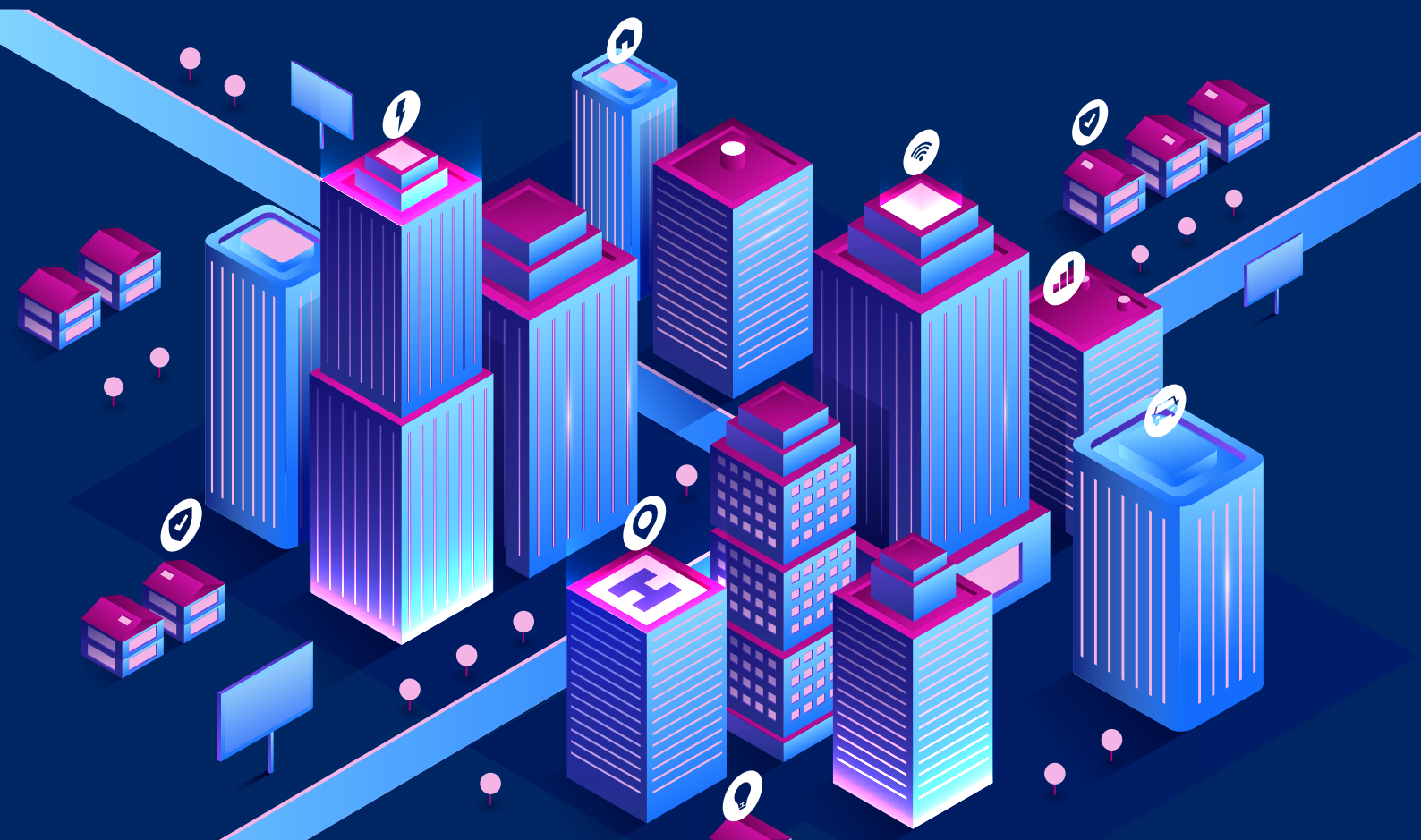
NSW GOVERNMENT

NSW Roadmap

For digitalising planning, design, construction and operation of infrastructure

November 2022



Acknowledgement of Country

We acknowledge the Traditional Custodians of the lands where we walk, work and live, and pays respect to their Elders past and present.

We acknowledge and respect their continuing connection to land, seas and waterways of NSW, and the continuation of their cultural, spiritual and educational practices.

We acknowledge the importance of Aboriginal and Torres Strait Islander people's unique history of land and water management, and of art, culture and society that began over 65,000 years ago.

Contents

Message from Minister Stokes

Infrastructure is evolving. We have an impetus to harness the opportunities associated with data and digital technology as it relates to infrastructure and the built environment.

Our view of infrastructure has been primarily focused on roads, bridges, schools, hospitals and parks: physical assets that benefit NSW citizens every day. Now, not only can we deliver and operate our assets more efficiently and effectively – with greater amenity, safety, utility and purpose – we can also plan for them in an increasingly uncertain future.

We can do this by routinely and consistently utilising digital tools, technology and processes: innovations such as digital engineering, building information modelling, digital twins, internet of things, artificial intelligence and augmented reality could be utilised on all state assets and projects. This will positively impact over $300 billion of infrastructure we currently own and operate, alongside the $113 billion we have planned to deliver or currently underway.

