Digital connectivity and technology

The Commonwealth Scientific and Industrial Research Organisation has estimated that digital innovation has the potential to deliver **$315 billion in gross economic value** to Australia over the next decade, with the possibility of generating a quarter of a million new jobs by 2025.[1]

What IWA heard

During consultation on the draft strategy, feedback reiterated the importance of digital connectivity to support equitable access to services, social inclusion and economic development. Stakeholders recognised the importance of data sharing and management, resulting in a strengthened focus on the need for a whole of government digital platform.

The opportunity to embed data standards into contracting processes was highlighted as a mechanism to achieve integration and interoperability, resulting in refinements to recommendations. Stakeholder concerns relating to cyber risk has led to a stronger recognition of the government's policy developments in cybersecurity and protection of critical infrastructure.

Other concerns relating to funding and procurement of digital technology projects has resulted in attention being drawn to the importance of the government's new Digital Capability Fund. Stakeholder feedback also highlighted the importance of research infrastructure to science and technology, prompting the inclusion of a new recommendation.

Digital connectivity and technology are rapidly changing almost every aspect of our lives. Technology is transforming how government and commercial services are accessed and delivered by redefining business models, supply chains and labour markets, and breaking down physical and social barriers. Embracing digital will enable data-informed and faster decision-making, support more flexible service delivery and create a more agile government. Digital has a role across all infrastructure sectors and warrants a strong and sustained government focus.

It is important that WA recognises digital connectivity infrastructure as a strategic asset and a major enabler for economic development and social equity. Data indicates that the international competitiveness of Australia's information and communications technology (ICT) sector is slipping. In 2019, Australia ranked seventh out of 16 countries across 24 indicators and, over 2 years, fell in rank in more than half of the indicators, including internet access, ecommerce and capabilities in the ICT sector.[2]

The importance of digital connectivity was highlighted by the unexpected isolation caused by the COVID-19 pandemic, when data demands on telecommunications networks surged more than 50% during peak periods across WA. The speed at which the sector adjusted to meet the challenge was impressive and it demonstrated how responsive government can be in delivering more essential services through online platforms and programs. It also demonstrated the importance of a resilient digital network. As infrastructure systems become more reliant on digital technology to operate, the risk of cyberattack also increases. Combined with the increasing

likelihood of other shock events such as storms, cyclones or bushfires, it is essential for resilience in digital infrastructure to be prioritised.

Supported by improved connectivity, WA has an opportunity to reimagine itself as a digital state. Enhancing infrastructure assets through digitisation, such as optimising supply chains with smart technologies, will improve system efficiency and realise the value of rich, up-to-date data in long-term infrastructure planning. For example, in the water sector, the integration of digital technologies, such as sensors, smart meters and pressure control systems, has reduced water loss and consumption and improved water conservation. Efficiencies such as these can create competitive advantage and jobs. Another example is the Digital Built Britain program, which was designed to transform how the United Kingdom construction industry and operations management professionals plan, build, maintain and use infrastructure through digital technology. The program is forecast to unlock an increase of 0.5% to 0.7% in annual gross domestic product over a 5-year period, rising to 1% to 2.7% over the subsequent 10 years, and growing to 3% to 6% after 15 years.[3]

The rise of the cloud, big data, mobility, artificial intelligence, augmented and virtual reality, and the Internet of Things is fuelling a fourth industrial revolution – **Industry 4.0**. Between 2018 and 2024, it is estimated that **demand for technology workers in Australia will grow by 100,000**.[4] The contribution of digital technology to gross domestic product is expected to **grow by 40%** between 2018 and 2023.[5]

What is digital?

For the purposes of this Strategy, digital refers to the application of technology to physical infrastructure, which facilitates the connection of assets and people to the internet. It encompasses:

- telecommunications infrastructure, such as submarine cables and fibre transmission
- access networks, such as fixed-line, mobile and satellite
- end-point user devices and applications, such as Internet of Things devices and handsets
- policies and frameworks, such as those used to secure and organise digital information.

Digital refers to how data is generated and collected to create value. Data is an asset class that transforms infrastructure systems into information generators and enables more efficient asset management practices.

Digital connectivity and the digital divide

Aside from the Australian Government's national broadband network (NBN), telecommunications infrastructure is largely delivered by the private sector. NBN Co's multi-technology mix model has resulted in satellite service coverage for large areas of WA which, due to frequent service dropouts, bandwidth (speed and contention) and latency issues, poses challenges in meeting current and future connectivity demand.[6]

To meet the demand of 95% of households nationwide, Australia's bandwidth requirements are estimated to more than double over 10 years, from 24 megabits per second in 2018 to 56 megabits per second in 2028.[7] Average household data demand is estimated to nearly quadruple from 199 gigabytes per month to 767 gigabytes over the same period.[8]

WA's size and low population density in many regions limits the commercial viability of service delivery and, as a result, the private sector has not delivered adequate connectivity (particularly mobile) to meet the ever-growing needs of regional communities, businesses and government in many areas of the state. For example, it is estimated that approximately 74% of WA (geographically) has no mobile coverage (Figure 14).[9]

These shortfalls create a digital divide between metropolitan, regional and remote areas, and the gap is widening in vulnerable communities. Aboriginal people are especially impacted, with Indigenous Australians' digital inclusion scoring 7.9 points below the national average.[10] While WA ranks second in the nation on the Australian Digital Inclusion Index 2021 (with a score of 72), many regional areas sit below the national average.[11] On a national level, the divide between metropolitan and regional areas remains marked, with regional areas recording a score of 67.4, 3.6 points less than the national average of 71.1 and 5.5 points less than metropolitan areas, which scored 72.9.[12]

In WA, 94% of regional local government areas scored below the state average, with a gap of 13 points at the lowest end, compared to metropolitan local government areas where only 2 scored below the state average and some scored up to 7 points higher.[13]

As a result, many regional and remote areas experience poor-quality mobile network coverage, limited choice of providers and higher-cost broadband services of variable quality. Consequently, economic growth, service delivery and social participation in these areas are impacted. Emerging technologies, such as low earth orbit satellites, may result in wider access to high-speed broadband services in regional WA, and it will be important for government to consider how to support and leverage these developments where appropriate.

Other factors can also lead to digital exclusion. In 2021, highly excluded Australians were the most likely to have not completed a secondary education (38%), fall in the lowest income quintile (31%), live in a single-person household (26%), have a disability (23%), be unemployed (21%) or not be in the labour force (22%).[14] Some groups may have limited access to internet or online platforms, have fewer skills to connect them digitally or may experience language or accessibility barriers that limit their opportunities to engage with online resources.

