developed in a four month project co-funded by all of the Hub partners. The recommendations within have had varying degrees of oversight by all of the partners, but have not yet been considered by all of the Executives in the individual organisations nor yet been considered by the Lincoln Hub Governance Group.



Contents

- Acknowledgements 2
- Status of this Document 2
- Executive Summary 4
- 1 Vision statement..... 6
- 2 Introduction 7
 - 2.1 What is the Data² Project? 7
 - 2.2 Methodology 9
- 3 The problem definition 10
- 4 The International and National Environments 11
 - 4.1 United Kingdom and Australia 11
 - 4.2 International data management policy settings..... 12
 - 4.3 The New Zealand Environment 13
 - 4.4 Conclusions 14
- 5 Lincoln Hub environment 15
 - 5.1 Landcare Research 19
 - 5.2 Lincoln University..... 19
 - 5.3 Plant and Food Research 20
 - 5.4 AgResearch 20
 - 5.5 DairyNZ 21
- 6 Desired future state 22
 - 6.1 Organisation..... 22
 - 6.2 Technology..... 23
 - 6.3 Resources..... 24
- 7 Issues and opportunities..... 25
 - 7.1 Issues..... 25
 - 7.2 Opportunities..... 28
- 8 Benefits 29
- 9 Recommendations 30
 - 9.1 Local capability and shared infrastructure 30
 - 9.2 National infrastructure and policy setting..... 31
- 10 Appendices 32
 - Appendix 1: List of organisations consulted and letters of support..... 32
 - Appendix 2: Overview of existing developments and capability across the NZ research sector 36
 - Appendix 3: CSIRO Selects Ex Libris, Alma and Primo 38

Executive Summary

The vision for the DATA² project is to enable the intellectual capital produced by researchers and scientists in the Lincoln Hub to be better managed, curated and shared for reuse. This will facilitate the production of new knowledge and innovation of direct benefit to New Zealand's economic, environmental, social and cultural aspirations over time.

Representatives from all five organisations formed a Working Group to assess the state of each organisation's data management maturity (using the CARDIO¹ tool) and identify common research data management needs. Four workshops were held in Palmerston North, Auckland and Lincoln (2) to gather input from researchers and other staff to inform our vision for an ideal state, identify issues, best practice and generate ideas for the way forward. In addition a review of the International and national contexts identified common themes and best practice and in the New Zealand situation this was backed up to visits to a range of national agencies and government departments (See Appendix 1).

The **CARDIO assessment tool** was used by four of the partners to assess data maturity and the comparative results are detailed in section 5. It is important to note that there are differences between organisations in the complexity and type of data they generate and when DairyNZ is added in there will be differences again with an industry body. While the assessments, with one or two exceptions in individual areas, paint a picture of relatively low maturity of the Hub partners this does not mean that there are not pockets of good practice within the Hub partners which can be shared and leveraged. More in-depth analysis to understand the relative strengths and best opportunities for collaboration is recommended.

The national context

The concept for the Lincoln Hub sits within a total government agenda for a stronger economy, greater productivity, and boosting skills and employment. A number of initiatives and objectives are relevant to these objectives. Particularly relevant to the Lincoln Hub context is:

- Ultrafast broadband, particularly the Rural Broadband roll out;
- Primary Industry sector growth with a target of export earnings by 20% by 2025;
- Alignment of NESI/REANNZ goals;
- The National Science Challenge 'Science and Society leadership Challenge' brought about by deficits in science education, science communication, science literacy and the application of evidence in all levels of decision making. This challenge covers a huge array of themes, including encouraging members of the public to participate in science as 'citizen scientists';
- Schools connectedness, in particular the Network for Learning (N4L), resulting in seamless pathways between primary, secondary and tertiary education;
- Better public services which is looking for efficiency and effectiveness across government.

Facilitating better access to publically funded research data will play an important role in achieving many of these objectives and it was with this in mind that the Data² Project is recommending a number of 'next steps' that will ensure that data generated by the partner organisations is accessible, shareable, managed and maintained, and available for reuse over time.

¹ Developed by the Digital Curation Centre (DCC) in the UK <http://www.dcc.ac.uk/projects/cardio>

Recommended next steps

The report recommends that

- In order to put effect to the recommendations the Lincoln Hub Governance Board set up a Data² Working/Steering Group reporting to the Science, Research and Education workstream that can provide the mechanism to oversee and/or implement and evaluate these initiatives;
- The existing partner Data Management policies are reviewed in order to develop a common core Data Management policy across the Lincoln Hub;
- Hub partners conduct a more in-depth analysis of data management readiness building on the initial high level CARDIO analysis; this will enable the partners to better identify opportunities for shared infrastructure, services and tools relating to data management. One example is for a shared research data repository as not all partners currently have this capability. Findings to be presented to the March 2015 meeting of the Science, Research and Education workstream;
- Individual Hub partners assess the benefits/risks of leveraging the recently implemented joined up research infrastructure at Lincoln University (Workstream 1);
- The Working/Steering Group scope the requirements for a discovery layer across hub partners institutional repositories (publication & data), potentially linking into other significant discipline repositories;
- The Working/Steering Group in conjunction with the Science, Research and Education Workstream identify suitable collaborative research projects and support them to serve as demonstrators/exemplars of best practice data management solutions across the Hub;
- Data literacy modules are incorporated in all pre degree and degree courses, and Post Graduate School courses, and in all staff development programmes for researchers and research support staff at each organisation.

The Data² Project was clear that the Lincoln Hub should leverage from national infrastructure, align itself with Government objectives, and not duplicate effort that was being expended elsewhere. We believe it is in the interests of the Lincoln Hub as well as New Zealand research organisations in general for there to be strategic national policy and whole of country solutions to some of the bigger problems identified in this report. It is therefore recommended that the Working/Steering Group work with MBIE and/or a cross-Govt group to enhance the effectiveness and impact of the national infrastructure, for the benefit of Lincoln Hub and New Zealand research, industry, business, education and individuals to:

- Develop a policy position aligned to the Australian/UK position on Open Access to publically funded research outputs including data;
- Encourage the setting up of a New Zealand national data service leveraging from the knowledge and expertise of the Australian National Data Service;
- Accelerate the development of the Digital Preservation as a Service (DPaSS) across the public sector, to avoid the costly loss over time of New Zealand's publicly funded research output.



1 Vision statement

The vision for the Lincoln Innovation Hub DATA² project is to:

Ensure that the Lincoln Innovation Hub is well positioned to achieve the highest research impact with the data it produces by ensuring that it is available for reuse and repurposing. This will be achieved through a combination of national and local initiatives.

For New Zealand

Facilitate production of new knowledge, ideas and innovation of direct benefit to New Zealand's economic, environmental, social and cultural aspirations by ensuring that publically funded research data is accessible for reuse.

And

Develop robust policy settings where comprehensive Data Access Management Plans are a requirement for the granting of any publically funded research, including the National Science Challenges.

And

In collaboration with national and international partners, develop and promote a scalable and sustainable New Zealand National Data Service which ensures the better management, curation, long term access and where appropriate, protection, of New Zealand's unique publically funded research data.

And

Across the Lincoln Innovation Hub

Better manage, curate and preserve research data produced by some 900 scientists in the Lincoln Hub, so as to enable easy discovery and sharing for future reuse and re-engagement by others including industry partners.

And

Build data literacy capability and confidence across researchers, degree and post graduate students in the Lincoln Hub and ensure greater access to the intellectual capital produced by Lincoln Hub researchers.

And

Aim to collaborate and jointly provision technology infrastructure and data management policy, to reduce costs, remove barriers and ensure Open Access to data produced by Lincoln Hub partners. Where joint provision is not feasible ensure that solutions are interoperable through open standards with the solutions of other hub partners.



2 Introduction

In April 2013 Ministers Steven Joyce, Nathan Guy and Amy Adams launched the concept of the Lincoln Innovation Hub. In launching the Lincoln Hub initiative Minister Joyce indicated:

“The Lincoln Hub has the potential to transform New Zealand’s farming productivity by providing a one-stop shop allowing information and ideas to be shared more easily. Internationally, science and innovation parks that collect together public and private organisations in one place drive a lot of education, science and innovation. The Lincoln Hub can achieve this for New Zealand farming.”²

The Lincoln Hub is a venture initially between Lincoln University, AgResearch, Plant & Food Research, Landcare Research and DairyNZ to deliver science, technology transfer and capability more effectively and efficiently to New Zealand’s primary industry sectors. One of the key features of the hub will be better linking of industry, including private businesses, to research.