By using digital tools, technology and processes, we can have our cake and eat it too. This Roadmap establishes a strategic framework for NSW Government working towards a 'digital by default' approach to how our infrastructure assets are planned, designed, built, operated, maintained and decommissioned.

While the future of innovation and digital is unclear, the need to lay strong foundations to accelerate towards that future is clear. The decisions we make now will impact generations to come. This Roadmap and the initiatives the NSW Government implements in the years to come will build the foundations for a modern, data and technology-enabled built environment.

I'm passionate about the future of infrastructure and the actions we need to make today.

The Hon. Rob Stokes MP
Minister for Infrastructure, Cities and Active Transport

Message from Minister Dominello

A ‘digital thread’ is defined as “the use of digital tools and representations for design, evaluation and life cycle management”. In Australia, there is no state or territory that operates on a unified digital thread when it comes to infrastructure planning, design and construction. This Roadmap is the first step in a journey to build this ‘digital thread’ in NSW.

This will allow the NSW Government to support communities that flourish for current and future generations, enabled by systems and data that are interoperable, reliable and secure. Only then will the latest technologies and innovations, such as the internet of things, artificial intelligence and augmented reality, fully enable better outcomes.

For this to be a reality, foundations need to be set now.

A future state of the built environment that would be characterised by:

- ‘Digital first’ approaches are mainstream and adopted from the onset of a project. Analogue processes such as printing, static versions and nonlinked sets of information, data and documentation become a thing of the past.
- Information and data are seamlessly transferred across the full project lifecycle, from initial planning stages through to asset operation, maintenance and enhancements in the future.
- Collaboration is seamless and transparent across government, industry and academia.
- Better quality of public infrastructure, delivered and operated with greater value for money.
- Smart cities unlock the benefits from the latest technology and innovations, such as smart agriculture, driverless cars, integrated planning and artificial intelligence.
- Newly skilled, capable and diverse workforces across the sector.

This Roadmap will build strong foundations for a digitally enabled infrastructure pipeline to the benefit of NSW and its citizens.

The Hon. Victor Dominello MP
Minister for Customer Service and Digital Government

Introduction

Infrastructure digitalisation imperative

Since 2011, the NSW Government has invested $178 billion in infrastructure, improving community wellbeing through new and improved hospitals, schools, roads and rail, parks and green spaces, as well as cultural and sporting facilities.[1]

Infrastructure investment will increase over the decades to come as needs change and demand grows.[2] Investment in quality infrastructure is fundamental. It underpins how each of us live, work and play. It enables NSW industry and businesses to remain globally competitive while meeting the NSW Government's social and environmental policy goals.

However, public infrastructure is increasingly facing headwinds. Productivity of the sector is declining, cost of capital is rising, usage of infrastructure is undergoing structural shifts, capacity is constrained as are the supply chains for materials and equipment that underpin it (Box 1). The need to deliver more quality infrastructure has never been greater.

We can tackle this challenge head on by planning, delivering and operating our infrastructure more efficiently and effectively.

We will do this by harnessing the power of digital technology, processes and systems on each and every infrastructure investment as well as our existing assets (Figure 1). This will save time and cost, deliver better services, ensure community voices are heard and drive innovation and productivity across the sector.

We will:

Adopt a 'digital by default' way of working on new and existing infrastructure

Build essential capabilities across industry and government for widespread application of digital tools in infrastructure

Establish the environment needed to optimise the value of data and information throughout all stages of the asset lifecycle

Take a partnership-based approach with industry and academia in implementing this Roadmap

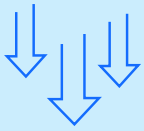
Box 1 – Construction industry productivity challenges

The construction industry is integral to the NSW and Australian economies. It is the fourth largest industry in the State, employing about 8% of workers in NSW and contributing about 7% of Gross State Product.[3] Nationally, the industry employs approximately 1 in 10 people and contributes almost 8% of Gross Domestic Product.[4]

Australia's construction productivity growth has been slow over the past 30 years, lagging behind other industries by over 25%.[5] This trend is not unique to Australia. In terms of construction labour productivity growth, Australia's rate of growth is comparable to other advanced economies, although the rate of productivity growth is lower than the top performing economies.[6]

Lifting the level of productivity in the construction sector is particularly important in the current environment, given the NSW Government's ambitious infrastructure investment agenda and the significant capacity constraints faced by the sector.[7]

Figure 1 – Key challenges in the built environment and opportunities from digitalisation



Declining productivity

Australia's infrastructure sector is facing a systemic productivity decline.

Skill shortages, diversity and cultural challenges, cost pressures and low profit margins are all contributing to this decline.

How digitalisation can respond

Implementing more efficient digital processes, systems, data and resources could unlock significant productivity improvements by replacing manual or paper-based workflows, reducing errors and inaccuracies, and enhancing collaboration.

Increasing complexity

Infrastructure projects have become larger and more connected to their surrounding systems.

This is challenging traditional forms of infrastructure planning, design and delivery.