Figure 14: Western Australia's telecommunications coverage[15]

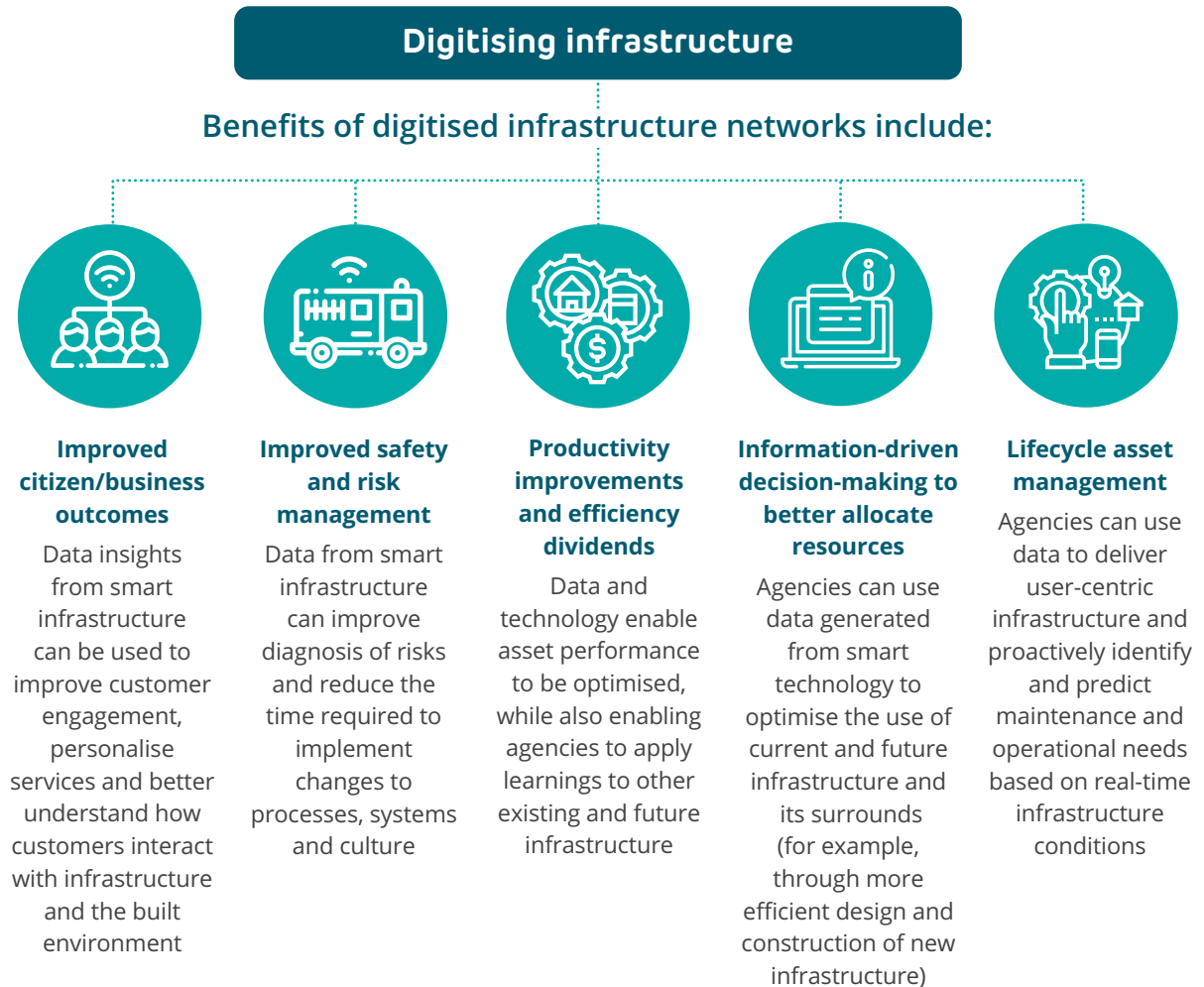■ NBN fixed   ■ NBN wireless   ■ Mobile coverage   ■ NBN satellite
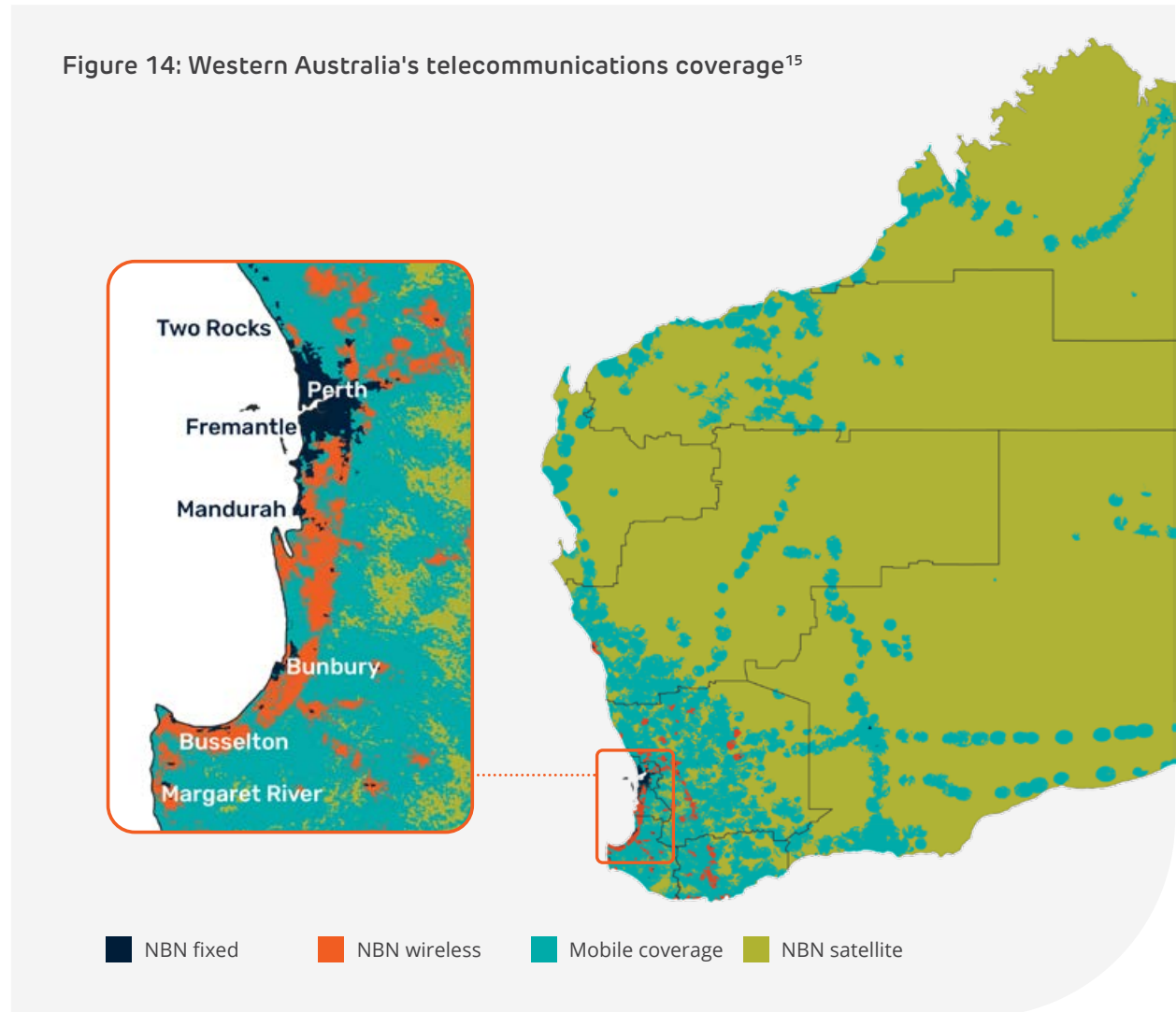
On a global scale, **Australia's fixed broadband speeds lag far behind comparable developed countries** and the quality, reliability and affordability of data services across WA varies greatly.[16]