The concept for the Lincoln Hub sits within a total government agenda for a stronger economy, greater productivity, and boosting skills and employment. A number of initiatives and objectives are relevant to these objectives. Particularly relevant to the Lincoln Hub context is:

- The roll out of ultrafast broadband, particularly the Rural Broadband roll out;
- Primary Industry sector growth with a target of export earnings by 20% by 2025;
- Alignment of NESI/REANNZ goals;
- The National Science Challenge ‘Science and Society leadership Challenge’ brought about by deficits in science education, science communication, science literacy and the application of evidence in all levels of decision making. This challenge covers a huge array of themes, including encouraging members of the public to participate in science as ‘citizen scientists’;
- Schools connectedness, in particular the Network for Learning (N4L), resulting in seamless pathways between primary, secondary and tertiary education;
- Better public services which is looking for efficiency and effectiveness across government.

Facilitating better access to publically funded research data will play an important role in achieving many of these objectives and it was with this in mind that the Data² Project has sought to determine what the Lincoln Hub needs to do to ensure that data generated by the partners was available for reuse over time.

2.1 What is the Data² Project?

To position the Lincoln Hub to be a success, robust governance arrangements have been put in place and workstreams established. The DATA² project sits within the context of the Science, Research and Education Workstream.

The vision for the DATA² project is to enable the intellectual capital produced by scientists in the Lincoln Hub to be better managed, curated and shared for reuse. This will facilitate the production of new knowledge and innovation of direct benefit to New Zealand’s economic, environmental,

² New Lincoln Hub plans unveiled – National Party <https://www.national.org.nz/news/news/media-releases/detail/2013/04/29/new-lincoln-hub-plans-unveiled>



-
- Identify common research data management needs and determine which should be met by this project;
 - Review existing data management initiatives within New Zealand, and internationally where appropriate, to assess what they currently offer Hub partners by way of a solution, or will offer in the next two years;
 - Assess what additional functionality will be required by way of adding or building on to these initiatives;
 - Identify a potential pilot project or exemplar.

2.2 Methodology

A project manager was engaged by the Working Group and over the period July to October 2014 the following was completed:

- A series of interviews with several Government departments, NIWA and REANNZ to seek information and to look for opportunities to leverage existing infrastructure;
- Four workshops with scientists, researchers, information managers, librarians, IT specialists and Informaticians from the Hub partners to help define the issues and to begin the dialogue on solutions. The workshops were held in Auckland, Palmerston North and Lincoln (2);
- A high level desk top review of international endeavours in the field;
- Four of the Hub partners used the CARDIO tool to assess their data maturity against a set of criteria as a first step to beginning a review of strengths and weaknesses across the Hub.

The Working Party met eight times via Video conferencing facilities to offer insight and review progress.

These objectives are relevant to the New Zealand context both at a national research infrastructure level as well for research clusters such as the National Science Challenges and the Lincoln Hub. The emerging development of the Australian Research Data Commons led by ANDS presents a powerful model for New Zealand to draw from.

“The Australian Research Data Commons (ARDC) will support the discovery of, and access to, research data held in Australian universities, publicly funded research agencies and government organisations for the use of research. The Australian National Data Service (ANDS) has a charter to build the ARDC. It will enable the construction of a range of ICT utilities to capitalise on and ensure greater use and re-use of existing data resources, as well as better management of new data generated in Australian research” (www.ands.org.au).

When looking at the developments in Australia and the United Kingdom, it is important to remember that infrastructure and data management systems are in themselves, not the most important factors. Rather, it is a dual recognition that research data is a vital asset and that the asset’s value is greatest when it is shared and coordinated. Australia and the United Kingdom have understood and recognised the importance of data management and acted upon it. New Zealand must do the same.

4.2 International data management policy settings

Paradoxically, it is not necessarily those countries that have invested heavily in data infrastructure which ultimately have the most successful data management strategies. Clear policy positions, linked closely with public research grants, have been an equally strong lever for changing established research practice and culture. Where infrastructure investment and clear policy settings are strongly linked, beneficial research outcomes and return on investment are most likely. In this regard the Australian Government has struck an effective balance between investments in national research infrastructure, and increasingly clear policy settings relating to data management plans, as well as a clear strategy for building capability.

The Australian Research Council (ARC) has taken an increasingly progressive stance on the management and accessibility of research data. The *ARC Publication and Dissemination of Research Outputs* outlines the obligation of researchers and institutions to “care for and maintain research data”:

“Researchers and institutions have an obligation to care for and maintain research data in accordance with the Australian Code for the Responsible Conduct of Research (2007). The ARC considers data management planning an important part of the responsible conduct of research and strongly encourages the depositing of data arising from a Project in an appropriate publically accessible subject and/or institutional repository.”⁶

The 2014 ARC Funding Agreements⁷ state that:

“19.4 All Proposals and ARC-funded research projects must comply with the ARC Open Access policy, which is available at: www.arc.gov.au. In accordance with this policy, the ARC requires that any publications arising from a Project must be deposited into an open access institutional repository within a twelve (12) month period from the date of publication. The ARC strongly

⁶ <http://www.arc.gov.au/default.htm>

⁷ http://www.arc.gov.au/pdf/DECRA14/DE14_funding_agreement.pdf

encourages the depositing of data arising from a Project in an appropriate publicly accessible subject and/or institutional repository”.

In the UK, JISC and DCC have for many years, provided guidance to the research sector in the UK on the need for clear policy in relation to the management of research data.⁸ Research funders in the UK increasingly require grant-holders and applicants to meet certain standards with regard to the management of the data produced as a result of their research.

In 2011, Research Councils UK (RCUK) released seven Common Principles on Data Policy:

“Making research data available to users is a core part of the Research Councils’ remit and is undertaken in a variety of ways. We are committed to transparency and to a coherent approach across the research base. These RCUK common principles on data policy provide an overarching framework for individual Research Council policies on data policy.”⁹

These two examples of national funding agencies in UK and Australia, taking a proactive policy position in relation to linking public research grants with a requirement to provide data management plans, are illustrative of similar trends in Europe and USA. These are models that New Zealand research funding agencies can learn from and leverage.

4.3 The New Zealand Environment

The New Zealand research sector has drawn from these initiatives to develop local strategies and solutions. While trans-Tasman relationships remain strong, due to the size of investment in New Zealand, we have not achieved the scale of collaboration or continuity needed to develop a robust and sustainable research system for the country. Nevertheless good projects have been delivered and capability has evolved, sometimes in pockets but with clear benefits.

Getting some real momentum and agreeing to solutions to improve management of New Zealand’s unique research data will ultimately determine the real value of the Lincoln Hub DATA² Report. It has not been the intention of this exercise to simply repeat the concerns clearly articulated by scientists and researchers both nationally and internationally, but to draw together the common themes and make circuit breaking recommendations which are generally agreed to need very little further debate.

We are seeing common themes and problem identification emerge from two very recent New Zealand initiatives; the eResearch 2020 discussions (2014)¹⁰ and the New Zealand Data Futures Forum (NZDFF) report *Harnessing the Economic and Social Power of Data (2014)*.¹¹

There is a theme of growing urgency, frustration and concern being voiced by leading scientists and researchers from across local and central government, universities, CRIs and industry. The issues around the need for effective management of New Zealand’s unique research data are well articulated by this group and solutions suggested as well. What is missing is a clear framework which would unlock the considerable intellectual capital inaccessible currently.

⁸ <http://www.jisc.ac.uk/guides/research-data-management>.

⁹ <http://www.rcuk.ac.uk/research/datapolicy/>

¹⁰ <http://ereseach2020.org.nz/>

¹¹ https://www.nzdatafutures.org.nz/sites/default/files/NZDFF_harness-the-power.pdf

Both NZDFF Report and e-Research 2020 discussion led by REANNZ, NeSI and NZGL have involved input from a broad cross section of organisations, communities, local and central government. The eResearch 2020 initiative facilitated national forums of scientist and researchers to identify and make recommendations providing guidance to the Government on targeting future investments in e-research infrastructure. The report is due later this year. Many of the scientist and researchers who contributed comment have also been generous in providing their insights to the Lincoln Hub DATA² workshops.

In the NZ research sector the perception is that there is lack of clear sector leadership and coordination in relation to management and long term access to publicly funded research data and research infrastructure generally. That said, there are some very successful existing initiatives, strategy and policy signals from Government which could, if they were be better leveraged and coordinated, provide a clearer direction to the Research sector.

A more detailed review of the New Zealand scene is attached as Appendix 2.