How digitalisation can respond

Digital technology allows industry and government to manage project complexity and risks in a digital environment. This will improve coordination and collaboration and reduce mistakes and construction rework.

Population growth

The NSW population is expected to grow to 9.9 million by 2041.[8] As the population grows, so too will demand for government services.

How digitalisation can respond

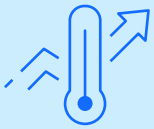
Digital processes and tools can drive better utilisation of existing assets and services. It can also reduce project delivery times, meaning that more infrastructure can be delivered quicker and at less cost. Strategic land use platforms can also improve coordinated infrastructure, land use and service planning across a range of stakeholders.

Increasing asset maintenance costs

NSW operates and maintains more than $300 billion of infrastructure assets. Maintaining these assets effectively and efficiently is critical.

How digitalisation can respond

Digital asset management practices can transform the way assets are managed by identifying potential asset failures, capturing accurate real time data, scheduling maintenance work and much more. This will help improve asset efficiency, utilisation and amenity.



Climate change

The economic cost of more frequent and severe natural disasters could cost the State between $15.8 billion and $17.2 billion a year on average by 2060-61.[9]

Improving the resilience of the State's assets and networks through better planning, preparation and response is essential.

How digitalisation can respond

Digitalisation can help to identify, manage and mitigate against potential and preventable failures, including those that cascade through interconnected infrastructure systems.

It also provides an opportunity to improve the infrastructure planning and delivery in locations vulnerable to natural hazards such as floods, and improve the resilience of existing vulnerable assets.

Purpose of this Roadmap

This Roadmap sets out the NSW Government's approach to driving widespread adoption and application of digital technologies throughout the infrastructure lifecycle (Box 2).

While there is a strong appetite and an increasing number of initiatives being rolled out across NSW Government agencies to digitalise infrastructure, more work is needed to drive alignment and harmonisation (Box 3).

A key objective of this Roadmap and its implementation is to establish a standardised approach to digitalising the process to plan, design, construct, operate and maintain the State's infrastructure assets.

Transforming the way government and industry approach infrastructure through digitalisation requires a concerted and integrated program.

This transformation will not happen instantly. It will require sustained commitment and leadership to achieve progressive and lasting change.

The digital landscape is constantly changing. Government initiatives to support this Roadmap are expected to evolve over time.

Box 2 – Digitalisation and digital technologies

'Digitalisation' often means different things to different people.

In this Roadmap, it represents much more than simply adopting digital tools. It is about the way in which government and private organisations create, manage and use data throughout the entire infrastructure lifecycle.

Adopting new tools, platforms and processes supports digitalisation of the infrastructure sector. This ranges from embedding sensors to physical infrastructure, to digital engineering and planning platforms used for individual projects (such as BIM and asset management systems), to models of the built environment as a whole (such as Digital Twins).

Box 3 – Alignment with NSW Government priorities

This Roadmap aligns with the NSW Government's policy priorities for improving economic, social and environmental outcomes, and putting customers at the centre of everything the NSW Government does.

Specific recommendations to the NSW Government to adopt digital engineering and planning tools were made in Infrastructure NSW's 2018 and 2022 State Infrastructure Strategies, the NSW Smart Places Strategy and the recent bushfire and flood inquiries.

These strategies and documents highlight the importance of digital technologies as a key enabler of new and efficient ways to plan, prioritise, coordinate, construct and manage infrastructure assets.

Opportunities and benefits from digitalisation

The potential benefits of digitalising infrastructure are significant (Box 4, Figure 2, Figure 3).

The EU BIM Task Group for example, reports that the estimated financial opportunity for digitalising engineering, construction and operations processes to be in the range of 10%-20% of capital expenditure of infrastructure projects.[10]

Even if just half of this financial opportunity were to be realised across the entire annual NSW infrastructure program, savings for NSW taxpayers would be considerable. Widespread adoption of "digital technologies" across the infrastructure lifecycle is therefore worth pursuing.

However, 'digitalisation' of infrastructure (including consistent practices applied to data and information management) is yet to be well-entrenched across the NSW infrastructure sector. The level of digital maturity and capability, processes and practices applied, and the types of systems and technology used across the sector vary substantially.

Key to unlocking productivity and efficiency benefits of digitalisation is reliable data, standardised processes supported by relevant policy and guidelines, and workforce capability.

Box 4 – Benefits of digitalising infrastructure for projects

While the actual efficiency and productivity gains of digitalising infrastructure will vary across individual projects, examples of reported benefits include:

- **20% labour productivity increase,** with less time spent on fixing errors, and avoiding rework and duplication of efforts across a range of tasks.[11] This creates capacity for everyone to focus on higher value activities.
- **7% reduction in delivery time** from improved work sequencing and project management.[12,13] A reduction in delivery time also means improved safety and less disruption for everyone.
- **Longer asset life** from predictive maintenance scheduling and approaches.[14]
- **Reduced environmental costs** by increasing the ability to capture, monitor, report and test environmental outcomes.[15] Examples include smart water monitoring solutions which reduce water consumption and modular construction to reduce material waste.[16]
- **A positive return on investment.** Over half of the surveyed Australian firms that focus on infrastructure projects reported up to a 25% return on investment for BIM.[17]

Other benefits include improved quality of public infrastructure, reduced project cost, greater transparency and community engagement, improved safety and greater sustainability of the built environment.