A digital-first approach – the case for digitising infrastructure

Digitising infrastructure creates a range of benefits including better business outcomes, improved safety, greater customer engagement and experience, operating efficiencies, opportunities for new revenue streams and better lifecycle management. Sophisticated use of building information modelling technology alone was estimated to have saved the United Kingdom the equivalent of $4 billion over a 6-year period by enabling interventions to be modelled and tested before they are fully deployed.[17] Going forward, the Digital Built Britain program will apply a new model of digitisation that will provide the platform for a full cross-integration of the built environment sector.[18] Greater savings are possible from sharing data to inform lifecycle planning for related projects, and demonstrating value and efficiencies created through optimisation and automation.

Adopting a digital-first approach will help manage operational risks and improve safety. Embedding digital tools and thinking will deliver benefits at every stage of the infrastructure lifecycle (Figure 15). This is demonstrated through the Australian Integrated Multimodal EcoSystem project in Melbourne, which uses digital technology to link transport infrastructure with its users to deliver safer, cleaner and more sustainable urban transport. The system also includes a predictive platform that enables a near-future view to optimise the transport system in real time.

Figure 15: The benefits of digitising infrastructure

Digitising infrastructure

Benefits of digitised infrastructure networks include:

Improved citizen/business outcomes

Data insights from smart infrastructure can be used to improve customer engagement, personalise services and better understand how customers interact with infrastructure and the built environment

Improved safety and risk management

Data from smart infrastructure can improve diagnosis of risks and reduce the time required to implement changes to processes, systems and culture

Productivity improvements and efficiency dividends

Data and technology enable asset performance to be optimised, while also enabling agencies to apply learnings to other existing and future infrastructure

Information-driven decision-making to better allocate resources

Agencies can use data generated from smart technology to optimise the use of current and future infrastructure and its surrounds (for example, through more efficient design and construction of new infrastructure)

Lifecycle asset management

Agencies can use data to deliver user-centric infrastructure and proactively identify and predict maintenance and operational needs based on real-time infrastructure conditions

The volume and value of data being generated is constantly increasing, and many public and private sector entities hold large and powerful data sets comprising static and real-time information. In 2019, the Organisation for Economic Cooperation and Development estimated that public sector data access and sharing generates social and economic benefits worth between 0.1% and 1.5% of gross domestic product.[19] An opportunity exists to better use data to solve complex business and societal challenges, and to improve the quality and consistency of infrastructure planning, policymaking and investment decision-making. This requires a range of supporting capabilities, such as robust privacy frameworks, data sharing and management policies and platforms, and digital literacy and specialist skills. New infrastructure should be designed and built to capture at least baseline data, with the view to broadening and deepening this data capture in line with a digital-first approach and to support business and operational needs. As standard practice, state agencies and government trading enterprises (GTEs) should identify digital alternatives to physical built form investments, using digital tools in the planning and design phases.

Digital infrastructure systems need to be protected with effective cybersecurity and information privacy controls. Achieving the right balance between data security and data sharing is a delicate balance but this is critical to enabling innovation and realising value. For state-owned and regulated infrastructure, there is a need for a continuous focus on

setting and implementing clear cybersecurity standards. This will help manage critical risks, support digital transformation and protect industry, individual and government data. WA is well positioned to lead in this space, building on its strong track record and leveraging its skills, such as through the Southern Hemisphere's largest university-based security operations centre at Edith Cowan University.

Digital opportunity for Western Australia

WA Government investment in telecommunications infrastructure has been relatively modest and largely focused on addressing the digital divide, particularly through leveraging Australian Government grant co-investment programs. These programs have delivered benefits to some regional and remote communities but there are still very significant gaps in connectivity across the state. A prioritisation framework to guide future investment decision-making, coupled with effective cross-government coordination, is needed to support improved outcomes.

The Office of Digital Government (within the Department of the Premier and Cabinet) addresses digital inclusion gaps in its *Digital inclusion in Western Australia, A Blueprint for a digitally-inclusive state* consultation draft. This initiative provides the strategic direction to address the impacts of digital exclusion and is an important policy instrument that will enhance the benefits of connectivity by also addressing digital literacy, affordability and accessibility barriers.