4.4 Conclusions

Our review of international and national directions and trends in relation to research infrastructure and improving management and accessibility of New Zealand's unique research data, as well as the clearly articulated suggestions from some of New Zealand's leading scientists and researchers, has lead to the following conclusions and suggestions:

- **There is urgent need for clear leadership and coordination of New Zealand's eResearch infrastructure and data services.** While there are some excellent existing initiatives attracting considerable public investment, closer coordination would add significant benefit. There is an opportunity for REANNZ, NeSI and NZGL to work more closely together in a national coordinating role. The eResearch 2020 discussions have highlighted some of the issues the research sector currently faces.
- **MBIE's current policy position could be considerably strengthened by tying public research funding much more closely to a requirement to have clear data management plans which lead to greater public access to research data funded from the public purse.** There are many international models to draw from, however Australian Research Council (ARC) and JISC in the UK are probably the most relevant to the NZ context and reflect other similar initiatives in Europe, USA and Canada.
- **A fundamental component of a national e-research structure is the need to establish a coordinated national data service.** While there are several nationally significant data management initiatives in the NZ context (see Appendix 3) they currently lack scale, a sustainable infrastructure or a federated discovery mechanism. The Australian National Data Service¹² provides an excellent model for New Zealand to draw from. It is an initiative which has grown capability in the management of research data across the university and CSIRO organisations in Australia. It is considered to be a leading international model and ANDS have signalled a willingness to work closely with the New Zealand research sector.
- **The issue of the loss of unique and valuable research data, either through obsolete technologies or poor data management practices, services and infrastructure needs to be addressed.** In relation to building capability in digital preservation NZ is uniquely positioned to respond at a national level. From 2004 successive Governments have invested 35million NZD in building digital preservation capability. While the issues of long term access to research data are likely to be complex, involving for example, replication of experiments and evidence, the

¹² www.ands.edu.au

anticipated across Government initiative to deliver digital preservation as a service across the public sector through the Department of Internal Affairs would be welcomed. Building a digital preservation capability across individual research organisations or even a cluster like the Lincoln Hub would be too costly and unlikely to succeed. A coordinated approach to the preservation of NZ's publicly funded research data is a core part of the national eResearch infrastructure.

5 Lincoln Hub environment

A high level assessment of the data maturity of each organisation within the Hub has been completed by four of the partners. The tool used is CARDIO (Collaborative Assessment of Research Data Infrastructure and objectives) developed by the Digital Curation Centre (DCC) in the UK. It uses a model developed by Cornell University and added to by JISC in the UK to assess digital asset management in terms of the organisation, technology and resources. All three aspects need to be in place to ensure data is well managed, accessible and kept safe for future use.

The comparative results for all the questions are grouped under the three headings. The ranking was between 0 and 5.

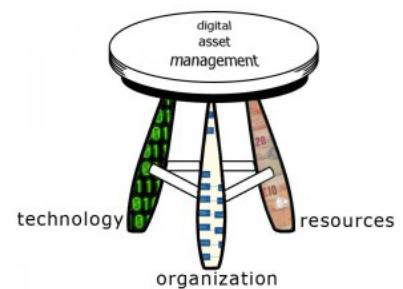
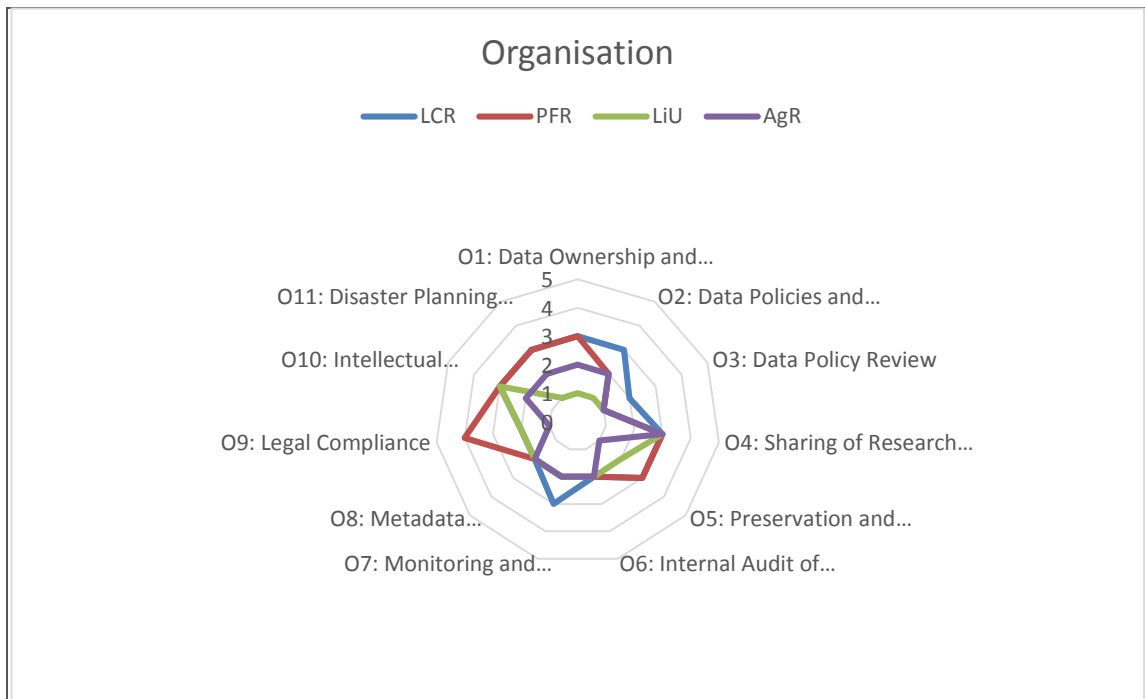


Fig 1

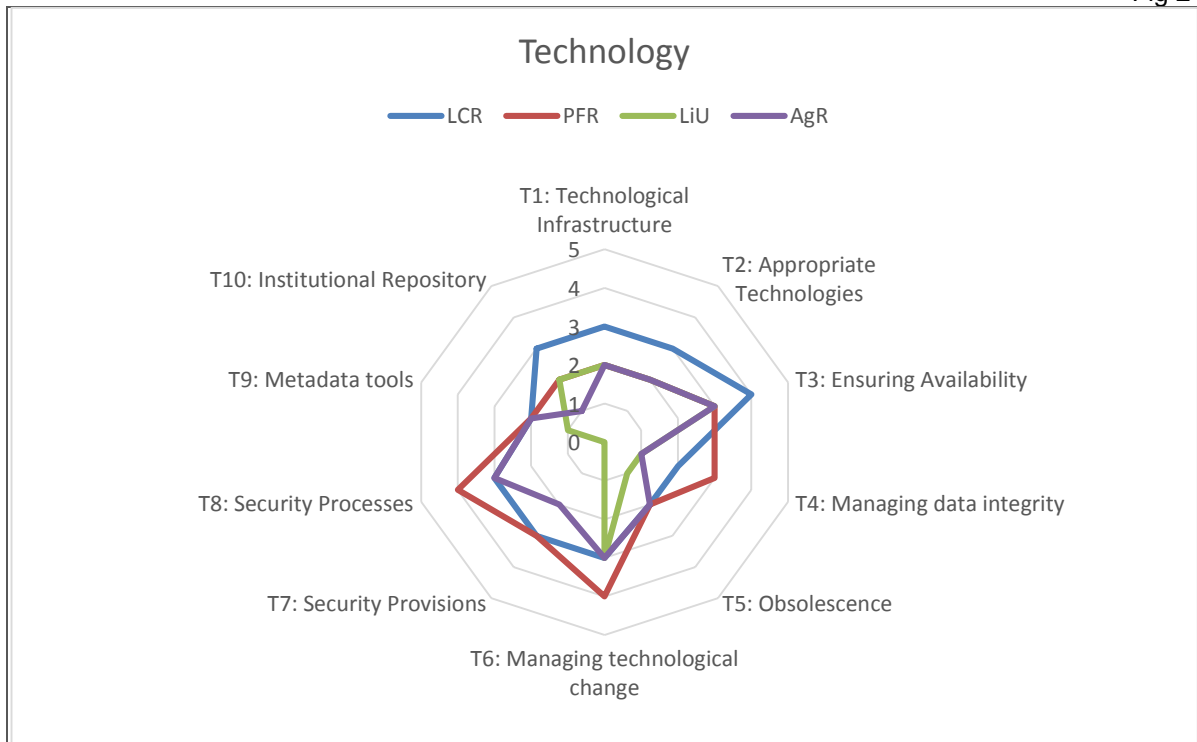


In this set of questions the average score over all the questions for each of the organisations was:

- Landcare 2.64
- Plant & Food 2.55
- Lincoln University 1.82
- Ag Research 1.82

The area in which organisations were most aligned was in the sharing of and access to research data where all organisations scored themselves a 3 which indicated that there were a mix of systems in place to meet different access needs but security was questionable due to the varied working practices.