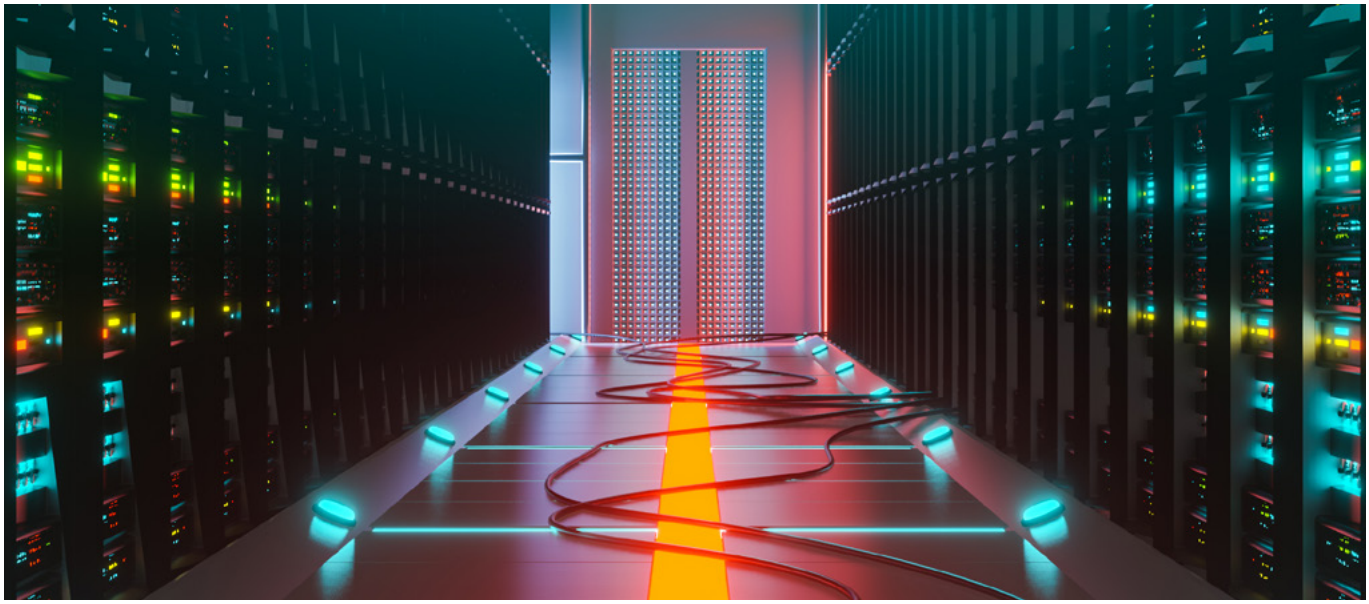
Figure 2 – Economic, environmental and social benefits of digitalising infrastructure

	Government / public assets		Industry		Individual / community
	Planning, design and delivery	**Operation and maintenance**	**Construction**	**Digital / other**	
Economic	• Improved project efficiency and faster delivery • Greater collaboration • Accuracy of shared information • Reduced uncertainty	• Lower maintenance cost • Lower operations cost	• Increased competitiveness • New jobs / specialisation opportunities • Increased export capability • Less errors and rework	• New market innovation, services and business opportunities (e.g. advanced manufacturing) • Improved cyber-security / ancillary services	• More efficient and effective government services • Faster and simpler planning approvals and through digital processes
Environmental	• Reduced waste • Lower carbon emissions • Better assessment and consideration of natural hazards / climate change risks / green infrastructure and the ecological network	• Optimised energy use • Asset life longevity	• Resource efficiency • Circular economy	• Enhanced practices in related fields (e.g. environmental assessments / design / resource efficiency)	• Improved environmental and community design considerations • Improved asset performance and comfort
Social	• Improved health and safety	• Improved social outcomes from better quality / customer-focused infrastructure services	• More diverse and safer jobs in construction • Attraction and establishment of the next generation of the workforce	• Improved awareness for digital inclusion • Broader sector opportunities for the workforce	• Improved and inclusive public consultation and engagement • Customer-centric design

Source: INSW based on multiple sources

Figure 3 – Digitalising infrastructure – unlocking opportunities

Category	Description	Example digital technologies, approaches, processes and opportunities
Digital in physical infrastructure delivery	The application of digital technologies, processes, and systems to plan, design and deliver infrastructure in a more efficient way. The dominant opportunity within this area is better decisions, reporting, savings across the project and asset lifecycle enabled by improved information flow.	• Building Information Modelling (BIM) • Digital Engineering • Design for Manufacture and Assembly (DfMA) • Kit of Parts • Virtual Reality • Augmented Reality • Unmanned Aerial Vehicles/Drones
Digital systems & technological infrastructure	The activation of physical infrastructure through digital networks and communications. Internet of Things and similar technologies create new information sources within infrastructure and project assets that were previously 'static' and required manual investigation to gauge status.	• Embedded Sensors • Smart infrastructure • 5G • Edge Computing • Blockchain
Data as an infrastructure asset	Valuing and improving the quality of data that underpins infrastructure project planning, delivery and asset management. Unlocking the value of data through consistent structures and classifications, enabling better decisions, faster.	• Digital Twins • 3D and 4D foundation spatial data • Digital Asset Management • Automated Infrastructure • Rules as Code



The future of our built environment

A connected system of assets and networks

The built environment that surrounds us has increasingly become a complex system of connected assets and networks comprising economic infrastructure, social infrastructure and the natural environment (Figure 4).