WA's capacity to **digitise, create value from and futureproof its infrastructure assets** depends on the success of a range of critical capabilities.
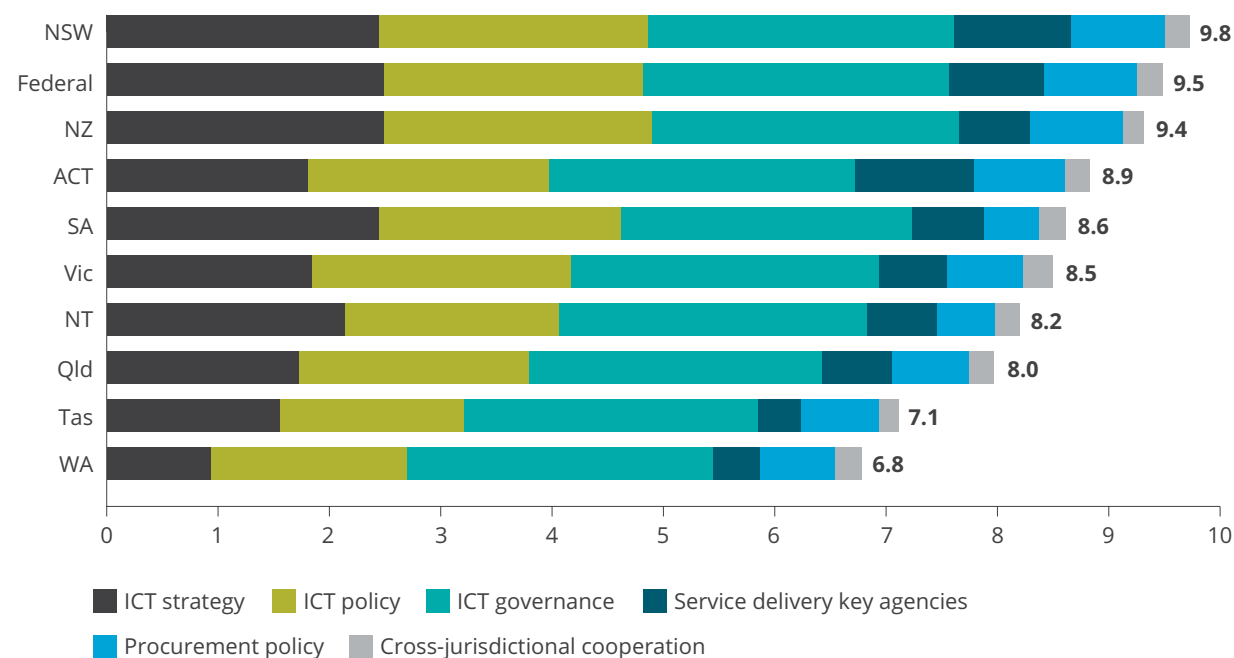
Its implementation as part of the WA Government's *Digital Strategy for the Western Australian Government 2021–2025* should be supported. Other jurisdictions are increasingly recognising the negative economic and social impacts of poor regional connectivity and addressing this through the establishment of dedicated programs and additional investment. For example, the New South Wales Government is progressing the $400 million Regional Digital Connectivity program, which aims to address the digital divide between metropolitan centres and regional areas through investment in digital infrastructure.

In terms of digital readiness (how well a jurisdiction is positioned to benefit from the internet economy), WA ranks fourth of all Australian jurisdictions on the Cisco Australian Digital Readiness Index. WA performs well in technology adoption and human capital, but poorly in government and business investment and provision of critical technology infrastructure.[20]

Figure 16: Digital Government Readiness Indicator 2021[21]

WA ranks lowest on the Digital Government Readiness Indicator.[22] Many factors contributed to this low ranking, including expiration of the Digital WA: State ICT Strategy 2016–2020, the lack of a central service delivery state agency and continuing to operate without adequate privacy legislation (Figure 16). The WA Government has since released its Digital Strategy for the Western Australian Government 2021–2025 and is implementing its Whole of Government Digital Services Policy by establishing a whole of government service delivery portal.

Stakeholder feedback suggests outdated ICT systems operating within government create limitations for service delivery and increase risk, which is impacting its digital readiness. This is exacerbated by a funding model that is not well suited to recognise the unique characteristics of digital project lifecycle and funding requirements. The WA Government's $500 million Digital Capability Fund announced in September 2021 acknowledges the importance of providing a dedicated funding stream to enhance its digital capability. Continued investment in digital infrastructure will help WA to realise the economic and social dividends that digital connectivity and technology provide. The WA Government needs to develop a strong digital readiness agenda and be agile in its governance, planning and decision-making to keep pace with demand and technological change.

Case study

Health in a virtual environment

In December 2020, the East Metropolitan Health Service commenced HIVE (Health in a virtual environment), an inpatient remote monitoring service. HIVE is staffed by clinical experts and provides continuous 24/7 monitoring of vulnerable patients at Royal Perth and Armadale hospitals.

The service uses an artificial intelligence platform that interacts with a range of medical devices and clinical applications to identify subtle changes in patients' conditions and detect early signs of clinical deterioration. When the platform identifies a problem with a patient, HIVE clinicians and staff are notified. HIVE clinicians use a 2-way audiovisual system to intervene and support staff to care for the patient.

The benefits of the service include enhanced safety and quality of patient care, improved hospital operations and patient flow, improved patient satisfaction and improved staff satisfaction and morale.

While currently applied to inpatient care, the service has the potential to be combined with mobile and wearable technologies to support and empower patients with chronic health problems to co-manage their health in the community. Managing health at home may assist in decreasing admissions to hospitals, therefore reducing pressure on existing infrastructure.