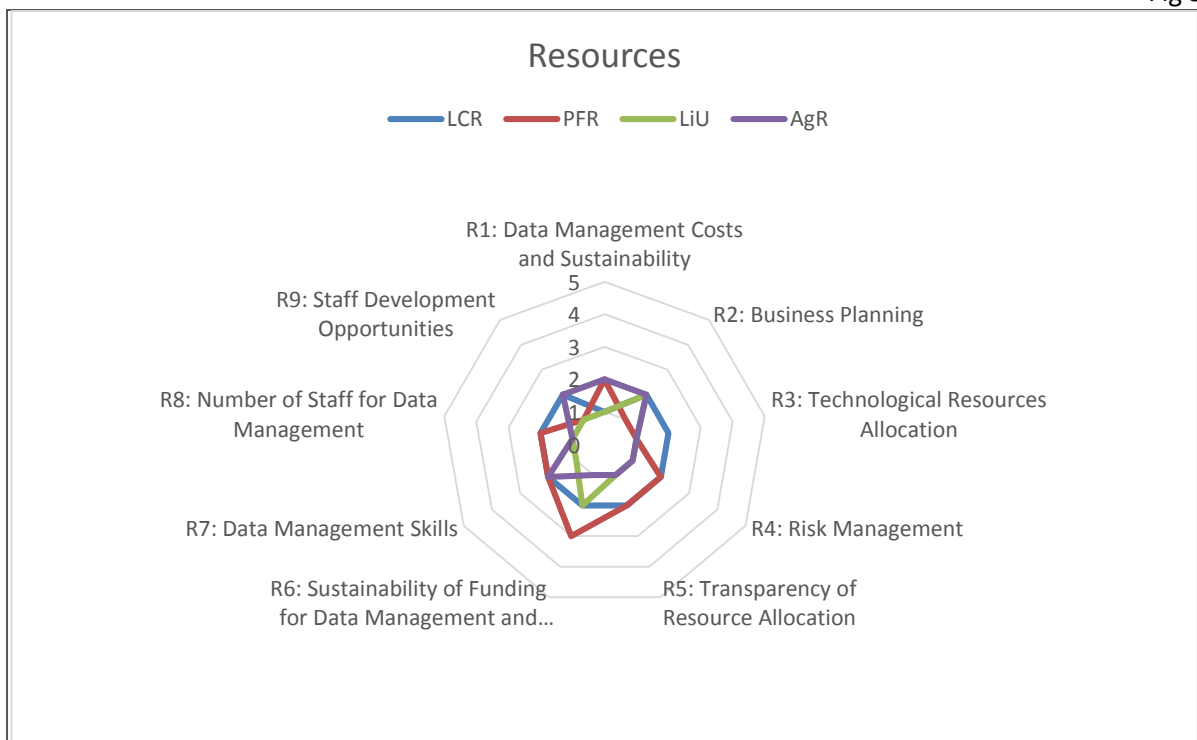
Fig 2



In the Technology category the two best categories were Ensuring availability and managing technological change. The average scores for each organisation were:

- Landcare 2.8
- Plant & Food 2.7
- Lincoln University 1.88
- Ag Research 2.1

Fig 3



The third area, Resources, was the worst performing category for all organisations. The questions measured the maintenance and development of a range of resources required for effective research data management. Elements covered in the Resources section included human resources, financial sustainability, business planning and risk management. The critical underlying questions were:

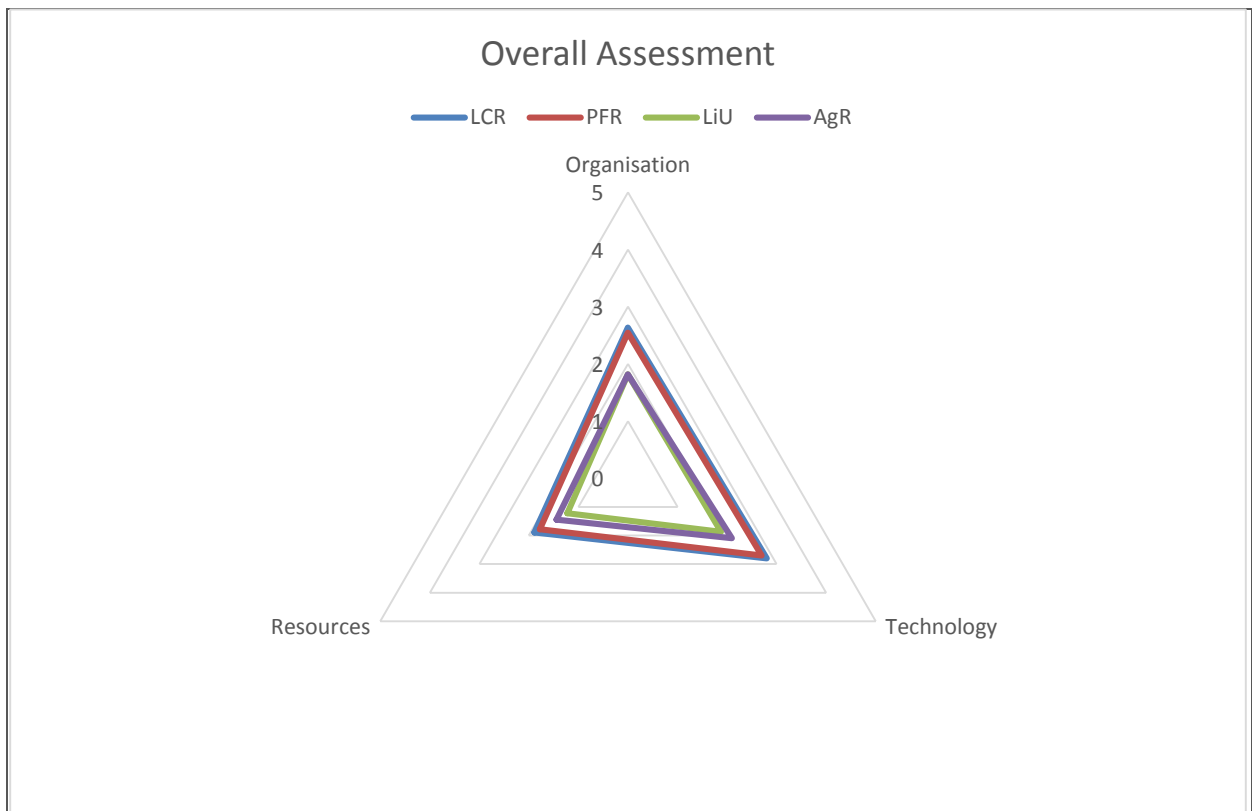
- Are sufficient resources in place to ensure research data are effectively managed and shared?
- Are the resources suitably developed and sustainable?

The average scores for each organisation were:

- Landcare 1.89
- Plant & Food 1.78
- Lincoln University 1.22
- Ag Research 1.44

The final diagram shows the average for all organisations plotted against the three questions.

Fig 4



Landcare is overall performing the best, followed by Plant & Food with AgResearch and Lincoln University assessing themselves to be in a similar position. The best performing category for all organisations was Technology.

It is important to note that there are differences between organisations in the complexity and type of data they generate and when DairyNZ is added in there will be differences again with an industry body. The assessment at this level is painting a high level picture only. It will be important to do more in-

depth analysis to understand the relative strengths and best opportunities for collaboration which can help raise the level of data maturity across all organisations.

While the assessments, with one or two exceptions in individual questions, paint a picture of relatively low maturity of the Hub partners this does not mean that there are not pockets of good practice within the Hub partners. Some of these were identified during the workshops and by the Steering Group members who undertook the assessments.

5.1 Landcare Research

Landcare Research's focus on public good environmental science and in particular management of national biotic collections and their associated databases and national geospatial datasets has ensured that Landcare Research has built up a solid core data management capability and ethos of good practice. Key staff members have been proactive not only within Landcare Research but also nationally and internationally influencing standards and their adoption. The MBIE/MoRST Environmental Data Management Policy Statement (April 2010) is due in part to their influence and encouragement. More recently Landcare Research has established a Research Data Manager position with the role of lifting data management practice across the long tail of research data gathered in disciplines outside the national data assets. Other associated recent initiatives include promulgation of a Data Management Policy and a template for Data Management Plans, establishment of an institutional Data Repository (based on CKAN) with support for Digital Object Identifiers. DataUp has been trialled as a tool for helping staff to QA their spreadsheets, create spreadsheet metadata and deposit the spreadsheet into the Data Repository, and it will shortly be rolled out to all staff. Collectively these tools facilitate Landcare Research's moves to increase its compliance with the NZ Government Open Access and Licensing framework (NZGOAL).

