

Boosting the Commercial Returns from Research: AARNet Submission

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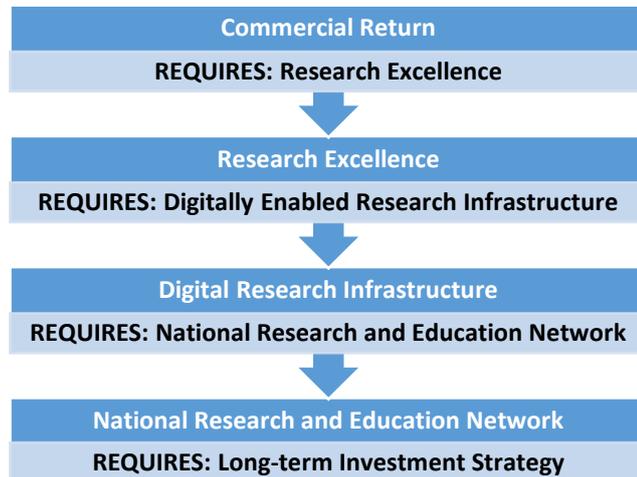
Introduction

The Boosting Commercial Returns from Research¹ discussion paper highlights four factors that contribute to a country's successful translation of research into commercial outcomes:

1. Research Excellence
2. Targeted Research Effort
3. Cooperation Between Researchers and Industry
4. Entrepreneurship

This submission addresses the first factor, **Research Excellence**, and the critical role Australia's National Research and Education Network (NREN) plays in ensuring Australia has world-class research infrastructure, supporting the retention of a highly-skilled research workforce, enabling critical mass in areas of research strength and facilitating international research engagement.

Executive Summary



AARNet strongly supports the Government's objective to "develop a roadmap for long-term research infrastructure investment". Further, we recommend that a strategy be put in place to ensure that the Commonwealth is able to respond to commercial opportunities for investment in digital infrastructure in a timely manner in the coming decade.

Digital Research Infrastructure

The discipline of using digital methods for generating ideas and knowledge from data is a key enabling technology for the advanced nations of the 21st century. The USA, China and Japan continue to invest huge sums on creating the necessary infrastructure to support

¹ Boosting the commercial returns from research, Department of Education, Department of Industry, 2014

these research developments because of positive return in terms of growth in the industrial and commercial sectors².

Such digital methods are often termed “eResearch”, and leverage a digital research infrastructure comprising very high speed networks, huge data repositories, high performance computing (HPC) and advanced software tools. This eResearch infrastructure increases both the efficiency and effectiveness of research collaboration and scientific and commercial outcomes and opens up new and innovative research possibilities across all disciplines including the ability to disseminate that knowledge for competitive advantage. This reflects the fact that eResearch infrastructure is an integral part of modern research³.

Access to world-class infrastructure is a factor known to drive research excellence⁴. It is therefore critical that Australia’s eResearch infrastructure is also world class. The eResearch investments made by the Federal government’s National Collaborative Research Infrastructure Strategy (NCRIS) have established a capability that is globally competitive, however future investments will be needed to maintain and enhance this infrastructure in an increasingly globalised and competitive research and innovation market.

The pre-requisite enabling characteristic of eResearch infrastructure is connectivity enabled by data communications networks that can support broadband (bandwidth and quality) services that are not available or reasonably priced from traditional commercial data communication providers. This connectivity allows data to be ingested into storage and for data to be transferred to computational resources where it can be processed. It allows instruments, data storage and HPC services to be accessed remotely, and it provides a means for digital collaboration to occur at every level. In every country in the world, this network for the research sector is provided by a National Research and Education Network (NREN). In Australia, the national and international NREN operator is the Australian Academic and Research Network (AARNet).

Note that the other factors identified in the discussion paper⁵ as contributors to research excellence, in addition to world class infrastructure, namely

- a highly skilled research workforce,
- maintaining a critical mass in areas of research strength and
- international research engagement,

are all also critically dependent on Australia’s NREN. Moreover, because of Australia’s unique geographic location on the globe and our sparse distributed population, digital network connectivity is more important for Australian researchers than it is for their peers in any other nation because today’s research is truly global. Research papers are accepted and cited where multiple institution based researchers have collaborated to disseminate their work, this in turn drives Australia’s ability to attract the brightest research mind around the globe to work here on important socio-economic research outcomes and for our industries to gain access to commercialisation opportunities for growth and competitive advantage.