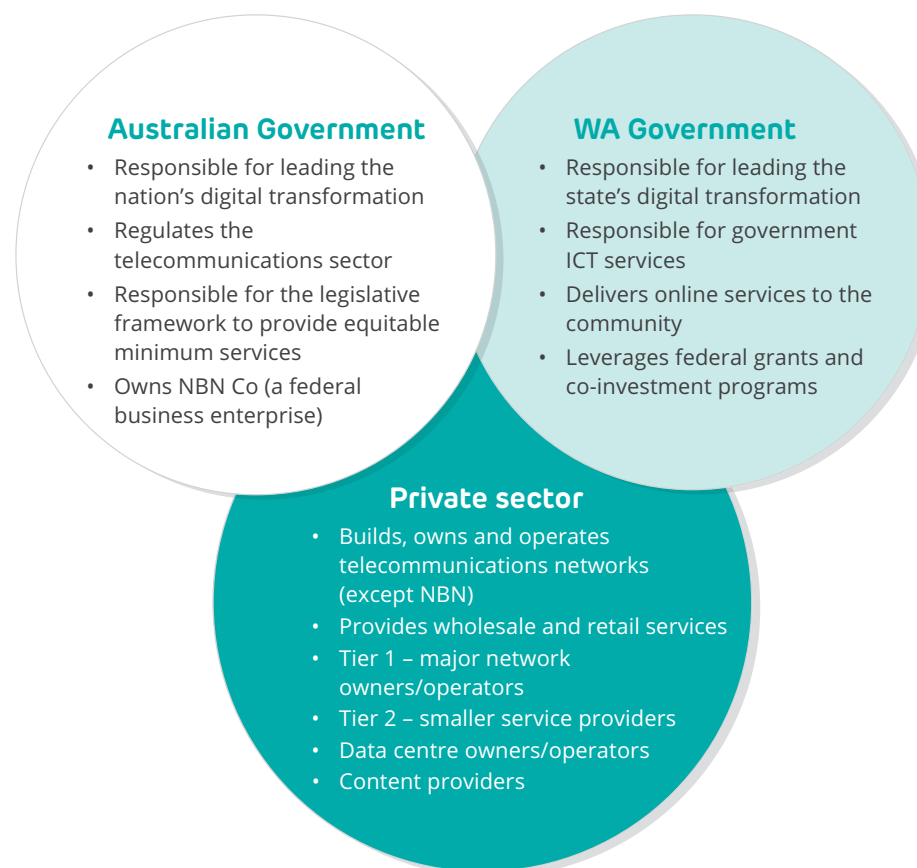For further information, refer to www.emhs.health.wa.gov.au.

Governance

Provision of telecommunications infrastructure is regulated by the Australian Government and most services provided to consumers are delivered by the private sector (with the exception of NBN) (Figure 17). Services provided to end users can be broadly separated into 2 areas: mobile and fixed services.

Three mobile network operators provide mobile services to the Australian market: Telstra, Optus and Vodafone. In addition, more than 50 smaller virtual mobile network operators lease network space from these major operators, offering the market a lower-cost alternative but with fewer features. Mobile services have evolved from 3G (low speed/wide range) to 5G (higher speed/shorter range). 5G is being designed to respond to major growth in the demand for data and connectivity. Deployment of 5G requires higher densities of towers and cells. Given the additional investment requirements and lower concentration of customers in regional areas, it is unlikely that 5G will be commercially viable outside highly-populated centres.

Internet services are currently provided via a range of technologies, including fixed-line, mobile and satellite services. NBN Co owns and operates Australia's wholesale broadband access network. NBN Co's primary objective is to ensure all Australians have access to fast broadband at affordable prices, with the least cost to taxpayers. In accordance with the 2016 *NBN Co statement of expectations*, NBN Co is expected to deliver access to peak wholesale download speeds of at least 25 megabits per second to all eligible premises, and at least 50 megabits per second to 90% of fixed-line premises. NBN Co is solely a wholesale provider of broadband services and sells access to its network to over 150 large and small retail service providers nationally.[23]

NBN Co provides 121 points of interconnect across Australia to connect users within a local area to the NBN network. In regional WA, retail service providers are required to establish and manage the connection from these points back to Perth, meaning they must either build or own existing backhaul fibre, or lease space on other operators'

Figure 17: Telecommunications sector roles

Australian Government
- Responsible for leading the nation's digital transformation
- Regulates the telecommunications sector
- Responsible for the legislative framework to provide equitable minimum services
- Owns NBN Co (a federal business enterprise)

WA Government
- Responsible for leading the state's digital transformation
- Responsible for government ICT services
- Delivers online services to the community
- Leverages federal grants and co-investment programs

Private sector
- Builds, owns and operates telecommunications networks (except NBN)
- Provides wholesale and retail services
- Tier 1 – major network owners/operators
- Tier 2 – smaller service providers
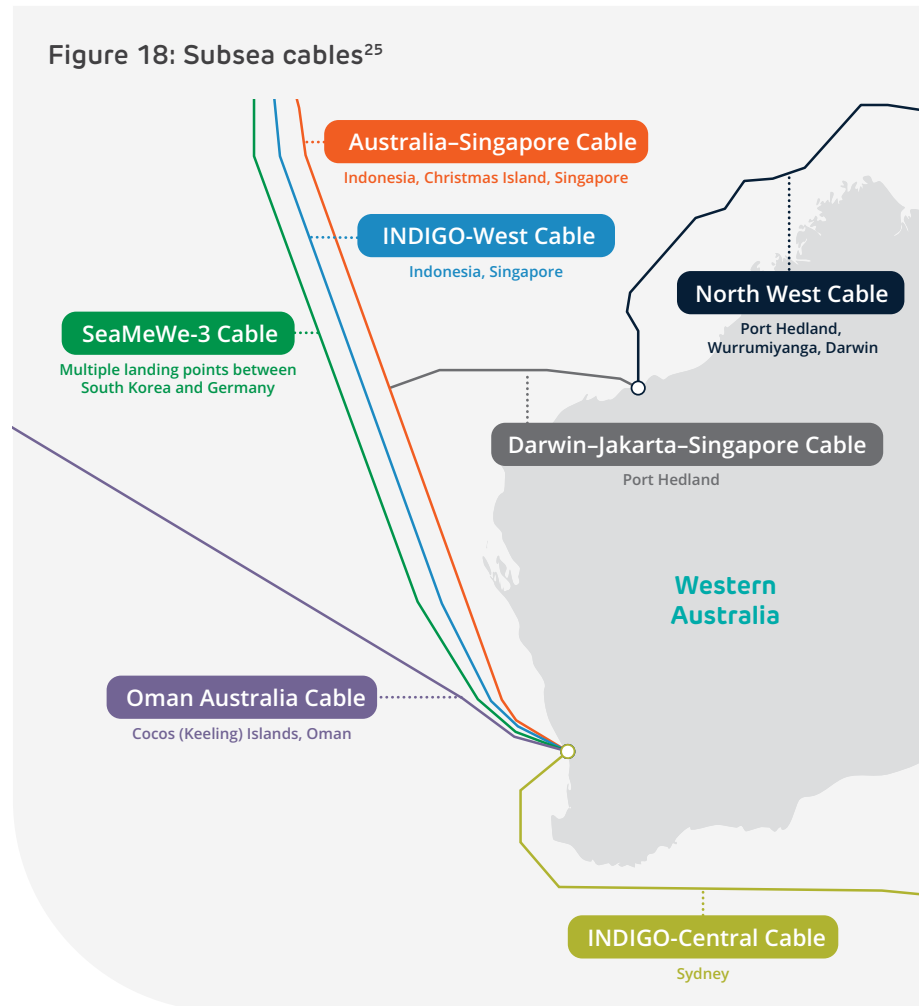- Data centre owners/operators
- Content providers

fibre transmission. In many cases, the owners of fibre transmission are also large retailers of NBN products and services, which gives them an inherent advantage over other service providers. In the future, the emergence of mobile 5G technology and low earth orbit satellite technologies may offer alternative options for end users of internet services.