The CARDIO assessment tool confirms that Landcare Research is moving in the right direction, that more work is needed to lift staff digital literacy both with the new tools and in adoption of good digital data management practice and that as with achieving any institutional change, the hardest part will be resourcing the continuing effort needed to achieve a deep change in research practice across Landcare Research's many disciplines.

5.2 Lincoln University

Lincoln University undertakes a wide diversity of activities that generate research data – through academic staff research, partnered research and through postgraduate research. This diversity alongside the autonomy and academic freedom of individual researchers means the University currently holds a comparatively low score using the CARDIO assessment tool.

Lincoln University is however growing its capability in data literacy and data management, ensuring that its students and academic staff have a growing awareness about how to manage and curate data and present it in a way that can be reused and repurposed for ongoing reuse.

In August 2013, Lincoln University became the first New Zealand University to endorse an Open Access Policy which takes a position on open data and open research. Recent qualification reform has resulted in the addition of data literacy competencies to compulsory core first year undergraduate courses. Lincoln University has also recently mandated the deposit of research outputs in the Lincoln University Research Archive.¹³ from 1 January 2015

¹³ <https://researcharchive.lincoln.ac.nz/>

A number of projects and pilots are underway to develop data management, these include providing information online (via the Learning Management System) and evaluating tools (e.g. SQLShare) to aid researchers with managing data. The University has adopted an Infrastructure as a Service (IaaS) model for storage provision allowing scalability without large capital expenditure and has adopted solutions to support federated identity (Tuakiri).

Work is beginning to understand how to engage with PhD students and post-doctoral researchers early in their careers to ensure that they have appropriate data management skills and that current good practice becomes the norm for the next generation of researchers.

Lincoln University is uniquely placed within the Lincoln Hub to influence and train students (undergraduate and postgraduate) and researchers in data management. Effective maturity in CARDIO assessment for Lincoln University will be achieved through capability development with appropriate institutional incentives rather than by mandate alone.

5.3 Plant and Food Research

Plant breeding is a central activity for Plant and Food Research. Each year hundreds of thousands of plants need to be individually identified and their parentage recorded. A 3rd party plant-breeding application, E-Brida, has been implemented across the organisation in a multi-year programme which is nearing its end.

A PFR-developed sample handling system, Kea, is used to manage the analysis of samples associated with the plant breeding programmes and this application is in the process of being generalised so that it can be used for sample management in other domains.

In PFR's many and varied research domains outside of plant breeding data management is generally patchier, with spreadsheets and PC databases often used for experimental data. PFR has recently completed a review of environmental and chemical data management and identified areas for improvement.

In a long-running programme of work, science groups are progressively being set up with Share Point team and project sites in iPlant, PFR's intranet and records management system. The metadata associated with files in Share Point document libraries, is a significant improvement over that in file shares, and staff are encouraged to move in this direction wherever possible. Share Point/Office 2007 combination will be upgraded to the 2013 version to facilitate collaboration on documents, and improve ease of use and buy-in.

5.4 AgResearch

Data management is at a very low level of maturity with little management, preservation or embedded activity. Awareness of the need to address this situation is growing amongst the Executive Team and those engaged in scientific research, and there is an increasing emphasis on internal sharing of data and information, including IT enhancements and services to make data more widely available.

Silos of well-defined practice exist, for example in Bioinformatics and HPC, and these will serve as exemplars upon which to broaden activity.

Three key activities are underway: a project to develop a data management roadmap is currently scoping requirements, a repository for research outputs is scheduled to go-live on 30 October 2014 and although initially only for reports, consideration is being given to extending the scope to

datasets. SharePoint is being migrated to version 2013, which will enhance the ability to collaborate and share data both internally and with external partners. The new version of SharePoint will be accompanied by a push to increase usage by science projects.

5.5 DairyNZ

DairyNZ is an industry-good organisation representing all levy-paying dairy farmers in New Zealand. DairyNZ Inc. invests levy monies to fund research, development, extension, policy and advocacy on behalf of dairy farmers, which are conducted by various external providers (including AgResearch, Lincoln University and other Lincoln Hub partners) as well as by its internal provider organisation, DairyNZ Ltd. Data generated by DairyNZ funded projects are owned by DairyNZ, but these data are not necessarily held or managed if they are generated by external providers. A project, Mega Research Database, is currently investigating the possibility of storing and managing data from research conducted by external providers.

Data generated internally by DairyNZ Ltd. from experiments/trials conducted on our research farms are managed through the Dairy Trial Database (DTDB). These are typically only animal and production-related fields. Other data, including genomic, metabolite, hormone, pasture, crop data etc., is not stored on DTDB and is generally within spreadsheets or PC databases on the researchers own or shared drives. DairyNZ Ltd. also has a customer relationship management database (CRM) for its extension work with dairy farmers.

In addition, as DairyNZ is an industry-good body, custodianship of the national dairy cattle database, and operation of dairy cattle Animal Evaluation are being transferred from LIC to DairyNZ. The transition will occur over a multi-year programme of work. DairyNZ are investing in new IT systems and organisational capability to ensure current services to the dairy industry are maintained, and that pursuit of the National Breeding Objective is supported. The collection of systems is called the Dairy Industry Good Animal Database (DIGAD), and comprises data interfaces, databases, reporting, analytics and administration tools.

DairyNZ has not undertaken the CARDIO analysis at this stage, but could be considered to have relatively low (but growing) maturity of data management processes. It is also expected that DairyNZ and the industry it serves, will be able to engage with and use, where appropriate, the data produced by other Hub partners to add value to their activities and vice versa. A shared infrastructure and data services may help to leverage their opportunity for data sharing and reuse.

6 Desired future state

During the workshops we explored with the participants what it would be like if we were using best practice in managing and curating data so that it was easily found, shared and maintained for current, future use and re-use. Their views, together with international and national thinking on this issue, have been used to describe the desired future state using the CARDIO framework.

6.1 Organisation

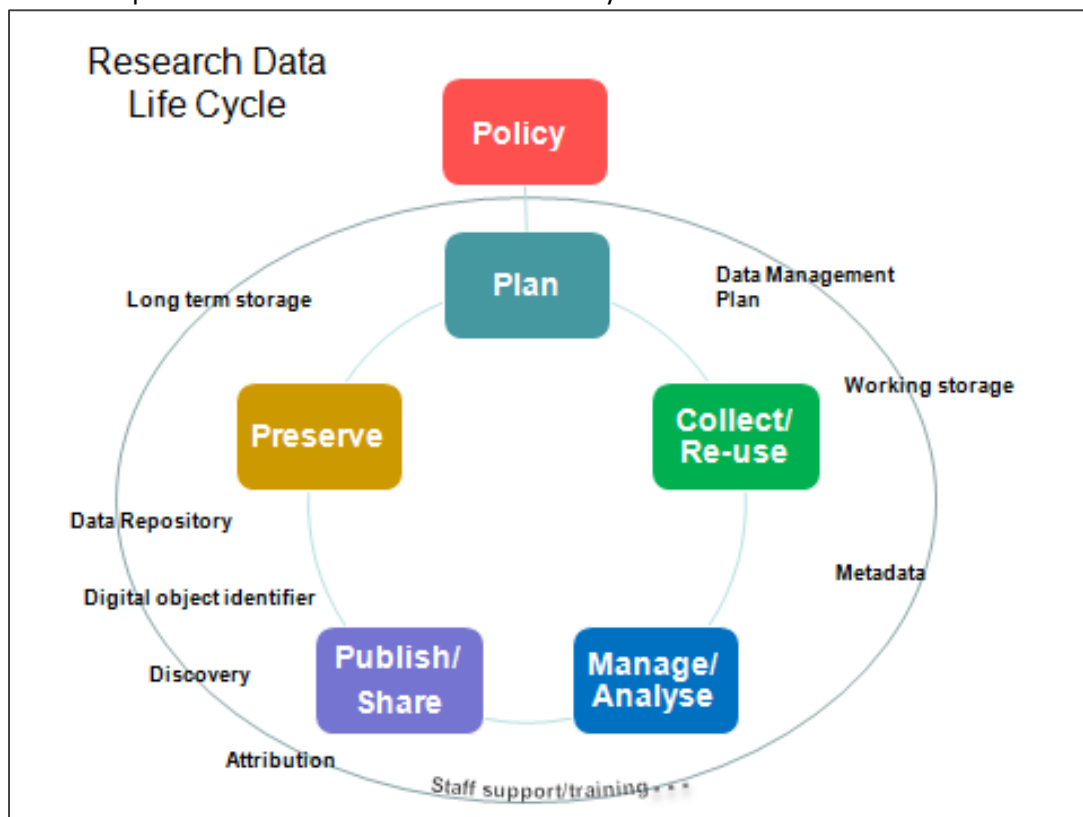
Organisational infrastructure covers the policies, procedures, systems and skills needed for data management. To be regarded as best practice the following needs to be in place:

6.1.1 Policy and leadership

Each partner organisation and the Lincoln Hub needs to have a strategic policy in place outlining the importance of data and its management to research outcomes and the creation of new knowledge. Such a policy demonstrates that executive leadership understands, and governance of the organisation reflects, this importance and provides the mandate underlying all other decisions. Ideally this policy is supported by National Policy which requires that all publicly funded research has proper policies and plans in place to ensure that data generated from such research can be easily found, shared and reused or repurposed over time.

