Submission
2016 National Research Infrastructure Roadmap
Capability Issues Paper

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Question 1: Are there other capability areas that should be considered?

Capabilities for developing applying smart materials, 3-D printing and beyond, should be added to the section entitled '*Bioengineering solutions for precision medicine*'.

Question 2: Are these governance characteristics appropriate and are there other factors that should be considered for optimal governance for national research infrastructure.

The governance structure should be tight (5-7 people), skills-based not representative, allowing participating organisations to make nominations, but NCRIS or its successor to approve.

Question 3: Should national research infrastructure investment assist with access to international facilities?

No, that should be covered by project budgets via existing granting schemes.

Question 4: What are the conditions or scenarios where access to international facilities should be prioritised over developing national facilities?

Where the facility is not vital to have locally and there is cost-effective and convenient accessibility in facilities elsewhere.

Question 5: Should research workforce skills be considered a research infrastructure issue?

No. Universities and other elements of the research landscape are well equipped to do this through existing mechanisms, like postdoctoral fellowships and PhD stipends. However, I recommend encouraging universities to waive foreign student postgraduate fees for those who can obtain a competitive scholarship for their living expenses. This adds enormously to our intellectual capital, and is great foreign policy, as our graduates remain friends for life.

Question 9: What should the criteria and funding arrangements for defunding or decommissioning look like?

This is an important issue that needs to be addressed to reduce he present ad hocery of the support arrangements for national facilities. That is, to have a mechanism that acknowledges, balances and manages the trade-off between, on the one hand, stability of tenure (especially for highly skilled staff) and, on the other, the performance and continued relevance of the facility.

I suggest that national facilities are provided 5+3 years (or some other context-dependent combination, see below**) funding guarantee, whereby facilities are guaranteed 8 years, with an extensive, deep review of scientific and financial performance, and economic relevance at the 5-year mark, following which, if good, funding is extended for years 9-13 (i.e., total now 10+3 potential transition buffer), and if not, the facility is told that it has 3 years to come good (i.e., improve their performance and/or relevance) or shut down.

This X+Y years arrangement may be varied in context dependent ways, for example, major facilities such as ANSTO or the Synchrotron may be given longer timelines.

Question 10: What financing models should the Government consider to support investment in national research infrastructure?

Enough funds for the necessary / relevant equipment (which goes without saying), but also decent operating funds, perhaps equivalent to that provided to CRCs, not only to attract to level staff but also to foster leading edge projects and applications.

Health and Medical Sciences

Question 15: Are the identified emerging directions and research infrastructure capabilities for Health and Medical Sciences right? Are there any missing or additional needed?

Genomics

Developments in massively parallel sequencing and other high-content molecular profiling methods empower human-centred discovery research, from cancer to cardiovascular disease to neurodegenerative disorders.

The allocation of additional infrastructure for genomics / DNA sequencing should respect the considerable philanthropic support that has been provided to date for human genome sequencing, which is available at cost via the Kinghorn Centre for Clinical Genomics to the entire nation and other jurisdictions such as New Zealand.

Clinical cohorts

Australia has an enviable international reputation for high quality clinical cohorts. Such cohorts have been used for 20 years as an accurately phenotyped resource pivotal to genetic research at the population level. As genomic technologies evolve from oligogenic platforms through genome-wide association studies to whole genome sequencing, such cohorts only gain power with age. The ability to follow populations accurately over time adds an increasingly powerful dimension to the analysis of outcomes.

Funding for cohorts of national and international significance is fundamentally unsuited to project-based funding mechanisms, which are essentially time-limited. Well-annotated, biospecimen-rich and appropriately consented cohorts constitute a national resource that should be treated as essential infrastructure for Australia's future research strategy. Given the progressive constraints on clinical research governance and ethics, the failure to sustain existing high value cohorts not only wastes the investment in time-dependent outcomes, but will come at a greater cost and lower efficiency. Equally

important is the ability to instigate the new, fit-for-purpose prospective clinical cohorts, which will answer the medical research questions of the future.

Question 16: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

We recommend Australian involvement in population-scale clinical genome projects, in partnership with the UK and other jurisdictions. Genomics will revolutionise medicine, healthcare and health economics, and create entirely new industries in the largest, most important, and fastest growing domain of the global financial and social economies.

Genomics, and supporting structures, especially in elation to big data, will dwarf all other areas in the biomedical sector in its impact. The inflexion point is now, so returns on investment will be maximal.