Recently announced major investment in a fibre network that will connect major data hubs in capital cities across Australia promises to boost data transmission capacity, which may unlock new economic opportunities.

Two other areas of major influence for digital connectivity are the availability of international optical fibre cable routes and data centres. Served by 4 international submarine cable routes and a national Perth–Sydney submarine cable route, Perth is well positioned as an internet hub location (Figure 18).[24] Outside Perth, there are few data centres and no international submarine cable landings, which can impact the ability to support low-latency, high-bandwidth applications.

Figure 18: Subsea cables[25]

Australia–Singapore Cable
Indonesia, Christmas Island, Singapore

INDIGO-West Cable
Indonesia, Singapore

North West Cable
Port Hedland, Wurrumiyanga, Darwin

SeaMeWe-3 Cable
Multiple landing points between South Korea and Germany

Darwin–Jakarta–Singapore Cable
Port Hedland

Western Australia

Oman Australia Cable
Cocos (Keeling) Islands, Oman

INDIGO-Central Cable
Sydney

Recommendations

Prioritise digital transformation

Maintaining and increasing WA's global competitiveness through digital transformation requires prioritised investment in digital connectivity infrastructure. Strategic and coordinated WA Government intervention in the digital and telecommunications sector will address the most pressing needs of the state and build the basis for a strong digital future. The WA Government's Digital Capability Fund is an initiative that aims to enable more strategic and targeted investment in digital transformation and achieve coordinated and collaborative investment in digital capabilities.

A centralised and strengthened role for government is needed to coordinate statewide investments where market forces are failing to deliver the infrastructure to bridge the digital divide and build digital prosperity. Government funding should focus on improvements and upgrades in regional and remote areas across a diverse range of proven emerging technology types such as 5G and low earth orbit satellites. Investment should be aimed at enhancing economic and social benefits and/or supporting critical services, such as emergency, health, education and transport. Connectivity that is augmented by digital infrastructure, skills and ecosystems will drive adoption and deliver improved economic and social outcomes.

Digital connectivity is a core strategic asset and enabler of economic development and social equity. The digital future is characterised by a rapidly changing technological landscape, the pace of which has increased due to the increased focus on digital technologies during the COVID-19 pandemic. Due to this pace of change, the level of disruption is high. Outcomes-based, agile planning is needed to support the application of the most appropriate technologies and infrastructure types at any given time.

Several levels available to the WA Government can be applied in a coordinated manner to optimise investment outcomes. These include but are not limited to:

- recognition of economic and social benefits of digital technologies in business cases
- coordinated procurement to leverage government spend on telecommunications services
- a whole of government approach to leveraging NBN investment
- co-investment with the private sector and the Australian Government.

Recommendation 1

Elevate WA's focus on accelerating digital transformation and the priority given to underlying connectivity infrastructure by:

a. allocating a lead state agency with a statewide, whole of government focus to proactively increase digital technology adoption and ensure digital services are more accessible and responsive to community and business needs

b. developing and implementing an integrated statewide plan for digital connectivity, supported by a prioritisation framework, to guide future government investment

c. developing a collaboration model, adopting a coordinated WA Government approach to federal programs and encouraging private sector investment

d. providing multi-year WA Government funding and leveraging Australian Government co-investment opportunities for initiatives that have been prioritised in the statewide plan for digital connectivity.

A digital-first approach

Embedding digital tools and thinking throughout the infrastructure lifecycle will deliver improved safety and risk management, increased productivity and efficiency dividends, and optimise resource allocation (Figure 19). For example, a digital twin that replicates a physical asset or real-world process, such as a building or supply chain, enables sophisticated real-time monitoring and adjustments. This kind of digital solution can support rapid decision-making, with a high degree of confidence in outcomes, and provide valuable information to inform planning and management of assets (Figure 20).

Infrastructure digitisation proposals should be supported by cost-benefit assessments to determine the potential investment net benefit from digitisation scenarios, taking into consideration commercial, environmental and social factors. A decision to not digitise any aspect of a new infrastructure asset should be supported by evidence-based rationale.

Reporting on the uptake of digital in the public sector will be important to embed a digital culture and make informed cost-benefit analyses. Indicators that could be used for reporting include:

- prioritisation phase: demonstration that digital alternatives and enhancements were considered, and data collection and analysis opportunities were identified in business cases
- design phase: extent to which digital tools were used in the design process, including building information modelling
- procurement phase: data sharing included as a condition of contracts
- build phase: extent of digitisation and percentage of total expenditure attributed to digitisation
- operate and maintain phase: optimisation and automation achieved, data collection and management controls and potential value created/efficiencies generated.