6.1.2 Work practices and processes

The data management lifecycle will be well understood and there are plans, guidelines, processes and tools in place to ensure that work practices are easy to follow and implement. Data authors will be able to publish and disseminate their data easily.



Each stage of the life cycle has its own infrastructure, tools and practices that make it easy to collect data, manage and analyse the data, publish and share the results, including the data itself.

Discovery systems with appropriate metadata make it easy to identify data elements, the relevant researcher/scientist and the methods used to arrive at the conclusion. This data is stored in long term storage which ensures preservation over time.

Changing work practices (to share & consume data) is transformative and the ideal future state for a researcher at the hub. Technology, policy, culture, etc. underpin and enable those work practice changes.

6.1.3 Data ownership, IP and provenance

Researchers need to know who owns the data, who can access and reuse those data and what use has been made of the data already. All research data which has been publicly funded should be freely available for reuse with appropriate privacy considerations. Data which has been funded by commercial or other private funding may also be available, and it may be desirable that its existence is known and listed so that it can be sourced even if it is not available without discussion and/or negotiation. There may also be reasons for data that is culturally significant to Māori to be under restricted access.

Data provenance is also important. Knowing who has created the data, who has used it, what they did to the data, if other data has been added, and if there are different versions of the data are all important. Raw data is only part of the data management process; the data that is produced through combining and analysing data is also important to anyone who might want to replicate a finding, or reuse the data in combination with other data.

There needs to be straight forward tools and standard metadata schemas to ensure that all of this data is captured and stored and that experiments can be replicated over time with integrity.

6.1.4 Culture

The ideal culture is one in which everyone understands the importance of good data management and the benefits that accrue for individuals, the organisation(s) and the country at large. Collaborative approaches to research become the norm and the reuse of data, or the linking of different data sets to create new knowledge is valued and expected.

6.2 Technology

Technology covers the hardware, software, networks, applications and tools that are necessary for data manipulation, curation, storage, discovery and preservation.

6.2.1 Data storage, infrastructure and standards

The ideal situation would be for there to be a shared infrastructure somewhere that all Hub partners could leverage. Certainly where there are good systems and technology in place in one organisation and another is looking to acquire these technologies then leveraging from the infrastructure that is already in place makes good sense.

However, the most important issue is that even if organisations have different data platforms, as long as they use open standards that enable interoperability then a federated search or discovery layer can be put across the top to enable data to be easily searched for and found.

Sufficient data storage is crucial. If storage is offsite then fast and dedicated broadband capability is crucial so that time is not wasted uploading and downloading large data sets. The long-term integrity and continuity of the data sets created are assured.

guidance is needed on when and how it is appropriate to share the data on which the research is based. At the very least identifying that the data exists and making this known provides researchers with the knowledge of who is working on what.

Some identified that there was an issue around who actually “owned” the data – the researcher or the organisation or the client. These issues need to be clearly identified through organisational policy.

Provenance of data over time is important. If data is used and reused or combined with other data to produce new results this needs to be tracked through versioning. Provenance becomes especially important when journal publishers require not only the output to be published but the data as well.

7.1.4 Culture

Several issues around culture were identified. We have moved from a competitive environment to a collaborative one but mindsets take longer to catch up so the benefits of sharing are not necessarily understood or agreed. With some there is a strong element of “not how we do things”. A researcher’s reputation comes from what they publish and having first cut at the data gathered, or protecting that data for future use might mean researchers do not want to share data or make it available to others.

Even when researchers and academics see the benefit of data management there are time pressures, both in getting them up to speed with the tools that are available, and also in them actually putting the work practices into action. Solutions for the initial input of metadata need to be simple, intuitive and where possible automated.

7.1.5 Data storage, infrastructure and standards

Infrastructure, even within individual organisations, is siloed which makes it difficult to search or layer across multiple data and information sources. Few have digital repositories and the ability to access and find data in order to reuse is limited. There is a tension between those who want to use open source software and those who favour proprietary solutions and see the benefit of supporting a restricted number of software tools. Some people are happy to use the most appropriate tool to get the job done.

There are different requirements for research IT than for corporate IT and these differences are not always fully understood. How IT is funded and the costs assigned vary from organisation to organisation – one organisation charges departments for internet use which can have limitations when needing to move large data sets around. If bandwidth is inadequate it can be very time consuming uploading data.

Storage falls into two types: working storage and long term storage. The amount of working storage available in some organisations was constrained by funding making it difficult for researchers to share data at times.

The lack of a consolidated national infrastructure was mentioned as an issue. Whilst NZGL, REANZ and NeSI are collaborating through eResearch 2020 there is still no joined up infrastructure and it is difficult to see where the leadership is coming from in terms of a whole of New Zealand solution similar to the Australian National Data Services.

All agreed that we need to work towards open and interoperable standards, whether these are data citations standards, metadata standards or anything which requires systems and networks to talk to each other. Some organisations are still at the stage of principles and guidelines for how they want to operate and reaching agreement on standards is further down the track.

Descriptive Metadata standards depend on the discipline and we need to align ourselves with international standards. Some are well defined, e.g. astronomy, but others are not.

7.1.6 Data continuity and preservation

The long term storage of data is a significant problem. While national significant data sets have in the past received core funding for their maintenance and preservation, other data sets have not. Research funding may cover the collection and manipulation of data, and even the short term storage but once the research is completed the funding ceases.

New Zealand will lose data if it is not properly managed, stored and maintained. Over time as formats become obsolete we will lose data unless we deal to data preservation now. Format shifting over time is costly and a national solution would be beneficial for the Lincoln Hub to buy in to.

Another issue which affects both preservation and discovery is the data that is currently stored on external devices like USB drives and local hard drives. The size of the problem is unknown but experience indicates that there could be significant data, particularly data collected over ten years ago, that is now not available or known about to share.

7.1.7 Costs and funding

Several issues were identified related to costs and funding. Certainly the costs of IT infrastructure are significant and even though storage costs have come down dramatically the amount of data needing to be stored has outpaced those cost reductions. The cost of back systems is also significant. For example, it is cheaper for a researcher to keep their data on a 1 terabyte USB drive than to store on organisational storage systems which are charged back to their department at \$250 per month per terabyte.

As well as the cost of infrastructure there are costs involved in putting the systems and processes in place and ensuring that appropriate resources and staff skills are available to support research. These costs can be seen by the organisation as sunk costs – not generating revenue in the same way as the research does. But without proper data management the Lincoln Hub will not be able to share and reuse data and thus it will not leverage the benefits that the Hub has been set up to achieve.

Nationally significant big data sets have been seen as worth funding in the past. However “little” data is not valued in the same way although aggregated it may have more benefit and some data’s value becomes more valuable over time.

7.1.8 Capacity and capability

The capability to manage data is not widespread through the organisations. There are pockets of expertise and excellence and recognition by many that we need to do better if we are to maximise the investment in our research outputs.

Understanding the different roles played by the different disciplines in data analysis, management and curation is needed. The research scientist is only one player. Others involved come from Informatics, data collection, data analysts, library and records management and IT. . There was a

strong push for data management-related professionals to have professional recognition and not be regarded solely as a support service to researchers.

Professional development and training are crucial if we are to embed new data management practices in the Lincoln Hub. Lincoln University's programme to ensure all new under graduates and post graduates understand the principles and requirements for data management was supported.

7.2 Opportunities

Workshop participants were asked to identify potential opportunities that result from the formation of the Lincoln Hub and identify the first steps that might be taken to move us forward. There were lots of ideas and only some are recorded here as being possible first steps.