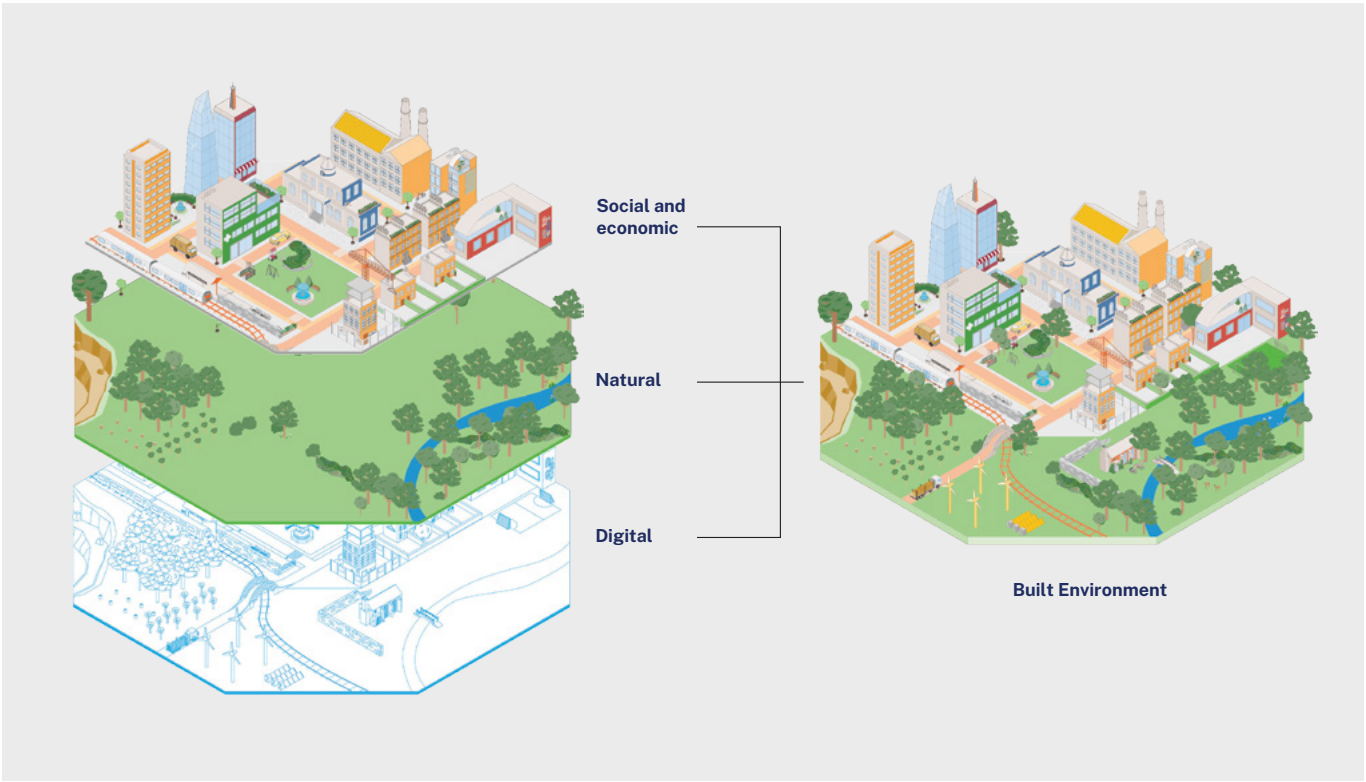
Challenges faced by the built environment are also growing in complexity – from the need to build-in resilience to our public assets against shocks (e.g. natural hazards and pandemics), to reducing the carbon footprint of infrastructure delivery and operation.

Further, evolving digital technology, faster connectivity and big data will continue to permeate all aspects of society – in what we do, and how we interact with the physical world each day.

Within this context, interventions in one part of the built environment are increasingly having consequences elsewhere in the connected system of assets and networks.

A holistic view across the built environment is essential when planning, designing, constructing and operating our infrastructure assets to ensure the right outcomes for our communities and businesses are achieved.

Figure 4 – The built environment as a complex system of connected assets and networks



Source: based on Centre for Digital Built Britain 2021 – National Digital Twin Programme

Better outcomes from services delivered through the built environment

The built environment as an interconnected system provides the services we rely on and the outcomes we seek to achieve. Our wellbeing is determined by the quality of the services enabled by, or directly delivered through, the built environment.