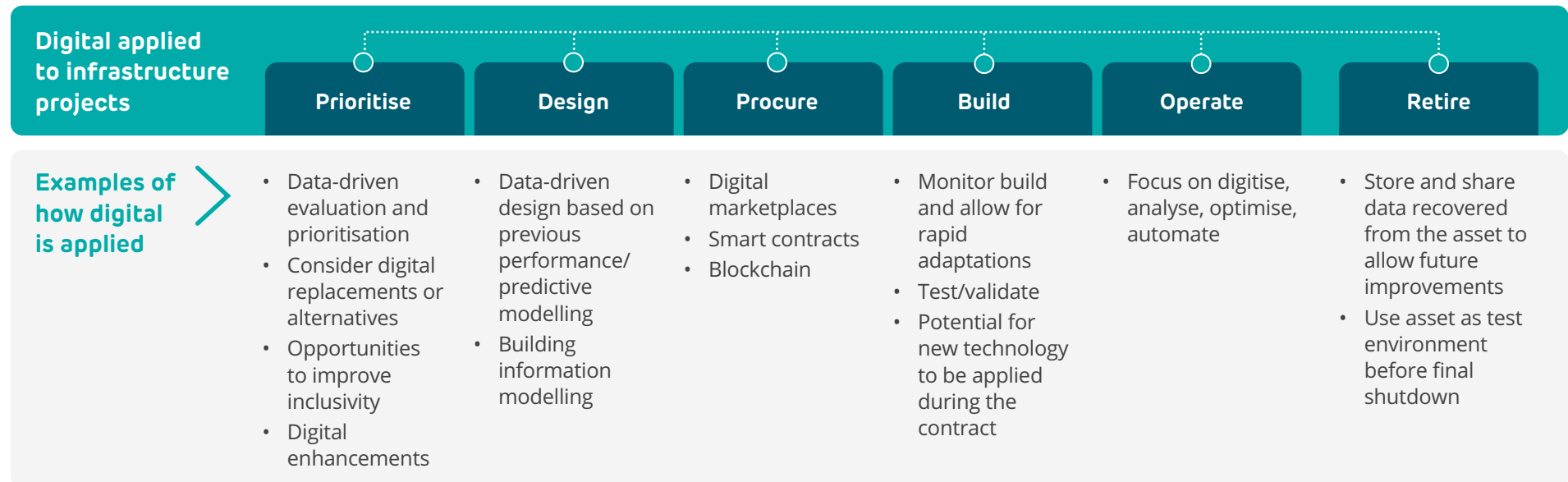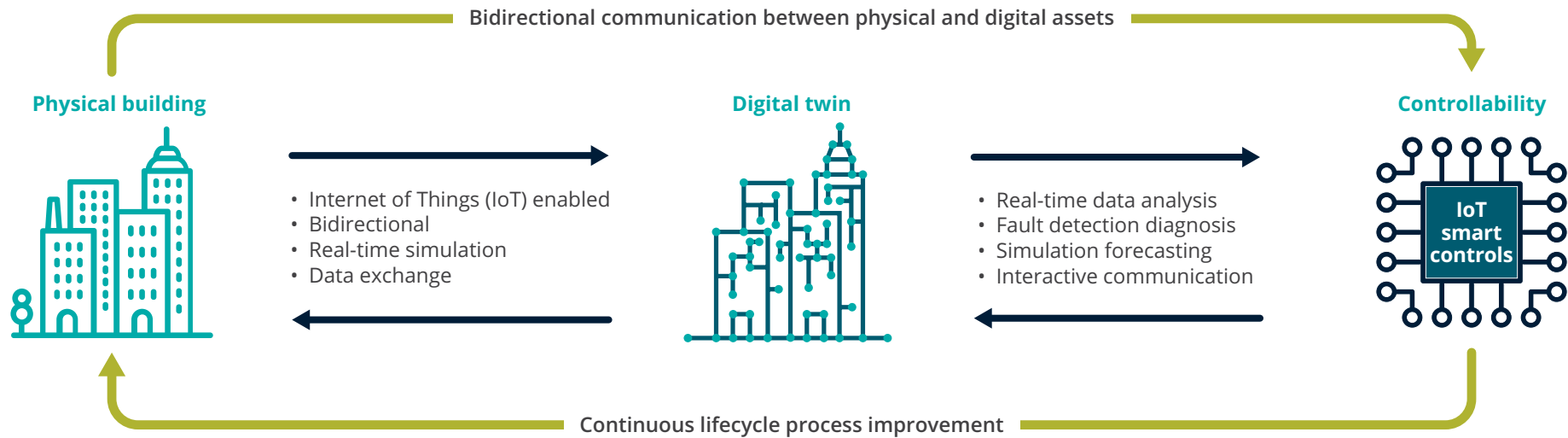**Figure 19: Application of digital across the infrastructure lifecycle**

Digital applied to infrastructure projects	Prioritise	Design	Procure	Build	Operate	Retire
Examples of how digital is applied	• Data-driven evaluation and prioritisation • Consider digital replacements or alternatives • Opportunities to improve inclusivity • Digital enhancements	• Data-driven design based on previous performance/predictive modelling • Building information modelling	• Digital marketplaces • Smart contracts • Blockchain	• Monitor build and allow for rapid adaptations • Test/validate • Potential for new technology to be applied during the contract	• Focus on digitise, analyse, optimise, automate	• Store and share data recovered from the asset to allow future improvements • Use asset as test environment before final shutdown

Figure 20: Digital twins in the built environment[26]

Bidirectional communication between physical and digital assets

Physical building

Digital twin

Controllability

IoT smart controls

- Internet of Things (IoT) enabled
- Bidirectional
- Real-time simulation
- Data exchange

- Real-time data analysis
- Fault detection diagnosis
- Simulation forecasting
- Interactive communication

Continuous lifecycle process improvement

Recommendation 2

Improve infrastructure efficiency and performance and enhance service delivery through application of a digital-first approach to all stages of the infrastructure lifecycle, by:

a. developing a digital-first smart infrastructure policy that guides the application of digital technologies, that includes:

   - design principles for digital-enabled infrastructure such as interoperability and flexibility, resilience, open standards and user-centred design

   - minimum requirements to embed smart technology in new and upgraded infrastructure where a positive net benefit can be demonstrated

   - a clear process for state agencies and government trading enterprises that would identify how to assess and implement digital at all points of the lifecycle, including accounting for upfront and recurring costs in the business case phase

   - outcomes and metrics

b. amending the Strategic Asset Management Framework's Strategic Asset Plan and Business Case guidelines to require state agencies and government trading enterprises to apply the digital-first smart infrastructure policy commencing with projects and programs with a capital cost of $100 million or more

c. undertaking annual public reporting on digitisation of infrastructure, including on prioritisation, design, procurement, build and operational phases.

Cybersecurity

Cybersecurity is a major focus for state agencies and GTEs. Until recently, the Australian Government's *Security of Critical Infrastructure Act 2018* (SOCI Act) applied to specific entities in the electricity, gas, water and maritime ports sectors.

The *Security Legislation Amendment (Critical Infrastructure) Act 2021* (Cth) amended the SOCI Act on 2 December 2021, creating a framework for managing risks relating to critical infrastructure, focusing on cybersecurity and expanding the scope of the original SOCI Act to include critical infrastructure entities in a wider range of sectors, including communications, financial services and markets, data storage or processing, defence industry, higher education and research, energy, food and grocery, health care and medical, space technology and transport.

The Australian Government is consulting on a second piece of legislation, the Security Legislation Amendment (Critical Infrastructure Protection) Bill 2022, with the intention of introducing it into the Australian Parliament in early 2022. This legislation would require owners and operators of critical infrastructure assets to establish, maintain and comply with a risk management program appropriate to their business.