- The Lincoln Hub has an opportunity to leverage economies of scale when negotiating with commercial vendors
- Move to Electronic Lab books and automated data capture from instruments – much valuable data is currently unavailable because it is in paper form
- Develop a data literacy/management programme across the Hub to raise the level of understanding of the importance and benefits of data management
- Identify and share best practice that can be applied across the Hub partners
- Agree to common standards for high level metadata
- Develop a common Data management plan across the Hub
- Identify data champions and leaders who can work within the individual organisations but also across the Hub to effect change
- Identify a particular research project and use that as an exemplar for across Hub data management best practice. Several projects were identified for consideration.

9 Recommendations

The recommendations outlined fall into two categories.

The first set of recommendations draw from sections 5-8 and focus on what is needed locally within the Lincoln Hub organisations to better manage, curate and disseminate data produced by Lincoln hub researchers.

The second set of recommendations relate to strengthening the national policy setting relating to research data as well as strengthening the national research infrastructure. Having a clear national policy framework and a robust, integrated national infrastructure will support the research activities of the Lincoln Hub and ensure that duplication of effort is avoided. These national infrastructure issues are described in section 4.

9.1 Local capability and shared infrastructure

In the first quarter 2015

- 9.1.1 In order to put effect to the recommendations the Lincoln Hub Governance Board set up a Data² Working/Steering Group reporting to the Science and Research workstream that can provide the mechanism to oversee and/or implement and evaluate these initiatives.
- 9.1.2 Conduct a more in-depth analysis of data management readiness of the Hub partners building on the initial high level CARDIO analysis;
- 9.1.3 Review existing partner Data Management policies and draw from these and international best practice to develop a common core Data Management policy across the Lincoln Hub;

During 2015

- 9.1.4 Work together to identify opportunities for shared infrastructure, services and tools relating to data management (low hanging fruit, e.g. a shared research data repository for publishing file based data sets) and present these findings to the March 2015 meeting of the Science, Research and Education workstream;
- 9.1.5 Assess the benefits/risks of leveraging the recently implemented joined up research infrastructure at Lincoln University (Workstream 1);
- 9.1.6 Scope the requirements for a discovery layer across hub partners' institutional repositories (publication & data), potentially linking into other significant discipline repositories;
- 9.1.7 Work with the Science, Research and Education Workstream to identify suitable collaborative research projects and support them to serve as demonstrators/exemplars of best practice data management solutions across the Hub;
- 9.1.8 Incorporate data literacy modules in all pre degree and degree courses, and Post Graduate School courses, and in all staff development programmes for researchers and research support staff at each organisation;

9.2 National infrastructure and policy setting

The Data² Project was clear that the Lincoln Hub should leverage from national infrastructure, align itself with Government objectives, and not duplicate effort that was being expended elsewhere. We believe it is in the interests of the Lincoln Hub as well as New Zealand research organisations in general for there to be strategic national policy and whole of country solutions to some of the bigger problems identified in this report. We therefore recommend that:

- 9.2.1 That the Working/Steering Group (recommendation 9.1.1) work with MBIE and/or a cross-Govt group to enhance the effectiveness and impact of the national infrastructure, for the benefit of Lincoln Hub and New Zealand research, industry, business, education and individuals by:
- Collaborating with MBIE to extend and strengthen their 2014 Science Investment advice for the Environmental funding stream.¹⁴ to other streams; and develop a policy position aligned to the Australian/UK position on Open Access to publically funded research outputs including data;
 - Work with the appropriate National agencies (REANNZ, NeSI, NZGL etc) to encourage the setting up a New Zealand national data service leveraging from the knowledge and expertise of the Australian National Data Service;
 - Supporting the Government CIO (DIA) to accelerate the development of the Digital Preservation as a Service (DPaSS) across the public sector, to avoid the costly loss over time of New Zealand's publicly funded research output.

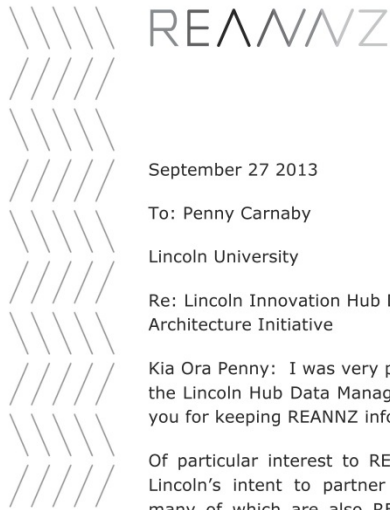
¹⁴ <http://www.msi.govt.nz/get-funded/research-organisations/2014-contestable-science-investment-round/questions-and-answers/#envirofund>

10 Appendices

Appendix 1: List of organisations consulted and letters of support

Meetings with

- Dr Prue Williams, General Manager Science Investments, Ministry of Business, Innovation and Employment (NBIE)
- Keitha Booth, NZGoal, Land Information New Zealand (LINZ)
- Dr James Palmer, Deputy Secretary, Sector Strategy, Ministry for the Environment (MfE)
- Alison Stringer and Glen Wigley, Ministry for the Environment (MfE)
- Dr Geoff Hicks, Alan Ross, Department of Conservation (DOC)
- Alison Elliott and Lewis Brown, National Library of New Zealand, Department of Internal Affairs
- Dr Jochen Schmidt, Chief Scientist Environmental Information, National Institute of Water and Atmospheric Research (NIWA)



September 27 2013

To: Penny Carnaby

Lincoln University

Re: Lincoln Innovation Hub Data Management and Shared Information Architecture Initiative

Kia Ora Penny: I was very pleased to hear of the progress that has been made on the Lincoln Hub Data Management and Shared Information Initiative, and I thank you for keeping REANNZ informed.

Of particular interest to REANNZ is the collaborative nature of the project and Lincoln's intent to partner with various research and governmental agencies, many of which are also REANNZ members. The ability to connect to partner agencies via the REANNZ network will be a valuable tool for the Lincoln Hub Initiative and will facilitate greater collaboration between member organisations within New Zealand as well as globally given REANNZ's connection to the wider global NREN community.

REANNZ considers the Lincoln Innovation Hub Data Management and Shared Information Architecture Initiative to be an exciting development for research and education within New Zealand and REANNZ is pleased to provide in principle support for this initiative. In addition I accept your kind invitation to be involved with the Steering Group for the Lincoln Hub. I look forward to receiving further information from you regarding this and wish you continued success in your endeavours.

Nga mihi nui

Chief Executive

REANNZ

RESEARCH AND EDUCATION ADVANCED NETWORK NEW ZEALAND
Level 1, 22 The Terrace, Wellington 6011 POSTAL PO Box 3325, Wellington 6140, New Zealand
TELEPHONE +64 4 913 1090 FACSIMILE +64 4 916 0064 WEBSITE www.reannz.co.nz





National Librarian's Office
PO Box 1467
Wellington 6140
New Zealand

Telephone: +64 4 474 3009
Facsimile: +64 4 474 3035
www.natlib.govt.nz



8 October 2013

Penny Carnaby
University Librarian
Professor Digital Knowledge Systems Library, Teaching and Learning
Ivey Hall
PO Box 85064
Lincoln University
Lincoln
CHRISTCHURCH 7647

Dear Penny

LINCOLN HUB AND POTENTIAL DIA COLLABORATION

This letter is provided in acknowledgement of recent contacts with DIA regarding the Lincoln Hub project and possible engagement with DIA.

It is clear that the Lincoln Hub is closely aligned with current DIA Information Management activities and, in particular, with the Government ICT Strategy and Action Plan to 2017 and the Department's Digital Preservation as a Service project. With regard to the ICT Strategy and Action Plan there is an especial connection with two of the Strategy's key objectives – 'Information is managed as an asset' and 'Investment and capability are shared'.

I think it would be useful for the Hub project to engage with DIA's Government ICT Strategic and Planning team which has overall responsibility for the Strategy and Action Plan.

Also, as previously discussed I expect ongoing engagement with the Hub project via the Digital Preservation as a Service (DPaaS) project here at DIA. I have asked Steve Knight to follow this up and keep you updated with progress of the DPaaS project.

I look forward to further conversations regarding this as the various programmes evolve.

Best wishes

Bill Macnaught
National Librarian

The National Library of New Zealand is part of the Department of Internal Affairs





30 October 2013

Lincoln Hub CEOs
Lincoln Hub
Lincoln

Dear Colleagues,

Re: Lincoln Hub Data Management and Shared Information Architecture Initiative

My comments are in reference to the Lincoln Hub data initiative, informed by initial discussions with colleagues within several of your institutions; I extend NeSI's congratulations and support, for this far-sighted and innovative initiative.