Opportunities to leverage the built environment as a means to achieving outcomes for people should be front-of-mind at all stages of the asset lifecycle. When new services or assets are needed, they should be integrated into the broader system, rather than designed and constructed in isolation.

Embedding a standardised 'digital' approach

New capabilities, tools and processes are needed to effectively manage an increasingly complex and interconnected system of assets and networks.

Digitalisation of the infrastructure lifecycle essentially seeks to enable people to:

- manage data and information effectively
- standardise and improve processes
- apply technology effectively to achieve desired outcomes.

Widespread adoption and application of digital technology in infrastructure will provide an essential bedrock for better decision-making by giving the right people access to the right information at the right time.

Across NSW Government agencies, the adoption and application of digital technologies in infrastructure are gaining momentum. Many agencies have made significant progress applying digital technologies at different stages of the infrastructure lifecycle (Box 5).

Box 5 – NSW Government digital initiatives in infrastructure – selected examples

- **Transport for NSW Digital Engineering framework** – The framework brings together systems and related data sets into a common data environment. This drives a consistent approach across organisations and allows projects to adopt digital engineering simply and rapidly.
- **Land iQ** – Department of Planning and Environment's Land iQ helps the NSW Government identify and analyse suitable sites for land evaluation or development. The assessment of site options within the tool supports consistent, more informed and faster decision making.
- **Building Trustworthy Indicator** – This creates a 'building DNA' in terms of what materials have been used, how the building was constructed and managed and who has been involved in the development. This transparency drives trust and confidence in the built environment.
- **NSW Spatial Digital Twin/Live NSW** – The NSW Spatial Digital Twin is an interactive platform to capture and display real-time 3D and 4D spatial data to model the built environment.
- **Modern Methods of Construction** – School Infrastructure NSW has adopted consistent, repeatable and digitally-enabled design approaches. This has improved the speed of delivering high quality, efficient and sustainable educational infrastructure.
- **Smart Planning Approvals** – This project seeks to streamline the Development Application (DA) assessment process by leveraging the data captured by existing planning tools and applying artificial intelligence algorithms.
- **Asset AI** – Artificial intelligence algorithms and real-time data are helping NSW Government and local councils understand road network conditions and address road repairs faster.

These initiatives have enabled more accurate and sophisticated analysis, cost savings from efficiency gains, and enhanced outcomes through better decision-making, and scaling their application is on the horizon.

Overcoming challenges to wider adoption

The true value of digitalisation is only unlocked when data and information used throughout the infrastructure lifecycle is reliable and interoperable, and when digital approaches become the norm across the sector.

However, there are challenges and barriers that will need to be addressed (Box 6, Box 7, Box 8). Lack of consistency or the absence of relevant standards, policies and procurement processes, and inadequate digital-related skills and capability both in the public and private sectors are critical barriers to widespread adoption.

Moreover, the level of 'digital maturity' varies across NSW government infrastructure delivery agencies. Some agencies have well-established internal policies, frameworks, guidelines and training programs, while others are at early stages of exploring digital approaches to infrastructure.

A whole of NSW Government approach is essential to ensure that practices and requirements across NSW Government agencies are broadly consistent. This will make it easier for industry to work across multiple government clients and infrastructure projects.

Box 6 – Barriers to adoption – Construct NSW (2021)

The 2021 report *Construct NSW: Digitalisation of Construction* prepared for the Office of the NSW Building Commissioner highlights the criticality of uplifting digital capabilities in order to unlock productivity benefits across the construction sector.[18]

Based on a survey targeting class 2 builders and designers, it was found that while most survey respondents were at a basic stage of digitalisation, there was broad recognition of its potential benefits such as achieving greater accuracy, and delivering projects on time and on budget.

The report also identified a range of barriers to digitalisation, including:

- the cost of software and licenses
- the cost of hardware
- inadequate design fees.

The research found that it could take up to 10 years before class 2 designers and builders reached a level of digital maturity where advanced capabilities such as BIM and Digital Twins are widespread.

The report concluded that investment in training and capability building would likely be the most impactful enabler for achieving digital maturity faster, followed by measures to reduce barriers to costs and system interoperability.

Box 7 – Barriers to adoption – Australian Institute of Architects (2021)

BIM and Beyond: Design Technology in Architecture released in 2021 by the Australian Institute of Architects reported on the state of digital adoption in the sector based on a survey of senior architects and design technology specialists across Australia.[19]

Based on the survey, the top five most common barriers selected by respondents included:

- lack of in-house expertise
- cost of software
- lack of standardised protocols
- no established contractual framework for working with BIM
- lack of training.