The Australian Cyber Security Centre draws attention to the growing cybersecurity risk associated with the increasing convergence of information technology and operational technology (for example, digitised infrastructure networks). Approximately one-quarter of all cyber incidents reported to the Australian Cyber Security Centre during the 2020–21 reporting period were associated with Australia's critical infrastructure or essential services.[27] This means an essential service or critical infrastructure was attacked every 32 minutes. As infrastructure systems become increasingly digitised, the risk of cyberattack also increases, threatening the availability and reliability of critical services and security of personal and commercial data. The Australian Cyber Security Centre provides guidance on essential mitigation strategies for industrial control systems.

The Cyber Security Unit within the WA Government's Office of Digital Government is leading and coordinating whole of government cybersecurity initiatives to protect the integrity of government systems and grow cybersecurity maturity across the public sector. The Western Australian Cyber Security Policy prescribes a minimum baseline of cybersecurity controls for state agencies to implement. The Office of Digital Government is also leading a security operations centre, a resource available to all state agencies and GTEs to assist with threat detection, incident response, recovery activities and other security-related services. State agencies and GTEs need to ensure the resilience of their infrastructure and protect critical assets by adopting these best-practice approaches and adhering to recognised cybersecurity standards for major infrastructure assets.

WA Government attention to this matter should be strengthened to ensure owners and operators of critical infrastructure protect against cyber risks to information, assets and service delivery.

Recommendation 3

Manage critical risks and support digital transformation by improving cybersecurity practices for state-owned and regulated infrastructure owners and operators, including:

a. clearly articulating state and federal government cybersecurity obligations to government infrastructure owners and operators

b. implementing mechanisms to mandate application of the Western Australian Cyber Security Policy by government trading enterprises

c. updating the Strategic Asset Management Framework's Strategic Asset Plan and Business Case guidelines to require all infrastructure strategic asset plans and business cases to demonstrate compliance with the Western Australian Cyber Security Policy and, where applicable, the *Security of Critical Infrastructure Act 2018* (Cth).

Digital capabilities and enablers

WA's capacity to digitise, create value from and futureproof its infrastructure assets depends on the success of a range of critical capabilities. These include robust privacy frameworks, data sharing and management policies, protocols and platforms (including across government and between the private and public sector) and a diverse skills base that infrastructure owners and operators can draw on to embed digital into infrastructure assets.

The development of privacy and responsible information-sharing legislation for WA will be a critical step to foster a data-sharing culture. Alignment of legislation with existing Australian privacy laws where possible will ensure consistency and streamline information data sharing across jurisdictions. Legislation should also support adaptive approaches that respond to technology advancements. While legislation is critical, organisational cultural barriers relating to the sharing of information should also be addressed.

Effective data sharing across the public and private sectors, and academia, is key to supporting improved infrastructure planning, design, construction, operation and maintenance, and ensuring decisions are supported by robust evidence and analysis. For example, location or place-based information is powerful and enables the creation of digital twins (digital models of the real world) and smart cities. Bringing this data together through a collaborative exchange or platform would allow entities to share and visualise location information (such as buildings, infrastructure and services), simulate concepts, test options and solve problems. This practice is increasingly being established in other jurisdictions. To reduce duplication and ensure interoperability, it is important that environments such as these integrate with other platforms being developed by the WA Government, such as that being developed to allow customers to access integrated government services through a single portal.

The prioritisation and management of maintenance programs relies on up-to-date and accurate asset information. The quality of asset information is often inconsistent and lacking in some areas, making it difficult to develop fit for purpose, risk-based management plans that consider asset condition and lifecycle status. More sophisticated asset information (including that provided through building information modelling) will enable good practice asset management, such as risk-based decision-making, preventative maintenance and lifecycle asset optimisation. Information on asset use, lifecycle cost, performance and benefits should be systematically captured and used to inform planning and justification for future assets, as part of strategic asset plan and business case development processes. Embedding data-sharing requirements in procurement processes provides an opportunity to ensure relevant data is shared to required standards.

Recommendation 4

Ensure optimal operation and security of infrastructure by developing digital capabilities within state agencies and government trading enterprises, including:

a. prioritising development of state privacy and information-sharing legislation that addresses the need to protect information and leverage value from the state's information and data and, where practicable, aligns with existing Australian privacy laws to enable streamlined information sharing

b. establishing a whole of government digital platform that enables the sharing of location-based asset information

c. developing a WA Government data management and asset information policy that would include processes and appropriate standards to enable data sharing and analysis that supports improved planning and delivery of new infrastructure and better management of existing assets and embed these in government procurement processes, where applicable

d. assigning a centralised lead state agency that is responsible for developing and retaining data science capabilities within government, including developing a comprehensive workforce strategy.

Advancing science and research in Western Australia

The Strategy's vision acknowledges the science and technology expertise within WA and the opportunities this expertise provides to improve the productivity, efficiency and competitiveness of the economy. This is reflected in the WA Government's Diversify WA framework which identifies science, innovation and technology as a cross-sectoral enabler. Many existing and emerging industries rely heavily on science and technology to thrive, and rely on research and development processes for the development of new products and services. In addition, a wide range of critical services provided by state agencies rely on science and technology for

decision-making and delivery, in areas ranging from environmental regulation to forensics, and from the provision of clean drinking water to climate change modelling.

WA has a strong and emerging science and research capability, with significant Australian and WA Government investment in associated research infrastructure, such as the Pawsey Supercomputing Centre and the Murchison Radio-astronomy Observatory that supports the Square Kilometre Array. Government investment in science has given WA a comparative advantage in a number of research niches and has catalysed private sector investment.

Research infrastructure comprises a range of assets, facilities and services that support

leading-edge research and innovation, and are often of a scale and technical complexity that warrants them being considered state or nationally significant infrastructure. Investment in this type of infrastructure is often only possible through a common-use approach, either because of the high cost of the asset, the speed at which redundancy occurs and/or the highly specialised nature of the technology.

In WA, the approach to development and investment in this infrastructure has often been ad hoc and has not been assessed in a systematic way. The condition of the infrastructure and the risks to the state from its decline are also not clearly understood. There is a need for the WA Government to consider the technologies and assets that are needed for economic diversification, agency service delivery, environmental protection and community wellbeing. This assessment should include needs for both new infrastructure as well as the optimisation of existing infrastructure. Identification of priority infrastructure projects will also assist WA research organisations to access National Collaborative Research Infrastructure Strategy and other co-investment funding.

Recommendation 5

Advance economic, environmental and social outcomes by undertaking an assessment of WA's science and research infrastructure needs.