Research and Innovation

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Department of Education
GPO Box 9880, Canberra, ACT, 2601

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Re: Draft National Digital Research Infrastructure Strategy

The University of Queensland (UQ) welcomes the opportunity to contribute to the ambitious vision set out by the Department of Education for the future of Australia's National Digital Infrastructure (NDRI) ecosystem.

Across all disciplines, UQ is one of Australia's top research-intensive universities. Through UQ's Strategic Plan, *Toward 2032*, we have charted a pathway to foster mutually beneficial partnerships at scale, to deliver positive impact for our communities, the environment and economy. As Australia's most comprehensive research university, UQ sees enormous opportunity to connect the strengths and leadership of our discipline excellence to deliver mission-driven research that is aligned with government, industry, and community priorities.[1]

UQ manages over 70 world-class research facilities and services, 11 internal collaborative research platforms, 22 capabilities across 11 national collaborative research infrastructure (NCRIS) facilities, and over $300 million in research infrastructure. It is UQ's access to highly experienced staff, advanced equipment, and expertly-curated facilities and systems available through our multi-million dollar research infrastructure portfolio which allow our researchers to consistently deliver some of the nation's most transformative, impactful, and groundbreaking research outcomes.

The University strongly supports the user-centric design goal of the Strategy as a vision for the future of the NDRI system. We also commend the Department for the development and articulation of the six priority outcomes underpinning the prospective NDRI ecosystem. These outcomes create an ambitious, and achievable, desired end-state for the system in 2030; they will facilitate nation-wide collaboration at scale and serve to coordinate and integrate the extant digital infrastructure and make provisions for future-proofing the system.

While the vision for the ecosystem is admirable, UQ would like to provide additional feedback relating to:

Outcome 4 – Integrated across levels of computing and data.

UQ believes that a special emphasis must be placed on this outcome, given its foundational nature with respect to the other five outcomes. The draft Strategy notes that the outcomes are not mutually exclusive, and researcher or research community access to different tiers of computing and data capability underpins the user-centric design aim of the NDRI system.

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[1] UQ is ranked in the top 300 global universities in 50 subject areas in the QS Subject rankings 2023, more than any other Australian university.

At a national level, the strong need for improved computational and data integration is evidenced in the gaps in system capability across high performance computing (HPC). There is significant 'Tier 1' HPC investment from the Australian government by way of the National Computational Infrastructure (NCI) and the Pawsey Supercomputing Centre, each of which supports major, but discrete, research communities. At the 'Tier 3' institutional level, university facilities are increasingly expected to support capability in HPC through various investment mechanisms including Research Block Grants or internal capital funding models. The level of investment and maturity at Tier 3 varies greatly across higher education institutions, however a critical gap in the integrated access of computing and data lies in the paucity of 'Tier 2' computational facilities across the nation. The relative lack of Tier 2 systems imposes workloads on Tier 1 systems that might be handled in alternative ways. Tier 2 supercomputers within national agencies and national consortia such as MASSIVE, QCIF, OzStar, and UQ's own 'Bunya' are pivotal to the work of regional and local research communities and provide baseline support for national programs of work.

Looking forward to 2030, the targeted year by which the Strategy will have had impact, Australia must consider well-matured, established systems of Tier 2 HPC from around the world. High Performance Computing UK, for example, brings together medium-sized consortia or alliances of universities in order to facilitate access to research activities that require advanced computing methods, capabilities, and data management.

Serious consideration must be given to how Tier 2 capabilities will be enabled, and funded, into the future. While Tier 1 HPC may focus on climate change, defence, and energy, it is likely that Tier 2 activity will centre on research specialities such as targeted applications in artificial intelligence and specialised sub-domains of life sciences. Further, Tier 2 capabilities are also an enabler of edge-computing capabilities, supporting very high throughput institutional and regional scientific instrumentation data processing with interactive and site-specific workflows where urgency, latency, and immediacy of data to compute interactions matter for the outcome of the research endeavour.

An attribute of Tier 2 supercomputing facilities is their agility in procurement and the technology currency that they enable. This creates an enhanced ability to meet immediate specialised requirements in rapidly changing research. This is due their ability to implement cutting edge infrastructures to benefit scientific research in shorter time frames with appropriate enablement.

Tier 2 supercomputers are able to satisfy specific research domains and cohorts that cannot be easily or efficiently supported by Tier 1 facilities. For example, UQ's bioinformatics researchers are able to facilitate their research endeavours by making use of Bunya's uniformly very high memory footprint per node.[2] Additionally, Bunya's new capabilities, added under 'Bunya Phase 2.0' are also benefitting drug development and genomics researchers who require state-of-the-art GPU facilities.[3]

From the perspective of service and capability scalability, UQ believes that it has evolved an appropriate set of architectural principles that will enable such integrated access to different tiers of computing capability and a shared data infrastructure model for the sector.

We note that while some of the specifics of the development and integration of Tier 2 HPC into the NDRI are implicit in the *requirements* of Outcome 4, a more explicit mention of the importance of Tier 2 HPC should be emphasised, in keeping with its capability to link all levels the digital infrastructure. Emphasising this requirement would also better align with the *approach* of the outcome – integrated access to different tiers of computing capability and shared data.

We recognise the importance of the NDRI to further enable high-quality, high-impact and collaborative research that addresses national and global challenges. We also acknowledge the significant investment and coordination required to develop and maintain a world-class NDRI system that is accessible, affordable, sustainable and secure.

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[2] https://www.itnews.com.au/news/uq-adding-gpus-cpus-to-bunya-supercomputer-598497
[3] https://rcc.uq.edu.au/article/2023/11/new-uq-supercomputer-%E2%80%9Cgame-changer%E2%80%9D

Thank you again for the opportunity to comment on the draft NDRI Strategy. We would welcome the opportunity for ongoing engagement and consultation on this important policy agenda. We hope that our input will contribute to the development of a comprehensive and coherent NDRI strategy that will benefit the Australian research and innovation community, and the nation as a whole.

Kind regards,

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Pro-Vice-Chancellor (Research Infrastructure)