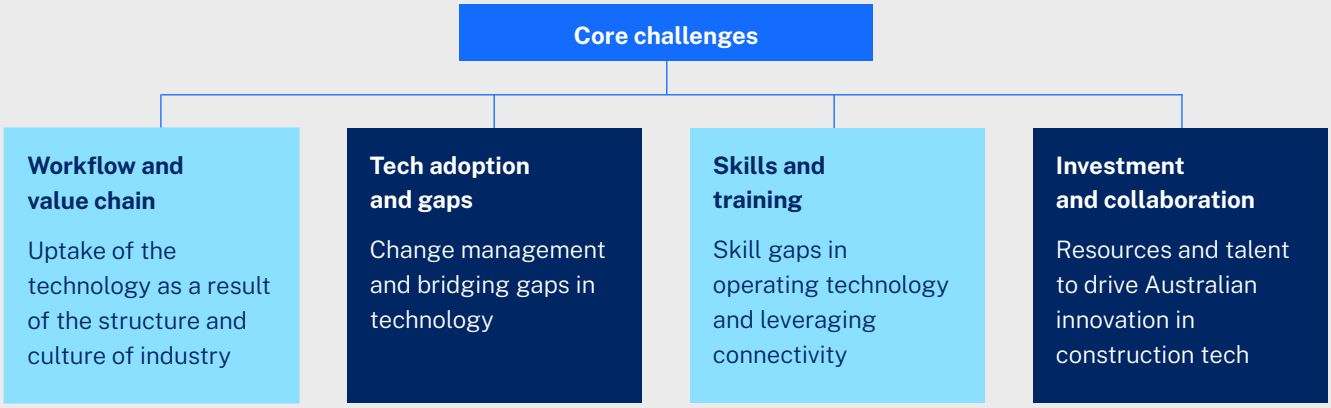
The report also highlighted that ongoing market education and further client education as key enablers to increase adoption and use of BIM and other digital engineering tools in Australia.

Box 8 – Barriers to adoption – Australian Broadband Advisory Council (2022)

The Australian Broadband Advisory Council advises the Australian Government on maximising the social and economic benefits of high speed broadband connectivity and digital technologies. To support this council, a Construction Expert Working Group (CEWG) was established to investigate the uptake of technology within the construction sector.

CEWG has identified four core challenges to wider adoption of construction technologies within the construction sector.[20] An integrated and sectoral-wide response is required to respond to these challenges.

However, not all organisations are the same. The varying needs of organisations will need to be considered to best overcome specific challenges.



Four workstreams for success

A multi-pronged approach to drive change

The NSW Government is committed to the long-term digital transformation of the State's infrastructure program - both existing and new. This commitment includes a program of work to be delivered over several years that will be developed and implemented in partnership with industry.

A multi-pronged approach is needed to achieve widespread adoption of digital planning and engineering tools throughout the infrastructure lifecycle.

Four workstreams are fundamental to this transformation, with each having a critical role (Figure 5). An overview of each pillar and some of the key focus areas are outlined below.

For each workstream, the NSW Government will identify and implement a range of actions. Many of these will build the necessary foundations and enablers to accelerate wider adoption of digital tools.

Importantly, actions progressed will seek to align and integrate with national and international standards to ensure the NSW infrastructure sector and workforce remain globally competitive.

As the digital landscape evolves, the role of NSW Government to support widespread adoption and application of digital technologies will also evolve.

Figure 5 – Four workstreams to achieve widespread adoption and application of digital in infrastructure

People & Governance

Such as:

- Whole of NSW Government vision and leadership
- Digital skills and capabilities (both government and industry)
- Partnering with industry

Policy & Standards

Such as:

- Whole of NSW Government standards and guidance
- Policies within agencies
- Procurement requirements

Data

Such as:

- Data standards and interoperability
- Common data environment
- Data security

Technology & Systems

Such as:

- System innovation and real time sensors
- Digital systems throughout the lifecycle
- Cyber-security

People and Governance workstream

The People and Governance workstream is a fundamental element of driving the progress of this Roadmap. Delivering digital transformation in infrastructure will require strong leadership, ownership and governance of the program.

Focus areas of the People and Governance workstream include:

- define and communicate the compelling drivers and goals of this Roadmap
- provide leadership and ownership within government to champion the Roadmap and associated initiatives
- define the necessary roles, functions, processes and technology used across NSW Government to ensure that all agencies involved are working in collaboration and partnership
- drive capability uplift across the sector through existing and new training initiatives
- work with industry to facilitate and support capability uplift across the construction sector.

Case study	**School Infrastructure NSW – Modern Methods of Construction**		
What we're doing	**Benefits**	**Critical lessons**	**How to scale it**
Over the past two years, School Infrastructure NSW has adopted a consistent, repeatable and digitally enabled design approach to educational infrastructure.	Opens up the market to new participants and builds a strong skill base in advanced manufacturing. Reduced disruption to school operations, using offsite manufacturing and onsite assembly. Faster delivery to be more responsive to local demographics, particularly in areas of rapid growth.	Design and process standardisation will drive efficiencies, but requires industry to adapt and innovate. Industry support is critical for successful outcomes and requires change management support from cluster side.	Ongoing and expanded use of digital design (BIM), procurement (marketplace) and logistic (track and trace) platforms to identify efficiencies and advance the delivery model.

Policy and Standards workstream

The Policy and Standards workstream seeks to establish the enabling policy landscape for widespread adoption and use of digital tools. This workstream focuses on assessing and addressing legal, regulatory, procurement and policy barriers to collaborative working and data sharing throughout the infrastructure lifecycle. It will also seek to develop guidance material to support government practitioners and industry looking to adopt digital approaches to infrastructure.