² A Strategic Vision for UK e-Infrastructure, 2011

³ National Collaborative Research Infrastructure Strategic Roadmap 2011, Department of Innovation, Industry, Science, Research

⁴ 2012 National Research Investment Plan, Department of Industry, Innovation, Science, Research and Tertiary Education, 2012

⁵ Boosting the commercial returns from research, Department of Education, Department of Industry, 2014

Australia's National Research and Education Network

Australia's NREN, AARNet, was established by the (then) Australian Vice-Chancellors Committee in 1989 to nationally interconnect the universities and CSIRO, and provide international connectivity via other NRENs to the global research community. In doing so, AARNet brought the Internet to Australia and pioneered the use of Internet technologies and applications.

Today, AARNet is a licensed telecommunications carrier operating as a not-for-profit company limited by shares and owned by the universities and CSIRO. AARNet provides telecommunications services that are not commercially available (technically unique), or not available at reasonable cost (commercially unique) to all Australian research and education organisations. AARNet has over 200 directly connected member and customer institutions and operates sustainably, based on a subscription consumption model.

AARNet's vision is to advance Australian excellence in research and education by ensuring world leading connectivity, creating platforms for collaboration and developing unique solutions for the sector. This is achieved by providing educational institutions with access to digital content, resources, and people that **enable the creation and delivery of new digitally-enabled educational experiences** (online, flipped, blended, MOOCs⁶). For Australian researchers, collaborating in an increasingly globalised and digitally-enabled sector, AARNet **removes barriers to collaboration and innovation**.

Both capabilities are crucial to supporting Australia's innovation system as Australia's investments in education and research play a critical role in ensuring the continued prosperity of Australia on all fronts – socially, culturally and economically – for all our citizens and for our place in the world⁷.

Like most NREN's, AARNet is able to provide unique services to the research and education community by having direct access to (or by owning) fibre optic links and building and operating its own active infrastructure. This underpins the key differentiating aspects of an NREN service:

Technically

- **Performance** – Extremely high bandwidth, high availability, very low congestion and latency, and the capacity to accommodate peaks of demand
- **Reach** – Interconnects campuses and scientific instruments in metropolitan and regional areas, with national and international connectivity to peer institutions via other National Research and Education Networks (NRENs)
- **Scalability** – Network services can be upgraded by upgrading active network equipment

Commercially

- Operational costs, incremental expansions and capability enhancements covered by **annual member and customer subscriptions** and charges
- Membership **subscriptions based on organisation size**

⁶ Massive Open Online Course (MOOC)

⁷ Science, Technology, Engineering and Mathematics in the National Interest: A Strategic Approach, Office of the Chief Scientist, 2013

- Operates as a **Not-for-Profit** company with an Education and Research mission
- Some Commonwealth investments are required at irregular intervals

Long Term Investment Strategy

In 2003 as part of the Backing Australia's Ability initiative (via NCRIS and its predecessors and successors) the Australian Government assisted AARNet, along with significant investment of its own funds, to acquire long-term access to the "dark fibre" of an existing national commercial network⁸. In the same year, an arrangement was concluded, again with Australian Government support, to secure international capacity to the United States on a long-term basis with a commercial operator.

These were incredibly valuable and timely investments in Australia's digital research infrastructure and have enabled AARNet to develop successive generations of new networking capability to meet the extreme demands of the Australian research sector.

However, both arrangements have finite lifetimes, which will come to end in the next decade. In addition, many of Australia's future research partnerships are with Asian partners, and investment in network capacity into Asia will be required.

The Australian Government also contributed to the development of State-based infrastructure in Victoria (creating VERNet) and in South Australia (creating SABRENet). Together with AARNet these networks are known as the Australia Research and Education Network (AREN) and AARNet is the designated "operator" of the national and international AREN.

Significantly, the business case for the AREN was articulated by the Commonwealth as part of a long-term strategy for future investments to build out Australia's NREN in 2002⁹. This laid the policy groundwork to enable the early AREN investments to be made quickly and opportunistically, based on the commercial availability of infrastructure at extremely attractive prices. The return on this investment has been immeasurable.

AARNet strongly supports the Government's objective to "develop a roadmap for long-term research infrastructure investment¹⁰". Further, we recommend that a strategy be put in place to ensure that the Commonwealth is able to respond to commercial opportunities for investment in digital infrastructure in a timely manner, particularly to support the AREN.

Australia's NREN is a national asset and a critical factor in supporting research excellence, which in turn will boost the commercial returns from research.

⁸ <http://www.computerworld.com.au/mediareleases/5008/aarnet-acquires-nextgen-capacity-for-national-rese/>

⁹ A Framework for an Australian Research and Education Network, Department of Science, Education and Training, 2002

¹⁰ Boosting the commercial returns from research, Department of Education, Department of Industry, 2014