The Lincoln Hub data initiative sits within a sector wide discussion concerned with the establishment of a coherent system wide approach to establishing research data related capabilities and infrastructure. With the research sector marching towards greater degrees of cooperation and coordination, recognising and prioritising shared concerns is a key contributor to our joint progress. NeSI sees information services as enablers of contemporary research, positioning libraries, information technology services, and the people within these organisations as key assets within a contemporary research system. Sector wide and shared approaches to research information and data management should significantly reduce barriers and enhance system wide effectiveness.

Complementing your initiative, NeSI, with support from NZ Genomics and REANNZ, has recently initiated a sector wide consultation, eResearch 2020; eResearch 2020 aims to inform future vision and guiding principles for national investments into eresearch infrastructure, including any renewed investment into NeSI from July 2014. We anticipate contributions from and collaboration with your initiative, to inform eResearch 2020 and establish a system wide view of sector needs and NeSI's direction.

In relation to research data infrastructures and capabilities, NeSI is maturing offerings in the specific areas of data transfer, store and share services, and has expertise in data analysis and processing. As the data holdings across the sector grow in scale and significance, the scope of support required for specialised research infrastructure capabilities will grow. Working alongside the Lincoln Hub initiative will provide valuable insight into an ongoing role for NeSI, one of several parts of a system wide approach to managing and working with research data.

With kind regards

Nick Jones
Director
New Zealand eScience Infrastructure - NeSI



Appendix 2: Overview of existing developments and capability across the NZ research sector

There are good examples of capability in the sector which, if brought together into a joined-up, connected research infrastructure for New Zealand, could scale into a national infrastructure which would increase the ROI for public investment into the research sector immeasurably. The opportunity to provide a scalable exemplar environment, partnering with national and international agencies and organisations, is core to the purpose of the Lincoln Innovation Hub DATA² project proposed.

Looking back over the last decade there has been investment in research infrastructure in New Zealand which, if better connected and with clearer leadership of the sector, could be leveraged to provide the scalable infrastructure that is needed.

Examples of investment include:

Connectivity

- An advanced research network for New Zealand delivered by REANNZ (KAREN) (Research and Education Advanced Network)¹⁵. Established in 2006, REANNZ provides advanced network capability to universities, CRIs and other research intensive organisations in New Zealand.
- The \$1.35Billion NZD investment by the New Zealand Government in the rollout of UFB (Ultra Fast Broadband) and the rural broadband network, potentially connecting a high percentage of those working in primary industries by 2015.
- Network for Learning (N\$L) to leverage the UFB rollout and bring content and connectivity to schools.
- \$27.1m Government and \$21m research industry investment in HPC capability for NeSI.¹⁶

Capability and capacity

- New Zealand eScience Infrastructure (NeSI) building relationships across the science sector relating to e-science infrastructure and capability. NeSI launched '[eResearch 2020: Setting the Direction for New Zealand's eResearch Infrastructure](#)' in September 2013. It is due to report by the end of 2014.

Continuity

- The \$36million NZD invested by successive governments in building a digital preservation capability through the National Library of New Zealand and Archives NZ to ensure the long term continuity of digital assets. The development of this capability has the potential to provide digital preservation services to the research sector in New Zealand. In scope for this service would be New Zealand's unique data sets and research outputs. Currently the Department of Internal Affairs is developing a business case which could offer digital preservation services across the public sector. The business case is likely to be presented early in 2015.

Content

- The nationally significant data sets e.g. www.landcareresearch.co.nz.

¹⁵ <http://reannz.co.nz/>

¹⁶ <https://www.nesi.org.nz/announcing-nesi-nz-escience-hpc-investment>

-
- Open Access research repositories in all New Zealand universities (www.nzresearch.org.nz).

Not only do we need to ensure that the past investment in research infrastructure is better leveraged but it is also critically important to ensure that there is policy coherence which provides clarity for the sector. The existing policy positions need to be revised so that they link more clearly with existing high level policies and strategies relating to data management, licensing, open access, digital continuity and the rapidly changing patterns in scholarly communication and how we measure research impact and ROI (return on investment) on publicly funded research.

Realising better value and reach for New Zealand's publicly funded research outputs has been the desire of successive New Zealand governments. While the desire has been strong, the policy framework and the technology platform in which this could operate has been relatively weak compared to those of other countries such as the UK, Australia and the USA.

Notwithstanding the structural and systemic issues facing the research sector in New Zealand, there have been some useful developments that could be described as policy enablers which would support a more robust research framework in New Zealand in the future

These include:

- [NZ Digital Strategy 2.0 2008](#)
- [NZ Digital Content Strategy 2007](#)
- [Kiwi Advanced Research and Education Network \(KAREN\) including universities and CRIs](#)
- [New Zealand eScience Infrastructure \(NeSI\)](#)
- Nationally significant data sets (MORST was a catalyst for these)
- New Zealand Data Futures Forum (NZDFF). Harnessing the Economic and Social power of Data 2014 www.nzdatafutures.org.nz

There are also useful enablers at government level including:

- [NZGOAL](#) (New Zealand Government Open Access Licensing 2010)
- [NZ Government Data Online 2010](#)
- [Government ICT Strategy and Action Plan to 2017](#)
- Creative Commons Aotearoa NZ (CCANZ) <http://creativecommons.org.nz/>

Also Government investment in building a digital continuity capability over several years means that New Zealand is relatively well placed to ensure the long term access to publicly funded digital content and data in the future.

- National Digital Heritage Archive (NDHA), \$24million NZD, National Library of New Zealand 2008 - 2010
- Government Archive, \$12.6million NZD, Archives New Zealand 2010

These are important Government investments and initiatives which have fostered innovation and capability across industry and the research sector and have provided the infrastructure for some outstanding international collaboration for New Zealand research. The next stage in leveraging the full value and opportunity from this investment needs to be a collaborative initiative with key players.

Appendix 3: CSIRO Selects Ex Libris, Alma and Primo

CSIRO is replacing numerous systems with a single platform for unified resource management and discovery

Adelaide, Australia—November 20, 2013. Ex Libris® Group, a world leader in the provision of library automation solutions, is pleased to announce that the Commonwealth Scientific and Industrial Research Organisation (CSIRO) has selected the Alma library management service and the Primo® discovery and delivery solution. Alma and Primo replace a number of systems including Ex Libris Voyager and Proquest AquaBrowser.

The implementation of Alma and Primo will allow CSIRO to consolidate existing systems, thereby reducing the technical and administrative burden on staff members. The move will enable CSIRO to consolidate workflows and knowledge bases across all collections, and enhance the discoverability of cutting-edge research material by simplifying support for all resource types, using new and emerging standards.

Thomas Girke, information support manager at CSIRO, commented: “CSIRO Library Services has a tradition of innovation. We were the first library in Australia to implement a web-enabled catalogue, and among the first libraries globally to provide researchers with access to full-text online content. Upgrading from Voyager to Alma and Primo will support the management of our rapidly growing collection of online resources, and provide researchers with improved search tools to find information resources more easily.”

Holley Dumble, Ex Libris sales director for Australia and New Zealand, remarked: “I am very proud to welcome CSIRO into the expanding Australian community of Alma and Primo users. It is gratifying to see that the Ex Libris vision of unifying resource management and discovery on a single, cloud-based platform is being endorsed by leading libraries in the field of science and technology such as CSIRO.”

About CSIRO

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is Australia's national science agency, and one of the largest and most diverse research agencies in the world.

CSIRO researchers deliver solutions for agribusiness, energy and transport, environment and natural resources, health, information technology, telecommunications, manufacturing and mineral resources. The largest science library in Australia, CSIRO Library Services provides support to over 6,500 staff located at more than 40 sites, and places the highest priority on desk-top access to information resources and services. For more information, see www.csiro.au/.

About Ex Libris

Ex Libris is a leading provider of automation solutions for academic, national, and research libraries. Offering the only comprehensive product suite for electronic, digital, and print materials, Ex Libris provides efficient, user-friendly products that serve the needs of libraries today and will facilitate their



transition into the future. Ex Libris maintains an impressive customer base consisting of thousands of sites in more than 90 countries on six continents.

Dedicated to developing creative solutions in close collaboration with customers, Ex Libris enables libraries to maximize productivity and efficiency and, at the same time, greatly enhance the user experience. By empowering users to discover and obtain the information they need, libraries ensure their position as the bridge to knowledge.

For more information about Ex Libris Group, see our [website](#), and join us on [Facebook](#), [YouTube](#), [LinkedIn](#), and [Twitter](#).

Media Contact:
Karina Koch
Marketing Communications
Ex Libris Group
Tel. +972 2649 9100