Focus areas of the Policy and Standards workstream include:

- develop and implement a whole-of-government framework for data and information management applied to the infrastructure lifecycle, including underlying processes and procedures required to support digital engineering at agency and project level
- update NSW Government policies and guidelines to clarify data and information requirements in public infrastructure procurement
- establish consistent and appropriate data standards and requirements that ensure interoperability and usability of information throughout the infrastructure lifecycle.

Case study	**Transport for NSW - Digital Engineering Framework (DEF)**		
What we're doing	**Benefits**	**Critical lessons**	**How to scale it**
The Digital Engineering Framework has been acknowledged as a world leading management system for engineering processes. Its advanced data exchange capabilities make sense of the complex spaghetti of standards and asset classifications.	The DEF is conservatively saving 2-3% CAPEX based on analysis of seven projects. Efficiencies are increasing in line with industry uplift.	Industry capability uplift and the investment to do this is key to success. Being technology agnostic is important so industry can optimise their technology and workflows while complying with government data requirements.	A consistent whole-of-government and digitally enabled taxonomy for classifying assets will allow the benefits of the framework to be scaled. Simultaneously, software vendors need to adopt open-source standards to enable interoperability.

Data workstream

The Data workstream seeks to establish good practices in information management. The built environment is rich with data and is more productive when that data is connected. Ensuring consistency, reliability and interoperability of project and infrastructure data will be a key focus, as these are prerequisites for unlocking efficiency and productivity gains across the sector.

Focus areas of the Data workstream include:

- create standardised data sets where appropriate as the 'single source of truth' that can be applied across multiple agencies
- develop consistent and interoperable digital environments so the right people have the right information at the right time
- support the processes and systems that handle built environment data across the infrastructure lifecycle
- establish frameworks and protocols that enables effective information exchange within and across infrastructure projects and the built environment.

Case study	**Department of Planning and Environment - Land iQ**		
What we're doing	**Benefits**	**Critical lessons**	**How to scale it**
Land iQ provides a single source of truth for land identification and assessment across NSW Government by aggregating data from more than 100 different sources to assess size, location and zoning constraints.	Estimated $15 million in savings from cutting site assessments to hours or days, down from weeks or months. Reduced duplication of basic data collection and land use analysis functions and tools. Prevents agencies undertaking work on the same parcel of land for different purposes in silos.	Automation is critical to manage and consolidate large amounts of data. Uptake hinges on effective change management supported by training.	Expanding the data repository that Land iQ draws from will enable its functionality to be applied across agencies and produce richer insights. Managing software licensing at an enterprise-wide level will remove barriers for use by NSW Government agencies.

Technology and Systems workstream

The Technology and Systems workstream supports and activates initiatives in the Data workstream. 'Digital first' approaches to the planning, delivery and operations of infrastructure require the adoption of new platforms and processes.

However, any new digital approaches or platforms must ensure cyber-security foundations are robust and build-in the necessary protocols and processes to mitigate system failure risks. Focus areas of the Technology and Systems workstream include:

- build the cyber-security and data management frameworks needed to support a growing digital engineering and planning environment
- identify and capitalise opportunities to automate standard processes, approvals and compliance checks
- embed technologies that collect, capture and communicate information in real time
- investigate the potential for additional state-wide digital tools.

Case study	**Spatial Services – NSW Spatial Digital Twin (SDT)**		
What we're doing	**Benefits**	**Critical lessons**	**How to scale it**
The NSW Spatial Digital Twin is a comprehensive 4D digital model of the State's physical and built environment.	The estimated net present value of benefits for the NSW Spatial Digital Twin is $948 million over 10 years derived from the ability to visualise projects before they start and better predict and plan future outcomes. The NSW Spatial Digital Twin facilitates richer stakeholder engagement, speeds up infrastructure delivery, and provides greater confidence to industry, policy makers, and ultimately better community outcomes.	Inconsistent data standards present a challenge to widespread adoption across government.	Consistent guidelines, policies and data standards would enable the integration of digital engineering models into the NSW Spatial Digital Twin and allow it to be applied more broadly across NSW Government agencies.

Working with industry

Our commitment to ongoing industry engagement

Engagement and collaboration across the construction industry, academia and NSW Government is fundamental to ensure this Roadmap is practical, implementable and impactful.

Many industry members operating internationally and across jurisdictions have a strong track-record of delivering digitally enabled projects. Because of this, working alongside industry and academia is critical to the success of this Roadmap.

In progressing this Roadmap, the NSW Government will:

- collaborate with industry and academia in developing a NSW Government action plan to support implementation of this Roadmap
- leverage existing forums such as the NSW Government Construction Leadership Group to continue engagement with industry
- ensure digitalisation of the infrastructure lifecycle and existing assets remains a key focus of NSW Government policy and industry dialogue going forward.

> The NSW Government is committed to engaging and collaborating with industry to address key barriers preventing adoption of digital tools throughout the infrastructure lifecycle.

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